Me 'n' Mine™

VIII

Answer Book
Pullout Worksheets
Mathematics

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Solutions to

PULLOUT WORKSHEETS AND PRACTICE PAPERS

Chapter 1

RATIONAL NUMBERS

WORKSHEET–1

1. (D) Negative of – 7 = – (– 7) = 7

$[\because -(-a) = a]$

2. (C) Multiplicative identity for any rational number = 1.

3. (B) Reciprocal of $\frac{4}{-5} = \left(\frac{4}{-5}\right)^{-1} = \frac{-5}{4}$.

4. (D) $\frac{7}{5}$ × Reciprocal of $\frac{-7}{13} = \frac{7}{5} \times \frac{13}{-7}$

$= \frac{-13}{5}$.

5. (A) The given property is commutativity under multiplication.

6. (B) $\frac{-3}{5} \times \frac{4}{7} \times \frac{15}{16} \times \left(\frac{-14}{9}\right)$

$= \frac{-3}{9} \times \frac{4}{16} \times \frac{15}{5} \times \frac{-14}{7}$

$= \frac{-1}{3} \times \frac{1}{4} \times \frac{3}{1} \times \frac{-2}{1}$

$= \frac{6}{12} = \frac{1}{2}$.

7. (B) Since addition is associative for rational numbers. Therefore, for rational numbers *a*, *b* and *c*,

$a + (b + c) = (a + b) + c.$

8. (A) Since – 3 is a negative number, so it is on the left of 0 on the number line.

9. (D) Reciprocal of zero is not defined.

10. (D) Rational numbers between – 1 and 0 must be negative. $-\frac{2}{3}$ and $-\frac{1}{3}$ lie between – 1 and 0.

11. (C) $\frac{1}{7} = 0.1428$, $\frac{1}{6} = 0.1667$

$\frac{13}{100} = 0.13$, $\frac{9}{50} = \frac{18}{100} = 0.18$,

$\frac{3}{20} = \frac{15}{100} = 0.15$

$\therefore \frac{3}{20}$ is between $\frac{1}{7}$ and $\frac{1}{6}$.

12. (B) The sum, subtraction and multiplication of two rational numbers is always a rational number.

13. (D) $\frac{7}{0}$ is not defined and so it is not a rational number.

14. (A) Area of rectangle

= Length × Breadth

$= \frac{4}{7} \times \frac{3}{8}$

$= \frac{12}{56} = \frac{3}{14}$ m^2.

15. (C) Length $= \frac{\text{Area}}{\text{Breadth}} = \frac{1}{\left(\frac{3}{5}\right)} = \frac{5}{3}$ cm.

16. (A) Additive inverse of $\frac{19}{-6} = -\left(\frac{19}{-6}\right)$

$= \frac{19}{6}$.

WORKSHEET–2

1. Yes. $1\frac{3}{7} = \frac{1\times 7+3}{7} = \frac{7+3}{7} = \frac{10}{7}$

Multiplicative inverse of $1\frac{3}{7}$

$$= \frac{1}{\left(\frac{10}{7}\right)} = \frac{7}{10} = 0.7.$$

2. (*i*) $\frac{-51}{-72} = \frac{51}{72} = \frac{17\times 3}{24\times 3} = \frac{17}{24}.$

(*ii*) $\frac{-15}{30} = \frac{-1\times 15}{2\times 15} = \frac{-1}{2}.$

3. (*i*) $\because\ -10 < -5$

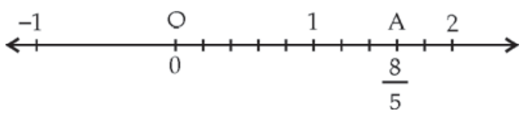
$\therefore\quad \frac{-10}{7} \boxed{<} \frac{-5}{7}.$

(*ii*) $\because\quad 7 > -7$

$\therefore\quad \frac{7}{3} \boxed{>} \frac{-7}{3}.$

4. Let us 1 is represented on the number line by 5 divisioins

Therefore, $\frac{8}{5}$ is represented by $\frac{8}{5} \times 5$ *i.e.*, 8 divisions.



Thus, the point A represents $\frac{8}{5}$ on the number line.

5. There are infinitely many rational numbers less than 3. Five of them are: $-3, -1, 0, 1, 2$.

6. (*i*) Let us first find the LCM of 6, 5, 3 and 2

LCM of 6, 5, 3 and 2

$= 2 \times 3 \times 5 = 30$

2	6, 5, 3, 2
3	3, 5, 3, 1
5	1, 5, 1, 1
	1, 1, 1, 1

Now,

$$\frac{-1}{6} = \frac{-1\times 5}{6\times 5} = \frac{-5}{30}$$

$$\frac{1}{-5} = \frac{1\times 6}{-5\times 6} = \frac{-6}{30}$$

$$\frac{-1}{3} = \frac{-1\times 10}{3\times 10} = \frac{-10}{30}$$

$$\frac{-1}{-2} = \frac{-1\times 15}{-2\times 15} = \frac{15}{30}$$

$$1 = \frac{1}{1} = \frac{1\times 30}{1\times 30} = \frac{30}{30}$$

$\because\quad -10 < -6 < -5 < 15 < 30$

$\therefore\quad \frac{-10}{30} < \frac{-6}{30} < \frac{-5}{30} < \frac{15}{30} < \frac{30}{30}$

or $\quad \frac{-1}{3} < \frac{1}{-5} < \frac{-1}{6} < \frac{-1}{-2} < 1.$

(*ii*) LCM of 2, 5, 10 and 15 = 30

Now,

$$\frac{2}{5} = \frac{2\times 6}{5\times 6} = \frac{12}{30}$$

$$\frac{-1}{2} = \frac{-1\times 15}{2\times 15} = \frac{-15}{30}$$

$$\frac{8}{-15} = \frac{-8\times 2}{15\times 2} = \frac{-16}{30}$$

$$\frac{-3}{10} = \frac{-3\times 3}{10\times 3} = \frac{-9}{30}$$

$\because\quad -16 < -15 < -9 < 12$

$\therefore\quad \frac{-16}{30} < \frac{-15}{30} < \frac{-9}{30} < \frac{12}{30}$

or $\frac{8}{-15} < \frac{-1}{2} < \frac{-3}{10} < \frac{2}{5}$.

7.(*i*) LHS $= \frac{-5}{8} + \frac{3}{5}$

$= \frac{-5\times5+3\times8}{40} = \frac{-1}{40}$

RHS $= \frac{3}{5} + \frac{-5}{8} = \frac{3\times8-5\times5}{40}$

$= \frac{24-25}{40} = \frac{-1}{40}$

Clearly, LHS = RHS

Hence verified.

(*ii*) LHS $= (-8) \times \frac{18}{24} = \frac{-8}{24} \times 18$

$= \frac{-1}{3} \times 18 = \frac{-18}{3}$

RHS $= \frac{18}{24} \times (-8) = 18 \times \frac{-8}{24}$

$= 18 \times \frac{-1}{3} = \frac{-18}{3}$

Clearly, LHS = RHS

Hence verified.

8. (*i*) $1 + \frac{1}{7} - \frac{3}{14} = \frac{1\times14+1\times2-3\times1}{14}$

[$\because$ LCM (1, 7, 14) = 14]

$= \frac{14+2-3}{14} = \frac{13}{14}$.

(*ii*) $\frac{-4}{9} + \frac{-2}{3} - \frac{-5}{9}$

$= \frac{-4}{9} + \frac{-2}{3} + \frac{5}{9}$

[$\because -(-a) = a$]

$= \frac{-4\times1-2\times3+5\times1}{9}$

[$\because$ LCM (3, 9) = 9]

$= \frac{-4-6+5}{9} = \frac{-5}{9}$.

9. (*i*) $-\frac{7}{8} + \frac{1}{4} = \frac{-7}{8} + \frac{1}{4}$

$= \frac{-7\times1+1\times2}{8} = \frac{-7+2}{8}$

$= \frac{-5}{8}$.

(*ii*) $\frac{3}{5} + \left(-\frac{7}{6}\right) = \frac{3}{5} + \frac{-7}{6}$

$= \frac{3\times6-7\times5}{30} = \frac{18-35}{30}$

$= \frac{-17}{30}$.

(*iii*) $\frac{-9}{13} - \left(-\frac{1}{26}\right) = \frac{-9}{13} + \frac{1}{26}$

[$\because -(-a) = a$]

$= \frac{-9\times2+1\times1}{26}$

$= \frac{-18+1}{26} = \frac{-17}{26}$.

WORKSHEET–3

1. Substitute $a = \frac{-5}{7}$, $b = \frac{13}{15}$ and $c = \frac{-1}{4}$ in LHS and RHS separately.

L.H.S $= a \times (b \times c)$

$= \frac{-5}{7} \times \left(\frac{13}{15}\times\frac{-1}{4}\right)$

$= \frac{-5}{7} \times \left(\frac{-13}{15\times4}\right)$

$$= \frac{5 \times 13}{7 \times 15 \times 4} = \frac{13}{7 \times 3 \times 4}$$

$$= \frac{13}{84}.$$

RHS $= (a \times b) \times c$

$$= \left(\frac{-5}{7} \times \frac{13}{15}\right) \times \frac{-1}{4}$$

$$= \left(\frac{-1 \times 13}{7 \times 3}\right) \times \frac{-1}{4}$$

$$= \frac{-13}{7 \times 3} \times \frac{-1}{4} = \frac{13}{7 \times 3 \times 4}$$

$$= \frac{13}{84}.$$

Hence, $a \times (b \times c) = (a \times b) \times c$ verified.

2. (*i*) Reciprocal of -7

$$= \text{Reciprocal of } \frac{-7}{1} = \frac{1}{-7}.$$

(*ii*) Reciprocal of 1

$$= \text{Reciprocal of } \frac{1}{1} = \frac{1}{1} = 1.$$

(*iii*) Reciprocal of $\frac{-4}{7} = \frac{7}{-4}$.

(*iv*) Reciprocal of $\frac{3}{-5} = \frac{-5}{3}$.

3. $$\frac{4}{7} \div \frac{1}{3} = \frac{4}{7} \times \frac{3}{1} = \frac{12}{7}$$

$$= \frac{12 \times 12}{7 \times 12} = \frac{144}{84}$$

And $$\frac{1}{3} \div \frac{4}{7} = \frac{1}{3} \times \frac{7}{4} = \frac{7}{12}$$

$$= \frac{7 \times 7}{12 \times 7} = \frac{49}{84}$$

$\because$ $144 \neq 49$ $\therefore$ $\frac{144}{84} \neq \frac{49}{84}$

or $\frac{4}{7} \div \frac{1}{3} \neq \frac{1}{3} \div \frac{4}{7}$.

4. (*i*) $$-2 \div \frac{-2}{5} = -2 \times \frac{5}{-2} = \frac{(-2) \times 5}{-2}$$

$$= 5.$$

(*ii*) $$\frac{13}{7} \div \left(\frac{-14}{13}\right) = \frac{13}{7} \times \left(\frac{13}{-14}\right)$$

$$= \frac{13 \times 13}{7 \times (-14)} = \frac{-169}{98}.$$

(*iii*) $$\frac{-2}{13} \div \left(\frac{-4}{39}\right) = \frac{-2}{13} \times \frac{39}{-4} = \frac{3}{2}.$$

5. (*i*) Substituting $x = \frac{-3}{14}$ and $y = \frac{1}{9}$ in $x + y$, we get

$$x + y = \frac{-3}{14} + \frac{1}{9} = \frac{-3 \times 9 + 1 \times 14}{126}$$

[$\because$ LCM (14, 9) = 126]

$$= \frac{-27 + 14}{126} = \frac{-13}{126} \quad \ldots(i)$$

Substituting $x = \frac{-3}{14}$ and $y = \frac{1}{9}$ in

$y + x$, we get

$$y + x = \frac{1}{9} + \frac{-3}{14}$$

$$= \frac{1 \times 14 + (-3) \times 9}{126}$$

$$= \frac{14 - 27}{126} = \frac{-13}{126} \quad \ldots(ii)$$

From equations (*i*) and (*ii*), we have

$$x + y = y + x$$

(*ii*) Substituting $x = \frac{-5}{8}$ and $y = \frac{-2}{5}$ in $x + y$, we get

$$x + y = \frac{-5}{8} + \frac{-2}{5}$$
$$= \frac{-5 \times 5 + (-2) \times 8}{40}$$
[∵ LCM (5, 8) = 40]
$$= \frac{-25-16}{40} = \frac{-41}{40} \qquad \ldots(iii)$$

Substituting $x = \frac{-5}{8}$ and $y = \frac{-2}{5}$ in $y + x$, we get

$$y + x = \frac{-2}{5} + \frac{-5}{8}$$
$$= \frac{-2 \times 8 + (-5) \times 5}{40}$$
$$= \frac{-16-25}{40} = \frac{-41}{40} \qquad \ldots(iv)$$

From equations (*iii*) and (*iv*), we have $x + y = y + x$.

6. Total number of students = 36.

Number of students liking cricket

$$= \frac{2}{3} \text{ of } 36$$
$$= \frac{2}{3} \times 36$$
$$= 2 \times 12 = 24$$

Number of students liking football

$$= \frac{1}{6} \text{ of } 36$$
$$= \frac{1}{6} \times 36 = 1 \times 6 = 6.$$

7. Total number of books = 12480

Number of books on literature

$$= \frac{5}{8} \text{ of } 12480 = \frac{5}{8} \times 12480$$
$$= 5 \times 1560$$
$$= 7800.$$

Number of books on fiction

$$= \frac{2}{5} \text{ of } 12480 = \frac{2}{5} \times 12480$$
$$= 2 \times 2496 = 4992.$$

8. $A = 16\frac{1}{4} \text{ m}^2 = \frac{16 \times 4 + 1}{4} \text{ m}^2 = \frac{65}{4} \text{ m}^2.$

$l = 11\frac{1}{8} \text{ m} = \frac{11 \times 8 + 1}{8} \text{ m} = \frac{89}{8} \text{ m}$

Area of a rectangle is given by

$A = l \times b$

$$\therefore \quad b = A \div l = \frac{65}{4} \div \frac{89}{8} = \frac{65}{4} \times \frac{8}{89}$$
$$= \frac{65 \times 2}{1 \times 89} = \frac{130}{89} = 1\frac{41}{89} \text{ m}.$$

So, the width of the rectangle is $1\frac{41}{89}$ m.

9. (*i*) $\text{LHS} = \left(\frac{-7}{8} \times \frac{4}{21}\right) \times \frac{-3}{4}$

$$= \left(\frac{-7 \times 4}{8 \times 21}\right) \times \frac{-3}{4}$$
$$= \left(\frac{-1 \times 1}{2 \times 3}\right) \times \frac{-3}{4}$$
$$= \frac{-1}{6} \times \frac{-3}{4}$$
$$= \frac{(-1) \times (-3)}{6 \times 4} = \frac{3}{6 \times 4} = \frac{1}{2 \times 4}$$
$$= \frac{1}{8}$$

$$\text{RHS} = \frac{-7}{8} \times \left(\frac{4}{21} \times \frac{-3}{4}\right)$$
$$= \frac{-7}{8} \times \left\{\frac{4 \times (-3)}{21 \times 4}\right\}$$
$$= \frac{-7}{8} \times \left\{\frac{1 \times (-1)}{7}\right\}$$
$$= \frac{-7}{8} \times \frac{-1}{7} = \frac{(-7) \times (-1)}{8 \times 7}$$

$$= \frac{7}{8 \times 7} = \frac{1}{8}$$

As, LHS = RHS, the given rational numbers satisfy the property of multiplication.

(*ii*) LHS $= \left(\frac{3}{7} \times \frac{-3}{8}\right) \times \frac{-2}{3}$

$$= \frac{3 \times (-3)}{7 \times 8} \times \frac{-2}{3} = \frac{-9}{56} \times \frac{-2}{3}$$

$$= \frac{9 \times 2}{56 \times 3} = \frac{3 \times 1}{28 \times 1} = \frac{3}{28}$$

RHS $= \frac{3}{7} \times \left(\frac{-3}{8} \times \frac{-2}{3}\right)$

$$= \frac{3}{7} \times \left\{\frac{(-3) \times (-2)}{8 \times 3}\right\}$$

$$= \frac{3}{7} \times \left(\frac{3 \times 2}{8 \times 3}\right) = \frac{3}{7} \times \frac{1}{4} = \frac{3}{28}$$

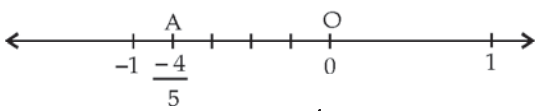
As LHS = RHS, the given rational numbers satisfy the property of multiplication.

WORKSHEET– 4

1. Additive inverse of

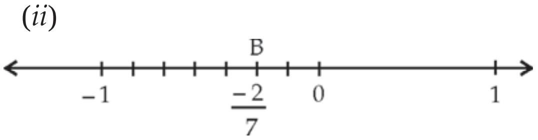
$$\frac{-2}{7} = -\left(\frac{-2}{7}\right) = \frac{2}{7}.$$

2. (*i*)



Point A represents $\frac{-4}{5}$ on the number line.

(*ii*)



Point B represents $\frac{-2}{7}$ on the number line.

3. Perimeter $= 13\frac{1}{2} + 11\frac{3}{4} + 3\frac{3}{8}$

$$= \frac{27}{2} + \frac{47}{4} + \frac{27}{8}$$

$$= \frac{27 \times 4 + 47 \times 2 + 27 \times 1}{8}$$

[∵ LCM (2, 4, 8) = 8]

$$= \frac{108 + 94 + 27}{8} = \frac{229}{8}$$

$$= 28\frac{5}{8} \text{ m.}$$

4. As we know that additive inverse of $-a = a$

∴ (*i*) Additive inverse of $\frac{6}{-11} = \frac{6}{11}$

And (*ii*) Additive inverse of $\frac{4}{-15} = \frac{4}{15}$.

5. Let the other rational number be x. Then,

$$x + \left(\frac{-5}{2}\right) = -7 \text{ or } x - \frac{5}{2} = -7$$

$$\therefore \quad x = -7 + \frac{5}{2}$$

(Transposing $\frac{-5}{2}$ to RHS)

$$= \frac{-14 + 5}{2} = \frac{-9}{2}$$

Thus, the other rational number is $\frac{-9}{2}$.

6. Let the other rational number be y.

Then,

$$y + \left(\frac{-3}{2}\right) = -8 \text{ or } y - \frac{3}{2} = -8$$

$$\therefore \quad y = -8 + \frac{3}{2}$$

(Transposing $-\frac{3}{2}$ to RHS)

$$= \frac{-16+3}{2} = \frac{-13}{2}.$$

Thus, the other rational number is $\frac{-13}{2}$.

7. $\frac{-2}{7} \times \frac{-42}{88} = \frac{-2}{7} \times \frac{-21}{44}$

$$= \frac{-2}{44} \times \frac{-21}{7}$$

$$= \frac{-1}{22} \times \frac{-3}{1} = \frac{(-1)\times(-3)}{22\times 1}$$

$$= \frac{3}{22}.$$

8. LHS $= \frac{-9}{20} \times \frac{35}{-27} = \frac{9 \times 35}{20 \times 27}$

$$= \frac{1 \times 7}{4 \times 3} = \frac{7}{12}$$

RHS $= \frac{35}{-27} \times \frac{-9}{20} = \frac{35 \times 9}{27 \times 20}$

$$= \frac{7 \times 1}{3 \times 4} = \frac{7}{12}.$$

Since LHS = RHS. Therefore, verified.

9. $\frac{5}{6} \times \frac{-3}{10} + \frac{-3}{10} \times \frac{2}{3}$

$$= \frac{1 \times (-1)}{2 \times 2} + \frac{(-1) \times 1}{5 \times 1}$$

$$= \frac{-1}{4} + \frac{-1}{5} = \frac{(-1)\times 5 + (-1) \times 4}{20}$$

$$= \frac{-5-4}{20} = \frac{-9}{20}.$$

10. LHS $= \left(\frac{-8}{3}\right) \times \frac{9}{25} = \frac{-8 \times 9}{3 \times 25}$

$$= \frac{-8 \times 3}{1 \times 25} = \frac{-24}{25}$$

RHS $= \frac{9}{25} \times \left(\frac{-8}{3}\right) = \frac{9 \times (-8)}{25 \times 3}$

$$= \frac{3 \times (-8)}{25 \times 1} = \frac{-24}{25}$$

Clearly, LHS = RHS.

Hence, $\left(\frac{-8}{3}\right) \times \frac{9}{25} = \frac{9}{25} \times \left(\frac{-8}{3}\right)$ is verified.

11. (*i*) $\frac{-8}{13} + \frac{-6}{13} = \frac{-8+(-6)}{13} = \frac{-8-6}{13}$

$$= \frac{-14}{13}.$$

(*ii*) $\frac{-1}{3} + \frac{2}{3} + \frac{5}{6} = \frac{-1\times 2 + 2 \times 2 + 5 \times 1}{6}$

[∵ LCM (3, 3, 6) = 6]

$$= \frac{-2+4+5}{6}$$

$$= \frac{-2+9}{6} = \frac{7}{6}.$$

12. Substituting $x = \frac{-3}{16}$ and $y = \frac{1}{9}$ in $x + y$, we get

$$x + y = \frac{-3}{16} + \frac{1}{9}$$

$$= \frac{-27+16}{144} = \frac{-11}{144} \qquad \ldots(i)$$

[∵ LCM (16, 9) = 144]

Substituting $x = \frac{-3}{16}$ and $y = \frac{1}{9}$ in $y + x$, we get

$$y + x = \frac{1}{9} + \frac{-3}{16} = \frac{16-27}{144}$$

$$= \frac{-11}{144} \qquad \ldots(ii)$$

From equations (*i*) and (*ii*), we obtain

$$x + y = y + x.$$

WORKSHEET–5

1. Substituting $x = \frac{-2}{15}$ and $y = \frac{1}{4}$ in $x + y$, we get

$$x + y = \frac{-2}{15} + \frac{1}{4}$$

$$= \frac{-8+15}{60} = \frac{7}{60} \quad \ldots(i)$$

$[\because \text{LCM }(15, 4) = 60]$

Substituting $x = \frac{-2}{15}$ and $y = \frac{1}{4}$ in $y + x$, we get

$$y + x = \frac{1}{4} + \frac{-2}{15} = \frac{15-8}{60} = \frac{7}{60} \quad \ldots(ii)$$

From equations (*i*) and (*ii*), $x + y = y + x$ is verified.

2. Other rational number

$$= -9 - \left(\frac{-3}{2}\right)$$

$$= -9 + \frac{3}{2} = \frac{-9\times 2+3}{2}$$

$$= \frac{-18+3}{2} = \frac{-15}{2}.$$

3. $\frac{-3}{7} \times \frac{-42}{66} = \frac{-3}{7} \times \frac{-7}{11}$

$$= \frac{(-3)\times(-7)}{7\times 11} = \frac{(-3)\times(-1)}{1\times 11}$$

$$= \frac{3}{11}.$$

4. LHS $= \frac{-8}{20} \times \frac{25}{24} = \frac{-2}{5} \times \frac{25}{24}$

$$= \frac{-2\times 25}{5\times 24} = \frac{-1\times 5}{1\times 12} = \frac{-5}{12}$$

RHS $= \frac{25}{24} \times \frac{-8}{20} = \frac{25}{24} \times \frac{-2}{5}$

$$= \frac{25\times(-2)}{24\times 5} = \frac{5\times(-1)}{12\times 1} = \frac{-5}{12}$$

Since, LHS = RHS.

Therefore, $\frac{-8}{20} \times \frac{25}{24} = \frac{25}{24} \times \frac{-8}{20}$ is verified.

5. $\frac{-9}{5} \times \frac{15}{27} + \frac{7}{8} \times \frac{-16}{35}$

$$= \frac{-1\times 3}{1\times 3} + \frac{1\times(-2)}{1\times 5}$$

$$= -1 + \frac{-2}{5}$$

$$= \frac{-5-2}{5} = \frac{-7}{5}.$$

6. LHS $= \left(\frac{-8}{3}\right) \times \frac{9}{25} = \frac{-8\times 9}{3\times 25}$

$$= \frac{-8\times 3}{1\times 25} = \frac{-24}{25}$$

RHS $= \frac{9}{25} \times \left(\frac{-8}{3}\right) = \frac{9\times(-8)}{25\times 3}$

$$= \frac{3\times(-8)}{25\times 1} = \frac{-24}{25}$$

Since LHS = RHS, so the given statement is proved.

7. $12\frac{1}{4}$ m $= \frac{48+1}{4}$ m $= \frac{49}{4}$ m

₹ $212\frac{1}{3}$ = ₹ $\frac{636+1}{3}$ = ₹ $\frac{637}{3}$

$\because$ Cost of $\frac{49}{4}$ m cloth = ₹ $\frac{637}{3}$

$\therefore$ Cost of 1m cloth = ₹ $\dfrac{\frac{637}{3}}{\frac{49}{4}}$

$= ₹\ \frac{637}{3} \times \frac{4}{49}$

$= ₹\ \frac{4}{3} \times 13 = ₹\ \frac{52}{3}$

$= ₹\ 17\frac{1}{3}$.

8. $\frac{-1}{4} = \frac{-1\times 18}{4\times 18} = \frac{-18}{72}$

$\frac{-1}{6} = \frac{-1\times 12}{6\times 12} = \frac{-12}{72}$

Since any 5 rational numbers between – 18 and – 12 are: – 17, – 16, – 15, – 14 and – 13

Therefore, 5 rational numbers between $\frac{-18}{72}$ and $\frac{-12}{72}$ are:

$\frac{-17}{72}, \frac{-16}{72}, \frac{-15}{72}, \frac{-14}{72}$ and $\frac{-13}{72}$.

9. Sum of $\frac{-1}{4}$ and $\frac{-8}{12}$

$= \frac{-1}{4} + \frac{-8}{12} = \frac{-1\times 3}{4\times 3} + \frac{-8}{12}$

$= \frac{-3}{12} + \frac{-8}{12} = \frac{-11}{12}$

Product of $\frac{-1}{4}$ and $\frac{-8}{12}$

$= \frac{-1}{4} \times \frac{-8}{12} = \frac{8}{4\times 12} = \frac{8}{48} = \frac{1}{6}$

Now, the required quotient

$= \frac{\frac{-11}{12}}{\frac{1}{6}} = \frac{-11}{12} \times \frac{6}{1}$

$= \frac{-11}{2}$.

10. LCM of 5, 10 and 25 = 50.

Now,

$\frac{1}{5} = \frac{1\times 10}{5\times 10} = \frac{10}{50} \quad \left(\because \frac{50}{5} = 10\right)$

$\frac{-2}{10} = \frac{-2\times 5}{10\times 5} = \frac{-10}{50} \left(\because \frac{50}{10} = 5\right)$

and $\frac{4}{25} = \frac{4\times 2}{25\times 2} = \frac{8}{50} \quad \left(\because \frac{50}{25} = 2\right)$

$\because \quad -10 < 8 < 10$

$\therefore \quad \frac{-10}{50} < \frac{8}{50} < \frac{10}{50}$

or $\frac{-2}{10} < \frac{4}{25} < \frac{1}{5}$.

11. $\left(-20 \div \frac{5}{10}\right) \times \left(\frac{-1}{10} \times 5\right)$

$= \left(-20 \times \frac{10}{5}\right) \times \left(\frac{-1}{2}\right)$

$= (-40) \times \left(-\frac{1}{2}\right) = \frac{40}{2} = 20.$

12. Total expenditure

= Expenditure on shopping

+ Expenditure on groceries.

$= 15\frac{3}{4} + 58\frac{1}{8}$

$= \frac{60+3}{4} + \frac{464+1}{8}$

$= \frac{63}{4} + \frac{465}{8}$

$= \frac{63\times 2 + 465\times 1}{8} = \frac{126+465}{8}$

$= \frac{591}{8} = 73\frac{7}{8}$.

Thus, Reema spent ₹ $73\frac{7}{8}$ in all.

WORKSHEET–6

1. Let the other number be x. Then,

$$x + \frac{1}{3} = \frac{5}{9}$$

$$\therefore \quad x = \frac{5}{9} - \frac{1}{3}$$

(Transposing $\frac{1}{3}$ to RHS)

$$= \frac{5 \times 1 - 1 \times 3}{9} = \frac{5-3}{9} = \frac{2}{9}$$

So, the required number is $\frac{2}{9}$.

2. Let y should be added. Then,

$$\therefore \quad y + \frac{-7}{8} = \frac{5}{9} \quad \text{or} \quad y = \frac{7}{8} + \frac{5}{9}$$

$$\text{or} \quad y = \frac{7 \times 9 + 5 \times 8}{72}$$

[$\because$ LCM (8, 9) = 72]

$$= \frac{63 + 40}{72} = \frac{103}{72} \quad \text{or} \quad 1\frac{31}{72}$$

So, $1\frac{31}{72}$ should be added.

3. Let p should be subtracted. Then,

$$\frac{3}{7} - p = \frac{5}{4}$$

$$\therefore \quad \frac{3}{7} - \frac{5}{4} = p \quad \text{or} \quad \frac{3 \times 4 - 5 \times 7}{28} = p$$

$$\text{or} \quad \frac{12 - 35}{28} = p \quad \text{or} \quad \frac{-23}{28} = p$$

So, $\frac{-23}{28}$ should be subtracted.

4. Let A should be added. Then,

$$A + \frac{2}{3} + \frac{3}{5} = \frac{-2}{15}$$

$$\therefore \quad A = \frac{-2}{15} - \frac{2}{3} - \frac{3}{5}$$

$$= \frac{-2 \times 1 - 2 \times 5 - 3 \times 3}{15}$$

$$= \frac{-2 - 10 - 9}{15} = \frac{-21}{15} = \frac{-7}{5}.$$

So, $\frac{-7}{5}$ should be added.

5. Let B should be added. Then,

$$B + \left(\frac{1}{2} + \frac{1}{3} + \frac{1}{5}\right) = 3$$

$$\text{or} \quad B + \left(\frac{15 + 10 + 6}{30}\right) = 3$$

$$\text{or} \quad B + \frac{31}{30} = 3$$

$$\therefore \quad B = 3 - \frac{31}{30} = \frac{90 - 31}{30} = \frac{59}{30}$$

So, $\frac{59}{30}$ should be added.

6. Let x should be subtracted. Then,

$$\left(\frac{3}{4} - \frac{2}{3}\right) - x = \frac{-1}{6}$$

$$\therefore \quad \frac{3}{4} - \frac{2}{3} + \frac{1}{6} = x$$

$$\text{or} \quad \frac{3 \times 3 - 2 \times 4 + 1 \times 2}{12} = x$$

$$\text{or} \quad \frac{9 - 8 + 2}{12} = x \quad \text{or} \quad \frac{3}{12} = x$$

$$\text{or} \quad \frac{1}{4} = x$$

So, $\frac{1}{4}$ should be subtracted.

7. Let y should be added. Then,

$$y + \frac{-4}{9} = \frac{-1}{9}$$

$$\therefore \quad y = \frac{4}{9} - \frac{1}{9} = \frac{4-1}{9} = \frac{3}{9} = \frac{1}{3}$$

So, $\frac{1}{3}$ should be added.

8. Let M should be added. Then,

$$M + \left(\frac{1}{3} + \frac{1}{4} + \frac{1}{5}\right) = 4$$

or $\quad M + \frac{20 + 15 + 12}{60} = 4$

or $\quad M + \frac{47}{60} = 4$

$$\therefore \quad M = 4 - \frac{47}{60} = \frac{240 - 47}{60} = \frac{193}{60}.$$

or $\quad = 3\frac{13}{60}$

So, $3\frac{13}{60}$ should be added.

9. Let x should be subtracted. Then,

$$\left(\frac{4}{5} - \frac{3}{4}\right) - x = \frac{-1}{8}$$

$$\therefore \quad \frac{4}{5} - \frac{3}{4} + \frac{1}{8} = x$$

or $\quad \frac{4 \times 8 - 3 \times 10 + 1 \times 5}{40} = x$

or $\quad \frac{32 - 30 + 5}{40} = x$ or $\frac{7}{40} = x$

So, $\frac{7}{40}$ should be subtracted.

10. $\frac{8}{-9} \times \frac{-7}{-16} = \frac{8 \times (-7)}{-16 \times -9} = \frac{1 \times -7}{2 \times 9}$

$$= \frac{-7}{18}.$$

11. $\left(\frac{-3}{2} \times \frac{4}{5}\right) + \left(\frac{9}{5} \times \frac{-10}{3}\right) - \left(\frac{1}{2} \times \frac{3}{4}\right)$

$$= \left(\frac{-3 \times 2}{1 \times 5}\right) + \left(\frac{3 \times (-2)}{1 \times 1}\right) - \left(\frac{1 \times 3}{2 \times 4}\right)$$

$$= \frac{-6}{5} + \frac{-6}{1} - \frac{3}{8}$$

$$= \frac{-6 \times 8 - 6 \times 40 - 3 \times 5}{40}$$

$$= \frac{-48 - 240 - 15}{40} = \frac{-303}{40} = -7\frac{23}{40}.$$

12. $\left(\frac{-7}{18} \times \frac{15}{-7}\right) - \left(1 \times \frac{1}{4}\right) + \left(\frac{1}{2} \times \frac{1}{4}\right)$

$$= \left(\frac{1 \times 5}{6 \times 1}\right) - \left(\frac{1}{4}\right) + \left(\frac{1}{8}\right)$$

$$= \frac{5}{6} - \frac{1}{4} + \frac{1}{8}$$

$$= \frac{5 \times 4 - 1 \times 6 + 1 \times 3}{24}$$

$$= \frac{20 - 6 + 3}{24} = \frac{17}{24}.$$

WORKSHEET–7

1. Let $\frac{3}{14}$ is multiplied by x. Then,

$$x \times \frac{3}{-14} = \frac{5}{12}$$

$$\therefore \quad x = \frac{5}{12} \times \frac{-14}{3} = \frac{5 \times (-7)}{6 \times 3}$$

$$= \frac{-35}{18} = -1\frac{17}{18}.$$

2. Let the other number be y. Then,

$$y \times \frac{14}{27} = \frac{-28}{21}$$

$$\therefore \quad y = \frac{-28}{21} \times \frac{27}{14} = \frac{-2 \times 9}{7 \times 1}$$

$$= \frac{-18}{7} = -2\frac{4}{7}$$

So, the other number is $-2\frac{4}{7}$.

3. Let the other number be M. Then,

$$M \times \frac{4}{5} = \frac{1}{5}$$

$$\therefore \quad M = \frac{1}{5} \times \frac{5}{4} = \frac{1}{4}$$

So, the other number is $\frac{1}{4}$.

4. Let the required number be x. Then,

$$\frac{-33}{10} \div x = \frac{-11}{4}$$

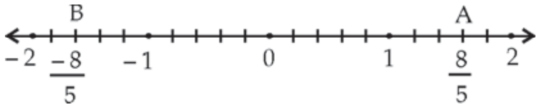
or $$\frac{-33}{10} \times \frac{1}{x} = \frac{-11}{4}$$

$$\therefore \quad \frac{-33}{10} \times \frac{4}{-11} = x \quad \text{or} \quad \frac{-3 \times 2}{5 \times (-1)} = x$$

or $$x = \frac{6}{5} \quad \text{or} \quad 1\frac{1}{5}$$

So, $\frac{-33}{10}$ should be divided by $1\frac{1}{5}$.

5. The point A represents $\frac{8}{5}$ and the point B represents $\frac{-8}{5}$ on the number line.



6. The required three rational numbers are:
– 2, –1, 0.

7. $\left(\frac{3}{11} \times \frac{5}{6}\right) - \left(\frac{9}{12} \times \frac{4}{3}\right) + \left(\frac{5}{13} \times \frac{6}{5}\right)$

$$= \left(\frac{1 \times 5}{11 \times 2}\right) - \left(\frac{3 \times 1}{3 \times 1}\right) + \left(\frac{1 \times 6}{13 \times 1}\right)$$

$$= \frac{5}{22} - 1 + \frac{6}{13} = \frac{5 \times 13 - 286 + 6 \times 22}{286}$$

[$\because$ LCM (13, 22) = 286]

$$= \frac{65 + 132 - 286}{286} = \frac{197 - 286}{286} = \frac{-89}{286}.$$

8. (*i*) $\frac{-7}{4} \div \frac{63}{-64} = \frac{-7}{4} \times \frac{-64}{63}$

$$= \frac{7 \times 64}{4 \times 63} = \frac{1 \times 16}{1 \times 9} = \frac{16}{9}$$

$$= 1\frac{7}{9}.$$

(*ii*) $\frac{-3}{13} \div \frac{-4}{65} = \frac{-3}{13} \times \frac{65}{-4}$

$$= \frac{3 \times 5}{4} = \frac{15}{4} = 3\frac{3}{4}.$$

9. LCM of 7 and 12 = 84

Sum of $\frac{65}{12}$ and $\frac{12}{7} = \frac{65}{12} + \frac{12}{7}$

$$= \frac{455 + 144}{84} = \frac{599}{84}.$$

Difference of $\frac{65}{12}$ and $\frac{12}{7} = \frac{65}{12} - \frac{12}{7}$

$$= \frac{455 - 144}{84} = \frac{311}{84}.$$

Now, the required result

$$= \frac{599}{84} \div \frac{311}{84}$$

$$= \frac{599}{84} \times \frac{84}{311} = \frac{599}{311}$$

$$= 1\frac{288}{311}.$$

10. ∵ Amount of iron filings for 24 cartons = 54 kilos

∴ Amount of iron filings for 1 carton

$$= \frac{54}{24} \text{ kilos}$$

$$= \frac{9}{4} \quad \text{or} \quad 2\frac{1}{4} \text{ kilos}$$

So, the required amount of iron filings is $\frac{9}{4}$ kilos.

11. (*i*) $\frac{-16}{21} \times \frac{14}{5} = \frac{-16}{5} \times \frac{14}{21}$

$$= \frac{-16}{5} \times \frac{2}{3}$$

$$= \frac{-32}{15}.$$

(*ii*) $\frac{-11}{9} \times \frac{-81}{-88} = \frac{-11}{9} \times \frac{81}{88}$

$$= \frac{-11}{88} \times \frac{81}{9}$$

$$= \frac{-1}{8} \times \frac{9}{1} = \frac{-9}{8}.$$

WORKSHEET–8

1. There are countless number of rational numbers.

2. $-\frac{11}{6}$.

3. Associative property of multiplication.

4. 0(zero).

5. 1 and –1.

6. $|x| = \frac{5}{11}$ then x = ?

$$x = \frac{+5}{11}, \frac{-5}{11}.$$

7. Yes, $\frac{-3}{5} = -0.6$

and $\frac{3}{4} = 0.7$

$\frac{4}{7} = 0.6$

$\frac{4}{7}$ lies between $\frac{-3}{5}$ and $\frac{3}{4}$.

8. $\frac{p}{q} + \frac{3}{10} = 0$ (Given)

$$\frac{p}{q} = \frac{-3}{10}$$

∴ $\frac{p}{q}$ is the additive inverse of $\frac{3}{10}$.

9. Yes,

Multiplicative inverse of $3\frac{1}{3} = \frac{10}{3} = \frac{3}{10}$

$$0.3 = \frac{3}{10}.$$

10. $x = \frac{3}{7}, y = \frac{-5}{11}$ (Given)

$$(-x) + (-y) = -(x + y)$$

$$\left(\frac{-3}{7}\right) + \left(\frac{5}{11}\right) = -\left(\frac{3}{7} + \frac{-5}{11}\right)$$

$$-\frac{3}{7} + \frac{5}{11} = -\left(\frac{3}{7} - \frac{5}{11}\right)$$

$$\frac{-33+35}{77} = -\left(\frac{33-35}{77}\right)$$

$$\frac{2}{77} = -\left(\frac{-2}{77}\right)$$

$$\frac{2}{77} = \frac{2}{77}$$

LHS = RHS verified.

11. $x\ \frac{-5}{7}, y = \frac{1}{12}, \quad z = \frac{3}{4}$ (Given)

$$(x - y) - z \neq x - (y - z)$$

$$\left(\frac{-5}{7} - \frac{1}{12}\right) - \frac{3}{4} \neq -\frac{5}{7} - \left(\frac{1}{2} - \frac{3}{4}\right)$$

$$\left(\frac{-60 - 7}{84}\right) - \frac{3}{4} \neq -\frac{5}{7} - \left(\frac{2 - 3}{4}\right)$$

$$\left(-\frac{67}{84}\right) - \frac{3}{4} \neq \frac{-5}{7} + \frac{1}{4}$$

$$-\frac{67}{84} - \frac{3}{4} \neq -\frac{5}{7} + \frac{1}{4}$$

$$\frac{-67 - 63}{84} \neq \frac{-20 + 7}{28}$$

$$-\frac{130}{84} \neq \frac{-13}{28}$$

LHS ≠ RHS verified.

12. Let the numbers be x and y

According to question,

$$x \times y = -17\frac{1}{2}$$

$$1\frac{1}{6} \times y = -17\frac{1}{2} \quad (\because \text{First number} = 1\frac{1}{6})$$

$$\frac{7}{6} \times y = \frac{-35}{2}$$

$$y = \frac{\frac{-35}{2}}{\frac{7}{6}}$$

$$y = \frac{-35}{2} \times \frac{6}{7}$$

$y = -15.$

13. Sum of $\frac{-7}{6}$ and $\frac{4}{5}$

$$\frac{-7}{6} + \frac{4}{5} = \frac{-35 + 24}{30}$$

$$= \frac{-11}{30} \qquad \ldots(i)$$

Product of $\frac{-7}{6}$ and $\frac{4}{5}$

$$\frac{-7}{6} \times \frac{4}{5} = \frac{-14}{15} \qquad \ldots(ii)$$

Dividing equations (*i*) and (*ii*).

$$\frac{\frac{-11}{30}}{\frac{-14}{15}} = \frac{-11}{30} \times \frac{15}{-14} = \frac{11}{28}.$$

❑❑

Chapter 2

LINEAR EQUATIONS IN ONE VARIABLE

WORKSHEET–9

1. (C) $x - 2 = 5 \Rightarrow x = 2 + 5 = 7.$

2. (A) $1.3 = \frac{y}{1.2} \Rightarrow y = 1.3 \times 1.2$

$y = 1.56.$

3. (D) $8x + 6 = 5(x - 2) + 3$

or $8x + 6 = 5x - 10 + 3$

or $8x - 5x = -10 + 3 - 6$ or $3x = -13$

$x = -\frac{13}{3}.$

4. (C) $3m = 5m - \frac{8}{5}$ or $\frac{8}{5} = 5m - 3m$

or $\frac{8}{5} = 2m$ $\therefore$ $m = \frac{4}{5}.$

5. (B) $z - 7 = 2\left(\frac{z}{3} + 5\right)$

or $z - 7 = \frac{2}{3}z + 10$

$\therefore$ $z - \frac{2}{3}z = 10 + 7$ or $\frac{1}{3}z = 17$

or $z = 17 \times 3$ $\therefore$ $z = 51.$

6. (B) $\frac{x}{3} + \frac{1}{4} = \frac{x}{2} - \frac{1}{5}$

or $\frac{x}{3} - \frac{x}{2} = -\frac{1}{4} - \frac{1}{5}$ (Transposing)

or $\frac{2x - 3x}{6} = \frac{-5 - 4}{20}$

or $\frac{x}{6} = \frac{9}{20}$ or $x = \frac{9 \times 6}{20}$

i.e., $x = \frac{27}{10}.$

7. (C) $0.15(10t - 9) = 0.75(4t - 3)$

or $1.5t - 1.35 = 3t - 2.25$

or $2.25 - 1.35 = 3t - 1.5t$ (Transposing)

or $\frac{0.9}{1.5} = t$ or $\frac{3}{5} = t$

i.e., $t = 0.6.$

8. (A) $\frac{y}{2y - 15} = \frac{7}{9}$ or $9y = 14y - 105$

or $-5y = -105$ $\therefore$ $y = \frac{-105}{-5} = 21.$

9. (D) $x - \frac{x - 1}{3} = 1 - \frac{x - 2}{2}$

or $\frac{3x - x + 1}{3} = \frac{2 - x + 2}{2}$

or $\frac{2x + 1}{3} = \frac{4 - x}{2}$

or $4x + 2 = 12 - 3x$

or $7x = 10$ or $x = \frac{10}{7}.$

10. (B) Substituting $m = \frac{3}{2}$ in $7m + 3 = 6 + 5m$, we get

$7\left(\frac{3}{2}\right) + 3 = 6 + 5\left(\frac{3}{2}\right)$

or $\frac{21}{2} + 3 = 6 + \frac{15}{2}$

or $\frac{21 + 6}{2} = \frac{12 + 15}{2}$ or $\frac{27}{2} = \frac{27}{2}$

Which is true.

So, the given equation is satisfied by $m = \frac{3}{2}.$

11. (B) $7y = 14$ or $\frac{7y}{7} = \frac{14}{7}$

$\therefore$ $y = 2.$

12. (A) Let x should be added. Then,

$$x + \frac{-14}{3} = \frac{3}{7}$$

$$\therefore \quad x = \frac{3}{7} + \frac{14}{3} = \frac{9+98}{21}$$

$$= \frac{107}{21}.$$

13. (B) Let the required number be y.

Product of y and $\frac{3}{5} = y \times \frac{3}{5} = \frac{3}{5}y.$

Sum of this product and $\frac{7}{12} = \frac{3}{5}y + \frac{7}{12}$

According to the given condition,

$$\frac{3}{5}y + \frac{7}{12} = \frac{11}{60}$$

$$\therefore \quad \frac{3}{5}y = \frac{11}{60} - \frac{7}{12}$$

$$\text{or} \quad \frac{3}{5}y = \frac{11-35}{60}$$

$$\therefore \quad y = \frac{-24}{60} \times \frac{5}{3} = \frac{-8}{12} = \frac{-2}{3}.$$

14. (C) Let present age of Anand = x years

Then, present age of his father = $4x$ years

According to the given condition,

$$(x + 4) + (4x + 4) = 58$$

$$\therefore \quad 5x = 58 - 8$$

$$\text{or} \quad x = \frac{50}{5} = 10 \text{ years.}$$

And $4x = 4 \times 10 = 40$ years.

15. (B) Let the number of boys be $5x$ and the number of girls be $3x$.

So, $5x - 3x = 20$

$$\therefore \quad x = \frac{20}{2} = 10$$

$$\therefore \quad 3x = 3 \times 10 = 30.$$

16. (D) Let the numerator of the original number be x.

Then its denominator = $x + 6$.

$$\text{So} \quad \frac{x+2}{x+6+2} = \frac{3}{5}$$

or $5x + 10 = 3x + 24$

$$\therefore \quad x = \frac{24-10}{2} = 7$$

And, $x + 6 = 7 + 6 = 13.$

Hence, the original number is $\frac{7}{13}$.

17. (D) Let ten's digit = x.

Then units's digit = $x + 5$

So $[10x + x + 5] + [10(x + 5) + x] = 99$

or $22x + 55 = 99$

$$\therefore \quad x = \frac{44}{22} = 2$$

And, $x + 5 = 2 + 5 = 7$

$\therefore$ The original number $= 10x + x + 5$
$= 27.$

WORKSHEET–10

1. Let Mr. Sharma's son's age now = x years

Then Mr. Sharma's age now = $2x$ years

After 4 years, Mr. Sharma's age
$= (2x + 4)$ years

9 years ago, The son's age = $(x - 9)$ years

According to the given condition,

$2x + 4 = 4(x - 9)$

or $2x + 4 = 4x - 36$

or $40 = 2x$

or $20 = x$ (Dividing both sides by 2)

$\therefore$ $2x = 2 \times 20 = 40$ years.

Thus, Mr. Sharma's age is of 40 years and his son is of 20 years now.

OR

Let breadth b_1 of the rectangle be x, *i.e.*, $b_1 = x$

Then, length $l_1 = 7 + b_1 = 7 + x$

$\therefore$ Area $A_1 = l_1 \times b_1 = (7 + x) \times x$

New length $l_2 = l_1 - 10 = 7 + x - 10$

$= x - 3$

New breadth $b_2 = b_1 - 3 = x - 3$

$\therefore$ New area $A_2 = l_2 \times b_2$

$= (x - 3) \times (x - 3)$

But, $A_2 = A_1 - 108$

$\therefore$ $(x - 3)(x - 3) = (7 + x)x - 108$

or $x^2 - 6x + 9 = 7x + x^2 - 108$

or $x^2 - 6x - 7x - x^2 = -108 - 9$

or $-13x = -117$

Dividing both sides by – 13, we get

$x = 9$

i.e., $b_1 = 9$ m

Further, $l_1 = 7 + x = 7 + 9$

$= 16$ m

Thus, length = 16 m and breadth = 9 m.

2. (*i*) $3x = 36$

or $\dfrac{3x}{3} = \dfrac{36}{3}$ (Dividing throughout by 3)

$\therefore$ $x = 12.$

(*ii*) $\dfrac{3x}{2} = 60$

or $\dfrac{3x}{2} \times \dfrac{2}{3} = 60 \times \dfrac{2}{3}$

(Multiplying throughout by $\dfrac{2}{3}$)

$\therefore$ $x = 40.$

(*iii*) $\dfrac{x}{17} = \dfrac{3}{34}$

or $\dfrac{x}{17} \times 17 = \dfrac{3}{34} \times 17$

(Multiplying throughout by 17)

$\therefore$ $x = \dfrac{3}{2}.$

(*iv*) $x - 5 = 17$

or $x - 5 + 5 = 17 + 5$

(Adding 5 to both sides)

$\therefore$ $x = 22.$

OR

(*i*) $-x + 1 = 3$

or $-x + 1 - 1 = 3 - 1$

(Subtracting 1 from both sides)

or $-x = 2$

or $-x \times (-1) = 2 \times (-1)$

(Multiplying throughout by – 1)

$\therefore$ $x = -2.$

(*ii*) $2x + 1 = 5$

or $2x + 1 - 1 = 5 - 1$

(Subtracting 1 from both sides)

or $2x = 4$

or $x = 2.$ (Dividing throughout by 2)

(*iii*) $-7 - x = 3$

or $7 + x = -3$

(Multiplying throughout by – 1)

or $7 + x - 7 = -3 - 7$

(Subtracting 7 from both sides)

$\therefore$ $x = -10.$

(*iv*) $3(x + 1) = 12$

or $3x + 3 = 12$

or $x + 1 = 4$

(Dividing throughout by 3)

or $x + 1 - 1 = 4 - 1$

(Subtracting 1 from both sides)

$\therefore$ $x = 3.$

3. (*i*) $\frac{x}{10} + \frac{70 - x}{2} = 19$

or $\frac{x + 350 - 5x}{10} = 19$

Multiplying both sides by 10, we get

$x + 350 - 5x = 190$

or $-4x = 190 - 350$

(Transposing 350 to RHS)

or $-4x = -160$

Dividing both sides by – 4, we get

$x = 40.$

(*ii*) $8(x + 40) = 1.5(2x + 8)$

or $8x + 320 = 3x + 12$

or $8x - 3x = 12 - 320$

(On transposing)

or $5x = -308$

Dividing both sides by 5, we get

$x = -61.6.$

OR

(*i*) $\frac{3x - 7}{5} = \frac{1 - x}{-3}$

Multiplying both sides by 15, we get

$9x - 21 = -5 + 5x$

On transposing, we get

$9x - 5x = -5 + 21$

or $4x = 16$

Dividing both sides by 4, we get

$x = 4.$

(*ii*) $\frac{y + 1}{y - 1} = \frac{2y + 3}{2y + 5}$

Cross-multiplying, we have

$(y + 1)(2y + 5) = (y - 1)(2y + 3)$

or $2y^2 + 5y + 2y + 5$

$= 2y^2 + 3y - 2y - 3$

or $2y^2 - 2y^2 + 5y + 2y - 3y + 2y$

$= -3 - 5$

or $6y = -8$

Dividing both sides by 6, we get

$y = \frac{-4}{3}.$

4. $\frac{2x + 1}{3x - 2} = \frac{5}{9}$

Cross-multiplying, we have

$9(2x + 1) = 5(3x - 2)$

or $18x + 9 = 15x - 10$

or $18x - 15x = -10 - 9$

or $3x = -19$

Dividing both sides by 3, we get

$x = \frac{-19}{3}.$

Verification:

$$\text{LHS} = \frac{2x + 1}{3x - 2} = \frac{2\left(-\frac{19}{3}\right) + 1}{3\left(-\frac{19}{3}\right) - 2}$$

(Substituting $x = \frac{-19}{3}$)

$$= \frac{\frac{-38}{3} + 1}{\frac{-57}{3} - 2} = \frac{-38 + 3}{-57 - 6} = \frac{-35}{-63}$$

$= \frac{35}{63} = \frac{5}{9}$ = RHS

Hence verified.

5. Let weight of box B = x kg

Then weight of box A

$$= x + 3\frac{1}{4} = x + \frac{13}{4}$$

$$= \frac{4x+13}{4} \text{ kg}$$

And weight of box C

$$= x + 2\frac{3}{4} = x + \frac{11}{4}$$

$$= \frac{4x+11}{4} \text{ kg}$$

Total weight of the three boxes = 39

or $\frac{4x+13}{4} + x + \frac{4x+11}{4} = 39$

or $4x + 13 + 4x + 4x + 11 = 156$

or $12x + 24 = 156$

or $12x = 156 - 24 = 132$

or $x = \frac{132}{12} = 11$

$\therefore$ Weight of box B = x = 11 kg

Weight of box A

$$= \frac{4x+13}{4} = \frac{4 \times 11 + 13}{4} = \frac{57}{4}$$

$$= 14\frac{1}{4} \text{ kg.}$$

And weight of box C

$$= \frac{4x+11}{4} = \frac{4 \times 11 + 11}{4} = \frac{55}{4}$$

$$= 13\frac{3}{4} \text{ kg.}$$

6. (*i*) $\frac{x+1}{5} - \frac{3(x-1)}{10} = 2$

or $\frac{x+1}{5} - \frac{3x-3}{10} = 2$

or $\frac{2x+2-3x+3}{10} = 2$

or $2x + 2 - 3x + 3 = 20$

or $-x + 5 = 20$ or $-x = 15$

$\therefore$ $x = -15.$

(*ii*) $\frac{1}{a+2} + \frac{1}{a+1} = \frac{2}{a+10}$

or $\frac{(a+1)+(a+2)}{(a+1)(a+2)} = \frac{2}{a+10}$

or $(a + 1)(a + 10) + (a + 2)(a + 10)$
$= 2(a + 1)(a + 2)$

or $a^2 + 10a + a + 10 + a^2 + 10a + 2a + 20 = 2a^2 + 4a + 2a + 4$

or $2a^2 + 23a - 2a^2 - 6a = 4 - 30$

or $17a = -26$

or $a = \frac{-26}{17}.$

(*iii*) $\frac{0.1}{2}x - 5\left(0.2x - \frac{2}{25}\right) = 3x$

Multiplying both sides by 2, we get

$$0.1x - 10\left(0.2x - \frac{2}{25}\right) = 6x$$

Again multiplying both sides by 25, we get

$$2.5x - 250\left(0.2x - \frac{2}{25}\right) = 150x$$

or $2.5x - 50x + 20 = 150x$

or $20 = 150x - 2.5x + 50x$

or $20 = 197.5x$

$\therefore$ $x = \frac{20}{197.5} = \frac{200}{1975} = \frac{8}{79}.$

WORKSHEET–11

1. (*i*) $\frac{1}{x-1} + \frac{2}{x+1} - \frac{3}{x} = 0$

or $\frac{x(x+1)+2(x-1)x-3(x-1)(x+1)}{(x-1)(x+1)x} = 0$

or $x^2 + x + 2x^2 - 2x - 3x^2 + 3 = 0$

or $3x^2 - x - 3x^2 + 3 = 0$

or $-x + 3 = 0$

or $3 = x$

i.e., $x = 3.$

(*ii*) $\frac{6a+7}{3a+2} = \frac{5}{3}$

or $3(6a + 7) = 5(3a + 2)$

or $18a + 21 = 15a + 10$

or $18a - 15a = 10 - 21$

or $3a = -11$

$\therefore$ $a = \frac{-11}{3}.$

(*iii*) $7x = 42$

Dividing both sides by 7, we get

$x = \frac{42}{7}$

$\therefore$ $x = 6.$

2. Let side of the square be x metres.

Then length of rectangles, $l = (x + 3)$ m

And breadth of rectangle, $b = (x - 3)$ m

$\therefore$ Perimeter of the rectangle

$= 2(l + b) = 2(x + 3 + x - 3)$

$= 4x$ m.

According to given perimeter, we have

$4x = 36$

or $x = 9.$

Therefore, the side of the square is 9 m.

OR

Let the number of total children in the group be y.

Then number of children playing in the park $= \frac{y}{2}$

Number of remaining children

$= y - \frac{y}{2} = \frac{y}{2}$

Number of children busy in studies

$= \frac{3}{4} \times \frac{y}{2} = \frac{3y}{8}$

Number of children doing yoga = 9

Consequently, we obtain

$y = \frac{y}{2} + \frac{3y}{8} + 9$

or $y = \frac{4y+3y}{8} + 9$

or $y = \frac{7y}{8} + 9$ or $y - \frac{7y}{8} = 9$

or $\frac{y}{8} = 9$ or $y = 9 \times 8 = 72$

Thus, the number of total children in the group is 72.

3. (*i*) $\frac{3x+2}{x+1} = 7$

or $3x + 2 = 7(x + 1)$

or $3x + 2 = 7x + 7$

or $2 - 7 = 7x - 3x$ or $-5 = 4x$

$\therefore$ $x = \frac{-5}{4}.$

(*ii*) $\frac{4m-1}{m} = \frac{2}{3}$

$3(4m - 1) = 2m$ or $12m - 3 = 2m$

or $10m = 3$ $\therefore$ $m = \frac{3}{10}.$

OR

(*i*) $p + \frac{p+1}{3} = 6p$

or $\frac{3p+p+1}{3} = 6p$

or $4p + 1 = 18p$

or $1 = 18p - 4p$ or $1 = 14p$

$\therefore$ $p = \frac{1}{14}$.

(*ii*) $\frac{5(-7y-1)}{y} = -70$

or $5(-7y-1) = -70y$

or $-35y - 5 = -70y$

or $70y - 35y = 5$

or $35y = 5$

$\therefore$ $y = \frac{5}{35} = \frac{1}{7}$

Thus, $y = \frac{1}{7}$.

4. (*i*) Let the number be x.

Twice this number = $2 \times x = 2x$

and 4 times this number = $4 \times x = 4x$

According to given condition, we obtain

$2x + 4x = 10$

This is the required equation.

Let us solve it.

$2x + 4x = 10$

or $6x = 10$

$\therefore$ $x = \frac{10}{6} = \frac{5}{3}$

Thus, the number is $\frac{5}{3}$.

(*ii*) Let the cost of a chair be ₹ y

Then the cost of a table = ₹ $(y + 20)$

According to given condition, we obtain

$2(y + 20) + 3y = 340$

This is the required equation.

Let us solve it.

$2(y + 20) + 3y = 340$

$2y + 40 + 3y = 340$

or $5y = 340 - 40 = 300$

or $y = \frac{300}{5} = 60$

$\therefore$ $y + 20 = 60 + 20 = 80$

$\therefore$ Cost of 1 chair is ₹60 and cost of 1 table is ₹ 80.

OR

(*i*) Let three consecutive number be x, $x + 1$ and $x + 2$.

Sum of these numbers = – 54

$\therefore$ $x + (x + 1) + (x + 2) = -54$

This is the required equation.

Let us solve it.

$x + (x + 1) + (x + 2) = -54$

or $3x + 3 = -54$

or $3x = -54 - 3$

$= -57$

or $x = \frac{-57}{3} = -19$

$\therefore$ $x + 1 = -19 + 1 = -18$

and $x + 2 = -19 + 2 = -17$.

Hence, the required numbers are – 19, – 18 and – 17.

(*ii*) Let the number be y.

Its one-third = $\frac{1}{3} \times y = \frac{y}{3}$

According to given condition, we obtain $\frac{y}{3} - 2 = 3$

This is the required equation.

Let us solve it.

$$\frac{y}{3} - 2 = 3$$

or $\frac{y}{3} = 3 + 2 = 5$

or $y = 3 \times 5 = 15$

Thus, the required number is 15.

5. (*i*) Let an odd number be x

Then the next odd number = $x + 2$

And again the next odd number

$= x + 2 + 2 = x + 4$

Sum of these three numbers = 63

or $x + x + 2 + x + 4 = 63$

or $3x + 6 = 63$

or $3x = 63 - 6 = 57$

or $x = \frac{57}{3} = 19$

$\therefore$ $x + 2 = 19 + 2 = 21$

And $x + 4 = 19 + 4 = 23$

Therefore, the required numbers are 19, 21 and 23.

(*ii*) Let the numbers be $7y$ and $8y$.

Their sum = 45

i.e., $7y + 8y = 45$ or $15y = 45$

or $y = \frac{45}{15} = 3$

$\therefore$ $7y = 7 \times 3 = 21$

and $8y = 8 \times 3 = 24$

Therefore, the required numbers are 21 and 24.

6. (*i*) $\frac{3(a-5)}{4} - 4a = 3 - \frac{a-3}{2}$

or $\frac{3a - 15 - 16a}{4} = \frac{6 - a + 3}{2}$

or $\frac{-13a - 15}{4} = \frac{-a + 9}{2}$

Multiplying both sides by 4, we get

$-13a - 15 = -2a + 18$

or $-15 - 18 = -2a + 13a$

or $-33 = 11a$

or $\frac{-33}{11} = a$

$\therefore$ $a = -3.$

(*ii*) $\frac{(3x+4)-(x+1)}{5x-3} = \frac{1}{23}$

or $\frac{3x + 4 - x - 1}{5x - 3} = \frac{1}{23}$

or $\frac{2x + 3}{5x - 3} = \frac{1}{23}$

By cross multiplying, we have

$23(2x + 3) = 5x - 3$

or $46x + 69 = 5x - 3$

or $41x = -72$

$\therefore$ $x = \frac{-72}{41}.$

WORKSHEET–12

1. Let number of ten rupee notes be x.

Then number of five rupee notes

$= x + 3.$

Amount by ten rupee notes

$= ₹ (x \times 10) = ₹\ 10x$

Amount by five rupee notes

$= ₹ \{(x + 3) \times 5\}$

$= ₹ (5x + 15)$

Sum of these amounts

$= ₹\ 10x + ₹(5x + 15)$

$= ₹ (15x + 15)$

This is given to be ₹ 195.

$\therefore$ $15x + 15 = 195$

or $15x = 195 - 15 = 180$

or $x = \frac{180}{15} = 12$

$\therefore$ $x + 3 = 12 + 3 = 15.$

Thus, Rohan has 12 notes of ten rupees and 15 notes of five rupees.

2. (*i*) $12(3 - x) = 48$

or $36 - 12x = 48$ or $36 - 48 = 12x$

or $\frac{-12}{12} = x \quad \therefore \quad x = -1.$

(*ii*) $2x + (x + 1) + (x + 2) = 103$

or $2x + x + 1 + x + 2 = 103$

or $4x = 103 - 3$

or $4x = 100$

or $x = \frac{100}{4}$

$\therefore$ $x = 25.$

(*iii*) $\frac{x}{3} + 1 = \frac{7}{15}$

or $5x + 15 = 7$

(Multiplying both sides by 15)

or $5x = 7 - 15 = -8$

$\therefore$ $x = -\frac{8}{5}.$

3. (*i*) Let the number be x.

Thrice $x = 3x$

According to given condition, we have

$3x = 60$

This is the required equation.

Let us solve this equation.

$3x = 60$

or $\frac{3x}{3} = \frac{60}{3}$

(Dividing both sides by 3)

or $x = 20.$

Therefore, 20 is the required number.

(*ii*) Let the number be y.

Subtracting 60 from y, we get $y - 60$.

According to given condition, we have

$y - 60 = 52$

This is the required equation.

Let us solve this equation.

$y - 60 = 52$

or $y = 52 + 60 = 112.$

Therefore, 112 is the required number.

(*iii*) Let the numbers be $5z$ and $8z$.

According to given condition, we have

$5z + 8z = 130$

This is the required equation.

Let us solve this equation.

$5z + 8z = 130$ or $13z = 130$

or $z = \frac{130}{13} = 10$

$\therefore$ $5z = 5 \times 10 = 50$

and $8z = 8 \times 10 = 80.$

Therefore, 50 and 80 are the required numbers.

OR

(*i*) Let present age of Sumi's brother = x years.

Then present age of Sumi = $(x + 9)$ years.

After 10 years, age of Sumi

$= (x + 9 + 10)$ years

$= (x + 19)$ years.

10 years ago, age of Sumi's brother = $(x - 10)$ years.

According to given condition, we have

$x + 19 = 2 \times (x - 10)$

or $x + 19 = 2x - 20$

or $19 + 20 = 2x - x$

or $39 = x$

$\therefore$ $x + 9 = 39 + 9 = 48.$

Therefore, present age of Sumi is 48 years and present age of her brother is 39 years.

(*ii*) Let Mintu's present age be $5x$ years and Shanu's present age be $7x$ years.

Four years later, Mintu's age

$= (5x + 4)$ years.

and, Shanu's age $= (7x + 4)$ years.

According to given condition, we have

$$\frac{5x+4}{7x+4} = \frac{3}{4}$$

Cross-multiplying, we get

or $21x + 12 = 20x + 16$

or $21x - 20x = 16 - 12$

or $x = 4$

$\therefore$ $5x = 5 \times 4 = 20$ and $7x = 7 \times 4 = 28$

Therefore, the age of Mintu is 20 years and the age of Shanu is 28 years.

4. (*i*) $4x - \frac{1}{2}(x + 1) = 8(x + \frac{1}{32})$

or $4x - \frac{1}{2}(x + 1) = 8x + \frac{1}{4}$

Multiplying both sides by 4, we get

$16x - 2x - 2 = 32x + 1$

or $-2 - 1 = 32x - 14x$

or $-3 = 18x$

or $\frac{-3}{18} = x$ or $\frac{-1}{6} = x$

i.e., $x = \frac{-1}{6}$.

(*ii*) $\frac{x+2}{8} - x = \frac{x-2}{4}$

Multiplying both sides by 8, we get

$x + 2 - 8x = 2x - 4$

or $2 + 4 = 2x + 7x$ or $6 = 9x$

or $\frac{6}{9} = x$ or $\frac{2}{3} = x$

$\therefore$ $x = \frac{2}{3}$.

(*iii*) $4 - \frac{2(x-6)}{3} = \frac{1}{2}(4x + 6)$

or $4 - \frac{2x-12}{3} = 2x + 3$

Multiplying both sides by 3, we get

$12 - 2x + 12 = 6x + 9$

or $24 - 9 = 6x + 2x$ or $15 = 8x$

or $\frac{15}{8} = x$

i.e., $x = \frac{15}{8}$.

(*iv*) $$\frac{\frac{2}{5}y+8}{\frac{3}{7}y-4} = \frac{7}{4} \text{ or } \frac{\frac{2y+40}{5}}{\frac{3y-28}{7}} = \frac{7}{4}$$

or $\frac{2y+40}{5} \times \frac{7}{3y-28} = \frac{7}{4}$

Multiplying both sides by $\frac{20(3y-28)}{7}$, we get

$4 \times (2y + 40) = 5(3y - 28)$

or $8y + 160 = 15y - 140$

or $160 + 140 = 15y - 8y$

or $300 = 7y$ or $\frac{300}{7} = y$

i.e., $y = \frac{300}{7}$.

(*v*) $$\frac{x^2-(x+1)(x+2)}{5x+1} = 6$$

Multiplying both sides by $(5x + 1)$, we get

$x^2 - (x + 1)(x + 2) = 6(5x + 1)$

or $x^2 - (x^2 + 2x + x + 2) = 6(5x + 1)$

or $x^2 - x^2 - 3x - 2 = 30x + 6$

or $-2 - 6 = 30x + 3x$

or $-8 = 33x$

or $\frac{-8}{33} = x$

i.e., $x = -\frac{8}{33}$.

(*vi*) $\frac{4x+3}{4} - \left(x - \frac{2x-1}{3}\right) = x + \frac{1}{3}$

Multiplying both sides by 12, we get

$12x + 9 - (12x - 8x + 4) = 12x + 4$

or $12x + 9 - 12x + 8x - 4 = 12x + 4$

or $9 - 4 - 4 = 12x - 8x$

or $1 = 4x$

or $\frac{1}{4} = x$

i.e., $x = \frac{1}{4}$.

WORKSHEET–13

1. Let length of the rectangle be x m.

Then its breadth = $(x - 50)$ m.

So the perimeter

$= 2 \times (\text{length} + \text{breadth})$

$= 2 \times (x + x - 50)$

$= (4x - 100)$ m.

But the perimeter is given to be 280 m

$\therefore$ $4x - 100 = 280$

or $4x = 280 + 100 = 380$

or $x = \frac{380}{4} = 95$ m

Therefore, length = 95 m.

And breadth = $x - 50 = 95 - 50 = 45$ m.

OR

Let one multiple of 5 be x.

Then the next one = $5 + x$.

Sum of these two multiples $= x + 5 + x$

$= 2x + 5$

But this is given to be 55

$\therefore$ $2x + 5 = 55$

or $2x = 55 - 5 = 50$

or $x = \frac{50}{2} = 25$

$\therefore$ $5 + x = 5 + 25 = 30$.

Therefore, 25 and 30 are the two required multiples.

2. (*i*) Let the number be x.

Seven times of $x = 7 \times x = 7x$

It is given to be 49.

$\therefore$ $7x = 49$

or $\frac{7x}{7} = \frac{49}{7}$

(Dividing both sides by 7)

$\therefore$ $x = 7$.

Thus, 7 is the required number.

(*ii*) Let the number be y.

One and half $= 1 + \frac{1}{2} = \frac{2+1}{2} = \frac{3}{2}$

$\frac{3}{2}$ times $y = \frac{3}{2} \times y = \frac{3}{2}y$

This is given to be 300.

$\therefore$ $\frac{3}{2}y = 300$

or $\frac{3}{2}y \times \frac{2}{3} = 300 \times \frac{2}{3}$

(Multiplying both sides by $\frac{2}{3}$)

or $y = 100 \times 2 = 200$

Thus, 200 is the required number.

OR

Let the larger part be ₹ x.

Then the smaller part = ₹ $(1500 - x)$

10% of $x = \frac{10}{100} \times x = \frac{x}{10}$

8% of $(1500 - x) = \frac{8}{100} \times (1500 - x)$

$= 120 - \frac{2}{25}x$

According to given condition, we have

$\frac{x}{10} - \left(120 - \frac{2}{25}x\right) = 60$

or $\frac{x}{10} - 120 + \frac{2}{25}x = 60$

or $\frac{x}{10} + \frac{2}{25}x = 60 + 120$

or $\frac{5x + 4x}{50} = 180$

or $9x = 180 \times 50$

or $x = \frac{180 \times 50}{9}$

$\therefore$ $x = 1000$

$\therefore$ $1500 - x = 1500 - 1000 = 500.$

So, the larger part is ₹ 1000 and the smaller part is ₹ 500.

3. (*i*) $2x = 50$

or $x = \frac{50}{2}$ $\therefore$ $x = 25.$

(*ii*) $\frac{1}{2}y = 6$

or $y = 2 \times 6$ $\therefore$ $y = 12.$

(*iii*) $-1.5x = -4.5$

or $x = \frac{-4.5}{-1.5}$ or $x = \frac{45}{15}$

$\therefore$ $x = 3.$

(*iv*) $\frac{x}{-5} = 2$

or $x = 2 \times (-5)$ $\therefore$ $x = -10.$

(*v*) $\frac{-p}{4} = \frac{-3}{4}$

or $-p = \frac{-3}{4} \times 4$ or $-p = -3$

$\therefore$ $p = 3.$

4. (*i*) $x - 40 = 70$

or $x = 70 + 40$ $\therefore$ $x = 110.$

(*ii*) $p - 15 = -30$

or $p = -30 + 15$ $\therefore$ $p = -15.$

(*iii*) $a - 10 = 10$

or $a = 10 + 10$ $\therefore$ $a = 20.$

(*iv*) $-x - 6 = -7$

or $-6 + 7 = x$ $\therefore$ $x = 1.$

(*v*) $x - \frac{1}{2} = 3$

or $x = 3 + \frac{1}{2}$ or $x = \frac{6+1}{2}$

$\therefore$ $x = \frac{7}{2}.$

5.(*i*) Let the number be x. Then

$x + 34 = 86.$

(*ii*) Let the number by y. Then

$2y = 20.$

(*iii*) Let the number be p. Then

$\frac{p}{2} = 16.$

(*iv*) Let Romi's age be q years. Then

$5q = 100.$

(*v*) Let the number be r. Then

$8r + 2 = 60.$

6. (*i*) $\frac{3x+5}{2x+7} = 4$

Cross-multiplying, we get

$3x + 5 = 8x + 28$

or $5 - 28 = 8x - 3x$ or $-23 = 5x$

or $\frac{-23}{5} = x$

i.e., $x = \frac{-23}{5}.$

Check:

Numerator of LHS of given equation

$$= 3 \times \left(\frac{-23}{5}\right) + 5 = \frac{-69}{5} + 5$$

$$= \frac{-69+25}{5} = \frac{-44}{5}$$

And its denominator

$$= 2\left(\frac{-23}{5}\right) + 7 = \frac{-46}{5} + 7$$

$$= \frac{-46+35}{5} = \frac{-11}{5}$$

$$\therefore \quad \text{LHS} = \frac{\frac{-44}{5}}{\frac{-11}{5}} = \frac{44}{11} = 4$$

$$= \text{RHS.}$$

(*ii*) $\frac{2y+5}{y+4} = 1$

Cross-multiplying, we get

$2y + 5 = 1 \times (y + 4)$

or $2y + 5 = y + 4$

or $2y - y = 4 - 5$

$\therefore$ $y = -1.$

Check:

Numerator of LHS = 2(– 1) + 5 = 3

Denominator of LHS = – 1 + 4 = 3

$\therefore$ LHS = $\frac{3}{3}$ = 1 = RHS.

WORKSHEET–14

1. Let one of the two numbers be x.

Then the other one = $x + 16$.

Sum of these two numbers = $x + x + 16$

$= 2x + 16$

This is given to be 60.

$\therefore$ $2x + 16 = 60$

or $2x = 60 - 16 = 44$

or $x = \frac{44}{2} = 22$

$\therefore$ $x + 16 = 22 + 16 = 38.$

Hence, the two numbers are 22 and 38.

OR

Let larger part be y toffees.

Then smaller part = $(y - 12)$ toffees.

Sum of these two parts

$= y + y - 12$

$= (2y - 12)$ toffees

Since the total number of toffees is 72

$\therefore$ $2y - 12 = 72$

or $2y = 72 + 12 = 84$

or $y = \frac{84}{2} = 42$

$\therefore$ $y - 12 = 42 - 12 = 30$

Therefore, the larger part is 42 toffees and the smaller part is 30 toffees.

2. (*i*) Let the number be x.

Adding 2 to 8 times x, we get $8x + 2$.

So, the required equation is

$8x + 2 = 60.$

(*ii*) Let the number be y.

Multiplying y by 9, we get $9y$

So, the required equation is

$9y = 117.$

(*iii*) Let the number be z.

Subtracting 20 from z, we get $z - 20$

So, the required equation is

$z - 20 = 80.$

OR

(*i*) Let a number be x.

$$\frac{1}{10} \text{ of } x = \frac{1}{10} \times x = \frac{x}{10}.$$

So, the required equation is

$$\frac{x}{10} = 45.$$

(*ii*) Let the sum be y.

$$40\% \text{ of } y = \frac{40}{100} \times y = \frac{2}{5}y = \frac{2y}{5}.$$

So, the required equation is

$$\frac{2y}{5} = 300.$$

(*iii*) Let the number be z.

$$2 \text{ and half} = 2 + \frac{1}{2} = \frac{4+1}{2} = \frac{5}{2}$$

$$\frac{5}{2} \text{ of } z = \frac{5z}{2}$$

So, the required equation is

$$\frac{5z}{2} = 250$$

3. (*i*) Let the number be x.

30 less than x is $x - 30$

This is given to be 80

$\therefore \quad x - 30 = 80$

This is the required equation.

Let us solve it

$x - 30 = 80$

or $\quad x = 30 + 80$

or $\quad x = 110$

Therefore, the required number is 110.

(*ii*) Let Gaurav's age be y years

Then Preeti's age = $(y - 4)$ years

But this is given to be 18 years.

$\therefore \quad y - 4 = 18$

This is the required equation.

Let us solve it.

$y - 4 = 18$

or $\quad y = 18 + 4 = 22$

Therefore, Gaurav's age is 22 years.

(*iii*) Let the number be z.

$$50\% \text{ of } z = \frac{50}{100} \times z = \frac{z}{2}$$

This is given to be 50.

$\therefore \quad \frac{z}{2} = 50$

This is the required equation.

Let us solve it.

$\frac{z}{2} = 50$

or $\quad z = 2 \times 50 = 100$

Therefore, the required number is 100.

4. (*i*) $\frac{x}{7} - \frac{3x-1}{5} + 3 = 0$

Multiplying both sides by LCM (7, 5, 1) = 35, we get

$5x - 7(3x - 1) + 105 = 0$

or $\quad 5x - 21x + 7 + 105 = 0$

or $\quad 7 + 105 = 21x - 5x$ or $112 = 16x$

or $\quad \frac{112}{16} = x$ *i.e.* $x = 7.$

(*ii*) $\frac{2}{3}(4x - 1) - \left(4x - \frac{1-3x}{2}\right) = \frac{x-7}{2}$

or $\quad \frac{2(4x-1)}{3} - \frac{8x-1+3x}{2} = \frac{x-7}{2}$

Multiplying both sides by LCM(3, 2) = 6, we get

$4(4x - 1) - 3(11x - 1) = 3(x - 7)$

or $\quad 16x - 4 - 33x + 3 = 3x - 21$

or $\quad -17x - 1 = 3x - 21$

or $\quad -1 + 21 = 3x + 17x$

or $\quad 20 = 20x$ or $\frac{20}{20} = x$

or $1 = x$ *i.e.*, $x = 1$.

(*iii*) $m - \frac{m-1}{2} = 4 - \frac{m-2}{3}$

or $\frac{2m-(m-1)}{2} = \frac{12-(m-2)}{3}$

or $\frac{m+1}{2} = \frac{14-m}{3}$

or $3m + 3 = 28 - 2m$

or $m = \frac{25}{5} = 5$

Thus, $m = 5$.

(*iv*) $\frac{4x+3}{4} - \left(x - \frac{2x-1}{3}\right) = x + \frac{1}{3}$

or $\frac{4x+3}{4} - \frac{3x-2x+1}{3} = \frac{3x+1}{3}$

or $\frac{4x+3}{4} - \frac{x+1}{3} = \frac{3x+1}{3}$

Multiplying both sides by LCM (3, 4) = 12, we get

$12x + 9 - 4x - 4 = 12x + 4$

or $-4x = -1$

or $x = \frac{-1}{-4} = \frac{1}{4}$

Thus, $x = \frac{1}{4}$

(*v*) $\frac{4p-2}{4} - \frac{2p+5}{2} + \frac{2}{3} = p$

Multiplying both sides by LCM (2, 3, 4) = 12, we get

$12p - 6 - 12p - 30 + 8 = 12p$

or $-28 = 12p$ or $\frac{-28}{12} = p$

or $\frac{-7}{3} = p$ *i.e.*, $p = -\frac{7}{3}$.

(*vi*) $\frac{x^2-9}{x^2+5} = \frac{-5}{9}$

Putting $x^2 = y$, we get

$\frac{y-9}{y+5} = \frac{-5}{9}$

Cross-multiplying, we get

$9y - 81 = -5y - 25$

or $9y + 5y = 81 - 25$

or $14y = 56$ or $y = \frac{56}{14} = 4$

$\therefore$ $x^2 = 4$ $(\because y = x^2)$

or $x = \pm\sqrt{4}$

or $x = \pm 2$.

(*vii*) $\frac{x+2}{3} - \frac{x-3}{4} = 5 - \frac{x-1}{2}$

or $\frac{x+2}{3} - \frac{x-3}{4} + \frac{x-1}{2} = 5$

or $\frac{4x+8-3x+9+6x-6}{12} = 5$

or $7x + 11 = 12 \times 5$

or $7x = 60 - 11 = 49$

or $x = \frac{49}{7} = 7$

Thus, $x = 7$.

WORKSHEET – 15

1. Let the number be x.

One-fourth $x = \frac{x}{4}$.

Since $\frac{x}{4}$ is 8 more than 5.

$\therefore$ $\frac{x}{4} = 5 + 8$

or $x = 13 \times 4 = 52$

Thus, the required number is 52.

2. $$\frac{3m+4}{6-6m} = \frac{2}{3}$$

Cross-multiplying, we get

$$9m + 12 = 12 - 12m$$

or $9m + 12m = 12 - 12$ or $21m = 0$

or $$m = \frac{0}{21} = 0$$

i.e., $m = 0$.

3. Let Vedant's salary before the increase = ₹ x.

∴ Increase in the salary = 10% of x

$$= \frac{10}{100} \times x$$

$$= ₹\ \frac{x}{10}.$$

∴ Salary after the increase

$$= ₹\ x + ₹\ \frac{x}{10} = ₹\ \left(x + \frac{x}{10}\right)$$

$$= ₹\ \frac{11x}{10}$$

This is given to ₹ 84500.

∴ $$\frac{11x}{10} = 84500$$

or $$\frac{11x}{10} \times \frac{10}{11} = 84500 \times \frac{10}{11}$$

(Multiplying both sides by $\frac{10}{11}$)

or $$x = \frac{845000}{11} = 76818.18$$

So, Vedant's salary before the increase was ₹ 76818.18.

4. Let digit in units's place of the given number be x.

Then digit in ten's place = $9 - x$.

∴ Given number = $10(9 - x) + x$.

A number obtained by interchaning its digits = $10x + (9 - x)$.

This obtained number – Given number

$= [10x + (9 - x)] - [10(9 - x) + x]$

$= 10x + 9 - x - (90 - 10x + x)$

$= 10x + 9 - x - 90 + 10x - x$

$= 18x - 81$

This is given to be 27.

∴ $18x - 81 = 27$

or $18x = 27 + 81 = 108$

or $$x = \frac{108}{18} = 6.$$

i.e., Digit in unit's place = 6

And digit in ten's place = $9 - x = 9 - 6 = 3$.

Now, given number

$= 3 \times 10 + 6 = 30 + 6$

$= 36$.

Thus, the required number is 36.

OR

Let the numerator of the original rational number be x. Then denominator will be $x + 6$.

So, the original rational number = $\frac{x}{x+6}$.

Numerator of new rational number

$= x + 9$.

And its denominator

$= (x + 6) - 3 = x + 3$.

So, the new rational number

$$= \frac{x+9}{x+3}.$$

This is given to be $\frac{5}{2}$.

$\therefore \quad \frac{x+9}{x+3} = \frac{5}{2}$

Cross-multiplying, we get

$$5x + 15 = 2x + 18$$

Transposing $2x$ to LHS and 15 to RHS, we get

$$5x - 2x = 18 - 15$$

or $\quad 3x = 3$

or $\quad x = \frac{3}{3} = 1$

$\therefore \quad x + 6 = 1 + 6 = 7$

Therefore, the rational number is $\frac{1}{7}$.

5. (*i*) $\quad \frac{b^2 - (b-1)(b+2)}{3} = \frac{1}{5}$

or $\quad \frac{b^2 - (b^2 + 2b - b - 2)}{3} = \frac{1}{5}$

or $\quad \frac{b^2 - (b^2 + b - 2)}{3} = \frac{1}{5}$

or $\quad \frac{b^2 - b^2 - b + 2}{3} = \frac{1}{5}$

or $\quad \frac{-b + 2}{3} = \frac{1}{5}$

Cross-multiplying, we get

$3 = -5b + 10$ or $5b = 10 - 3$

or $\quad 5b = 7$ or $b = \frac{7}{5}$.

(*ii*) $\quad \frac{7y - 2}{5y - 1} = \frac{3 + 7y}{4 + 5y}$

Cross-multiplying, we get

$(7y - 2)(4 + 5y) = (3 + 7y)(5y - 1)$

or $\quad 28y + 35y^2 - 8 - 10y = 15y - 3 + 35y^2 - 7y$

or $\quad 18y + 35y^2 - 8 = 8y + 35y^2 - 3$

or $\quad 18y + 35y^2 - 8y - 35y^2 = -3 + 8$

or $\quad 10y = 5$ or $y = \frac{5}{10}$

or $\quad y = \frac{1}{2}$.

6. (*i*) $\quad 7x - 1 = 13$

or $\quad 7x = 13 + 1 = 14$

(Adding 1 to both sides)

or $\quad x = \frac{14}{7}$

(Dividing both sides by 7)

or $\quad x = 2.$

(*ii*) $\quad \frac{4x - 1}{2} = 1$

or $\quad 4x - 1 = 1 \times 2 = 2$

(Multiplying both sides by 2)

or $\quad 4x = 2 + 1 = 3$

$\therefore \quad x = \frac{3}{4}$.

(Dividing both sides by 4)

(*iii*) $\quad 2x + 3(x - 1) = \frac{5}{2}$

or $\quad 2x + 3x - 3 = \frac{5}{2}$

or $\quad 5x = \frac{5}{2} + 3 = \frac{11}{2}$

or $\quad x = \frac{11}{2} \times \frac{1}{5}$

$\therefore \quad x = \frac{11}{10} = 1\frac{1}{10}$.

(*iv*) $\quad \frac{2x - 3}{2} - \frac{x + 1}{3} = \frac{3x - 8}{4}$

Multiplying both sides by LCM (2, 3, 4) = 12, we get

$$6(2x - 3) - 4(x + 1) = 3(3x - 8)$$

or $12x - 18 - 4x - 4 = 9x - 24$

or $-18 - 4 + 24 = 9x - 12x + 4x$

or $2 = x$

i.e., $x = 2$.

(*v*) $\frac{2}{3}(4x - 1) - \left(4x - \frac{1-3x}{2}\right) = \frac{x-7}{2}$

or $\frac{2}{3}(4x - 1) - \frac{8x - 1 + 3x}{2} = \frac{x-7}{2}$

Multiplying both sides by LCM (2, 3) = 6, we get

$4(4x - 1) - 3(11x - 1) = 3(x - 7)$

or $16x - 4 - 33x + 3 = 3x - 21$

or $-4 + 3 + 21 = 3x - 16x + 33x$

or $20 = 20x$

or $\frac{20}{20} = x$ or $1 = x$

i.e., $x = 1$.

WORKSHEET – 16

1. One

(∵ An equation which has only one variable is called an equation in one variable)

For example $7x = 8$

2. $x = 0$ (∵ $x = 0$ given)

3. No

$7x - 2y = 0$ (∵ x and y are linear equation in two variable)

∴ $7x - 2y = 0$ is not a linear equation in one variable.

4. $7x = 7$

Dividing both sides by 7

$$\frac{7x}{7} = \frac{7}{7}$$

∴ $x = 1$.

5. $\frac{5p}{3p} = \frac{p}{1}$ (∵ $p \neq 0$)

⇒ $\frac{5}{3} = \frac{p}{1}$ ∴ $p = \frac{5}{3}$.

6. Sum of ratios = 2 + 3 = 5

Divided by ₹ 10 = $\frac{2}{5} \times 10$ = ₹ 4

$\frac{3}{5} \times 10$ = ₹ 6.

7. $x - 2 = 5$

$x - 5 = 2$ (Transposing 2)

$x = 7$.

8. $x + 3 = 4 + 3$ (∵ $x = 4$)

$x + 3 = 7$

$x - 3 = 4 - 3 = 1$ (∵ $x = 4$)

$7 > 1$.

Therefore, $x + 3$ is greater.

9. $0.3(6 + m) = 0.5(8 - m)$

$1.8 + 0.3m = 4 - 0.5m$

$0.5m + 0.3m = 4 - 1.8$

$0.8m = 2.2$

$$m = \frac{2.2}{0.8} = \frac{\frac{22}{10}}{\frac{8}{10}}$$

$$m = \frac{22}{10} \times \frac{10}{8}$$

$$m = \frac{11}{4}.$$

10. $\frac{2-7x}{1-5x} = \frac{3+7x}{4+5x}$

$(2 - 7x)(4 + 5x) = (1 - 5x)(3 + 7x)$

(∵ By cross-multiplication)

⇒ $8 + 10x - 28x - 35x^2$

$= 3 + 7x - 15x - 35x^2$

⇒ $8 + 10x - 28x - 35x^2 - 3 - 7x + 15x + 35x^2 = 0$

⇒ $-10x + 5 = 0$

⇒ $5 = 10x$

$$\Rightarrow \quad x = \frac{5}{10}$$

$$\therefore \quad x = \frac{1}{2}.$$

11. Let the number be x

According to question,

$$x + \frac{2}{3}x + \frac{x}{2} + \frac{x}{7} = 97$$

$$\frac{42x + 28x + 21x + 6x}{42} = 97$$

$$\frac{97x}{42} = 97$$

$$x = 97 \times \frac{42}{97}$$

$$x = 42.$$

12. Let the total number of 10 paise coins be x

Then 50 paise coins = $70 - x$

Value of 10 paise coins = $10 \times x = 10x$

Value of 50 paise coins = $50(70 - x)$

Total value of coins = ₹ 19 = 1900 paise

Now, according to question,

$$10x + 50(70 - x) = 1900$$

$$\Rightarrow \quad 10x + 3500 - 50x = 1900$$

$$\Rightarrow \quad 3500 - 40x = 1900$$

$$\Rightarrow \quad 3500 - 1900 = 40x$$

$$\Rightarrow \quad 1600 = 40x$$

$$\therefore \quad x = \frac{1600}{40} = 40$$

$\therefore$ Number of 10 paise coins = 40

and number of 50 paise coins = 70 – 40

= 30.

Chapter 3

UNDERSTANDING QUADRILATERALS

WORKSHEET – 17

1. (A) As we know that the sum of angles of a polygon = $(n - 2) \times 180°$,

n = number of sides.

So, the sum of the angles of a quadrilateral $= (4 - 2) \times 180°$ [$\because n = 4$]

$= 2 \times 180° = 360°$.

2. (D) By the definition, a concave polygon has any angle greater than 180° (*i.e.,* reflex angle).

3. (C) A quadrilateral has 4 sides, 4 angles (or vertices) and 2 diagonals.

4. (C) Sum of all exterior angles of a polygon = 360°. It is constant.

5. (D) Sum of all interior angles of a polygon = $(n - 2) \times 180°$.

(It is a formula)

6. (A) As we know that each exterior angle of a polygon $= \frac{360°}{n}$,

n = number of sides.

$\Rightarrow n = \frac{360°}{\text{Measure of each exterior angle}}$

By putting one by one obtains we find that with angle measure 12°, number of sides is in whole number otherwise it is in decimals which is not possible.

$\therefore$ A regular polygon is possible with each exterior angle of 12°.

7. (B) Sum of exterior angles = 360°

$\Rightarrow \quad x + 125° + 115° = 360°$

$\therefore \quad x = 360° - 240° = 120°$.

8. (C) The diagonals of a rhombus (or a square) bisect each other at 90°.

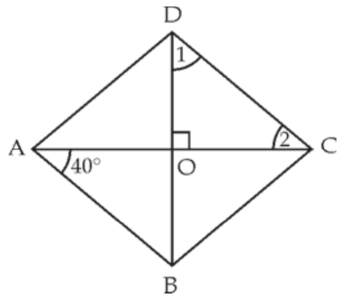
9. (C) $\because$ AB $\parallel$ DC and AC is a transversal.

$\therefore \quad \angle DCA = \angle BAC$

$\Rightarrow \quad \angle 2 = 40°$.

In ΔODC,

$\angle OCD + \angle ODC + \angle COD = 180°$



$\Rightarrow \quad 40° + \angle 1 + 90° = 180°$

(From figure, $\angle COD = 90°$)

$\Rightarrow \quad \angle 1 = 180° - 130° = 50°$.

10. (A) $\because$ Sum of two adjacent angles of a parallelogram = 180°

$\Rightarrow \quad 3x + 2x = 180°$

($\because$ Given ratio = 3 : 2)

$\Rightarrow \quad 5x = 180°$

$\therefore \quad x = \frac{180°}{5} = 36°$

$\therefore$ Required angle $= 3 \times 36° = 108°$.

11. (B) Diagonals of a rhombus intersect each other at right angle, *i.e.*, 90°.

12. (B) Consider

$\angle QPS + \angle RSP = 120° + 60° = 180°$

$\therefore$ PQ $\parallel$ SR.

13. (D) Diagonals of a rectangle are equal to each other.

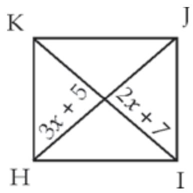
14. (A) A rectangle is a kind of a parallelogram.

15. (A) A rhombus has all sides of equal length.

16. (A) A rectangle has four sides and four right angles so it is a convex quadrilateral.

17. (B) As we know that diagonals of a square are equal and bisect each other at right angle.

So, from figure



HJ = IK or HO = IO

$\Rightarrow \quad 3x + 5 = 2x + 7$

$\Rightarrow \quad 3x - 2x = 7 - 5$

$\therefore \quad x = 2.$

18. (D) Number of side of a polygon

$$= \frac{360°}{\text{Measure of an exterior angle}}$$

$$= \frac{360°}{12°} = 30.$$

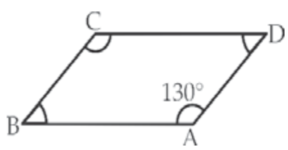
WORKSHEET – 18

1. (*i*) Octagon

(*ii*) Decagon

2. Let ABCD be a parallelogram in which $\angle A = 130°$.

$\therefore$ Two adjacent angles of a parallelogram are supplementary.



$\therefore \quad \angle A + \angle B = 180°$

$\Rightarrow \quad 130° + \angle B = 180°$

$\Rightarrow \quad \angle B = 180° - 130° = 50°$

Also, we know that opposite angles of a parallelogram are equal.

$\Rightarrow \quad \angle A = \angle C \text{ and } \angle B = \angle D$

$\therefore \quad \angle C = 130° \text{ and } \angle D = 50°$

Thus, other angles of the parallelogram are 50°, 130° and 50°.

3. Let one angle of the parallelogram be x. According to question,

Two adjacent angles are equal so another angle also be x.

Since, the sum of two adjacent angles are supplementary.

$\therefore \quad x + x = 180°$

$\Rightarrow \quad 2x = 180°$

$\therefore \quad x = \frac{180°}{2} = 90°$

As we know that a parallelogram whose each angle is of measure 90° is a rectangle.

4. As we know that a quadrilateral whose all sides are equal is called rhombus. But the quadrilateral has one of the angle is 90° so adjacent angle of the rhombus is also 90°.

Thus, the quadrilateral is a square. In other words, a rhombus with one of the angle of 90° is called a square.

5. The given three angles of a quadrilateral are 45°, 75° and 105°.

Let fourth angle be x.

Using Angle sum property,

$45° + 75° + 105° + x = 360°$

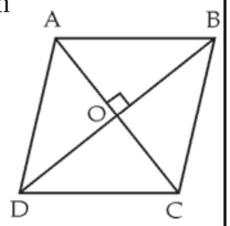
$\Rightarrow \quad x = 360° - 225°$

$= 135°.$

6. Let ABCD be a rhombus in which AC = 6 cm and BD = 8 cm.

$AO = \frac{AC}{2} = \frac{6}{2} = 3 \text{ cm}$

$BO = \frac{BD}{2} = \frac{8}{2} = 4$ cm



In right triangle AOB,

$AB^2 = AO^2 + OB^2$

$= 3^2 + 4^2$

$= 9 + 16$

$\therefore \quad AB = \sqrt{25} = 5$ cm

Thus, required side of the rhombus is 5 cm.

7. Let the length of a rectangle = $5x$

and breadth = $4x$.

Given perimeter = 90 cm.

We know that perimeter of the rectangle = $2(l + b)$

$\Rightarrow \quad 2(5x + 4x) = 90$

$\Rightarrow \quad 2 \times 9x = 90$

$\Rightarrow \quad x = \frac{90}{18} = 5$

$l = 5x = 5 \times 5 = 25$ cm

$b = 4x = 4 \times 5 = 20$ cm.

8. Suppose two adjacent angles of a parallelogram are $5x$ and $4x$ respectively.

Since adjacent angles are supplementary.

$5x + 4x = 180°$

$9x = 180°$

$\therefore \quad x = \frac{180°}{9} = 20°$

$\therefore \quad 5x = 5 \times 20 = 100°$ and

$4x = 4 \times 20° = 80°$

Thus, the four angles of the parallelogram are 100°, 80°, 100° and 80°.

9. Let one adjacent angle of an angle of measure 120° be x in the given parallelogram.

So $\quad x + 120° = 180°$

[$\therefore$ Two adjacent angles are supplementary]

$\Rightarrow \quad x = 180° - 120° = 60°$

Also opposite angles of these angles are 120° and 60°.

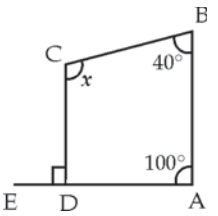
Thus remaining angles are 60°, 120° and 60°.

10. (*i*) From figure,

$\angle EDC + \angle ADC = 180°$ (Linear pair)

$90° + \angle ADC = 180°$

$\therefore \quad \angle ADC = 180° - 90° = 90° \ldots(i)$



Now, in quadrilateral ABCD,

$\angle ABC + \angle BCD + \angle CDA + \angle DA$

$= 360°$

(Angle sum property)

$\Rightarrow 40° + x + 90° + 100° = 360°$

$\Rightarrow \quad x = 360° - 230°$

$\therefore \quad x = 130°$.

(*ii*) Using angle sum property in a quadrilateral,

$50° + 120° + 110° + x = 360°$

$\Rightarrow \quad x = 360° - 280°$

$\therefore \quad x = 80°$.

11. (*i*) Concave polygon

(*ii*) Concave polygon

(*iii*) Concave polygon

(*iv*) Convex polygon.

Note: A convex polygon has the whole parts of each diagonal in its interior region.

WORKSHEET – 19

1. (*i*) Pentagon (*ii*) Heptagon

2. No, because sum of the four angles

$= 95° + 98° + 98° + 39°$

$= 330° \neq 360°.$

3. Let, fourth angle of the quadrilateral be x.

Three given angles are 45°, 75° and 105°.

Using Angle sum property, we have

$45° + 75° + 105° + x = 360°$

$\Rightarrow \quad 225° + x = 360°$

$\therefore \quad x = 360° - 225° = 135°.$

4. Let the common factor of the angles be x. So, the four angles of the quadrilateral are $3x$, $5x$, $7x$ and $9x$.

Using Angle sum property,

$3x + 5x + 7x + 9x = 360°$

$\Rightarrow \quad 24x = 360°$

$\therefore \quad x = \dfrac{360°}{24} = 15°$

Thus, four angles are:

$3 \times 15°, 5 \times 15°, 7 \times 15°$ and $9 \times 15°$

i.e., 45°, 75°, 105° and 135°.

5. Let each equal angle of the quadrilateral be x.

Measure of one given-angle = 93°

We know that sum of the angles

= 360°

$\Rightarrow \quad x + x + x + 93° = 360°$

$\Rightarrow \quad 3x = 360° - 93°$

$\therefore \quad x = \dfrac{267°}{3} = 89°$

So, the three equal angles are 89°, 89° and 89°.

6. Suppose the common factor be x. So remaining three angles are $2x$, $3x$ and $7x$.

Mean of these angles = 64°

$\Rightarrow \quad \dfrac{2x + 3x + 7x}{3} = 64°$

$\Rightarrow \quad \dfrac{12x}{3} = 64°$

$\therefore \quad x = \dfrac{64° \times 3}{12} = 16°$

Therefore, the three angles are

$2 \times 16°, 3 \times 16°$ and $7 \times 16°$

i.e., 32°, 48° and 112°

So, fourth angle

$= 360° -$ sum of three angles

$= 360° - (32° + 48° + 112°)$

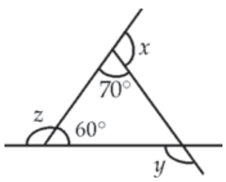
$= 360° - 192° = 168°.$

Thus, required angles are 32°, 48°, 112° and 168°.

7. Using linear pair axiom,

$x + 70° = 180°$

$\therefore \quad x = 180° - 70° = 110°$



and $z + 60° = 180°$

$\therefore \quad z = 180° - 60° = 120°$

Using Exterior angle property in a triangle,

$y = 60° + 70°$

$= 130°$

Thus, $x + y + z = 110° + 130° + 120°$

$= 360°.$

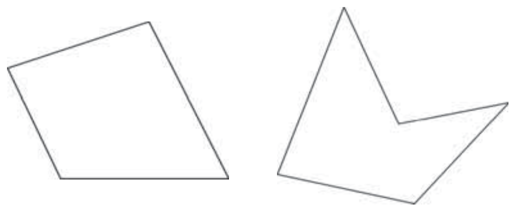
Alternative Method:

We know that sum of all exterior angles in a polygon is 360°.

So, $x + y + z = 360°$

[From given figure]

8.



Convex polygon   Concave polygon

9. (*i*) Convex quadrilateral

(*ii*) Convex quadrilateral

(*iii*) Concave quadrilateral

[A convex quadrilateral has all angles less than 180° but a concave quadrilateral has any angle more than 180°.]

10. (*i*) From figure,

$\angle 1 + 80° = 180°$ (Linear pair)

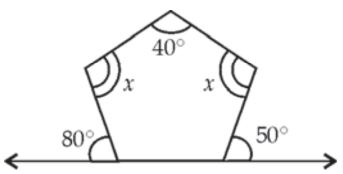
$\therefore \angle 1 = 180° - 80°$

$= 100°$

and $\angle 2 + 50° = 180°$ (Linear pair)

$\angle 2 = 180° - 50°$

$= 130°$



We know that sum of interior angles of a pentagon = $(5 - 2) \times 180°$

$\Rightarrow \angle 1 + \angle 2 + x + 40° + x = 3 \times 180°$

$\Rightarrow 100° + 130° + 40° + 2x = 540°$

$\Rightarrow 2x = 540° - 270°$

$\Rightarrow x = \dfrac{270°}{2} = 135°.$

(*ii*) Each interior angle of a regular hexagon $= \dfrac{(6-2) \times 180°}{6}$

$\therefore x = \dfrac{4 \times 180°}{6} = 120°.$

(*iii*) Sum of all exterior angles of a polygon = 360°

$\Rightarrow 130° + 130° + x = 360°$

$\therefore x = 360° - 260°$

$= 100°.$

WORKSHEET–20

1. As the sum of the angles of a quadrilateral = 360°.

So, $110° + 72° + 35° + x = 360°$

$\Rightarrow 217° + x = 360°$

$\therefore x = 360° - 217°$

$= 143°.$

2. Let the measure of the fourth angle be x.

Three acute angles are given as 70° each.

So, $x + 70° + 70° + 70° = 360°$

(Using Angle sum property)

$\Rightarrow x + 210° = 360°$

$\therefore x = 360° - 210°$

$= 150°.$

3. Let each equal angle of the quadrilateral be x.

So, $x + x + x + x = 360°$

$\Rightarrow 4x = 360°$

$\therefore x = \dfrac{360°}{4} = 90°.$

4. Let each of the three equal angle be x.

Fourth Angle = 120° (Given)

Using Angle sum property, we have

$x + x + x + 120° = 360°$

$\Rightarrow 3x = 360° - 120° = 240°$

$\therefore x = \dfrac{240°}{3} = 80°.$

5. Let the common factor of the angles be x. So the four angles are $4x$, $3x$, $5x$ and $6x$.

Using Angle sum property,

$$4x + 3x + 5x + 6x = 360°$$

$$\Rightarrow \quad 18x = 360°$$

$$\therefore \quad x = \frac{360°}{18} = 20°.$$

Therefore, four angles are:

$4 \times 20°$, $3 \times 20°$, $5 \times 20°$ and $6 \times 20°$

i.e., 80°, 60°, 100°, and 120°.

6. Each interior angle of a regular hexagon

$$= \frac{(6-2)\times 180°}{6}$$

$$= \frac{4 \times 180°}{6} = 120°$$

$\therefore$ All the angles are 120°, 120°, 120°, 120°, 120° and 120°.

7. Let each equal adjacent angle be x.

As the sum of two adjacent angles of a parallelogram = 180°

$$\text{So,} \quad x + x = 180°$$

$$\Rightarrow \quad 2x = 180°$$

$$\therefore \quad x = \frac{180°}{2} = 90°.$$

8. Let common factor of adjacent angles be x. So the two angles are $2x$ and $3x$.

As we know that adjacent angles of a parallelogram are supplementary.

$$\text{So,} \quad 2x + 3x = 180°$$

$$\Rightarrow \quad 5x = 180°$$

$$\therefore \quad x = \frac{180°}{5} = 36°$$

$\Rightarrow \quad 2x = 2 \times 36° = 72°$

and $3x = 3 \times 36° = 108°$

Thus, four angles are 72°, 108°, 72° and 108°.

9. In a parallelogram, one given angle = 20°. Let one adjacent angle of the given angle be x.

As the two adjacent angles are supplementary.

$$\text{So,} \quad x + 20° = 180°$$

$$\Rightarrow \quad x = 180° - 20°$$

$$= 160°$$

Thus, required angles are 20°, 160°, 20° and 160°.

10. Two adjacent sides of a parallelogram are 10 cm and 12 cm.

As the perimeter of a parallelogram

= 2 × (sum of two adjacent sides)

= 2 × (10 cm + 12 cm)

= 2 × 22 cm = 44 cm.

11. Given: Shorter side of a parallelogram = 10 cm

According to question, longer side

= 2 × shorter side

= 2 × 10 cm

= 20 cm.

So the perimeter of the parallelogram = 2 × (sum of two adjacent sides)

= 2 × (10 cm + 20 cm)

= 2 × 30 cm = 60 cm.

12. (*i*) Since sum of all exterior angles of a polygon = 360°

$$\therefore \quad 125° + 125° + x = 360°$$

$$\Rightarrow \quad 250° + x = 360°$$

$$\Rightarrow \quad x = 360° - 250°$$

$$= 110°.$$

(*ii*) As the sum of all exterior angles of a quadrilateral = 360°

$$\Rightarrow \quad 110° + x + 90° + 40° = 360°$$

$$\Rightarrow \quad 240° + x = 360°$$

$$\therefore \quad x = 360° - 240°$$

$$= 120°.$$

WORKSHEET – 21

1. Suppose the two adjacent angles of a parallelogram are x and $2x$. As the adjacent angles are supplementary.

So, $x + 2x = 180°$

$\Rightarrow \quad 3x = 180°$

$$x = \frac{180°}{3} = 60°$$

$\therefore \quad 2x = 2 \times 60 = 120°$

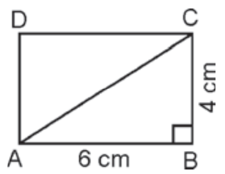
Then, four angles are 60°, 120°, 60° and 120°.

2. Suppose ABCD is a rectangle with AB = 6 cm and BC = 4 cm.

We have to find diagonal AC.

In right triangle ABC.

Using Pythagoras theorem,.



$$AC^2 = AB^2 + BC^2$$
$$= 6^2 + 4^2$$
$$= 36 + 16 = 52$$

$\therefore \quad AC = \sqrt{52} = 2\sqrt{13}$ cm.

3. Two adjacent sides of a parallelogram are given as 12 cm and 7 cm.

Perimeter of a parallelogram

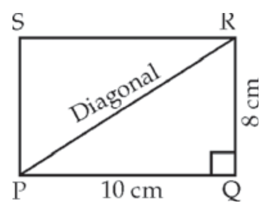
= 2 × (sum of two adjacent sides)

= 2 × (12 cm + 7 cm)

= 2 × 19 cm = 38 cm.

4. In figure, PQRS is a rectangle with sides PQ = 10 cm and QR = 8 cm.

Diagonal PR = ?



In right ΔPQR,

$PR^2 = PQ^2 + QR^2$ (By Pythagoras theorem)

$= (10)^2 + (8)^2$

$= 100 + 64$

$\therefore \quad PR = \sqrt{164} = 2\sqrt{41}$ cm.

5. Let the number of sides of a regular polygon be n.

Given: Each exterior angle = 24°

But we know each exterior angle of a regular polygon $= \dfrac{360°}{\text{Number of sides}}$

So, $24° = \dfrac{360°}{n}$

$\Rightarrow \quad 24° \times n = 360°$

$\therefore \quad n = \dfrac{360°}{24°} = 15.$

6. Let each of the three equal angles be x.

Given: One angle of the quadrilateral = 72°.

Using Angle sum property,

$x + x + x + 72° = 360°$

$\Rightarrow \quad 3x + 72° = 360°$

$\Rightarrow \quad 3x = 360° - 72° = 288°$

$\Rightarrow \quad x = \dfrac{288°}{3} = 96°.$

7. Let the number of sides of a regular polygon be n.

Given: Each interior angle = 165°.

But each interior angle of a regular polygon with n sides $= \dfrac{(n-2) \times 180°}{n}$

$\Rightarrow \quad 165° = \dfrac{(n-2) \times 180°}{n}$

$\Rightarrow \quad 165° \times n = (n - 2) \times 180°$

$\Rightarrow \quad 165° \times n = n \times 180° - 360°$

$\Rightarrow \quad 360° = n \times 180° - n \times 165°$

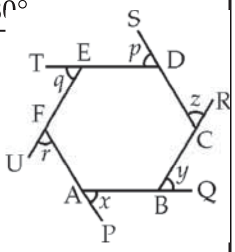
$\Rightarrow \quad n \times (180° - 165°) = 360°$

$\Rightarrow \quad n \times 15° = 360°$

$\therefore \quad n = \dfrac{360°}{15} = 24.$

8. Each interior angle of a regular

hexagon $= \dfrac{(6-2)\times 180°}{6}$



$\left(\text{Using } \dfrac{(n-2)\times 180°}{n}\right)$

$= \dfrac{4\times 180°}{6}$

$= 120°$

Using Linear pair axiom at vertex A,

$\angle BAP + \angle BAF = 180°$

$\Rightarrow \quad x + 120° = 180°$

$\Rightarrow \quad x = 180° - 120° = 60°.$

Similarly, $y = z = p = q = r = 60°$

So, $x + y + z + p + q + r =$

$60° + 60° + 60° + 60° + 60° + 60°$

$= 360°.$

Alternative Method:

We know that the sum of exterior angles of a polygon = 360°.

Here, x, y, z, p, q and r are the exterior angles of a regular hexagon.

So, $x + y + z + p + q + r = 360°.$

9. (*i*) $\angle A + \angle B = 180°$

(Since two adjacent angles are supplementary).

$\Rightarrow \quad 60° + x = 180°$

($\because$ $\angle A = 60°$ (given))

$\therefore \quad x = 180° - 60° = 120°.$

Also, $\angle A = \angle C$ and $\angle B = \angle D$

[In a parallelogram, opposite angles are equal)

$\therefore$ $y = 60°$ and $z = 120°$.

(*ii*) $\angle A + \angle D = 180°$

($\because$ Two adjacent angles are supplementary)

$\Rightarrow \quad x + 50° = 180°$ (Given $\angle D = 50°$)

$\Rightarrow \quad x = 180° - 50° = 130°.$

$\angle A = \angle C$ (Opposite angles are equal)

$\therefore \quad y = 130°$

and $\quad z = x$ (Corresponding angles are equal)

$\therefore \quad z = 130°.$

(*iii*) $\angle B = \angle D$ (Opposite angles are equal)

$\therefore \quad y = 102°.$

In ΔACD,

$\angle ACD + \angle CDA + \angle DAC = 108°$

(Using angle sum property)

$\Rightarrow \quad x + 102° + 40° = 180°$

$x = 180° - 142°$

$= 38°.$

(*iv*) $\angle A + \angle B = 180°$

(Adjacent angles are supplementary)

$\Rightarrow \quad x + 70° = 180°$(Given $\angle B = 70°$)

$\Rightarrow \quad x = 180° - 70°$

$= 110°.$

Since opposite angles of a parallelogram are equal.

So, $\angle B = \angle D \Rightarrow y = 70°.$

Also, $\quad y = z$ (Alternate interior angles are equal; AD || BC)

$\therefore \quad z = 70°.$

WORKSHEET – 22

1. Given: One angle of a parallelogram is 100°.

Let one of the adjacent angles to the given angle be x.

$\therefore \quad x + 100° = 180°$

($\because$ Two adjacent angles are supplementary).

$\Rightarrow \quad x = 180° - 100°$

$= 80°$

$\therefore$ Other three angles are 80°, 100° and 80°.

2. Given: Perimeter of a parallelogram = 80 cm

Let shorter side of the parallelogram be x.

So longer side of it is $x + 20$.

Now, perimeter = 2 × (sum of two adjacent sides)

$\Rightarrow \quad 80 = 2 \times (x + x + 20)$

$\Rightarrow \quad 80 = 2 \times (2x + 20)$

$\Rightarrow \quad 80 = 4x + 40$

$\Rightarrow \quad 80 - 40 = 4x$

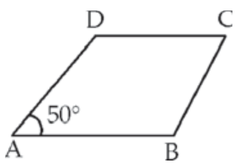
$\Rightarrow \quad 4x = 40$

$\therefore \quad x = \frac{40}{4} = 10$

$\therefore \quad x + 20 = 10 + 20 = 30$

Thus, the adjacent sides of the parallelogram are 10 m and 30 m.

3. In ||gm ABCD,



$\angle A = 50°$.

We know that the sum of two adjacent angles is 180°.

So, $\quad \angle A + \angle B = 180°$

$\Rightarrow \quad 50° + \angle B = 180°$

$\Rightarrow \quad \angle B = 180° - 50°$

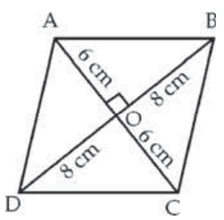
$\therefore \quad \angle B = 130°$

Also, $\angle A = \angle C$ and $\angle B = \angle D$

($\because$ Opposite angles are equal)

$\therefore \quad \angle C = 50°$ and $\angle D = 130°$.

4. In figure, ABCD is a rhombus with diagonals AC = 12 cm and CD = 16 cm.



We know that diagonals of a rhombus bisect each other at 90°.

$\therefore \quad AO = OC = \frac{AC}{2} = 6$ cm

and $\quad BO = OD = \frac{BD}{3} = 8$ cm.

Now, in right-angled ΔAOB,

$AB^2 = AO^2 + OB^2$

(Using Pythagoras theorem)

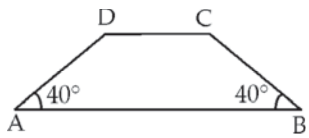
$= 6^2 + 8^2$

$= 36 + 64$

$\therefore \quad AB = \sqrt{100} = 10$ cm.

Thus, required side of the rhombus is 10 cm.

5. In trapezium ABCD, AB || DC and $\angle A = \angle B = 40°$.



Since AB || DC and AD is a transversal.

So $\quad \angle A + \angle D = 180°$

(Co-interior angles are supplementary)

$\Rightarrow \quad 40° + \angle D = 180°$

$\Rightarrow \quad \angle D = 180° - 40°$

$\therefore \quad \angle D = 140°$

Similarly, $\quad \angle C = 180° - \angle B = 140°$.

6. As given two diagonals of a rectangle are $3x + 2$ and $2x + 3$

But we know that diagonals of a rectangle are equal to each other.

So, $\quad 3x + 2 = 2x + 3$

$\Rightarrow \quad 3x - 2x = 3 - 2$

$\therefore \quad x = 1$

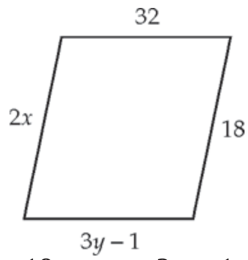
Now, putting the value of x in given expressions, we get each diagonal

$= 3 \times 1 + 2$

or $2 \times 1 + 3$

$= 5$ cm.

7. (*i*) As we know that opposite sides of parallelogram are equal.



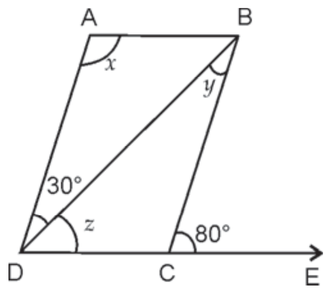
So, $2x = 18$ or $3y - 1 = 32$

$\Rightarrow \quad x = \frac{18}{2}$ or $3y = 32 + 1$

$\Rightarrow \quad x = 9$ or $y = \frac{33}{3} = 11.$

(*ii*) In the given figure, ABCD is ∥ gm.

AD ∥ BC and DE is a transversal.



$\therefore \quad \angle ADC = \angle BCE$

$\Rightarrow \quad 30° + z = 80°$

$\therefore \quad z = 80° - 30° = 50°$

Again, $\angle ADB = \angle CBD$

$\Rightarrow \quad 30° = y$

Further, $\angle ADC + \angle DAB = 180°$

(Sum of adjacent angles)

$\Rightarrow \quad 80° + x = 180°$

$\Rightarrow \quad x = 180° - 80° = 100°$

Thus, $x = 100°$, $y = 30°$ and $z = 50°$.

8. (*i*) Sum of all the four angles of a quadrilateral $= 360°$

$\therefore \quad 60° + 140° + 70° + x = 360°$

$\Rightarrow \quad 270° + x = 360°$

$\therefore \quad x = 360° - 270°$

$= 90°.$

(*ii*) Using Angle sum property,

$x + 90° + 90° + 50° = 360°$

$\Rightarrow \quad x + 230° = 360°$

$\therefore \quad x = 360° - 230°$

$= 130°.$

(*iii*) Using Angle sum property,

$90° + 100° + 140° + x = 360°$

$\Rightarrow \quad 330° + x = 360°$

$x = 360° - 330°$

$= 30°.$

(*iv*) Using Angle sum property,

$\Rightarrow \quad 45° + 110° + x + 60° = 360°$

$\Rightarrow \quad 215° + x = 360°$

$\Rightarrow \quad x = 360° - 215°$

$\therefore \quad x = 145°.$

WORKSHEET – 23

1. Number of diagonals in a hexagon

$= \frac{n(n-3)}{2} = \frac{6(6-3)}{2}$

$= \frac{6 \times 3}{2} = 9$ diagonals.

2. Sum of interior angles of a polygon of n sides $= (n - 2) \times 180°$.

3. Measure of each exterior angle of a regular polygon

$= \frac{360°}{n}$

$72° = \frac{360°}{n} \Rightarrow n = \frac{360°}{72°} = 5$

$n = 5$

Hence, there are 5 sides of the given regular polygon.

4. Square, Rhombus, kite.

5. No.

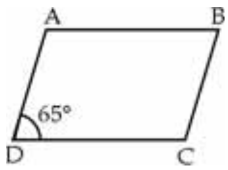
6. 90°.

7. (*i*) Square (*ii*) Square.

8. Square and Rectangle.

9. $\angle B = \angle D$

$B = 65°$



($\because$ Opposite angles are equal in a parallelogram)

$\angle A + \angle D = 180°$

($\because$ Adjacent angles are made 180° in a parallelogram)

$\Rightarrow \quad \angle A + 65° = 180°$

$\Rightarrow \quad \angle A = 180° - 65°$

$\Rightarrow \quad \angle A = 115°$

$\angle A = \angle C = 115°$

(Opposite angles)

The measure of angles of ||gm are 65°, 115°, 65°, 115°.

10. Let two adjacent angles of a parallelogram are $5x$ and $4x$

$5x + 4x = 180°$

$9x = 180°$

$x = \frac{180°}{9} = 20°$

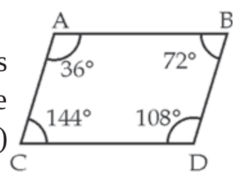
$\because \quad 5x = 5 \times 20° = 100°$

$4x = 4 \times 20° = 80°$

The measure of each angles are 100°, 80°, 100°, 80°.

11. Let the angles of a quadrilateral are x, $2x$, $3x$ and $4x$

$x + 2x + 3x + 4x = 360°$



($\because$ Sum of all angles of a quadrilateral are 360°)

$x = \frac{360°}{10} = 36°$

$x = 36°$

$2x = 2 \times 36° = 72°$

$3x = 3 \times 36° = 108°$

$4x = 4 \times 36° = 144°$

$\angle A + \angle D = 36° + 144° = 180°$

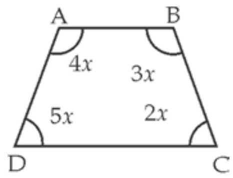
$\angle B + \angle C = 72° + 108° = 180°$

Adjacent angles are made 180°

So, quadrilateral is trapezium.

12. $\angle A + \angle D = 180°$

($\because$ Adjacent angles are made 180°)



$4x + 5x = 180°$

$9x = 180°$

$x = 20°$

$\angle A = 4x = 4 \times 20° = 80°$

$\angle B = 5x = 5 \times 20° = 100°$

$\angle B + \angle D = 180°$

($\because$ Adjacent angles are made 180°)

$3x + 2x = 180°$

$5x = 180°$

$x = 36°$

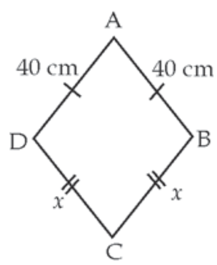
$\angle B = 3x = 3 \times 36° = 108°$

$\angle C = 2x = 2 \times 36° = 72°$

$\angle A = 80°, \angle B = 108°,$

$\angle C = 72°, \angle D = 100°.$

13.



Perimeter = 200 m

$40 + 40 + x + x = 200$

$80 + 2x = 200$

$2x = 200 - 80 = 120$

$x = \frac{120}{2} = 60$

Length of other two sides are 60 cm.

❑❑

Chapter 4

PRACTICAL GEOMETRY

WORKSHEET–24

1. (C) A quadrilateral has 4 sides, 4 angles and 2 diagonals in which any 5 parts we need to construct it uniquely.

2. (A) If the measures of four sides and one of the diagonals are given to construct a quadrilateral then we firstly draw a triangle containing the given diagonal of it.

3. (B) According to given procedure in question, we required to complete a ΔABC so the next step is to mark for AC.

4. (C) Measures of PR and $\angle S$ can't help in the construction of quadrilateral PQRS.

5. (D) According to given measures and steps, when we draw firstly OR and $\angle R$ then next step would be to draw $\angle O$.

6. (D) Only square can be constructed using a side because its all sides are equal and each angle be 90° are known.

7. (B) To construct a rectangle, angles are already known so we need either two adjacent sides or one side and one diagonal. In the case diagonal is not given so we choose one adjacent side among the given choices.

8. (C) After drawing a side AB and an arc with radius AD and centre as A we would draw a diagonal BD to determine another vertex D.

9. (C) To construct a quadrilateral we need total 5 parts out of 10. Here two diagonals are given so we need 3 sides.

10. (D) To construct a unique parallelogram, we need two more parts out of a adjacent side, a diagonal and an angle or only two diagonals.

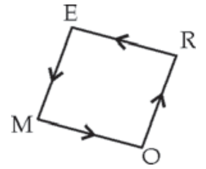
11. (D) For constructing a quadrilateral, if we first draw a triangle using available data then we try to determine fourth vertex.

12. (C)

13. (C) Two diagonals are sufficient to construct a rhombus because the diagonals are perpendicular bisector of each other.

14. (C) Diagonals of a rhombus bisect each other perpendicularly.

15. (D) MO, OR, RE, EM



16. (C) Length of the side of a rhombus

$$= \frac{1}{2}\sqrt{d_1^2 + d_2^2}$$

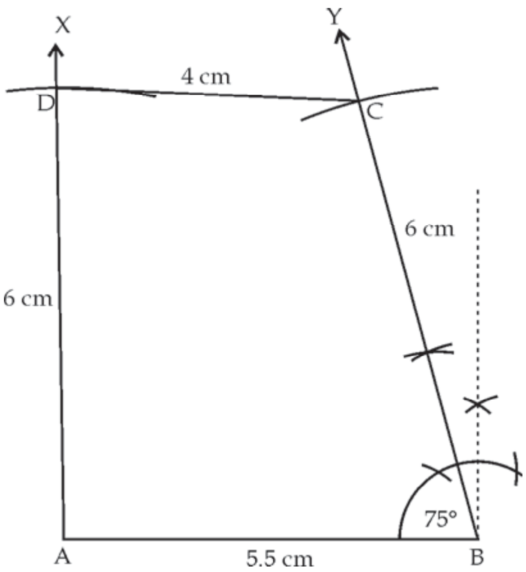
$$= \frac{1}{2}\sqrt{3^2 + 4^2} = \frac{1}{2}\sqrt{9+16}$$

$$= \frac{1}{2}\sqrt{25} = \frac{1}{2} \times 5$$

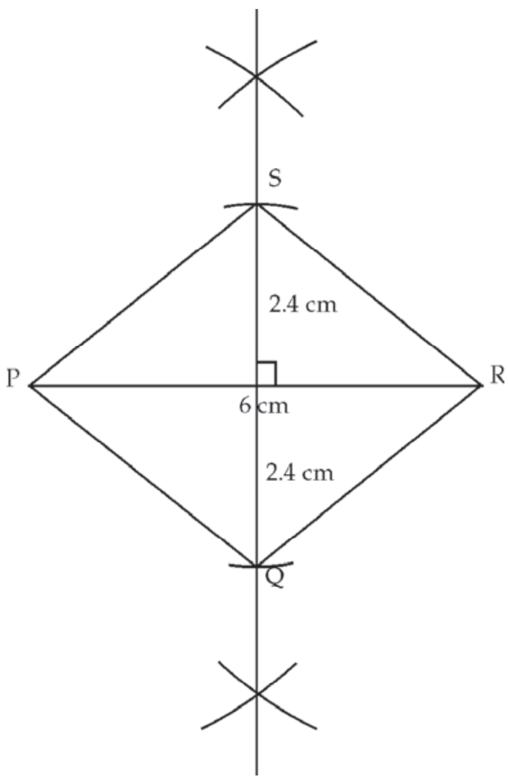
$= 2.5$ cm.

WORKSHEET – 25

1.

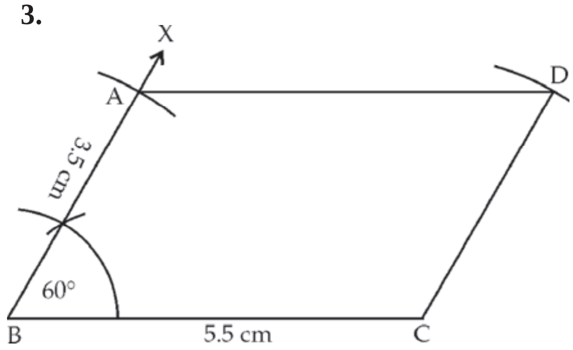


2.



Thus, PQRS is the required rhombus.

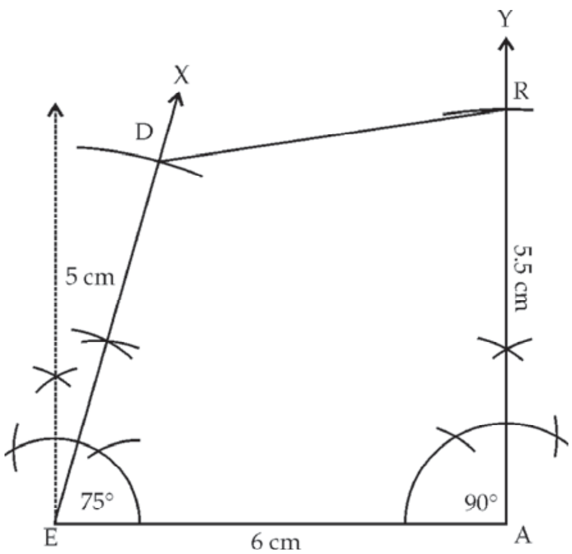
3.



Thus, ABCD is the required parallelogram.

4. **Steps of construction:**

1. Draw a line segment EA = 6 cm
2. Using ruler and compass, draw an angle of 75° at E and another angle of 90° at A.
3. Taking the radius of 5 cm and centre as E, mark the point D at other arm of ∠E.
4. Similarly, taking radius of 5.5 cm and centre as A. Mark the point R at other arm of ∠A.



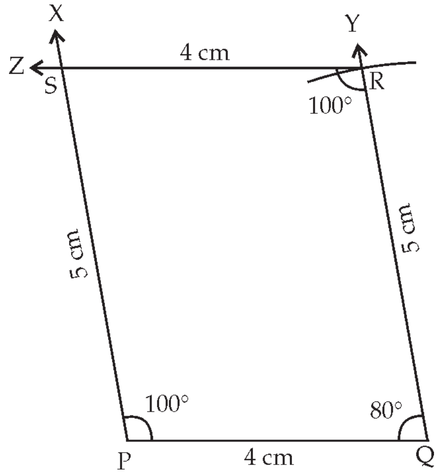
5. Now, join DR.

Thus, the required quadrilateral DEAR is formed.

5. Steps of construction:

1. Draw a line segment PQ = 4 cm.
2. Using protractor, make an angle of measure 100° at the end P and another angle of measure 80° at Q.
3. Taking radius of 5 cm and centre as Q, draw an arc to mark the point R at other arm of ∠Q,
4. Further, make an angle of measure 100° at R. Thus, we observe that another arms of ∠P and ∠R meet each other at a point say S.

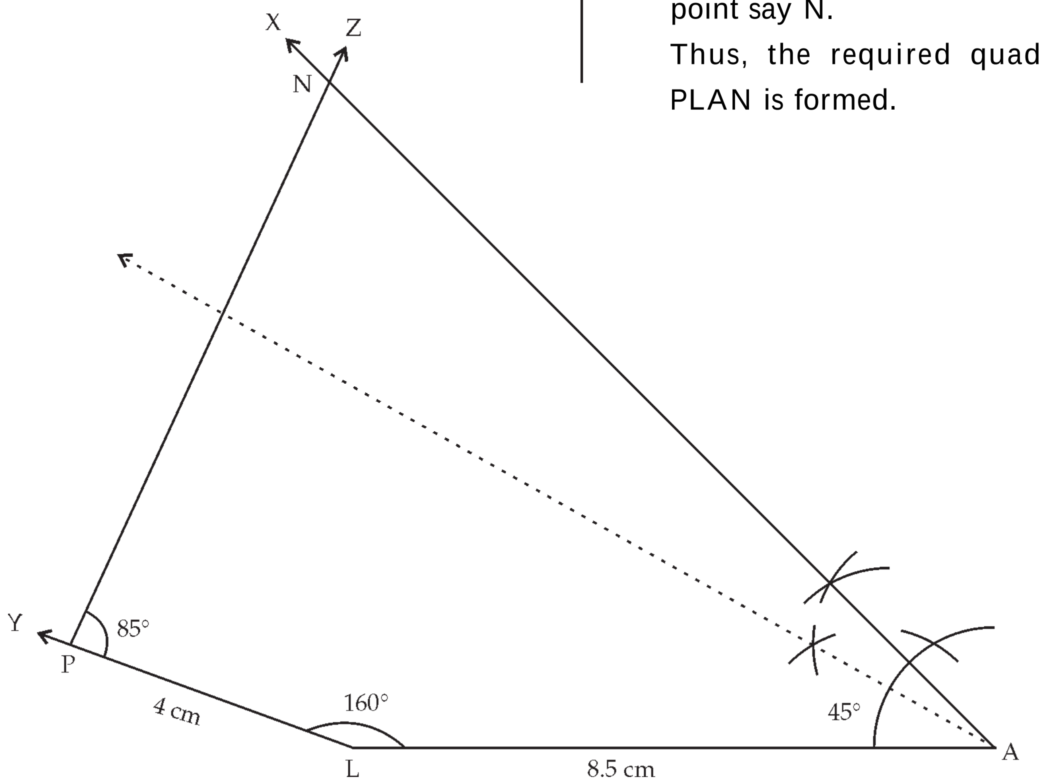
Hence, the required quadrilateral PQRS is obtained.



6. Steps of construction:-

1. Draw line segment ∠A = 8.5 cm.
2. At the end A, make an angle of 45° using ruler and compass then draw ray AX.
3. Further, make an angle of 160° at L with the help of protractor and draw a ray LY.
4. Taking radius of 4 cm and centre as L draw an arc to mark the point P on ray LY.
5. Now, make an angle of 85° at P with the help of protractor and draw a ray PZ which intersects the ray AX at a point say N.

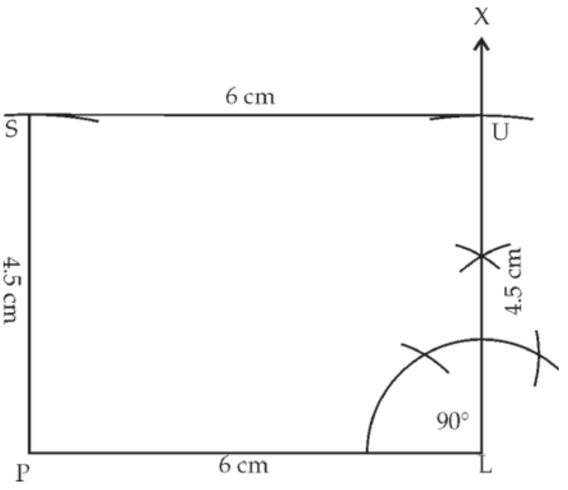
Thus, the required quadrilateral PLAN is formed.



7. Steps of construction:

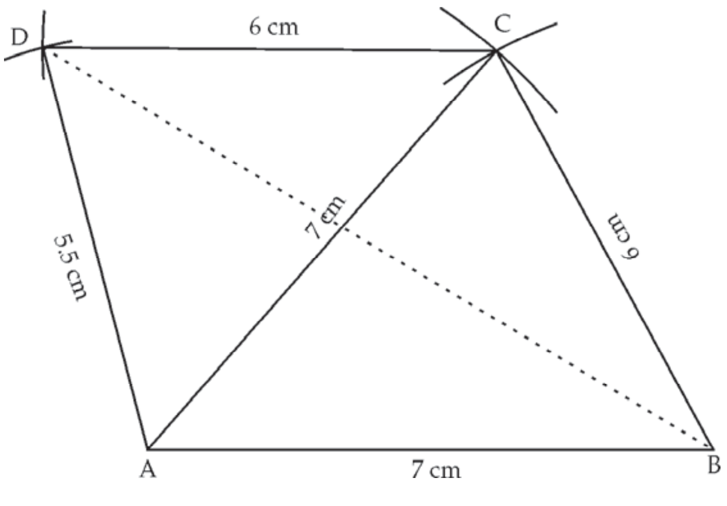
1. Draw a line segment of measure 6 cm. Name it as PL.
2. Using ruler and compass, make an angle of 90° (because each angle of a rectangle is right angle) at the end L and draw a ray LX.
3. Taking radius of 4.5 cm and centre as L, cut the line segment of measure 4.5 cm (say LU) from ray LX.
4. Further, draw the two arcs of radii 6 cm and 4.5 cm and centres as U and P respectively. These arcs cut each other at a point say S.
5. Now, join PS and VS.

Thus, PLUS is the required rectangle is so obtained.



WORKSHEET – 26

1. The length of diagonal BD = 10.1 cm.



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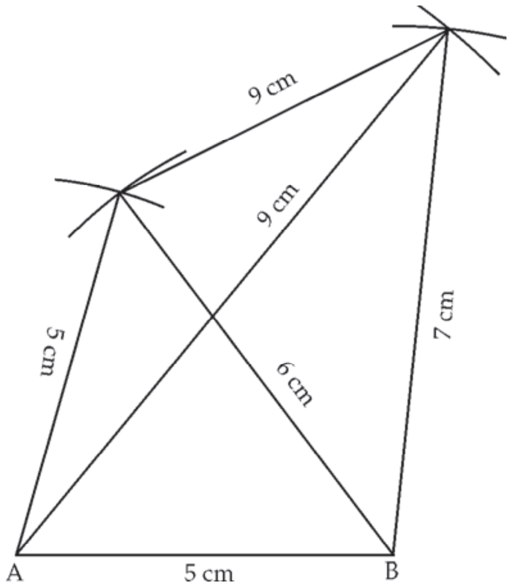

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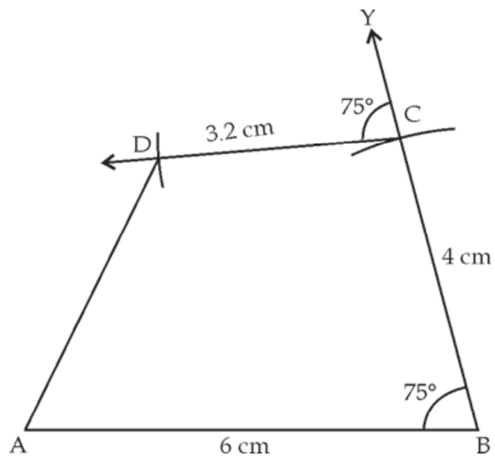
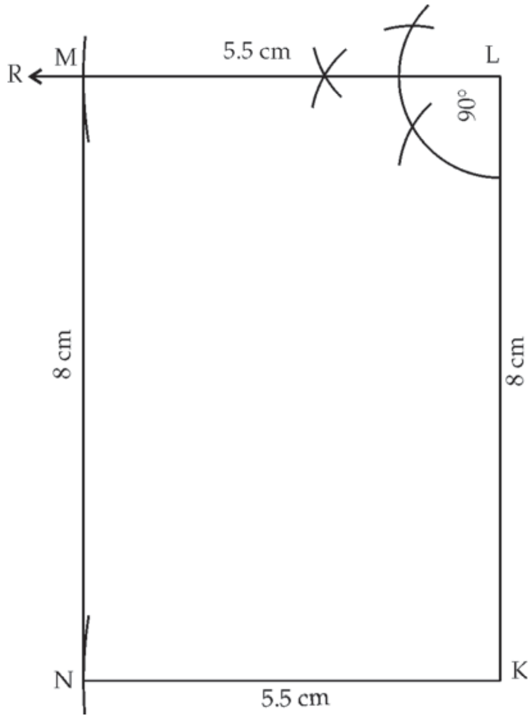


4. Steps of construction:

1. Draw a line segment of length 8 cm and name it KL.
2. As we know that a rectangle has all four angles of measure 90°.

   So, we make a right angle at L using ruler and compass and draw ray LR.
3. Taking radius of 5.5 cm and centre as L, draw an arc to mark the point M at ray LR.
4. Further, draw two arcs of radii 5.5 cm and 8 cm with centres as K and M respectively. Then cut each other at N.



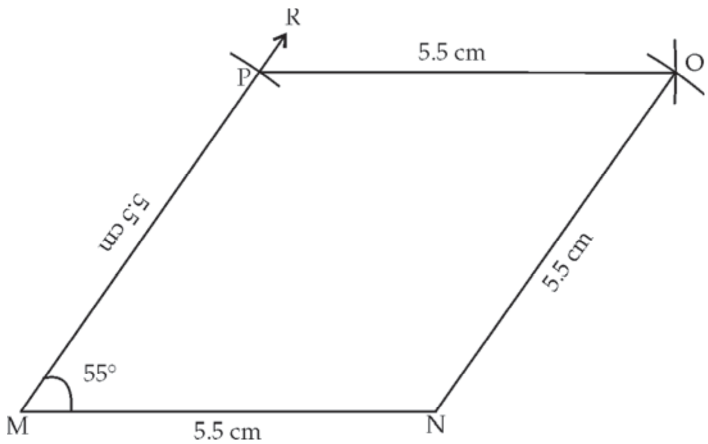
5. Join KN and MN.

   Thus, the required rectangle KLMN is so formed.

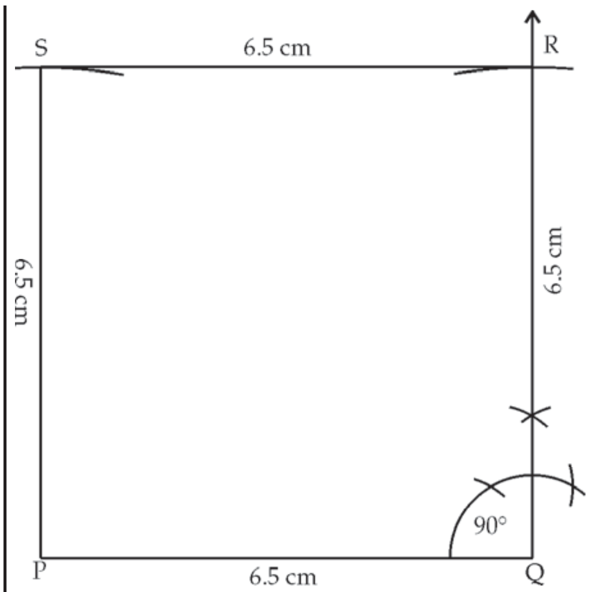
5. Steps of construction:

1. Take a line segment MN = 5.5 cm and then make an angle of 55° at M using protractor.
2. Taking radius of 5.5 cm and centre as M, draw an arc which cuts the other arm MR of ∠M at P.
3. Further, draw two arcs of the same radii as 5.5 cm with the centres as N and P. Thus, they cut each other at O.
4. Now join the intersecting point O to P and N.

   Thus, the rhombus MNOP is so formed.



6. Steps of construction:

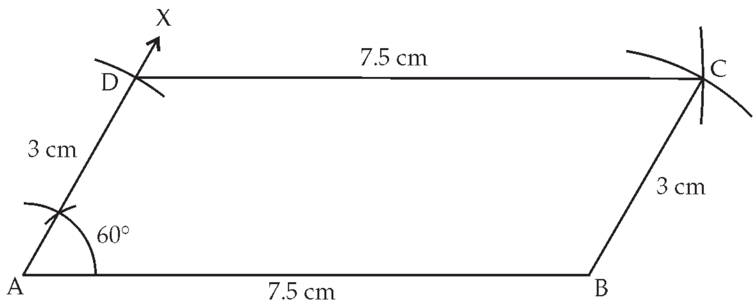


1. Draw a line segment of length 6.5 cm and name it as PQ.
2. Since each angle of a square has of measure 90°. So we draw a right angle at Q using ruler and compass.
3. Taking the radius of 6.5 cm and centre as Q, draw an arc to mark the point R at ray QY.
4. Draw two arcs taking the same radii 6.5 cm and centres as P and R respectively. They cut each other at a point say S.
5. Now join PS and RS.

   Thus, the required square PQRS is so obtained.

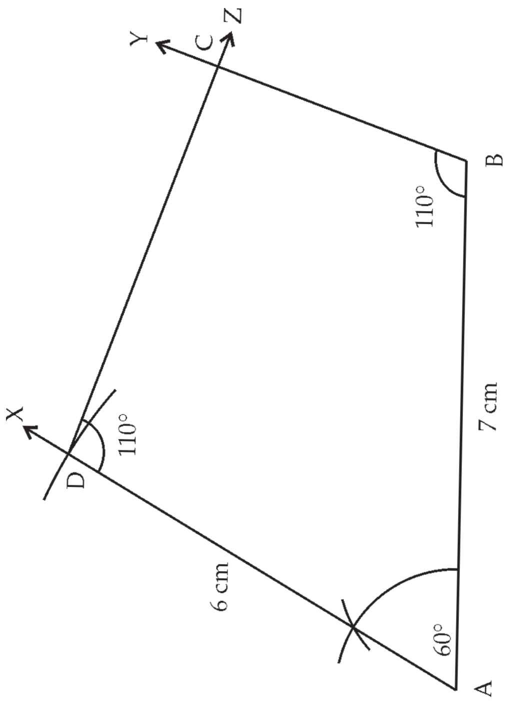
7. Steps of construction:

1. Draw AB = 7.5 cm.
2. Using ruler and compass, make an angle of 60° at A and draw another arm ray AX.
3. Taking radius of 3 cm and centre as A draw an arc to cut the segment AD = 3 cm from ray AX.
4. Further, taking radii as 3 cm and 7.5 cm with centres as B and D respectively, draw two arcs that cut each other at C.
5. Join BC and DC to obtain the required parallelogram ABCD.



WORKSHEET–27

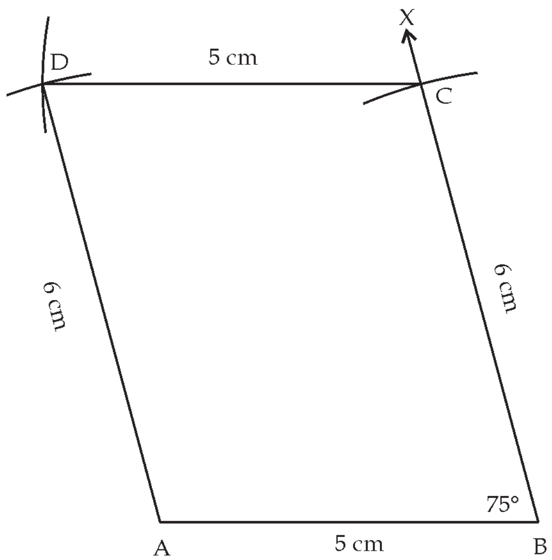
1.



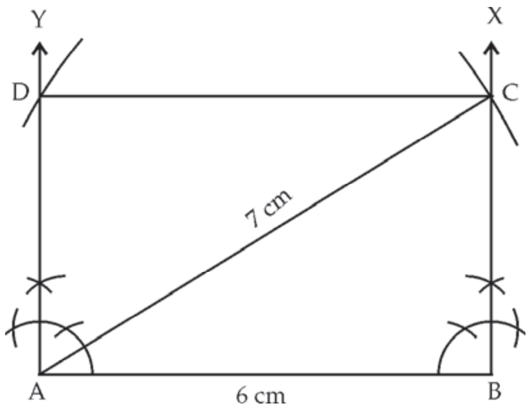
2. Consider ∠P + ∠Q + ∠R = 105° + 120° + 135° = 360°.

As we know that sum of all the four angles of a quadrilateral is equal to 360°. But in this case, the sum of only three angles is equal to 360°. So the construction of PQRS is not possible.

3.



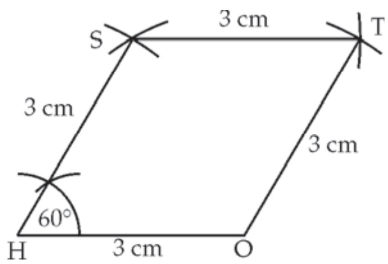
4. Steps of construction:
   1. Draw a line segment AB = 6 cm.
   2. We know that all angles of a rectangle has measure of 90°. So, we make right angles at B as well as at A using ruler and compass. Then draw rays BX and AY.
   3. Also we know that a rectangle has equal diagonals. So, we take equal radii as 7 cm and centres as A as well as B to mark the point C and D on the rays BX and AY respectively.



4. Now, join CD to get the required rectangle ABCD.

5. Steps of construction:

1. Draw a line segment HO = 3 cm.
2. Using ruler and compass, make an angle of 60° at H and draw a ray HX.
3. Taking a radius of 3 cm and centre as H, cut the segment HS = 3 cm.
4. Further, draw two arcs of the same radii 3 cm with centres as O and S. Thus, they cut each other at T.



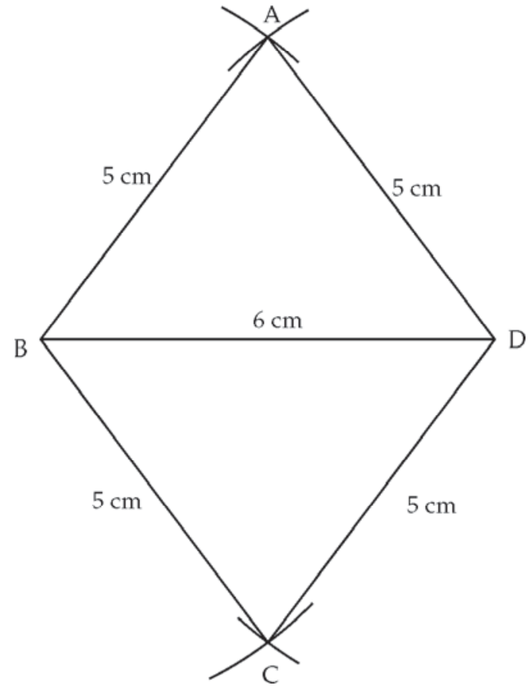
5. Now, join ST and OT.

Thus, the required rhombus HOTS is so obtained

6. Steps of construction:

1. Draw a line segment (diagonal) BD = 6 cm.
2. Taking a radius of 5 cm and centre as B, draw two arcs on either side of BD.
3. Taking the same radius of 5 cm but centres as D again draw two arcs on either side of BD. Thus, they cut the previous arcs at A and C respectively.
4. Now, join AB, AD, CB and CD.

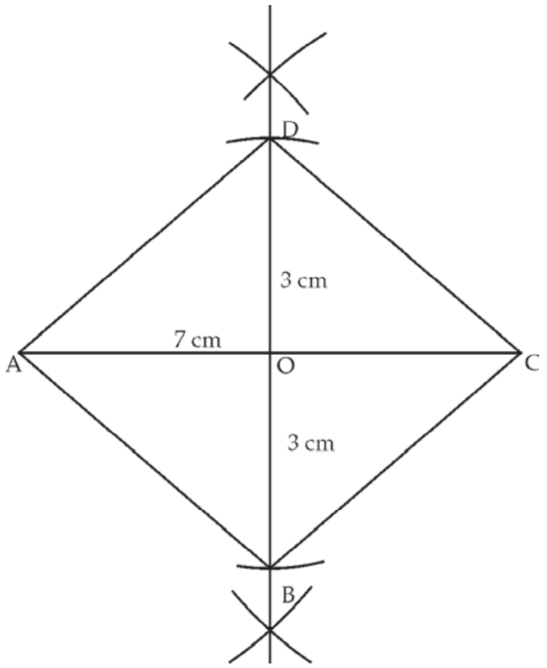
Hence, the required rhombus ABCD is so obtained.



7. Steps of construction:

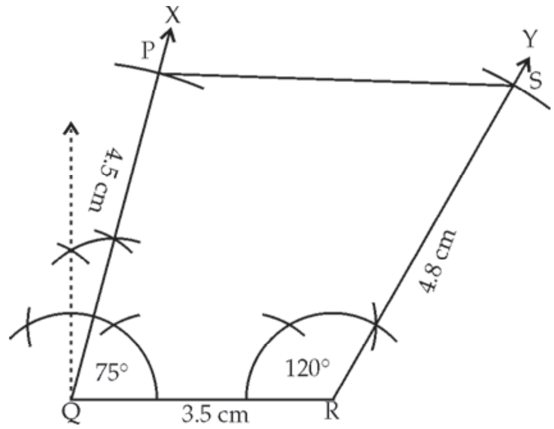
1. Draw a line segment of length 7 cm and say it diagonal AC.
2. Draw perpendicular bisector (say PQ) of the segment AC. Let it intersect at O.
3. As we know that diagonals of a rhombus bisect each other at 90°. So we take the radius as half of other diagonal (*i.e.*, 3 cm) and centre as O then mark the points B and D at PQ on either side of AC.
4. Now, join BA, BC and DA, DC.

Thus, we obtain the required rhombus ABCD.



WORKSHEET – 28

1. The measurement of PS = 4.6 cm.



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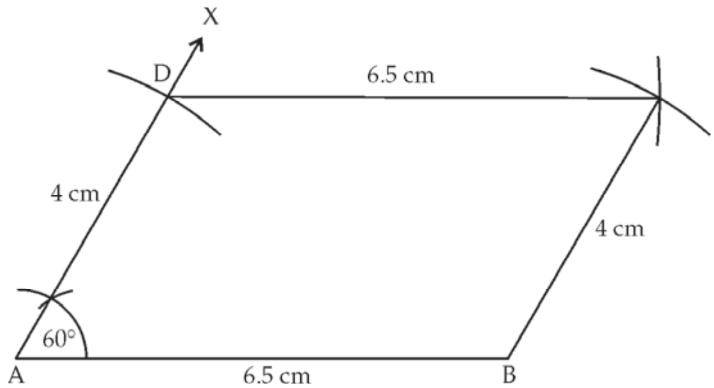

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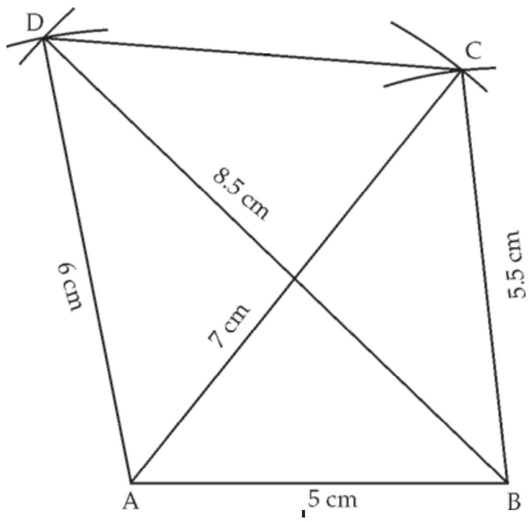
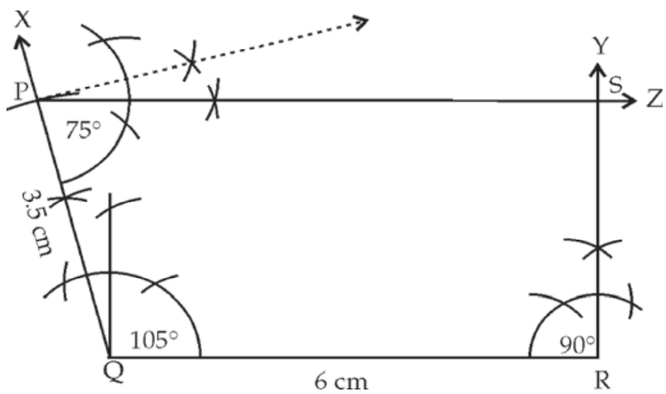


4. Steps of construction:

1. Draw a line segment QR = 6 cm.
2. Using ruler and compass, make an angle of 90° at R and draw a ray RY.
3. Also, using ruler and compass, make an angle of 105° at Q and draw a ray QX.
4. Further, take a radius of 3.5 cm and centre as Q then mark P on the ray QX.
5. Now, using ruler and compass, make an angle of 75° at P and draw a ray PZ.
6. Thus, the two rays RY and PS cut each other at S.

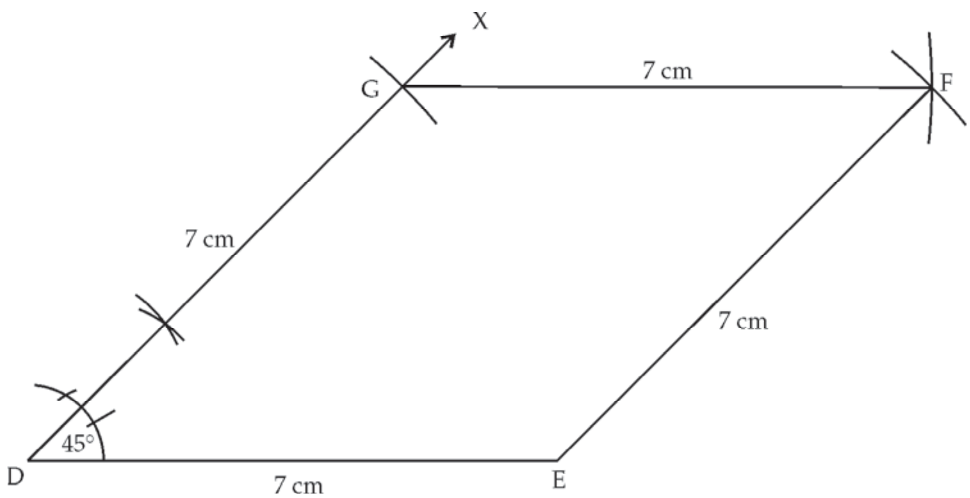
Hence, the required quadrilateral PQRS is so obtained.



5. Steps of construction:

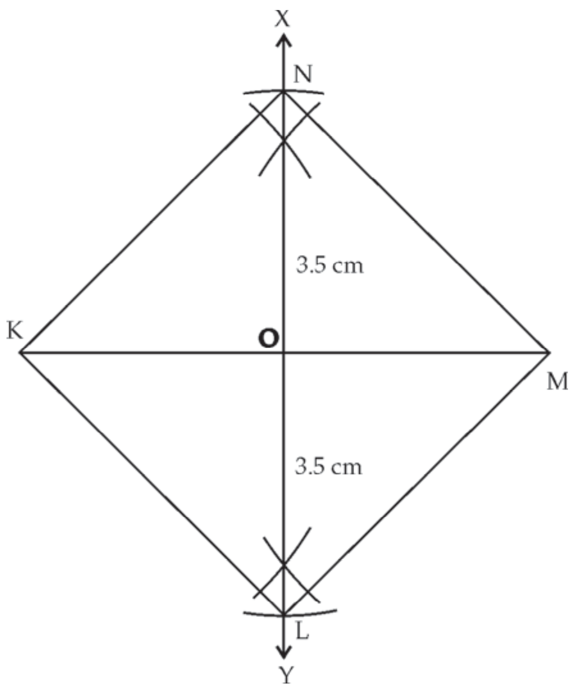
1. Draw a line segment DE = 7 cm.
2. Using ruler and compass, make an angle of 45° at D and draw a ray DX.
3. Taking a radius of 7 cm and centre as D, draw an arc to mark the point G on DX.
4. Further, taking the same radii of 7 cm with centres as G as well as E, draw two arcs that cut each other at a point F.
5. Now, join the segments FG and FE.

Thus, the required rhombus DEFG is so formed.



6. Steps of construction:

1. Draw a line segment of length 7 cm, name it as KM.
2. Draw perpendicular bisector of the segment KM and name it as XY.
3. Further, taking half of KM (*i.e.*, KO = OM) as radius and centre as O, cut ON as well as OL from XY on either side of KM.



[Note: Diagonals of a square are bisect each other at 90°.]

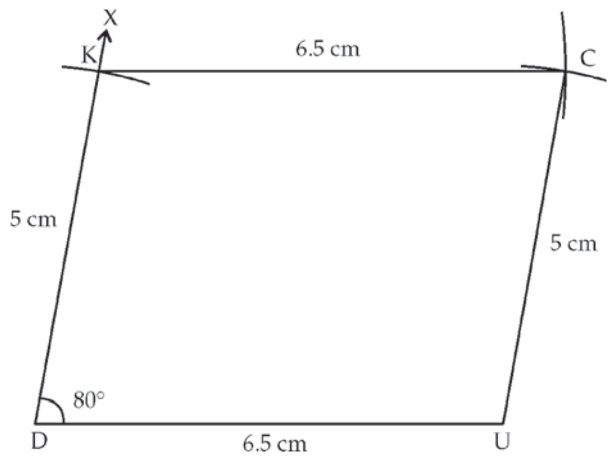
4. Now, join LK, LM and NK, NM.

Thus, the required squared KLMN is so formed.

7. Steps of construction:

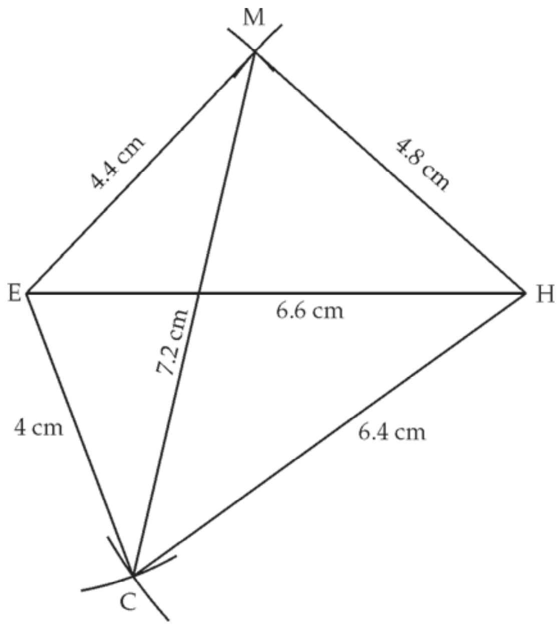
1. Draw a line segment of length 6.5 cm and name it as DU.
2. Using protractor make an angle of 80° at the point D and draw a ray DX.
3. Taking radius of 5 cm and centre as D, draw an arc that cut the ray DX at K.
4. Further, take two radii as 6.5 cm and 5 cm and centres as K and U, then draw two arcs that cut each other at C.
5. Now, join CK and CU.

Thus, the required parallelogram DUCK is so formed.

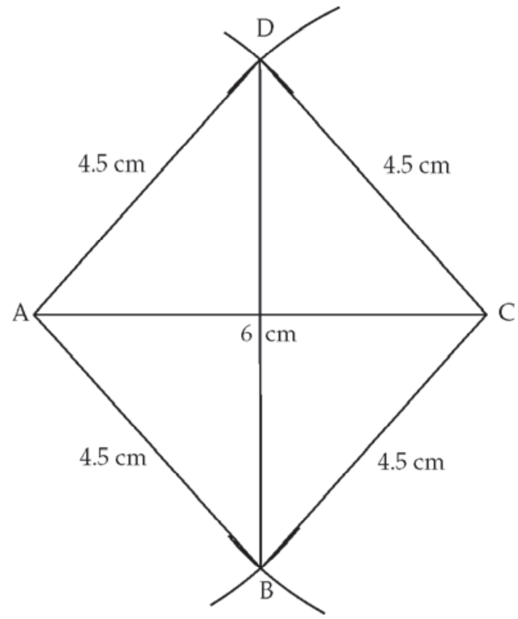


WORKSHEET–29

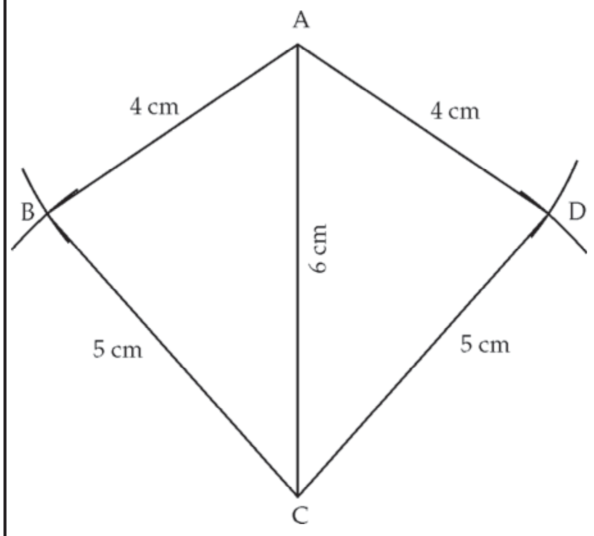
1\.



2\.



3\.

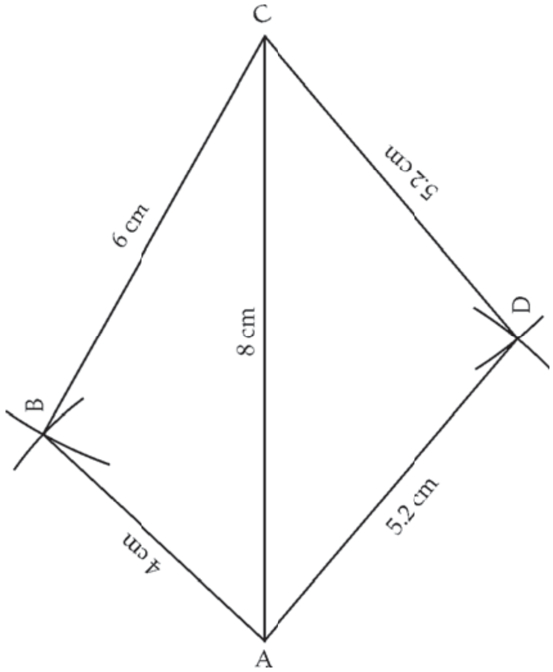


4. Yes, since AB + BC > AC and CD + AD > AC.

Steps of construction:

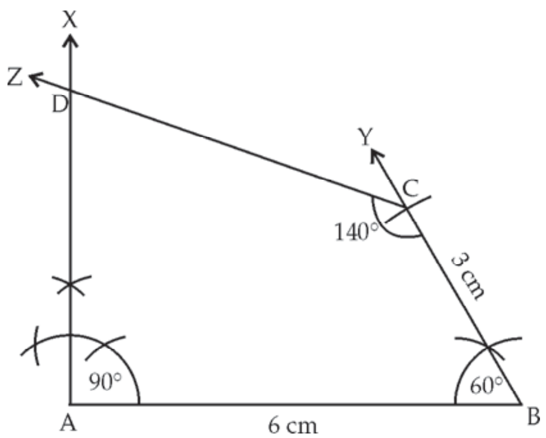
1. Draw a line segment AC = 8 cm.
2. Taking radius of 4 cm and centre as A draw an arc on one side of AC.
3. Taking radius of 6 cm and centre as C draw another arc on the same side of AC in which previous arc is drawn. Thus, they cut each other at B.
4. Join B to A and C. Thus, a triangle ABC is formed.
5. Further, taking the same radii of 5.2 cm with centres as A and C, draw two arcs on other side of AC. Thus, they cut at point D.
6. Now, join DA and DC.

   Hence, quadrilateral ABCD is so formed.



5. Steps of construction:

1. Draw a line segment AB = 6 cm
2. At the ends A and B, make angles of measures 90° and 60° respectively using ruler and compass. Also draw the rays AX and BY.
3. Taking radius of 3 cm and centre as B, draw an arc to mark C on ray BY.
4. Further, using protractor, make an angle of measure 140° at C and draw a ray CZ.



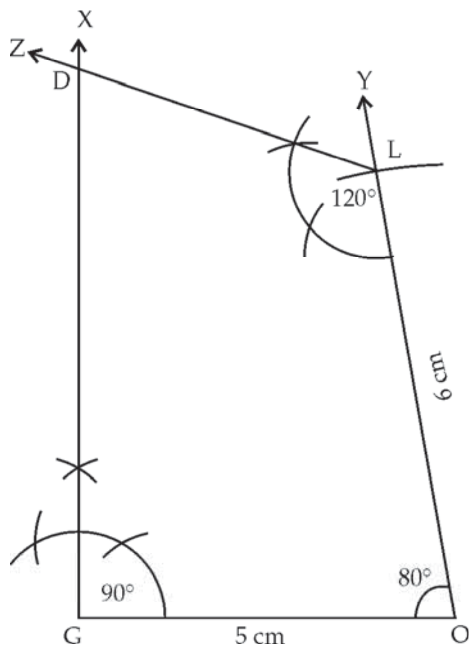
5. Thus, the two rays AX and CZ cut each other at a point D.

   Hence, the required quadrilateral ABCD is so formed.

6. Steps of construction:

1. Draw a line segment GO = 5 cm.
2. Using ruler and compass, make and angle of 90° at G and draw a ray GX.
3. Using protractor, make an angle of 80° at O and draw a ray OY.
4. Further, taking radius of 6 cm and centre as O, draw an arc which cut OY at L.
5. Now, using ruler and compass, make an angle of 120° at L and draw a ray LZ that intersect the ray GX at D.

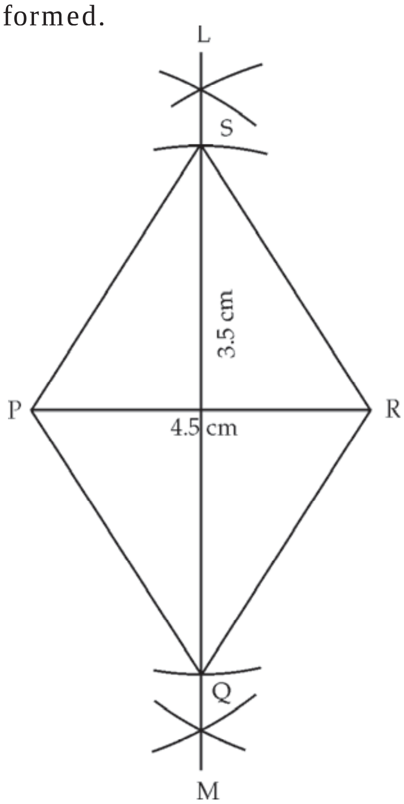
   Thus, the required quadrilateral GOLD is so formed.



7. Steps of construction:

1. Draw a line segment of length 4.5 cm and name it as PR.
2. Draw perpendicular bisector LM of PR and name the intersecting point as O.
3. Now take the radius as half of other diagonal (*i.e.*, $\frac{3.5}{2}$ cm) and centre as O and hence cut OS and OQ on LM.
4. Now join QP, QR, SP and SR.

Thus, the required rhombus PQRS is formed.



WORKSHEET–30

1. Concave quadrilateral.

2. No.

3. Rhombus.

4. Kite

5. Steps of construction:

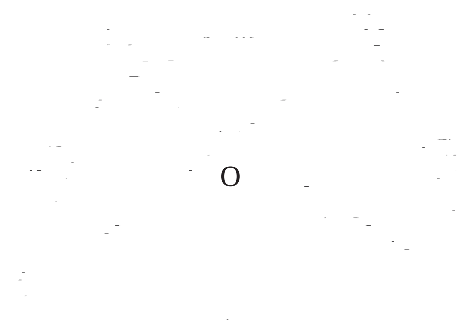
1. Draw a line segment of measure 4.5 cm. Name it as AB.
2. Draw a line segment of measure 6 cm. Name it as AD.
3. Draw a diagonal 7.5 cm.

Yes, rectangle.

6. Ten parts, *i.e.*, four sides, four angles and two diagonals.

7. Steps of construction:

1. Draw a line segment AB = 6.5 cm.
2. Using ruler at A draw a ray AD.
3. Taking a radius of 3.5 cm and centre as A draw an arc to mark the point O on AD.



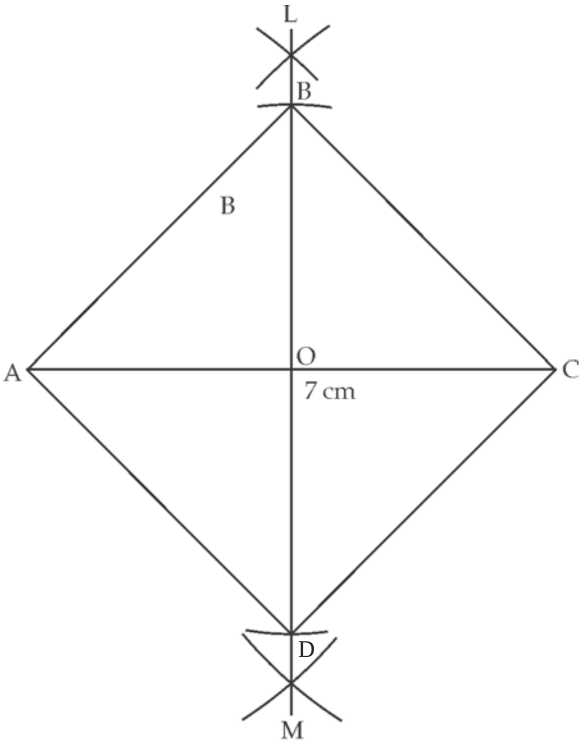
4. Further, taking the radius 4 cm centres as B as well as A, draw two arcs that cut each other at a point C.
5. Now, join the segments DC and AC.

   Thus, the required BD is measured as 6 cm.

8. *Try yourself.*

9. Steps of construction:

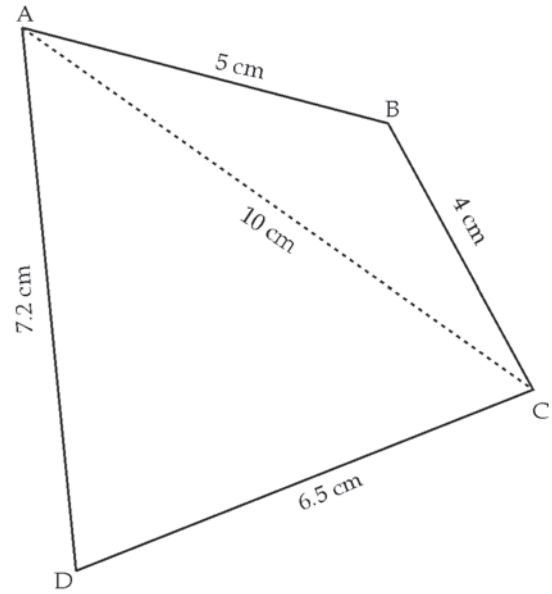
1. Draw a line segment having 7 cm as length.



2. Draw perpendicular bisector LM of AC and name the intersecting point as O.
3. Now, take the radius as half of other diagonals $\frac{7}{2}$ cm and centres as O and hence cut OD and OB on LM.
4. Now, join AB, BC, DA and DC.

   Thus, the required rhombus ABCD is formed.

10. No, AB + BC < AC, but sum of adjacent sides can't be less than any diagonal.



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Chapter 5

DATA HANDLING

WORKSHEET– 31

1. (A) Class size = Upper class limit – Lower class limit.

2. (A) For the class 10 - 20,

lower class limit = 10

and upper class limit = 20.

3. (A) Class size = Upper class limit – Lower class limit

= 10 – 5 = 5.

4. (C) Upper limit = 60

and lower limit = 40.

5. (C) The lowest frequency is 1 which corresponds to the class 20 - 30.

6. (B) The height of a bar in a histogram shows the corresponding frequency.

7. (D) There is no gap between any two consecutive bars in a histogram.

8. (D) The bar corresponding to 2008 - 09 is the highest. So the number of students is maximum in 2008 - 09.

9. (B) Central angle = $\frac{360°}{100} \times 15 = 54°$.

10. (C) Required per cent = $\frac{4}{20} \times 100\%$

= 20%.

11. (C)Probability = $\frac{1}{2}$.

12. (C)Favourable outcomes: (1, 4), (2, 3), (3, 2), (4, 1).

Number of all possible outcomes = 36

∴ Probability = $\frac{4}{36} = \frac{1}{9}$.

13. (A) Number of non-black balls

= 3 + 5 = 8

Number of all balls = 3 + 4 + 5 = 12

∴ Required probability = $\frac{8}{12} = \frac{2}{3}$.

14. (C) Draw a horizontal line. The spinner is divided into 8 equal parts.

There are 5 parts in the unshaded portion.

∴ Required probability = $\frac{5}{8}$.

15. (C) Numbers less than or equal to 5 are: 1, 2, 3, 4, 5.

Required probability = $\frac{5}{10}$

= $\frac{1}{2}$.

WORKSHEET– 32

1.

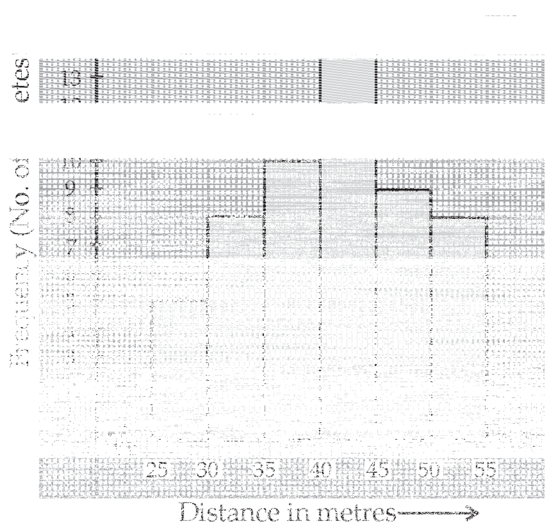


Fig.: Histogram

2. Frequency Table:

Weight (in kg)	Tally Marks	No. of Students
50	||	2
51	卌	5
52	卌 ||	7
53	|||	3
54	||||	4
55	卌 |	6
60	|||	3
	Total	**30**

3. Frequency Table:

Hobbies of Students	Tally Marks	No. of Students
Art	||||	4
Book reading	|||	3
Dance	卌	5
Instrumental music	||	2
Music	卌 |||	8
Total		**22**

4. (*i*) Let us draw pictograph.

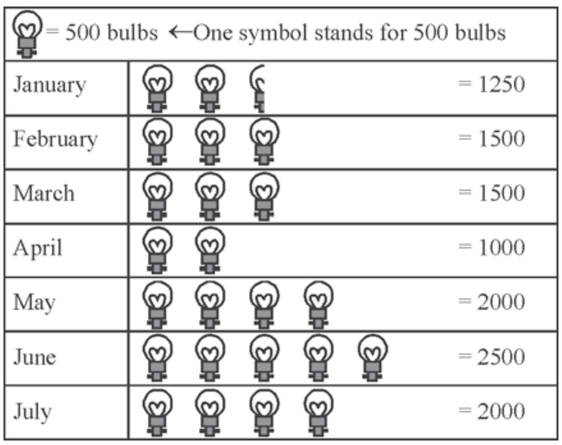


Fig.: Pictograph

(*ii*) Let us draw bar graph.

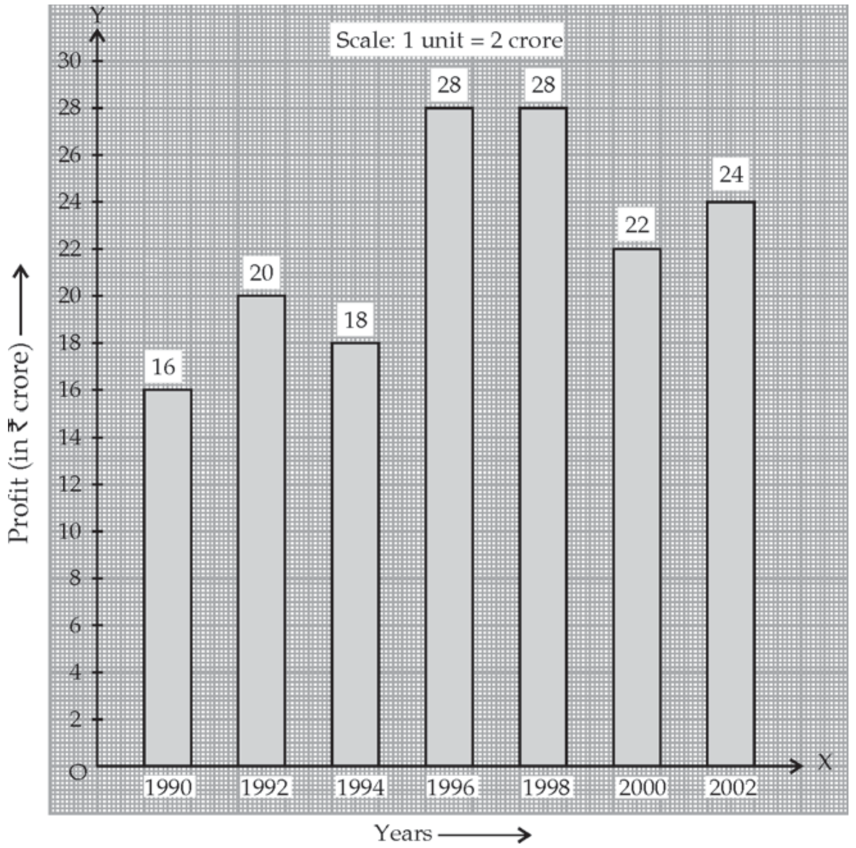


Fig.:Bar graph

(*iii*) Let us draw bar graph.

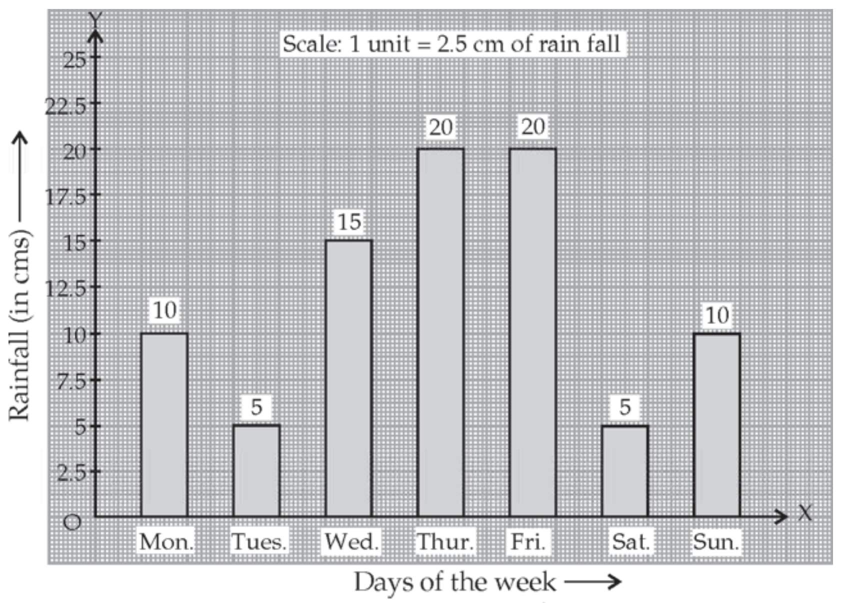
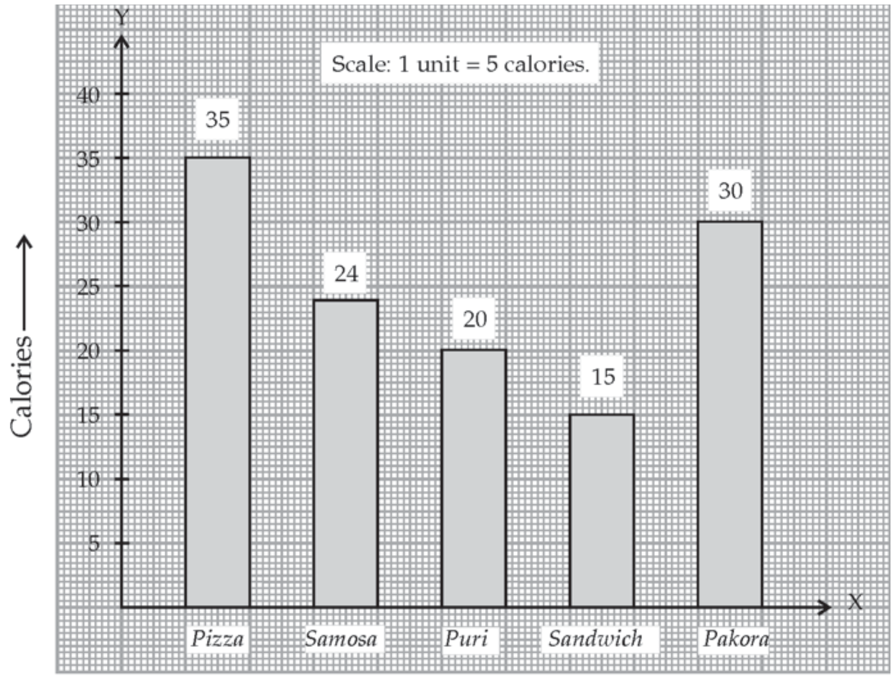


Fig.: Bar graph

(*iv*)



Types of food ⟶

Fig.: Bar graph

WORKSHEET – 33

1. Number of heads (H) = 6;

Number of tails (T) = 4

Total number of outcomes = 10

Percentage chance of occurrence of head

$$(H) = \frac{6}{10} \times 100\%$$

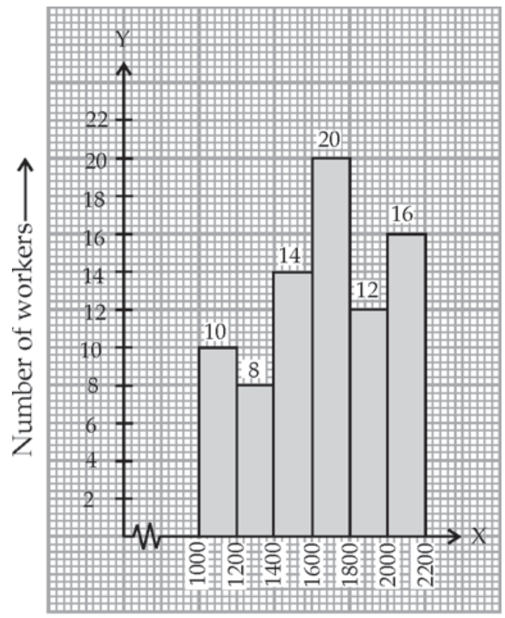
$$= 60\%$$

Percentage chance of occurrence of tail

$$(T) = \frac{4}{10} \times 100\%$$

$$= 40\%$$

2.



Wages (in ₹) ⟶

Fig.: Histogram

3.

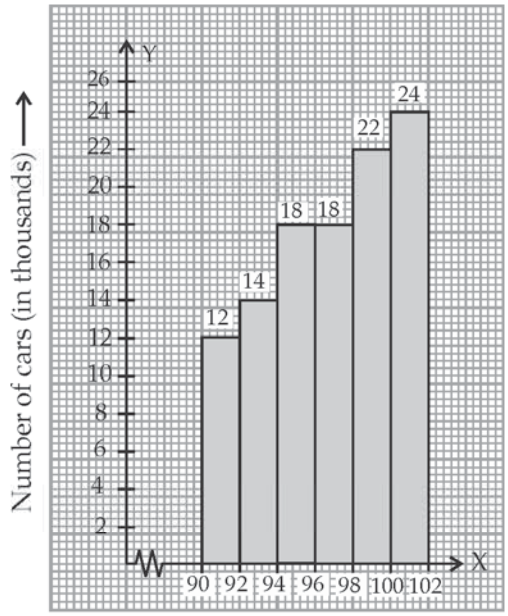


Fig.: Histogram

4. (*i*) Since pink has the largest central angle, so it is the favourite colour.

(*ii*) Lemon and blue were equally liked by the family, as they have equal central angles.

(*iii*) Since green has the smallest central angle, so it is liked the least.

5. (*i*) Lowest observation = 28 marks

Highest observation = 61 marks.

(*ii*)

Marks Obtained	**Tally Marks**	**Frequency**
28	||	2
30	||||	4
34	|	1
35	||	2
55	||	2
56	|||	3
60	|||	3
61	|||	3
Total		20

6. (*i*)

Expenditure Modes	**Expenditure (in %)**
House rent	20
Household items	30
Daughter's fees	10
Savings	25
Petrol	15

(*ii*)

Expenditure Modes	**Expenditure**		**Central Angle**
	(in %)	**In fraction**	
House rent	20	$\frac{20}{100} = \frac{1}{5}$	$\frac{1}{5} \times 360° = 72°$
Household items	30	$\frac{30}{100} = \frac{3}{10}$	$\frac{3}{10} \times 360° = 108°$
Daughter's fees	10	$\frac{10}{100} = \frac{1}{10}$	$\frac{1}{10} \times 360° = 36°$
Savings	25	$\frac{25}{100} = \frac{1}{4}$	$\frac{1}{4} \times 360° = 90°$
Petrol	15	$\frac{15}{100} = \frac{3}{20}$	$\frac{3}{20} \times 360° = 54°$

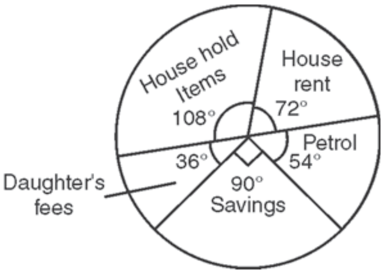


Fig.: Pie-chart

7. For the given information, we have to draw a double bar graph.

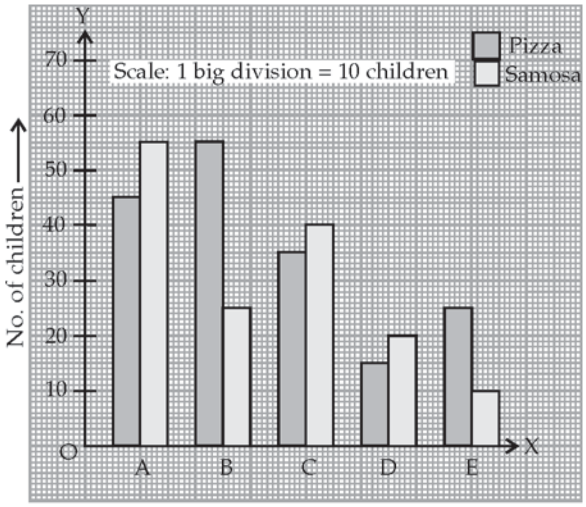


Fig.: Double bar graph

WORKSHEET – 34

1. Total number of items = 6 + 4 = 10.

(*i*) Probability of removing a rubber

$= \frac{4}{10} = \frac{2}{5}.$

(*ii*) Probability of removing a pencil

$= \frac{6}{10} = \frac{3}{5}.$

2. (*i*) Total number of marbles

= 7 + 5 + 3 = 15.

(*ii*) (*a*) P(a red marble)

$= \frac{\text{Number of red marbles}}{\text{Total number of marbles}}$

$= \frac{7}{15}.$

(*b*) P(a blue marble)

$= \frac{\text{Number of blue marbles}}{\text{Total number of marbles}}$

$= \frac{5}{15} = \frac{1}{3}.$

(*c*) P(a green marble)

$= \frac{\text{Number of green marbles}}{\text{Total number of marbles}}$

$= \frac{3}{15} = \frac{1}{5}.$

3. Percentage of no heads

$= \frac{\text{Number of outcomes having no head}}{\text{Total number of outcomes}} \times 100\%$

$= \frac{1}{6} \times 100\% = 16\frac{2}{3}\%.$

Percentage of 1 head

$= \frac{\text{Number of outcomes having 1 head}}{\text{Total number of outcomes}} \times 100\%$

$= \frac{2}{6} \times 100\% = \frac{100}{3}\%$

$= 33\frac{1}{3}\%.$

Percentage of 2 heads

$= \frac{\text{Number of outcomes having 2 heads}}{\text{Total number of outcomes}} \times 100\%$

$= \frac{2}{6} \times 100\% = 33\frac{1}{3}\%$

Percentage of 3 heads

$= \frac{\text{Number of outcomes having 3 heads}}{\text{Total number of outcomes}} \times 100\%$

$= \frac{1}{6} \times 100\% = 16\frac{2}{3}\%.$

No. of Heads	Frequency	Percentage
0	1	$16\frac{2}{3}\%$
1	2	$33\frac{1}{3}\%$
2	2	$33\frac{1}{3}\%$
3	1	$16\frac{2}{3}\%$
Total	**6**	**100%**

4. (*i*) Required probability

= P(5 on 1^{st} die and 6 on 2^{nd} die) + P(6 on 1^{st} die and 5 on 2^{nd} die).

$$= \frac{1}{8} \times \frac{1}{8} + \frac{1}{8} \times \frac{1}{8}$$

$$= \frac{1}{64} + \frac{1}{64} = \frac{2}{64} = \frac{1}{32}.$$

(*ii*) Let E represents the event that sum of two numbers is 10.

∴ E = {(2, 8), (3, 7), (4, 6), (5, 5), (6, 4), (7, 3), (8, 2)}

∴ $n(E) = 7$. $n(S) = 8 \times 8 = 64$

$$\therefore\ P(E) = \frac{n(E)}{n(S)} = \frac{7}{64}.$$

(*iii*) P(both the numbers are even)

= P(an even number on 1^{st} die) × P(an even number on 2^{nd} die)

$$= \frac{4}{8} \times \frac{4}{8} = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}.$$

(*iv*) Required probability

= P(an odd number on 1^{st} die and an even number on 2^{nd} die)

+ P(an even number of 1^{st} die and an odd number on 1^{st} die)

$$= \frac{4}{8} \times \frac{4}{8} + \frac{4}{8} \times \frac{4}{8} = \frac{1}{4} + \frac{1}{4} = \frac{1}{2}.$$

(*v*) Required probability

= P(6 is not on 1^{st} die) × P(6 is not on 2^{nd} die)

$$= \frac{7}{8} \times \frac{7}{8} = \frac{49}{64}.$$

5. On tossing a coin three times, the sample space S is given by

S = {HHH, HHT, HTH, HTT, THH, THT, TTH, TTT}

∴ n(s) = 8.

(*i*) Let E_1 = Event of showing up three heads

∴ E_1 = {HHH} ∴ $n(E_1) = 1$

$$\therefore\ P(E_1) = \frac{n(E_1)}{n(S)} = \frac{1}{8}.$$

(*ii*) Let E_2 = Event of showing up three tails

= {TTT}

∴ $n(E_2) = 1$

$$\therefore\ P(E_2) = \frac{n(E_2)}{n(S)} = \frac{1}{8}.$$

(*iii*) Let E_3 = Event of showing same side all the three times

= {HHH, TTT}

∴ $n(E_3) = 2$

$$\therefore\ P(E_3) = \frac{n(E_3)}{n(E_3)} = \frac{2}{8}.$$

(*iv*) Let E_4 = Event of tails showing up 2 times and heads once

= {HTT, THT, TTH}

∴ $n(E_4) = 3$

$$\therefore\ P(E_4) = \frac{n(E_4)}{n(S)} = \frac{3}{8}.$$

(*v*) Let E_5 = Event of heads showing up 2 times and tails once.

= {HHT, HTH, THH}

$\therefore \quad n(E_5) = 3$

$\therefore \quad P(E_5) = \frac{n(E_5)}{n(S)} = \frac{3}{8}$.

6. Ishita's marks in English

$= \frac{70°}{360°} \times 216 = \frac{7}{36} \times 216$

$= 7 \times 6 = 42$.

Ishita's marks in Hindi

$= \frac{30°}{360°} \times 216 = \frac{1}{12} \times 216$

$= 18$.

Ishita's marks in Maths

$= \frac{100°}{360°} \times 216 = \frac{5}{18} \times 216$

$= 60$.

Ishita's marks in Science

$= \frac{70°}{360°} \times 216 = \frac{7}{36} \times 216$

$= 42$.

Ishita's marks in S.St.

$= \frac{90°}{360°} \times 216$

$= \frac{1}{4} \times 216 = 54$.

WORKSHEET–35

1. The most common outcome is 4 as its frequency is the highest, *i.e.*, 4

$\therefore \quad$ Probability of $4 = \frac{4}{12} = \frac{1}{3}$.

2. Number of H's = 10

∴ Chance (Probability) of occurrence of

$H = \frac{10}{20} = \frac{1}{2}$

Number of T's = 10

∴ Chance (Probability) of occurrence of

$T = \frac{10}{20} = \frac{1}{2}$.

3. (*i*) The sale of T.V. was maximum in July.

(*ii*) The sale of T.V. was minimum in March and May.

(*iii*) 30 T.V. were sold in each of January, April, June, August, September and December.

(*iv*) 45 T.V. were sold in October.

(*v*) 10 T.V. were sold in March and May each.

(*vi*) Required number of T.V.

= Total number of T.V. sold in January, February and March

= 30 + 20 + 10 = 60.

(*vii*) Required number of T.V.

= Total number of T.V. sold in April, May and June

= 30 + 10 + 30 = 70.

(*viii*) Required number of T.V.

= Total number of T.V. sold in July, August and September

= 50 + 30 + 30 = 110.

(*ix*) Required number of T.V.

= Total number of T.V. sold in October, November and December

= 45 + 20 + 30 = 95.

(*x*) The sale was maximum in the third quarter and it was minimum in the first quarter of the year.

4. In order to draw a histogram, you have to follow the steps given below:

Step I: Take a graph paper and draw a pair of perpendicular lines OX and OY on it. The horizontal line OX is called x-axis and the vertical axis OY is called y-axis.

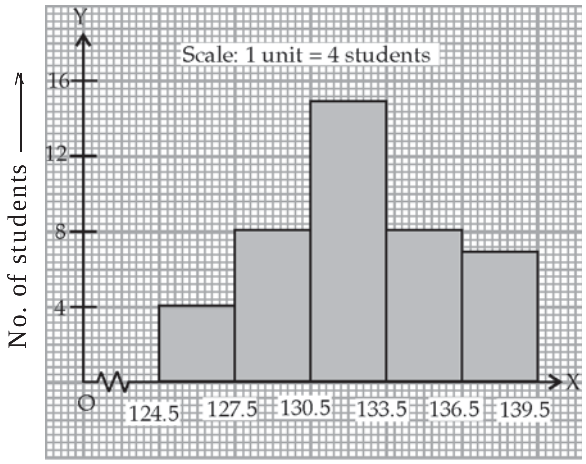


Fig: Histogram

Step II: Mark heights of the students on the x-axis and number of students on the y-axis by taking a scale as

1 unit = 3 cm height on x-axis and

1 unit = 4 student on y-axis.

Step III: Draw the bars on the x-axis such that the width of each bar is same and there is no gap between any two consecutive bars.

Step IV: The heights of these bars are proportional to the number of students.

5.

Favourite Dish	Tally Marks	Frequency (No. of Children)
French fries	||	2
Macroni	~~||||~~ |||	8
Pizza	~~||||~~ ~~||||~~	10
Sandwich	||||	4
Total		24

6. The appropriate graph of the given data is a double bar graph.

In order to draw a bar graph, you have to follow the steps:

Step I. Draw a pair of perpendicular lines say OX and OY on a graph paper. OX is called x-axis or horizontal axis and OY is y-axis or vertical axis.

Step II. Write names of students on the x-axis and percentage of marks on the y-axis taking an appropriate scale as

1 unit = 10% on the y-axis

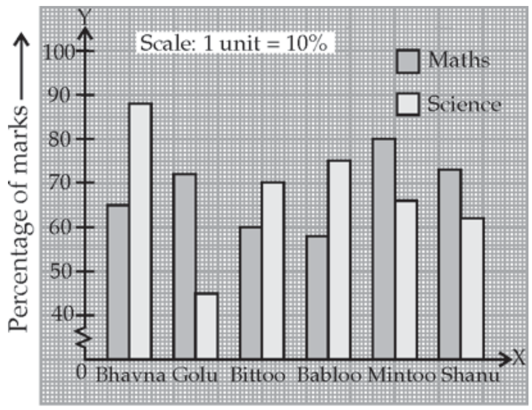


Fig: Double bar-graph

Step III: Draw the bars on the x-axis such that any two bars of Maths and Science touch each other with equal width for a student. The gap between any two consecutive pairs of bars should be equal.

Step IV: The heights of these bars correspond to the percentage of marks.

WORKSHEET–36

1. Pictograph:

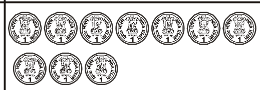
 = ₹ 100 ← 1 Coin represent ₹100.		
Expenses	Amount	
Books		= 550
Travelling		= 1000
Entertainment		= 600
Eating		= 200
Savings		= 200

Fig: Pictograph

2. (*i*) People of 30-35 age group spent maximum time for working out at the Gym.

(*ii*) People of 25-30, 35-40 and 40-45 age groups spent equal number of hours at the Gym.

(*iii*) People of 15-20 age group spent 1 hour at the Gym.

3. (*i*) Required number of members

$= 4 + 8 = 12.$

(*ii*) 10 members are in the age group of 25-30.

(*iii*) Age group of 31-36 has the maximum number of members.

4. Frequency Distribution Table:

Score Obtained	Tally Marks	Frequency
1	|||	3
2	卌 |	6
3	||||	4
4	||||	4
5	||||	4
6	||||	4
Total		**25**

5. Total number of students = 180

(*i*) Number of students liking Basketball

$$= \frac{60°}{360°} \times 180$$

$$= \frac{1}{6} \times 180 = 30.$$

(*ii*) Number of students liking Badminton

$$= \frac{120°}{360°} \times 180$$

$$= \frac{1}{3} \times 180 = 60.$$

Number of students liking Cricket

$$= \frac{100°}{360°} \times 180$$

$$= \frac{5}{18} \times 180 = 50.$$

∴ Required number of students

$$= 60 - 50 = 10.$$

(*iii*) Number of students liking Tennis

$$= \frac{80°}{360°} \times 180$$

$$= \frac{2}{9} \times 180 = 40.$$

∴ Required ratio $= \frac{40}{30}$ [Using part (*i*)]

$$= \frac{4}{3} = 4 : 3.$$

6. In order to draw a histogram, you have to follow the steps given below:

Step I: Take a graph paper and draw a pair of perpendicular lines OX and OY on it. The horizontal line OX is called x-axis and the vertical axis OY is called y-axis.

Step II: Mark daily earnings (in ₹) of given drug stores on the x-axis and number of stores on the y-axis by taking a scale as.

1unit = 2 stores on the y-axis.

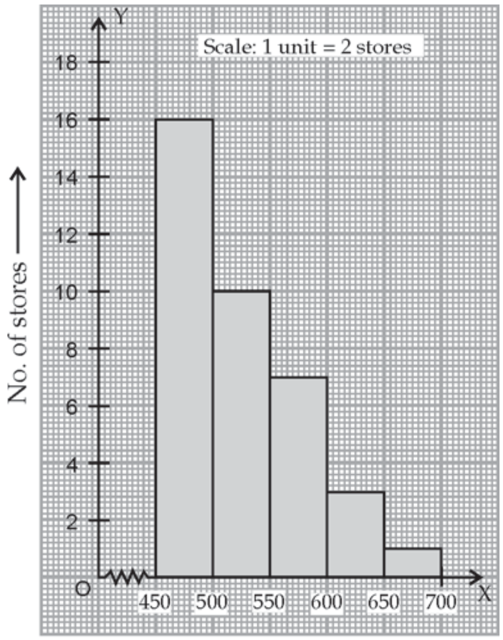


Fig: Histogram

Step III: Draw the bars on the x-axis by taking it as base, such that the width of each bar is same and there is no gap between any two consecutive bars.

Step IV: The heights of these bars are proportional to the number of stores.

7. (*i*) Range = Maximum wage – Minimum wage

= ₹ 400 – ₹ 200

= ₹ 200.

(*ii*) 3 workers are getting ₹ 350 each.

(*iii*) 5 workers are getting minimum wages of ₹ 200 each.

(*iv*) The highest amount of wages earned by workers is ₹ 400 each.

(*v*) 5 workers get ₹ 200 each as weekly wages.

WORKSHEET–37

1. (*i*) Lower limit of class 50 - 60 is 50.

(*ii*) Class marks of class 40 - 50 = $\frac{40+50}{2}$

= 45.

Class marks of class 50 - 60 = $\frac{50+60}{2}$

= 55.

(*iii*) Size of each given class is 10.

2. Frequency Distribution Table:

Marks	Tally Marks	Frequency
8	|||	3
9	|	1
10	||	2
11	||	2
12	||	2
15	||	2
16	|	1
17	|	1
18	|	1
19	|	1
20	||||	4
Total		20

(*i*) Range = 20 – 8 = 12 marks

(*ii*) Highest marks = 20 and lowest marks = 8.

(*iii*) 20 marks are occurring most frequently.

3. (*i*) Since the classes are 0 - 10, 10-20, 20 - 30, ... Therefore, the class size is 10.

(*ii*) Number of students in the class interval 0 - 10 are 3. So, 3 students obtained less than 10 marks.

(*iii*) Number of students obtaining 40 or more marks but less than 50

= Number of students in the class interval 40-50

= 8.

(*iv*) Class 70-80 is of highest marks and 5 students are there in this interval.

(*v*) Number of failures = 3 + 6 + 10 + 3

= 22.

4. (*i*) In the age group of 15-20, the number of literate females is the highest. In the age group of 10-15, the number of literate females is the lowest.

(*ii*) 300 is the lowest frequency.

(*iii*) Class-mark of class 10-15

$$= \frac{10+15}{2} = 12.5$$

Class-mark of class 15-20

$$= \frac{15+20}{2} = 17.5$$

Class-mark of class 20-25

$$= \frac{20+25}{2} = 22.5$$

Class-mark of class 25-30

$$= \frac{25+30}{2} = 27.5$$

Class-mark of class 30-35

$$= \frac{30+35}{2} = 32.5$$

Class-mark of class 35-40

$$= \frac{35+40}{2} = 37.5$$

(*iv*) Width of each class = 15 – 10 = 5.

5. (*i*)

Mark	Tally Marks	No.of Students
30 - 40	𝍷	1
40 - 50	𝍷𝍷𝍷	3
50 - 60	𝍷𝍷𝍷𝍷	4
60 - 70	𝍸 𝍷𝍷	7
70 - 80	𝍸	5
80 - 90	𝍸	5
90 - 100	𝍷𝍷𝍷𝍷	4
100 - 110	𝍷	1
Total		**30**

(*ii*) 100 marks is the highest score

(*iii*) 34 marks is the lowest score.

(*iv*) Range = 100 – 34 = 66 marks.

(*v*) Number of failures

= Sum of number of students having less than 40 marks

= 1.

(*vi*) Number of students having 75 or more marks = 3 + 5 + 4 + 1 = 13.

(*vii*) 100 is beyond the class 90-100.

(*viii*) Number of students having less than 50 marks = 1 + 3 = 4.

WORKSHEET–38

1. No, it is not possible.

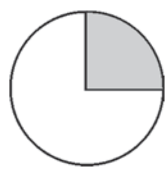
2. We represent the numerical value along the *y*-axis, while constructing a bar graph.

3. Given, the item covers an area of 25%

Angle of a circle = 360°

Now, 25% of 360°

$$\Rightarrow \quad \frac{25}{100} \times 360° = 90°$$



∴ The corresponding angle is 90°.

4. 6 outcomes are possible as a dice is having six faces.

5. Possible outcomes on tossing a coin = H, T (Taking H for head and T for tail)

Now, probability of getting head or tail

$= \frac{\text{Number of outcomes}}{\text{Total no. of outcomes}} = \frac{2}{2} = 1.$

6. Probability of winning a game = 0.3

Now, probability of losing it = 1 – 0.3

= 0.7

7. No. of red balls in the bag = 4

No. of white balls in the bag = 6

No. of black balls in the bag = 5

Total no. of balls in the bag = 15

(*i*) Probability of getting white ball

$= \frac{\text{No. of white balls in the bag}}{\text{Total no. of balls in the bag}}$

$= \frac{6}{15} = \frac{2}{5}.$

(*ii*) Probability of getting red ball

$= \frac{\text{No. of red balls in the bag}}{\text{Total no. of balls in the bag}}$

$= \frac{4}{15}.$

(*iii*) Probability of not getting black balls

$= \frac{\text{No. of red balls + No. of white balls}}{\text{Total no. of balls.}}$

$= \frac{6+4}{15} = \frac{10}{15} = \frac{2}{3}.$

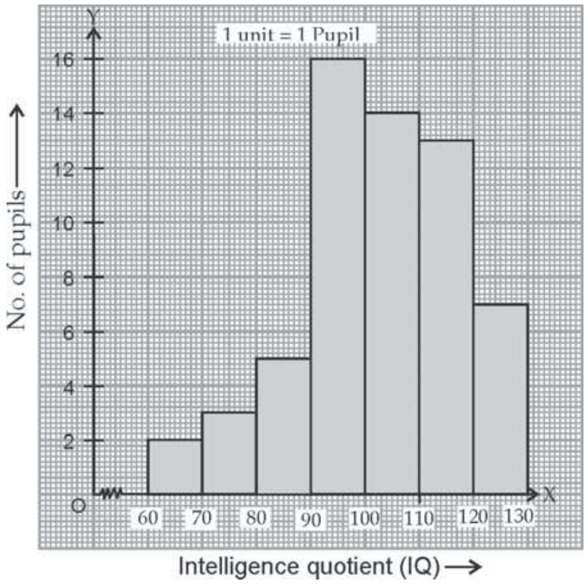
(*iv*) Probability of getting red or white balls

$= \frac{\text{No. of red balls + No. of white balls}}{\text{Total no. of balls}}$

$= \frac{6+4}{15} = \frac{10}{15} = \frac{2}{3}.$

8. *Try yourself.*

9.



10. (*i*) The class size = 1.

(*ii*) 8 Students obtained less than 10 marks.

(*iii*) 3 students obtained 30 or more marks but less than 40 marks.

(*iv*) The interval of highest marks is 70–80 and 5 students are in this interval.

(*v*) If passing marks are 30, then number of failures = No. of students getting marks less than 30 = 3 + 6 + 10 = 19.

❑❑

SQUARES AND SQUARE ROOTS

WORKSHEET–39

1. (B) $\sqrt{36} = 6$ or $36 = 6 \times 6 = 6^2$.

2. (B) $10^2 = 10 \times 10 = 100$.

3. (A) $441 = 21 \times 21 = 21^2$.

4. (B) The square ends in 1.

5. (D) $12^2 + 35^2 = 144 + 1225 = 1369$
$= 37^2$.

6. (C) $93^2 = 93 \times 93 = 8649$.

7. (B) $\sqrt{169} = \sqrt{13 \times 13} = 13$.

8. (B) $1372 = 2 \times 2 \times 7 \times 7 \times 7$
$= 2^2 \times 7^2 \times 7$

2	1372
2	686
7	343
7	49
7	7
	1

So, the given number should be divided by 7.

9. (D) $44 = 2 \times 2 \times 11$
$= 2^2 \times 11$

So, the given number should be multiplied by 11.

10. (B) $38^2 - 1400 = 1444 - 1400$
$= 44$

	37
3	$\overline{14}\,\overline{00}$
	9
67	500
×7	– 469
	31

So, 44 must be added to 1400.

11. (A)

	6.5
6	$\overline{42}.\overline{25}$
	–36
125	625
5	625
	0

$\therefore \sqrt{42.25} = 6.5$.

12. (C) $81 < 88 < 100$

Here $\sqrt{81} < \sqrt{88} < \sqrt{100}$

or $9 < \sqrt{88} < 10$

Since $88 - 81 = 7$ is smaller than $100 - 88 = 12$

Therefore, $\sqrt{88}$ is approximately 9.

13. (C) Area = Side^2 = $43^2 = 43 \times 43$
$= 1849$ m^2.

14. (C) $4 \times 4 = 16$.

15. (C) Required number
$= 133 - 11^2$
$= 133 - 121$
$= 12$.

	11
1	$\overline{1}\,\overline{33}$
	–1
21	33
1	21
	12

16. (D) Square root is the inverse operation of square and vice-versa.

17. (C) $\sqrt{9} = 3, -3$

$\sqrt{144} = 12, -12$.

18. (D) $\sqrt{64} = 8, -8$

19. (A)

2	4, 6, 15
2	2, 3, 15
3	1, 3, 15
5	1, 1, 5
	1, 1, 1

LCM $= 2 \times 2 \times 3 \times 5 = 60$

$\therefore 60 = 2^2 \times 3 \times 5$

$\therefore$ Required number $= 60 \times 3 \times 5$
$= 900$.

20. (C) Using the given pattern, we get

$5^2 = 1 + 3 + 5 + 7 + (7 + 2)$

$\therefore$ Missing number $= 7 + 2 = 9$.

21. (D) $\sqrt{\frac{49}{121}} = \frac{\sqrt{49}}{\sqrt{121}} = \frac{\sqrt{7 \times 7}}{\sqrt{11 \times 11}} = \frac{7}{11}$.

22. (A) $99^2 = 99 \times 99 = 9801$.

WORKSHEET–40

1. Two perfect square numbers are:
(a) 2 × 2 = 4 and (b) 3 × 3 = 9.

2. (i) $15^2 = 15 \times 15 = 225$.
(ii) $25^2 = 25 \times 25 = 625$.

3.

2	882
3	441
3	147
7	49
7	7
	1

$\therefore\ 882 = 2 \times 3 \times 3 \times 7 \times 7$
$= 2 \times 3^2 \times 7^2$

The given numbers must be multiplied by 2.

4. $\therefore\ 9408 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 7 \times 7$
$= 2^2 \times 2^2 \times 2^2 \times 7^2 \times 3$.

The given number must be divided by 3.

2	9408
2	4704
2	2352
2	1176
2	588
2	294
3	147
7	49
7	7
	1

5. Perimeter of a square = 4 × Side

or 148 = 4 × Side or $\frac{148}{4}$ = Side

$\therefore$ Side = 37 m.

$\therefore$ Area = $\text{Side}^2 = 37^2 = 37 \times 37$
$= 1369\ \text{m}^2$.

6. Area = Side^2

$\therefore\ 4624 = \text{Side}^2$

or $2 \times 2 \times 2 \times 2 \times 17 \times 17 = \text{Side}^2$

or $2^2 \times 2^2 \times 17^2 = \text{Side}^2$

$\therefore$ Side = 2 × 2 × 17
= 68 m.

2	4624
2	2312
2	1156
2	578
17	289
17	17
	1

7. Let one of the required numbers be x.

Then the other number = $16x$

Their product = $x \times 16x = 16x^2$

This is given to be 1296

$\therefore\ 16x^2 = 1296$

or $x^2 = \frac{1296}{16} = 81$

or $x = \sqrt{81} = \sqrt{9 \times 9} = 9$

$\therefore\ 16x = 16 \times 9 = 144$

Hence, the numbers are 144 and 9.

OR

Let the two consecutive natural numbers be x and $x + 1$.

Then, $(x + 1)^2 - x^2 = 79$

or $x^2 + 2x + 1 - x^2 = 79$ or $2x = 78$

or $x = 39\ \therefore\ x + 1 = 40$

Now we can write $40^2 - 39^2 = 79$

and the required numbers are 40 and 39.

8. $\sqrt{18} = 4.24$

	4.24
4	$\overline{18}.\overline{00}\overline{00}$
	−16
82	200
×2	– 164
844	3600
×4	– 3376
848	224

9. (i) $\sqrt{49} = \sqrt{7 \times 7} = 7$

(ii) $\sqrt{2500} = \sqrt{5 \times 10 \times 5 \times 10}$
$= 5 \times 10 = 50$.

(iii) $\sqrt{4 \times 4 \times 7 \times 7 \times 5 \times 5}$
$= 4 \times 7 \times 5 = 140$.

(iv) $\sqrt{729} = \sqrt{3 \times 3 \times 3 \times 3 \times 3 \times 3}$
$= 3 \times 3 \times 3$
$= 27$.

OR

First find the LCM of 8, 9 and 10.

2	8, 9, 10
2	4, 9, 5
2	2, 9, 5
3	1, 9, 5
3	1, 3, 5
5	1, 1, 5
	1, 1, 1

LCM $= 2 \times 2 \times 2 \times 3 \times 3 \times 5 = 360$

$\therefore\ 360 = 2^2 \times 3^2 \times 2 \times 5$

$\therefore$ Required number $= 360 \times 2 \times 5$

$= 3600.$

10. (*i*) $13^2 = 169$

$5^2 + 12^2 = 25 + 144 = 169.$

So, the Pythagorean triplet is 5, 12, 13.

(*ii*) $8^2 = 64$

$10^2 - 6^2 = 100 - 36 = 64.$

So, the Pythagorean triplet is 6, 8, 10.

OR

(*i*) $\sqrt{\dfrac{225}{441}} = \dfrac{\sqrt{225}}{\sqrt{441}} = \dfrac{\sqrt{15 \times 15}}{\sqrt{21 \times 21}}$

$= \dfrac{15}{21} = \dfrac{5}{7}.$

(*ii*) $\sqrt{\dfrac{9216}{10000}} = \dfrac{\sqrt{9216}}{\sqrt{10000}} = \dfrac{\sqrt{96 \times 96}}{\sqrt{100 \times 100}}$

$= \dfrac{96}{100} = \dfrac{24}{25}.$

11. (*i*) $\sqrt{169} = \sqrt{13 \times 13} = \sqrt{13^2} = 13.$

(*ii*) (*a*) $\because\ 625 = 5 \times 5 \times 5 \times 5$

$= 5^2 \times 5^2$

$\therefore\ \sqrt{625} = 5^2 = 25.$

(*b*) $\because\ 4096 = 2^{12} = 2^6 \times 2^6$

$\therefore\ \sqrt{4096} = 2^6 = 64.$

(*c*) $\because\ 16\ m^2 = 4\ m \times 4\ m$

$\therefore\ \sqrt{16\ m^2} = 4\ m.$

WORKSHEET–41

1. Since the square of 4 is an even number, so the square of 34 is also an even number.

2. (*i*)

	1.6
1	$\overline{2}.\overline{56}$
	1
26	156
6	156
	0

Thus, $\sqrt{2.56} = 1.6.$

(*ii*)

	2.94
2	$\overline{8}.\overline{67}\overline{00}$
	4
49	467
9	441
584	2600
4	2336
	264

Thus, $\sqrt{8.67} = 2.94$ (approximately).

OR

$\dfrac{13}{15} = 0.867$ (approx.)

	0.931
9	$0.\overline{86}\ \overline{70}\ \overline{00}$
	81
183	570
3	549
1861	2100
1	1861
1862	239

Thus, $\sqrt{\dfrac{13}{15}} = 0.931$ (approx.).

3. Let the number be x. Then

$x \times x = 1.1881$

or $x^2 = 1.1881$

$\therefore \quad x = \sqrt{1.1881}$

$= 1.09.$

	1.09
1	$1.\overline{18}\ \overline{81}$
1	1
209	18 81
9	18 81
218	0

4.

	737
7	$\overline{54}\ \overline{32}\ \overline{91}$
	49
143	532
3	429
1467	10391
7	10269
	122

Required number $= 738^2 - 543291$

$= 544644 - 543291$

$= 1353.$

5. $\frac{23}{87} = 0.264$

$\therefore \sqrt{\frac{23}{87}} = 0.513$

	0.513
5	$0.\overline{26}\ \overline{40}\ \overline{00}$
	25
101	140
1	101
1023	3900
3	3069
	831

6.

2	10224
2	5112
2	2556
2	1278
3	639
3	213
71	71
	1

$\therefore\ 10224 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 71$

$= 2^2 \times 2^2 \times 3^2 \times 71$

So, 10224 should be divided by 71 to make it a perfect square.

OR

3	1575
3	525
5	175
5	35
7	7
	1

$\therefore\ 1575 = 3 \times 3 \times 5 \times 5 \times 7$

$= 3^2 \times 5^2 \times 7$

So, 1575 should be divided by 7 to make it a perfect square.

7.

2	5476
2	2738
37	1369
37	37
	1

$\therefore\ 5476 = 2 \times 2 \times 37 \times 37$

$= 2^2 \times 37^2$

$\sqrt{5476} = 2 \times 37 = 74.$

8.

	75
7	$\overline{56}\ \overline{34}$
	49
145	734
5	725
150	9

Required number $= 5634 - 75^2$

$= 5634 - 5625 = 9.$

9. (*i*)

	9.327
9	$\overline{87}.\overline{00}\ \overline{00}\ \overline{00}$
9	81
183	6 00
3	5 49
1862	5100
2	3724
18647	137600
7	130529
18654	7071

$\therefore \quad \sqrt{87} = 9.327 = 9.33$ (approx.).

(*ii*)

	26.191
2	$\overline{6}\overline{86}.\ \overline{00}\ \overline{00}\ \overline{00}$
2	4
46	286
6	276
521	1000
1	521
5229	47900
9	47061
52381	83900
1	52381
52382	31519

$\therefore \quad \sqrt{686} = 26.191 = 26.19$ (approx.).

OR

(*i*)

```
          601
     ----------
   6 | 36 12 01
     | 36
-----|---------
1201 |  1201
   1 |  1201
-----|---------
     |     0
```

$\therefore \quad \sqrt{361201} = 601.$

(*ii*)

```
        162
    ---------
  1 | 2 62 44
    | 1
----|--------
 26 | 162
  6 | 156
----|--------
322 | 644
  2 | 644
----|--------
    |   0
```

$\therefore \quad \sqrt{26244} = 162.$

10. No.

Reasons:

Given equality is $\sqrt{0.4} = 0.2$

Square of LHS = 0.4

Square of RHS = $(0.2)^2 = 0.2 \times 0.2$

$= 0.04$

Since 0.4 is not equal to 0.04

i.e., $\quad 0.4 \neq 0.04$

$\therefore \quad \sqrt{0.4} \neq \sqrt{0.04}$

or $\quad \sqrt{0.4} \neq 0.2$

11. (*i*)

```
  1141
  × 26
  ----
  6846
 2282×
 -----
 29666
```

$\therefore \; 1.141 \times 2.6 = 2.9666$

Now,

```
          1.722
     -------------
   1 | 2.96 66 00
   1 | 1
-----|------------
  27 | 196
   7 | 189
-----|------------
 342 |  766
   2 |  684
-----|------------
3442 |   8200
   2 |   6884
-----|------------
     |   1316
```

$\therefore \quad \sqrt{1.141 \times 2.6} = 1.722$ (approx.).

(*ii*)

```
   48
 × 52
 ----
   96
 240 ×
 ----
 2496
```

Now,

$\therefore \quad 4.8 \times 5.2 = 24.96$

```
             4.995
      --------------
    4 | 24.96 00 00
      | 16
------|-------------
   89 |  896
    9 |  801
------|-------------
  989 |   9500
    9 |   8901
------|-------------
 9985 |    59900
    5 |    49925
------|-------------
 9990 |     9975
```

$\therefore \sqrt{4.8 \times 5.2} = 4.995$ (approx.).

WORKSHEET–42

1. We know that a number may be a perfect square if its unit's digit is either 0, 1, 4, 5, 6 or 9. So, 10668 is not a perfect square number

2. Square of 78 is an even number, as square of 8 is 64 which is an even number.

3.

```
 2 | 880
 2 | 440
 2 | 220
 2 | 110
 5 |  55
11 |  11
   |   1
```

$\therefore \quad 880 = 2 \times 2 \times 2 \times 2 \times 5 \times 11$

$= (2 \times 2) \times (2 \times 2) \times 5 \times 11$

Clearly, 880 is not perfect square.

4. $248 = 2 \times 2 \times 2 \times 31$

$= (2 \times 2) \times 62$

2	248
2	124
2	62
31	31
	1

So, 248 must be multiplied by 62 to make it a perfect square.

5. $490 = 2 \times 5 \times 7 \times 7$

$= 10 \times (7 \times 7)$

2	490
5	245
7	49
7	7
	1

So, 490 must be divided by 10.

6. We know that

$A^2 - B^2 = (A + B)(A - B)$

Substituting A = 131 and B = 130, we get

$131^2 - 130^2 = (131 + 130)(131 - 130)$

$= 261 \times 1 = 261.$

7. Let the two consecutive natural numbers be x and $x + 1$ such that

$(x + 1)^2 - x^2 = 51$

or $(x + 1 + x)(x + 1 - x) = 51$

or $(2x + 1) \times 1 = 51$

or $2x = 51 - 1$

or $x = \dfrac{50}{2}$ or $x = 25$

$\therefore\ x + 1 = 25 + 1 = 26.$

So, 51 is written as $26^2 - 25^2 = 51$.

8. $9^2 = 81 = 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17.$

9. $13^2 + 17^2 = (13 \times 13) + (17 \times 17)$

$= 169 + 289 = 458$

$19^2 = 19 \times 19 = 361$

$\therefore\ 13^2 + 17^2 \neq 19^2.$

So, 13, 17 and 19 do not form a Pythagorean triplet.

10. $\left(\dfrac{-12}{13}\right)^2 = \dfrac{-12}{13} \times \dfrac{-12}{13} = \dfrac{(-12) \times (-12)}{13 \times 13}$

$= \dfrac{12^2}{13^2}$ $[\because (-a) \times (-a) = a^2]$

$= \dfrac{144}{169}.$

11. Area of square = Side^2

$\therefore$ Side^2 = 57121

$\therefore$ Side = $\sqrt{57121}$

or Side = 239 m.

	239
2	$\overline{5}\ \overline{71}\ \overline{21}$
	4
43	171
3	129
469	4221
9	4221
	0

12. We know that for $m > 1$,

$(m^2 + 1)^2 = (2m)^2 + (m^2 - 1)^2$

Let $m^2 + 1 = 5$. Then $m^2 = 5 - 1 = 4$

$\therefore\ m = 2$

So, $2m = 2 \times 2 = 4$ and

$m^2 - 1 = 2^2 - 1 = 3$

Hence, the Pythagorean triplet is: 3, 4, 5.

13. First find the LCM of 4, 6 and 10.

LCM (4, 6, 10) $= 2 \times 2 \times 3 \times 5$

$= 60.$

2	4, 6, 10
2	2, 3, 5
3	1, 3, 5
5	1, 1, 5
	1, 1, 1

The prime factorization of 60 is:

$60 = 2 \times 2 \times 3 \times 5$ $\therefore$ $60 = 2^2 \times 15$

Now, the required number $= 60 \times 15$

$= 900.$

OR

(*i*)

	2.58
2	$\overline{6}.\overline{65}\,\overline{64}$
	4
45	265
5	225
508	4064
8	4064
	0

$\therefore\ \sqrt{6.6564} = 2.58.$

(*ii*)

	5.729
2	$\overline{32}.\overline{83}\ \overline{28}\ \overline{00}$
	25
107	783
7	749
1142	3428
2	2284
11449	114400
9	103041
11458	11359

$\therefore\ \sqrt{32.8328} = 5.729 = 5.73$ (approx.).

WORKSHEET – 43

1. $\sqrt{11 \times 51 \times 51 \times 11}$

$= \sqrt{(11 \times 51) \times (11 \times 51)}$

$= 11 \times 51 = 561.$

2. Let the number of students in each row be x. Then the number of rows is also x.

$\therefore$ Total number of students

$= x \times x = x^2$

But this is given to be 841.

$\therefore \quad x^2 = 841$

$\therefore \quad x = \sqrt{841} = 29$

So, 29 students stand in each row.

	29
2	$\overline{8}\ \overline{41}$
	4
49	441
9	441
	0

3.

	506
5	$\overline{25}\overline{60}\overline{36}$
	25
1006	6036
6	6036
	0

$\therefore \sqrt{256036} = 506.$

4. Area = 143641 m^2

$\therefore$ Side^2 = 143641

$\therefore$ Side = $\sqrt{143641}$

= 379 m.

	379
3	$\overline{14}\ \overline{36}\ \overline{41}$
	9
67	536
7	469
749	6741
9	6741
	0

5. The least number of 4 digits is 1000. We have to make 1000 as a perfect square. For which, we have to add a least number to it.

$32^2 - 1000 = 24$

Therefore, the required number is 1024.

6.

	0.197
1	$0.\overline{03}\overline{88}\overline{09}$
	1
29	288
9	261
387	2709
7	2709
394	0

$\therefore \sqrt{0.038809} = 0.197.$

7.

	1.414
1	$2.\overline{00}\overline{00}\overline{00}$
	1
24	100
4	96
281	400
1	281
2824	11900
4	11296
2828	604

$\therefore \sqrt{2} = 1.414 \approx 1.41.$

8.

	85
8	$\overline{73}\ \overline{03}$
8	64
165	903
5	825
	78

$\therefore$ Required number $= 7303 - 85^2$

$= 7303 - 7225$

$= 78.$

9.

	245
2	$\overline{6}\overline{00}\overline{25}$
	4
44	200
4	176
485	2425
5	2425
490	0

Side of square $= \sqrt{\text{Area}}$

$= \sqrt{60025} = 245.$

$\therefore$ Perimeter $= 4 \times$ Side

$= 4 \times 245 = 980$ m.

10.

	31
3	$\overline{9}\overline{61}$
	9
61	61
1	61
	0

	25
2	$\overline{6}\overline{25}$
	4
45	225
5	225
	0

Now, $\sqrt{\dfrac{961}{625}} = \dfrac{\sqrt{961}}{\sqrt{625}} = \dfrac{31}{25}.$

11.

	149.07
1	$\overline{2}\ \overline{22}\ \overline{22}.\overline{00}\ \overline{00}$
	1
24	122
4	96
289	2622
9	2601
29807	210000
7	208649
	1351

Clearly, 22222 is not a perfect square.

12. Area $= 30\frac{1}{4} = \frac{120+1}{4} = \frac{121}{4}\ m^2$

Side $= \sqrt{\text{Area}} = \sqrt{\frac{121}{4}} = \sqrt{\frac{11 \times 11}{2 \times 2}}$

$= \sqrt{\frac{11}{2} \times \frac{11}{2}} = \frac{11}{2} = 5\frac{1}{2}$ m.

13. $2880 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5$

$= (2 \times 2) \times (2 \times 2) \times (2 \times 2) \times (3 \times 3) \times 5$

2	2880
2	1440
2	720
2	360
2	180
2	90
3	45
3	15
5	5
	1

Here 5 does not make its pair.
Therefore, the required number is 5.

WORKSHEET–44

1. $111^2 - 109^2 = (111 + 109)(111 - 109)$
$= 220 \times 2 = 440.$

OR

$\sqrt{\frac{529}{729}} = \frac{\sqrt{23 \times 23}}{\sqrt{27 \times 27}} = \frac{23}{27}.$

2.

	17
1	$\overline{2}\ \overline{89}$
1	1
27	189
7	189
	0

Clearly, 289 is a perfect square.

$\sqrt{289} = 17.$

3. 2-digit perfect square numbers are 16, 25, 36, 49, 64, and 81.

Therefore, the required number is 81.

4.

2	28812
2	14406
3	7203
7	2401
7	343
7	49
7	7
	1

$\therefore\ 28812 = 2 \times 2 \times 3 \times 7 \times 7 \times 7 \times 7$

$= (2 \times 2) \times (7 \times 7) \times (7 \times 7) \times 3$

Consequently, we get that we should divide 28812 by 3 to make it a perfect square.

5.

3	4851
3	1617
7	539
7	77
11	11
	1

$\therefore\ 4851 = 3 \times 3 \times 7 \times 7 \times 11$

$= (3 \times 3) \times (7 \times 7) \times 11$

11 does not make its pair. Therefore, 4851 must be multiplied by 11 to make it a perfect square.

6. (*i*) Since, unit's digit of 3^2 is 9.

Therefore, unit's digit of 4583^2 is also 9.

(*ii*) Since, unit's digit of 5^2 is 5.

Therefore, unit's digit of 55505^2 is also 5.

7.

3	11025
3	3675
5	1225
5	245
7	49
7	7
	1

$\therefore\ 11025 = 3 \times 3 \times 5 \times 5 \times 7 \times 7$

$= (3 \times 3) \times (5 \times 5) \times (7 \times 7)$

$\therefore\ \sqrt{11025} = 3 \times 5 \times 7 = 105.$

8. Largest 3-digit number = 999

Smallest 3-digit number = 100

	31.606
3	$\overline{9}\,\overline{99}.\overline{00}\,\overline{00}$
3	9
61	99
1	61
626	3800
6	3756
63206	440000
6	379236
	60764

$\therefore \quad \sqrt{999} = 31.606 \approx 31.61$

Also $\sqrt{100} = \sqrt{10 \times 10} = 10$

$\therefore$ Required number $= \sqrt{999} - \sqrt{100}$

$= 31.61 - 10$

$= 21.61.$

9. Let the number of students in the school was x. So each student paid ₹ x.

$\therefore$ Collection = $x \times x$ = ₹ x^2

This is given to be ₹ 202500

$\therefore \ x^2 = 202500$

$\therefore \quad x = \sqrt{202500}$

Let us find $\sqrt{202500}$

	450
4	$\overline{20}\,\overline{25}\,\overline{00}$
4	16
85	425
5	425
90	00

$\therefore \quad x = 450.$

Thus, the number of students in the school was 450.

OR

Area of square = Side^2

$\therefore \quad 75625 = \text{Side}^2$

$\therefore \quad \text{Side} = \sqrt{75625}$

$= 275$ m.

	275
2	$\overline{7}\,\overline{56}\,\overline{25}$
	4
47	356
7	329
545	2725
5	2725
	0

Now, distance covered by the man

= Perimeter of the square

= 4 × Side = 4 × 275 = 1100 m.

Speed of the man = 20 km / hour

$= 20 \dfrac{\text{km}}{\text{hour}} = 20 \times \dfrac{1000\,\text{m}}{3600\ \text{s}}$

$= 20 \times \dfrac{5}{18}$ m / s $= \dfrac{50}{9}$ m / s.

Time taken $= \dfrac{\text{Distance covered}}{\text{speed}}$

$= \dfrac{1100}{\left(\dfrac{50}{9}\right)}$

$= 1100 \times \dfrac{9}{50} = 22 \times 9 = 198$ s

= (180 + 18) s = 3 min 18 s.

Thus, the man returns after 3 minutes and 18 seconds.

10. First find the LCM of 8, 12, 15 and 20.

2	8, 12, 15, 20
2	4, 6, 15, 10
2	2, 3, 15, 5
3	1, 3, 15, 5
5	1, 1, 5, 5
	1, 1, 1, 1

So, LCM = 2 × 2 × 2 × 3 × 5

= (2 × 2) × 2 × 3 × 5

= (2 × 2) × 30

We have to multiply this LCM by 30 to make it a perfect square.

So, required number = 2 × 2 × 30 × 30

= 3600

Thus, 3600 is the least square number which is exactly divisible by 8, 12, 15 and 20.

11. (*i*) (*a*)

2	10000
2	5000
2	2500
2	1250
5	625
5	125
5	25
5	5
	1

$\therefore$ 10000

= 2 × 2 × 2 × 2 × 5 × 5 × 5 × 5

= (2 × 2) × (2 × 2) × (5 × 5) × (5 × 5)

Hence, 10000 is the perfect square number.

(*b*)

2	2916
2	1458
3	729
3	243
3	81
3	27
3	9
3	3
	1

$\therefore$ 2916 = 2 × 2 × 3 × 3 × 3 × 3 × 3 × 3

= (2 × 2) × (3 × 3) × (3 × 3) × (3 × 3)

Hence, 2916 is the perfect square number.

(*ii*)

2	11520
2	5760
2	2880
2	1440
2	720
2	360
2	180
2	90
3	45
3	15
5	5
	1

$\therefore$ 11520 = 2 × 2 × 2 × 2 × 2 × 2 × 2 × 2 × 3 × 3 × 5

= (2 × 2) × (2 × 2) × (2 × 2) × (2 × 2) × (3 × 3) × 5

Clearly 5 does not make its pair. Therefore, 11520 should be multiplied by 5 to make it as a perfect square.

WORKSHEET–45

1. Smallest 5-digit number = 10000

Greatest 5-digit number = 99999

Their sum = 99999 + 10000

= 109999.

2. (*i*) $\sqrt{2\times2\times2\times2\times3\times3\times7\times7}$

$= \sqrt{(2\times2)\times(2\times2)\times(3\times3)\times(7\times7)}$

= 2 × 2 × 3 × 7 = 84.

(*ii*) $\sqrt{9a^4b^8\times c^{10}}$

$= \sqrt{3^2\times(a^2)^2\times(b^4)^2\times(c^5)^2}$

$= 3\times a^2\times b^4\times c^5 = 3a^2b^4c^5.$

3. (*i*) $\sqrt{\dfrac{144}{400}} = \dfrac{\sqrt{144}}{\sqrt{400}} = \dfrac{\sqrt{12\times12}}{\sqrt{20\times20}}$

$= \dfrac{12}{20} = \dfrac{3}{5}.$

(*ii*) $\sqrt{\dfrac{1}{16}} = \dfrac{\sqrt{1}}{\sqrt{16}} = \dfrac{\sqrt{1\times1}}{\sqrt{4\times4}} = \dfrac{1}{4}.$

4. (*i*)

	56.4
5	$\overline{31}\,\overline{80}.\overline{96}$
5	25
106	680
6	636
1124	4496
4	4496
	0

Clearly, $\sqrt{3180.96}$ = 56.4.

(*ii*)

	2315
2	$\overline{5}\,\overline{35}\,\overline{92}\,\overline{25}$
	4
43	135
3	129
461	692
1	461
4625	23125
5	23125
	0

Clearly, $\sqrt{5359225}$ = 2315.

5

	0.0447
0	$0.\overline{00}\,\overline{20}\,\overline{00}\,\overline{00}$
0	00
4	20
4	16
84	400
4	336
887	6400
7	6209
	191

$$\sqrt{0.002} = 0.0447$$

i.e., $\sqrt{0.002} \approx 0.045.$

6. According to the Pythagoras property, we have.

Hypotenuse^2 = Sum of squares of other two sides

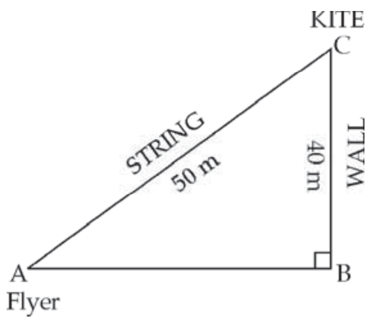
$\therefore$ Hypotenuse $= \sqrt{12^2 + 5^2}$

$= \sqrt{144+25} = \sqrt{169}$

$= \sqrt{13 \times 13} = 13$ m.

Thus, the length of the hypotenuse is 13 m.

7. AC is string, BC is wall, the flyer is at A and kite is at C (see fig.). AC = 50 m, BC = 40 m



Using Pythagoras property, we have

$$AB^2 + BC^2 = AC^2$$

$\therefore$ $AB^2 + 40^2 = 50^2$

or $AB^2 = 50^2 - 40^2$

$= 2500 - 1600$

$= 900$

$\therefore$ $AB = \sqrt{900}$

$= \sqrt{30 \times 30}$

$= 30$ m.

Therefore, the flyer is at a distance of 30 m from the wall.

8.

2	298116
2	149058
3	74529
3	24843
7	8281
7	1183
13	169
13	13
	1

$\therefore$ $298116 = 2 \times 2 \times 3 \times 3 \times 7 \times 7 \times 13 \times 13$

$= (2 \times 2) \times (3 \times 3) \times (7 \times 7) \times (13 \times 13).$

$\therefore$ $\sqrt{298116} = 2 \times 3 \times 7 \times 13 = 546.$

9. $147 = 3 \times 7 \times 7 = 3 \times (7 \times 7)$

The prime factor 3 does not occur in pair. Therefore, 147 must be multiplied by 3 to make it as a perfect square.

Hence, the required number is 3.

10. Represent 1152 as its prime factors

2	1152
2	576
2	288
2	144
2	72
2	36
2	18
3	9
3	3
	1

$1152 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3$

$= (2 \times 2) \times (2 \times 2) \times (2 \times 2) \times (3 \times 3) \times (3 \times 3) \times 2.$

Here, a 2 does not occur in pair.

Therefore the required least number is 2.

11. Let each side of the wall be x metres.

Area of the square wall = Side^2

$= x^2$ m^2

$\because$ Expenditure on paving at 1 m^2

= ₹ 25

$\therefore$ Expenditure on paving

at x^2 m^2 = ₹ 25 × x^2

= ₹ 25 x^2

This is given to be ₹ 176400.

$\therefore \quad 25\,x^2 = 176400$

Dividing both sides by 25, we get

$$x^2 = \frac{176400}{25} = 7056$$

$$= (2 \times 2) \times (2 \times 2) \times (3 \times 3) \times (7 \times 7)$$

2	7056
2	3528
2	1764
2	882
3	441
3	147
7	49
7	7
	1

$\therefore \quad x = 2 \times 2 \times 3 \times 7 = 84$

So, the length of each side of the wall is 84 metres.

12. First find LCM of 3, 5 and 12

2	3, 5, 12
2	3, 5, 6
3	3, 5, 3
5	1, 5, 1
	1, 1, 1

$\therefore$ LCM (3, 5, 12) = 2 × 2 × 3 × 5 = 60

Now, make 60 as a perfect square by multiplying it by a least number. so, first find the least number.

$60 = 2 \times 2 \times 3 \times 5$ (obtained above)

$= (2 \times 2) \times 3 \times 5.$

Since 3 and 5 do not occur in pairs, so, 3 × 5 = 15 is the least number Multiplying 60 by 15, we get 60 × 15 = 900.

Hence, 900 is the required smallest number

OR

Let us use long division method to obtain square roots.

(*i*)

$$\begin{array}{r|l} & 0.070 \\ \hline 0 & 0.\overline{00}\ \overline{50}\ \overline{00}\ \overline{00} \\ 0 & 0 \\ \hline 7 & 50 \\ 7 & 49 \\ \hline & 10000 \end{array}$$

Thus, $\sqrt{0.005} = 0.07.$

(*ii*)

$$\begin{array}{r|l} & 8.207 \\ \hline 8 & 67.\overline{36}\ \overline{20}\ \overline{00} \\ 8 & 64 \\ \hline 162 & 336 \\ 2 & 324 \\ \hline 16407 & 122000 \\ 7 & 114849 \\ \hline & 7151 \end{array}$$

Thus, $\sqrt{67.362} = 8.207 \approx 8.21.$

WORKSHEET–46

1. Two smaller numbers of Pythagorean triplet are 3 and 4.

$h^2 = p^2 + b^2$

$h^2 = 3^2 + 4^2$

$h^2 = 9 + 16 = 25$

$h = \sqrt{25} = 5.$

2. Square of 4 = 4 × 4 = 16.

Square root of 4 = $\sqrt{4} = \sqrt{2 \times 2} = 2.$

3. $1^2 = 1 \times 1 = 1.$

4. Unit digit of square of 32 = 2

$2^2 = 2 \times 2 = 4.$

5. No. 34 = 2 × 17 = $\sqrt{2 \times 17}$

Therefore, 34 is not perfect square number.

6. $(400)^2 = 400 \times 400$

= 4 zeroes.

7. A square number.

8. $\sqrt{529} = \sqrt{23 \times 23} = 23$

= 2 digit.

9. $(39)^2 = (40 - 1)^2$

$= 40^2 - 2 \times 40 \times 1 + (1)^2$

$(\because (a - b)^2 = a^2 - 2ab + b^2)$

$= 1600 - 80 + 1 = 1521.$

10. Required number = $30 - (5)^2$

$= 30 - 25 = 5$

Therefore, 5 is the least number subtracted from 30 to get a perfect square .

11. Required number = 48 + 1 = 49

$7^2 = 49$

Therefore, 1 is the least number added to 48 to get a perfect square.

12. (*a*) 6, 8, 10

$h^2 = p^2 + b^2$

$10^2 = (6)^2 + (8)^2$

$100 = 36 + 64$

$100 = 100$

(*b*) 5, 12, 13

$h^2 = p^2 + b^2$

$(13)^2 = (5)^2 + (12)^2$

$169 = 25 + 144$

$169 = 169$

Both (*a*) and (*b*) are Pythagorean triplet.

13. Square root of

$3136 = \sqrt{56 \times 56} = 56$

5 5	$\overline{31}\,\overline{36}$ 25	56
106 6	636 636	
	× × ×	

Now, $\sqrt{31.36} + \sqrt{0.3136}$

$\sqrt{5.6 \times 5.6} + \sqrt{0.56 \times 0.56}$

$= 5.6 + 0.56$

$= 6.16.$

14. Five digit greatest number 99999

	316
3 3	9 $\overline{99}$ $\overline{99}$ 9
61 1	×99 61
626 6	3899 3756
632	×143

Greatest 5 digit square number

= (99999 – 143)

= 99856

Square root of that number = 316.

❑❑

Chapter 7

CUBES AND CUBE ROOTS

WORKSHEET – 47

1. (C) $1729 = 12^3 + 1^3 = 10^3 + 9^3$.

2. (C) $7^3 = 7 \times 7 \times 7 = 343$.

3. (C) $\sqrt[3]{729} = \sqrt[3]{9 \times 9 \times 9} = 9$

i.e., $\sqrt[3]{729}$ is equal to 9.

4. (A) $100 = 10 \times 10$ which is not a perfect cube.

5. (B) $675 = 3 \times 3 \times 3 \times 5 \times 5$

5 is not in triplet, so the required multiplier is 5.

6. (A) $432 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3$

$= (2 \times 2 \times 2) \times (3 \times 3 \times 3) \times 2$

A prime 2 is not a group of three. So 2 is the required divisor.

7. (D)The symbol $\sqrt{\ }$ denotes square root

The symbol $\sqrt[3]{\ }$ denotes cube root.

8. (C) $688 - 8^3 = 176$ and $9^3 - 688 = 41$.

So, estimated value of $\sqrt[3]{688}$ is 9.

9. (B) $\sqrt[3]{\frac{27}{125}} = \frac{\sqrt[3]{27}}{\sqrt[3]{125}} = \frac{\sqrt[3]{3 \times 3 \times 3}}{\sqrt[3]{5 \times 5 \times 5}} = \frac{3}{5}$.

10. (A) $\sqrt[3]{4913} = \sqrt[3]{17 \times 17 \times 17}$

$= 17$.

17	4913
17	289
17	17
	1

11. (D) $19 \times 19 \times 19 = 361 \times 19 = 6859$.

12. (C) Comparing corresponding terms between the equations

$1^3 + 2^3 + x^3 + 4^3 = (1 + 2 + 3 + y)^2$

and $1^3 + 2^3 + 3^3 + 4^3$

$= (1 + 2 + 3 + 4)^2$, we obtain

$x = 3$ and $y = 4$.

13. (B) According to the given pattern, the number of consecutive odd numbers whose sum provides n^3 is n. Therefore, the required number is 9.

14. (A) One's digit of 1007^3

= One's digit of 7^3

= One's digit of 343

= 3.

15. (A) Unit digit of $\sqrt[3]{1331}$

= unit digit of $\sqrt[3]{1} = 1$.

16. (C) One's digit of cube of a number ending with 6 = One's digit of $6^3 = 6$.

17. (D) $\left(\frac{1}{8}\right)^3 = \frac{1}{8} \times \frac{1}{8} \times \frac{1}{8} = \frac{1}{512}$.

18. (A) If a perfect cube number ends with 0, then its cube root also ends with 0.

WORKSHEET – 48

1. Let us take 8 and 12 as two even natural numbers.

$8^3 = 8 \times 8 \times 8 = 512$, which is even.

$12^3 = 12 \times 12 \times 12 = 1728$, which is even.

2. (*i*) Cube of $x = x \times x \times x = x^3$

(*ii*) $17^3 = 17 \times 17 \times 17 = 4913$.

(*iii*) $\left(\frac{21}{43}\right)^3 = \frac{21}{43} \times \frac{21}{43} \times \frac{21}{43} = \frac{9261}{79507}$.

(*iv*) $(-18)^3 = (-18) \times (-18) \times (-18)$

$= -5832$.

3. (*i*) 147^3 ends in 3. Therefore, 147^3 is odd.

(*ii*) 1516^3 ends in 6. Therefore, 1516^3 is even.

(*iii*) 1100^3 ends in 0. Therefore, 1100^3 is even.

(*iv*) $(-198)^3$ ends in 8. Therefore $(-198)^3$ is even.

4. Volume of cube $= (\text{Edge})^3 = (2.5)^3$

$= 2.5 \times 2.5 \times 2.5$

$= 6.25 \times 2.5$

$= 15.625 \text{ cm}^3$.

5. Here, $3087 = 3 \times 3 \times 7 \times 7 \times 7$

$= 3 \times 3 \times (7 \times 7 \times 7)$

3	3087
3	1029
7	343
7	49
7	7
	1

The prime factor 3 does not occur in the group of three. To make 3087 a perfect cube, you will have to complete this group. For this, multiply 3087 by 3.

Hence, the required number is 3.

6. Volume of a cube $= (\text{Edge})^3$

$\therefore$ Edge $= \sqrt[3]{\text{Volume}} = \sqrt[3]{343}$

$= \sqrt[3]{7 \times 7 \times 7} = 7$

Thus, edge of the cube is 7 cm.

7. (*i*) $2197 = 13 \times 13 \times 13 = 13^3$

$9261 = 3 \times 3 \times 3 \times 7 \times 7 \times 7$

$= 3^3 \times 7^3 = (3 \times 7)^3 = 21^3$

$\therefore \quad \frac{2197}{9261} = \frac{13^3}{21^3} = \left(\frac{13}{21}\right)^3$

Therefore, cube root of $\frac{2197}{9261}$

$= \sqrt[3]{\frac{2197}{9261}} = \frac{13}{21}$.

(*ii*) Here, 3375

3	3375
3	1125
3	375
5	125
5	25
5	5
	1

$= 3 \times 3 \times 3 \times 5 \times 5 \times 5$

$= 3^3 \times 5^3 = (3 \times 5)^3$

$= 15^3$

Therefore, cube root of 3375

$= \sqrt[3]{3375} = 15$.

8. Here, 6561

$= 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$

$= (3 \times 3 \times 3) \times (3 \times 3 \times 3) \times 3 \times 3$

3	6561
3	2187
3	729
3	243
3	81
3	27
3	9
3	3
	1

Clearly all the 3's do not appear in the groups of three. To complete such groups, we should multiply by 3.

$\therefore$ Product $= 6561 \times 3 = 19683$.

Now, $19683 = (3 \times 3 \times 3)$

$\times (3 \times 3 \times 3)$

$\times (3 \times 3 \times 3)$

$= 3^3 \times 3^3 \times 3^3$

$= (3 \times 3 \times 3)^3 = 27^3$

Therefore, cube root of 19683

$= \sqrt[3]{19683} = 27$.

9. (*i*)

3	729
3	243
3	81
3	27
3	9
3	3
	1

$\therefore 729 = 3 \times 3 \times 3 \times 3 \times 3 \times 3$

$= (3 \times 3 \times 3) \times (3 \times 3 \times 3)$

729 is a perfect cube number as prime factor is in the group of three.

(*ii*) Here, 3375

$= 3 \times 3 \times 3 \times 5 \times 5 \times 5$

$= (3 \times 3 \times 3) \times (5 \times 5 \times 5)$

3	3375
3	1125
3	375
5	125
5	25
5	5
	1

3375 is a perfect cube number as each prime factor appears in group of three.

(*iii*) Here, 10648

$= 2 \times 2 \times 2 \times 11 \times 11 \times 11$

$= (2 \times 2 \times 2) \times (11 \times 11 \times 11)$

2	10648
2	5324
2	2662
11	1331
11	121
11	11
	1

10648 is a perfect cube number as each prime factor occurs in the group of three.

(*iv*) Here, 625000

$= 2 \times 2 \times 2 \times 5 \times 5 \times 5$
$\times 5 \times 5 \times 5 \times 5$

$= (2 \times 2 \times 2) \times (5 \times 5 \times 5)$
$\times (5 \times 5 \times 5) \times 5$

625000 is not a perfect cube number as a 5 does not occur in the group of three.

2	625000
2	312500
2	156250
5	78125
5	15625
5	3125
5	625
5	125
5	25
5	5
	1

10. (*i*) Here, 27000

$= (2 \times 2 \times 2)$
$\times (3 \times 3 \times 3) \times (5 \times 5 \times 5)$

$= 2^3 \times 3^3 \times 5^3$

$= (2 \times 3 \times 5)^3 = 30^3.$

$\therefore \quad \sqrt[3]{27000} = 30.$

2	27000
2	13500
2	6750
3	3375
3	1125
3	375
5	125
5	25
5	5
	1

(*ii*) Here, 13824

$= 2 \times 2 \times 2 \times 2 \times 2 \times 2$
$\times 2 \times 2 \times 2 \times 3 \times 3 \times 3$

$= 2^3 \times 2^3 \times 2^3 \times 3^3$

$= (2 \times 2 \times 2 \times 3)^3 = 24^3$

$\therefore \sqrt[3]{13824} = 24.$

2	13824
2	6912
2	3456
2	1728
2	864
2	432
2	216
2	108
2	54
3	27
3	9
3	3
	1

(*iii*) Here, 10648

$= 2 \times 2 \times 2 \times 11 \times 11 \times 11$

$= 2^3 \times 11^3 = (2 \times 11)^3$

$= 22^3.$

$\therefore \quad \sqrt[3]{10648} = 22.$

2	10648
2	5324
2	2662
11	1331
11	121
11	11
	1

(*iv*) $\quad \dfrac{27}{729} = \dfrac{3 \times 3 \times 3}{3 \times 3 \times 3 \times 3 \times 3 \times 3}$

$= \dfrac{1}{3 \times 3 \times 3} = \left(\dfrac{1}{3}\right)^3$

$\therefore \quad \sqrt[3]{\dfrac{27}{729}} = \dfrac{1}{3}.$

WORKSHEET – 49

1. (*i*) Unit digit of 53^3 = Unit digit of 3^3 = 7.

(*ii*) Unit digit of 4441^3 = Unit digit of 1^3 = 1.

(*iii*) Unit digit of 825^3 = Unit digit of 5^3 = 5.

(*iv*) Unit digit of 8888 = Unit digit of 8^3 = 2.

2. (*i*) $\sqrt[3]{27 \times 64}$

$= \sqrt[3]{(3 \times 3 \times 3) \times (2 \times 2 \times 2) \times (2 \times 2 \times 2)}$

$= 3 \times 2 \times 2 = 12.$

(*ii*) $\sqrt[3]{8 \times 11 \times 11 \times 11}$

$= \sqrt[3]{(2 \times 2 \times 2) \times (11 \times 11 \times 11)}$

$= 2 \times 11 = 22.$

3. Volume of a cube = Edge^3

$\therefore \quad$ Edge $= \sqrt[3]{\text{Volume}}$

$= \sqrt[3]{42875}$

$= \sqrt[3]{5^3 \times 7^3}$

$= \sqrt[3]{(5 \times 7)^3}$

$= 5 \times 7 = 35.$

5	42875
5	8575
5	1715
7	343
7	49
7	7
	1

Thus, edge of the metallic cube is 35 cm.

4. (*i*) ∵ $10.5 = \frac{105}{10} = \frac{21}{2}$

∴ $10.5^3 = \frac{21}{2} \times \frac{21}{2} \times \frac{21}{2} = \frac{9261}{8}$

$= 1157.625.$

(*ii*) $\left(\frac{11}{14}\right)^3 = \frac{11}{14} \times \frac{11}{14} \times \frac{11}{14} = \frac{1331}{2744}.$

(*iii*) $(-13)^3 = (-13) \times (-13) \times (-13)$

$= -13 \times 13 \times 13 = -2197.$

5. (*i*) ∵ $108 = 2 \times 2 \times (3 \times 3 \times 3)$

∴ 108 is not a perfect cube.

(*ii*) ∵ $216 = (2 \times 2 \times 2) \times (3 \times 3 \times 3)$

∴ 216 is a perfect cube.

(*iii*) ∵ $512 = (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times (2 \times 2 \times 2)$

∴ 512 is a perfect cube.

6. First represent 1600 as its prime factors.

∴ $1600 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 5 \times 5$

$= (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times 5 \times 5$

2	1600
2	800
2	400
2	200
2	100
2	50
5	25
5	5
	1

The prime factor 5 does not appear in a group of three. If we divide the number by 5 × 5 = 25, then the prime factorisation of the quotient will not contain 5.

So, the required smallest number is 25.

7. (*i*) ∵ $125 = 5 \times 5 \times 5 = 5^3$

∴ $\sqrt[3]{125} = 5.$

(*ii*) ∵ $5832 = 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$

$= 2^3 \times 3^3 \times 3^3$

$= (2 \times 3 \times 3)^3$

∴ $\sqrt[3]{5832} = 2 \times 3 \times 3 = 18.$

(*iii*) ∵ $1728 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3$

$= 2^3 \times 2^3 \times 3^3$

$= (2 \times 2 \times 3)^3 = 12^3$

∴ $\sqrt[3]{1728} = 12.$

8. (*i*) $343 = 7 \times 7 \times 7 = 7^3$

$1728 = (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times (3 \times 3 \times 3)$

$= 2^3 \times 2^3 \times 3^3 = (2 \times 2 \times 3)^3$

$= 12^3$

Now, $\sqrt[3]{\frac{343}{1728}} = \sqrt[3]{\frac{7^3}{12^3}} = \sqrt[3]{\left(\frac{7}{12}\right)^3}$

$= \frac{7}{12}.$

(*ii*) $0.001 = \frac{1}{1000} = \frac{1}{10} \times \frac{1}{10} \times \frac{1}{10}$

$= \left(\frac{1}{10}\right)^3 = (0.1)^3$

Now, $\sqrt[3]{0.001} = \sqrt[3]{(0.1)^3} = 0.1.$

9. (*i*) $0.003375 = \frac{3375}{1000000}$

$= \frac{3 \times 3 \times 3 \times 5 \times 5 \times 5}{10 \times 10 \times 10 \times 10 \times 10 \times 10}$

$= \frac{3^3 \times 5^3}{10^3 \times 10^3} = \frac{(3 \times 5)^3}{(10 \times 10)^3}$

$= \frac{15^3}{100^3} = \left(\frac{15}{100}\right)^3 = \left(\frac{3}{20}\right)^3$

Therefore, $\sqrt[3]{0.003375} = \frac{3}{20} = 0.15.$

(*ii*) $3.1 \times 3.1 \times 3.1 \times 5 \times 5 \times 5$

$= (3.1)^3 \times 5^3 = (3.1 \times 5)^3$

$= (15.5)^3.$

Therefore, $\sqrt[3]{3.1 \times 3.1 \times 3.1 \times 5 \times 5 \times 5}$

$= 15.5.$

WORKSHEET – 50

1. $\left(7\frac{2}{5}\right)^3 = \left(\frac{37}{5}\right)^3 = \frac{37 \times 37 \times 37}{5 \times 5 \times 5}$

$= \frac{50653}{125} = 405\frac{28}{125}$.

2. Volume $= \frac{1331}{216} = \frac{11 \times 11 \times 11}{6 \times 6 \times 6}$

$= \left(\frac{11}{6}\right)^3 \text{ m}^3$

We know that:

Volume of a cube = Side^3

$\therefore$ Side $= \sqrt[3]{\text{Volume}} = \sqrt[3]{\left(\frac{11}{6}\right)^3}$

$= \frac{11}{6}$ m.

3. (*i*) $\because$ $345 = 3 \times 5 \times 23$

$\therefore$ 345 is not a perfect cube number.

(*ii*) $\because$ $1331 = 11 \times 11 \times 11 = 11^3$

$\therefore$ 1331 is a perfect cube number.

4. $\frac{27}{125} = \frac{3 \times 3 \times 3}{5 \times 5 \times 5} = \frac{3^3}{5^3}$

or $\left(\frac{3}{5}\right)^3 = \frac{27}{125}$

Therefore, $\frac{27}{125}$ is the cube of $\frac{3}{5}$.

5. Volume = 474.552

$= \frac{474552}{1000}$

$= \frac{2^3 \times 3^3 \times 13^3}{10^3}$

$= \left(\frac{2 \times 3 \times 13}{10}\right)^3$

2	474552
2	237276
2	118638
3	59319
3	19773
3	6591
13	2197
13	169
13	13
	1

$= \left(\frac{39}{5}\right)^3 = (7.8)^3 \text{ m}^3$.

We know that:

Volume of a cubical box = Side^3

$\therefore$ Side $= \sqrt[3]{\text{Volume}} = \sqrt[3]{(7.8)^3}$

= 7.8 metres.

6. First represent 3600 as its prime factorisation.

$3600 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5$

$= (2 \times 2 \times 2) \times 2 \times 3 \times 3 \times 5 \times 5$

2	3600
2	1800
2	900
2	450
3	225
3	75
5	25
5	5
	1

Here, one 2's, two 3's and two 5's do not occur in the groups of three each. For happening this, we should multiply 3600 by $2 \times 2 \times 3 \times 5 = 60$.

So, the required smallest number is 60.

Therefore, product $= 3600 \times 60$

$= 216000$

Hence, $216000 = (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times (3 \times 3 \times 3) \times (5 \times 5 \times 5)$

$= 2^3 \times 2^3 \times 3^3 \times 5^3$

$= (2 \times 2 \times 3 \times 5)^3$

$= (60)^3$

$\therefore$ $\sqrt[3]{216000} = 60$.

Thus, the cube root of the product is 60.

7. First represent 8192 as its prime factorisation.

$8192 = (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times 2$

A prime factor 2 does not appear in its group of three.

So, we should divide 8192 by 2 to make it a perfect cube.

Thus, 2 is the required smallest number.

2	8192
2	4096
2	2048
2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

$$\text{Quotient} = \frac{8192}{2} = 4096$$

Further, $4096 = 2^3 \times 2^3 \times 2^3 \times 2^3$

$= (2 \times 2 \times 2 \times 2)^3$

$= 16^3$

$\therefore \quad \sqrt[3]{4096} = 16.$

Thus, the cube root of the quotient 4096 is 16.

8. The five natural numbers are 3, 6, 9, 12 and 15

Now, obtain the cubes of these numbers.

Cube of 3 = $3^3 = 3 \times 3 \times 3 = 27$.

Cube of 6 = $6^3 = 6 \times 6 \times 6 = 216$.

Cube of 9 = $9^3 = 9 \times 9 \times 9 = 729$.

Cube of 12 = $12^3 = 12 \times 12 \times 12 = 1728$.

Cube of 15 = $15^3 = 15 \times 15 \times 15 = 3375$.

9. (*i*) $27 = 3 \times 3 \times 3 = 3^3$

$$0.008 = \frac{8}{1000} = \frac{2 \times 2 \times 2}{10 \times 10 \times 10}$$

$$= \left(\frac{2}{10}\right)^3 = (0.2)^3.$$

Therefore,

$$\sqrt[3]{27} + \sqrt[3]{0.008} = \sqrt[3]{3^3} + \sqrt[3]{(0.2)^3}$$

$$= 3 + 0.2 = 3.2.$$

(*ii*) $$\frac{729}{216} = \frac{3 \times 3 \times 3 \times 3 \times 3 \times 3}{2 \times 2 \times 2 \times 3 \times 3 \times 3}$$

$$= \frac{3 \times 3 \times 3}{2 \times 2 \times 2} = \left(\frac{3}{2}\right)^3.$$

Therefore,

$$\sqrt[3]{\frac{729}{216}} \times \frac{6}{9} = \sqrt[3]{\left(\frac{3}{2}\right)^3} \times \frac{6}{9}$$

$$= \frac{3}{2} \times \frac{6}{9} = \frac{18}{18} = 1.$$

(*iii*) $0.1 \times 0.1 \times 0.1 \times 10 \times 10 \times 10$

$= (0.1)^3 \times (10)^3$

$= (0.1 \times 10)^3 = 1^3 = 1.$

Therefore,

$$\sqrt[3]{0.1 \times 0.1 \times 0.1 \times 10 \times 10 \times 10}$$

$$= \sqrt[3]{1} = 1.$$

WORKSHEET – 51

1. (*i*) $(-12)^3 = (-12) \times (-12) \times (-12)$

$= 144 \times (-12) = -1728.$

(*ii*) $$\left(\frac{11}{13}\right)^3 = \frac{11 \times 11 \times 11}{13 \times 13 \times 13} = \frac{1331}{2197}.$$

2. (*i*) $$\sqrt[3]{\frac{27}{125}} = \sqrt[3]{\frac{3 \times 3 \times 3}{5 \times 5 \times 5}} = \frac{3}{5}$$

i.e., $$\sqrt[3]{\frac{27}{125}} = \frac{\boxed{3}}{5}$$

(*ii*) $\sqrt[3]{5} \times \sqrt[3]{9} = \sqrt[3]{5 \times 9} = \sqrt[3]{45}$

i.e., $\sqrt[3]{\boxed{45}} = \sqrt[3]{5} \times \sqrt[3]{9}$.

3. (*i*) $256 = (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times 2 \times 2$

256 is not a perfect cube number.

(*ii*) $216 = (2 \times 2 \times 2) \times (3 \times 3 \times 3)$

216 is a perfect cube number.

$\sqrt[3]{216} = 2 \times 3 = 6.$

(*iii*) $64000 = (4 \times 4 \times 4) \times (10 \times 10 \times 10)$

64000 is a perfect cube number.

$\sqrt[3]{64000} = 4 \times 10 = 40.$

4. First, represent 392 as its prime factors.

$392 = 2 \times 2 \times 2 \times 7 \times 7$

$= (2 \times 2 \times 2) \times 7 \times 7$

The prime factor 7 does not occur in a group of three. To make this group, we need one 7. And then 392 will make a perfect cube.

In this case,

$392 \times 7 = (2 \times 2 \times 2) \times (7 \times 7 \times 7)$

$= 2744$

which is a perfect cube.

Hence the required smallest number is 7.

5. Let the given number be a

Its cube $= a \times a \times a = a^3$ ...(*i*)

New number = Double of given number

$= 2a$

Cube of new number $= 2a \times 2a \times 2a$

$= 8a^3$ ...(*ii*)

From equations (*i*) and (*ii*), we have cube of new number

= 8 × Cube of given number

For example, if $a = 2$

then $a^3 = 2^3 = 8$, $2a = 2 \times 2 = 4$

and $(2a)^3 = 4^3 = 64$

Here, $64 = 8 \times 8$ *i.e.*, $(2a)^3 = 8 \times a^3$

Hence if a given number is doubled, then its cube becomes eight times the cube of the given number.

6. (*i*) $2744 = (2 \times 2 \times 2) \times (7 \times 7 \times 7)$

$= 2^3 \times 7^3$

$= (2 \times 7)^3$

$= (14)^3$

$\therefore \sqrt[3]{2744} = 14.$

2	2744
2	1372
2	686
7	343
7	49
7	7
	1

(*ii*) $35937 = (3 \times 3 \times 3) \times (11 \times 11 \times 11)$

$= 3^3 \times 11^3$

$= (3 \times 11)^3$

$= 33^3$

$\therefore \sqrt[3]{35937} = 33.$

3	35937
3	11979
3	3993
11	1331
11	121
11	11
	1

(*iii*) $4913 = 17 \times 17 \times 17$

$= 17^3$

$\therefore \sqrt[3]{4913} = 17.$

7. $32.768 = \dfrac{32768}{1000}$

Here, $32768 = (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times (2 \times 2 \times 2)$

$= 2^3 \times 2^2 \times 2^3 \times 2^3 \times 2^3$

$= (2 \times 2 \times 2 \times 2 \times 2)^3$

$= 32^3$

And $1000 = 10 \times 10 \times 10$

$= 10^3$

2	32768
2	16384
2	8192
2	4096
2	2048
2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

$\therefore 32.768 = \dfrac{32^3}{10^3} = \left(\dfrac{32}{10}\right)^3$

$= \left(\dfrac{16}{5}\right)^3$

Taking cube root both sides, we get

$\sqrt[3]{32.768} = \dfrac{16}{5}$

8. $1.331 = \dfrac{1331}{1000}$

Here, $1331 = 11 \times 11 \times 11$

And $1000 = 10 \times 10 \times 10$

$\therefore 1.331 = \dfrac{11 \times 11 \times 11}{10 \times 10 \times 10} = \dfrac{11^3}{10^3}$

$= \left(\dfrac{11}{10}\right)^3 = (1.1)^3$

Taking cube root both the sides, we get

$\sqrt[3]{1.331} = 1.1$

9. (*i*) $125 = 5 \times 5 \times 5$ and $216 = 6 \times 6 \times 6$

$\therefore \quad 125 \times 216 = 5^3 \times 6^3$

$= (5 \times 6)^3 = 30^3$

$\therefore \quad \sqrt[3]{125 \times 216} = 30.$

(*ii*) $10^3 \times 1.4^3 = (10 \times 1.4)^3 = 14^3$

$\therefore \quad \sqrt[3]{10^3 \times 1.4^3} = 14.$

(*iii*) $74088 = 42 \times 42 \times 42 = 42^3$

$\therefore \quad \sqrt[3]{74088} = 42.$

WORKSHEET–52

1. 8000 is a cube of an even number as this ends in 0.

2. Side of a cube = 3.1 cm

Volume of a cube = Side^3

$= (3.1)^3 = \left(\frac{31}{10}\right)^3$

$= \frac{31 \times 31 \times 31}{10 \times 10 \times 10}$

$= \frac{29791}{1000}$

$= 29.791 \text{ cm}^3$

3. Volume = 778688 mm^3

2	778688
2	389344
2	194672
2	97336
2	48668
2	24334
23	12167
23	529
23	23
	1

$778688 = (2 \times 2 \times 2)$

$\times (2 \times 2 \times 2)$

$\times (23 \times 23 \times 23)$

$= 2^3 \times 2^3 \times 23^3$

$= (2 \times 2 \times 23)^3$

$= 92^3$

$\because$ Volume = Edge^3

$\therefore \quad \text{Edge} = \sqrt[3]{\text{Volume}}$

$= \sqrt[3]{92^3} = 92$ mm.

4. Volume = 1728000 cm^3

$1728000 = 1728 \times 1000$

2	1728
2	864
2	432
2	216
2	108
2	54
3	27
3	9
3	3
	1

$= (2 \times 2 \times 2)$

$\times (2 \times 2 \times 2)$

$\times (3 \times 3 \times 3)$

$\times 10 \times 10 \times 10$

$= 2^3 \times 2^3 \times 3^3 \times 10^3$

$= (2 \times 2 \times 3 \times 10)^3$

$= 120^3.$

$\text{Side} = \sqrt[3]{\text{Volume}}$

$= \sqrt[3]{120^3}$

$= 120$

Thus, the measure of side is 120 cm.

5. (*i*) $(-10)^3 = (-10) \times (-10) \times (-10)$

$= -10 \times 100 = -1000.$

(*ii*) $\left(\frac{3}{7}\right)^3 = \frac{3}{7} \times \frac{3}{7} \times \frac{3}{7} = \frac{27}{343}.$

(*iii*) $(1.5)^3 = \left(\frac{15}{10}\right)^3 = \left(\frac{3}{2}\right)^3$

$= \frac{3}{2} \times \frac{3}{2} \times \frac{3}{2} = \frac{27}{8} = 3.375.$

6. (*i*) $4096 = (2 \times 2 \times 2)$

2	4096
2	2048
2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

$\times (2 \times 2 \times 2)$

$\times (2 \times 2 \times 2)$

$\times (2 \times 2 \times 2)$

$= 2^3 \times 2^3 \times 2^3 \times 2^3$

$= (2 \times 2 \times 2 \times 2)^3$

$= 16^3$

Clearly, 4096 is a perfect cube number.

(*ii*) $2197 = 13 \times 13 \times 13 = 13^3$

Clearly, 2197 is a perfect cube number.

(*iii*) $6859 = 19 \times 19 \times 19 = 19^3$

Clearly, 6859 is a perfect cube number.

7. (*i*) Unit digit of cube of 1024 is same as unit digit of cube of 4.

$4^3 = 4 \times 4 \times 4 = 64$

Clearly, unit digit of 4^3 is 4.

Hence, unit digit of 1024^3 is 4.

(*ii*) Unit digit of cube of 77 is same as unit digit of cube of 7.

$7^3 = 7 \times 7 \times 7 = 49 \times 7 = 343$

Clearly, unit digit of 7^3 is 3.

Hence, unit digit of 77^3 is 3.

8. (*i*)

$$91125 = (3 \times 3 \times 3) \times (3 \times 3 \times 3) \times (5 \times 5 \times 5)$$
$$= 3^3 \times 3^3 \times 5^3$$
$$= (3 \times 3 \times 5)^3$$
$$= 45^3$$

3	91125
3	30375
3	10125
3	3375
3	1125
3	375
5	125
5	25
5	5
	1

∴ Cube root of 91125

$$= \sqrt[3]{91125}$$
$$= 45.$$

(*ii*)

$$551368 = 2 \times 2 \times 2 \times 41 \times 41 \times 41$$
$$= 2^3 \times 41^3$$
$$= (2 \times 41)^3$$
$$= 82^3$$

2	551368
2	275684
2	137842
41	68921
41	1681
41	41
	1

∴ Cube root of 551368

$$= \sqrt[3]{551368}$$
$$= 82.$$

9. (*i*)

$$\frac{3.5 \times 3.5 \times 3.5 \times 2 \times 2 \times 2}{0.5 \times 0.5 \times 0.5} = \frac{3.5^3 \times 2^3}{0.5^3}$$
$$= \left(\frac{3.5 \times 2}{0.5}\right)^3 = \left(\frac{7}{0.5}\right)^3$$
$$= \left(\frac{70}{5}\right)^3 = 14^3$$
$$\therefore \sqrt[3]{\frac{3.5 \times 3.5 \times 3.5 \times 2 \times 2 \times 2}{0.5 \times 0.5 \times 0.5}} = \sqrt[3]{14^3}$$
$$= 14.$$

(*ii*)

$$\frac{125}{2744} = \frac{5 \times 5 \times 5}{2 \times 2 \times 2 \times 7 \times 7 \times 7}$$
$$= \frac{5^3}{2^3 \times 7^3} = \frac{5^3}{(2 \times 7)^3} = \left(\frac{5}{14}\right)^3$$
$$\therefore \sqrt[3]{\frac{125}{2744}} = \sqrt[3]{\left(\frac{5}{14}\right)^3} = \frac{5}{14}.$$

10. (*i*) ∵ $36 = 6 \times 6$

And $384 = 6 \times 4 \times 4 \times 4$

$$\therefore \sqrt[3]{36} \times \sqrt[3]{384} = \sqrt[3]{36 \times 384}$$
$$= \sqrt[3]{6 \times 6 \times 6 \times 4 \times 4 \times 4}$$
$$= 6 \times 4 = 24.$$

(*ii*) ∵ $121 = 11 \times 11$

And $297 = 11 \times 3 \times 3 \times 3$

$$\therefore \sqrt[3]{121} \times \sqrt[3]{297}$$
$$= \sqrt[3]{121 \times 297}$$
$$= \sqrt[3]{11 \times 11 \times 11 \times 3 \times 3 \times 3}$$
$$= 11 \times 3 = 33.$$

WORKSHEET – 53

1. Volume of cube $= \text{Side}^3 = (2.3)^3$

$$= \left(\frac{23}{10}\right)^3 = \frac{12167}{1000}$$
$$= 12.167 \text{ cm}^3.$$

2.

$$243 = 3 \times 3 \times 3 \times 3 \times 3$$
$$= (3 \times 3 \times 3) \times 3 \times 3$$

The prime factor 3 does not appear in the groups of three absolutely. If we divide 243 by 3 × 3 = 9, this will happen.

So, the required smallest number is 9.

3. (*i*) Unit digit of cube root of 226981

= Unit digit of cube root of 1

= 1.

(*ii*) Unit digit of cube root of 175616

= Unit digit of cube root of 6

= 6.

4.
$$\text{Side} = 0.8 \text{ cm} = \frac{8}{10} \text{ cm}$$

$$\text{Volume} = \text{Side}^3 = \left(\frac{8}{10}\right)^3$$

$$= \frac{8}{10} \times \frac{8}{10} \times \frac{8}{10} = \frac{512}{1000}$$

$$= 0.512 \text{ cm}^3.$$

5.
$$3\frac{920}{1331} = \frac{3 \times 1331 + 920}{1331} = \frac{4913}{1331}$$

$$\therefore \quad \sqrt[3]{3\frac{920}{1331}} = \sqrt[3]{\frac{4913}{1331}} = \sqrt[3]{\frac{17 \times 17 \times 17}{11 \times 11 \times 11}}$$

$$= \frac{17}{11} = 1\frac{6}{11}.$$

6. (*i*) 6859 = 19 × 19 × 19

The only prime factor of 6859 is 19 which appears in triplet. So, 6859 is a perfect cube number.

(*ii*) 74088 = (2 × 2 × 2)

× (3 × 3 × 3)

× (7 × 7 × 7)

2	74088
2	37044
2	18522
3	9261
3	3087
3	1029
7	343
7	49
7	7
	1

The prime factors of 74088 are 2, 3 and 7. Each of them appears in triplet.

So, 74088 is a perfect cube number.

7. First, represent 1250235 in its prime factors.

1250235 = (3 × 3 × 3)

× (3 × 3 × 3)

× 5 × (7 × 7 × 7)

3	1250235
3	416745
3	138915
3	46305
3	15435
3	5145
5	1715
7	343
7	49
7	7
	1

The prime factor 5 does not occur in the triplet. If we divide 1250235 by 5, all the prime factors occur in the triplets.

$$\therefore \quad \text{Quotient} = \frac{1250235}{5}$$

= 250047

In this case,

quotient = 3 × 3 × 3 × 3 × 3 × 3 × 7 × 7 × 7

$= 3^3 \times 3^3 \times 7^3$

$= (3 \times 3 \times 7)^3 = 63^3$

Cube root of the quotient = $\sqrt[3]{63^3}$ = 63.

8. Volume of the box = 15625 cm^3

Side of the cubical store = 2.5 m

= 2.5 × 100 cm

= 250 cm

Volume of the store = Side^3

= 250 × 250 × 250 cm^3.

(*i*) Number of boxes

$$= \frac{\text{Volume of the store}}{\text{Volume of 1 box}}$$

$$= \frac{250 \times 250 \times 250}{15625}$$

$$= \frac{250 \times 250 \times 250}{25 \times 25 \times 25}$$

= 10 × 10 × 10 = 1000.

Thus, 1000 boxes can be put in the store.

(*ii*) Length, breadth and height of the box are of equal measurement as it is a cube.

$\therefore$ Edge = $\sqrt[3]{\text{Volume}} = \sqrt[3]{15625}$

$= \sqrt[3]{25 \times 25 \times 25} = 25$

Thus, dimensions of the box are 25 cm, 25 cm, 25 cm.

9. (*i*) $\sqrt[3]{\dfrac{729}{1000}} = \sqrt[3]{\dfrac{9 \times 9 \times 9}{10 \times 10 \times 10}} = \dfrac{9}{10}$.

(*ii*) $\sqrt[3]{\dfrac{512}{343}} = \sqrt[3]{\dfrac{8 \times 8 \times 8}{7 \times 7 \times 7}} = \dfrac{8}{7}$.

(*iii*) $\sqrt[3]{1000} + \sqrt[3]{0.125}$

$= \sqrt[3]{1000} + \sqrt[3]{\dfrac{125}{1000}}$

$= \sqrt[3]{10 \times 10 \times 10} + \dfrac{\sqrt[3]{5 \times 5 \times 5}}{\sqrt[3]{10 \times 10 \times 10}}$

$= 10 + \dfrac{5}{10} = 10 + 0.5 = 10.50.$

(*iv*) $\sqrt[3]{27} - \sqrt[3]{0.064}$

$= \sqrt[3]{3 \times 3 \times 3} - \sqrt[3]{\dfrac{64}{1000}}$

$= \sqrt[3]{3 \times 3 \times 3} - \sqrt[3]{\dfrac{4 \times 4 \times 4}{10 \times 10 \times 10}}$

$= 3 - \dfrac{4}{10} = \dfrac{26}{10} = 2.6.$

(*v*) $\sqrt[3]{4^3 \times 6^3} = \sqrt[3]{(4 \times 6)^3} = 4 \times 6 = 24.$

(*vi*) $\sqrt[3]{1.331} = \sqrt[3]{\dfrac{1331}{1000}} = \sqrt[3]{\dfrac{11 \times 11 \times 11}{10 \times 10 \times 10}}$

$= \dfrac{11}{10} = 1.1.$

WORKSHEET – 54

1. Cube root of 27 = $\sqrt[3]{3 \times 3 \times 3}$

Cube root of 27 = 3 times.

2. $8 = 2 \times 2 \times 2 = (2)^3$

2	8
2	4
2	2
	1

Cube root of 8 = $\sqrt[3]{2^3} = 2$

$\therefore$ Power of factor = 3.

3. No.

$2^5 = 2 \times 2 \times 2 \times 2 \times 2$

$2^5 = \sqrt[3]{2 \times 2 \times 2 \times 2 \times 2}$

$2^5 = 2\sqrt[3]{2 \times 2}$

$= 2\sqrt[3]{4}$

4. $1 = \sqrt[3]{1 \times 1 \times 1} = 1$

$1 = \sqrt[3]{(-1) \times (-1) \times (-1)} = -1$

1 and – 1 is cube of itself.

5. Ones digit of the number 3331 = 1

Cube root of 1 = $\sqrt[3]{1 \times 1 \times 1} = 1$

Cube of ones digit of 3331 is 1.

6. No.

Cube root of 243

$= \sqrt[3]{3 \times 3 \times 3 \times 3 \times 3}$

$= 3\sqrt[3]{3 \times 3}$

$= 3\sqrt[3]{9}$.

3	243
3	81
3	27
3	9
3	3
	1

7. Let x be added to 124

$x + 124 = 1 + 124$ ($\because x = 1$)

$= 125$

Perfect cube of 125

$= \sqrt[3]{5 \times 5 \times 5} = 5$

5	125
5	25
5	5
	1

Therefore, 1 should be added to 124 make it a perfect cube.

8. Area of one face of cube = 36 sq.m

Side of one face of cube = 6 m.

Volume = 6 m × 6 m × 6 m = 216 m^3.

9. $\left\{\sqrt{3^2+4^2}\right\}^3 = \left\{\sqrt{9+16}\right\}^3$

$= \left\{\sqrt{25}\right\}^3$

$= \left\{\sqrt{5\times 5}\right\}^3 = \{5\}^3$

$= 5 \times 5 \times 5 = 125.$

10. (*i*) Cube root of – 205379

59	205379
59	3481
59	59
	1

$= \sqrt[3]{(-59)\times(-59)\times(-59)}$

$= -59.$

(*ii*) Cube root of – 300763

67	300763
67	4489
67	67
	1

$= \sqrt[3]{(-67)\times(-67)\times(-67)}$

$= -67.$

(*iii*) Cube root of – 753571

91	753571
91	8281
91	91
	1

$= \sqrt[3]{(-91)\times(-91)\times(-91)}$

$= -91.$

11. (*i*) $\sqrt[3]{1372} \times \sqrt[3]{1458}$

2	1372
2	686
7	343
7	49
7	7
	1

2	1458
9	729
9	81
9	9
	1

$= \sqrt[3]{2\times 2\times 7\times 7\times 7} \times \sqrt[3]{2\times 9\times 9\times 9}$

$= \sqrt[3]{2\times 2\times 2\times 7\times 7\times 7\times 9\times 9\times 9}$

$= 2 \times 7 \times 9 = 126.$

(*ii*) $\sqrt[3]{(-729)\times(-15625)}$

9	729
9	81
9	9
	1

5	15625
5	3125
5	625
5	125
5	25
5	5
	1

$\sqrt[3]{9\times 9\times 9\times 5\times 5\times 5\times 5\times 5\times 5}$

$= 9 \times 5 \times 5 = 225.$

(*iii*) $\sqrt[3]{\dfrac{4096}{-2197}}$

13	2197
13	169
13	13
	1

2	4096
2	2048
2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

$= \sqrt[3]{\dfrac{(2\times 2\times 2\times 2\times 2\times 2\times 2\times 2\times 2\times 2\times 2\times 2)}{(-13)\times(-13)\times(-13)}}$

$= \dfrac{2\times 2\times 2\times 2}{-13}$

$= -\dfrac{16}{13}.$

❑❑

Chapter 8

COMPARING QUANTITIES

WORKSHEET – 55

1. (D) $\frac{5\text{ m}}{6\text{ km}} = \frac{5\text{ m}}{6000\text{ m}} = \frac{1}{1200}$

$= 1 : 1200.$

2. (A) $4 : 5 = \frac{4}{5} = \frac{4}{5} \times 100\% = 80\%$

3. (C) Required number $= 25 - 28\%$ of 25

$= 25 - \frac{28}{100} \times 25$

$= 25 - 7 = 18.$

4. (A) Bill amount $=$ ₹ $550 +$ ₹ $550 \times \frac{5}{100}$

$=$ ₹ $550 +$ ₹ 27.50

$=$ ₹ $577.50.$

5. (A) Price before VAT $=$ ₹ $2700 \times \frac{100}{108}$

$=$ ₹ $2500.$

6. (C) CP for each article $= \frac{₹\ 2125}{85} =$ ₹ 25

SP for each article

$=$ CP + Profit

$=$ ₹ $25 +$ ₹ $25 \times \frac{12}{100}$

$=$ ₹ $28.$

7. (B) CP $=$ ₹ $1350 +$ ₹ $150 =$ ₹ 1500

SP $=$ ₹ 1650

Since SP > CP, therefore there is a gain.

Gain% $= \frac{\text{SP} - \text{CP}}{\text{CP}} \times 100$

$= \frac{1650 - 1500}{1500} \times 100$

$= \frac{150}{1500} \times 100 = 10\%.$

8. (A) Marked price $=$ ₹ $47.50 \times \frac{100}{100 - 5}$

$=$ ₹ $\frac{4750}{95} =$ ₹ $50.$

9. (C) Let CP $= x$,

Then SP $= x \times \frac{135}{100} \times \frac{80}{100} = 1.08x$

$\because$ SP > CP

$\therefore$ Gain% $= \frac{1.08x - x}{x} \times 100 = 8.$

10. (D) Let a single discount be $x\%$, then

$\text{CP} \times \frac{x}{100} = \text{CP} \times \frac{40}{100} + \text{CP} \times \frac{60}{100} \times \frac{30}{100}$

or $100x = 4000 + 1800$

$\therefore x = 58.$

11. (A) SI $=$ ₹ $\frac{1000 \times 5 \times 2}{100} =$ ₹ $100.$

12. (C) P $=$ ₹ 2000, A $=$ ₹ 2205,

$n = 2$ years, R = ?

$A = P\left(1 + \frac{R}{100}\right)^n$ gives $\frac{2205}{2000}$

$= \left(1 + \frac{R}{100}\right)^2$

or $1 + \frac{R}{100} = 1.05$ or R = 5%.

13. (C) $2P = P\left(1+\frac{R}{100}\right)^4$ gives

$$2^{\frac{1}{4}} = \left(1+\frac{R}{100}\right)$$

Further, $8P = P\left(1+\frac{R}{100}\right)^n$ gives

$$8 = 2^{\frac{n}{4}} \text{ or } 2^3 = 2^{\frac{n}{4}}$$

or $n = 3 \times 4 = 12$ years.

14. (A) P = ₹ 1600,

$R = \frac{10}{2} = 5\%$ per half annum,

$n = 3$ half years.

$$A = 1600\left(1+\frac{5}{100}\right)^3$$

$= 1600 \times 1.157625 =$ ₹ 1852.20.

15. (D) $100000 = P\left(1+\frac{7}{100}\right)^3$ gives

$$P = \frac{100000}{1.225043}$$

or $P = 81629.79 \approx 81630$.

WORKSHEET – 56

1. SP = ₹ 657

Loss percentage = $8\frac{3}{4}\% = \frac{35}{4}\%$

Loss percentage = $\frac{CP - SP}{CP} \times 100$

$\therefore \quad \frac{35}{4} = \frac{CP - 657}{CP} \times 100$

or $35 \times CP = 400 \times CP - 262800$

or $CP = \frac{262800}{365} = 720$.

Thus, the cost price of the chair is ₹ 720.

2. Let single discount be x%.

$\therefore$ Single discount = CP $\times \frac{x}{100}$.

1st out of two successive discounts

$= CP \times \frac{20}{100} = \frac{CP}{5}$.

And 2nd out of two successive discounts

$= \left(CP - \frac{CP}{5}\right) \times \frac{10}{100}$

$= \frac{2}{25}CP$.

According to the given condition,

$$CP \times \frac{x}{100} = \frac{CP}{5} + \frac{2}{25}CP$$

or $x = 20 + 8 = 28$

Thus, the required discount is 28%.

3. Amount paid by a customer

= Marked Price – Discount

$= 650 - 650 \times \frac{4}{100}$

= 650 – 26 = ₹ 624

Thus, the amount paid by a customer is ₹ 624.

4. Let the constant of ratio be x. Then

cost of calculator = ₹ x

and cost of typewriter = ₹ $9x$.

$\therefore \quad 9x = 360$ or $x = 40$

Therefore, the cost of the calculator is ₹ 40.

5. $A = P\left(1+\frac{R}{100}\right)^n$ gives

$$A = 5000\left(1+\frac{8}{100}\right)^2$$

$= 5000 \times \frac{27}{25} \times \frac{27}{25}$

= 8 × 729 = ₹ 5832

$\therefore$ CI = A – P = 5832 – 5000 = ₹ 832.

Thus, the compound intersect is ₹ 832.

6. CP = ₹ 12000

Sales Tax = 12% of CP = $\frac{12}{100} \times 12000$

= ₹ 1440

Cost for a buyer = SP for the seller

= CP + Sales tax

= ₹ 12000 + ₹ 1440

= ₹ 13440.

7. CP = ₹ 80

Sales tax = 8% of CP = $\frac{8}{100} \times 80$

= ₹ 6.40.

$\therefore$ Actual cost price = CP + Sales tax

= ₹ 80 + ₹ 6.40

= ₹ 86.40.

8. Let original cost price be ₹ x.

VAT = 8% of x = $\frac{8}{100} \times x$

= ₹ $0.08x$

Now, $x + 0.08x = 162$

or $1.08x = 162$

$\therefore$ $x = \frac{162}{1.08}$ = ₹ 150

OR

Let Kishore's savings be ₹ x.

Expenditure on a car = $\frac{1}{2}$ of x = ₹ $\frac{x}{2}$

Now, required percentage = $\frac{\frac{x}{2}}{x} \times 100\%$

$= \frac{1}{2} \times 100\%$

= 50%.

9. Loss percentage = 25%

$\text{CP} - \text{CP} \times \frac{25}{100} = 720$

or $\frac{75}{100}\text{CP} = 720$

$\therefore$ $\text{CP} = \frac{720 \times 100}{75}$ = ₹ 960.

The man wants to a gain of 25%.

$\therefore$ $\text{SP} = \text{CP} + \text{CP} \times \frac{25}{100} = \frac{125}{100}\text{CP}$

$= \frac{5}{4} \times 960 = 5 \times 240$ = ₹ 1200.

Thus, he must sell the furniture for ₹ 1200.

10. Marked Price = $\text{CP} + \text{CP} \times \frac{10}{100}$

$= \text{CP} + \frac{\text{CP}}{10} = \frac{11}{10}\text{CP}$.

Discount = 10% of marked price

$= \frac{10}{100} \times \frac{11}{10}\text{CP} = \frac{11}{100}\text{CP}$.

SP = MP – Discount

$= \frac{11}{10}\text{CP} - \frac{11}{100}\text{CP}$

$= \frac{99}{100}\text{CP}$.

$\because$ SP < CP as $\frac{99}{100}\text{CP} < \text{CP}$

So, there is a loss.

Loss = CP – SP = $\text{CP} - \frac{99}{100}\text{CP} = \frac{\text{CP}}{100}$

Loss percentage = $\frac{\text{Loss}}{\text{CP}} \times 100$

$= \frac{\frac{\text{CP}}{100}}{\text{CP}} \times 100 = 1\%$.

Thus, the shopkeeper loses by 1%.

11. Let the constant of ratio be y. Then Miti has $2y$ stamps and Gunjan has $5y$ stamps.

After taking 30 stamps, Miti has $(2y + 30)$ stamps. After giving 30 stamps, Gunjan has $(5y - 30)$ stamps.

Since, finally both have same number of stamps.

$$\therefore \quad 2y + 30 = 5y - 30$$
$$\text{or} \quad 30 + 30 = 5y - 2y$$
$$\text{or} \quad 60 = 3y$$
$$\text{or} \quad 20 = y$$
$$\therefore \quad 2y = 2 \times 20 = 40$$

Therefore, Miti has 40 stamps.

WORKSHEET – 57

1. (*i*) ₹ 125 to ₹ 175 $= \dfrac{₹\,125}{₹\,175} = \dfrac{5}{7} = 5 : 7.$

(*ii*) 4 hours to 80 minutes

$$= \frac{4 \text{ hours}}{80 \text{ minutes}}$$
$$= \frac{4 \times 60 \text{ minutes}}{80 \text{ minutes}}$$
$$= \frac{3}{1} = 3 : 1.$$

2. (*i*) $5 : 8 = \dfrac{5}{8} = \dfrac{5}{8} \times 100\% = 62.5\%.$

(*ii*) $10 : 40 = \dfrac{10}{40} = \dfrac{1}{4} = \dfrac{1}{4} \times 100\%$

$= 25\%.$

OR

(*i*) $\dfrac{16}{48} = \dfrac{1}{3} = 1 : 3.$

(*ii*) $\dfrac{144}{120} = \dfrac{24 \times 6}{24 \times 5} = \dfrac{6}{5} = 6 : 5.$

3. Let the other number be x. Then

$$\frac{240}{x} = \frac{6}{5}$$

Cross-multiplying, we have

$$6 \times x = 5 \times 240$$
$$\therefore \quad x = \frac{5 \times 240}{6} = 5 \times 40 = 200.$$

Thus, the other number is 200.

4. Increase in the population

= Final population – Initial population

= 3,00,000 – 1,75,000

= 1,25,000.

Increase in percentage

$$= \frac{\text{Increase}}{\text{Initial population}} \times 100$$
$$= \frac{125000}{175000} \times 100$$
$$= \frac{5}{7} \times 100 = 71\frac{3}{7}\%.$$

5. Marked Price = ₹ 1200, SP = ₹ 1100

$\therefore$ Discount = Marked price – SP

= ₹ 1200 – ₹ 1100

= ₹ 100.

Rate of discount

$$= \frac{\text{Discount}}{\text{Marked Price}} \times 100$$
$$= \frac{100}{1200} \times 100 = 8\frac{1}{3}\%.$$

6. Let the constant of ratio be x. Then

Rushil's amount = ₹ $3x$

and Timmy's amount = ₹ $4x$

Also Timmy's amount

= ₹ 6 more than Rushil's amount

= ₹ $(6 + 3x)$

There are two amounts of Timmy here, compare them, we get

$$4x = 6 + 3x$$
$$\therefore \quad 4x - 3x = 6 \quad \text{or} \quad x = 6$$

$\therefore$ Rushil's amount = ₹ 3 × 6 = ₹ 18

And Timmy's amount = ₹ 4 × 6 = ₹ 24

Now, Total amount = ₹ 18 + ₹ 24

= ₹ 42.

7. For each goat CP = ₹ 1200

For one goat, loss = 5% of CP

$= \frac{5}{100} \times 1200 =$ ₹ 60.

$\therefore$ SP for this goat = CP – Loss

= ₹ 1200 – ₹ 60

= ₹ 1140.

For second goat, profit = 10% of CP

$= \frac{10}{100} \times 1200$

= ₹ 120.

$\therefore$ SP for this goat = CP + Profit

= ₹ 1200 + ₹ 120

= ₹ 1320.

Thus, selling price of one goat is ₹ 1140 and that of other one is ₹ 1320.

8. A man sells a cow for ₹ 7200 at a loss of 25%.

This means if CP = ₹ 100,

then SP = ₹ 75.

or if SP = ₹ 75, Then CP = ₹ 100

Therefore, if SP = ₹ 7200,

CP = ₹ $\frac{100}{75} \times 7200 =$ ₹ 9600.

Now, the selling price to gain 25%

= CP + Gain

= CP + 25% of CP

$= \text{CP} + \frac{25}{100} \times \text{CP} = \frac{5}{4}\text{CP}$

$= \frac{5}{4} \times 9600 =$ ₹ 1200

Thus, the must sell the cow for ₹ 12000.

OR

Let CP = x rupees.

$\therefore$ Loss $= \frac{1}{9}$ of CP $= \frac{\text{CP}}{9} = \frac{x}{9}$

Now, SP = CP – Loss

$\therefore$ $7200 = x - \frac{x}{9}$

or $64800 = 8x$

$\therefore$ $x = \frac{64800}{8} =$ ₹ 8100

Therefore, the cost price of the article is ₹ 8100.

9. CP for Bebo = ₹ 12000

SP for Bebo = ₹ 12000 – Loss

= ₹ 12000 – 5% of ₹ 12000

= ₹ $\left(12000 - \frac{5}{100} \times 12000\right)$

= ₹ (12000 – 600)

= ₹ 11400

CP for Monika = SP for Bebo = ₹ 11400

SP for Monika = ₹ 12540

Profit for Monika = SP – CP

= ₹ 12540 – ₹ 11400

= ₹ 1140

Profit % for Monika $= \frac{1140}{11400} \times 100$

= 10%.

Thus, cost price for Monika is ₹ 11400 and profit is 10%.

10. P = ₹ 200, R $= 10\frac{1}{2}\% = \frac{21}{2}\%$,

$n = 2$ years

$A = P\left(1+\frac{R}{100}\right)^n = 200 \times \left(1+\frac{21}{200}\right)^2$

$$= 200 \times \left(\frac{221}{200}\right)^2 = 200 \times \frac{221}{200} \times \frac{221}{200}$$

$$= \frac{221 \times 221}{200} = \frac{48841}{200} = ₹\ 244.205$$

CI = A – P = 244.205 – 200 = ₹ 44.205

≈ 44.20

Thus, the compound interest is ₹ 44.20.

WORKSHEET – 58

1. Number of boys = 40% of 50

$$= \frac{40}{100} \times 50 = \frac{2000}{100}$$

= 20

Number of girls = 50 – Number of boys

= 50 – 20 = 30.

So, the boys are 20 and girls are 30.

2. Let the store contains x vegetables in altogether.

Then $x \times \frac{25}{100} = 13$ or $x = \frac{1300}{25} = 52$

Therefore, there are 52 vegetables in the store.

3. Let ratio of constant be x.

Then, weight of Sanya = $8x$ kg

and weight of Guddu = $7x$ kg.

But it is given that weight of Sanya is 40 kg

∴ $8x = 40$ or $x = \frac{40}{8} = 5$.

Hence, weight of Guddu = $7x = 7 \times 5$ = 35 kg.

4. Let Deepali's age = x

And Anuj's age = y

∴ Half of Deepali's age = $\frac{x}{2}$

and One-third of Anuj's age = $\frac{y}{3}$

These last two ages are given to be equal

∴ $\frac{x}{2} = \frac{y}{3}$ gives $3x = 2y$

or $\frac{x}{y} = \frac{2}{3}$ or $x : y = 2 : 3$.

Thus, the required ratio is 2 : 3.

5. Let original salary be ₹ x. Then

New salary = x + 20% of x

$$= x + \frac{20x}{100} = ₹\ \frac{6}{5}x.$$

This is given to be ₹ 150000

∴ $\frac{6}{5}x = 150000$

or $x = \frac{5}{6} \times 150000$

or $x = 125000$

Thus, Mr. Verma's original salary is ₹ 1, 25, 000.

6. Let marked price be ₹ x.

Then Discount = 5% of $x = \frac{5x}{100} = \frac{x}{20}$

Now, SP = Marked price – Discount

$$= x - \frac{x}{20} = \frac{19x}{20}$$

This is given to be ₹ 3800.

∴ $\frac{19x}{20} = 3800$

or $x = \frac{20}{19} \times 3800 = 4000$.

Thus, marked price of the T.V. set is ₹ 4, 000.

7. CP = ₹ 850

Tax charges = 5% of CP

$$= \frac{5}{100} \times 850 = ₹\ 42.50$$

Now, actual cost = CP + Tax charged

= 850 + 42.50

= ₹ 892.50.

Thus, actual cost of the item is ₹ 892.50.

8. CP = ₹ 9900 and SP = ₹ 9000

Here, it is clear that CP > SP.

So, Billu made a loss.

Loss = CP – SP

= ₹ 9900 – ₹ 9000

= ₹ 900.

$$\text{Loss per cent} = \frac{\text{Loss}}{\text{CP}} \times 100$$

$$= \frac{900}{9900} \times 100 = 9\frac{1}{11}.$$

Thus, Billu's loss per cent is $9\frac{1}{11}$%.

9. CP = ₹ 5500, VAT = 10%.

$$\text{Price before VAT} = \text{CP} \times \frac{100}{100+10}$$

$$= 5500 \times \frac{100}{110}$$

= 50 × 100 = ₹ 5000.

Thus, price of a sofa set before VAT added was ₹ 5000.

10. P = ₹ 5000, R = 8%, n or T = 2 years

Let us first find simple interest.

$$\text{SI} = \frac{\text{PRT}}{100} = \frac{5000 \times 8 \times 2}{100} = 50 \times 16$$

= ₹ 800

i.e., Simple interest = ₹ 800.

Now, find compound interest.

$$\text{A} = \text{P}\left(1+\frac{\text{R}}{100}\right)^n = 5000\left(1+\frac{8}{100}\right)^2$$

$$= 5000 \times \left(1+\frac{2}{25}\right)^2$$

$$= 5000 \times \frac{27}{25} \times \frac{27}{25} = ₹\ 5832$$

∴ CI = A – P = 5832 – 5000 = ₹ 832.

i.e.,Compound interest = ₹ 832

Required difference = ₹ 832 – ₹ 800

= ₹ 32.

11. P_1 = ₹ 75550, R = 8.5%

(*i*) At the end of second year, there are 2 years elapsed

∴ n = 2 years

$$A_1 = P_1\left(1+\frac{R}{100}\right)^n$$

$$= 75550 \times \left(1+\frac{8.5}{100}\right)^2$$

$$= 75550 \times \frac{108.5}{100} \times \frac{108.5}{100}$$

$$= 75550 \times \frac{217}{200} \times \frac{217}{200}$$

= ₹ 88939.348 ≈ ₹ 88939.35

Therefore, amount at the end of second year received by Ritu is ₹ 88939.35.

(*ii*) The amount A_1 obtained in part (*i*) will be the principal for the third year.

∴ P_2 = ₹ 88939.35

$$\text{Now, } A_2 = P_2\left(1+\frac{R}{100}\right)^1$$

$$= 88939.35 \times \left(1+\frac{8.5}{100}\right)$$

$$= 88939.35 \times \frac{217}{200} = 96499.19$$

∴ Required interest

= 96499.19 – 88939.35

= 7559.84

Thus, interest for the third year is ₹ 7559.84.

WORKSHEET– 59

1. CP of microwave oven after adding

VAT = 5800 + 12% of 5800

$$= 5800 + \frac{12}{100} \times 5800$$

= 5800 + 696 = ₹ 6496 .

2. Decrease in number of people

= 800 – 150 = 650

$$\text{Per cent decreased} = \frac{650}{800} \times 100 = \frac{650}{8}$$

= 81.25

Thus, the decrease in number of people was 81.25%.

3. Total number of parts = 8 + 2 = 10

Let the percentage of milk be x.

Then,

x % of 10 = 8

or $\frac{x}{100} \times 10 = 8$

$$\therefore \quad x = \frac{8 \times 100}{10} = 80\%.$$

Thus, the percentage of milk in the can is 80%.

OR

Profit = SP – CP = 384 – 320

= ₹ 64.

$$\text{Profit \%} = \frac{\text{Profit}}{\text{CP}} \times 100$$

$$= \frac{64}{320} \times 100$$

$$= \frac{640}{32} = 20\%.$$

Thus, the profit is ₹ 64 and profit per cent is 20.

4. Let n games were played in all.

According to given condition, we have

40% of n = 20 or $\frac{40}{100} \times n = 20$

$$\therefore \quad n = \frac{20 \times 100}{40} = 50$$

Thus, 50 games were played in all.

5. Let constant of the ratio be x.

Then Mr. Lal's wife had ₹ $3x$.

and four sons had ₹ $5x$ in all.

Since all the sons has an equal share.

∴ Each son had ₹ $\frac{5x}{4}$.

Now, $3x = 135000$

$$\therefore \quad x = \frac{135000}{3} = 45000$$

$$\therefore \quad \frac{5x}{4} = \frac{5}{4} \times 45000 = 5 \times 11250$$

= 56250.

Thus, each son got ₹ 56250.

6. CP = ₹ 200 × 10 = ₹ 2000

Since 50 milk bars had to be thrown away due to be rotten.

∴ Number of remaining bars

= 200 – 50 = 150.

∴ SP = ₹ 150 × 15 = ₹ 2250

Since SP > CP

Therefore, Suman made a profit.

Profit = SP – CP = ₹ 2250 – ₹ 2000

= ₹ 250.

$$\text{Profit\%} = \frac{\text{Profit}}{\text{CP}} \times 100 = \frac{250}{2000} \times 100$$

$$= \frac{25}{2} = 12.5\%.$$

Thus, Suman's profit was 12.5%.

7. CP of each almirah = ₹ 1800.

SP of one almirah = CP – Loss

$= \text{CP} - 10\% \text{ of CP}$

$= \text{CP} - \frac{10}{100} \times \text{CP}$

$= \text{CP} - \frac{\text{CP}}{10}$

$= \frac{9}{10}\text{CP}$

$= \frac{9}{10} \times 1800$

= ₹ 1620.

SP of other almirah

= CP – Loss = CP – 2% of CP

$= \text{CP} - \frac{2}{100} \times \text{CP} = \text{CP} - \frac{\text{CP}}{50}$

$= \frac{49}{50}\text{CP} = \frac{49}{50} \times 1800$

= ₹ 1764.

Thus, Rinku sold one almirah for ₹ 1620. and other one for ₹ 1764.

OR

CP of 1 unit = ₹ $\frac{48}{12}$ = ₹ 4

SP of 1 unit = ₹ $\frac{50}{10}$ = ₹ 5

Clearly, SP is greater than CP.

Therefore, there is a gain

Gain on 1 unit = ₹ 5 – ₹ 4 = ₹ 1

$$\text{Gain\%} = \frac{\text{Gain}}{\text{CP}} \times 100 = \frac{1}{4} \times 100$$

$= 25$

Hence gain is 25%.

8. P = ₹ 1000, R = 8% per annuam = 4% half yealy.

$n = 1\frac{1}{2}$ years = 3 half-years.

$A = P\left(1 + \frac{R}{100}\right)^n$ gives

$$A = 1000 \times \left(1 + \frac{4}{100}\right)^3$$

$$= 1000 \times \left(1 + \frac{1}{25}\right)^3$$

$$= 1000 \times \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25}$$

$$= \frac{1000 \times 26}{25} \times \frac{26}{25} \times \frac{26}{25}$$

$= 40 \times 26 \times 1.04 \times 1.04$

$= 1040 \times 1.0816$

= ₹ 1124.864 ≈ ₹ 1124.86

∴ CI = A – P = 1124.86 – 1000

= ₹ 124.86.

Thus, the compound interest is ₹ 124.86.

9. P = ₹ 10000, n = 3 years, R = 10%

Using formula.

$A = P\left(1 + \frac{R}{100}\right)^n$, we get

$$A = 10000 \times \left(1 + \frac{10}{100}\right)^3$$

$$= 10000 \times \left(1 + \frac{1}{10}\right)^3$$

$$= 10000 \times \left(\frac{11}{10}\right)^3$$

$$= 10000 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10}$$

$= 10 \times 11 \times 11 \times 11 = 110 \times 121$

= ₹ 13310

∴ CI = A – P = 13310 – 10000 = ₹ 3310.

Thus, the compound interest is ₹ 3310.

WORKSHEET – 60

1. (*i*) $12 : 25 = \frac{12}{25} = \frac{12}{25} \times 100\% = 48\%.$

(*ii*) $3 : 8 = \frac{3}{8} = \frac{3}{8} \times 100\% = 37.5\%.$

2. $\frac{1}{4} = \frac{1}{4} \times 100\% = 25\%$

∴ 25% of students wear glasses.

And (100 – 25)% or 75% of students do not wear glasses.

3. Let Babita's income be ₹ 100.

Then Anita's income = ₹ (100 – 20)

= ₹ 80.

So, Babita's income is ₹ (100 – 80)

= ₹ 20 more than Anita's income.

∴ Require percentage $= \frac{20}{80} \times 100$

$= \frac{200}{8} = 25.$

Thus, Babita's income is 25% more than Anita's income.

4. CP = ₹ 1200

Total CP = CP + Sales tax

= CP + 6% of CP

$= \text{CP} + \frac{6}{100} \times \text{CP}$

$= \frac{106}{100} \times \text{CP} = \frac{106}{100} \times 1200$

= 106 × 12 = ₹ 1272.

Therefore, Poonam paid ₹ 1272 to the shopkeeper.

5. CP = ₹ 40000

Profit = 1% of 40000 = $\frac{1}{100} \times 40000$

= ₹ 400

SP = CP + Profit = 40000 + 400

= ₹ 40400.

Thus, selling price is ₹ 40400.

6. Let constant of ratio be x.

Then, speed of car = $3x$ km / hr

and speed of bus = $2x$ km / hr

Now, $3x = 36$ gives $x = 12$

∴ $2x = 2 \times 12 = 24.$

Therefore, the speed of the bus is 24 km / hr.

7. CP = ₹ 225000.

Additional expenditure

= 35000 + 25000 + 5000

= ₹ 65000.

Total CP = CP + Additional expenditure

= 225000 + 65000

= ₹ 290000.

SP = ₹ 550000

Profit = SP – Total CP

= 550000 – 290000

= ₹ 260000

Profit per cent $= \frac{\text{Profit}}{\text{Total CP}} \times 100$

$= \frac{260000}{290000} \times 100$

$= \frac{2600}{29} = 89\frac{19}{29}\%$

or ≈ 89.65

Thus, Mr. William's profit was $89\frac{19}{29}\%$ or 89.65%.

8. P = ₹ 800, $n = 2\frac{1}{2} = \frac{5}{2}$, R = 10%.

$$A = P\left(1+\frac{R}{100}\right)^n = 800 \times \left(1+\frac{10}{100}\right)^{2.5}$$

$= 800 \times \left(\frac{11}{10}\right)^{2.5} = 800 \times (1.1)^{2.5}$

$= 800 \times (1.1)^2 \times \sqrt{1.1}$

$= 800 \times 1.21 \times 1.05 = 1016.40$

CI = A – P = 1016.40 – 800 = ₹ 216.40.

Thus, amount is ₹ 1016.40 and compound interest is ₹ 216.40.

9. Total number of students = 1050.

Number of present students

= 28% of 1050

$= \frac{28}{100} \times 1050 = \frac{2940}{10}$

= 294.

Number of absentees

= Total number fo students – Number of present students

= 1050 – 294 = 756 students

Thus, 756 students were absent on Monday.

OR

(*i*) Let the original price of a soap be ₹ x.

Then, VAT = 8% of $x = \frac{8}{100} \times x$

$= \frac{8}{100}x$

$\therefore$ CP $= x + \frac{8}{100}x = \frac{108}{100}x$.

But this is given to be ₹ 35

$\therefore \frac{108}{100}x = 35$

This gives $x = \frac{35 \times 100}{108} = \frac{3500}{108}$

= 32.41 (approx.)

Thus, the original price of the soap was ₹ 32.41.

(*ii*) Let the original price of a shampoo be ₹y.

Then VAT = 8% of $y = \frac{8}{100} \times y = \frac{8}{100}y$.

$\therefore$ CP $= y + \frac{8}{100}y = \frac{108}{100}y$.

But this is given to be ₹ 180

$\therefore \frac{108}{100}y = 180$

This gives $y = \frac{180 \times 100}{108} = \frac{18000}{108}$

= 166.67 (approx.)

Thus, the original price of the shampoo was ₹ 166.67.

10. CP of each television = ₹ 50000

Loss on one television = 20% of 50000

$= \frac{20}{100} \times 50000 =$ ₹ 10000

SP of this television = CP – Loss

= 50000 – 10000 = ₹ 40000

Profit on other television

= 25% of 50000

$= \frac{25}{100} \times 50000 =$ ₹ 12500

SP of this television = CP + Profit

= 50000 + 12500 = ₹ 62500.

Total SP = 40000 + 62500 = ₹ 102500

Total CP = 50000 + 50000 = ₹ 100000

$\because$ SP > CP

Therefore, the shopkeeper made a profit.

Profit = SP – CP

= 102500 – 100000 = 2500.

Thus, the shopkeeper made a profit of ₹ 2500 on the whole transaction.

WORKSHEET– 61

1. Let Divya's salary before the increase be ₹ x.

Then, the increase in her salary

$$= 10\% \text{ of } x.$$

$$= \frac{10}{100} \times x = \frac{x}{10}.$$

So, her salary after increase

$$= x + \frac{x}{10} = \frac{11}{10}x.$$

But this is given to be ₹ 665500.

$$\therefore \quad \frac{11}{10}x = 665500$$

$$\therefore \quad x = 665500 \times \frac{10}{11} = 60500 \times 10$$

$$= ₹\ 605000$$

Thus, Divya's salary before increase was ₹ 6, 05, 000.

2. Number of good students

$$= 65\% \text{ of } 80$$

$$= \frac{65}{100} \times 80 = 52$$

∴ Number of students which are not good = 80 – 52 = 28.

3. SP = CP + 10% of CP

$$\text{or} \quad 495 = \text{CP} + \frac{10}{100}\text{CP}$$

$$\text{or} \quad 495 = \text{CP} + \frac{\text{CP}}{10} = \frac{11}{10}\text{CP}$$

$$\therefore \quad \text{CP} = \frac{495 \times 10}{11} = ₹\ 450.$$

Therefore, the cost price of the almirah was ₹ 450.

4. Let Rohan's income be ₹ 100

Then Amit's income = ₹ 125

If Amit's income is ₹ 125, then Rohan's income is less by ₹ 25

When Amit's income is ₹ 100, Rohan's income is less by

$$₹\ \frac{25}{125} \times 100 \quad i.e., ₹\ 20.$$

Therefore, Rohan's income is 20% less than Amit's income.

5. Let CP of 1 mango be ₹ x

Then CP of 18 mangoes = ₹ $18x$

∴ SP of 16 mangoes = ₹ $18x$

$$\therefore \text{ SP of 1 mango} = ₹\ \frac{18x}{16} = ₹\ \frac{9x}{8}$$

Now, profit on 1 mango

$$= ₹\left(\frac{9x}{8} - x\right) = ₹\ \frac{x}{8}$$

$$\text{Profit } \% = \frac{\frac{x}{8}}{x} \times 100 = \frac{100}{8} = 12.5\%$$

Therefore, the gain is 12.5%.

6. Let the rate of VAT be x %.

Then x % of 450 = 45

$$\text{or} \quad \frac{x}{100} \times 450 = 45 \quad \text{or} \quad \frac{45}{10}x = 45$$

$$\therefore \quad x = \frac{450}{45} = 10\%.$$

Thus, the rate of VAT is 10%.

7. Total CP = 225 + 15 = ₹ 240.

SP = ₹ 300

Profit = SP – Total CP

= 300 – 240 = ₹ 60.

$$\text{Profit per cent} = \frac{60}{240} \times 100 = 25\%.$$

OR

Discount = Marked price – Selling price

= 150 – 100 = ₹ 50

Discount per cent

$$= \frac{\text{Discount}}{\text{Marked price}} \times 100$$

$$= \frac{50}{150} \times 100 = 33\frac{1}{3}\%.$$

8. Marked price = ₹ 280

Discount = 10% of marked price

$$= \frac{10}{100} \times 280 = ₹\ 28$$

$\therefore$ SP = 280 – 28 = ₹ 252

Profit = SP – CP = 252 – CP

Now, using the formula,

$$\text{Profit } \% = \frac{\text{Profit}}{\text{CP}} \times 100, \text{ we get}$$

$$26 = \frac{252 - \text{CP}}{\text{CP}} \times 100$$

or 26 CP = 25200 – 100 CP

or 126 CP = 25200

or $\text{CP} = \frac{25200}{126}$ or CP = 200

Therefore, the cost price of the article is ₹ 200.

OR

Increase in the price = 20% of 40000

$$= \frac{20}{100} \times 40000$$

$$= \frac{40000}{5} = ₹\ 8000$$

New price = Price last year + Increase in the price

= 40000 + 8000 = ₹ 48000

Thus, the new price of the scooter is ₹ 48000.

9. P = ₹ 16000, $R = 12\frac{1}{2}\% = \frac{25}{2}\%$,

n = 3 years

Using the formula,

$$A = P\left(1 + \frac{R}{100}\right)^n, \text{ we get}$$

$$A = 16000 \times \left(1 + \frac{25/2}{100}\right)^3$$

$$= 16000 \times \left(1 + \frac{25}{200}\right)^3$$

$$A = 16000 \times \left(1 + \frac{1}{8}\right)^3 = 16000 \times \left(\frac{9}{8}\right)^3$$

$$= 16000 \times \frac{9}{8} \times \frac{9}{8} \times \frac{9}{8}$$

$$= 250 \times \frac{729}{8} = \frac{125}{4} \times 729$$

$$= \frac{91125}{4} = 22781.25$$

$\therefore$ CI = A – P = 22781.25 – 16000

= ₹ 6781.25

Thus, Roma paid ₹ 6781.25 as compound interest.

10. P = 15625,

n = 9 months = 3 quarters,

R = 16% per annum = $\frac{16}{4}$ *i.e.*, 4% quarterly. Using the formula,

$$A = P\left(1 + \frac{R}{100}\right)^n, \text{ we get}$$

$$A = 15625\left(1 + \frac{4}{100}\right)^3$$

$$= 15625 \times \left(1 + \frac{1}{25}\right)^3$$

$$= 15625 \times \left(\frac{26}{25}\right)^3$$

$$= 15625 \times \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25}$$

= 26 × 26 × 26 = ₹ 17576

$\therefore$ CI = A – P = 17576 – 15625

= ₹ 1951.

Thus, the compound interest is ₹ 1951.

WORKSHEET– 62

1. Marked price = ₹ 500

Discount = 50%

Discount = ₹ 500 of 50%

$= ₹\ 500 \times \frac{50}{100} = ₹\ 250$

Selling price = ₹ 500 – ₹ 250 = ₹ 250.

2. Cost price

3. Single discount

Discount = 100 of 10%

$= 100 \times \frac{10}{100} = ₹\ 10$

Two successive discount

Discount = 100 of 5%

$= 100 \times \frac{5}{100} = ₹\ 5$

SP = 100 – 5 = 95

$95 \text{ of } 5\% = 95 \times \frac{5}{100} = \frac{475}{100} = ₹4.75$

Total discount = 5 + 4.75 = ₹ 9.75

Therefore, single discount of 10% is more.

4. Let CP = ₹ 100

Single discount

$100 \text{ of } 20\% = 100 \times \frac{20}{100} = ₹\ 20$

Two successive discount

$100 \text{ of } 12\% = 100 \times \frac{12}{100} = ₹\ 12$

100 – 12 = ₹ 88

$88 \text{ of } 8\ \% = 88 \times \frac{8}{100} = \frac{704}{100} = ₹\ 7.04$

Total discount = 12 + 7.04 = ₹ 19.04

A single discount of 20% is better.

5. (*i*) $1200 \text{ of } 15\% = 1200 \times \frac{15}{100} = 12 \times 15$

= 180.

(*ii*) 1400 of 16%

$1400 \times \frac{16}{100} = 224.$

6. Let maximum marks be x

Passing marks = x of 36%

According to questions,

x of 36% = 123 + 39

$x \times \frac{36}{100} = 162$

$\frac{9x}{25} = 162$

$x = \frac{162 \times 25}{9}$

$x = 25 \times 18 = 450.$

Therefore, maximum marks are 450.

7. Cost of 80 kg rice = 16.75 × 80

$= \frac{1675}{100} \times 80$

= 335 × 4 = ₹ 1340

Cost price of 120 kg rice = 120 × 18

= ₹ 2160

Total cost price = 1340 + 2160

= 3500

Total rice = 80 +120 = 200 kg

Gain = 3500 of 20%

$= 3500 \times \frac{20}{100} = ₹\ 700$

Selling price = 3500 + 700 = ₹ 4200

$1 \text{ kg of SP} = \frac{4200}{200} = 21 = ₹\ 21.$

8. Total of hens = 144

Total cost of hens (CP) = ₹ 7200

Loss of hens = 6

$\text{Cost of one (hen)} = \frac{7200}{144} = 50$

∴ Loss = 6 × 50 = ₹ 300

SP of total hens =

₹ 7200 – 300 = ₹ 6900

$\text{SP of 1 hen} = \frac{6900}{144} = 47.91$

= ₹47.91

SP of 1 hen = ₹ 47.91 ≈ ₹ 48.

9. Let the actual cost of saree be x.

Then,

x + 15 % of x = ₹ 3680

$\Rightarrow \quad x + \frac{3}{20}x = ₹\ 3680.$

$$\frac{23}{20}x = 3680$$

$$x = \frac{3680 \times 20}{23}$$

$$x = ₹\ 3200$$

Let the actual cost of cosmetic items be y

$$y + 10\% \text{ of } y = 825$$

$$\Rightarrow \quad y + \frac{y}{10} = 825$$

$$\frac{11y}{10} = 825$$

$$\therefore \quad y = \frac{825 \times 10}{11} = ₹\ 750$$

Let the actual cost of purse be z. Then,

$$z + 8\% \text{ of } z = ₹\ 129.6$$

$$\Rightarrow \quad z + \frac{8}{100}z = ₹\ 129.6$$

$$\Rightarrow \quad \frac{108z}{100} = ₹\ 129.6$$

$$z = \frac{1296 \times 100}{108 \times 10} = ₹\ 120$$

$$z = ₹\ 120$$

Total actual cost of (*i.e.*, CP)

$$= ₹\ 3200 + ₹\ 750 + ₹120$$

$$= ₹\ 4070$$

Total cost including VAT

$$= ₹\ 3680 + ₹\ 825 + ₹\ 129.6$$

$$= ₹\ 4634.6$$

Amount of VAT $= ₹\ 4634.6 - ₹\ 4070$

$$= ₹\ 564.6$$

Let the VAT % be k. Then

$$k\ \%\ 4070 = ₹\ 564.6$$

$$\Rightarrow \quad \frac{k}{100} \times 4070 = ₹\ 564.6$$

$$\therefore \quad k = \frac{564.6 \times 100}{4070}$$

$$\therefore \quad k = 13.87\%$$

10. We know that

$$A = P\left(1 + \frac{r}{100}\right)^n$$

$$= \frac{9680 = P\left(1 + \frac{r}{100}\right)^2}{10648 = P\left(1 + \frac{r}{100}\right)^3}$$

$$\frac{9680}{10648} = \left(1 + \frac{r}{100}\right)^{2-3}$$

$$\frac{9680}{10648} = \left(1 + \frac{r}{100}\right)^{-1}$$

$$\frac{9680}{10648} = \left(\frac{100 + r}{100}\right)^{-1}$$

$$\frac{9680}{10648} = \frac{100}{100 + r}$$

$$9680 \times (100 + r) = 100 \times 10648$$

$$100 + r = \frac{10648 \times 100}{9680}$$

$$100 + r = 110$$

$$r = 110 - 100 = 10$$

$$r = 10\%$$

Again, we know that

$$A = P\left(1 + \frac{r}{100}\right)^n$$

$$9680 = P\left(1 + \frac{10}{100}\right)^2$$

$$9680 = P\left(\frac{100 + 10}{100}\right)^2$$

$$9680 = P\left(\frac{110}{100}\right)^2$$

$$9680 = P\left(\frac{110}{100} \times \frac{110}{100}\right)$$

$$9680 = P\left(\frac{11}{10} \times \frac{11}{10}\right)$$

$$P = 80 \times 10 \times 10 = 8000$$

$$P = ₹\ 8000.$$

❑❑

Chapter 9

ALGEBRAIC EXPRESSIONS AND IDENTITIES

WORKSHEET–63

1. (C) The expression $a - b$ is a binomial because it has 2 terms.

2. (A) $5x^2$ and $-7x^2$ are like terms because they are formed from same variable and the powers of the variable are the same.

3. (D) Adding,

$$\begin{array}{rrr} 3p^2q^2 & -\ 5pq & +\ 4 \\ -\ 2p^2q^2 & +\ 7pq & +\ 7 \\ \hline p^2q^2 & +\ 2pq & +\ 11. \end{array}$$

4. (A) Subtracting,

$$\begin{array}{rrrr} 5xy & -\ 2yz & -\ 2zx & +\ 10xyz \\ 3xy & +\ 5yz & -\ 7zx & \\ - & - & + & \\ \hline 2xy & -\ 7yz & +\ 5zx & +10xyz. \end{array}$$

5. (A) $\because \quad x \times y = xy$

$\therefore \quad 2x \times y = 2xy.$

6. (B) $(-a) \times (-a^2) \times a^3 = a^3 \times a^3 = a^6.$

7. (C) $(2a + 3b) \times (3a + 4b)$

$= 2a \times (3a + 4b) + 3b(3a + 4b)$

$= 6a^2 + 8ab + 9ab + 12b^2$

$= 6a^2 + 17ab + 12b^2.$

8. (D) $(a + b)(2a - 3b + c) - (2a - 3b)c$

$= a(2a - 3b + c) + b(2a - 3b + c) - 2ac + 3bc$

$= 2a^2 - 3ab + ac + 2ab - 3b^2 + bc - 2ac + 3bc$

$= 2a^2 - 3b^2 - ab + 4bc - ac.$

9. (B) $\because a + b \neq ab \quad \therefore 5x + y \neq 5xy.$

10. (D) $5(x - 6) = 5 \times x - 5 \times 6 = 5x - 30.$

11. (B) $\dfrac{18a^3b^2}{-2ab} = \dfrac{18}{-2} \times \dfrac{a^3}{a} \times \dfrac{b^2}{b} = -9a^2b.$

12. (B) We have $x^3 + 2x^2 + x$

$= x(x^2 + 2x + 1) = x(x + 1)^2$

Therefore, $\dfrac{x^3 + 2x^2 + x}{x(x+1)} = \dfrac{x(x+1)^2}{x(x+1)}$

$= x + 1.$

13. (C) $(a + b)(a - b) = a(a - b) + b(a - b)$

$= a^2 - ab + ab - b^2$

$= a^2 - b^2.$

14. (B) $(a + b)^2 = a^2 + 2ab + b^2.$

15. (A) The factorization of $25x^2 - 16y^2$ is a binomial as it is a binomial.

16. (B) $(3 + 5c)^2 = 3^2 + 2 \times 3 \times 5c + (5c)^2$

$= 9 + 30c + 25c^2.$

17. (D) $\dfrac{6x^2 - 31x + 40}{2x - 5} = 3x - 8$

$$\begin{array}{r|l} & 3x - 8 \\ 2x - 5 & 6x^2 - 31x + 40 \\ & 6x^2 - 15x \\ & -\quad + \\ \hline & -16x + 40 \\ & -16x + 40 \\ & +\quad - \\ \hline & 0 \end{array}$$

18. (C) $4(x^3y^2z^2 + x^2y^3z^2 + x^2y^2z^3)$

$= 4x^2y^2z^2(x + y + z)$

$\therefore \dfrac{4(x^3y^2z^2 + x^2y^3z^2 + x^2y^2z^3)}{2x^2y^2z^2}$

$= 2(x + y + z).$

19. (B) $(x + 3)(x - 2) = x(x - 2) + 3(x - 2)$
$= x^2 - 2x + 3x - 6$
$= x^2 + x - 6.$

20. (B) $(a - b)^2 = a^2 - 2ab + b^2.$

WORKSHEET–64

1. (*i*) $x^5 + 9x^3 - 7x^2 + 2x.$

(*ii*) $8p^4 - 7p^2 + 19p.$

2. (*i*) $7ab$ (*ii*) $x^2 + 7xy - 6x + 2$

3. (*i*) $(-2x)(5x^2) = (-2 \times 5) \times x \times x^2$
$= -10x^3.$

(*ii*) $\left(\sqrt{2}y\right)\left(\sqrt{2}y\right) = \left(\sqrt{2} \times \sqrt{2}\right) \times y \times y$
$= 2y^2.$

4. Area of a rectangle
= Length(l) × Breadth (b)

(*i*) $l = -7x, \quad b = -8y$

∴ Area $= l \times b = (-7x) \times (-8y)$
$= (-7) \times (-8)x \times y$
$= 56xy.$

(*ii*) $l_1 = 4ab^2, \ b_1 = -12a^2b$

∴ Area $= l_1 \times b_1 = 4ab^2 \times (-12a^2b)$
$= 4 \times (-12)ab^2 \times a^2b$
$= -48a^3b^3.$

OR

(*i*) Remember the identity:
$(a - b)^2 = a^2 - 2ab + b^2$
Put $a = 100$ and $b = 1.$
$(100 - 1)^2 = 100^2 - 2 \times 100 \times 1 + 1^2$
or $99^2 = 10000 - 200 + 1$
$= 9801.$

(*ii*) Remember the identity:
$(a + b)^2 = a^2 + 2ab + b^2$
Put $a = 90$ and $b = 3.$
$(90 + 3)^2 = 90^2 + 2 \times 90 \times 3 + 3^2$
or $93^2 = 8100 + 540 + 9$
$= 8649.$

5. (*i*) Volume of a cuboid
= Length × Breadth × Height
$= 7ax \times 3by \times 5cz$
$= 7 \times 3 \times 5 \times a \times b \times c \times x \times y \times z$
$= 105abcxyz$ cubic units.

(*ii*) Volume of a cuboid
= Length × Breadth × Height
$= (2xy) \times (-2y) \times (-2x)$
$= 2 \times (-2) \times (-2) \times xy \times y \times x$
$= 8x^2y^2$ cubic units.

6. Let $y = 4x(8x - 3) - 2$
$= 4x \times 8x - 4x \times 3 - 2$
$= 32x^2 - 12x - 2.$

Substituting, $x = \frac{1}{4}$, we get

$$y = 32\left(\frac{1}{4}\right)^2 - 12\left(\frac{1}{4}\right) - 2$$
$$= 32 \times \frac{1}{16} - 12 \times \frac{1}{4} - 2$$
$$= 2 - 3 - 2 = -3$$

OR

Remember the identity:
$(a - b)(a + b) = a^2 - b^2$
Putting
(*i*) $a = 70$ and $b = 3$, we have
$(70 - 3)(70 + 3) = 70^2 - 3^2$
or $67 \times 73 = (70 \times 70) - (3 \times 3)$
$= 4900 - 9 = 4891.$

(*ii*) $a = 100$ and $b = 1$, we get

$(100 - 1) \times (100 + 1) = 100^2 - 1^2$

or $99 \times 101 = (100 \times 100) - (1 \times 1)$

or $101 \times 99 = 10000 - 1 = 9999$.

7. (*i*) Adding,

$$\begin{array}{rrr} x^7 & -\ 2x^3 & +\ 4x^2 \\ 4x^7 & +\ 4x^3 & -\ 4x^2 \\ +\ x^7 & -\ x^3 & \\ 6x^7 & +\ x^3 & \\ \hline \end{array}$$

The required sum is $6x^7 + x^3$.

(*ii*) Adding,

$$\begin{array}{rrr} pq & -\ qr & \\ & +\ qr & -\ rp \\ -\ pq & & +\ rp \\ \hline 0 & +\ 0 & +\ 0 \end{array}$$

The required sum is 0.

8. (*i*) Subtracting,

$$\begin{array}{rrrr} -\ 5y^2 & +\ 7x^2 & +\ 4x^2y & -\ 7xy^2 \\ -\ y^2 & +\ 3x^2 & +\ 4x^2y & -\ 5xy^2 \\ + & - & - & + \\ \hline -\ 4y^2 & +\ 4x^2 & +\ 0 & -\ 2xy^2 \end{array}$$

The required subtraction is

$-4y^2 + 4x^2 - 2xy^2$.

(*ii*) Subtracting,

$$\begin{array}{rrrr} 3a^2 & -\ 4a^3 & +\ 3a & +\ 7 \\ a^2 & -\ a^3 & -\ a & +\ 1 \\ - & + & + & - \\ \hline 2a^2 & -\ 3a^3 & +\ 4a & +\ 6 \end{array}$$

The required subtraction is

$2a^2 - 3a^3 + 4a + 6$.

(*iii*) Subtracting,

$$\begin{array}{rr} 3b^2 & -\ 5ab \\ -\ b^2 & +\ ab \\ + & - \\ \hline 4b^2 & -\ 6ab \end{array}$$

The required subtraction is $4b^2 - 6ab$.

WORKSHEET– 65

1. Required value

$= (4x^2 - 5xy + 7y^2) - (3x^2 + 4y^2)$

$= 4x^2 - 5xy + 7y^2 - 3x^2 - 4y^2$

$= (4x^2 - 3x^2) - 5xy + (7y^2 - 4y^2)$

$= x^2 - 5xy + 3y^2$.

OR

Remember the identity:

$(a + b)^2 = a^2 + 2ab + b^2$

Substituting $a = 3x$ and $b = 2y$, we get

$(3x + 2y)^2 = (3x)^2 + 2 \times 3x \times 2y + (2y)^2$

or $12^2 = 9x^2 + 12 \times 6 + 4y^2$

or $144 = 9x^2 + 4y^2 + 72$

or $144 - 72 = 9x^2 + 4y^2$

or $9x^2 + 4y^2 = 72$.

2. (*i*) We have

$(a^2 - 5)(a + 5)$

$= a^2 \times (a + 5) - 5 \times (a + 5)$

$= a^3 + 5a^2 - 5a - 25$

$\therefore (a^2 - 5)(a + 5) + 15$

$= a^3 + 5a^2 - 5a - 25 + 15$

$= a^3 + 5a^2 - 5a - 10$.

(*ii*) $(t + s^2)(t^2 - s) = t(t^2 - s) + s^2(t^2 - s)$

$= t^3 - ts + s^2t^2 - s^3$.

OR

(*i*) $(3x^2 - 2y^2)(3x^2 - 2y^2)$

$= 3x^2(3x^2 - 2y^2) - 2y^2(3x^2 - 2y^2)$

$= 9x^4 - 6x^2y^2 - 6x^2y^2 + 4y^4$

$= 9x^4 - 12x^2y^2 + 4y^4$.

(*ii*) $\left(2a + \frac{3}{b}\right)\left(2a - \frac{3}{b}\right)$

$= 2a\left(2a - \frac{3}{b}\right) + \frac{3}{b}\left(2a - \frac{3}{b}\right)$

$$= 4a^2 - \frac{6a}{b} + \frac{6a}{b} - \frac{9}{b^2}$$

$$= 4a^2 - \frac{9}{b^2}.$$

3. (*i*) Remember an identity:

$(A - B)^2 = A^2 - 2AB + B^2$

Substituting A = a and B = 2, we get

$$(a - 2)^2 = a^2 - 2 \times a \times 2 + 2^2$$
$$= a^2 - 4a + 4.$$

(*ii*) Remember an identity:

$(A + B)^2 = A^2 + 2AB + B^2$

Substituting A = $\frac{3a}{4}$ and B = 4, we get

$$\left(\frac{3a}{4} + 4\right)^2 = \left(\frac{3a}{4}\right)^2 + 2 \times \left(\frac{3a}{4}\right) \times 4 + 4^2$$

$$= \frac{9a^2}{16} + 6a + 16.$$

OR

(*i*) $(x^2 + x + 1)(x^2 - x + 1)$

$$= x^2(x^2 - x + 1) + x(x^2 - x + 1) + 1(x^2 - x + 1)$$
$$= x^4 - x^3 + x^2 + x^3 - x^2 + x + x^2 - x + 1$$
$$= x^4 + x^2 + 1.$$

(*ii*) We have

$(2x + 3y)(2x - 3y)$

$$= 2x(2x - 3y) + 3y(2x - 3y)$$
$$= 4x^2 - 6xy + 6xy - 9y^2$$
$$= 4x^2 - 9y^2$$

$\therefore\ (2x + 3y)(2x - 3y)(4x^2 + 9y^2)$

$$= (4x^2 - 9y^2)(4x^2 + 9y^2)$$
$$= 4x^2(4x^2 + 9y^2) - 9y^2(4x^2 + 9y^2)$$
$$= 16x^4 + 36x^2y^2 - 36x^2y^2 - 81y^4$$
$$= 16x^4 - 81y^4.$$

4. (*i*) Remember the identity:

$$(a - b)(a + b) = a^2 - b^2$$

Putting a = 400 and b = 3, we get

$$(400 - 3)(400 + 3) = 400^2 - 3^2$$

or $$397 \times 403 = (400 \times 400) - (3 \times 3)$$
$$= 160000 - 9$$
$$= 159991.$$

(*ii*) Remember the identity:

$$a^2 - b^2 = (a + b)(a - b)$$

Putting a = 163 and b = 157, we get

$$163^2 - 157^2 = (163 + 157)(163 - 157)$$
$$= 320 \times 6 = 1920.$$

5. (*i*) $(5a + 4b)(2a + 3b)$

$$= 5a(2a + 3b) + 4b(2a + 3b)$$
$$= 5a \times 2a + 5a \times 3b + 4b \times 2a + 4b \times 3b$$
$$= 10a^2 + 15ab + 8ab + 12b^2$$
$$= 10a^2 + 23ab + 12b^2.$$

(*ii*) $(1 - 3x)(1 + x + x^2)$

$$= 1 \times (1 + x + x^2) - 3x \times (1 + x + x^2)$$
$$= 1 + x + x^2 - 3x - 3x^2 - 3x^3$$
$$= 1 - 2x - 2x^2 - 3x^3.$$

6. (*i*) Substituting a = 2 and b = 3 in $(a + 5)(b - 3)$, we get

$$(a + 5)(b - 3) = (2 + 5)(3 - 3)$$
$$= 7 \times 0 = 0$$
$$(\because m \times 0 = 0)$$

(*ii*) Substituting x = 0 and y = 1 in $(x^2 - y^2)(x^2 + y^2)$, we get

$$(x^2 - y^2)(x^2 + y^2) = (0^2 - 1^2)(0^2 + 1^2)$$
$$= (0 - 1)(0 + 1)$$
$$(\because 0^2 = 0)$$
$$= (-1) \times (1) = -1.$$

7. (*i*) $(a + 6)(a + 6) = (a + 6)^2$

Remember the identity:

$$(A + B)^2 = A^2 + 2AB + B^2$$

Put $A = a$ and $B = 6$ to get

$$(a + 6)^2 = a^2 + 2 \times a \times 6 + 6^2$$

or $(a + 6)(a + 6) = a^2 + 12a + 36.$

(*ii*) $(3a - 11)(3a - 11) = (3a - 11)^2$

Remember the identity:

$$(A - B)^2 = A^2 - 2AB + B^2$$

Put $A = 3a$ and $B = 11$ to get

$$(3a - 11)^2 = (3a)^2 - 2 \times 3a \times 11 + 11^2$$

or $(3a - 11)(3a - 11) = 9a^2 - 66a + 121.$

(*iii*) Remember the identity:

$$(A - B)(A + B) = A^2 - B^2$$

Put $A = 5x$ and $B = 3$ to get

$$(5x - 3)(5x + 3) = (5x)^2 - 3^2 = 25x^2 - 9.$$

WORKSHEET–66

1. Adding,

	$4x^2$	$+ 5x$	$-$	7
$-$	$3x^2$	$+ 3x$	$-$	4
$+$	x^2		$-$	1
	$2x^2$	$+ 8x$	$-$	12

2. $(a^2 + ab + b^2)(a - b)$

$= a^2(a - b) + ab(a - b) + b^2(a - b)$

$= a^3 - a^2b + a^2b - ab^2 + ab^2 - b^3$

$= a^3 - b^3.$

3. $3(x^2 - 5x + 3) - 2(x^2 + 2x + 4)$

$= 3x^2 - 15x + 9 - 2x^2 - 4x - 8$

$= x^2 - 19x + 1.$

4. Area of a rectangle

= Product of two consecutive sides

$= 6x^2 \times \left(x + \frac{1}{x^2}\right) = 6x^3 + 6$

$= 6(x^3 + 1)$ square units.

5. Perimeter of a square

$= 4 \times \text{Side}$

$= 4 \times (4x^2 + 3y - 3)$

$= 16x^2 + 12y - 12.$

6. Perimeter of a rectangle

$= 2 \times (\text{length} + \text{breadth})$

$= 2 \times (3x^2 + x + 3 + x^2 - 2x - 1)$

$= 2 \times (4x^2 - x + 2)$

$= 8x^2 - 2x + 4.$

7. $3 + x + 3x^2 - (x^2 - 1 - 2x)$

$= 3 + x + 3x^2 - x^2 + 1 + 2x$

$= (3 + 1) + (x + 2x) + (3x^2 - x^2)$

$= 4 + 3x + 2x^2.$

8. (*i*) Remember the identity:

$$(a - b)^2 = a^2 - 2ab + b^2$$

Substituting $a = 1000$ and $b = 1$, we get

$(1000 - 1)^2 = 1000^2 - 2 \times 1000 \times 1 + 1^2$

or $999^2 = 1000 \times 1000 - 2000 + 1$

$= 1000000 - 2000 + 1$

$= 998001.$

(*ii*) Remember the identity:

$$(a + b)^2 = a^2 + 2ab + b^2$$

Substituting $a = 1$ and $b = 0.2$, we get

$(1 + 0.2)^2 = 1^2 + 2 \times 1 \times 0.2 + (0.2)^2$

or $(1.2)^2 = 1 + 0.4 + 0.2 \times 0.2$

$= 1 + 0.4 + 0.04 = 1.44.$

9. Use the identity:

$$(a + b)^2 = a^2 + 2ab + b^2$$

(*i*) Substituting $a = \frac{2x}{3}$ and $b = 1$, we have

$$\left(\frac{2x}{3}+1\right)^2 = \left(\frac{2x}{3}\right)^2 + 2 \times \frac{2x}{3} \times 1 + 1^2$$
$$= \frac{4x^2}{9} + \frac{4x}{3} + 1.$$

(*ii*) Substituting $a = x^2y$ and $b = 2xy^2$, we have

$$(x^2y + 2xy^2) = (x^2y)^2 + 2 \times x^2y \times 2xy^2 + (2xy^2)^2$$
$$= x^4y^2 + 4x^3y^3 + 4x^2y^4.$$

OR

(*i*) We have

$$(2x + 5)(3x - 2)$$
$$= 2x(3x - 2) + 5(3x - 2)$$
$$= 6x^2 - 4x + 15x - 10$$
$$= 6x^2 + 11x - 10.$$

And $(x + 2)(2x - 3)$

$$= x(2x - 3) + 2(2x - 3)$$
$$= 2x^2 - 3x + 4x - 6$$
$$= 2x^2 + x - 6$$

Therefore, $(2x + 5)(3x - 2) + (x + 2)(2x - 3)$

$$= 6x^2 + 11x - 10 + 2x^2 + x - 6$$
$$= 8x^2 + 12x - 16.$$

(*ii*) We have

$$(6x^2 + 15y^2)(6x^2 - 15y^2)$$
$$= (6x^2)^2 - (15y^2)^2$$

[Using the identity: $(a + b)(a - b) = a^2 - b^2$]

$$= (6x^2 \times 6x^2) - (15y^2 \times 15y^2)$$
$$= 36x^4 - 225y^4$$

Therefore, $\frac{1}{3}(6x^2 + 15y^2)(6x^2 - 15y^2)$

$$= \frac{36x^4 - 225y^4}{3}$$
$$= 12x^4 - 75y^4.$$

10. Take the identity:

$$(a - b)^2 = a^2 - 2ab + b^2$$

(*i*) Substituting $a = 2x$ and $b = 5y$, we get

$$(2x - 5y)^2 = (2x)^2 - 2 \times 2x \times 5y + (5y)^2$$
$$= 4x^2 - 20xy + 25y^2.$$

(*ii*) Substituting $a = \frac{x}{2}$ and $b = \frac{4y}{3}$, we get

$$\left(\frac{x}{2}-\frac{4y}{3}\right)^2 = \left(\frac{x}{2}\right)^2 - 2 \times \frac{x}{2} \times \frac{4y}{3} + \left(\frac{4y}{3}\right)^2$$
$$= \frac{x^2}{4} - \frac{4xy}{3} + \frac{16y^2}{9}.$$

WORKSHEET–67

1. Side = $4x^2 + 8y - 8$

Perimeter of a square

$$= 4 \times \text{Side}$$
$$= 4 \times (4x^2 + 8y - 8)$$
$$= 16x^2 + 32y - 32.$$

2. Perimeter of a rectangle

$$= 2 \times (\text{one side + other side})$$
$$= 2 \times (8x^2 + 7x + 3 + 4x^2 - 3x - 7)$$
$$= 2 \times (12x^2 + 4x - 4)$$
$$= 24x^2 + 8x - 8.$$

3. Adding,

$$\begin{array}{rrr} 3x & -\ 2y & +\ 7 \\ -\ 3x & -\ 2y & -\ 5 \\ -\ x & -\ y & +\ 7 \\ \hline -\ x & -\ 5y & +\ 9 \end{array}$$

Thus, the required sum is $- x - 5y + 9$.

4. Substituting $p = -1, q = -2, s = -2$ in $5(p - q - s^2)$, we get

$$5(p - q - s^2) = 5\{-1 - (-2) - (-2)^2\}$$
$$= 5(-1 + 2 - 4) = 5(-3)$$
$$= -15.$$

Substituting $r = 3, s = -2$ in $2(r - s^2)$, we get

$$2(r - s^2) = 2\{3 - (-2)^2\} = 2(3 - 4)$$
$$= 2(-1) = -2$$

Therefore, $5(p - q - s^2) - 2(r - s^2)$

$$= -15 - (-2)$$
$$= -15 + 2 = -13.$$

5. (*i*) Take the identity:

$$(a - b)(a + b) = a^2 - b^2$$

Put $a = 400$ and $b = 10$ to get

$$(400 - 10)(400 + 10) = 400^2 - 10^2$$

or $390 \times 410 = (400 \times 400) - (10 \times 10)$

$$= 160000 - 100$$
$$= 159900.$$

(*ii*) Take the identity:

$$(a - b)^2 = a^2 - 2ab + b^2$$

Put $a = 1000$ and $b = 2$ to get

$$(1000 - 2)^2 = 1000^2 - 2 \times 1000 \times 2 + 2^2$$

or $998^2 = 1000000 - 4000 + 4$

$$= 996004.$$

6. (*i*) $11xy - 7y - (7xy - 8y)$

$$= 11xy - 7y - 7xy + 8y$$
$$= (11xy - 7xy) + (-7y + 8y)$$
$$= 4xy + y.$$

(*ii*) $-4a^2b - 8b^2 - (3a^2b + 7ab - b^2)$

$$= -4a^2b - 8b^2 - 3a^2b - 7ab + b^2$$
$$= (-4a^2b - 3a^2b) + (-8b^2 + b^2) - 7ab$$
$$= -7a^2b - 7b^2 - 7ab.$$

7. (*i*) $(7x + 15y)(x^2 + 3y)$

$$= 7x(x^2 + 3y) + 15y(x^2 + 3y)$$
$$= 7x^3 + 21xy + 15x^2y + 45y^2.$$

(*ii*) $(l^2 + lp + p^2)(l - p)$

$$= l^2(l - p) + lp(l - p) + p^2(l - p)$$
$$= l^3 - l^2p + l^2p - lp^2 + p^2l - p^3$$
$$= l^3 - p^3.$$

OR

(*i*) Substituting $m = 1, n = -1$ in $(3m - 2n)(2m - 3n)$, we get

$$(3m - 2n)(2m - 3n)$$
$$= \{3 \times 1 - 2 \times (-1)\}\{2 \times 1 - 3 \times (-1)\}$$
$$= (3 + 2)(2 + 3) = 5 \times 5 = 25.$$

(*ii*) Substituting $a = 1, b = 2$ in $(4a^2 + 3b)$, we get

$$(4a^2 + 3b) = 4(1)^2 + 3(2)$$
$$= 4 \times 1 + 3 \times 2$$
$$= 4 + 6 = 10$$

$$\therefore (4a^2 + 3b)(4a^2 + 3b) = 10 \times 10$$
$$= 100.$$

8. (*i*) Take the identity:

$$(x + a)(x + b) = x^2 + (a + b)x + ab$$

Substituting $a = -8$ and $b = -2$, we get

$$(x - 8)(x - 2) = x^2 + (-8 - 2)x + (-8)(-2)$$
$$= x^2 - 10x + 16.$$

(*ii*) Take the identity:

$$(A - B)^2 = A^2 - 2AB + B^2$$

Substituting $A = a$ and $B = \frac{1}{a}$, we get

$$\left(a - \frac{1}{a}\right)^2 = a^2 - 2 \times a \times \left(\frac{1}{a}\right) + \left(\frac{1}{a}\right)^2$$
$$= a^2 - 2 + \frac{1}{a^2}.$$

(*iii*) Take the identity:

$$(a + b)(a - b) = a^2 - b^2$$

Substituting $a = x^2$ and $b = y^2$, we get

$$(x^2 + y^2)(x^2 - y^2) = (x^2)^2 - (y^2)^2$$
$$= (x^2 \times x^2) - (y^2 \times y^2)$$
$$= x^4 - y^4.$$

WORKSHEET – 68

1. (*i*) We have

$$(a - b)(a + b) = a^2 - b^2$$

Substituting $a = 70$ and $b = 2$, we get

$$(70 - 2)(70 + 2) = 70^2 - 2^2$$

or $\quad 68 \times 72 = 4900 - 4 = 4896.$

(*ii*) We have

$$a^2 - b^2 = (a + b)(a - b)$$

Substituting $a = 128$ and $b = 77$, we get

$$128^2 - 77^2 = (128 + 77)(128 - 77)$$
$$= 205 \times 51 = 10455.$$

OR

$$\text{Product} = -3xy(xy + y^2)$$
$$= -3xy \times xy - 3xy \times y^2$$
$$= -3x^2y^2 - 3xy^3$$

Adding it to $2x^2y^2 - xy^3$, we get

$$-3xy(xy + y^2) + 2x^2y^2 - xy^3$$
$$= -3x^2y^2 - 3xy^3 + 2x^2y^2 - xy^3$$
$$= (-3x^2y^2 + 2x^2y^2) + (-3xy^3 - xy^3)$$
$$= -x^2y^2 - 4xy^3.$$

2. (*i*) Adding the three expressions,

$$\begin{array}{rr} 4xy^2 & -\ 7x^2y \\ -\ 7xy^2 & +\ 12x^2y \\ +\ 3xy^2 & -\ 2x^2y \\ \hline 0 & +\ 3x^2y \end{array}.$$

∴ Required sum is $3x^2y$.

(*ii*) Adding the three expressions,

$$\begin{array}{llll} \frac{7}{3}x^3 & -\frac{1}{3}x^2 & & +\frac{5}{2} \\ \frac{5}{3}x^3 & +\frac{7}{6}x^2 & -x & +\frac{1}{2} \\ & +\frac{5}{2}x^2 & -\frac{5}{2}x & -2 \\ \hline \end{array}$$

$$\frac{12}{3}x^3 + \left(-\frac{1}{3} + \frac{7}{6} + \frac{5}{2}\right)x^2 - \left(1 + \frac{5}{2}\right)x + \frac{5}{2} + \frac{1}{2} - 2$$

∴ Required sum

$$= 4x^3 + \left(\frac{-2 + 7 + 15}{6}\right)x^2 - \frac{2 + 5}{2}x + \frac{5 + 1 - 4}{2}$$
$$= 4x^3 + \frac{20}{6}x^2 - \frac{7}{2}x + \frac{2}{2}$$
$$= 4x^3 + \frac{10}{3}x^2 - \frac{7}{2}x + 1.$$

3. (*i*) Subtracting,

$$\begin{array}{rrrr} 4x^3 & +\ x^2 & +\ x & +\ 6 \\ 2x^3 & -\ 4x^2 & +\ 3x & +\ 5 \\ - & + & - & - \\ \hline 2x^3 & +\ 5x^2 & -\ 2x & +\ 1 \end{array}.$$

(*ii*) Subtracting,

$$\begin{array}{rrrr} & \frac{13}{3}bc & & +\ \frac{1}{5} \\ \frac{ab}{7} & -\ \frac{35}{3}bc & +\ \frac{6}{5}ac & \\ - & + & - & \\ \hline -\ \frac{ab}{7} & +\ \frac{48}{3}bc & -\ \frac{6}{5}ac & +\ \frac{1}{5} \end{array}$$

∴ Required subtraction

$$= -\frac{ab}{7} + 16bc - \frac{6}{5}ac + \frac{1}{5}.$$

4. (*i*) $(-3x^2) \times (-7xy^2) \times (-2yz^2)$

$$= (-3) \times (-7) \times (-2) \times x^2 \times xy^2 \times yz^2$$

$= 21 \times (-2) \times x^3 \times y^3 \times z^2$

$= -42x^3y^3z^2$.

(*ii*) $\left(\frac{5}{9}abc^3\right) \times \left(-\frac{9}{5}a^3b^2\right) \times (-3b^3c)$

$= \frac{5}{9} \times \left(-\frac{9}{5}\right) \times (-3) \times abc^3 \times a^3b^2 \times b^3c$

$= (-1) \times (-3) \times a^4 \times b^6 \times c^4$

$= 3a^4b^6c^4$.

5. (*i*) $\because$ $6a(a-2) = 6a^2 - 12a$

and $a(3+7a) = 3a + 7a^2$

$\therefore$ $15a^2 - 6a(a-2) + a(3+7a)$

$= 15a^2 - (6a^2 - 12a) + 3a + 7a^2$

$= 15a^2 - 6a^2 + 12a + 3a + 7a^2$

$= 16a^2 + 15a$

$= a(16a + 15)$.

(*ii*) $\because$ $5st(s-t) = 5s^2t - 5st^2$

$3s^2(t - t^2) = 3s^2t - 3s^2t^2$

$2t^2(s^2 - s) = 2s^2t^2 - 2st^2$

and $2st(s-t) = 2s^2t - 2st^2$

$\therefore$ $5st(s-t) - 3s^2(t-t^2) - 2t^2(s^2 - s) + 2st(s-t)$

$= 5s^2t - 5st^2 - (3s^2t - 3s^2t^2) - (2s^2t^2 - 2st^2) + 2s^2t - 2st^2$

$= 5s^2t - 5st^2 - 3s^2t + 3s^2t^2 - 2s^2t^2 + 2st^2 + 2s^2t - 2st^2$

$= (5s^2t - 3s^2t + 2s^2t) + (-5st^2 + 2st^2 - 2st^2) + (3s^2t^2 - 2s^2t^2)$

$= 4s^2t - 5st^2 + s^2t^2$

$= st(4s - 5t + st)$.

6. (*i*) Use the following identity:

$$(a+b)^2 = a^2 + 2ab + b^2$$

Put $a = \frac{2}{3}x^2$ and $b = 7y^2$ to get

$$\left(\frac{2}{3}x^2 + 7y^2\right)^2 = \left(\frac{2}{3}x^2\right)^2 + 2\left(\frac{2}{3}x^2\right)(7y^2) + (7y^2)^2$$

or $\left(\frac{2}{3}x^2 + 7y^2\right)\left(\frac{2}{3}x^2 + 7y^2\right)$

$$= \frac{4}{9}x^4 + \frac{28}{3}x^2y^2 + 49y^4$$

$(\because a^2 = a \times a)$

(*ii*) Use the following identity:

$$(a-b)(a+b) = a^2 - b^2$$

Put $a = 6x^2$ and $b = 7y^2$ to get

$(6x^2 - 7y^2)(6x^2 + 7y^2) = (6x^2)^2 - (7y^2)^2$

$= 36x^4 - 49y^4$.

(*iii*) Use the following identity:

$$(a-b)^2 = a^2 - 2ab + b^2$$

Put $a = \frac{1}{2}x$ and $b = \frac{1}{5}y$ to get

$$\left(\frac{1}{2}x - \frac{1}{5}y\right)^2 = \left(\frac{1}{2}x\right)^2 - 2\left(\frac{1}{2}x\right)\left(\frac{1}{5}y\right) + \left(\frac{1}{5}y\right)^2$$

or $\left(\frac{1}{2}x - \frac{1}{5}y\right)\left(\frac{1}{2}x - \frac{1}{5}y\right)$

$$= \frac{1}{4}x^2 - \frac{1}{5}xy + \frac{1}{25}y^2.$$

WORKSHEET–69

1. Length = 10 m (Given)

Breadth = 5 m (Given)

Area of rectangle = length × breadth

= 10 m × 5 m = 50m^2

2. $(a + b)^2 = a^2 + 2ab + b^2$ (Given)

$b = -b$ (Given)

$(a - b)^2 = a^2 + 2a(-b) + (-b)^2$

$(a - b)^2 = a^2 - 2ab + b^2$

Yes, satisfy the identity.

3. $a + b = 0$ (Given)

$a^2 + 2ab + b^2 = (a + b)^2$

$(\because (a + b)^2 = a^2 + 2ab + b^2)$

$(0)^2 = 0.$

4. $(2a + 3b)^2 = (2a)^2 + 2 \times 2a \times 3b + (3b)^2$

$(\because (a + b)^2 = a^2 + 2ab + b^2)$

$= 4a^2 + 12ab + 9b^2$

$(a + b)^2 = a^2 + 2ab + b^2$ satisfy the $(2a + 3b)^2$.

5. $101 \times 102 = (100 + 1)(100 + 2)$

$\because (x + a)(x + b) = x^2 + (a + b)x + ab$

$(100)^2 + (1 + 2) \times 100 + 1 \times 2$

$= 10000 + 300 + 2$

$= 10302$

6. $(a + b)(a - b) = a^2 - b^2$

LHS $= (a + b)(a - b)$

$[\because a^2 - b^2 = (a + b)(a - b)]$

7. Base $= 18x$ (Given)

Altitude $= 5y$

We know that,

Area of triangle $= \frac{1}{2} \times$ base $\times$ altitude

$= \frac{1}{2} \times 18x \times 5y$

$= 9x \times 5y = 45xy.$

8. $x - \frac{1}{x} = 6$ (Given)

$$x^2 + \frac{1}{x^2} = \left(x - \frac{1}{x}\right)^2 + 2 \times x \times \frac{1}{x}$$

$= (6)^2 + 2 = 36 + 2 = 38.$

$$x^4 + \frac{1}{x^4} = (x^2)^2 + \left(\frac{1}{x^2}\right)^2$$

$$= \left(x^2 + \frac{1}{x^2}\right)^2 - 2 \times x^2 \times \frac{1}{x^2}$$

$= (38)^2 - 2 = 1444 - 2 = 1442.$

9. $3a - 2b = 9$ and $ab = 7$ (Given)

$9a^2 + 4b^2 = (3a)^2 + (2b)^2$

$= (3a - 2b)^2 + 2 \times 3a \times 2b$

$[\because a^2 + b^2 = (a - b)^2 + 2ab]$

$= (9)^2 + 12 \times 7$

$= 81 + 84 = 165.$

10. $49x = (50)^2 - (48)^2$

$49x = (50 + 48)(50 - 48)$

$[\because a^2 - b^2 = (a + b)(a - b)]$

$49x = 98 \times 2$

$$x = \frac{98 \times 2}{49}$$

$x = 4.$

11. (*a*) $\dfrac{(4.35)^2 - (0.35)^2}{4}$

$$= \frac{(4.35 + 0.35)(4.35 - 0.35)}{4}$$

$[\because a^2 - b^2 = (a + b)(a - b)]$

$$= \frac{(4.70) \times (4.00)}{4} = \frac{4.70 \times 4}{4} = 4.70.$$

(*b*) $\dfrac{298 \times 298 - 202 \times 202}{96}$

$$= \frac{(298)^2 - (202)^2}{96}$$

$$= \frac{(298 + 202)(298 - 202)}{96}$$

$[\because a^2 - b^2 = (a + b)(a - b)]$

$$= \frac{500 \times 96}{96} = 500.$$

❑❑

Chapter 10

VISUALISING SOLID SHAPES

WORKSHEET – 70

1. (B) The relation among the numbers of faces F, vertices V and edges E of a polyhedron is given by

$F + V - E = 2.$

2. (C) Using $F + V - E = 2$, we get

$E = F + V - 2 = 8 + 6 - 2 = 12.$

3. (B) Using Euler's formula:

$F + V - E = 2,$

$x = V = E + 2 - F = 12 + 2 - 8 = 6$

$y = F = E + 2 - V = 9 + 2 - 6$

$= 11 - 6 = 5$

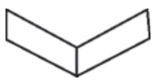
$z = E = F + V - 2 = 20 + 12 - 2 = 30.$

4. (C) A cuboid has 6 faces and 12 edges.

5. (A) A tetrahedron has 4 vertices.

6. (B) The top view is shown in the part B.

7. (C) The side view of the given figure is



.

8. (B) A cube has 6 congruent faces.

9. (A) Each vertex of a cuboid is formed by meeting of 3 faces.

10. (A) The lateral faces of a pyramid are triangles with a common vertex.

11. (D) A prism having a square base has 12 edges.

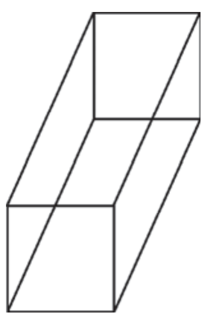


Fig.: Prism with square base

12. (C) A pyramid with rectangular base has 5 vertices.

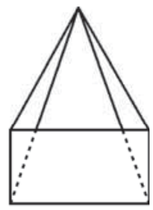


Fig.: Pyramid

13. (B) E = 10, F = 6.

Using $F + V - E = 2$, we get

$V = 10 + 2 - 6 = 6.$

14. (C) The match box is a cuboid.

15. (B) The solid shown in option (B) is made up of a cylinder and a cone, so it is a nested solid.

16. (C) A sphere has neither vertex nor flat face.

17. (B) A prism has the given properties.

WORKSHEET– 71

1.

	Name	Example
(*i*)	Cylinder	Drum
(*ii*)	Cone	Tent
(*iii*)	Sphere	Ball

.

2. (*i*) Tetrahedron

Example -Tent

No. of triangular faces - 4

No. of vertices - 4

No. of edges - 6.

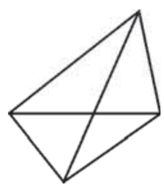


Fig.: Tetrahedron

(*ii*) Hexahedron (cube)

Example - Die

Number of square faces-6

Number of vertices - 8

Number of edges -12.

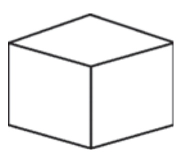


Fig.: Hexahedron

3. (*i*)

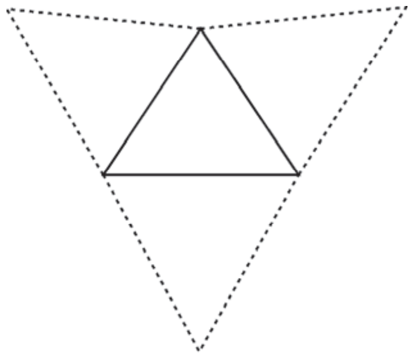


Fig.: Net for tetrahedron

(*ii*)

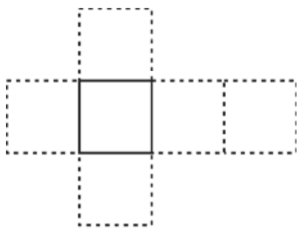


Fig.: Net for hexahedron

4. (*i*)

2	2	2
1	1	1

(*ii*)

2	1

.

5. (*i*)

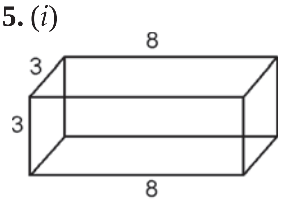


Fig.: Cuboid

(*ii*)

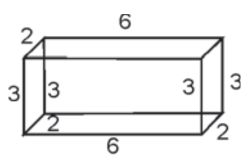


Fig.: Cuboid

6. We know that a cube has 6 faces, *i.e.*, $f = 6$ and 8 vertices, *i.e.*, $v = 8$

Using Euler's formula:

$f + v - e = 2$, we have

$$e = f + v - 2 = 6 + 8 - 2$$
$$= 14 - 2 = 12.$$

We know that an icosahedron has 20 faces, *i.e.*, $f = 20$ and 12 vertices, *i.e.*, $v = 12$.

Using Euler's formula:

$f + v - e = 2$, we have

$$e = f + v - 2 = 20 + 12 - 2 = 32 - 2 = 30$$

So, $f + v = 20 + 12 = 32$

and $e + 2 = 30 + 2 = 32$

	Solid	f	v	e	$f + v$	$e + 2$
(*i*)	Cube	6	8	12	14	14
(*ii*)	Icosahedron	20	12	30	32	32

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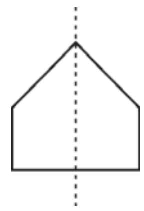
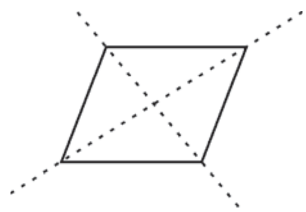
WORKSHEET – 72

1. (*i*)

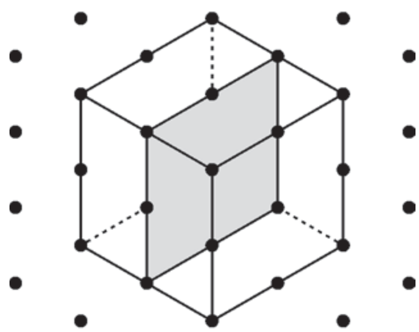


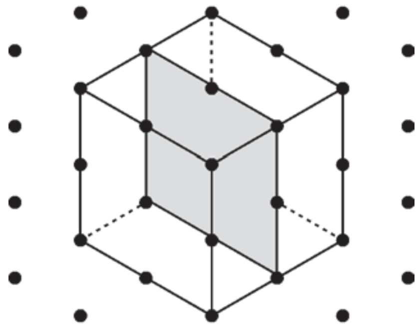
Line of symmetry

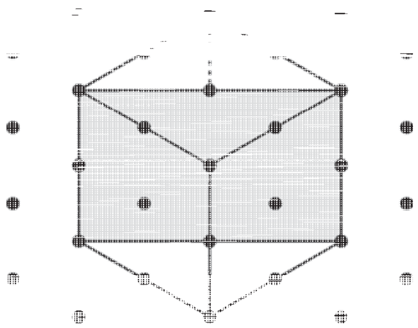
(*ii*) The given figure is a rhombus which has 2 lines of symmetry.

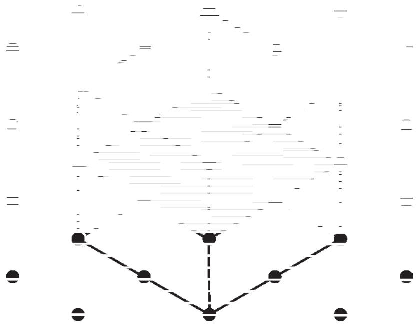


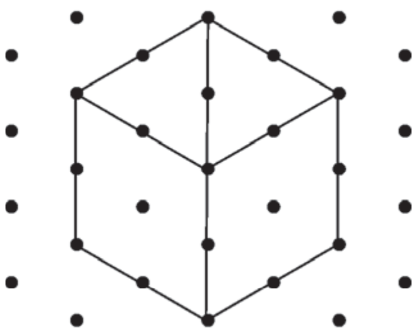
2. A cube has 5 planes of symmetry.



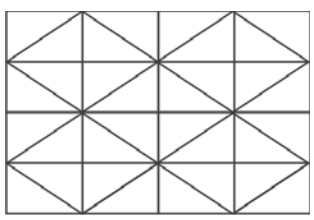




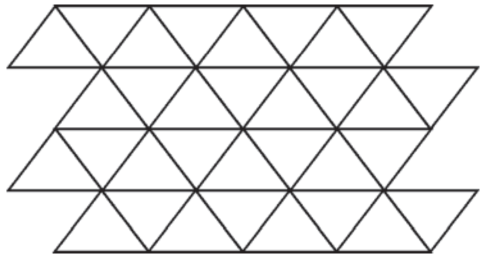




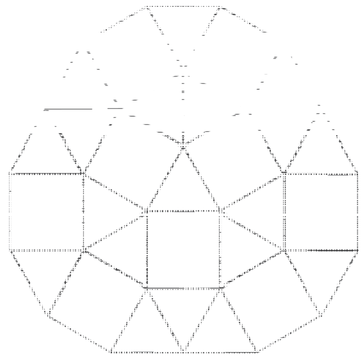
3.



4.



5.



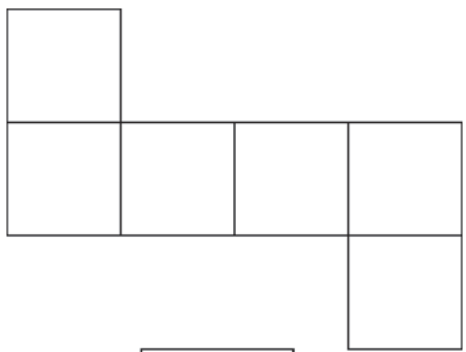
6. (*i*) A tetrahedron has 4 vertices.

(*ii*) A cuboid has 8 vertices.

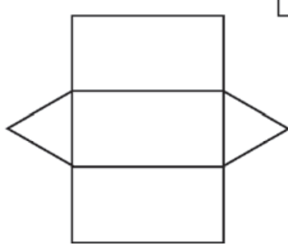
(*iii*) A pentagonal pyramid has 6 vertices.

(*iv*) An octagonal pyramid has 9 vertices.

7. (*i*)



(*ii*)



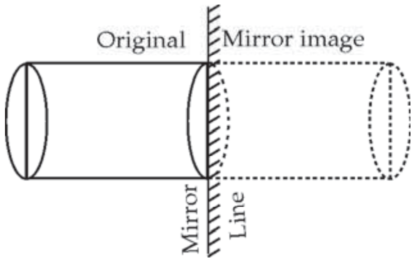
8. (*i*) A cuboid opened at the top.

(*ii*) A cone surmounted on a cylinder.

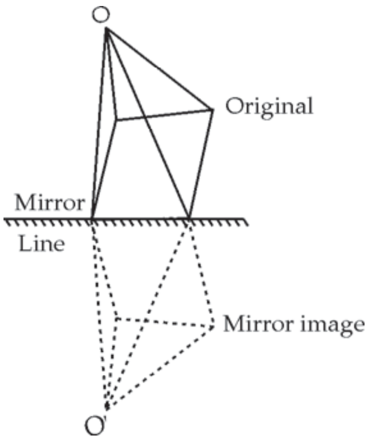
(*iii*) A cylinder.

(*iv*) A hollow cylinder.

9. (*i*)



(*ii*)



WORKSHEET – 73

1. F = 6, V = 8, E = ?

Using Euler's formula,

F + V – E = 2

or E = F + V – 2 = 6 + 8 – 2 = 12

Thus, the given polyhedron has 12 edges.

2.

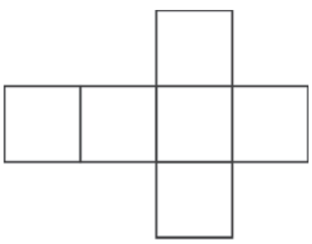
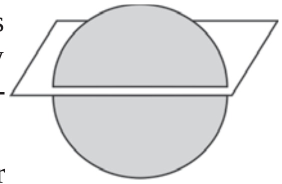


Fig.: Net of a cube

3. (*i*) Tetrahedron.

(*ii*) Cuboid opened at the top.

4. A sphere has infinitely many planes of symmetry.



5. (*i*) A triangular prism has 5 faces.

(*ii*) A hexagonal pyramid has 7 faces.

(*iii*) A pentagonal prism has 7 faces.

(*iv*) An octagonal prism has 10 faces.

6. (*i*) A square prism has 12 edges.

(*ii*) A cone has 1 edge.

(*iii*) An octahedron has 12 edges.

(*iv*) A rectangular prism has 12 edges.

7. (*i*) The given net is of a cone.

(*ii*) The given net is of a tetrahedron.

(*iii*) The given net is of a cylinder opened at the top.

8. (*i*)

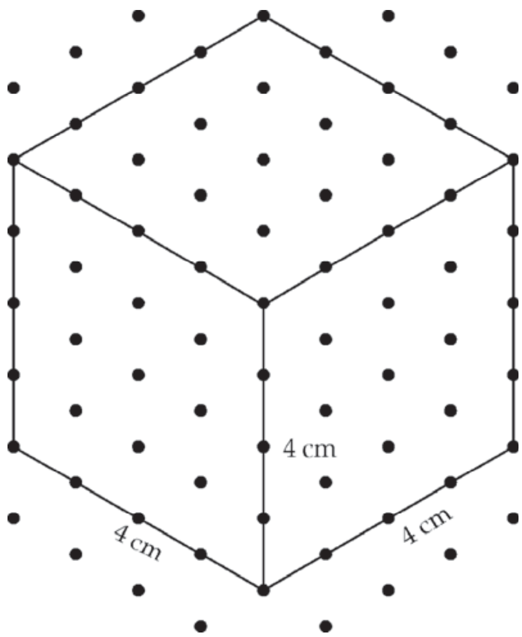


Fig.: Cube

(*ii*)

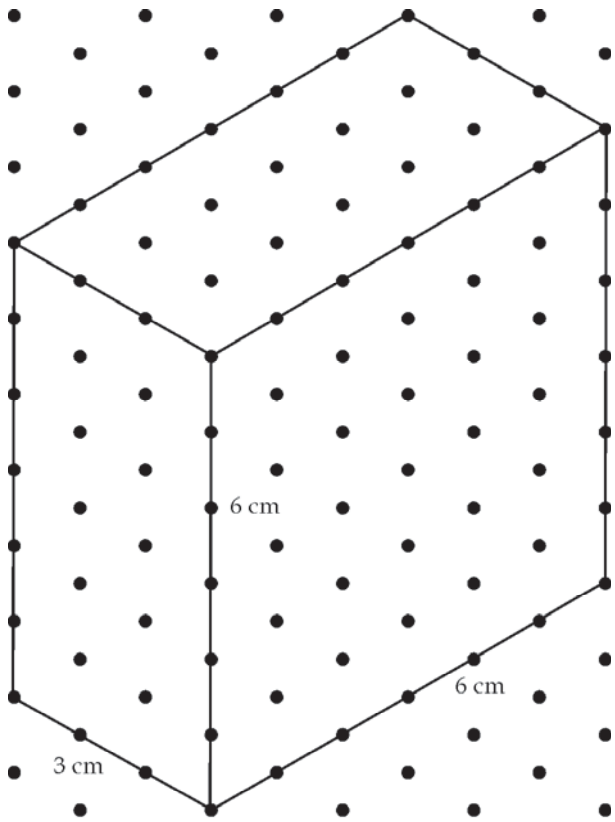


Fig.: Cuboid

9. (*i*)

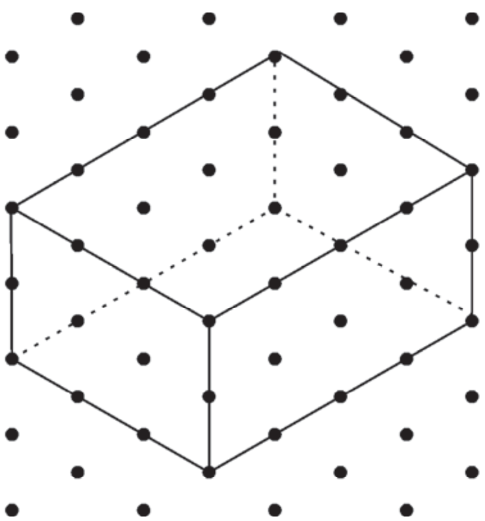


Fig.: Cuboid

(*ii*)

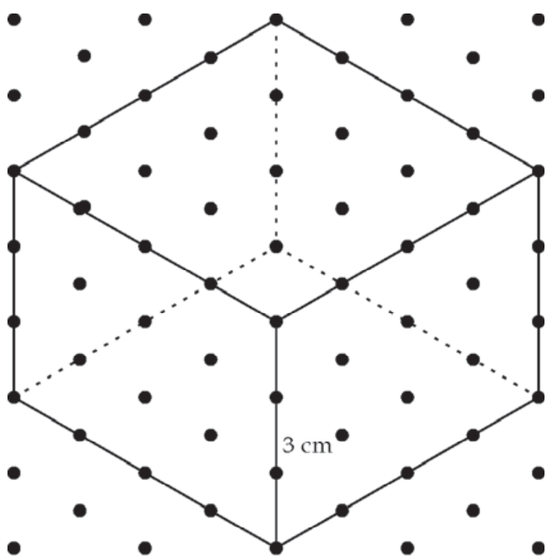


Fig.: Square Prism

(*iii*)

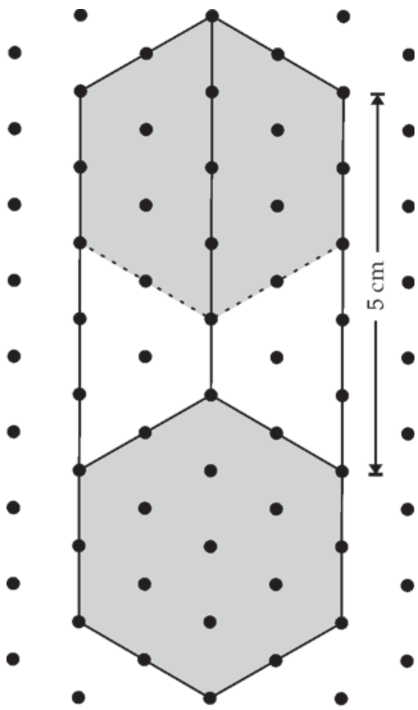


Fig.: Hexagonal Prism

WORKSHEET– 74

1.

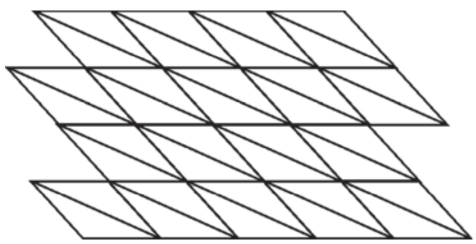


Fig.: Tessellations of an isosceles triangle.

Yes, we can use right angled triangle, 8, square etc.

2. The required net is given below.

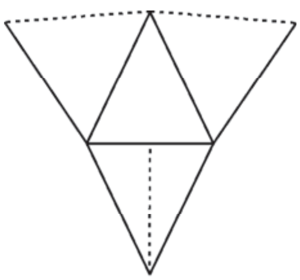


Fig.: Net

3.

4. In the given figure:

$f = 9, v = 9, e = 16$

Now, $f + v = 9 + 9 = 18$

And $e + 2 = 16 + 2 = 18$

Therefore, $f + v = e + 2$.

5. F = 20, E = 20, V = 15

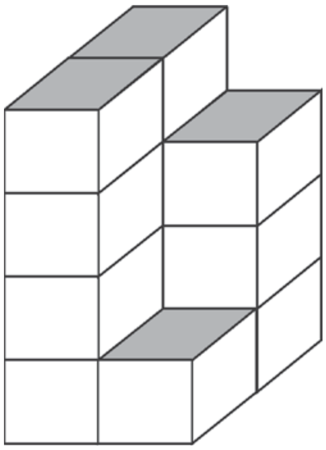
Using Euler's formula,

$F + V - E = 2$

Here, $F + V - E = 20 + 15 - 20 = 15 \neq 2$

Therefore, no polyhedron is possible.

6.



7. (*i*) Cylinder. (*ii*) Square pyramid.

(*iii*) Triangular prism.

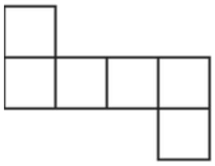
8. (*i*) A decagonal prism has 12 faces.

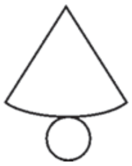
(*ii*) A pentagonal pyramid has 10 edges.

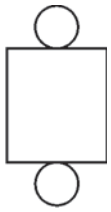
(*iii*) Each face of a tetrahedron is in the shape of a triangle.

(*iv*) Hexagonal prism.

9. (*i*) (*ii*) (*iii*)

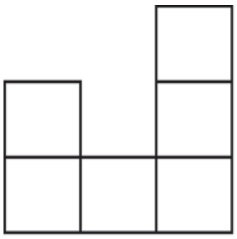




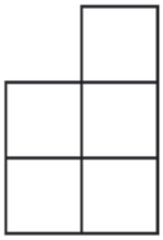


WORKSHEET– 75

1.



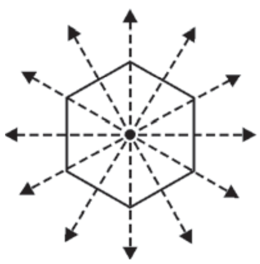
Front view

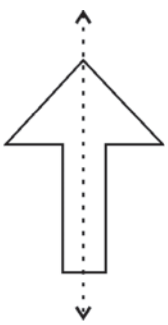


Side view

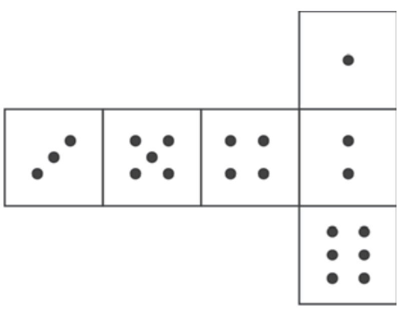
Top view

2. (*i*) (*ii*)





3.



4. (*i*) Isosceles trapezium, kite.

(*ii*) Rhombus, rectangle, square.

(*iii*) Rhombus, rectangle, square.

5. Let unknown numbers in 1st column be x, in 2nd column be y and in 3rd column be z.

Euler's formula is

$F + V - E = 2$

1st column:

$F = x, V = 6, E = 12$

Substituting these values in the Euler's formula, we get

$x + 6 - 12 = 2$

or $x = 2 - 6 + 12 = 8$

2nd Column:

$F = 5, V = y, E = 9$

Substituting these values in the Euler's formula, we get

$5 + y - 9 = 2$

or $y = 2 - 5 + 9 = 6$

3rd Column:

$F = 20, V = 12, E = z$

Substituting these values in the Euler's formula, we get

$20 + 12 - z = 2$

or $z = 20 + 12 - 2 = 30$

Therefore, the complete table will be:

Number of Faces	8	5	20
Number of Vertices	6	6	12
Number of Edges	12	9	30

.

6. Figure (*i*):

The given figure is of a tetrahedron.

∴ Number of faces = 4

Number of edges = 6

Number of vertices = 4

Figure (*ii*)

The given figure is of a triangular prism.

$\therefore$ Number of faces = 5

Number of edges = 9

Number of vertices = 6

Now, we can make a table as given below:

Fig.	**No. of faces**	**No. of edges**	**No. of vertices**
(*i*)	4	6	4
(*ii*)	5	9	6

7.

Solid	f	v	e	$f + v$	$e + 2$
Octahedron	8	6	12	14	14
Dodecahedron	12	20	30	32	32

8. (*i*) (*iii*)

(*ii*)

WORKSHEET – 76

1. (*i*) Yes, tessellation is possible by using equilateral triangle. The figure is given below:

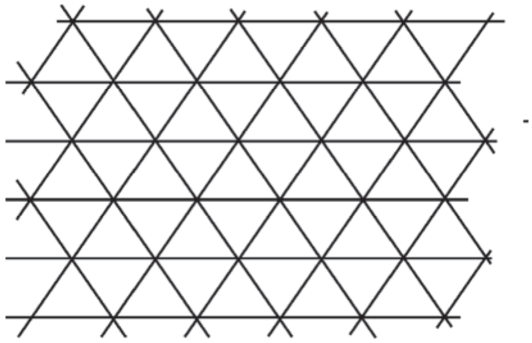


Fig.: Tessellation

(*ii*) Yes, tessellatiion is possible by using regular pentagon. The figure is given below:

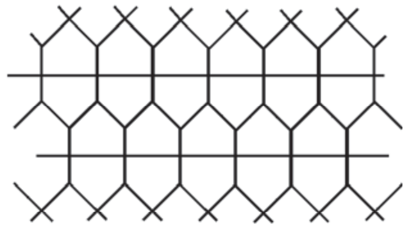


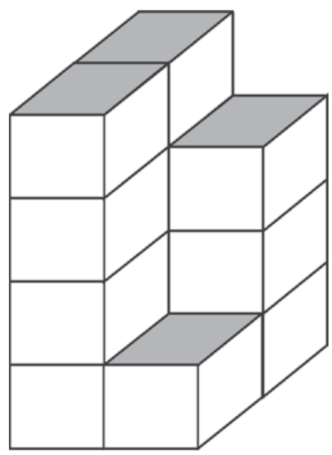
Fig.: Tessellation.

2.

2	2
1	1

Fig.: Base design

3.



4.

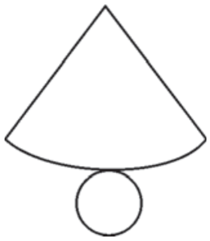
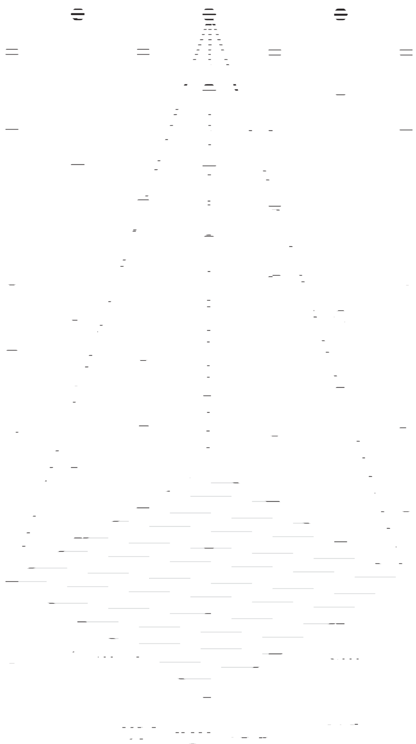


Fig.: Net of a cone

5.



6. Diamond is the example of octahedron.

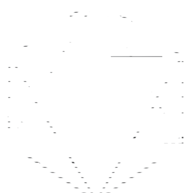
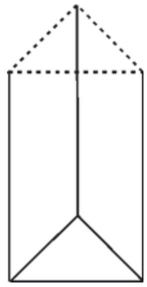


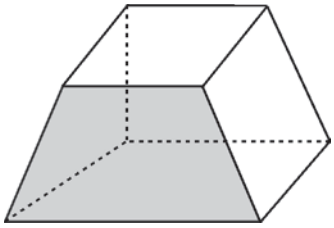
Fig.: Diamond

The octahedron has 8 faces, 6 vertices and 12 edges *i.e.*, $f = 8$, $v = 6$, $e = 12$.

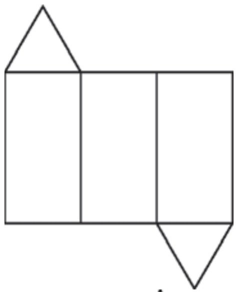
7. (*i*)



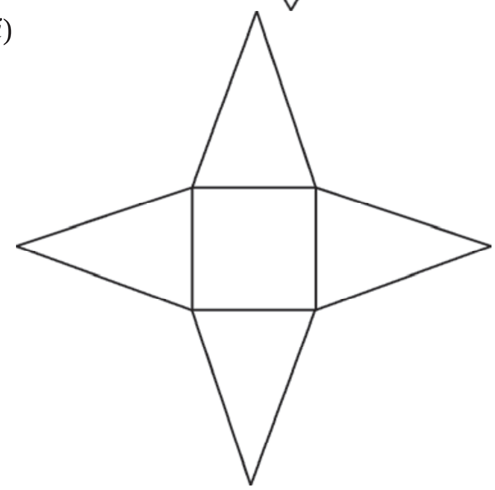
(*ii*)



8. (*i*)



(*ii*)



9. (*i*) The given tessellation is made up of regular hexagon and rhombus.

(*ii*) The given tessellation is made up of rectangles.

WORKSHEET – 77

1. Hexagonal prism.

2. A triangular prism has 6 vertices

3. Parallelogram is the shape of lateral faces of a prism.

4. Rectangular prism has 6 faces.

5. Euler's formula is

$F + V - E = 2.$

6. Dice is a square prism.

7. $E = 30$ (Given)

$V = 20$ (Given)

According to Euler's formula

$F + V - E = 2$

$F + 20 - 30 = 2$

$F - 10 = 2$

$F = 2 + 10 = 12$

Faces = 12.

8. No.

F = 10, E = 25, V = 16

According to Euler's formula,

$F + V - E = 2$

$10 + 16 - 25 = 2$

$26 - 25 = 2$

$1 = 2$

LHS ≠ RHS.

9.

10. (*a*) 15 cubes (*b*) 4 cubes

11. (*a*)

(*b*) *Do yourself.*

12. $F = 6$

$V = 9$

According to Euler's formula,

$F + V - E = 2$

$\Rightarrow 6 + 9 - E = 2$

$\Rightarrow 15 - E = 2$

$\Rightarrow -E = 2 - 15$

$\Rightarrow -E = -13$

$\therefore E = 13$

Polyhedron has 13 edges.

❑❑

Chapter 11

MENSURATION

WORKSHEET–78

1. (A) Area= $\frac{1}{2}d_1d_2 = \frac{1}{2} \times 8 \times 5 = 20\text{ cm}^2$.

2. (B) Area =

$$= \frac{\text{Sum of parallel sides} \times \text{Distance between them}}{2}$$

$$= \frac{(14+12)\times 8}{2} = 26 \times 4$$

$= 104\text{ cm}^2$.

3. (A) Area

$$= \frac{\text{Sum of parallel sides} \times \text{Altitude}}{2}$$

$\therefore$ Altitude = $\frac{14.1 \times 2}{12} = 2.35$ cm.

4. (D) Ar (ABCDE)

= Ar(ABC) + Ar(ACD) + Ar(AED)

$$= \left(\frac{1}{2}\times 8.8 \times 2.2\right) + \left(\frac{1}{2}\times 8.8\times 3.3\right) + \left(\frac{1}{2}\times 6.4 \times 1.1\right)$$

$= 9.68 + 14.52 + 3.52 = 27.72\text{ cm}^2$.

5. (C) $6a^2 = 294 \Rightarrow a^2 = \frac{294}{6} = 49$

$\Rightarrow$ $a = 7$ cm.

6. (A) Required number

$$= \frac{\text{Volume of cuboid}}{\text{Volume of 1 cube}}$$

$$= \frac{27\times 18\times 12}{3\times 3\times 3}$$

= 216.

7. (D) Length of rod

= Length of diagonal

$$= \sqrt{5^2 + \left(\sqrt{10^2+10^2}\right)^2}$$

$$= \sqrt{25+200} = \sqrt{225}$$

= 15 cm.

8. (C) Curved surface = $2\pi r \times h = 2\pi rh$

9. (B) $\pi r^2 h = 1925 \Rightarrow \frac{22}{7} \times r^2 \times 50 = 1925$

$\therefore$ $r^2 = \frac{1925\times 7}{22\times 50} = 12.25$

$\therefore$ $r = \sqrt{12.25} = 3.5$ cm

$\therefore$ $d = 2r = 2 \times 3.5 = 7$ cm.

10. (B) Volume = $4.2 \times 3 \times 1.1 = 13.86\text{ m}^3$

Capacity = $13.86 \times 1000\ l = 13860\ l$.

11. (C) Capacity = Volume = $10^3 = 1000\text{ cm}^3$

= $1\ l$.

12. (D) Volume = $\pi r^2 h = \frac{22}{7} \times 7 \times 7 \times 30$

$= 4620\text{ cm}^3$

$\therefore$ Capacity = $\frac{4620}{1000}\ l = 4.62\ l$.

13. (A) Surface area of the roller

$= 2\pi rh = 2 \times \frac{22}{7} \times 21 \times 50$

$= 6600\text{ cm}^2$.

Area of the road = $6600 \times 1500\text{ cm}^2$

$$= \frac{9900000}{10000}\text{ m}^2$$

$= 990\text{ m}^2$.

14. (C) $1\text{ m}^3 = 1000\ l$.

15. (A) $\because$ $1000 \text{ cm}^3 = 1\ l$

$\therefore$ $1 \text{ cm}^3 = \frac{1}{1000}\ l$

$\therefore$ $10000 \text{ cm}^3 = \frac{10000}{1000}\ l = 10\ l.$

16. (A) Area = Base × Height

$= 96 \times 24 = 2304 \text{ cm}^2.$

WORKSHEET–79

1. $l = 12.6$ cm, A = 37.8 cm^2, b = ?

A = $l \times b$ or 37.8 = 12.6 × b

$\therefore$ $b = \frac{37.8}{12.6} = \frac{378}{126}$

= 3 cm.

OR

Let constant of ratio be x.

Then, $l = 2x$, $b = x$, $h = 3x$

Total surface area $= 2 \times (lb + bh + hl)$

$= 2 \times (2x \times x + x \times 3x + 3x \times 2x)$

$= 2 \times (2x^2 + 3x^2 + 6x^2)$

$= 22x^2$

This is given to be 88 m^2.

$\therefore$ $22x^2 = 88 \Rightarrow x^2 = \frac{88}{22} = 4$

$\Rightarrow$ $x = 2.$

$\therefore$ $l = 2x = 2 \times 2 = 4,$

$b = x = 2,\ c = 3x = 3 \times 2 = 6.$

Therefore, the dimensions are 2 m, 4 m, 6 m.

2. Length of a rectangle $= \frac{\text{Area}}{\text{Width}}$

$= \frac{7200 \text{ m}^2}{90 \text{ m}}$

= 80 m.

Thus, length of the rectangular field is 80 m.

3. Side of a square $= \sqrt{\text{Area}}$

$= \sqrt{16900} = \sqrt{169 \times 100}$

$= \sqrt{13 \times 13 \times 10 \times 10}$

$= 13 \times 10$

$= 130$

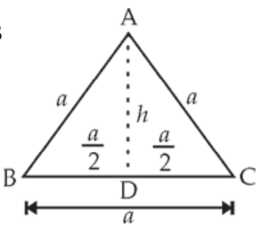
Thus, side of the square is 130 m.

OR

Let length of side = a and height = h

The given triangle is ABC.

Draw perpendicular AD on BC.



In right triangle ADC,

$a^2 = h^2 + \left(\frac{a}{2}\right)^2$ $\left(\because \text{CD} = \frac{a}{2}\right)$

or $h^2 = a^2 - \frac{a^2}{4} = \frac{3}{4}a^2 \Rightarrow h = \frac{\sqrt{3}}{2}a$

Now, area $= \frac{1}{2} \times a \times h = 36\sqrt{3}$

or $\frac{1}{2} \times a \times \frac{\sqrt{3}}{2}a = 36\sqrt{3}$

or $a^2 = \frac{36\sqrt{3} \times 2 \times 2}{\sqrt{3}}$

or $a = \sqrt{36 \times 4}$ or $a = 12$

Thus, length of side is 12 m.

4. Let $l = 3x$ and $b = 2x$

Then, perimeter $= 2(l + b)$

$= 2(3x + 2x) = 10x$

But this is given to be 2500 cm

$\therefore$ $10x = 2500$ cm

This gives, $x = 250$

$\therefore$ $l = 3x = 3 \times 250 = 750$ cm

and $b = 2x = 2 \times 250 = 500$ cm.

OR

$$\text{Base} = \sqrt{\text{Hypotenuse}^2 - \text{Side}^2}$$

$$= \sqrt{13^2 - 5^2} = \sqrt{169 - 25}$$

$$= \sqrt{144} = \sqrt{12 \times 12} = 12 \text{ cm}$$

Now, $\quad \text{area} = \frac{1}{2} \times \text{Base} \times \text{Height}$

$$= \frac{1}{2} \times 12 \times 5 = 30 \text{ cm}^2.$$

5. Side of square = 32 m

∴ Perimeter of the square

$= 4 \times \text{Side} = 4 \times 32$

$= 128$ m

For rectangle, $\quad l = 8$ m and $b = 4$ m

∴ Perimeter of the rectangle

$= 2 \times (l + b)$

$= 2 \times (8 + 4) = 24$ m.

Clearly, the square has larger perimeter than that of the rectangle.

6. The floor is in the shape of a rectangle.

∴ For the floor, $l = 20$ m and $b = 8$ m

Area of the floor $= l \times b = 20 \times 8$

$= 160 \text{ m}^2$

Side of a tile $= 0.4 \text{ m} = \frac{4}{10} \text{ m} = \frac{2}{5}$ m

Area of a tile $= \text{Side}^2 = \frac{2}{5} \times \frac{2}{5}$

$$= \frac{4}{25} \text{ m}^2$$

Now, the required number of tiles

$$= \frac{\text{Area of the floor}}{\text{Area of a tile}}$$

$$= \frac{160}{\left(\frac{4}{25}\right)} = 160 \times \frac{25}{4}$$

$= 40 \times 25 = 1000.$

OR

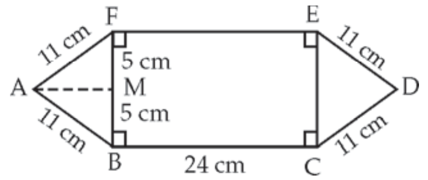
Area of rectangle BCEF $= \text{BC} \times \text{BF}$

$= 24 \times 10$

$= 240 \text{ cm}^2$

ΔABF is an isosceles triangle with

AB = AF = 11 cm



∴ $\quad \text{BM} = \text{MF} = \frac{10}{2} \text{ cm} = 5 \text{ cm}$

In right ΔAMF,

$\text{AM}^2 + \text{MF}^2 = \text{AF}^2$

(Pythagoras property)

or $\quad \text{AM}^2 + 5^2 = 11^2$

∴ $\quad \text{AM}^2 = 11^2 - 5^2$

$= 121 - 25 = 96$

or $\quad \text{AM} = 4\sqrt{6}$ cm

Now, area of ΔABF $= \frac{1}{2} \times \text{AM} \times \text{BF}$

$$= \frac{1}{2} \times 4\sqrt{6} \times 10$$

$$= 20\sqrt{6} \text{ cm}^2$$

Since ΔABF and ΔCDE are congruent

∴ $\quad$ Area of ΔCDE = Area of ΔABF

$= 20\sqrt{6} \text{ cm}^2$

So, area of the given polynomial

= Area of ΔABF + Area of rectangle BCEF + Area of ΔCDE

$= 20\sqrt{6} + 240 + 20\sqrt{6}$

$= 240 + 40\sqrt{6} = 40(6 + \sqrt{6}) \text{ cm}^2.$

7. Let the side of a square be a.

Then its area = a^2

But the area is given to be 14400 m^2

$\therefore \quad a^2 = 14400$

or $\quad a^2 = 144 \times 100 = 12 \times 12 \times 10 \times 10$

or $\quad a^2 = (12 \times 10)^2$

$\therefore \quad a = 12 \times 10 = 120$ m.

Now, perimeter $= 4 \times a = 4 \times 120$

$= 480$ m.

Thus, the perimeter of the square is 480 m.

8. (*i*) $l = 15$ cm, $b = 11$ cm

Area of rectangle $= l \times b = 15 \times 11$

$= 165 \text{ cm}^2$

Perimeter of the rectangle

$= 2 \times (l + b)$

$= 2 \times (15 + 11)$

$= 2 \times 26 = 52$ cm.

(*ii*) $l = 1.92$ m, $b = 0.66$ m

Area of rectangle $= l \times b = 1.92 \times 0.66$

$= 1.2672 \text{ m}^2$.

Perimeter of the rectangle

$= 2 \times (l + b)$

$= 2 \times (1.92 + 0.66)$

$= 2 \times 2.58 = 5.16$ m.

OR

(*i*) The given solid is a cuboid. Its measurements are given below:

Length $l = 12$ mm,

Breadth $b = 9$ mm,

Height $h = 9$ mm.

$\therefore$ Volume V $= l \times b \times h = 12 \times 9 \times 9$

$= 972 \text{ mm}^3$

Surface area $= 2 \times (lb + bh + hl)$

$= 2 \times (12 \times 9 + 9 \times 9 + 9 \times 12)$

$= 2 \times (108 + 81 + 108)$

$= 2 \times 297 = 594 \text{ mm}^2$

Lateral surface area

$= 2(l \times h + b \times h)$

$= 2 \times (12 \times 9 + 9 \times 9)$

$= 2 \times (108 + 81)$

$= 2 \times 189 = 378 \text{ mm}^2$

Diagonal $= \sqrt{l^2 + b^2 + h^2}$

$= \sqrt{12^2 + 9^2 + 9^2}$

$= \sqrt{144 + 81 + 81} = \sqrt{306}$

$= 3\sqrt{34}$ mm.

(*ii*) The given solid is a cube.

Edge $= a$

Volume $= a^3$

Surface area $= 6a^2$

Lateral surface area $= 4a^2$

Diagonal $= a\sqrt{3}$.

9. (*i*) Side of square $= a = 0.5$ cm

$\therefore$ Area $= a^2 = 0.5 \times 0.5$

$= 0.25 \text{ cm}^2$

and perimeter $= 4 \times a = 4 \times 0.5$

$= 2.0$ cm.

(*ii*) Side of square $= b = 1.1$ cm.

$\therefore$ Area $= b^2 = 1.1 \times 1.1$

$= 1.21 \text{ cm}^2$

and perimeter $= 4 \times b = 4 \times 1.1$

$= 4.4$ cm.

WORKSHEET – 80

1. Side $a = 8.5$ cm $= \frac{85}{10}$ cm

Area $= a^2 = \left(\frac{85}{10}\right)^2 = \frac{85}{10} \times \frac{85}{10}$

$= 72.25$ cm^2

Perimeter $= 4 \times a = 4 \times \frac{85}{10} = \frac{340}{10}$

$= 34$ cm.

OR

Let edge of a cube be b.

$\therefore$ Surface area $= 6b^2 = 4056$

$\therefore \quad b^2 = \frac{4056}{6} = 676 \qquad \therefore \quad b = 26$ m

Now, volume $= b^3 = 26^3 = 26 \times 26 \times 26$

$= 17576$ m^3.

2. $l = 63$ m, $b = 18$ m

Perimeter $= 2 \times (l + b) = 2 \times (63 + 18)$

$= 2 \times 81 = 162$ m.

Required length of wire

$= 2 \times$ Perimeter

$= 2 \times 162 = 324$ m.

3. Perimeter of the field $= 4 \times$ Side

$= 4 \times 44.4$

$= 177.60$ m.

Distance covered by Chulbul

$= 4 \times$ Perimeter

$= 4 \times 177.60$

$= 710.40$ m.

4. Area of a trapezium

$$= \frac{\text{Sum of parallel sides} \times \text{Distance between them}}{2}$$

$$= \frac{(2 + 3.2) \times 8}{2} = 5.2 \times 4$$

$= 20.8$ m^2

5. $d_1 = 8$ m, $d_2 = 3$ m

$\therefore \quad \frac{d_1}{2} = 4$ m, $\frac{d_2}{2} = \frac{3}{2}$ m

Area $= \frac{1}{2} d_1 d_2 = \frac{1}{2} \times 8 \times 3$

$= 4 \times 3 = 12$ m^2

Side $= \sqrt{\left(\frac{d_1}{2}\right)^2 + \left(\frac{d_2}{2}\right)^2} = \sqrt{16 + \frac{9}{4}}$

$= \frac{\sqrt{73}}{2} = \frac{8.54}{2} = 4.27$ m.

6. Base $= 5.2$ cm, height $= 2$ cm

Area of a parallelogram = Base × Height

$= 5.2 \times 2$

$= 10.4$ cm^2.

7. Base $= 8.2$ cm, area $= 24.6$ cm^2

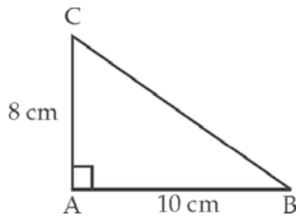
Area of a parallelogram = Base × Height

$\therefore \quad$ Height $= \frac{\text{Area}}{\text{Base}} = \frac{24.6}{8.2} = \frac{246}{82}$

$= 3$ cm.

8. Area of the triangle

$= \frac{1}{2} \times AB \times AC$



$= \frac{1}{2} \times 10 \times 8 = 40$ cm^2.

9. Area of floor = Length × Breadth

$= 18 \times 12$

Area of a tile = Length × Breadth

$= 3 \times 2$

Required number of tiles

$= \frac{\text{Area of floor}}{\text{Area of a tile}}$

$= \frac{18 \times 12}{3 \times 2} = 6 \times 6 = 36$

Thus, 36 tiles are required to pave the floor.

OR

(i) Area of the parallelogram

= Base × Height

= 3.2 × 2.4

= 7.68 cm^2.

(ii) Area of the parallelogram

= Base × Height

= 6 × 3.1= 18.6 cm^2.

10. Side of square a = 25 cm

Area of the square = a^2 = 25^2 = 25 × 25

= 625 m^2.

$\because$ Cost of cultivating on 100 m^2 = ₹ 250

$\therefore$ Cost of cultivating on 1 m^2 = ₹ $\frac{250}{100}$

$\therefore$ Cost of cultivating on 625 m^2

= ₹ $\frac{250}{100}$ × 625 = ₹ $\frac{15625}{10}$

= ₹ 1562.50

Thus, the cost of cultivating the field is ₹ 1562.50.

OR

(i) Area of trapezium

$$= \frac{\text{Sum of parallel sides} \times \text{Distance between them}}{2}$$

$$= \frac{(5+9)\times 4}{2} = 14 \times 2$$

= 28 cm^2.

(ii) Area of trapezium

$$= \frac{\text{Sum of parallel sides} \times \text{Distance between them}}{2}$$

$$= \frac{(11+4)\times 6}{2} = 15 \times 3 = 45 \text{ cm}^2.$$

11. Let other side of the rectangle be x.

Then, area = 22 × x

But this is given to be 836 sq.m.

$\therefore$ 22 × x = 836

$\therefore$ $x = \frac{836}{22}$ = 38 m.

Perimeter of the rectangle

= 2 × (22 + 38)

= 2 × 60 = 120

Thus, the perimeter of the field is 120 m.

WORKSHEET – 81

1. Area = $\frac{1}{2}$ × Base × Height

$= \frac{1}{2} \times s \times h = \frac{sh}{2}$ square unit.

2. Base = 11.2 cm, height = 4.4 cm

Area of a parallelogram

= Base × Height

= 11.2 × 4.4 = 49.28 cm^2.

3. Area = 507 m^2, h = 13 m

Area = $\frac{1}{2}$ × Base × Height

$\therefore$ Base = $\frac{2 \times \text{Area}}{\text{Height}} = \frac{2 \times 507}{13}$

= 2 × 39 = 78 m.

4. Sum of parallel sides = 1.8 m + 7.6 m

= 9.4 m

and distance between them = 0.6 m

Area of a trapezium

$$= \frac{\text{Sum of parallel sides} \times \text{Distance between them}}{2}$$

$$= \frac{9.4 \times 0.6}{2} = 4.7 \times 0.6 = 2.82 \text{ m}^2.$$

5. d_1 = 18.6 cm, d_2 = 11.5 cm

Area of rhombus $= \frac{1}{2}d_1d_2$

$= \frac{1}{2} \times 18.6 \times 11.5$

$= 9.3 \times 11.5$

$= 106.95$ cm^2.

6. Area = 192 m^2, d_1 = 16 m, d_2 = ?

Area $= \frac{1}{2}d_1d_2$

∴ $192 = \frac{1}{2} \times 16 \times d_2$

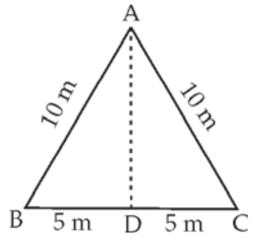
∴ $d_2 = \frac{192 \times 2}{16} = 24.$

Thus, the length of the other diagonal is 24 m.

7. ΔABC is the given triangle.

Draw AD ⊥ BC

In right triangle ACD,



$AC^2 = AD^2 + CD^2$

∴ $AD^2 = 10^2 - 5^2 = 100 - 25$

$= 75 = 5 \times 5 \times 3$

∴ AD = $5\sqrt{3}$ cm

Now, Area of ΔABC $= \frac{1}{2} \times BC \times AD$

$= \frac{1}{2} \times 10 \times 5\sqrt{3}$

$= 25\sqrt{3}$ m^2.

8. ∵ Area $= \frac{1}{2} \times h \times b$

∴ $h = \frac{2 \times \text{Area}}{b} = \frac{2 \times 431.20}{78}$

$= \frac{862.40}{78} = 11.06$ m.

9. Let constant of given ratio be x. Then length $l = 5x$ and breadth $b = 3x$.

So, Area $= l \times b = 5x \times 3x = 15x^2$

This is given to be 2160 m^2.

∴ $15x^2 = 2160$ ∴ $x^2 = \frac{2160}{15} = 144$

or $x = \sqrt{144} = 12$

∴ $l = 5x = 5 \times 12 = 60$

and $b = 3x = 3 \times 12 = 36$

Now, perimeter $= 2 \times (l + b)$

$= 2 \times (60 + 36)$

$= 2 \times 96 = 192$

Cost of fencing = Perimeter × Cost of fencing perimeter

$= 192 \times 350 = 67200.$

Thus, the cost of fencing around the field is ₹ 67200.

OR

Area of floor = 6000 m^2

$= 6000 \times 100 \times 100$ cm^2

Base of parallelogram = b = 12 cm

and corresponding height = h = 10 cm.

Area of a tile $= b \times h = 12 \times 10$

$= 120$ cm^2

Required number of tiles

$= \frac{\text{Area of floor}}{\text{Area of a tile}}$

$= \frac{6000 \times 100 \times 100}{120}$

$= 50 \times 100 \times 100.$

$= 500000$

Thus, 5,00,000 tiles are required to cover the floor.

10. (*i*) Side $a = 7\frac{1}{4}$ cm $= \frac{29}{4}$ cm

$$\text{Area} = \text{Side}^2 = \frac{29}{4} \times \frac{29}{4}$$

$$= \frac{841}{16} = 52\frac{9}{16} \text{ cm}^2$$

$$\text{Perimeter} = 4 \times \text{Side} = 4 \times \frac{29}{4}$$

$$= 29 \text{ cm.}$$

(*ii*) Side $b = 2.5$ cm

$$\text{Area} = \text{Side}^2 = 2.5 \times 2.5$$

$$= 6.25 \text{ cm}^2$$

$$\text{Perimeter} = 4 \times \text{Side} = 4 \times 2.5$$

$$= 10 \text{ cm.}$$

OR

The given figure is a right circular cylinder.

$r = \frac{34.3}{2} = 17.15$ cm, $h = 8.3$ cm

$$\text{Volume} = \pi r^2 h = \frac{22}{7} \times (17.15)^2 \times 8.3$$

$$= \frac{22}{7} \times 17.15 \times 17.15 \times 8.3$$

$$= 22 \times 2.45 \times 17.15 \times 8.3$$

$$= 7672.40 \text{ cm}^3$$

Curved surface area

$$= 2\pi r\text{h}$$

$$= 2 \times \frac{22}{7} \times 17.15 \times 8.3$$

$$= 894.74 \text{ cm}^2.$$

11. (*i*) Area of $\Delta ABC = \frac{1}{2} \times 14 \times 12$

$$= 7 \times 12 = 84 \text{ cm}^2$$

Area of small square $= 2^2 = 4$ cm^2

$\therefore$ Area of shaded portion

= Area of ΔABC

– Area of small square

$= 84 - 4 = 80$ cm^2.

(*ii*) The shaded portion represents six equilateral triangles each of side 5 cm.

Area of one such triangle

$$= \frac{\sqrt{3}}{4} \times \text{Side}^2 = \frac{\sqrt{3}}{4} \times 5^2$$

$$= \frac{25\sqrt{3}}{4} \text{ cm}^2.$$

$\therefore$ Area of shaded portion

$$= 6 \times \frac{25\sqrt{3}}{4} \text{ cm}^2$$

$$= \frac{75\sqrt{3}}{2} \text{ cm}^2.$$

OR

Join GD.

Let A_1 = Area of trapezium ABCH and A_2 = Area of rectangle CDGH.

Areas of trapeziums ABCH and GDEF are equal.

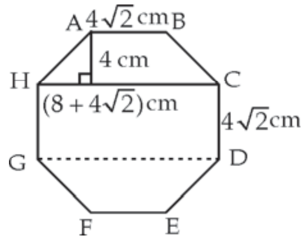
$$A = \frac{\text{Sum of parallel sides} \times \text{Distance between them}}{2}$$

$$= \frac{(4\sqrt{2} + 8 + 4\sqrt{2}) \times 4}{2}$$

$$= (8 + 8\sqrt{2}) \times 2$$

$$= 8 \times (1 + \sqrt{2}) \times 2$$

$$= 16(1 + \sqrt{2}) \text{ cm}^2$$



A_2 = Length × Breadth = HC × CD

$$= (8 + 4\sqrt{2}) \times 4\sqrt{2}$$

$$= 4\sqrt{2}(\sqrt{2} + 1) \times 4\sqrt{2}$$

$$= 32(\sqrt{2} + 1) \text{ cm}^2$$

Now, area of ABCDEFGH

$= 2A_1 + A_2$

$= 2 \times 16(1 + \sqrt{2}) + 32(1 + \sqrt{2})$

$= 64(1 + \sqrt{2})\ cm^2$.

WORKSHEET – 82

1. Area of a trapezium

$$= \frac{\text{Sum of parallel sides} \times \text{Distance between them}}{2}$$

$$= \frac{(8+28)\times 10}{2} = 36 \times 5 = 180\ cm^2.$$

2. Let length of required side be x.

Area of trapezium

$$= \frac{\text{Sum of parallel sides} \times \text{Distance between them}}{2}$$

or $\quad 4400 = \frac{(75+x)\times 80}{2}$

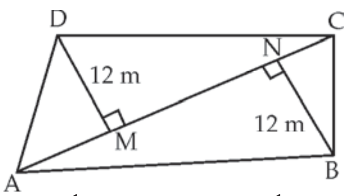
or $75 + x = \frac{4400}{40}$ or $x = 110 - 75 = 35$

Thus, the length of the required side is 35 m.

OR

ABCD is the given quadrilateral. We have to find AC.

Area of ABCD = Area of ΔABC + Area of ΔADC



$\therefore \quad 342 = \frac{1}{2} \times AC \times 12 + \frac{1}{2} \times AC \times 12$

or $\quad 342 = 12AC$

or $\quad AC = \frac{342}{12} = 28.5$

Thus, length of the other diagonal is 28.5 m.

3. Area = 2670.5 sq.m, b = 98 m, h = ?

Area $= \frac{1}{2}bh$ gives $h = \frac{2 \times \text{Area}}{b}$

$\therefore \quad h = \frac{2 \times 2670.5}{98} = 2 \times 27.25$

$= 54.50.$

Thus, height is 54.50 metres.

4. Let initially, base = b and height = h.

Then finally, base = $\frac{b}{2}$ and height = $3h$

So initially, area = $A_1 = \frac{1}{2} \times b \times h = \frac{bh}{2}$

and finally, area = $A_2 = \frac{1}{2} \times \frac{b}{2} \times 3h$

$= \frac{3bh}{4}$

Dividing A_2 by A_1,

$$\frac{A_2}{A_1} = \frac{\frac{3bh}{4}}{\frac{bh}{2}} = \frac{3bh}{4} \times \frac{2}{bh} = \frac{3}{2}$$

or $\quad A_2 = \frac{3}{2}A_1$

Hence, area of the triangle will be $\frac{3}{2}$ times.

OR

Area of a square = Side^2

$\therefore \quad$ Side^2 = 1225

$= 5 \times 5 \times 7 \times 7$

$\therefore \quad$ Side = $5 \times 7 = 35$

Thus, length of the side of the square is 35 m.

5. Area = 840 cm^2, d_1 = 14 cm, d_2 = ?

Area $= \frac{1}{2}d_1 \times d_2$

$\therefore \quad d_2 = \dfrac{2 \times \text{Area}}{d_1} = \dfrac{2 \times 840}{14} = 120$

Therefore, the measure of other diagonal is 120 cm.

OR

$l = 8 + 8 + 8 + 8 = 32, \; b = 8$ cm, $h = 8$ cm

Volume $= l \times b \times h = 32 \times 8 \times 8$

$= 2048$ cm^3

Surface area $= 2(lb + bh + hl)$

$= 2 \times (32 \times 8 + 8 \times 8 + 8 \times 32)$

$= 2 \times 576 = 1152$ cm^2.

6. (*i*) Let old side $= a$

Then new side $= 2a$

Old area $= a^2$

New area $= (2a)^2 = 4a^2$

So, $\dfrac{\text{New area}}{\text{Old area}} = \dfrac{4a^2}{a^2} = 4$

or new area $= 4 \times$ Old area

Thus, the new area will be four times.

(*ii*) Let old length $= l$

and old breadth $= b$

Then new length $= 2l$

and new breadth $= 2b$

$\therefore$ Old area $= l \times b$

and new area $= 2l \times 2b = 4l \times b$

So, $\dfrac{\text{New area}}{\text{Old area}} = \dfrac{4l \times b}{l \times b} = 4$

or New area $= 4 \times$ Old area

Thus, the new area of the rectangle will be four times.

OR

(*i*) Let old base $= b$ and old altitude $= h$

Then new base $= 2b$

and new altitude $= 2h$

$\therefore$ Old area $= bh$

and new area $= 2b \times 2h = 4bh$

So, $\dfrac{\text{New area}}{\text{Old area}} = \dfrac{4bh}{bh} = 4$

or new area $= 4 \times$ Old area

Thus, the new area will be four times.

(*ii*) Let old base $= b$ and old height $= h$

Then new base $= 2b$

and new height $= 2h$

$\therefore$ Old area $= \dfrac{1}{2} bh$

and new area $= \dfrac{1}{2} \times 2b \times 2h = 2bh$

So, $\dfrac{\text{New area}}{\text{Old area}} = \dfrac{2bh}{\frac{1}{2}bh} = 4$

or new area $= 4 \times$ Old area.

Thus, the new area will be four times.

7. Area of floor = Length × Breadth

$= 18 \times 12 = 216$ m^2

Area of a tile $= 2 \times 1 = 2$ m^2

Required number of tiles $= \dfrac{\text{Area of floor}}{\text{Area of a tile}}$

$= \dfrac{216}{2} = 108$

Thus, 108 tiles are required to pave the floor.

OR

$l = 30$ m, $b = 10$ m, $h = 6$ m

Area of floor of the pool $= l \times b$

$= 30 \times 10$

$= 300$ m^2

Area of walls of the pool

$= 2(l + b) \times h$

$= 2(30 + 10) \times 6$

$= 2 \times 40 \times 6 = 480 \text{ m}^2$

Total area of the floor and walls

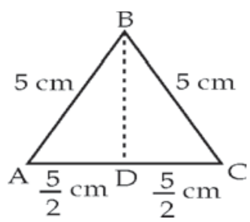
$= 300 + 480 = 780 \text{ m}^2$

Cost of cementing = ₹ 14 × 780

= ₹ 10920.

8. (*i*) Draw $BD \perp AC$

So, $BD = DC = \frac{5}{2}$ cm



In right ΔBDC,

$BD^2 + DC^2 = BC^2$

$\therefore \quad BD^2 = BC^2 - DC^2 = 5^2 - \left(\frac{5}{2}\right)^2$

$= 25 - \frac{25}{4} = \frac{75}{4}$

$\therefore \quad BD = \frac{5\sqrt{3}}{2}$ cm

Now area of $\Delta ABC = \frac{1}{2} \times AC \times BD$

$= \frac{1}{2} \times 5 \times \frac{5\sqrt{3}}{2}$

$= \frac{25\sqrt{3}}{4} \text{ cm}^2$.

(*ii*) Area of trapezium

$= \frac{\text{Sum of parallel sides} \times \text{Distance between them}}{2}$

$= \frac{(BC + AD) \times BF}{2}$

$= \frac{(10 + 20) \times 8}{2} = 30 \times 4$

$= 120 \text{ cm}^2$.

OR

(*i*) Area of $\Delta ABC = \frac{1}{2} \times AC \times BD$

$= \frac{1}{2} \times 20 \times 8 = 80 \text{ cm}^2$

Area of small rectangle $= 5 \times 4 = 20 \text{ cm}^2$

$\therefore$ Area of shaded portion $= 80 - 20$

$= 60 \text{ cm}^2$.

(*ii*) Area of parallelogram ABCD

$= AB \times EF = 20 \times 3$

$= 60 \text{ cm}^2$.

Area of $\Delta ABE = \frac{1}{2} \times AB \times EF$

$= \frac{1}{2} \times 20 \times 3 = 30 \text{ cm}^2$.

$\therefore$ Area of shaded portion $= 60 - 30$

$= 30 \text{ cm}^2$.

9. (*i*) The given polygon is made up of 6 equilateral triangles.

Height of one such triangle

$= \sqrt{3^2 - \left(\frac{3}{2}\right)^2} = \frac{3\sqrt{3}}{2}$ cm

$\therefore$ Area of one triangle

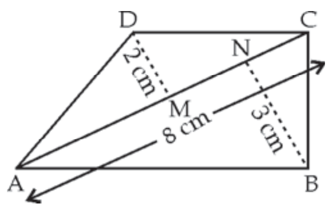
$= \frac{1}{2} \times 3 \times \frac{3\sqrt{3}}{2} = \frac{9\sqrt{3}}{4} \text{ cm}^2$

$\therefore$ Area of the polygon

$= 6 \times \frac{9\sqrt{3}}{4} = \frac{27\sqrt{3}}{2} \text{ cm}^2$.

(*ii*) Area of polygon ABCD

= Area of ΔABC + Area of ΔACD

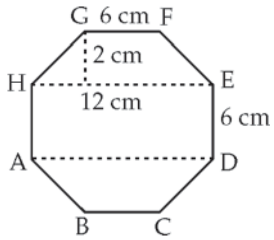


$= \frac{1}{2} AC \times BN + \frac{1}{2} AC \times DM$

$= \frac{1}{2} AC(BN + DM)$

$= \frac{1}{2} \times 8 \times (3 + 2) = 20 \text{ cm}^2.$

(*iii*) Area of trapezia ABCD and HEFG are same as they are congruent.



∴ Area of ABCDEFGH

= 2 × Area of trapezium HEFG + Area of rectangle ADEH

$= 2 \times \frac{(6+12)\times 2}{2} + 6 \times 12$

$= 36 + 72 = 108 \text{ cm}^2.$

WORKSHEET – 83

1. $l = 4$ m, $b = 3$ m, $h = 1$ m

Surface area $= 2(lb + bh + hl)$

$= 2(4 \times 3 + 3 \times 1 + 1 \times 4)$

$= 2 \times (12 + 3 + 4) = 2 \times 19$

$= 38 \text{ m}^2.$

2. $l = 1$ m, $b = 0.8$ m, $h = 0.3$

Total surface area

= Outer surface area + Inner surface area

= 2 × Outer surface area

$= 2 \times (lb + 2bh + 2hl)$

$= 2 \times (0.8 + 0.48 + 0.6)$

$= 2 \times 1.88 = 3.76 \text{ m}^2.$

3. Area of walls $= 57.4 \text{ m}^2$

$\therefore \quad 2 \times (l + b) \times h = 57.4$

or $\quad 2 \times (5 + 3.2) \times h = 57.4$

$\therefore \quad h = \frac{57.4}{2\times 8.2} = 3.5$ m.

4. Let side $= a$ $\quad \therefore \quad 6a^2 = 150$

$\therefore \quad a^2 = \frac{150}{6} = 25$ or $a = 5$ m.

5. $r = 14$ cm, $h = 20$ cm

Curved surface area $= 2\pi rh$

$= 2 \times \frac{22}{7} \times 14 \times 20$

$= 1760 \text{ cm}^2.$

6. $h = 350$ cm, $r = \frac{84}{2}$ cm $= 42$ cm

Area covered to level the road

= Curved surface area of the roller × Number of revolutions

$= 2\pi rh \times 500$

$= 2 \times \frac{22}{7} \times 42 \times 350 \times 500$

$= 44 \times 6 \times 175000 = 46200000 \text{ cm}^2$

$= \frac{46200000}{10000} \text{ m}^2 = 4620 \text{ m}^2.$

7. Edge of the cube $= a = 45$ mm $= 4.5$ cm

Space covered by the cube

$= \text{Volume} = a^3$

$= 4.5^3 = 4.5 \times 4.5 \times 4.5$

$= 91.125 \text{ cm}^3.$

8. $r = \frac{112}{2}$ cm $= 56$ cm, $h = 150$ cm

Volume of cylinder $= \pi r^2 h$

$= \frac{22}{7} \times 56 \times 56 \times 150$

$= 1478400 \text{ cm}^3.$

9. $l = 12$ m, $b = 8$ m, $h = 5$ m

Area of walls $= 2 \times (l + b) \times h$

$= 2 \times (12 + 8) \times 5$

$= 2 \times 20 \times 5 = 200 \text{ m}^2$

Area of ceiling $= l \times b = 12 \times 8 = 96 \text{ m}^2$

Total area of the walls and ceiling

$= 200 \text{ m}^2 + 96 \text{ m}^2$

$= 296 \text{ m}^2$

$\because$ 8 m^2 can be painted by 1 can

$\therefore$ 1 m^2 can be painted by $\frac{1}{8}$ can

$\therefore$ 296 m^2 can be painted by $\frac{1}{8} \times 296$ cans or 37 cans

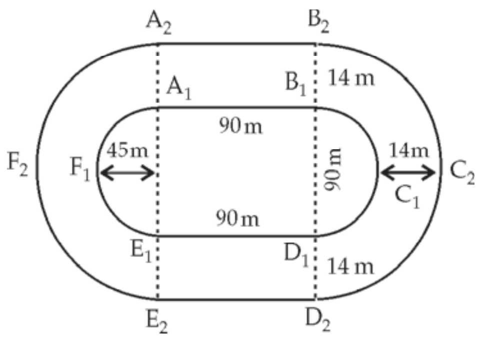
Thus, 37 cans of paint will be required.

OR

Area of region $A_1B_1C_1\,D_1E_1F_1$

= Area of $A_1E_1F_1$ + Area of $A_1B_1D_1\,E_1$ + Area of $B_1C_1D_1$

$= \frac{1}{2}\pi \times 45^2 + 90^2 + \frac{1}{2}\pi \times 45^2$



$= \frac{1}{2} \times \frac{22}{7} \times 45 \times 45 \times 2 + 90 \times 90$

$= 6364.29 + 8100 = 14464.29 \text{ m}^2$

Area of region $A_2B_2C_2D_2E_2F_2$

= Area of $A_2E_2F_2$

+ Area of $A_2B_2\,D_2E_2$

+ Area of $B_2C_2D_2$

$= \frac{1}{2}\pi \times (45 + 14)^2 + (90 + 28) \times 90$

$+ \frac{1}{2} \times \pi \times (45 + 14)^2$

$= \frac{1}{2} \times \frac{22}{7} \times 59 \times 59 \times 2 + 118 \times 90$

$= 10940.29 + 10620 = 21560.29 \text{ m}^2$

Now, area of the shaded portion

$= 21560.29 - 14464.29 = 7096 \text{ m}^2$.

10. Total surface area of the room

$= 2(lb + bh + hl)$

$= 2(12 \times 5 + 5 \times 3 + 3 \times 12)$

$= 2 \times 111 = 222 \text{ m}^2$

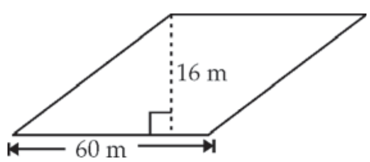
Cost of white washing = ₹ 222×3

= ₹ 666.

OR

Area of the garden = Base × Height

$= 60 \times 16 = 960 \text{ m}^2$



Cost of levelling = ₹ 960×2

= ₹ 1920.

11. Let height of the raised platform be h m.

Volume of platform

= Volume of earth dug out

or $11 \times 4 \times h = \pi\left(1\frac{3}{4}\right)^2 \times 16$

or $44h = \frac{22}{7} \times \frac{7}{4} \times \frac{7}{4} \times 16$

or $44h = 154$ or $h = \frac{154}{44}$

or $h = 3.5$

Thus, the height of the raised platform is 3.5 m.

OR

Required area

= Area(rectangle ABCD) + Area(semicircle)

$$= AB \times BC + \frac{1}{2}\pi \times \left(\frac{BC}{2}\right)^2$$

$$= 30 \times 14 + \frac{1}{2} \times \frac{22}{7} \times 7 \times 7$$

$= 420 + 77 = 497\ m^2$.

WORKSHEET – 84

1. Volume of a cube $= a^3 = 5.5^3$

$= 5.5 \times 5.5 \times 5.5$

$= 166.375\ cm^3$.

2. Volume of a cuboid $= l \times b \times h$

$= 12 \times 3.5 \times 2.4$

$= 100.8\ cm^3$.

3. Volume of resulting cuboid

$= l \times b \times h$

$= (8 + 8 + 8) \times 8 \times 8$

$= 1536\ cm^3$.

4. Let $l = 5x$, $b = 3x$ and $h = 2x$.

Then, $l \times b \times h = 5x \times 3x \times 2x = 30000$

or $x^3 = \frac{30000}{5 \times 3 \times 2} = 1000$ or $x = 10$

$\therefore$ $l = 5x = 50$, $b = 3x = 30$

and $h = 2x = 20$.

Thus, dimensions are: 50 cm, 30 cm, 20 cm.

OR

Area of a trapezium

$$= \frac{\text{Sum of parallel sides} \times \text{Height}}{2}$$

$\therefore$ Height $= \frac{2 \times 65}{13 + 26} = 3\frac{1}{3}$ cm.

5. $l = 300$ cm, $b = 250$ cm, $h = 8$ cm

Volume $= l \times b \times h = 300 \times 250 \times 8$

$= 600000\ cm^3$

Weight $= 600000 \times 9 = 5400000$ grams

$= 5400$ kg.

OR

Volume $= l \times b \times h = 720\ cm^3$

$\therefore$ $10 \times 8 \times h = 720$

This gives, $h = \frac{720}{10 \times 8} = 9$ cm.

6. Volume $= \pi r^2 h = 1.47 \times 1000000$

or $\frac{22}{7} \times \left(\frac{70}{2}\right)^2 \times h = 1470000$

This gives, $h = \frac{1470000 \times 7 \times 2 \times 2}{22 \times 70 \times 70}$

$= 381.82$ cm.

7. $r = \frac{14}{2}$ m $= 7$ m, $h = 50$ m.

A well is in the form of right circular cylinder.

$\therefore$ Volume of earth taken out $= \pi r^2 h$

$= \frac{22}{7} \times 7 \times 7 \times 50 = 7700\ m^3$.

8. $\pi r^2 h = 2870 \Rightarrow \frac{22}{7} \times 7 \times 7 \times h = 2870$

$\therefore$ $h = \frac{2870}{22 \times 7} = 18.64$ cm.

OR

Volume $= 84000\ l = \frac{84000}{1000}\ m^3 = 84\ m^3$

Let depth of the water $= h$.

Now, $6 \times 3.5 \times h = 84$

$\therefore$ $h = \frac{84}{6 \times 3.5} = 4$ m.

9. Since the rainwater falls 10 cm, therefore the height of water level on the roof is 10 cm.

(i) $\therefore$ Volume of rainwater

$= (70 \times 100) \times (44 \times 100) \times 10$

$= 308000000 \text{ cm}^3 = 308 \text{ m}^3.$

(ii) Rise in water level $= \dfrac{308}{\frac{22}{7} \times 14^2}$

$= 0.5 \text{ m} = 50 \text{ cm}.$

10. Let edge of the cube formed be a.

Volume of the cube formed

= Sum of volumes of three given cuboids

or $a^3 = 840 + 896 + 156 = 1892$

or $a = 12.37$ cm (approx.).

11. (i) The given solid is a cube with edge $a = 7.5$ m

Volume $= a^3 = 7.5 \times 7.5 \times 7.5$

$= 421.875 \text{ m}^3$

Total surface area $= 6a^2$

$= 6 \times 7.5 \times 7.5$

$= 337.50 \text{ m}^2$

Lateral surface area $= 4a^2$

$= 4 \times 7.5 \times 7.5$

$= 225 \text{ m}^2.$

(ii) The given solid is a cuboid with measures:

$l = 6$ cm, $b = 4$ cm, $h = 5$ cm

Volume $= l \times b \times h = 6 \times 4 \times 5$

$= 120 \text{ cm}^3.$

Total surface area

$= 2 \times (lb + bh + hl)$

$= 2 \times (24 + 20 + 30)$

$= 148 \text{ cm}^2$

Lateral surface area $= 2 \times (l + b) \times h$

$= 2 \times 10 \times 5$

$= 100 \text{ cm}^2.$

WORKSHEET – 85

1. $\dfrac{\text{New volume}}{\text{Old volume}} = \dfrac{(2a)^3}{a^3} = 8$

Thus, the volume will be 8 times.

2. Total surface area $= 2\pi rh + 2\pi r^2$

$= 2\pi r(h + r)$

$= 2 \times \dfrac{22}{7} \times 49 \times (160 + 49)$

$= 308 \times 209 = 64372 \text{ cm}^2.$

OR

$h = 3$ m, $2(l + b) = 30$ m or $l + b = 15$ m

Area of four walls $= 2 \times (l + b) \times h$

$= 2 \times 15 \times 3$

$= 90 \text{ m}^2.$

3. Total surface area $= 6a^2 = 6 \times 9 \times 9$

$= 486 \text{ cm}^2$

Volume $= a^3 = 9 \times 9 \times 9$

$= 729 \text{ cm}^3.$

4. Volume $= \pi r^2 h = \dfrac{22}{7} \times 2.8 \times 2.8 \times 20$

$= 492.80 \text{ cm}^3.$

Curved surface area $= 2\pi rh$

$= 2 \times \dfrac{22}{7} \times 2.8 \times 20$

$= 352 \text{ cm}^2.$

OR

$a = 50 \text{ cm} = 0.5 \text{ m}$

Volume of ice $= a^3 = (0.5)^3$

$= 0.125 \text{ m}^3$

Weight of the ice = 0.125 × 900 kg

= 112.5 kg.

5. $a^3 = 343 \Rightarrow a^3 = 7 \times 7 \times 7 \Rightarrow a = 7$ cm

Surface area = $6a^2 = 6 \times 7 \times 7 = 294$ cm^2.

OR

In the pool, length of water = 250 m,

breadth of water = 130 m.

Let height of water level = h

So, $250 \times 130 \times h = 3250$

$\therefore \quad h = \frac{3250}{250 \times 130} = 0.1$ m = 10 cm.

6. $h = 13$ m, $2(l + b) = 430$ m

or $l + b = 215$ m

Area of four walls = $2 \times (l + b) \times h$

= $2 \times 215 \times 13$

= 5590 m^2.

7. Volume = $\pi r^2 h = 1408$

or $\frac{22}{7} \times r^2 \times 7 = 1408$

$\therefore r^2 = \frac{1408}{22}$ or $r = 8$ cm

Lateral surface area = $2\pi rh$

$= 2 \times \frac{22}{7} \times 8 \times 7 = 352$ cm^2.

8. Let raise in height of the plot be h.

Volume of plot

= Volume of earth dug out

or $10 \times 8 \times h = \frac{22}{7} \times 7^2 \times 8$

or $80h = 1232$

$\therefore \quad h = \frac{1232}{80} = 15.4$ m.

OR

Let the edge of the cube be a.

Volume of cube = $a^3 = 800 \times 80 \times 64$

$= 8 \times 100 \times 8 \times 10 \times 8 \times 8$

$\therefore \quad a = 2 \times 8 \times 10 = 160$ cm

Surface area of the cube = $6a^2$

$= 6 \times 160 \times 160$

= 153600 cm^2.

9. (*i*) Area of shaded portion

$= \pi \times 7^2 - \pi \times 3.5^2$

$= \frac{22}{7} \times (49 - 12.25)$

= 115.50 cm^2.

(*ii*) Area of shaded portion

$= \pi \times 10^2 - \pi \times 2^2$

$= \frac{22}{7} \times (100 - 4)$

= 301.71 cm^2.

10. (*i*) The given solid is a cylinder

Volume = $\pi r^2 h = \frac{22}{7} \times 3.5 \times 3.5 \times 8.4$

= 323.40 mm^3

Curved surface area = $2\pi rh$

$= 2 \times \frac{22}{7} \times 3.5 \times 8.4$

= 184.8 mm^2

Total surface area = $2\pi rh + 2\pi r^2$

$= 184.8 + 2 \times \frac{22}{7} \times 3.5^2$

= 261.80 mm^2.

(*ii*) The given solid is a hollow cylinder.

$r_1 = 7$ cm, $r_2 = 9$ cm

Volume = $\pi(r_2^2 - r_1^2)\, h$

$= \frac{22}{7} \times (9^2 - 7^2) \times 28$

= 2816 cm^3

Curved surface area = $2\pi(r_1 + r_2)h$

$= 2 \times \frac{22}{7} \times (7 + 9) \times 28$

= 2816 cm^2

Total surface area

$= 2\pi(r_1 + r_2)h + 2\pi(r_2^2 - r_1^2)$

$= 2816 + 2 \times \frac{22}{7} \times (9^2 - 7^2)$

$= 3017.14 \text{ cm}^2$.

WORKSHEET – 86

1. Radius = 1 cm (Given)

Circumference of circle $= 2\pi r$

$= 2\pi \times 1$

$= 2\pi$ cm.

2. Lateral surface area of a right circular cylinder $= 2\pi rh$.

3. Both are identical.

4. One curved face and two circular faces.

5. No.

6. Edge = 3 cm (Given)

We know that,

Volume of a cube $= l^3$

$= (3)^3 = 3 \times 3 \times 3$

$= 27 \text{ cm}^3$.

7. Edge = 2 cm

We know that

Surface area of a cube $= 6l^2$

$= 6 \times (2)^2 = 6 \times 4$

$= 24 \text{ cm}^2$.

8. $\frac{\text{Area of base}}{\text{Area of top}} = \frac{\pi r^2}{\pi r^2} = 1 : 1$

9. Edge = 10 cm

Volume of a cube $= (a)^3$

$= (10)^3 = 10 \times 10 \times 10$

$= 1000 \text{ cm}^3 = 1l$.

10. Total surface area of a cylinder

$= 2\pi r(r + h)$

$= 2\pi \times \pi\left(\pi + \frac{\pi}{2}\right)$ [$\because r = \pi, h = \frac{\pi}{2}$ Given]

$= 2\pi^2\left(\frac{2\pi + \pi}{2}\right)$

$= 2\pi^2 \times \frac{3\pi}{2} = 3\pi^3$ cu. units

11. Area of trapezium = 26 cm^2

$\frac{1}{2}(a + b) \times h = 26$

$\frac{1}{2}(6.5) \times h = 26$

$\frac{1}{2} \times \frac{65}{10} \times h = 26$

$\frac{65}{20} \times h = 26$

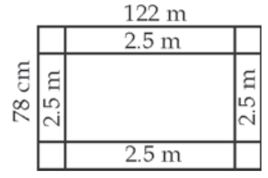
$h = 26 \times \frac{20}{65}$

$h = 8$ cm.

12. Area of big rectangle $= l \times b$

$= 122 \times 78$

$= 9516 \text{ m}^2$



Area of small rectangle $= l \times b$

$= 117 \times 73$

$= 8541 \text{ m}^2$

Area of way $= 9516 - 8541$

$= 97 \text{ m}^2$

Cost of constructing it at rate ₹ 3.40 / m^2

$= 3.40 \times 975 =$ ₹ 3315.

13. Population of 4000 requires 15 litres of water her head.

$l = 20$ m, $b = 15$ m, $h = 6$ cm (Given)

Volume of tank $= l \times b \times h$

$= 20 \times 15 \times 6$

$= 1800 \text{ m}^3$

$\because$ $1 \text{ m}^3 = 1000\ l$

$\therefore$ $1800 \text{ m}^3 = 1000 \times 1800$

$= 1800000\ l$

Total requirement of water

$= 4000 \times 15 = 60000\ l$

Water of tank be used $= \frac{1800000}{60000} = 30$ days.

❑❑

Chapter 12

EXPONENTS AND POWERS

WORKSHEET–87

1. (B) $\because$ In a^b, exponent is b

$\therefore$ In 10^7, exponent is 7.

2. (D) $3^5 = 3 \times 3 \times 3 \times$ .....five times

$= 3 \times 3 \times 3 \times 3 \times 3.$

3. (B) $\because$ $a^{-1} = \frac{1}{a}$ $\quad\therefore\quad$ $10^{-1} = \frac{1}{10}$.

4. (D) $\left(\frac{1}{2}\right)^{-4} = (2^{-1})^{-4} = 2^{(-1)\times(-4)} = 2^4$

$= 16.$

5. (D) $\because$ $a^0 = 1$ for $a \neq 0$

$\therefore$ $(2^{-1} + 3^{-1} + 4^{-1})^0 = 1$

$(\because 2^{-1} + 3^{-1} + 4^{-1} \neq 0)$

6. (D) $\left(\frac{3}{7}\right)^{-6} \times \left(\frac{7}{3}\right)^{-5} = \left(\frac{7}{3}\right)^{6} \times \left(\frac{7}{3}\right)^{-5}$

$= \left(\frac{7}{3}\right)^{6-5} = \frac{7}{3}.$

7. (C) $(-7^{-3} \div 7^{-8}) \div 7^5$

$= \left(-\frac{1}{7^3} \div \frac{1}{7^8}\right) \times \frac{1}{7^5}$

$= \left(-\frac{1}{7^3} \times 7^8\right) \times \frac{1}{7^5} = -7^5 \times \frac{1}{7^5}$

$= -1.$

8. (C) $7^7 \div 7^{-p} = 7^{10} \Rightarrow 7^7 \times \frac{1}{7^{-p}} = 7^{10}$

$\Rightarrow 7^{7+p} = 7^{10} \Rightarrow 7 + p = 10 \Rightarrow p = 3.$

9. (B) At $x = 2$,

$x(x^x) - x = 2 \times (2^2) - 2 = 8 - 2 = 6.$

10. (A) $\left\{\left(\frac{1}{3}\right)^{-2} - \left(\frac{1}{2}\right)^{-3}\right\} \div \left(\frac{1}{4}\right)^{-2}$

$= (3^2 - 2^3) \div 4^2 = 1 \div 16 = \frac{1}{16}.$

11. (A) $a^m \times b^m = (a \times b)^m = (ab)^m.$

12. (B) $0.000725 = 7.25 \div 10000$

$= 7.25 \times 10^{-4}.$

13. (C) 3×10^{-5} km $= \frac{3}{100000}$ km

$= 0.00003$ km.

14. (A) $3^3 + 3^3 + 3^3 = 3^3(1 + 1 + 1)$

$= 3^3 \times 3 = 3^4.$

15. (B) $\frac{1}{10000000}$ kg $= 1.0 \times 10^{-7}$ kg.

16. (C) $4.52 \times 10^4 = 4.52 \times 10000 = 45200.$

17. (D) $(-1)^1 = -1, (-1)^2 = 1$

and $(-1)^3 = -1$

$\therefore$ $(-1)^1 = (-1)^2 = (-1)^3$ is false.

18. (B) $0.00000000000792 = 7.92 \times 10^{-12}.$

19. (A) $1.00007 \times 10^8 = 1.00007 \times 100000000$

$= 100007000.$

20. (C) 1 nanometre $= \frac{1}{1000000000}$ m

$= \frac{1}{10^9}$ m $= 1 \times 10^{-9}$ m.

WORKSHEET–88

1. (*i*) $2^{-2} = (2)^{-2} = \left(\frac{1}{2^{-1}}\right)^{-2} = \frac{1}{2^2}.$

(*ii*) $10^{-100} = \frac{1}{10^{100}}.$

2. (*i*) $100^2 = 100 \times 100 = 10000.$

(*ii*) $30^4 = 30 \times 30 \times 30 \times 30 = 810000.$

3. (*i*) $0.4579 = \frac{4.579}{10} = 4.579 \times 10^{-1}$.

(*ii*) $0.0000021 = \frac{2.1}{1000000} = \frac{2.1}{10^6}$
$= 2.1 \times 10^{-6}$.

OR

Let the required number be x.

Then $x \times \left(\frac{5}{3}\right)^{-2} = \left(\frac{7}{3}\right)^{-1}$

or $x \times \left(\frac{3}{5}\right)^{2} = \frac{3}{7}$

or $\frac{9x}{25} = \frac{3}{7}$ or $x = \frac{3}{7} \times \frac{25}{9}$

or $x = \frac{25}{21}$

Thus, $\left(\frac{5}{3}\right)^{-2}$ should be multiplied by $\frac{25}{21}$.

4. (*i*) $\left(\frac{-1}{2}\right)^{5} \times \left(\frac{-1}{2}\right)^{3} \times \left(\frac{-1}{2}\right)^{2}$

$= \left(\frac{-1}{2}\right)^{5+3+2} = \left(\frac{-1}{2}\right)^{10} = \left(\frac{1}{2}\right)^{10}$

$= (2^{-1})^{10} = 2^{-10}$.

(*ii*) $\left(\frac{-1}{2}\right)^{-7} \times \left(\frac{-1}{2}\right)^{-3} \times \left(\frac{-1}{2}\right)^{5}$

$= \left(\frac{-1}{2}\right)^{-7-3+5} = \left(\frac{-1}{2}\right)^{-5}$

$= \left(\frac{2}{-1}\right)^{5} = (-2)^5 = (-1)^5 \times 2^5$

$= -2^5$.

5. (*i*) $\left(\frac{1}{16}\right)^{-7} \div \left(\frac{1}{16}\right)^{4} = 16^7 \div 16^{-4} = \frac{16^7}{16^{-4}}$

$= 16^{7+4} = 16^{11}$.

(*ii*) $\left(\frac{3}{5}\right)^{3} \div \left(\frac{3}{5}\right)^{-1} = \frac{\left(\frac{3}{5}\right)^{3}}{\left(\frac{3}{5}\right)^{-1}} = \left(\frac{3}{5}\right)^{4}$.

6. (*i*) $2^0 + 1^0 = 1 + 1 = 2$.

(*ii*) $(3^0 + 1^0) \times (2^0 + 1^0)$

$= (1 + 1) \times (1 + 1) = 4$.

7. (*i*) $(4^0 + 3^0) \div (2^0 + 5^0) = (1 + 1) \div (1 + 1)$

$= 2 \div 2 = 1$.

(*ii*) $6^0 \times 5^0 \times 2^0 = 1 \times 1 \times 1 = 1$.

8. (*i*) $(-5)^4 \times \left(\frac{3}{5}\right)^{4} = 5^4 \times \frac{3^4}{5^4} = 3^4$

$= 3 \times 3 \times 3 \times 3 = 81$.

(*ii*) $\left(\frac{1}{6}\right)^{-2} \times 6^{-4} = 6^2 \times 6^{-4}$

$\left[\because \left(\frac{1}{a}\right)^{-n} = a^n\right]$

$= 6^{2-4} = 6^{-2} = \frac{1}{6^2} = \frac{1}{36}$.

OR

(*i*) $(4^{-1} - 5^{-1}) \div 3^{-1}$

$= \left(\frac{1}{4} - \frac{1}{5}\right) \div \frac{1}{3} = \frac{5-4}{20} \times 3$

$= \frac{1}{20} \times 3 = \frac{3}{20}$.

(*ii*) $(3^{-1} \times 4^{-1}) \times 5^{-1} = \left(\frac{1}{3} \times \frac{1}{4}\right) \times \frac{1}{5}$

$= \frac{1 \times 1 \times 1}{3 \times 4 \times 5} = \frac{1}{60}$.

9. (*i*) $2^8 \div 2^{-4} = \frac{2^8}{2^{-4}} = 2^{8+4} = 2^{12}$.

(*ii*) $\left(\frac{1}{6}\right)^{-7} \div \left(\frac{1}{6}\right)^{4} = 6^7 \div 6^{-4} = \frac{6^7}{6^{-4}}$

$= 6^{7+4} = 6^{11}$.

(*iii*) $\left[\left(\frac{2}{3}\right)^{7} \div \left(\frac{2}{3}\right)^{9}\right] \times \left(\frac{2}{3}\right)^{3}$

$$= \left[\frac{\left(\frac{2}{3}\right)^7}{\left(\frac{2}{3}\right)^9}\right] \times \left(\frac{2}{3}\right)^3 = \left(\frac{2}{3}\right)^{7-9} \times \left(\frac{2}{3}\right)^3$$

$$= \left(\frac{2}{3}\right)^{-2} \times \left(\frac{2}{3}\right)^3 = \left(\frac{2}{3}\right)^{-2+3} = \left(\frac{2}{3}\right)^1$$

$$= \frac{2}{3}.$$

WORKSHEET–89

1. (*i*) $0.0000824 = \frac{8.24}{100000} = \frac{8.24}{10^5}$

$= 8.24 \times 10^{-5}$.

(*ii*) $0.0021 = \frac{2.1}{1000} = \frac{2.1}{10^3} = 2.1 \times 10^{-3}$.

2. (*i*) $3.2 \times 10^3 = 3.2 \times 1000 = 3200$.

(*ii*) $1.1 \times 10^7 = 1.1 \times 10000000$

$= 11000000$.

OR

Thickness $= 0.21$ mm $= \frac{2.1}{10}$ mm

$= 2.1 \times 10^{-1}$ mm.

3. $\because \quad \frac{a}{b} = \left(\frac{3}{2}\right)^{-2} \div \left(\frac{6}{7}\right)^0 = \left(\frac{2}{3}\right)^2 \div 1$

$= \left(\frac{2}{3}\right)^2$

$\therefore \quad \left(\frac{a}{b}\right)^{-3} = \left[\left(\frac{2}{3}\right)^2\right]^{-3} = \left(\frac{2}{3}\right)^{-6} = \left(\frac{3}{2}\right)^6$

$= \frac{729}{64}$

OR

(*i*) $0.000000564 = \frac{5.64}{10000000} = \frac{5.64}{10^7}$

$= 5.64 \times 10^{-7}$.

(*ii*) $9871 \times 10^{-4} = 9.871 \times 1000 \times 10^{-4}$

$= 9.871 \times 10^3 \times 10^{-4}$

$= 9.871 \times 10^{-1}$.

4. $\left(\frac{7}{6}\right)^{-5} \times \left(\frac{7}{6}\right)^m = \left(\frac{7}{6}\right)^{-2}$

or $\left(\frac{7}{6}\right)^{-5+m} = \left(\frac{7}{6}\right)^{-2}$

Comparing exponents as the bases are same, we have

$-5 + m = -2$ or $m = -2 + 5$

or $m = 3$.

5. Let the required number be x.

Then, $\frac{\left(\frac{3}{5}\right)^{-2}}{x} = 25$ or $\frac{\left(\frac{5}{3}\right)^2}{x} = \frac{25}{1}$

Cross-multiplying, $25x = \frac{25}{9}$

or $x = \frac{1}{9} = \frac{1}{3^2} = 3^{-2}$

Thus, $\left(\frac{3}{5}\right)^{-2}$ should be divided by 3^{-2}.

6. (*i*) $(2^{-1} \div 1^{-3})^3 = \left(\frac{1}{2} \div \frac{1}{1^3}\right)^3 = \left(\frac{1}{2} \div 1\right)^3$

$= \left(\frac{1}{2}\right)^3 = \frac{1}{8}$.

(*ii*) $\left[\left(\frac{-8}{13}\right)^{-1} \div \left(\frac{16}{5}\right)^{-1}\right] \div \left(\frac{4}{5}\right)^{-1}$

$= \left(\frac{-13}{8} \div \frac{5}{16}\right) \div \frac{5}{4}$

$= \left(\frac{-13}{8} \times \frac{16}{5}\right) \times \frac{4}{5} = \frac{-26}{5} \times \frac{4}{5}$

$= \frac{-104}{25}$.

7. (*i*) $\left(\frac{2}{3}\right)^2 = \left[\left(\frac{3}{2}\right)^{-1}\right]^2 = \left(\frac{3}{2}\right)^{-2}$.

(*ii*) $\left[\left(\frac{-2}{3}\right)^{-1} \times \left(\frac{3}{2}\right)^2\right]^2$

$= \left[(-1)^{-1} \times \left(\frac{2}{3}\right)^{-1} \times \left(\frac{3}{2}\right)^2\right]^2$

$$= \left[-1\times\left(\frac{2}{3}\right)^{-1}\times\left(\frac{2}{3}\right)^{-2}\right]^2$$

$$= (-1)^2 \times \left[\left(\frac{2}{3}\right)^{-3}\right]^2 = \left(\frac{2}{3}\right)^{-6}.$$

8. (*i*) $$\left(\frac{1}{3}\right)^3 \times \left(\frac{1}{3}\right)^{-6} = \left(\frac{1}{3}\right)^{2x-1}$$

or $$\left(\frac{1}{3}\right)^{3-6} = \left(\frac{1}{3}\right)^{2x-1}$$

Comparing the exponents as the bases are same, we get

$$3 - 6 = 2x - 1 \text{ or } 2x = -2$$

or $x = -1$.

(*ii*) $x \times (-5)^4 \div x^2 = 5$

or $$\frac{625x}{x^2} = 5 \text{ or } \frac{625}{x} = \frac{5}{1}.$$

Cross-multiplying, $5x = 625$

or $x = 125$.

9. (*i*) $$\left[\left(\frac{-3}{4}\right)^4\times\left(\frac{-3}{4}\right)^2\right] \div \left[\left(\frac{3}{4}\right)^2\right]^3$$

$$= \left(\frac{-3}{4}\right)^{4+2} \div \left(\frac{3}{4}\right)^{2\times 3}$$

$$= \left(\frac{-3}{4}\right)^6 \div \left(\frac{3}{4}\right)^6 = \left(\frac{3}{4}\right)^6 \div \left(\frac{3}{4}\right)^6$$

$= 1$.

(*ii*) $$\left(\frac{1}{4}\right)^5 \div \left(\frac{1}{4}\right)^4 \div \frac{1}{4}$$

$$= \left(\frac{1}{4}\right)^5 \times \left(\frac{1}{4}\right)^{-4} \times \left(\frac{1}{4}\right)^{-1}$$

$$= \left(\frac{1}{4}\right)^{5-4-1} = \left(\frac{1}{4}\right)^0 = 1.$$

10. (*i*) $$\because \left(\frac{1}{3}\right)^{-2} \div \left(\frac{4}{5}\right)^{-3} = 3^2 \times \left(\frac{4}{5}\right)^3$$

$$= 9 \times \frac{64}{125} = \frac{576}{125}$$

$$\therefore \text{ Reciprocal of } \left\{\left(\frac{1}{3}\right)^{-2} \div \left(\frac{4}{5}\right)^{-3}\right\}$$

$$= \frac{125}{576}.$$

(*ii*) $$\because \left(\frac{1}{2}\right)^{-3} \times \left(\frac{1}{2}\right)^{-4} = 2^3 \times 2^4 = 2^7 = 128$$

$$\therefore \text{ Reciprocal of } \left\{\left(\frac{1}{2}\right)^{-3} \times \left(\frac{1}{2}\right)^{-4}\right\} = \frac{1}{128}.$$

WORKSHEET–90

1. $$\left(\frac{2}{7}\right)^{-6} \times \left(\frac{14}{9}\right)^{-6} = \left(\frac{x}{y}\right)^{-6}$$

or $$\left(\frac{2}{7}\times\frac{14}{9}\right)^{-6} = \left(\frac{x}{y}\right)^{-6}$$

$[\because a^m \times b^m = (ab)^m]$

or $$\left(\frac{4}{9}\right)^{-6} = \left(\frac{x}{y}\right)^{-6}$$

Comparing, $$\frac{x}{y} = \frac{4}{9}.$$

OR

(*i*) $5.8 \times 10^2 = 5.8 \times 100 = 580$.

(*ii*) $$3.25 \times 10^{-7} = \frac{3.25}{10^7} = \frac{3.25}{10000000}$$

$= 0.000000325$.

2. (*i*) $$0.00022 = \frac{2.2}{10000} = \frac{2.2}{10^4} = 2.2 \times 10^{-4}.$$

(*ii*) $5240000 = 5.240000 \times 1000000$

$= 5.24 \times 10^6$.

3. $$\left(\frac{2}{5}\right)^{-6} \times \left(\frac{2}{5}\right)^{-6} = \left(\frac{x}{y}\right)^{-6}$$

or $$\left[\left(\frac{2}{5}\right)^{-6}\right]^2 = \left(\frac{x}{y}\right)^{-6}$$

or $\left[\left(\frac{2}{5}\right)^2\right]^{-6} = \left(\frac{x}{y}\right)^{-6}$

Comparing the bases of both sides as exponents are same, we get

$$\left(\frac{2}{5}\right)^2 = \frac{x}{y} \text{ or } \frac{x}{y} = \frac{4}{25}.$$

4. Let $(-8)^{-1}$ be multiplied by x.

Then $x \times (-8)^{-1} = 10^{-1}$

or $\frac{x}{-8} = \frac{1}{10}$ or $x = \frac{-8}{10}$ or $x = \frac{-4}{5}$

Thus, the required number is $\frac{-4}{5}$.

5. Size of a blue tablet $= 0.00005$ m

$= 500 \times 10^{-7}$ m

Size of a red tablet $= 0.0000175$ m

$= 175 \times 10^{-7}$ m

Clearly, size of the blue tablet is larger by $(500 \times 10^{-7} - 175 \times 10^{-7})$m, *i.e.*, 3.25×10^{-5} m.

Ratio of their sizes $= \frac{500 \times 10^{-7}\text{ m}}{175 \times 10^{-7}\text{ m}}$

$= \frac{20}{7} = 20 : 7.$

6. (*i*) $\because \left(\frac{1}{7}\right)^{-3} \times \left(\frac{1}{7}\right)^{-4} = \left(\frac{1}{7}\right)^{-7} = 7^7$

$\therefore$ Reciprocal of $\left\{\left(\frac{1}{7}\right)^{-3} \times \left(\frac{1}{7}\right)^{-4}\right\}$

$= \frac{1}{7^7} = 7^{-7}.$

(*ii*) $\because \left(\frac{2}{3}\right)^5 \times \left(\frac{2}{3}\right)^{-2} = \left(\frac{2}{3}\right)^{5-2} = \left(\frac{2}{3}\right)^3$

$\therefore$ Reciprocal of $\left\{\left(\frac{2}{3}\right)^5 \times \left(\frac{2}{3}\right)^{-2}\right\} = \frac{1}{\left(\frac{2}{3}\right)^3}$

$= \left(\frac{2}{3}\right)^{-3} = \left(\frac{3}{2}\right)^3.$

OR

(*i*) $\left(\frac{2}{5}\right)^{-2} \times \left(\frac{2}{5}\right)^{-2} \times \left(\frac{2}{5}\right)^{-2}$

$= \left(\frac{2}{5}\right)^{-2-2-2} = \left(\frac{2}{5}\right)^{-6} = \left(\frac{5}{2}\right)^6.$

(*ii*) $\left(\frac{1}{3}\right)^{-1} \times \left(\frac{1}{3}\right)^{-1} \times \left(\frac{1}{3}\right)^{-1} \times \left(\frac{1}{3}\right)^{-1}$

$= \left(\frac{1}{3}\right)^{-1-1-1-1} = \left(\frac{1}{3}\right)^{-4} = 3^4.$

7. (*i*) $(5^{-1} - 8^{-1}) \div \left(\frac{2}{3}\right)^{-2}$

$= \left(\frac{1}{5} - \frac{1}{8}\right) \times \left(\frac{2}{3}\right)^2 = \frac{8-5}{40} \times \frac{4}{9}$

$= \frac{3}{40} \times \frac{4}{9} = \frac{1}{30}.$

(*ii*) $\left(\frac{4}{5}\right)^0 \times \left(\frac{1}{2}\right)^{-2} = 1 \times 2^2 = 4.$

8. (*i*) $3.48 \times 10^5 = 3.48 \times 100000 = 348000.$

(*ii*) $1.54 \times 10^{-4} = \frac{1.54}{10^4} = \frac{1.54}{10000}$

$= 0.000154.$

(*iii*) $4 \times 10^{-5} = \frac{4}{10^5} = \frac{4}{100000} = 0.00004.$

9. (*i*) Thickness of a paper

$= 0.35$ mm $= \frac{3.5}{10^1}$ mm

$= 3.5 \times 10^{-1}$ mm.

(*ii*) Size of bacteria $= 0.000008$ mm

$= 8.0 \times 10^{-6}$ mm.

(*iii*) Size of a plant cell $= 0.00001475$ m

$= \frac{1.475}{100000}$ m $= \frac{1.475}{10^5}$ m

$= 1.475 \times 10^{-5}$ m.

10. (*i*) $(6^{-1} - 8^{-1})^{-1} + (2^{-1} - 3^{-1})^{-1}$

$$= \left(\frac{1}{6} - \frac{1}{8}\right)^{-1} + \left(\frac{1}{2} - \frac{1}{3}\right)^{-1}$$

$$= \left(\frac{4-3}{24}\right)^{-1} + \left(\frac{3-2}{6}\right)^{-1}$$

$$= \left(\frac{1}{24}\right)^{-1} + \left(\frac{1}{6}\right)^{-1} = 24 + 6 = 30.$$

(*ii*) $(4^{-1} + 8^{-1}) \div \left(\frac{2}{3}\right)^{-1} = \left(\frac{1}{4} + \frac{1}{8}\right) \div \frac{3}{2}$

$$= \frac{2+1}{8} \times \frac{2}{3}$$

$$= \frac{3}{8} \times \frac{2}{3} = \frac{1}{4}.$$

WORKSHEET–91

1. Let $(-15)^{-1}$ be divided by x.

Then, $\frac{(-15)^{-1}}{x} = (-5)^{-1}$

or $\frac{\frac{1}{-15}}{x} = \frac{1}{-5}$ or $\frac{1}{-15x} = \frac{1}{-5}$

Cross-multiplying, $-15x = -5$ or $x = \frac{1}{3}$

Thus, the required number is $\frac{1}{3}$.

2. Let $(-12)^{-1}$ should be divided by x.

Then, $\frac{(-12)^{-1}}{x} = \left(\frac{2}{3}\right)^{-1}$ or $\frac{1}{-12x} = \frac{3}{2}$

Cross-multiplying, $-36x = 2$

or $x = \frac{2}{-36} = \frac{-1}{18}$

So, the required number is $\frac{-1}{18}$.

3. Let $\left(\frac{-3}{2}\right)^{-3}$ should be divided by x.

Then, $\frac{\left(\frac{-3}{2}\right)^{-3}}{x} = \left(\frac{4}{27}\right)^{-2}$

or $\frac{\left(\frac{2}{-3}\right)^{3}}{x} = \left(\frac{27}{4}\right)^{2}$

or $\frac{8}{-27x} = \frac{27 \times 27}{4 \times 4}$

Cross-multiplying,

$$-27 \times 27 \times 27x = 8 \times 4 \times 4$$

$\therefore \quad x = \frac{8 \times 4 \times 4}{-27 \times 27 \times 27} = \frac{-128}{19683}$

Thus, the required number is $\frac{-128}{19683}$.

4. $\left(\frac{1}{3}\right)^{-5} \times \left(\frac{1}{3}\right)^{-10} = \left(\frac{1}{3}\right)^{3x}$

or $\left(\frac{1}{3}\right)^{-5+(-10)} = \left(\frac{1}{3}\right)^{3x}$

or $\left(\frac{1}{3}\right)^{-15} = \left(\frac{1}{3}\right)^{3x}$

Comparing the exponents as bases are same, we get

$-15 = 3x$ or $x = \frac{-15}{3} = -5$

Thus, $x = -5$.

5. (*i*) $6^{-1} = \frac{1}{6^1} = \frac{1}{6}$.

(*ii*) $\left(\frac{1}{4}\right)^{-1} = \frac{1}{\left(\frac{1}{4}\right)^1} = \frac{1}{\frac{1}{4}} = \frac{4}{1}$.

6. (*i*) $\left(\frac{1}{2}\right)^{-1} \div \left(\frac{1}{3}\right)^{-1} \div \left(\frac{1}{4}\right)^{-1}$

$$= 2 \div 3 \div 4 = 2 \times \frac{1}{3} \times \frac{1}{4} = \frac{1}{6}.$$

(*ii*) $(5^{-1} \times 2^{-1}) \div 6^{-1} = \left(\frac{1}{5} \times \frac{1}{2}\right) \div \frac{1}{6}$

$= \frac{1}{10} \times 6 = \frac{3}{5}.$

7. (*i*) $\left(\frac{5}{7}\right)^{-7} \times \left(\frac{8}{5}\right)^{-5} = \left(\frac{7}{5}\right)^{7} \times \left(\frac{5}{8}\right)^{5}$

$= \frac{7^7 \times 5^5}{5^7 \times 8^5} = \frac{7^7}{5^2 \times 8^5}$

$= \frac{7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7}{5 \times 5 \times 8 \times 8 \times 8 \times 8 \times 8}$

$= \frac{823543}{819200}.$

(*ii*) $\left(\frac{3}{7}\right)^{-2} \times \left(\frac{7}{6}\right)^{-3} = \left(\frac{7}{3}\right)^{2} \times \left(\frac{6}{7}\right)^{3}$

$= \frac{7^2 \times 6^3}{3^2 \times 7^3} = \frac{(3 \times 2)^3}{3^2 \times 7}$

$= \frac{3^3 \times 2^3}{3^2 \times 7} = \frac{3 \times 8}{7}$

$= \frac{24}{7}.$

8. (*i*) $\frac{8^{-1} \times 5^3}{2^{-4}} = \frac{\frac{1}{8} \times 5^3}{\frac{1}{2^4}} = \frac{2^4 \times 5^3}{8}$

$= \frac{16 \times 125}{8} = 2 \times 125 = 250.$

(*ii*) $\frac{25 \times a^{-4}}{5^{-3} \times 10 \times a^{-8}}$

$= 25 \times \frac{1}{a^4} \times 5^3 \times \frac{1}{10} \times a^8$

$= \frac{25 \times 5^3}{10} \times \frac{a^8}{a^4} = \frac{5 \times 125}{2} \times a^4$

$= \frac{625}{2} a^4.$

9. $x = \left(\frac{3}{2}\right)^{2} \times \left(\frac{2}{3}\right)^{-4}$

$= \left(\frac{2}{3}\right)^{-2} \times \left(\frac{2}{3}\right)^{-4} = \left(\frac{2}{3}\right)^{-6}$

$\therefore \quad \frac{1}{x} = \frac{1}{\left(\frac{2}{3}\right)^{-6}} = \left(\frac{2}{3}\right)^{6}$

So $\frac{1}{x} \times \frac{1}{x} = \left(\frac{2}{3}\right)^{6} \times \left(\frac{2}{3}\right)^{6}$

or $\frac{1}{x^2} = \left(\frac{2}{3}\right)^{12}$ or $x^{-2} = \left(\frac{2}{3}\right)^{12}.$

OR

(*i*) $(3^{-1} \div 6^{-1})^3 = \left(\frac{1}{3} \div \frac{1}{6}\right)^3 = \left(\frac{1}{3} \times 6\right)^3$

$= 2^3 = 8.$

(*ii*) $(4^{-1} + 5^{-1}) \div 3^{-1}$

$= \left(\frac{1}{4} + \frac{1}{5}\right) \div \frac{1}{3} = \left(\frac{5+4}{20}\right) \times 3$

$= \frac{9 \times 3}{20} = \frac{27}{20}.$

10. (*i*) $(5^{-1} \div 6^{-1})^3 = \left(\frac{1}{5} \div \frac{1}{6}\right)^3 = \left(\frac{1}{5} \times 6\right)^3$

$= \left(\frac{6}{5}\right)^3 = \frac{6 \times 6 \times 6}{5 \times 5 \times 5}$

$= \frac{216}{125}.$

(*ii*) $(3^{-1} \times 4^{-1})^{-1} = \left(\frac{1}{3} \times \frac{1}{4}\right)^{-1} = \left(\frac{1}{12}\right)^{-1}$

$= 12.$

OR

(*i*) $6^{-2} = \frac{1}{6^2} = \frac{1}{36}$.

(*ii*) $(-4)^{-2} = \frac{1}{(-4)^2} = \frac{1}{16}$.

(*iii*) $\left(\frac{1}{7}\right)^{-4} = \left(\frac{7}{1}\right)^4 = 7^4 = 7 \times 7 \times 7 \times 7$

$= 2401.$

WORKSHEET–92

1. $5^{2x} \div 5^{-3} = 5^5$

or $\frac{5^{2x}}{5^{-3}} = 5^5$ or $5^{2x+3} = 5^5$.

Comparing the exponents as bases are same, we get

$2x + 3 = 5$ or $2x = 5 - 3 = 2$

or $x = 1$.

2. $x = \left(\frac{3}{2}\right)^2 \times \left(\frac{2}{3}\right)^{-4}$

or $x = \left(\frac{3}{2}\right)^2 \times \left(\frac{3}{2}\right)^4 = \left(\frac{3}{2}\right)^6$

$\therefore$ $(x)^{-3} = \left[\left(\frac{3}{2}\right)^6\right]^{-3}$ or $x^{-3} = \left(\frac{3}{2}\right)^{-18}$.

3. (*i*) 1 micron = $\frac{1}{1000000}$ metre

$= \frac{1.0}{10^6}$ metre

$= 1.0 \times 10^{-6}$ metre.

(*ii*) Size of bacteria = 0.0000005 metre

$= \frac{5.0}{10000000}$ metre $= \frac{5.0}{10^7}$ metre

$= 5.0 \times 10^{-7}$ metre.

4. (*i*) $7.54 \times 10^{-4} = \frac{7.54}{10^4} = \frac{7.54}{10000}$

$= 0.000754.$

(*ii*) $3 \times 10^{-5} = \frac{3}{10^5} = \frac{3}{100000} = 0.00003.$

5. $\left\{\left(\frac{2}{3}\right)^2\right\}^3 \times \left(\frac{1}{3}\right)^{-4} \times 3^{-1} \times 6^{-1}$

$= \frac{2^6}{3^6} \times \frac{1}{3^{-4}} \times 3^{-1} \times (2 \times 3)^{-1}$

$= \frac{2^6 \times 1 \times 3^{-1} \times 2^{-1} \times 3^{-1}}{3^6 \times 3^{-4}}$

$= 2^{6-1} \times 3^{-1-1-6+4} = 2^5 \times 3^{-4} = \frac{2^5}{3^4}$

$= \frac{2 \times 2 \times 2 \times 2 \times 2}{3 \times 3 \times 3 \times 3} = \frac{32}{81}$.

OR

$x = \left(\frac{5}{2}\right)^2 \times \left(\frac{2}{5}\right)^{-4}$

or $x = \left(\frac{5}{2}\right)^2 \times \left(\frac{5}{2}\right)^4 = \left(\frac{5}{2}\right)^{2+4} = \left(\frac{5}{2}\right)^6$

$\therefore$ $(x)^{-2} = \left[\left(\frac{5}{2}\right)^6\right]^{-2}$ or $x^{-2} = \left(\frac{5}{2}\right)^{-12}$.

6. $x^3 = \left(\frac{1}{5}\right)^{-3} \times \left(\frac{1}{5}\right)^6$

or $x^3 = \left(\frac{1}{5}\right)^{-3+6} = \left(\frac{1}{5}\right)^3$

Taking cube root on both the sides, we get

$[x^3]^{\frac{1}{3}} = \left[\left(\frac{1}{5}\right)^3\right]^{\frac{1}{3}}$ or $x = \frac{1}{5}$.

7. (*i*) $\frac{1}{6^{-2}} \times 6^{-7} \times 36 = 6^2 \times 6^{-7} \times 6^2$

$= 6^{2-7+2} = 6^{-3}$

$= \frac{1}{6^3}$.

(*ii*) $\frac{1}{7^2} \times 49 \times \frac{1}{7^{-3}} = \frac{1}{7^2} \times 7^2 \times \frac{1}{7^{-3}}$

$= \frac{1}{7^{-3}} = 7^3.$

8. (*i*) $(-4)^{-1} \times \left(\frac{-3}{2}\right)^{-1}$

$= \frac{1}{(-4)^1} \times \left(\frac{2}{-3}\right)^1 = \frac{1}{-4} \times \frac{2}{-3}$

$= \frac{2}{(-4)\times(-3)}$

$= \frac{2}{12} = \frac{1}{6}.$

(*ii*) $\left(\frac{3}{5}\right)^{-1} \times \left(\frac{5}{2}\right)^{-1} = \left(\frac{5}{3}\right)^1 \times \left(\frac{2}{5}\right)^1$

$= \frac{5}{3} \times \frac{2}{5} = \frac{2}{3}.$

9. (*i*) $(4^{-1} \times 3^{-1})^2 = \left(\frac{1}{4}\times\frac{1}{3}\right)^2 = \left(\frac{1}{12}\right)^2$

$= \frac{1}{12} \times \frac{1}{12} = \frac{1}{144}.$

(*ii*) $(2^{-1} + 3^{-1})^{-1} = \left(\frac{1}{2}+\frac{1}{3}\right)^{-1} = \left(\frac{3+2}{6}\right)^{-1}$

$= \left(\frac{5}{6}\right)^{-1} = \left(\frac{6}{5}\right)^1 = \frac{6}{5}.$

10. (*i*) $6^{10} \div 6^7 = \frac{6^{10}}{6^7} = 6^{10-7} = 6^3 = \left(\frac{1}{6}\right)^{-3}.$

(*ii*) $(-4)^4 \div (-4)^{-2} \times \left(\frac{1}{-4}\right)^6$

$= (-4)^4 \times (-4)^2 \times (-4)^{-6} = (-4)^{\mathbf{0}}.$

(*iii*) $\left(\frac{2}{3}\right)^5 \times \left(\frac{3}{5}\right)^5 \times \left(\frac{5}{2}\right)^5$

$= 2^5 \times 3^{-5} \times 3^5 \times 5^{-5} \times 5^5 \times 2^{-5}$

$= 2^{5-5} \times 3^{-5+5} + 5^{-5+5}$

$= 1 \times 1 \times 5^0 = 5^{\mathbf{0}}.$

(*iv*) $10^5 \div 10^{10} \times 10^{-5}$

$= 10^5 \times 10^{-10} \times 10^{-5}$

$= 10^{5-10-5} = 10^{-10} = \left(\frac{1}{10}\right)^{\mathbf{10}}.$

OR

(*i*) $\left(\frac{3}{7}\right)^{21} \div \left(\frac{3}{7}\right) = \left(\frac{3}{7}\right)^{2x}$

or $\left(\frac{3}{7}\right)^{21-1} = \left(\frac{3}{7}\right)^{2x}$

or $\left(\frac{3}{7}\right)^{20} = \left(\frac{3}{7}\right)^{2x}$

Comparing the exponents as the bases are same, we get

$20 = 2x$ or $x = 10.$

(*ii*) $\left(\frac{1}{5}\right)^3 \times \frac{1}{5} = \left(\frac{1}{5}\right)^{2x}$

or $\left(\frac{1}{5}\right)^{3+1} = \left(\frac{1}{5}\right)^{2x}$

or $\left(\frac{1}{5}\right)^4 = \left(\frac{1}{5}\right)^{2x}$

Comparing the exponents as the bases are same, we get

$4 = 2x$ or $x = 2.$

WORKSHEET–93

1. $7^{-2} = \frac{1}{7^2}$

Multiplicative inverse of $\frac{1}{7^2} = 7^2.$

2. No.

3. $0.0000000000080756 = 8.0756 \times 10^{-12}.$

4. $(-3)^3 \div (-3)^m = \left(\frac{1}{-3}\right)^{-9}$

$$(-3)^{3-m} = \left(\frac{1}{-3}\right)^{-9}$$

$(\because x^m \div x^n = x^{m-n})$

$$(-3)^{3-m} = ((-3)^{-1})^{-9}$$

$$(-3)^{3-m} = (-3)^9$$

$$3 - m = 9$$

$$-m = 9 - 3$$

$$-m = 6 \therefore m = -6.$$

5. Let the required number be x.

According to question,

$$\frac{(-15)^{-1}}{x} = (-5)^{-1}$$

$$\Rightarrow \quad (-15)^{-1} = (-5)^{-1} \times x$$

$$x = \frac{1}{(-15)^1} \times \frac{(-5)^1}{1}$$

$$x = \frac{1}{-3} = (-3)^{-1}.$$

6. $\left(\frac{3}{5}\right)^{-4} \times \left(\frac{15}{10}\right)^{-4} = \left(\frac{x}{y}\right)^{-4}$

$$\left(\frac{3}{5}\right)^{-4} \times \left(\frac{3}{2}\right)^{-4} = \left(\frac{x}{y}\right)^{-4}$$

$$\left(\frac{3}{5} \times \frac{3}{2}\right)^{-4} = \left(\frac{x}{y}\right)^{-4}$$

$$\left(\frac{9}{10}\right)^{-4} = \left(\frac{x}{y}\right)^{-4}$$

$$\frac{9}{10} = \frac{x}{y}$$

$$\therefore \quad \frac{x}{y} = \frac{9}{10}.$$

7. $\frac{x}{y} = \left(-\frac{1}{3}\right)^{-3} \div \left(\frac{2}{3}\right)^{-4}$ (Given)

$$\frac{x}{y} = (-3)^3 \div \left(\frac{3}{2}\right)^4$$

$$\frac{x}{y} = -27 \div \frac{81}{16}$$

$$\frac{x}{y} = -27 \times \frac{16}{81}$$

$$\frac{x}{y} = \frac{-16}{3}$$

According to question,

$$\left(\frac{x}{y} + \frac{y}{x}\right)^{-1} = \left(\frac{-16}{3} + \frac{-3}{16}\right)^{-1}$$

$$= \left(\frac{-256 - 9}{48}\right)^{-1} = \left(\frac{-265}{48}\right)^{-1}$$

$$= \frac{-48}{265}.$$

8. (*i*) $\left(\frac{3}{2}\right)^5 \times \left(\frac{3}{2}\right)^7$

$$= \left(\frac{3}{2}\right)^{5+7} \quad (\because x^a \times x^b = x^{a+b})$$

$$= \left(\frac{3}{2}\right)^{12}$$

(*ii*) $\left(\frac{2}{9}\right)^{8-8} = \left(\frac{2}{9}\right)^0$

$$= 1 \quad (\because x^0 = 1)$$

(*iii*) $\left[\left(\frac{1}{2}\right)^2\right]^3 \div \left[\left(\frac{1}{2}\right)^3\right]^2$

$$= \left[\frac{1}{2}\right]^6 \div \left[\frac{1}{2}\right]^6$$

$[\because [(x^a)]^b = [x]^{ab}]$

$$\left(\frac{1}{2}\right)^6 \times \frac{1}{\left(\frac{1}{2}\right)^6} = 1.$$

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Chapter 13

DIRECT AND INVERSE PROPORTION

WORKSHEET–94

1. (C) Time = $\dfrac{\text{Distance}}{\text{Speed}} = \dfrac{270}{90}$ = 3 hours.

2. (B) $x = my$

At $x = 30$, $y = 6$; $30 = 6m \Rightarrow m = 5$

At $x = 70$; $70 = 5y \Rightarrow y = 14$.

3. (D) Cost = ₹ $\dfrac{450}{5} \times 8$ = ₹ 720.

4. (A) $\dfrac{x_1}{8.8} = \dfrac{7.2}{3.6} \Rightarrow x_1 = \dfrac{8.8 \times 7.2}{3.6}$

$\Rightarrow x_1 = 17.6$.

5. (A) Required number of tools

$= \dfrac{1800}{6} \times 9 = 2700$.

6. (B) A pole, its shadow, another pole (say h), that's shadow must be in proportion.

$\therefore \quad \dfrac{550}{270} = \dfrac{h}{810}$

or $\quad h = \dfrac{550 \times 810}{270}$ = 1650 cm

= 16 m 50 cm.

7. (D) Distance covered in the map

$= \dfrac{140}{20}$ cm = 7 cm.

8. (B) Cost of articles increases as the number of purchasing articles increases.

9. (B) $x^2y^2 = 8(xy - 2)$

or $\quad x^2y^2 - 8xy + 16 = 0$

or $\quad (xy - 4)^2 = 0 \quad$ or $\quad xy = 4$

or $\quad x = \dfrac{4}{y}$

So, x and y are in inverse proportion.

10. (C) Required weight = $\dfrac{59}{18} \times 9$ kg

= 29.5 kg.

11. (B) The working power and the time taken to complete a work are in inverse variation.

$\therefore$ Ratio of numbers of days = 5 : 3.

12. (B) The general equation representing x and y are in inverse proportion is $xy = k$, k being a constant.

13. (A) Let $x > 0$.

$\dfrac{1}{x}$ decreases as x increases and $\dfrac{1}{x}$ increases as x decreases.

So, x and $\dfrac{1}{x}$ are in inverse proportion.

14. (C) Number of men and number of days are in inverse proportion.

$\therefore$ Number of days = $\dfrac{10}{5} \times 10 = 20$.

15. (D) $a = 0.5b = 0.5 \times 11 = 5.5$.

WORKSHEET – 95

1. Speed = $\dfrac{72 \text{ km}}{1 \text{ hour}} = \dfrac{72 \times 1000 \text{ m}}{1 \times 60 \times 60 \text{ s}}$

= 20 m / s.

2. 30 m / s = $\dfrac{30 \text{ m}}{1 \text{ s}} = \dfrac{30 \times \dfrac{1}{1000} \text{ km}}{\dfrac{1}{3600} \text{ hr}}$

$= \dfrac{30}{1000} \times \dfrac{3600}{1}$ km / hr

= 108 km / hr.

3. Time = 8 min = $\frac{8}{60}$ hour

Distance = 800 m = $\frac{800}{1000}$ km = $\frac{8}{10}$ km

Speed = $\frac{\text{Distance}}{\text{Time}} = \frac{8/10}{8/60}$

= 6 km / hr.

4. Let k be the constant of proportionality.

Then $x = ky$

At $x = 7$ and $y = 21$; $k = \frac{7}{21} = \frac{1}{3}$

At $x = 9$, $y = a$ and $k = \frac{1}{3}$;

$x = ky$ gives $a = 27$

At, $x = b$, $y = 63$ and $k = \frac{1}{3}$;

$x = ky$ gives $b = 21$

Thus, $a = 27$ and $b = 21$.

5. Geeta's 1 day's work = $\frac{1}{8}$

1 day's work of both Geeta and Meeta

$= \frac{1}{6}$

So, Meeta's 1 day's work

$= \frac{1}{6} - \frac{1}{8} = \frac{4-3}{24} = \frac{1}{24}$.

Therefore, Meeta alone can finish the whole work in 24 days.

6. Mr. Menon's 1 day's work = $\frac{1}{6}$

Mr. Kumar's 1 day's work = $\frac{1}{12}$

1 day's work of both of them

$= \frac{1}{6} + \frac{1}{12} = \frac{2+1}{12} = \frac{3}{12}$

$= \frac{1}{4}$.

Therefore, both of them together can write the chapter in 4 days.

7. In 6 hours Ritu knits a whole sweater

So, in 1 hour she would knit $\frac{1}{6}$ of the sweater

So, in 4 hours she would knit $4 \times \frac{1}{6}$ *i.e.*, $\frac{2}{3}$ of the sweater.

Thus, Ritu will knit $\frac{2}{3}$ part of the sweater.

8. (*i*) x and y very **inversely**, if the product xy is constant.

(*ii*) If $\frac{x}{y}$ is constant for each pair of values of x and y, then x and y vary **directly**.

(*iii*) If $x = ky$, where k is a constant, then x and y vary **directly**.

WORKSHEET – 96

1. ∵ Distance travelled in 30 minutes

= 60 km.

∴ Distance travelled in 60 minutes

= 60 × 2 km = 120 km.

Therefore, the speed of the car is 120 km / hr.

2. ∵ Distance covered in 10 minutes

= 1000 m = 1 km

∴ Distance covered in 60 minutes

= 1 × 6 km = 6 km.

Therefore, Lily's speed is 6 km / hr.

3. Let the height of the tree be x metres.

The heights of an object and its shadow are in direct proportion.

$\therefore \quad \frac{14}{10} = \frac{x}{15} \quad \therefore \quad x = \frac{14 \times 15}{10} = 21$

Thus, the tree is 21 m high.

4. Let the required number of sheets be x.

The number of sheets and their weights are in direct proportion.

$\therefore \quad 12 : 40 = x : \left(2\frac{1}{2} \times 1000\right)$

or $\quad \frac{12}{40} = \frac{x}{2500}$

$\therefore \quad x = \frac{12 \times 2500}{40} = 750$

Thus, 750 sheets weigh $2\frac{1}{2}$ kg.

5. When parts of red pigments = 1,
parts of base = 8

When parts of red pigments = 4,
parts of base = 4 × 8
= 32

When parts of red pigments = 7,
parts of base = 7 × 8
= 56

When parts of red pigments = 12,
parts of base = 12 × 8
= 96

When parts of red pigments = 20,
parts of base = 20 × 8
= 160.

Thus the complete table is:

Parts of red pigments	1	4	7	12	20
Parts of base	8	32	56	96	160

6. Let the number of machines required be x.

Numbers of machines and days are in inverse proportion.

$\therefore \quad x \times 54 = 42 \times 63$

$\therefore \quad x = \frac{42 \times 63}{54} = 49.$

7. School time in a day = 8 × 45 minutes

$\because$ 9 periods are of 8 × 45 minutes

$\therefore$ 1 period is of $\frac{8 \times 45}{9}$ minutes, *i.e.*, 40 minutes

Thus, each period will be of 40 minutes.

8. $\because$ 48 shops require = 432 m

$\therefore$ 1 shop requires = $\frac{432}{48}$ m

$\therefore$ 20 shops will require = $\frac{432}{48} \times 20$ m

= 180 m.

9. 1 hour's work of Radha and Medha together = $\frac{1}{10}$

1 hour's work of Radha alone = $\frac{1}{15}$

$\therefore$ 1 hour's work of Medha alone

$= \frac{1}{10} - \frac{1}{15} = \frac{3-2}{30} = \frac{1}{30}.$

Therefore, Medha will take 30 hours to do the whole work.

10. 1 day's work of A alone = $\frac{1}{10}$

1 day's work of both A and B = $\frac{1}{6}$

$\therefore$ 1 day's work of B alone

$= \frac{1}{6} - \frac{1}{10} = \frac{5-3}{30} = \frac{2}{30}$

$= \frac{1}{15}$

So, B alone can do the work in 15 days.

11. After joining 6 more people, the family has 18 people.

Numbers of people and days are in inverse proportion. So, number of days decreases as number of people increases.

Let the required number of days be x.

Then, $\frac{12}{18} = \frac{x}{60}$ $\therefore$ $x = \frac{12 \times 60}{18} = 40$

Thus, the gas cylinder lasts after 40 days.

WORKSHEET – 97

1. Let the required number of balls be x.

Then, $\frac{8}{16} = \frac{x}{72}$ $\therefore$ $x = \frac{8 \times 72}{16} = 36$

Thus, Kanwar Singh should sell 36 cosco balls.

2. Required number of dollars

$$= \frac{120}{4800} \times 8000 = 200.$$

3. Since number of packets and their cost vary directly.

$\therefore$ Required number of packets

$$= \frac{6}{78} \times 143 = 11.$$

4. Let required number of packets be x.

Numbers of packets and cartons are in direct proportion

$\therefore$ $120 : 20 = x : 35$

This gives, $x = \frac{120 \times 35}{20} = 210.$

5. Let required number of men be x.

Since, numbers of men and days are in inverse proportion.

$\therefore$ $\frac{20}{x} = \frac{4}{10}$

This gives, $x = \frac{20 \times 10}{4} = 50.$

6. Distance = Length of train = 350 m

Speed = 70 km / h = $\frac{70 \times 1000}{3600}$ m / s

$= \frac{175}{9}$ m / s.

Time = $\frac{\text{Distance}}{\text{Speed}} = \frac{350}{\left(\frac{175}{9}\right)} = \frac{350 \times 9}{175}$

= 18 seconds.

7. Let $\frac{x}{y} = k$, k is a constant

At $x = 9$ and $y = 4.5$, $k = \frac{9}{4.5} = 2$

$\therefore$ At $y = 8$ and $k = 2$, $x = 2 \times 8 = 16$

At $y = 13.25$ and $k = 2$,

$x = 2 \times 13.25 = 26.50$

Therefore, the complete table is:

x	16	9	19	26.50
y	8	4.5	9.5	13.25

8. (*i*) Directly (*ii*) Directly (*iii*) Directly (*iv*) Directly.

9. Workdone by Rohan in 1 day = $\frac{1}{5}$

$\therefore$ Workdone by Rohan in 2 days

$$= 2 \times \frac{1}{5} = \frac{2}{5}$$

10. Let required number of time be x days.

After joining 30 girls, number of girls

= 50 + 30 = 80.

Since number of girls and food provision vary inversely

$\therefore$ $\frac{50}{80} = \frac{x}{40}$

This gives, $x = \frac{50 \times 40}{80} = 25.$

Thus, the provision will last after 25 days.

11. $\because$ In 2 kg of sugar, number of crystals

$= 9 \times 10^6$

$\therefore$ In 1 kg of sugar, number of crystals

$$= \frac{9 \times 10^6}{2}$$

(*i*) $\therefore$ In 5 kg of sugar, number of crystals $= \frac{5 \times 9 \times 10^6}{2} = 22.5 \times 10^6$

$= 2.25 \times 10^7$

(*ii*) $\therefore$ In 1.2 kg of sugar, number of crystals $= 1.2 \times \frac{9 \times 10^6}{2} = 5.4 \times 10^6$.

WORKSHEET – 98

1. Numbers of buses and tourists vary directly.

$\therefore$ Number of tourists $= \frac{200}{10} \times 12$

$= 20 \times 12 = 240.$

2. Height of wall $= 20\frac{1}{4}$ m $= \frac{81}{4}$ m

$= \frac{81}{4} \times 100$ cm

$= 81 \times 25$ cm

Number of bricks $= \frac{\text{Height of wall}}{\text{Height of a brick}}$

$= \frac{81 \times 25}{15} = 135.$

3. Fare = ₹ $\frac{260}{200}$ per km = ₹ 1.30 per km.

Required distance $= \frac{279.50}{1.30}$ km

$= \frac{27950}{130}$ km

$= 215$ km.

4. Gunjan's speed $= \frac{\text{Number of steps}}{\text{Time}}$

$= \frac{540}{30}$ steps/min

$[\because \frac{1}{2}$ hour = 30 min.]

= 18 steps/min.

Required number of steps

= Speed × Time = 18 × 6 = 108.

5. $\because$ 8 days' wage = ₹ 200

$\therefore$ 1 day's wage = ₹ $\frac{200}{8}$ = ₹ 25

$\therefore$ 20 days' wage = ₹ 25 × 20 = ₹ 500.

6. Let required number of men be x.

Number of days	35	15
Number of men	18	x

Note that less the number of days, more the number of men. Therefore, this is a case of inverse proportion.

So, $35 \times 18 = 15 \times x$

or $\frac{35 \times 18}{15} = x$ or $42 = x$

Thus, 42 men should be require to repair the machine.

7. $xy = k$

At $x = 16$ and $y = 6$, $k = 16 \times 6 = 96$

So $xy = 96$

Hence,

x	12	16	24	8	384
y	8	6	4	12	0.25

8. One month and ten days = 40 days

In 30 days, 75 kg is consumed by 24 persons

In 1 day, 75 kg is consumed by 24 × 30 persons

In 1 day, 1 kg is consumed by $\frac{24 \times 30}{75}$ persons

In 40 days, 1 kg is consumed by $\frac{24 \times 30}{75 \times 40}$ persons

In 40 days, 50 kg is consumed by $\frac{24 \times 30}{75 \times 40} \times 50$ persons *i.e.*, 12 persons.

Therefore, the required number of persons is 12.

9. At 125 g per child, 150 children take 21 days

At 125 g per child, 1 child takes 21 × 150 days

At 1 g per child, 1 child takes 21 × 150 × 125 days

At 1 g per child, 175 children take $\frac{21 \times 15 \times 125}{175}$ days

At 100g per child, 175 children take $\frac{21 \times 150 \times 125}{100 \times 175}$ days i.*e.*, 22.5 days.

Therefore, the rice is enough for 22.5 days.

10. In 200 days, 120 men can eat the food.

In 5 days, 120 men can eat $\frac{1}{40}$ of the food.

So, $\frac{39}{40}$ of the food remains.

Further, 120 men can eat the food in 200 days

So, 90 men can eat the food in $\frac{200}{90} \times 120$ days

So, 90 men can eat $\frac{39}{40}$ of the food in $\frac{200 \times 120}{90} \times \frac{39}{40}$ days, *i.e.*, 260 days.

Thus, the remaining food lasts after 260 days.

WORKSHEET – 99

1. Let Roma can do x of the work in 4 days.

Number of days	20	4
Quantity of work	1	x

Number of days and quantity of work are in direct proportion

$\therefore \quad \frac{20}{4} = \frac{1}{x} \quad$ or $\quad x = \frac{1}{5}$

Thus, Roma can do $\frac{1}{5}$ work in 4 days.

2. Let m cows will graze the field in 20 days.

Number of cows	55	m
Number of days	16	20

Numbers of cows and days are in inverse proportion

$\therefore \quad 55 \times 16 = m \times 20$

Which gives, $m = \frac{55 \times 16}{20} = 44$

Thus, 44 cows will graze the same field in 20 days.

3. Let the required number of days be x.

Income increases as number of days of work increases. So, income and days of work vary directly

$\therefore \quad x \times 200 = 6 \times 875$

$\therefore \quad x = \frac{6 \times 875}{200} = 26\frac{1}{4}$

Thus, the man works for $26\frac{1}{4}$ days.

4. $\because$ 1 day's work of both Rita and Mita $= \frac{1}{4}$

and 1 day's work of Rita $= \frac{1}{6}$

$\therefore$ 1 day's work of Mita $= \frac{1}{4} - \frac{1}{6}$

$$= \frac{3-2}{12} = \frac{1}{12}$$

Consequently, we obtain that Mita alone can do the work in 12 days.

5. 1 day's work of both A and B $= \frac{1}{20}$

A alone can do the work in 5 × 12, *i.e.*, 60 days

$\therefore$ 1 day's work of A alone $= \frac{1}{60}$

So, 1 day's work of B alone

$$= \frac{1}{20} - \frac{1}{60} = \frac{3-1}{60} = \frac{1}{30}$$

Consequently, we obtain that B alone can do the work in 30 days.

6. $\because$ 7 days's income of 12 girls = ₹ 840

$\therefore$ 7 days' income of 1 girl $= ₹\ \frac{840}{12}$

= ₹ 70

$\therefore$ 1 day's income of 1 girl $= ₹\ \frac{70}{7}$

= ₹ 10

$\therefore$ 1 day's income of 15 girls

= ₹ 10 × 15 = ₹ 150

$\therefore$ 6 day's income of 15 girls

= ₹ 150 × 6

= ₹ 900.

Thus, 15 girls will earn ₹ 900 in 6 days.

7. Let the length of the bridge be x m.

$$\text{Speed} = 60 \text{ km/hr} = \frac{60 \times 1000}{60 \times 60} \text{ m/s}$$

$$= \frac{50}{3} \text{ m/s}$$

Time = 90 s

Distance = Length of the train + Length of the bridge

= (600 + x) m

Now, distance = Speed × Time

$$\therefore \quad 600 + x = \frac{50}{3} \times 90$$

or x = 1500 – 600 = 900 m

Thus, length of the bridge is 900 metres.

8. Money on Raghu

= Number of machines × Price of 1 machine

= ₹ 75 × 200

After discount, CP of a machine

= ₹ 200 – ₹ 50

= ₹ 150

Number of required machines

$$= \frac{₹\ 75 \times 200}{\text{CP of 1 machine}}$$

$$= \frac{₹\ 75 \times 200}{₹\ 150} = 100.$$

Thus, Raghu can buy 100 machines.

9. 1 day's work of both X and Y $= \frac{1}{20}$

$\therefore$ 2 day's work of both X and Y $= \frac{2}{20}$

$$= \frac{1}{10}$$

Remaining work $= 1 - \frac{1}{10} = \frac{9}{10}$.

1 day's work of Y alone $= \frac{1}{30}$

So, Y alone can finish the whole work in 30 days.

So, Y alone will finish $\frac{9}{10}$ of the work in $\frac{9}{10} \times 30$, *i.e.*, 27 days.

WORKSHEET – 100

1. Cost of 1 mango = $\frac{₹\ 156}{12}$ = ₹ 13

Cost of 9 mangoes

= 9 × Cost of 1 mango

= 9 × ₹ 13 = ₹ 117.

2. Speed = 50 km / hr = $\frac{50}{60}$ km / min

Time = 12 min.

Distance = Speed × Time = $\frac{50}{60} \times 12$

= 10 km.

3. Let x men will dig the trench in 14 days.

Number of men increases as number of days decreases. So, numbers of men and days are in inverse proportion.

$\therefore \quad \frac{56}{x} = \frac{14}{42}$ or $x = \frac{56 \times 42}{14}$

or x = 168 men.

4. Let 55 carpets can be woven in x days

Numbers of carpets and days vary directly

$\therefore \quad \frac{35}{21} = \frac{55}{x}$ or $x = \frac{21 \times 55}{35}$ or $x = 33$

Thus, Jojo can weave 55 carpets in 33 days.

5. Let required number of hours per day be x.

Since, numbers of hours per day and days vary inversely.

$\therefore \quad \frac{8}{x} = \frac{12}{18}$ or $x = \frac{18 \times 8}{12}$ or $x = 12$

Thus, Kamla should work 12 hours per day.

6. Let required number of words be x.

Number of words and time vary directly.

$\therefore \frac{620}{60} = \frac{x}{6}$ (∵ 1 hour = 60 minutes)

or $x = \frac{6 \times 620}{60} = 62$

Thus, Geeta can type 62 words in 6 minutes

7. Let $x = ky$ as x and y vary directly.

At $x = 4$ and $y = 16$, $k = \frac{4}{16} = \frac{1}{4}$

So, $x = \frac{y}{4}$

At $x = 9$, $y = 9 \times 4 = 36$

At $y = 48$, $x = \frac{48}{4} = 12$

At $y = 36$, $x = \frac{36}{4} = 9$

At $x = 3$, $y = 3 \times 4 = 12$

At $y = 4$, $x = \frac{4}{4} = 1$

At $x = 11$, $y = 11 \times 4 = 44$

Therefore, the complete table is:

x	4	9	12	9	3	1	11
y	16	36	48	36	12	4	44

8. Cost of 25 books = 25 × Cost of 1 book

= 25 × 500 = ₹ 12500

New cost of 1 book = ₹ 500 + ₹ 125

= ₹ 625

Required number of books = $\frac{12500}{625}$

= 20

Thus, Veena will be able to buy 20 books.

9. (*i*) directly

(*ii*) direct

(*iii*)

x	8	2
y	10	**40**

($\because xy$ = constant)

10. 1 day's work of both X and Y = $\frac{1}{10}$

1 day's work of both Y and Z = $\frac{1}{12}$

1 day's work of both X and Z = $\frac{1}{15}$

$\therefore$ 1 day's work of 2X's, 2Y's and 2Z's

$$= \frac{1}{10} + \frac{1}{12} + \frac{1}{15} = \frac{6+5+4}{60}$$

$$= \frac{15}{60} = \frac{1}{4}$$

$\therefore$ 1 day's work of all the X, Y, and Z

$$= \frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$$

Now, 1 day's work of X alone

$$= \frac{1}{8} - \frac{1}{12} = \frac{3-2}{24} = \frac{1}{24}$$

1 day's work of Y alone

$$= \frac{1}{8} - \frac{1}{15} = \frac{15-8}{120} = \frac{7}{120}$$

and 1 day's work of Z alone

$$= \frac{1}{8} - \frac{1}{10}$$

$$= \frac{5-4}{40} = \frac{1}{40}$$

Consequently, we obtain that X alone, Y alone, and Z alone can finish the work in 24 days, $\frac{120}{7}$, *i.e.*, $17\frac{1}{7}$ days and 40 days respectively.

WORKSHEET – 101

1. Cost of 20 kg sugar = ₹ 400 (Given)

Cost of 1 kg sugar = $\frac{400}{20}$ = ₹ 20

Cost of 5 kg sugar = 20 × 5 = 100

= ₹ 100.

2. $\frac{x}{y} = k$ (Given)

$\therefore$ k is a constant.

3.

x	20	17	14	11	8	5	2
y	40	34	28	22	16	10	4

According to question,

$\frac{x}{y}$ is the proportion

So, $\frac{x}{y} = \frac{1}{2}$.

4. According to question,

40 toffees were distributed among 5 children

Now, 3 more children arrived

Total children = 5 + 3 = 8 children

Toffees got by each children .

$= \frac{40}{8}$ = 5 toffees.

5.

Scale	1	2000000
Actual distance	5	x

$$\frac{1}{5} = \frac{2000000}{x}$$

$$1 \times x = 2000000 \times 5$$

$$x = 10000000 \text{ cm}$$

$$10000000 \text{ cm} = \frac{10000000}{100} \text{ m}$$

$$= 100000 \text{ m}$$

$$100000 \text{ m} = \frac{100000}{1000} \text{ km}$$

$$= 100 \text{ km.}$$

6. Height of vertical pole = 5 m 60 cm (Given)

and its shadow = 3 m 20 cm

We know that,

1 m = 100 cm

In cm

Height of vertical pole = 5 × 100 + 60
= 560 cm

Shadow = 3 × 100 + 20
= 320 cm

(*a*) Let the length of shadow = x m

The length of pole = 10 m 50 cm (Given)
= 10 × 100 + 50
= 1050 cm

Now,

$$\frac{560}{320} = \frac{1050}{x}$$

$$x = \frac{1050 \times 320}{560}$$

x = 600 cm

x = 6 m.

(*b*) Let the height of pole = y m

and the length of its shadow = 5 m
= 500 cm

Now,

$$\frac{560}{320} = \frac{y}{500}$$

$$y = \frac{560 \times 500}{320}$$

y = 875 cm
= 8 m 75 cm.

7. 8 people use cylinder for 30 days

1 people will use cylinder for 8 × 30 = 240 days

Now, 4 guests join the family
= 8 + 4
= 12 people

Now, cylinder will be long last for $\frac{240}{12}$ = 20 days.

8. Naman and Param can plough in 12 hours respectively and 16 hours.

Total work = 48 (By LCM)

(Naman) Efficiency of work in 1 hour

$$= \frac{48}{12} = 4$$

(Param) Efficiency of work in 1 hour

$$= \frac{48}{16} = 3$$

Efficiency of both work in 1 hour
= 4 + 3 = 7

Both of them when work together plough the complete field in,

$$\frac{48}{7} = 6\frac{6}{7} \text{ hours.}$$

∴ Total time they will take to plough together = $6\frac{6}{7}$ hours.

9. Taps A and B can fill in 12 hours and 16 hours respectively

2	12, 16, 8
2	6, 8, 4
2	3, 4, 2
	3, 2, 1

Tap C can empty in 8 hour = – 8

Total work = 48

A filled in 1 hour = $\frac{48}{12}$ = 4

B filled in 1 hour = $\frac{48}{16}$ = 3

C empited in 1 hour = $\frac{48}{-8}$ = – 6

Taps A, B, C in 1 hour = 4 + 3 – 6 = 1

Taps A, B, C take a time = $\frac{48}{1}$ = 48 hours.

❑❑

Chapter 14

FACTORIZATION

WORKSHEET–102

1. (C) Factors of 2 are 1 and 2 itself.

2. (C) $2xy + 2y + 3x + 3$

$= 2y(x + 1) + 3(x + 1)$

$= (2y + 3)(x + 1)$.

3. (B) 1 is a common factor of abc and pqr as these are divisible by 1.

4. (A) $6m - 12n = 6(m - 2n)$.

5. (D) $(x + a)(x + b) = x^2 + (a + b)x + ab$ is an identity.

6. (B) $\frac{2x+3}{3} = \frac{2x}{3} + \frac{3}{3} = \frac{2x}{3} + 1$.

7. (B) $\frac{7x-6x}{x} = \frac{7x}{x} - \frac{6x}{x} = 7 - 6 = 1$.

8. (A)Let us take identity

$(a + b)(a - b) = a^2 - b^2$

Put $a = 4x$ and $b = 3y$

$\therefore\ (4x + 3y)(4x - 3y) = (4x)^2 - (3y)^2$

or $10xy(4x + 3y)(4x - 3y)$

$= 10xy(16x^2 - 9y^2)$.

9. (D) $5z^2 - 80 = 5(z^2 - 16)$

$= 5(z + 4)(z - 4)$.

10. (D) $(p^3q^6 - p^6q^3) \div p^3q^3$

$= p^3q^3(q^3 - p^3) \div p^3q^3$

$= q^3 - p^3$.

11. (C) $162 = 9 \times 18$

9 is a factor of 162.

12. (D) $a^2 - b^2 = (a + b)(a - b)$

At $a = 9$ and $b = 8$,

$9^2 - 8^2 = 17 \times 1 = 17$.

13. (B) $\frac{y^2}{y^2} = 1$.

14. (A) $6(x^2yz + xy^2z + xyz^2) = 6xyz(x + y + z)$

So, $6(x^2yz + xy^2z + xyz^2)$ is divisible by xyz.

15. (A) $120x^2 = 2^3 \times 3 \times 5 \times x \times x$

$96xy = 2^5 \times 3 \times x \times y$

$108xy^2 = 2^2 \times 3^3 \times x \times y \times y$

$\therefore$ HCF $= 2^2 \times 3 \times x = 12x$.

16. (B) $a^2 + bc + ab + ac$

$= a^2 + ab + ac + bc$

$= a(a + b) + c(a + b) = (a + b)(a + c)$.

Thus, factors are $(a + b)$ and $(a + c)$.

17. (C) $x^3 + 2x^2 + x = x(x^2 + 2x + 1)$

$= x(x + 1)(x + 1)$

Clearly, $x + 2$ is not a factor.

18. (D) Factors of 4 are 1, 2 and 4

Factors of x^2 are 1, x and x^2

So, all the factors of $4x^2$ are 1, 2, 4, x, x^2, $2x$, $2x^2$, $4x$ and $4x^2$.

19. (C) $x - 1 + (x - 1)x^2 = x^2(x - 1) + (x - 1)$

$= (x - 1)(x^2 + 1)$.

20. (A) $a^2 - b^2 = (a + b)(a - b)$

Substituting $a = z$ and $b = 11$, we get

$z^2 - 121 = (z + 11)(z - 11)$.

21. (B) $66 = 1 \times 2 \times 3 \times 11$

So, factors of 66 are, 1, 2, 3, 6, 11, 22, 33 and 66

So, number of factors of 66 is 8.

WORKSHEET – 103

1. (*i*) The further factors of $2y(xy + 3)$ are not possible,

So it is in the factor form.

(*ii*) $x^2 + 8x + 16 = (x + 4)^2$

$= (x + 4)(x + 4)$

So, $x^2 + 8x + 16$ is in the expanded form.

(*iii*) Factors of $(2x + 3) + 7$ or $2x + 10$ are possible, so it is in the expanded form.

(*iv*) Factors of $3x - 7$ are possible, so it is in the expanded form.

2. (*i*) $a^3 = a \times a \times a$ and $a = a$

So, HCF $(a^3, a) = a$.

(*ii*) $x^2y = x \times x \times y$ and $xy = x \times y$

So, HCF $(x^2y, xy) = x \times y = xy$.

(*iii*) $6x^2y^2 = 2 \times 3 \times x \times x \times y \times y$ and

$2x^2y = 2 \times x \times x \times y$

So, HCF $(6x^2y^2, 2x^2y) = 2 \times x \times x \times y$

$= 2x^2y$.

(*iv*) $a^3b = a \times a \times a \times b$ and $a^2 = a \times a$

So, HCF $(a^3b, a^2) = a \times a = a^2$.

3. (*i*) $4x = 2 \times 2 \times x$ and $8y = 2 \times 2 \times 2 \times y$

$\therefore$ HCF $(4x, 8y) = 2 \times 2 = 4$

Therefore, $4x + 8y = 4(x + 2y)$.

(*ii*) $3x = 3 \times x$ and $9y = 3 \times 3 \times y$

$\therefore$ HCF $(3x, 9y) = 3$

Therefore, $3x + 9y = 3(x + 3y)$.

(*iii*) $4x = 2 \times 2 \times x$ and $-12 = -2 \times 2 \times 3$

$\therefore$ HCF $(4x, -12) = 2 \times 2 = 4$

Therefore, $4x - 12 = 4(x - 3)$.

(*iv*) $6x^2 = 2 \times 3 \times x \times x$,

$-12x^3 = -2 \times 2 \times 3 \times x \times x \times x$

and $36x^4 = 2 \times 2 \times 3 \times 3 \times x \times x \times x \times x$

$\therefore$ HCF $(6x^2, -12x^3, 36x^4)$

$= 2 \times 3 \times x \times x = 6x^2$

Therefore, $6x^2 - 12x^3 + 36x^4$

$= 6x^2(1 - 2x + 6x^2)$.

4. (*i*) $x^2 + xy + 8x + 8y$

$= (x^2 + xy) + (8x + 8y)$

$= x(x + y) + 8(x + y)$

$= (x + y)(x + 8)$.

(*ii*) $15xy - 6x + 5y - 2$

$= (15xy - 6x) + (5y - 2)$

$= 3x(5y - 2) + 1(5y - 2)$

$= (5y - 2)(3x + 1)$.

(*iii*) $ax - ay + bx - by$

$= (ax - ay) + (bx - by)$

$= a(x - y) + b(x - y)$

$= (x - y)(a + b)$.

(*iv*) $z - 6 - 6xy + xyz$

$= (z - 6) + (xyz - 6xy)$

$= (z - 6) + xy(z - 6)$

$= (z - 6)(1 + xy)$.

(*v*) $10mn + 4m + 5n + 2$

$= (10mn + 4m) + (5n + 2)$

$= 2m(5n + 2) + 1(5n + 2)$

$= (5n + 2)(2m + 1)$.

5. (*i*) $x^2 + 10x + 25 = x^2 + 5x + 5x + 25$

$= x^2 + 2 \times 5x + 25$

$= (x + 5)^2$.

(*ii*) $m^2 + 8m + 16 = m^2 + 4m + 4m + 16$

$= m^2 + 2 \times 4m + 16$

$= (m + 4)^2$.

(*iii*) $x^2 + 17x + 60 = x^2 + 12x + 5x + 60$
$= x(x + 12) + 5(x + 12)$
$= (x + 12)(x + 5).$

(*iv*) $x^2 + 5xy - 24y^2$
$= x^2 + 8xy - 3xy - 24y^2$
$= x(x + 8y) - 3y(x + 8y)$
$= (x + 8y)(x - 3y).$

OR

(*i*) $x^2 + 3x - 40 = x^2 + 8x - 5x - 40$
$= x(x + 8) - 5(x + 8)$
$= (x + 8)(x - 5).$

(*ii*) $x^2 - 33x + 90 = x^2 - 30x - 3x + 90$
$= x(x - 30) - 3(x - 30)$
$= (x - 30)(x - 3).$

(*iii*) $n^2 + 17n - 60 = n^2 + 20n - 3n - 60$
$= n(n + 20) - 3(n + 20)$
$= (n + 20)(n - 3).$

(*iv*) $z^2 + 13z - 90 = z^2 + 18z - 5z - 90$
$= z(z + 18) - 5(z + 18)$
$= (z + 18)(z - 5).$

6. (*i*) $12x^2 - 23xy + 10y^2$
$= 12x^2 - 15xy - 8xy + 10y^2$
$= 3x(4x - 5y) - 2y(4x - 5y)$
$= (4x - 5y)(3x - 2y).$

(*ii*) $12x^2 + 7xy - 10y^2$
$= 12x^2 + 15xy - 8xy - 10y^2$
$= 3x(4x + 5y) - 2y(4x + 5y)$
$= (4x + 5y)(3x - 2y).$

(*iii*) $6x^2 + 35xy - 6y^2$
$= 6x^2 + 36xy - xy - 6y^2$
$= 6x(x + 6y) - y(x + 6y)$
$= (x + 6y)(6x - y).$

WORKSHEET – 104

1. (*i*) $(x + 5)(x + 3) = x(x + 3) + 5(x + 3)$
$= x^2 + 3x + 5x + 15$
$= x^2 + 8x + 15.$

(*ii*) $(x - 10)(x - 5) = x(x - 5) - 10(x - 5)$
$= x^2 - 5x - 10x + 50$
$= x^2 - 15x + 50.$

2. (*i*) $5y^2 - 20y + 8z - 2yz$
$= 5y(y - 4) - 2z(-4 + y)$
$= (y - 4)(5y - 2z).$

(*ii*) $ab - bx + ay - xy = b(a - x) + y(a - x)$
$= (a - x)(b + y).$

3. (*i*) $q^2 - 10q + 21 = (q - 5)^2 - 5^2 + 21$
$= (q - 5)^2 - 2^2$
$= (q - 5 + 2)(q - 5 - 2)$
$= (q - 3)(q - 7).$

(*ii*) $p^2 + 6p - 16 = (p + 3)^2 - 3^2 - 16$
$= (p + 3)^2 - 5^2$
$= (p + 3 + 5)(p + 3 - 5)$
$= (p + 8)(p - 2).$

4. (*i*) $p^2 - 36p + 99$
$= p^2 - 2 \times 18p + 99$
$= (p - 18)^2 - 18^2 + 99$
$= (p - 18)^2 - 225 = (p - 18)^2 - 15^2$
$= (p - 18 + 15)(p - 18 - 15)$
$= (p - 3)(p - 33).$

(*ii*) $x^2 + 4x - 45 = x^2 + 2 \times 2x - 45$
$= (x + 2)^2 - 2^2 - 45$
$= (x + 2)^2 - 7^2$
$= (x + 2 + 7)(x + 2 - 7)$
$= (x + 9)(x - 5).$

(*iii*) $p^2 + 4p - 77 = (p + 2)^2 - 2^2 - 77$
$= (p + 2)^2 - 9^2$

$= (p + 2 + 9)(p + 2 - 9)$

$= (p + 11)(p - 7).$

(*iv*) $a^2 - 4a - 21 = (a-2)^2 - 2^2 - 21$

$= (a-2)^2 - 5^2$

$= (a - 2 + 5)(a - 2 - 5)$

$= (a + 3)(a - 7).$

(*v*) $y^2 - 11y + 24$

$= \left(y - \frac{11}{2}\right)^2 - \left(\frac{11}{2}\right)^2 + 24$

$= \left(y - \frac{11}{2}\right)^2 - \left(\frac{5}{2}\right)^2$

$= \left(y - \frac{11}{2} + \frac{5}{2}\right)\left(y - \frac{11}{2} - \frac{5}{2}\right)$

$= (y - 3)(y - 8).$

(*vi*) $z^2 - 5z - 6 = \left(z - \frac{5}{2}\right)^2 - \left(\frac{5}{2}\right)^2 - 6$

$= \left(z - \frac{5}{2}\right)^2 - \left(\frac{7}{2}\right)^2$

$= \left(z - \frac{5}{2} + \frac{7}{2}\right)\left(z - \frac{5}{2} - \frac{7}{2}\right)$

$= (z + 1)(z - 6).$

5. (*i*) $2x^2 - 14x + 24 = 2(x^2 - 7x + 12)$

$= 2(x^2 - 4x - 3x + 12)$

$= 2\{x(x-4) - 3(x-4)\}$

$= 2(x - 4)(x - 3).$

(*ii*) $4x^2 - 16x - 9 = 4x^2 - 18x + 2x - 9$

$= 2x(2x - 9) + 1(2x - 9)$

$= (2x - 9)(2x + 1).$

(*iii*) $8a^2 - 22a + 15 = 8a^2 - 12a - 10a + 15$

$= 4a(2a - 3) - 5(2a - 3)$

$= (2a - 3)(4a - 5).$

(*iv*) $10a^2 - 83a - 17$

$= 10a^2 - 85a + 2a - 17$

$= 5a(2a - 17) + 1(2a - 17)$

$= (2a - 17)(5a + 1).$

(*v*) $2x^2 - 35x - 18$

$= 2x^2 - 36x + x - 18$

$= 2x(x - 18) + 1(x - 18)$

$= (x - 18)(2x + 1).$

WORKSHEET – 105

1. $8(p - 8q)^2 - 6(p - 8q)$

$= 2(p - 8q)\{4(p - 8q) - 3\}$

$= 2(p - 8q)(4p - 32q - 3).$

2. (*i*) $4y^2 + 12y + 5$

$= 4\left(y^2 + 3y + \frac{5}{4}\right)$

$= 4\left[\left(y + \frac{3}{2}\right)^2 - \left(\frac{3}{2}\right)^2 + \frac{5}{4}\right]$

$= 4\left[\left(y + \frac{3}{2}\right)^2 - 1^2\right]$

$= 4\left(y + \frac{3}{2} + 1\right)\left(y + \frac{3}{2} - 1\right)$

$= 4\left(y + \frac{5}{2}\right)\left(y + \frac{1}{2}\right)$

$= (2y + 5)(2y + 1).$

(*ii*) $x^2 + 17x + 30$

$= \left(x + \frac{17}{2}\right)^2 - \left(\frac{17}{2}\right)^2 + 30$

$= \left(x + \frac{17}{2}\right)^2 - \left(\frac{13}{2}\right)^2$

$= \left(x + \frac{17}{2} + \frac{13}{2}\right)\left(x + \frac{17}{2} - \frac{13}{2}\right)$

$= (x + 15)(x + 2).$

3. We are given the identity:

$a^2 - b^2 = (a + b)(a - b)$

(*i*) $9q^2 - 25p^2 = (3q)^2 - (5p)^2$

$= (3q + 5p)(3q - 5p).$

(*ii*) $9x^2y^2 - 16 = (3xy)^2 - (4)^2$
$= (3xy + 4)(3xy - 4).$

(*iii*) $4x^2 - 9y^2 = (2x)^2 - (3y)^2$
$= (2x + 3y)(2x - 3y).$

(*iv*) $x^4 - 25 = (x^2)^2 - (5)^2$
$= (x^2 + 5)(x^2 - 5)$
$= (x^2 + 5)\{x^2 - (\sqrt{5})^2\}$
$= (x^2 + 5)(x + \sqrt{5})(x - \sqrt{5}).$

(*v*) $12x^5 - 108x^3 = 12x^3(x^2 - 9)$
$= 12x^3(x^2 - 3^2)$
$= 12x^3(x + 3)(x - 3).$

4. (*i*) $x^2 + x - 6 = x^2 + 3x - 2x - 6$
$= x(x + 3) - 2(x + 3)$
$= (x + 3)(x - 2).$

(*ii*) $m^2 + 23m + 90$
$= m^2 + 18m + 5m + 90$
$= m(m + 18) + 5(m + 18)$
$= (m + 18)(m + 5).$

(*iii*) $b^2 - 5b - 24 = b^2 - 8b + 3b - 24$
$= b(b - 8) + 3(b - 8)$
$= (b - 8)(b + 3).$

(*iv*) $a^2 - 24ab + 140b^2$
$= a^2 - 14ab - 10ab + 140b^2$
$= a(a - 14b) - 10b(a - 14b)$
$= (a - 14b)(a - 10b).$

5. (*i*) $3x^2 + 12x + 12 = 3(x^2 + 4x + 4)$
$= 3(x + 2)^2$
$= 3(x + 2)(x + 2).$

(*ii*) $y^2 + y - 56 = y^2 + 8y - 7y - 56$
$= y(y + 8) - 7(y + 8)$
$= (y + 8)(y - 7).$

(*iii*) $\frac{1}{4}x^2 + x - 3$
$= \frac{1}{4}(x^2 + 4x - 12)$
$= \frac{1}{4}(x^2 + 6x - 2x - 12)$
$= \frac{1}{4}\{x(x + 6) - 2(x + 6)\}$
$= \frac{1}{4}(x + 6)(x - 2).$

(*iv*) $4x^2 - 8x + 4 = 4(x^2 - 2x + 1)$
$= 4(x - 1)^2$
$= 4(x - 1)(x - 1).$

(*v*) $49p^2 + q^2 - 9r^2 - 14pq$
$= (49p^2 - 14pq + q^2) - 9r^2$
$= (49p^2 - 7pq - 7pq + q^2) - 9r^2$
$= \{7p(7p - q) - q(7p - q)\} - 9r^2$
$= (7p - q)(7p - q) - 9r^2$
$= (7p - q)^2 - (3r)^2$
$= (7p - q + 3r)(7p - q - 3r).$

WORKSHEET – 106

1. (*i*) $12x^2 = 2 \times 2 \times 3 \times x \times x$
$16y^3 = 2 \times 2 \times 2 \times 2 \times y \times y \times y$
$\therefore$ HCF $(12x^2, 16y^3) = 2 \times 2 = 4.$

(*ii*) $18a^2b^2 = 2 \times 3 \times 3 \times a \times a \times b \times b$
$-24ab = -1 \times 2 \times 2 \times 2 \times 3 \times a \times b$
$\therefore$ HCF $(18a^2b^2, -24ab) = 2 \times 3 \times a \times b$
$= 6ab.$

(*iii*) $90a^2bc = 2 \times 3 \times 3 \times 5 \times a \times a \times b \times c$
$81bc = 3 \times 3 \times 3 \times 3 \times b \times c$
$\therefore$ HCF $(90a^2bc, 81bc) = 3 \times 3 \times b \times c$
$= 9bc.$

2. (*i*) $12ab - 8b - 6 + 9a$
$= (12ab + 9a) - (8b + 6)$
$= 3a(4b + 3) - 2(4b + 3)$
$= (4b + 3)(3a - 2).$

(*ii*) $28x - 21y + 8x^2 - 6xy$
$= (28x - 21y) + (8x^2 - 6xy)$

$= 7(4x - 3y) + 2x(4x - 3y)$

$= (4x - 3y)(7 + 2x).$

(*iii*) $5ab - 3a + 10b - 6$

$= (5ab + 10b) - (3a + 6)$

$= 5b(a + 2) - 3(a + 2)$

$= (a + 2)(5b - 3).$

(*iv*) $4x^2 - 16xy - 3x + 12y$

$= (4x^2 - 16xy) - (3x - 12y)$

$= 4x(x - 4y) - 3(x - 4y)$

$= (x - 4y)(4x - 3).$

(*v*) $16l^2 - 8l - 4lm + 2m$

$= (16l^2 - 8l) - (4lm - 2m)$

$= 8l(2l - 1) - 2m(2l - 1)$

$= (2l - 1)(8l - 2m)$

$= 2(2l - 1)(4l - m).$

3. (*i*) $-16m^2 = -1 \times 2 \times 2 \times 2 \times 2 \times m \times m$

$24m^3 = 2 \times 2 \times 2 \times 3 \times m \times m \times m$

$\therefore$ HCF $(-16m^2, 24m^3)$

$= 2 \times 2 \times 2 \times m \times m = 8m^2$

So, $-16m^2 + 24m^3 = 8m^2(-2 + 3m).$

(*ii*) $20l^3 = 2 \times 2 \times 5 \times l \times l \times l$

$30alm = 2 \times 3 \times 5 \times a \times l \times m$

$\therefore$ HCF $(20l^3, 30alm) = 2 \times 5 \times l = 10l$

So, $20l^3 + 30alm = 10l(2l^2 + 3am).$

(*iii*) $6x^3y = 2 \times 3 \times x \times x \times x \times y$

$-18xy^3 = -1 \times 2 \times 3 \times 3 \times x \times y \times y \times y$

$\therefore$ HCF $(6x^3y, -18xy^3) = 2 \times 3 \times x \times y$

$= 6xy$

So, $6x^3y - 18xy^3$

$= 6xy(x^2 - 3y^2)$

$= 6xy(x + \sqrt{3}y)(x - \sqrt{3}y).$

(*iv*) $-6a^2 = -1 \times 2 \times 3 \times a \times a$

$6ab = 2 \times 3 \times a \times b$

$-6ca = -1 \times 2 \times 3 \times c \times a$

$\therefore$ HCF $(-6a^2, 6ab, -6ca) = 2 \times 3 \times a$

$= 6a$

So, $-6a^2 + 6ab - 6ca = 6a(-a + b - c).$

(*v*) $p^2qr = p \times p \times q \times r$

$pq^2r = p \times q \times q \times r$

$pqr^2 = p \times q \times r \times r$

$\therefore$ HCF $(p^2qr, pq^2r, pqr^2) = p \times q \times r$

$= pqr$

So, $p^2qr + pq^2r + pqr^2 = pqr(p + q + r).$

4. (*i*) $4p^2q^2 - 36r^2 = 4(p^2q^2 - 9r^2)$

$= 4[(pq)^2 - (3r)^2]$

$= 4(pq + 3r)(pq - 3r).$

(*ii*) $s(r + q) + 4(r + q) = (r + q)(s + 4).$

(*iii*) $49x^2 - 36 = (7x)^2 - 6^2$

$= (7x + 6)(7x - 6).$

(*iv*) $16x^2 - 9y^2 = (4x)^2 - (3y)^2$

$= (4x + 3y)(4x - 3y).$

OR

(*i*) $a^2 - 2ab + b^2 - c^2$

$= (a^2 - 2ab + b^2) - c^2$

$= (a - b)^2 - c^2$

$= (a - b + c)(a - b - c).$

(*ii*) $8x^3y - 32xy^3 = 8xy(x^2 - 4y^2)$

$= 8xy[x^2 - (2y)^2]$

$= 8xy(x + 2y)(x - 2y).$

(*iii*) $12xyz^2 - 27x^3y^3$

$= 3xy(4z^2 - 9x^2y^2)$

$= 3xy[(2z)^2 - (3xy)^2]$

$= 3xy(2z + 3xy)(2z - 3xy).$

(*iv*) $50a^2b^2 - 98c^2 = 2(25a^2b^2 - 49c^2)$

$= 2[(5ab)^2 - (7c)^2]$

$= 2(5ab + 7c)(5ab - 7c).$

5. (*i*) $49 - x^2 - y^2 + 2xy$

$= 49 - (x^2 + y^2 - 2xy)$

$= 7^2 - (x - y)^2$

$= (7 - x + y)(7 + x - y).$

(*ii*) $x^2 - y^2 + 4xz + 4z^2$

$= x^2 + 4xz + 4z^2 - y^2$

$= (x + 2z)^2 - y^2$

$= (x + y + 2z)(x - y + 2z).$

(*iii*) $a^2 + 2ab + b^2 - c^2$

$= (a + b)^2 - c^2$

$= (a + b + c)(a + b - c).$

WORKSHEET – 107

1. (*i*) $x^2 + 4x - 21 = (x + 2)^2 - 2^2 - 21$

$= (x + 2)^2 - 5^2$

$= (x + 2 + 5)(x + 2 - 5)$

$= (x + 7)(x - 3).$

(*ii*) $1 - 16x^2 + 64x^4$

$= (1 - 8x^2)^2 = [1^2 - (2\sqrt{2}x)^2]^2$

$= (1+2\sqrt{2}x)^2(1-2\sqrt{2}x)^2$

$= (1+2\sqrt{2}x)(1+2\sqrt{2}x)$

$(1-2\sqrt{2}x)(1-2\sqrt{2}x).$

2. $18a^2b^3c - 12abc + 24ab^2c^2$

$= 6abc(3ab^2 - 2 + 4bc)$

Now, $\dfrac{18a^2b^3c - 12abc + 24ab^2c^2}{6abc}$

$= \dfrac{6abc(3ab^2 + 4bc - 2)}{6abc}$

$= (3ab^2 + 4bc - 2).$

3. (*i*) $p^4q^3r^2 = p \times p \times p \times p \times q \times q \times q \times r \times r$

$p^2q^4r^3 = p \times p \times q \times q \times q \times q \times r \times r \times r$

$p^3q^2r^4 = p \times p \times p \times q \times q \times r \times r \times r \times r$

$\therefore$ HCF $(p^4q^3r^2, p^2q^4r^3, p^3q^2r^4)$

$= p \times p \times q \times q \times r \times r = p^2q^2r^2$

So, $p^4q^3r^2 + p^2q^4r^3 + p^3q^2r^4$

$= p^2q^2r^2(p^2q + q^2r + pr^2).$

(*ii*) $-10a^3b = -1 \times 2 \times 5 \times a \times a \times a \times b$

$-30ab^3 = -1 \times 2 \times 3 \times 5 \times a \times b \times b \times b$

$-20a^3b^3 = -1 \times 2 \times 2 \times 5 \times a \times a \times a \times b \times b \times b$

$\therefore$ HCF $(-10a^3b, -30ab^3, -20a^3b^3)$

$= -1 \times 2 \times 5 \times a \times b = -10ab$

So, $-10a^3b - 30ab^3 - 20a^3b^3$

$= -10ab(a^2 + 3b^2 + 2a^2b^2).$

(*iii*) $x^3 = 1 \times x \times x \times x$

$x^2 = 1 \times x \times x$

$x = 1 \times x$

$1 = 1$

$\therefore$ HCF $(x^3, x^2) = x \times x = x^2$

and HCF $(x, 1) = 1$

So, $x^3 + x^2 + x + 1 = x^2(x + 1) + 1(x + 1)$

$= (x + 1)(x^2 + 1).$

OR

(*i*) $x^2 - 6x + 9 = (x - 3)^2$

$= (x - 3)(x - 3)$

$\therefore \dfrac{x^2 - 6x + 9}{x - 3} = \dfrac{(x - 3)(x - 3)}{x - 3}$

$= x - 3.$

(*ii*) $x^2 - 16 = x^2 - 4^2 = (x + 4)(x - 4)$

$\therefore \dfrac{x^2 - 16}{x + 4} = \dfrac{(x + 4)(x - 4)}{x + 4}$

$= (x - 4).$

4. (i) $m^2 - 10m + 24 = m^2 - 6m - 4m + 24$
$= m(m - 6) - 4(m - 6)$
$= (m - 6)(m - 4).$

(ii) $p^2 + p - 72 = p^2 + 9p - 8p - 72$
$= p(p + 9) - 8(p + 9)$
$= (p + 9)(p - 8).$

(iii) $a^2 + 13a - 14 = a^2 + 14a - a - 14$
$= a(a + 14) - 1(a + 14)$
$= (a + 14)(a - 1).$

(iv) $x^2 - 17x + 30 = x^2 - 2x - 15x + 30$
$= x(x - 2) - 15(x - 2)$
$= (x - 2)(x - 15).$

(v) $9a^2 + 12ab + 4b^2 = (3a + 2b)^2$
$= (3a + 2b)(3a + 2b).$

(vi) $6x^2 - x - 15 = 6x^2 - 10x + 9x - 15$
$= 2x(3x - 5) + 3(3x - 5)$
$= (3x - 5)(2x + 3).$

(vii) $4x^2 - 8x + 4 = 4(x^2 - 2x + 1)$
$= 4(x - 1)^2$
$= 4(x - 1)(x - 1).$

(viii) $2x^2 + 13x + 20 = 2x^2 + 8x + 5x + 20$
$= 2x(x + 4) + 5(x + 4)$
$= (x + 4)(2x + 5).$

(ix) $49a^2b^2 - 64c^2 = (7ab)^2 - (8c)^2$
$= (7ab + 8c)(7ab - 8c).$

(x) $m(x + a) + 3(x + a) = (x + a)(m + 3).$

(xi) $x^4 - y^4 = (x^2)^2 - (y^2)^2$
$= (x^2 + y^2)(x^2 - y^2)$
$= (x^2 + y^2)(x + y)(x - y).$

(xii) $9x^2 + 16y^2 - 24xy = (3x - 4y)^2$
$= (3x - 4y)(3x - 4y).$

WORKSHEET – 108

1. $2x^2 + 13x + 20 = 2x^2 + 8x + 5x + 20$
$= 2x(x + 4) + 5(x + 4)$
$= (x + 4)(2x + 5)$

Now, $\dfrac{2x^2 + 13x + 20}{x + 4} = \dfrac{(x + 4)(2x + 5)}{x + 4}$
$= 2x + 5.$

2. $\because$ Cost of $7z$ metres cloth
$= ₹\,(14z^2 + 21z^3)$
$= ₹\,7z^2(2 + 3z)$

$\therefore$ Cost of 1 metre cloth
$= \dfrac{₹\,7z^2(2 + 3z)}{7z}$
$= ₹\,z(2 + 3z)$
$= ₹\,(2z + 3z^2).$

3. (i) $40x^4 \div 20x^2 = \dfrac{20x^2 \times 2x^2}{20x^2} = 2x^2.$

(ii) $12xy \div 3xy = \dfrac{4 \times 3xy}{3xy} = 4.$

(iii) $a^6 \div a^3 = \dfrac{a^3 \times a^3}{a^3} = a^3.$

4. (i) $\dfrac{5x^5y^2}{5xy} = \dfrac{5xy \times x^4y}{5xy} = x^4y.$

(ii) $\dfrac{7a - 7b}{7} = \dfrac{7(a - b)}{7} = a - b.$

(iii) $\dfrac{72y^6 + 8y^4}{8y^3} = \dfrac{8y^3(9y^3 + y)}{8y^3}$
$= 9y^3 + y.$

5. Area $= 5a^2 + 25a = 5a(a + 5)$
$b = 25a,\ l = ?$

Area = $l \times b$

$\therefore$ $5a(a + 5) = l \times 25a$

or $l = \frac{5a(a+5)}{5 \times 5a} = \frac{a+5}{5}$

Thus, length of the rectangle is $\frac{a}{5} + 1$.

6. (*i*) $3x^2 + 11xy + 6y^2$

$= 3x^2 + 9xy + 2xy + 6y^2$

$= 3x(x + 3y) + 2y(x + 3y)$

$= (x + 3y)(3x + 2y)$.

(*ii*) $6x^2 - 13x + 6 = 6x^2 - 9x - 4x + 6$

$= 3x(2x - 3) - 2(2x - 3)$

$= (2x - 3)(3x - 2)$.

(*iii*) $x^4 - 81 = (x^2)^2 - 9^2 = (x^2 + 9)(x^2 - 9)$

$= (x^2 + 9)(x^2 - 3^2)$

$= (x^2 + 9)(x + 3)(x - 3)$.

7. (*i*) $x^2 + 7x + 10 = x^2 + 2x + 5x + 10$

$= x(x + 2) + 5(x + 2)$

$= (x + 2)(x + 5)$

$\therefore \frac{x^2 + 7x + 10}{x+5} = \frac{(x+2)(x+5)}{x+5}$

$= x + 2$.

(*ii*) $x^2 + 5x + 6 = x^2 + 2x + 3x + 6$

$= x(x + 2) + 3(x + 2)$

$= (x + 2)(x + 3)$

$\therefore \frac{x^2 + 5x + 6}{x+3} = \frac{(x+2)(x+3)}{x+3}$

$= x + 2$.

(*iii*) $x^2 + 10x + 24 = x^2 + 6x + 4x + 24$

$= x(x + 6) + 4(x + 6)$

$= (x + 6)(x + 4)$

$\therefore \frac{x^2 + 10x + 24}{x+4} = \frac{(x+6)(x+4)}{x+4}$

$= x + 6$.

(*iv*) $x^2 + x - 56 = x^2 + 8x - 7x - 56$

$= x(x + 8) - 7(x + 8)$

$= (x + 8)(x - 7)$

$\therefore \frac{x^2 + x - 56}{x+8} = \frac{(x+8)(x-7)}{x+8}$

$= x - 7$.

(*v*) $x^2 + 7x + 6 = x^2 + 6x + x + 6$

$= x(x + 6) + 1(x + 6)$

$= (x + 6)(x + 1)$

$\therefore \frac{x^2 + 7x + 6}{x+1} = \frac{(x+6)(x+1)}{x+1}$

$= x + 6$.

(*vi*) $x^4 - 16 = (x^2)^2 - 4^2 = (x^2 + 4)(x^2 - 4)$

$= (x^2 + 4)(x^2 - 2^2)$

$= (x^2 + 4)(x + 2)(x - 2)$

$\therefore \frac{x^4 - 16}{x+2} = \frac{(x^2+4)(x+2)(x-2)}{x+2}$

$= (x^2 + 4)(x - 2)$.

WORKSHEET – 109

1. Factors of $ab = 1 \times a \times b$

1, a and b are the factors of ab.

2. 1 is the factor of every natural number.

3. Factors of $xy = x \times y$

Factors of $yz = y \times z$

Common factor = y.

4. $12 = 1 \times 12, 2 \times 6, 3 \times 4, 4 \times 3,$

$6 \times 2, 12 \times 1$

1, 2, 3, 4, 6 and 12 are all the factors of 12.

5. $x^2 - 4 = (x)^2 - (2)^2$

$= (x + 2)(x - 2)$

$[\because a^2 - b^2 = (a + b)(a - b)]$.

6. Length = x cm, Breadth = y cm (Given)

We know that,

Area of rectangle = length × breadth

$= x \times y = xy$ cm^2.

7. No.

8. $15xy = 3 \times 5 \times x \times y$

9. $6x^2 \div (-2x) = \dfrac{6x^2}{-2x} = \dfrac{6 \times x \times x}{(-2) \times x} = -3x.$

10. (*i*) $x^2 + 6x + 9 = x^2 + 3x + 3x + 9$

$= x^2 + 2 \times 3x + 3^2$

$= (x + 3)^2$

$[\because (a + b)^2 = a^2 + 2ab + b^2]$

(*ii*) $c^2 - 2cd + d^2 = c^2 - cd - cd + d^2$

$= c^2 - 2 \times cd + d^2$

$= (c - d)^2$

$[\because (a - b)^2 = a^2 - 2ab + b^2]$

(*iii*) $4x^2 + 20xy + 25y^2$

$= (2x)^2 + 10xy + 10xy + (5y)^2$

$= (2x)^2 + 2 \times 10xy + (5y)^2$

$= (2x)^2 + 2 \times 2x \times 5y + (5y)^2$

$= (2x + 5y)^2$

$[\because (a + b)^2 = a^2 + 2ab + b^2]$.

11. (*i*) To factorise $x^2 + 6x + 8$, we find the numbers m and n such as $m + n = b = 6$ and $m \times n = a \times c = 1 \times 8 = 8$

So, the given expression can be factorise as $x^2 + 6x + 8 = x^2 + (4 + 2)x + 8$

(Splitting the middle term)

$= x^2 + 4x + 2x + 8$

$= x(x + 4) + 2(x + 4)$

$= (x + 2)(x + 4)$

(*ii*) $q^2 - 10q + 21$

To factorise $q^2 - 10q + 21$, we find the numbers m and n such as $m + n = -10 = b$ and $m \times n = a \times c = 1 \times 21 = 21$

So, the given expression can be factorise as

$q^2 - 10q + 21 = q^2 - 3q - 7q + 21$

(Splitting the middle term)

$= q(q - 3) - 7(q - 3)$

$= (q - 3)(q - 7)$

(*iii*) $p^2 + 6p - 16 = p^2 + 8p - 2p - 16$

(Splitting the middle term)

$= p(p + 8) - 2(p + 8)$

$= (p - 2)(p + 8)$

(*iv*) $a^2 - 5a - 36 = a^2 - 9a + 4a - 36$

(Splitting the middle term)

$= a(a - 9) + 4(a - 9)$

$= (a + 4)(a - 9)$.

❑❑

Chapter 15

INTRODUCTION TO GRAPHS

WORKSHEET – 110

1. (B) A point (x, 0) lies on the x-axis.

2. (A) (2, 0) lies on the x-axis as (x, 0) lies on the x-axis.

3. (D) x-coordinate of E = 5

y-coordinate of E = 4

So, the coordinates of E are (5, 4).

4. (A) The coordinates of A are (1, 7).

5. (B) The coordinates of O are (0, 0) as O is the origin.

6. (C) The coordinates of C are (8, 5).

7. (B) Distance travelled in first 1 hour

= y-coordinate of the graph at 3 p.m.

= 8 km.

8. (B) The traveller is the fastest between 4 p.m. and 5 p.m.

9. (B) The traveller stops twice from 3 : 20 p.m. to 4 : 00 p.m. and from 5 p.m. to 6 p.m.

10. (D) Distance = 32 km – 8 km = 24 km.

11. (C) y = Area of square = Side^2 = x^2

= 4^2 = 16 square units.

12. (D) y = Perimeter of square = $4x$

= 4 × 1 = 4.

13. (B) Cartesian plane has 2 axes, namely, x-axis and y-axis.

14. (A) Coordinates of any points on the y-axis are of the form (0, y)

$\therefore$ x-coordinate = 0.

15. (B) Equation of a straight line is of the form $ax + by + c = 0$, whose degree is 1.

16. (D) The x-coordinate of a point is its perpendicular distance from the y-axis.

The y-coordinate of a point is its perpendicular distance from the x-axis.

17. (B) The graph is a straight line as simple interest is directly proportional to the number of years.

18. (C) A line graph changes over time.

WORKSHEET – 111

1. (*i*) The required set is {3, 6, 12}.

(*ii*) The required set is $\left\{\frac{1}{4}, 1\frac{1}{2}, 2\right\}$.

2. (*i*) 50 km = 1 big division on the vertical line.

1 hour = 1 big division on the horizontal line.

(*ii*) Distance covered after 3 hours = 100 km.

(*iii*) Distance covered in 1 hour = 50 km

Distance covered in 4 hours = 125 km

$\therefore$ Required distance

= 125 – 50

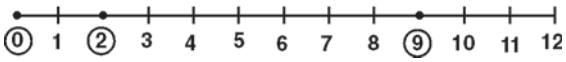
= 75 km.

(*iv*) Yes, we can tell.

Distance covered between 3 hours and 5 hours = 200 – 100 = 100 km.

3. (*i*)

(*ii*)



4. (*i*) The graph represents the measures of temperature of a city from 8 a.m. to 2 p.m. of a day.

(*ii*) The temperature was highest from 9 a.m. to 10 a.m.

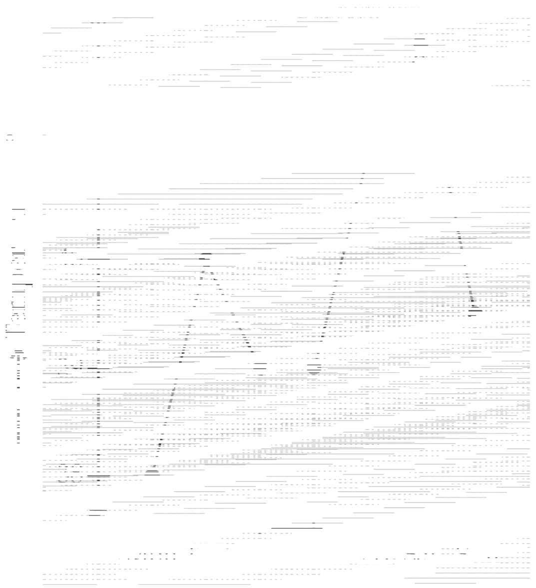
(*iii*) The temperature was least at 2 p.m.

(*iv*) Increase in temperature

$= 40°C - 35°C = 5°C.$

(*v*) The temperature at 8 a.m. was 35°C which is less than 40°C.

5. (*i*) To draw the required graph, let us take days of the week on the x-axis and temperature on the y-axis.



(*ii*) To draw the required graph, let us take distance travelled on the x-axis and the cost on the y-axis.

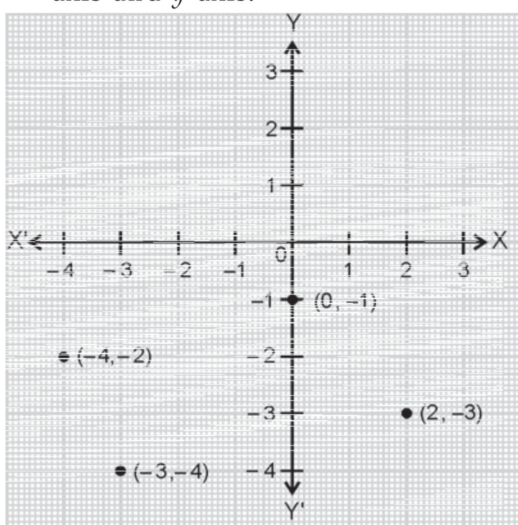
WORKSHEET – 112

1. (*i*) If x-coordinate of a point is 0, then the point will lie on the y-axis.

(*ii*) If y-coordinate of a point is 0, then the point will lie on the x-axis.

(*iii*) A point with coordinates (0, 0) lies at the point of intersection of the x-axis and y-axis.

2.



3. Point corresponding to $x = 1$, $y = 2$ is (1, 2)

Point corresponding to $x = 3$, $y = 6$ is (3, 6)

Point corresponding to $x = 4$, $y = 8$ is (4, 8)

Point corresponding to $x = 5$, $y = 10$ is (5, 10)

Point corresponding to $x = 7$, $y = 14$ is (7, 14).

Joining these points, we obtain a straight line (see graph), Therefore the points lie on a straight line.

4. We know that area of a square is the square of its side. For example, if side is a than area = a^2.

Hence,

S. No.	Side of square	Area
1.	2 cm	4 cm^2
2.	4 cm	16 cm^2
3.	5 cm	25 cm^2
4.	6 cm	36 cm^2
5.	8 cm	64 cm^2

Let us draw graph using this table and taking side of the square at x-coordinate and its area as y-coordinate.

Joining the points, we obtain that the graph is a curve not a line segment.

5. (*i*) Point (4, 1) is represented by the letter F.

(*ii*) Point (3, 8) is represented by the letter M.

(*iii*) Point (1, 2) is represented by the letter Q.

(*iv*) Point (5, 7) is represented by the letter O.

6.

(*i*) The points lie in the first and third quadrants and at the origin. All the points lie on a straight line (see figure).

(*ii*) x-coordinate and y-coordinate of each point are equal, so $x = y$.

WORKSHEET – 113

1. (*i*) Given point is A(–3, 2)

Its x-coordinate is –3 and y-coordinate is 2.

(*ii*) Given point is B(2, –1)

Its x-coordinate is 2 and y-coordinate is –1.

(*iii*) Given point is C(0, –7)

Its x-coordinate is 0 and y-coordinate is –7.

2. From the graph, we conclude that

When $x = 0$, $y = 1$

When $x = 1$, $y = 3/2$

When $x = 3$, $y = 5/2$

When $x = 4$, $y = 3$

When $x = 6$, $y = 4$

So, when $x = 2$, $y = 2$

and when $x = 5$, $y = 7/2$

The complete table will be as follows

x	0	1	2	3	4	5	6
y	1	3/2	2	5/2	3	7/2	4

Consequently, we obtain that the relationship between x and y will be $2y = x + 2$.

3.

4. (*i*) The graph shows the temperature of a city at the time from 8 a.m. to 6 p.m. of a day.

(*ii*) The temperature was highest at 10 a.m.

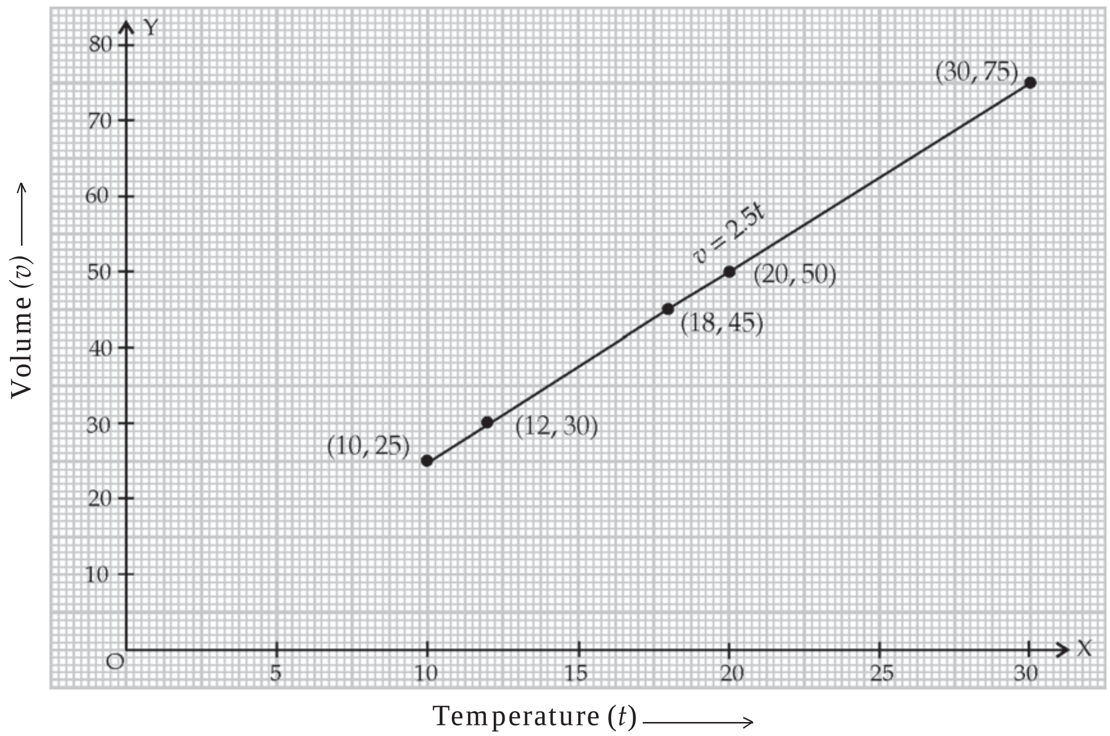
(*iii*) The temperature was least at 6 p.m.

5.

6. Let us take side of square as x-coordinate and its perimeter as y-coordinate to draw a graph.

7. The given relation between volume (v) and temperature t is

$$v = 2.5t.$$

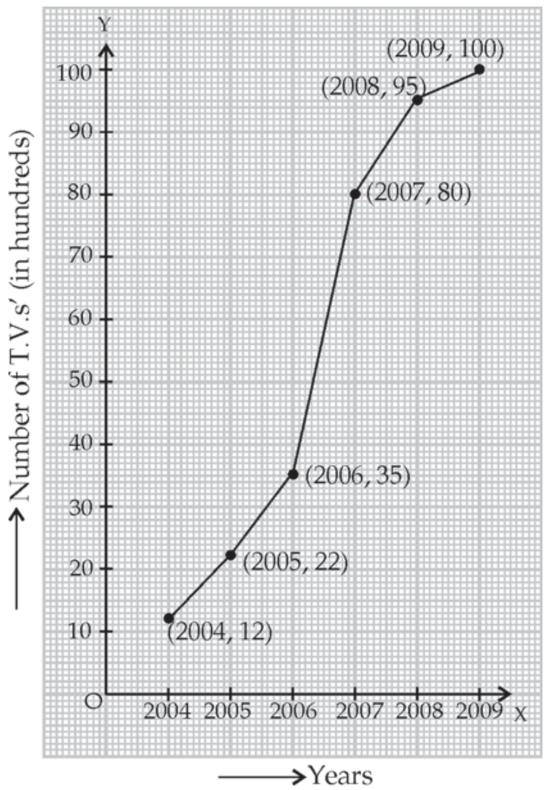


At t = 10°C, v = 2.5 × 10
= 25 cubic units
At t = 12°C, v = 2.5 × 12
= 30 cubic units
At t = 18°C, v = 2.5 × 18
= 45 cubic units
At t = 20°C, v = 2.5 × 20
= 50 cubic units
At t = 30°C, v = 2.5 × 30
= 75 cubic units

Let us draw graph, taking t as x-coordinate and v as y-coordinate.

After ploting the points from the given table and joining them, we get a straight line.

4. Taking years as x-coordinate and number of T.V.s'. sold in hundreds as y-coordinate, we get the following graph.

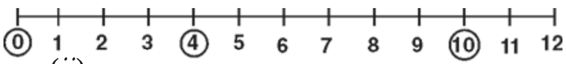


5. (*i*) x-coordinate of A(0, 5) = 0
y-coordinate of A(0, 5) = 5
(*ii*) x-coordinate of B(–6, –4) = –6
y-coordinate of B(–6, –4) = –4
(*iii*) x-coordinate of C(2, 2) = 2
y-coordinate of C(2, 2) = 2.

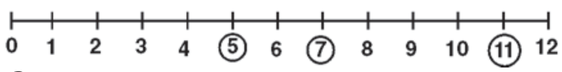
WORKSHEET –114

1. (*i*) y-coordinate of the point A is 6
(*ii*) y-coordinate of the point B is 0
(*iii*) y-coordinate of the point C is 2
(*iv*) y-coordinate of the point D is –3.

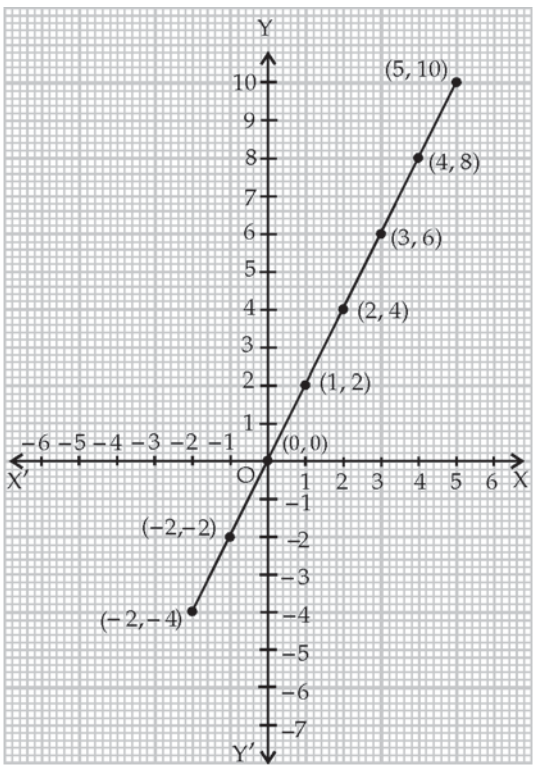
2. (*i*)



(*ii*)



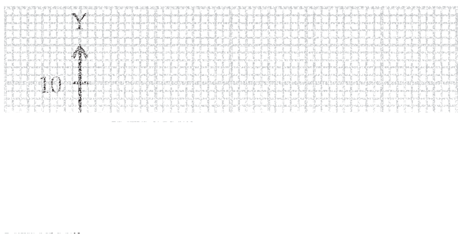
3.



6. Let us make a table of three pairs of points of x and y such that $x = y$.

x	2	4	6
y	2	4	6

Let us plot the points and join them.



From the graph, it is clear that the points lie on the line passing through the origin O(0, 0).

7. The coordinates of letter A are (2, –1)
The coordinates of letter B are (3, 2)
The coordinates of letter C are (–2, 2)
The coordinates of letter D are (–3, –1)

8. (*i*) The meeting was gone from 2 hours to 4 hours. So, the duration was 4 – 2 = 2 hours.

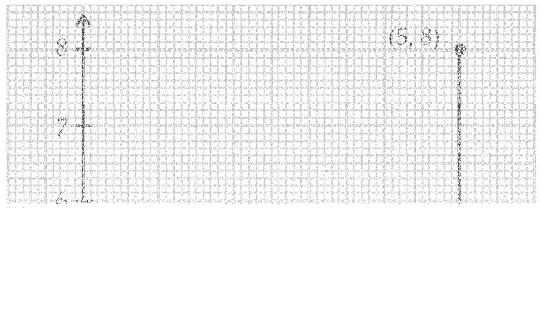
(*ii*) Distance travelled after $2\frac{1}{2}$ hours
= Distance travelled after 4 hours
= 70 km.

(*iii*) Time taken to travel the first 40 km was $1\frac{1}{4}$ hours.

(*iv*) Time spent to travel a distance between 30 km and 50 km was $1\frac{1}{2}$ hours –1 hour = 30 minutes.

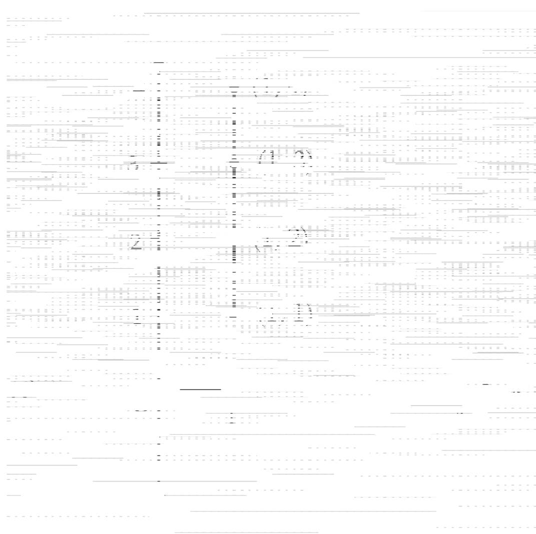
WORKSHEET – 115

1.

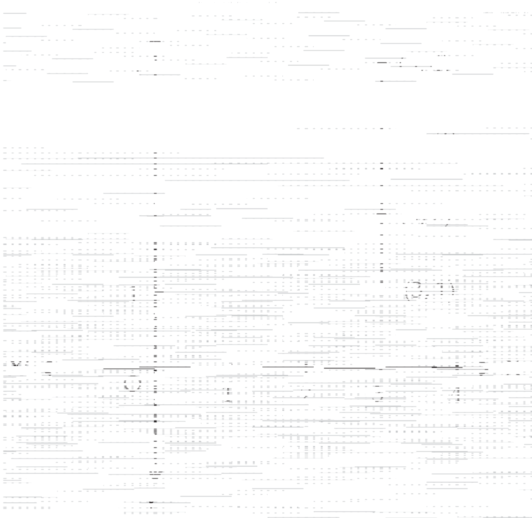


Yes, the given points lie on a line. This line is parallel to the y-axis.

2. (*i*)

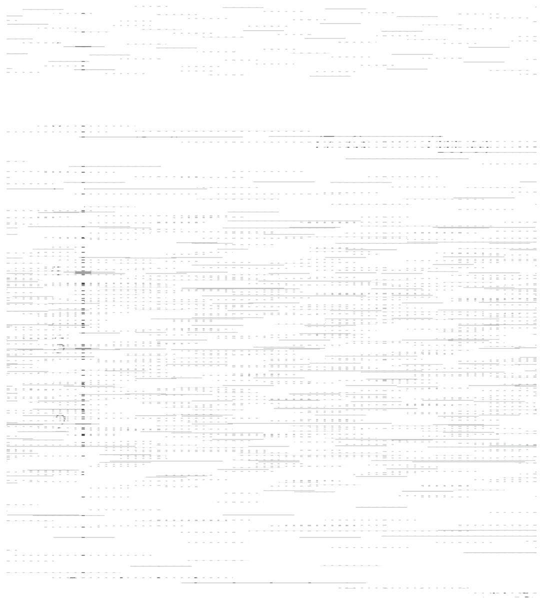


(*ii*)



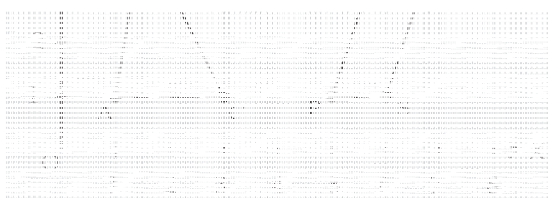
3. y-coordinate of each point is zero. They lie on the x-axis.

4.



Yes the given points lie on a line which is parallel to x-axis. y-coordinate of each point is 6.

5. Coordinates of vertices of the triangle are A(1, 1), B(3/2, 4) and C(3, 1). Coordinates of the parallelogram are P(5, 1), Q(6, 4), R(7, 4) and S(6, 1).



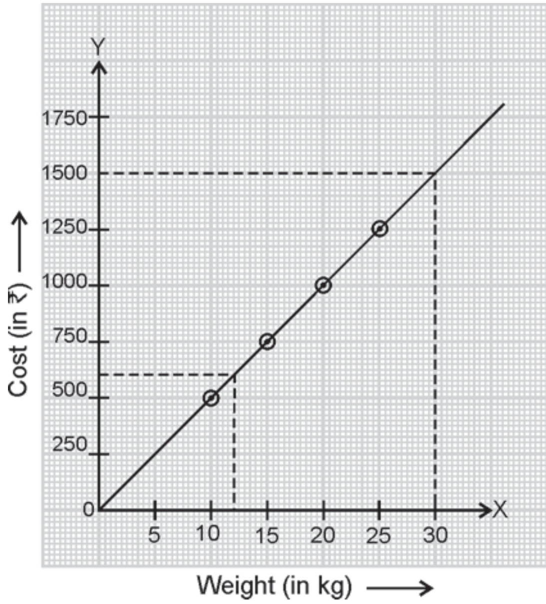
6. Coordinates of A are (1, 2)

Coordinates of B are (2, 2)

Coordinates of C are (4, 4)

Coordinates of D are (6, 1).

7. (*i*)



(*ii*) The vertical line passing through 12 kg intersects the graph at a point which corresponds to ₹ 600 on the y-axis. So, the cost of 12 kg rice is ₹ 600.

(*iii*) The horizontal line passing through ₹ 1500 intersects the graph at a point which corresponds to 30 kg on the x-axis. So, 30 kg of rice can be purchased for ₹ 1500.

WORKSHEET – 116

1. Yes, $x + y = 0$

$0 + y = 0$ (Let $x = 0$)

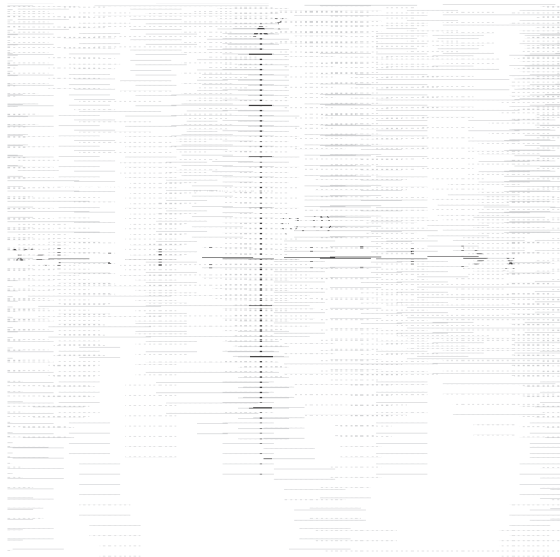
$y = 0$

$x = y = 0$

So, $x = y$

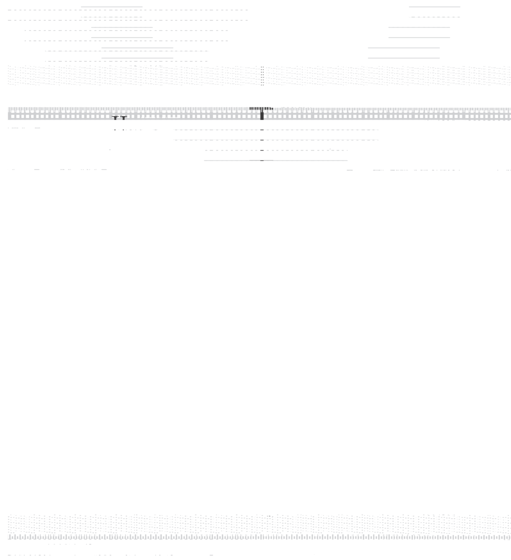
2. Yes

3.



The coordinate of the origin is (0, 0)

4.



$\angle YOX = \angle XOY' = \angle Y'OX' = \angle X'OY$…(*i*)

$\angle YOX = \angle XOY' + \angle Y'OX' + \angle X'OY = 360°$

(We know that all angles are equal to each other.)

So,

$\angle YOX + \angle YOX + \angle YOX + \angle YOX = 360°$

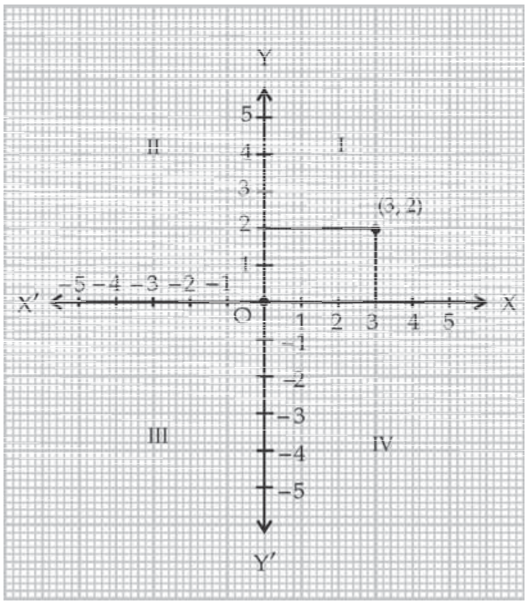
[∵ From (*i*)]

$$4\angle YOX = 360°$$

$$\angle YOX = \frac{360°}{4} = 90°$$

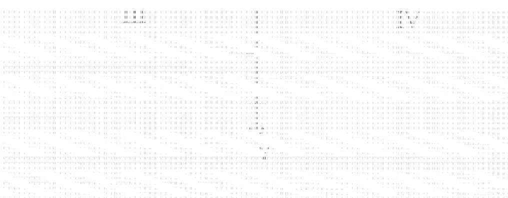
$$\therefore \quad \angle YOX = \angle XOY' = \angle Y'OX' = X'OY = 90°.$$

5.



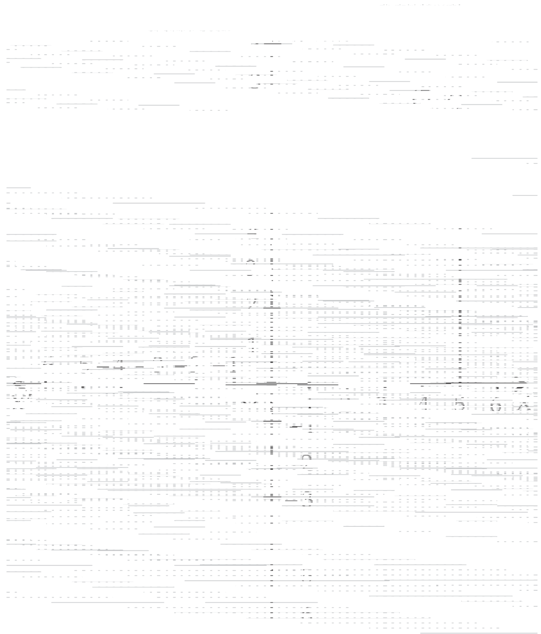
The point (3, 2) lie in first quadrant.

6.



Second quadrant.

7.



7 units.

8.

No.

9. (*a*) Time = 2h

Distance = 30 km / h

$$\text{Average speed} = \frac{\text{Distance}}{\text{Time}} = \frac{30}{2}$$

$$= 15 \text{ km / hr.}$$

(*b*) From 11 am till 12 noon, the cylinder took rest.

(*c*) The cyclist started homeward journey.

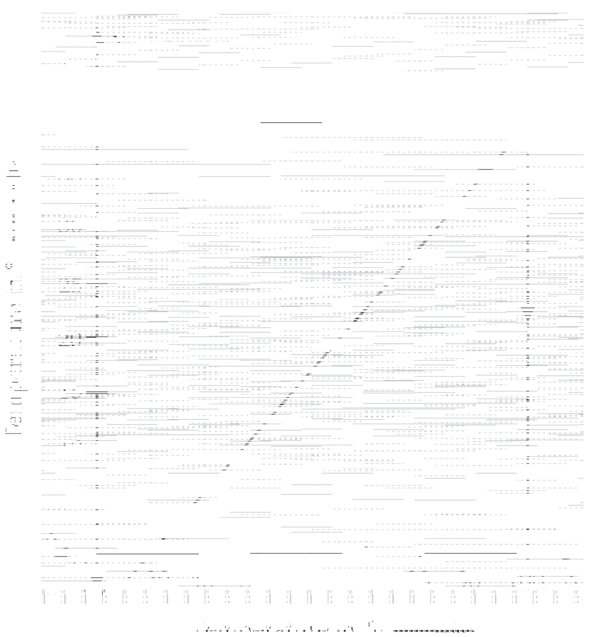
(*d*) The cyclist started homeward journey at 2 pm.

(*e*) Distance = 35 km / h.

Time = 2h

$$\text{Average speed} = \frac{35}{2} = 17.5 \text{ km / h.}$$

10.



(*i*) F = 176 (Given)

$$C = \frac{5}{9}(F - 32)$$

$$C = \frac{5}{9}(176 - 32)$$

$$C = \frac{5}{9}(144)$$

$$C = \frac{5}{9} \times 144 = 80°$$

$$C = 80°$$

(*ii*) $C = 40°$

$$C = \frac{5}{9}(F - 32)$$

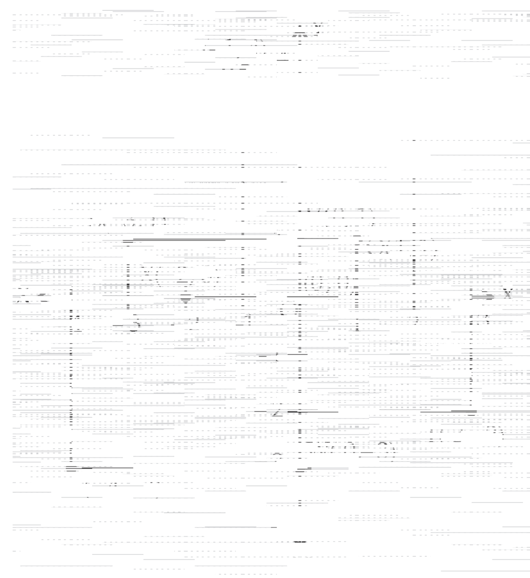
$$40 = \frac{5}{9}(F - 32)$$

$$F - 32 = 40 \times \frac{9}{5}$$

$$F - 32 = 72$$

$$F = 72 + 32 = 104.$$

11.



Points are: O(0, 0); P(2, 3); Q(1, 1) R(–1, 4); S(–3, 1); T(3, – 2); U(– 4, – 3); V(0, 1); W(0, – 3); X(– 2, 0); Y(0, 3).

❑❑

Chapter 16

PLAYING WITH NUMBERS

WORKSHEET – 117

1. (A) $42 = 40 + 2 = 10 \times 4 + 2$.

2. (D) $421 = 400 + 20 + 1$

$= 100 \times 4 + 10 \times 2 + 1 \times 1$.

3. (D) Reversing the order of the digits of 408, we get 804.

4. (A)

$$\begin{array}{r} 5\,\textcircled{1} \\ +\;7\;2 \\ \hline \textcircled{1}\,2\;3 \end{array}$$

5. (C) Since 8 is divisible by 2, therefore 28 is divisible by 2.

6. (B)Let ten's digit = x

Then unit's digit = $9 - x$

So, $10x + (9 - x) - 9 = 10(9 - x) + x$

or $9x = -9x + 90$ or $x = 5$

$\therefore$ $9 - x = 4$

Now, required number $= 10 \times 5 + 4$

$= 54$.

7. (D) $5 + a + 1 + 2 = (8 + a)$ is divisible by 9 if $a = 1$.

8. (B) $4 + y + 2 = (6 + y)$ is divisible by 3 if $y = 0$, 3, 6 or 9.

9. (B) 440 is divisible by 5 as it ends with zero.

10. (B)

$$\begin{array}{r} 7\;\textcircled{6} \\ \times\,\textcircled{6} \\ \hline 4\;5\,\textcircled{6} \end{array}$$

11. (C)

$$\begin{array}{r} 9\;6\,\textcircled{8} \\ -\;1\,\textcircled{7}\,2 \\ \hline \textcircled{7}\,9\;6 \end{array}$$

12. (A) Let the missing number be x.

Then,

$8 + \frac{65}{x} = x$ or $8x + 65 = x^2$

or $x^2 - 8x - 65 = 0$

or $(x + 5)(x - 13) = 0$

i.e., $x = -5$ or $x = 13$.

13. (B) $8 + 1 = 5 + 4 = 3 + 6 = 7 + 2 = 9$.

14. (C)

$$\begin{array}{r} 7\,\textcircled{5}\,\textcircled{5} \\ \times\,\textcircled{5} \\ \hline 3\;7\;7\,\textcircled{5} \end{array}$$

15. (A) Sum of the numbers in any horizontal or vertical strip is 22.

So, $m = 1$.

WORKSHEET – 118

1. 999 is the closest to 1000 such that it is a multiple of 9.

2. (*i*) Reversing the digits of 912, we get 219.

$219 = 200 + 10 + 9$

$= 2 \times 100 + 1 \times 10 + 9$.

(*ii*) Reversing the digits of 476, we get 674.

$674 = 600 + 70 + 4$

$= 6 \times 100 + 7 \times 10 + 4$.

3. Yes, such fractions are possible as

$$\frac{-x}{y} = \frac{x}{-y} \text{ for } x > 0,\ y > 0.$$

Example: $\frac{-3}{4} = \frac{3}{-4}$.

4. $94 - 49 = 45 = 9 \times 5$

(*i*) On dividing 9×5 by 9, the quotient is 5.

(*ii*) On dividing 9 × 5 by 5, the quotient is 9.

5. $\because$ Difference = 985 – 958 = 27

$\therefore \quad \frac{985-958}{9} = \frac{27}{9} = 3.$

6. (*i*) 547 = 500 + 40 + 7 = 540 + 7

= 10 × 54 + 7

(*ii*) 1524 = 1000 + 500 + 20 + 4

= 1520 + 4 = 10 × 152 + 4.

OR

(*i*) 15 is divisible by 3 but not by 9. Answer may vary.

(*ii*) 25 is divisible by 5 but not by 10. Answer may vary.

7. (*i*)

```
   3 4 ⑦ 6
 + ⑧ 1 6 8
 ---------
 1 1 6 4 4
```

$\therefore$ $x = 7$

and $y = 8$

(*ii*)

```
   6 ⑦ ⑦ 5 ⑦
 + 7 ① ① ① ②
 -----------
 1 3 8 8 6 9
```

$\therefore$ $x = 7, y = 1$

and $z = 2$

8. (*i*)

```
   ⑧ 7 ⑨
 – 3 9 8
 -------
   4 ⑧ 1
```

$\therefore$ $p = 8, q = 9, r = 8$

(*ii*)

```
   7 ⑥
 – ⑥ 3
 -----
   1 3
```

$\therefore$ $q = r = 6.$

9. Let unit's digit of required number be x, then ten's digit would be $(8 - x)$

So, the required number

$= 10 \times (8 - x) + x$

On reversing the digits, the new number

$= 10 \times x + (8 - x)$

According to given condition,

$10 \times x + (8 - x) = 10 \times (8 - x) + x + 18.$

or $10x + 8 - x = 80 - 10x + x + 18$

or $18x = 90$ or $x = 5$

$\therefore \quad 8 - x = 8 - 5 = 3$

So, required number = 10 × 3 + 5 = 35.

10. (*i*)

```
   2 ④ ⑦
 + ④ ⑦ 1
 -------
   ⑦ 1 8
```

$\therefore$ A = 4 and B = 7

(*ii*) ①① × ①① = ①②①

$\therefore$ A = 1, B = 1 and C = 2

Answer may vary.

WORKSHEET – 119

1. 13, (13 + 5), (13 + 10), (13 + 15), (13 + 20), (13 + 25), ...

or 13, 18, 23, 28, ㉝, ㊳, ...

2. 92 – 28 = 64 $\quad \because \frac{64}{7} = 9\frac{1}{7}$

$\therefore$ Required quotient = 9.

3. Since (2 + 4 + 5 + 1) – (3 + 6 + 0) *i.e.*, 3 is not divisible by 11. So, 2346501 is not completely divisible by 11.

4. a must be either 0 or 5.

5. It will be sunday after 7 days, 14 days, 21 days, 28 days, ... So, it will be Tuesday after 30 days.

6. $\because$ 3 × 7 × 37 = 777

$\therefore$ $x = 3$ and $y = 7$.

7. Let $* = m$

Now, $(6 + 6 + 7) - (2 + m)$ is divisible by 11

or $(17 - m)$ is divisible by 11

$\therefore \quad m = 6$

Thus the number is 62667.

OR

13p4 would be a multiple of 6 if it is multiple of both 2 and 3.

So, p can take values 1, 4, or 7.

8. Let ten's digit be x. Then the required number will be $10 \times x + 4$, *i.e.*, $10x + 4$

Further, $10x + 4 = 6 \times (x + 4)$

or $10x - 6x = 24 - 4$

or $4x = 20$ or $x = 5$

$\therefore\ 10x + 4 = 10 \times 5 + 4 = 54.$

Hence, the required number is 54.

9.

$$\begin{array}{r} 5\ \boxed{2}\ 3 \\ \times\ \boxed{4}\ 2 \\ \hline 1\ \boxed{0}\ 4\ 6 \\ +\ 2\ 0\ \boxed{9}\ 2\ \ \\ \hline \boxed{2}\ 1\ \boxed{9}\ \boxed{6}\ 6 \end{array}$$

10. $1 \times 1 = 1$

$11 \times 11 = 121$

(*i*) $111 \times 111 = \boxed{12321}$.

(*ii*) $1111 \times 1111 = \boxed{1234321}$

$11111 \times 11111 = 123454321.$

11. (*i*) $2\ \boxed{3} \times 8 = 184.$

(*ii*) $\boxed{10} \times 6 + 9 = 69.$

OR

(*i*)

$$\begin{array}{r} 8\ \textcircled{8}\ 5 \\ +\ 9\ 4\ \textcircled{8} \\ \hline 1\ \textcircled{8}\ 3\ 3 \end{array}$$

$\therefore$ A = 8.

(*ii*) 29 + 92 = 121

$\therefore$ A = 2, B = 9 and D = 1.

WORKSHEET–120

1. 1500 is divisible by 3 not by 9 as 1 + 5 + 0 + 0 = 6 is divisible by 3 not by 9.

2. $\because$ 11 × 9 = 99 and 11 × 91 = 1001

Thus 99 is the closest to 100 and 1001 is the closest to 1000.

3. If a number ends with 0, 2, 4, 6 or 8, then it is divisible by 2.

So, 525620 is divisible by 2.

4. (7 + 9 + 3 + 5) – (2 + 8 + 4) = 24 – 14 = 10

Since 10 is not divisible by 11, so 7298345 is not divisible by 11.

OR

83450210 is divisible by 2 as it ends with 0.

Sum of digits

= 8 + 3 + 4 + 5 + 0 + 2 + 1 + 0 = 23.

83450210 is not divisible by 3 as 23 is not divisible by 3.

5. Let us think a number A.

Double A = 2 × A = 2A

Adding 18 to 2A, we get 2A + 18

Taking away 10 from (2A + 18), we get 2A + 8.

Half (2A + 8) = A + 4

Taking away 4 from (A + 4), we get A

Now, we get the number A itself

OR

(9 + 8 + 6 + 4) – (2 + 5 + 7 + 2)

= 27 – 16 = 11

Remainder will be 0 when 92856742 is divided by 11 as 11 is divisible by 11.

6. 927643 = 9 × 100000 + 2 × 10000 + 7 × 1000 + 6 × 100 + 4 × 10 + 3.

7. Calculation 1:

$$\begin{array}{r} M\ O\ R\ E \\ +\ S\ E\ N\ D \\ \hline M\ O\ N\ E\ Y \end{array}$$

Calculation 2:

$$\begin{array}{r} 1\ 0\ 8\ 5 \\ +\ 9\ 5\ 6\ 7 \\ \hline 1\ 0\ 6\ 5\ 2 \end{array}$$

Comparing both calculations, we obtain

M = 1, O = 0, R = 8, E = 5, S = 9, N = 6, D = 7, Y = 2.

8. (*i*)

$$\begin{array}{r} \textcircled{7}\ 8\ 5\ \textcircled{7} \\ +\ 1\ 9\ 1\ 5 \\ \hline 9\ \textcircled{7}\textcircled{7}\ 2 \end{array}$$

$\therefore\ y = 7$

(*ii*)

$$\begin{array}{r} \textcircled{2}\ 9\ \textcircled{2}\ 9 \\ +\ 5\ \textcircled{2}\textcircled{7}\ 2 \\ \hline 8\ \textcircled{2}\ 0\ 1 \end{array}$$

$\therefore\ y = 2.$

9. Let Reema's age be x years

$\therefore$ Seema's age = $(8 - x)$years.

Since Reema is 7 years younger than Seema.

$\therefore\quad x + 7 = 8 - x$ or $2x = 1$

or $\quad x = 0.5$ year

$\therefore\quad 8 - x = 8 - 0.5 = 7.5$ years.

Therefore, Reema's age is 6 months and Seema's age is 7.5 years.

10. (*i*)

$$\begin{array}{r} 2\ \textcircled{4}\ \textcircled{7} \\ +\ \textcircled{4}\ \textcircled{7}\ 1 \\ \hline \textcircled{7}\ 1\ 8 \end{array}$$

Thus, A = 4 and B = 7.

(*ii*) 29 + 92 = 121

$\therefore$ A = 2, B = 9 and D = 1.

WORKSHEET–121

1. 6257034 is divisible by 2 as the number ends with an even number.

2. Sum of digits of 3482341

$= 3 + 4 + 8 + 2 + 3 + 4 + 1 = 25.$

3482341 is neither divisible by 9 nor by 3 because 25 is neither divisible by 9 nor by 3.

3. Let perimeter of the equilateral triangle as well as the square be $4a$ units.

Then, area of the triangle

$$= \frac{\sqrt{3}}{4} \times \left(\frac{4a}{3}\right)^2 = \frac{4\sqrt{3}a^2}{9} \text{ sq. units}$$

Area of the square $= \left(\frac{4a}{4}\right)^2 = a^2$

$$= \frac{9a^2}{9} \text{ sq. units}$$

Therefore, the square occupies more area.

OR

Number of books in 18 crates

$= 18 \times 25 = 450$

Cost of 18 crates of books

= Number of books × Cost of a book

$= 450 \times 129 = 58050$

Thus, the required cost is ₹ 58050.

4. (*i*) $(2 + 6 + 5) - (7 + * + 2)$

$= 13 - (9 + *) = 4 - *$

Put $4 - * = 0$. So, $* = 4$.

(*ii*) $(5 + 2 + 4) - (* + 1 + 8)$

$= 11 - (9 + *) = 2 - *$

Put $2 - * = 0$. So, $* = 2$.

5. Let us start with a number 3. Then the first domino may be filled as given below

3	6

Then the second domino may be filled as given below

6	2

Further, the last domino must be filled as given below

2	1

Hence the result is:

3	6		6	2		2	1

Answer may vary.

6. The given number 47824600 ends with 0, so it is divisible by 5.

Also, the number ends with two zeroes, so it is divisible by 4.

Hence, the given number is divisible by both 5 and 4.

7. Calculation 1:

$$\begin{array}{r} p\,q \\ \times\, r \\ \hline s\,t \\ +\,u\,v \\ \hline w\,x \end{array}$$

Calculation 2:

$$\begin{array}{r} 17 \\ \times\, 4 \\ \hline 68 \\ +\,25 \\ \hline 93 \end{array}$$

Comparing both the calculations, we obtain $p = 1$, $q = 7$, $r = 4$, $s = 6$, $t = 8$, $u = 2$, $v = 5$, $w = 9$ and $x = 3$.

8. (*i*)

20	(1)	(12)
3	11	(19)
(10)	(21)	2

(*ii*)

1	15	14	(4)
(12)	(6)	7	(9)
8	(10)	(11)	(5)
13	3	2	16

9. (*i*) Numbers of eggs and crates vary directly. So the required number of crates $= \frac{1000}{20} = 50$.

Thus, 50 crates will be filled by 1000 eggs.

(*ii*) $3 + p - 1 = 2 + p$

To make $(2 + p)$ as a multiple of 11, we must put $p = 9$.

So, $p = 9$.

WORKSHEET–122

1. Let the value of $*$ be x.

According to the given conditions, we have

$$\frac{(x+2)\times 3-6}{3} = x + 2 - 2 = x$$

But $* = x$.

So, the result is the number $(*)$ itself.

2. Reversing the order of digits of 928456, we get number 654829.

$654829 = 6 \times 100000 + 5 \times 10000 + 4 \times 1000 + 8 \times 100 + 2 \times 10 + 9$

3. $21x8$ is a multiple of 2.

$2 + 1 + 8 = 11$

$11 + 1 = 12$ is a multiple of 3

Also, $11 + 4 = 15$ and $11 + 7 = 18$ are multiples of 3

Therefore, $x = 1, 4$ or 7.

4. $1784 = 1780 + 4 = 10 \times 178 + 4$

$1784 = 1700 + 80 + 4$

$= 100 \times 17 + 10 \times 8 + 4.$

5. Sum of the digits

$= 1 + 8 + 2 + 3 + 4 + 6 + 5 + 2 = 31$

$31 - 4 = 27$ is divisible by 9.

So, the required remainder is 4.

OR

3 years = 12 × 3 months = 36 months

∵ Incoming of 1 month = ₹ 9250

∴ Incoming of 36 months = 36 × ₹ 9250

= ₹ 333000

Thus, the man earns ₹ 333000 in 3 years.

6. $(9 + 4 + 8 + 6) - (2 + 9 + 2) = 27 - 13 = 14$

$14 - 3 = 11$ is divisible by 11.

So, the required remainder is 3.

7. $5 + 2 - x = 7 - x$

To make $(7 - x)$ as a multiple of 11, we must substitute $x = 7$

So, $x = 7$.

8. The three-digit least number whose digits are in ascending order is 123.

To make 123 as a multiple of 4, we should replace 3 by 4.

Therefore, the required number is 124.

9. (*i*)

$$\begin{array}{r} 4\ 5\ 5 \\ +\ 1\ \textcircled{6}\ 1 \\ \hline \textcircled{6}\ 1\ \textcircled{6} \end{array}$$

Thus, $x = 6$

(*ii*)

$$\begin{array}{r} \textcircled{6} \\ \textcircled{6} \\ \textcircled{6} \\ +\textcircled{6} \\ \hline 24 \end{array}$$

Thus, $x = 6$.

10.

$$\begin{array}{r} 1\ 2\ 1 \\ 5\ 8\ 0\ 3 \\ +\ 8\ 6\ 9\ 2\ 3 \\ \hline 9\ 2\ 8\ 4\ 7 \end{array}$$

OR

(*i*) 9 + 2 + 5 + 6 = 22

22 + 2 = 24 is divisible by 3

So, $*$ = 2.

(*ii*) 8 + 2 + 4 + 6 + 7 = 27

27 is divisible by 3

So, $*$ = 0.

11. 4 + 7 + 8 + 6 + 3 + 4 + 8 = 40

40 is not divisible by 3.

4786348 is not divisible by 3 because sum of the digits is not divisible by 3. 48 is divisible by 4.

4786348 is divisible by 4 because number obtained by last two digits is divisible by 4.

WORKSHEET–123

1. No, are all numbers that are divisible by 9.

2. 1 9 5 6

Th H T O

Hundreds place = 9.

3. 17893

Expanded form = 1 × 10000 + 7 × 1000 + 8 × 100 + 9 × 10 + 3.

4. Yes.

5. Let unit's digit of required number be x, then ten's digit would be $(12 - x)$

So, the required number

$= 10 \times (12 - x) + x$

According to given condition,

$10 \times x + (12 - x) = 10 \times (12 - x) + x - 36$

$\Rightarrow \quad 10x + 12 - x = 120 - 10x + x - 36$

$\Rightarrow \quad 9x + 12 = 84 - 9x$

$\Rightarrow \quad 18x - 72 = 0$

$\Rightarrow \quad 18x = 72$

$x = 4$

$\therefore \quad 12 - x = 12 - 4 = 8$

So, required number = 10 × 8 + 4

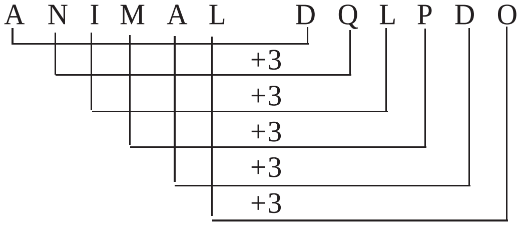
= 80 + 4 = 84.

6.

		61		
		47		
53	31	17	19	41
		23		
		13		

Answer may vary.

7. A N I M A L D Q L P D O



D O L P H I N G R O S K L Q

DOLPHIN

8.

$$\begin{array}{r} \text{SEND} \\ +\ \text{MORE} \\ \hline \text{MONEY} \end{array} \quad \ldots (i)$$

Verify

$$\begin{array}{r} 9567 \\ +\ 1085 \\ \hline 10652 \end{array} \quad \ldots (ii)$$

Comparing (*i*) and (*ii*), we obtain

S = 9, E = 5, N = 6, M = 1

O = 0, R = 8, D = 7, Y = 2

9. A × B = 30, C × D = 32 (Given)

B × D = 48, B × C = 24 (Given)

A × B × C × D + 1

= 30 × 32 + 1 = 960 + 1 = 961.

10. (*a*) $\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+1}}}}$, $\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+1}}}}}$

$\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+1}}}}}}$

(*b*) $\dfrac{1}{1+1} = \dfrac{1}{2}$, $\dfrac{1}{1+\dfrac{1}{1+1}} = \dfrac{2}{3}$,

$\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+1}}} = \dfrac{3}{5} = \dfrac{1}{1+\dfrac{2}{3}} = \dfrac{1}{\dfrac{5}{3}} = \dfrac{3}{5}$.

❑❑

Practice Paper-1

SECTION-A

1. (A) Since denominator of any rational number cannot be zero.

2. (D) Consider $2x - \frac{3}{2} = \frac{-5}{2}$

$$\Rightarrow \quad 2x = \frac{-5}{2} + \frac{3}{2} = \frac{-5+3}{2}$$

$$= \frac{-2}{2} = -1$$

$$\therefore \quad x = -\frac{1}{2}.$$

3. (C) We know that diagonals of a rhombus (or a square) bisect each other at 90°.

4. (C) We know that if a dice is rolled then all possible outcomes are: 1, 2, 3, 4, 5, 6.

Out of them getting a set of prime numbers is 2, 3, 5.

5. (D) A set a, b, c is said to be Pythagorean triplet if $a^2 + b^2 = c^2$.

Here, $3^2 + 4^2 = 9 + 16 = 25 = 5^2$.

$\therefore$ 3, 4, 5 is the Pythagorean triplet.

6. (B) Since the cube root of 8^3

$$= \sqrt[3]{8^3} = 8^{3 \times \frac{1}{3}} = 8.$$

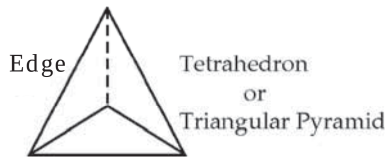
7. (B) Sum = $(5xy - 6z + 7) + (10xy + 6z - 7)$

$= (5xy + 10xy) + (-6z + 6z) + (7 - 7)$

(Regrouping like terms)

$= 15xy + 0 + 0 = 15xy.$

8. (A) Number of edges = 6.



9. (D) We have

$(-4)^8 \div (-4)^5$

$= (-4)^{8-5}$ $[\because a^m \div a^n = a^{m-n}]$

$= (-4)^3 = (-4) \times (-4) \times (-4)$

$= -64.$

10. (C) Given: $\frac{7}{6} = \frac{x}{3} \Rightarrow x = \frac{7}{6} \times 3 = \frac{7}{2}$

$$\therefore \quad \frac{2}{7}x = \frac{2}{7} \times \frac{7}{2} = 1.$$

SECTION-B

11. Cube of $-1.3 = (-1.3)^3$

$= (-1.3) \times (-1.3) \times (-1.3)$

$= -2.197.$

12. Let the number of side of a regular polygon be n.

We have measure of each exterior angle $= 45°$

$$\Rightarrow \frac{360°}{n} = 45° \Rightarrow \frac{360°}{45°} = n \quad \therefore \quad n = 8.$$

13. One rational number between $\frac{1}{3}$ and $\frac{1}{2}$

$$= \frac{\frac{1}{3}+\frac{1}{2}}{2} = \frac{\frac{2+3}{6}}{2} = \frac{5}{6} \times \frac{1}{2}$$

$$= \frac{5}{12}.$$

Second rational number between $\frac{1}{3}$ and $\frac{1}{2}$ *i.e.*, the rational number between $\frac{5}{12}$ and $\frac{1}{2}$ $= \dfrac{\frac{5}{12}+\frac{1}{2}}{2} = \dfrac{\frac{5+6}{12}}{2}$

$= \frac{11}{12} \times \frac{1}{2} = \frac{11}{24}$

Thus, two rational numbers between $\frac{1}{3}$ and $\frac{1}{2}$ are $\frac{5}{12}$, $\frac{11}{24}$.

[**Note.** There are infinitely many rational numbers between two rational numbers.]

Alternative Method:

Given rational numbers are $\frac{1}{3}$ and $\frac{1}{2}$.

Taking equivalent rationals with the same denominator (*i.e.*, L.C.M.),

$\frac{1\times 2}{3\times 2}$ and $\frac{1\times 3}{2\times 3}$ [$\because$ L.C.M. of 2 and 3 $= 2 \times 3 = 6$]

$\Rightarrow \frac{2}{6}$ and $\frac{3}{6}$

Here difference between the numerators 2 and 3 is 1 and we have to find two rational numbers.

Therefore, we multiply both rationals (Numerator and Denominator) by 3.

$\Rightarrow \frac{2\times 3}{6\times 3}$ and $\frac{3\times 3}{6\times 3}$ $\Rightarrow \frac{6}{18}$ and $\frac{9}{18}$

$\Rightarrow \frac{6}{18} < \frac{7}{18} < \frac{8}{18} < \frac{9}{18}$

$\Rightarrow \frac{1}{3} < \frac{7}{18} < \frac{8}{18} < \frac{1}{2}$

Thus, the rationals are $\frac{7}{18}$ and $\frac{8}{18}$.

(Answer may vary)

14. $\left(\frac{3}{4}\right)^2 \times \left(\frac{-1}{3}\right)^2 = \frac{3^2}{4^2} \times \frac{(-1)^2}{3^2}$

$= \frac{9}{16} \times \frac{1}{9} = \frac{1}{16}$.

15. Given: $a = \frac{-8}{7}$, $b = \frac{2}{3}$

To verify: $a + b = b + a$

L.H.S. $= a + b = \frac{-8}{7} + \frac{2}{3}$

$= \frac{-8\times 3+2\times 7}{21} = \frac{-24+14}{21}$

$= \frac{-10}{21}$

R.H.S. $= b + a = \frac{2}{3}+\frac{-8}{7}$

$= \frac{2\times 7+(-8)\times 3}{21}$

$= \frac{14-24}{21} = \frac{-10}{21}$

Thus, L.H.S. = R.H.S.

16. Let a number be x. So eight times of the number is $8x$.

According to question, now to simplify the equation divide both sides by 8.

$\frac{8x}{8} = \frac{72}{8}$ $\therefore$ $x = 9$.

17. Given expression: $x^2 + 10x + 24$

Find the product x^2 and 24 *i.e.*, $24x^2$

Factorize the product,

2	$24x^2$
2	$12x^2$
2	$6x^2$
3	$3x^2$
x	x^2
	x

Regroup these factors into two groups such that their sum is equal to the middle term.

So we find such groups as $2 \times 2 \times x$ and $2 \times 3 \times x$ *i.e.*, $4x$ and $6x$.

Now split up the middle term as the sum $4x + 6x$.

∴ Expression

$= x^2 + 4x + 6x + 24$

$= (x^2 + 4x) + (6x + 24)$ (Regrouping)

$= x(x + 4) + 6(x + 4)$

(Taking common)

$= (x + 4)(x + 6).$

18. In a triangle, base $(b) = 30$ cm, altitude $(h) = 6$ cm } Given

∴ Area of the triangle

$= \frac{1}{2} \times b \times h$ (Formula)

$= \frac{1}{2} \times 30 \times 6 = 90 \text{ cm}^2.$

SECTION-C

19. Side of a small cube = 15 cm

∴ Volume of the cube

$= (\text{Side})^3 = (15 \text{ cm})^3$

= 15 cm × 15 cm × 15 cm

Dimensions of a big cuboidal box

= 1.5 m × 90 cm × 75 cm

= 150 cm × 90 cm × 75 cm

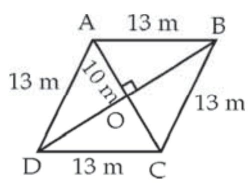
∴ The number of cubes that can be filled in bigger box

$= \frac{\text{Volume of cuboidal box}}{\text{Volume of a cube}}$

$= \frac{150 \times 90 \times 75}{15 \times 15 \times 15}$

= 10 × 6 × 5 = 300.

20. Let ABCD be a rhombus in which all sides are of 13 m and diagonal AC = 10 m.



Also let diagonals AC and BD bisect each other perpendicularly at O.

$\therefore \text{AO} = \text{OC} = \frac{10}{2} = 5 \text{ m}$

In right-triangle AOB, using Pythagoras theorem,

$\text{AO}^2 + \text{OB}^2 = \text{AB}^2$

$\Rightarrow 5^2 + \text{OB}^2 = 13^2$

$\Rightarrow \text{OB}^2 = 169 - 25 = 144$

$\therefore \text{OB} = \sqrt{144} = 12 \text{ m}$

∴ BD = 2 × OB = 2 × 12 = 24 m

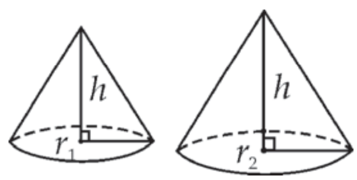
Therefore, area of the rhombus

$= \frac{1}{2} \times \text{AC} \times \text{BD}$

$= \frac{1}{2} \times 10 \times 24 = 120 \text{ m}^2.$

21. We have base radii of two right circular cones are in the ratio 3 : 5

$\Rightarrow \frac{r_1}{r_2} = \frac{3}{5}$



Also their height are same say h.

Therefore, ratio of their volumes $= \frac{V_1}{V_2}$

$= \frac{\frac{1}{3}\pi r_1^2 h}{\frac{1}{3}\pi r_2^2 h}$

$\left(\because \text{ Volume of a cone } = \frac{1}{3}\pi r^2 h\right)$

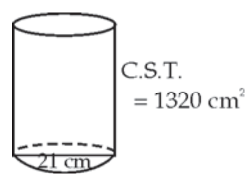
$= \frac{r_1^2}{r_2^2} = \left(\frac{r_1}{r_2}\right)^2 = \left(\frac{3}{5}\right)^2 = \frac{9}{25}$

$\therefore V_1 : V_2 = 9 : 25.$

22. **Given**: Curved surface area of a cylinder = 1320 cm^2

and base diameter = 21 cm

$\therefore$ Radius $r = \frac{21}{2}$ cm.



We know that curved surface area of the cylinder $= 2\pi rh$

$$\Rightarrow \quad 1320 = 2 \times \frac{22}{7} \times \frac{21}{2} \times h$$

$$\Rightarrow \quad h = \frac{1320 \times 7 \times 2}{2 \times 22 \times 21} = 20 \text{ cm}$$

Now, volume of the cylinder

$$= \pi r^2 h = \frac{22}{7} \times \left(\frac{21}{2}\right)^2 \times 20$$

$$= \frac{22}{7} \times \frac{441}{4} \times 20$$

$$= 22 \times 63 \times 5 = 6930 \text{ cm}^3.$$

23. Square root of 28 = $\sqrt{28}$

Using long division method,

```
              5.291
        ___________
  5    | 28.00 00 00
  5    |-25
 ----  |-----
 102   |  300
   2   | -204
 ----  |-------
 1049  |   9600
    9  |  -9441
 ----- |--------
 10581 |    15900
       |   -10581
       |   ------
       |     5319
```

$\therefore \ \sqrt{28} = 5.291 \approx 5.29.$

24. (*i*) Out of 0 to 9, 5 is the only digit which when added odd number of times the sum also has the ones digit as 5.

So we take A = 5 and add three times.

Thus, we get B = 1.

(*ii*)

```
  3 1 Q   Rewrite    5 0 1         5 0 1
+ 1 Q 3     →      − 1 Q 3  →  − 1 [8] 3
-------            -------     ----------
  5 0 1              3 1 Q         3 1 [8]
```

Subtract the right column and transfer the digit so obtained

$\therefore \qquad Q = 8$

25.

Length of a train = 375 m

Speed of the train = 45 km / h

$$= 45 \times \frac{5}{18} = \frac{25}{2} \text{ m / s}$$

Since, the train has to pass a single post, that means train has to cover its length *i.e.*, 375 m.

$$\therefore \quad \text{Time taken} = \frac{\text{Distance}}{\text{Speed}} = \frac{375 \text{ m}}{\frac{25}{2} \text{ m / s}}$$

$$= \frac{375 \times 2}{25} = 30 \text{ seconds.}$$

26. (*i*) $\left\{\left(\frac{1}{3}\right)^{-1} - \left(\frac{1}{4}\right)^{-1}\right\} = \{3 - 4\}$

(Taking reciprocals)

$= -1.$

(*ii*) $(3^{-1} + 4^{-1} + 5^{-1})^0$

$$= \left(\frac{1}{3} + \frac{1}{4} + \frac{1}{5}\right)^0 \quad \text{(Taking reciprocals)}$$

$$= \left(\frac{20 + 15 + 12}{60}\right)^0 = \left(\frac{47}{60}\right)^0 = 1.$$

$[\because a^0 = 1]$

27. Cost price of a sofa = ₹ 800

Selling price of the same sofa = ₹ 1040

Here, S.P. > C.P.

$\therefore$ Profit = S.P. – C.P.

= ₹ 1040 – ₹ 800 = ₹ 240

$$\therefore \text{ Profit \%} = \frac{\text{Profit}}{\text{C.P.}} \times 100$$

$$= \frac{240}{800} \times 100 = 30\%.$$

28. Cube root of 13824

$= \sqrt[3]{13824}$

Let us factorize 13824

2	13824
2	6912
2	3456
2	1728
2	864
2	432
2	216
2	108
2	54
3	27
3	9
	3

$\therefore \sqrt[3]{13824}$

$= \sqrt[3]{\underline{2\times2\times2}\times\underline{2\times2\times2}\times\underline{2\times2\times2}\times\underline{3\times3\times3}}$

$= \sqrt[3]{2^3\times2^3\times2^3\times3^3}$

$= 2 \times 2 \times 2 \times 3$

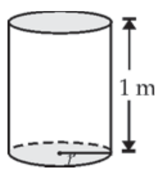
$= 24.$

SECTION-D

29. **Given:** Capacity of a cylinder = 15.4 l

$\Rightarrow$ Volume of the cylinder $= \frac{15.4}{1000}$ m^3

$[\because 1000\ l = 1\ m^3]$



$\Rightarrow \quad \pi r^2 h = \frac{154}{10000}$

$\Rightarrow \frac{22}{7} \times r^2 \times 1 = \frac{154}{10000}$

$(\because h = 1$ m given)

$\Rightarrow \quad r^2 = \frac{154}{10000} \times \frac{7}{22} = \frac{7\times7}{100\times100}$

$\therefore \quad r = \frac{7}{100}$

Now total surface area of closed cylinder

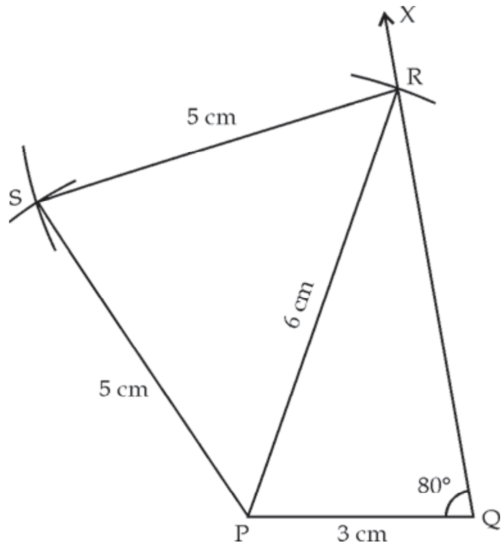
$= 2\pi r(r + h)$

$= 2 \times \frac{22}{7} \times \frac{7}{100}\left(\frac{7}{100}+1\right)$

$= \frac{2\times22}{100} \times \frac{107}{100} = \frac{4708}{10000}$

$= 0.4708\ m^2$.

30.



Steps of construction:

1. Take a line segment PQ = 3 cm.

2. Make an angle of measure 80° at Q with the help of protractor. Then draw a ray QX.

3. Taking P as centre and 6 cm as radius, draw an arc which cuts ray QX at R.

4. Further, taking 5 cm as radii and with centres P as well as R, draw two arcs which cut each other at S.

5. Now join PR, PS and RS.

Thus, the quadrilateral PQRS is formed.

31. (*i*) Let B's income be ₹ 100.

So A's income = ₹ 100 – 40% of ₹ 100

= ₹ 100 – ₹ 40 = ₹ 60

So the difference between their incomes

= ₹ 100 – ₹ 60 = ₹ 40.

Since A's income is ₹ 60 then B's income is ₹ 40 more than that of A's income

$\therefore$ A's income is ₹ 1 then B's income is ₹ $\frac{40}{60}$ more than that of A's income.

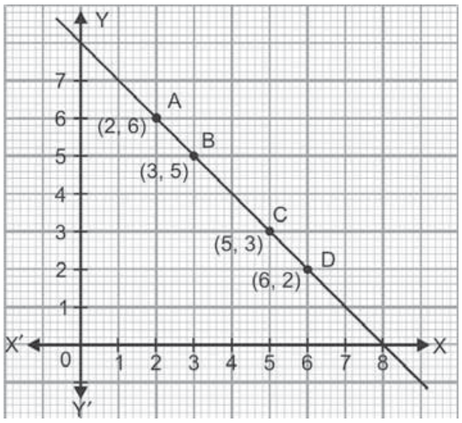
$\therefore$ A's income is ₹ 100 then B's income is ₹ $\frac{40}{60} \times 100 = 66\frac{2}{3}\%$.

(*ii*) Given 30% of $x = 60$

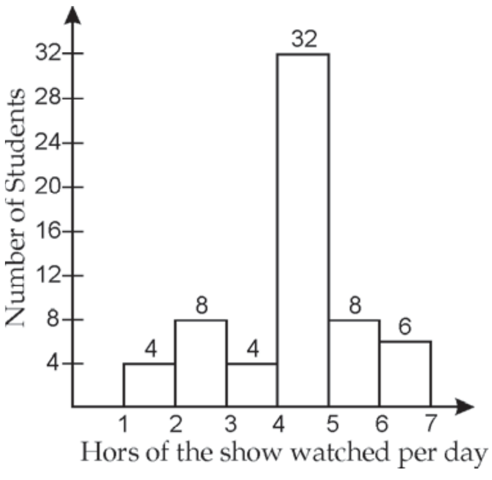
$$\Rightarrow \frac{30}{100} \times x = 60$$

$$\therefore \quad x = \frac{60 \times 100}{30} = 200.$$

32. From graph plotted to the below, it is clear that the points lie on the same line ABCD.



33. (*i*) In the given graph, maximum number of students is 32 and they watched the show for 4-5 hours.



(*ii*) The students watched the show for less than 4 hours means that students watched the show for 1 to 2, 2 to 3 or 3 to 4 hours.

So, the total number of such students $= 4 + 8 + 4 = 16.$

(*iii*) The students spent more than 5 hours in watching the show means the students that spent 5 to 6 or 6 to 7 hours.

So, the total number of such students $= 8 + 6 = 14.$

34. (*i*) Given monomials are $9x^2y$, $\frac{-3}{7}yz^2$, $\frac{-3}{8}y^2z$ and $6x^3y^2z^2$.

$\therefore$ Product of the monomials

$$= (9x^2y) \times \left(\frac{-3}{7}yz^2\right) \times \left(\frac{-3}{8}y^2z\right) \times (6x^3y^2z^2)$$

$$= \left(9 \times \frac{-3}{7} \times \frac{-3}{8} \times 6\right) \times (x^2 \times x^3) \times (y \times y \times y^2 \times y^2) \times (z^2 \times z \times z^2)$$

$$= \frac{243}{28} \cdot x^{2+3} \cdot y^{1+1+2+2} \cdot z^{2+1+2}$$

$$= \frac{243}{28} x^5y^6z^5.$$

(*ii*) Given number is 5184.

Using prime factorization,

$$\therefore \; 5184 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3$$

$$= 2^3 \times 2^3 \times 3^3 \times 3$$

2	5184
2	2592
2	1296
2	648
2	324
2	162
3	81
3	27
3	9
	3

In factorization, we observe that a 3 is not in exponent of 3. So we need eliminate 3 to 5184 a perfect cube.

Thus, the least required number is 3.

Practice Paper-2

SECTION-A

1. (C) L.H.S. $= 14x^3 = 2 \times 7 \times x \times x \times x$

[Using prime factorization]

= R.H.S.

2. (D) Starting from 0, firstly we move 3 units to the right on x-axis and then 5 units upward along y-axis.

Thus, we reach at the point D which represents (3, 5).

3. (A) By the divisibility test of 10, we know that number divisible by 10 has always ones digit as 0.

4. (B) Subtraction is not commutative

e.g., $\frac{1}{2} - \frac{1}{4}\left(=\frac{1}{4}\right) \neq \frac{1}{4} - \frac{1}{2}\left(=-\frac{1}{4}\right)$.

5. (C) Putting $m = \frac{-4}{3}$ in L.H.S,

$$17 + 6m = 17 + 6 \times \frac{-4}{3}$$
$$= 17 + 2 \times (-4) = 17 - 8$$
$$= 9 = \text{R.H.S.}$$

6. (A) By theorem, sum of all exterior angles of a quadrilateral (or any polygon) = 360°.

7. (B) Class width of a class interval

= Upper limit – Lower limit

= 40 – 30 = 10.

8. (D) Consider $12^2 - 1^2$

$= (12 + 1)(12 - 1)$

$[\because a^2 - b^2 = (a + b)(a - b)]$

$= 13 \times 11 = 143$.

9. (C) $(a + b)^2 = (a + b)(a + b)$

$= a(a + b) + b(a + b)$

(Distributive property)

$= a^2 + ab + ba + b^2$

$= a^2 + ab + ab + b^2$

(Commutative property)

$= a^2 + 2ab + b^2$

(Closure property).

10. (B) We have V = 5, F = 5, E = ?

Using Euler's formula, F + V – E = 2

$\Rightarrow$ 5 + 5 – E = 2 $\Rightarrow$ 10 – 2 = E

$\therefore$ E = 8.

SECTION-B

11. $\because$ In 2 kg of sugar, there are 9×10^6 crystals.

$\therefore$ In 1 kg of sugar, there are $\frac{9 \times 10^6}{2}$ crystals

$\therefore$ In 5 kg of sugar, there are

$$\frac{9 \times 10^6}{2} \times 5 \text{ crystals.}$$
$$= 22.5 \times 10^6$$
$$= 2.25 \times 10^7 \text{ crystals.}$$

Alternative Method:

Weight of sugar	2 kg	5 kg
Number of crystals	9×10^6	x

Here, weight and number of crystals of sugar are in direct variation.

$\therefore$ $\frac{2}{5} = \frac{9 \times 10^6}{x} \Rightarrow 2 \times x = 5 \times 9 \times 10^6$

$\Rightarrow$ $x = \frac{45 \times 10^6}{2} = 22.5 \times 10^6$

$= 2.25 \times 10^7$.

12. We have $\frac{3x-1}{4} = \frac{2x+5}{3}$

Cross-multiplying,

$$3(3x - 1) = 4(2x + 5)$$

$\Rightarrow$ $9x - 3 = 8x + 20$

Transposing, $9x - 8x = 20 + 3$

$\therefore$ $x = 23$.

13. Given:

$$\begin{array}{r} B\ A \\ \times\ 2\ 3 \\ \hline 5\ 7\ A \\ \hline \end{array}$$

Changing into complete system,

$$\begin{array}{r} B\ A \\ \times 2\ 3 \\ \hline \square\square \\ \square\square\ 0 \\ \hline 5\ 7\ A \\ \hline \end{array}$$

Putting A = 5

[∵ 5 is the digit that gives product 15 (*i.e.*, ones digit A) when multiplied by 3].

$$\begin{array}{r} B\ 5 \\ \times 2\ \ 3 \\ \hline {}^{+1} \\ {}^{+1}\square\boxed{5} \\ \square\boxed{0}\ 0 \\ \hline 5\ \ 7\ A \\ \hline \end{array}$$

Now, $7 - (1 + 0) = 6$

and $6 \div 3 = 2$.

So putting B = 2,

$$\begin{array}{r} 2\ \ 5 \\ \times 2\ \ 3 \\ \hline {}^{+1} \\ {}^{+1}\boxed{6}\boxed{5} \\ \boxed{4}\boxed{0}\ 0 \\ \hline 5\ \ 7\ \ 5 \\ \hline \end{array}$$

∴ A = 5, B = 2.

14. Given: Sum of two numbers $= \frac{-8}{5}$

One number $= \frac{2}{15}$

∴ Other number $= \frac{-8}{5} - \frac{2}{15}$

L.C.M. of 5 and 15 is 15.

$$= \frac{-24-2}{15} = \frac{-26}{15}.$$

15. Given expression $= x^2 + 5x + 4$

and value of $x = -3$

∴ Value of expression at $x = -3$ is

$$(-3)^2 + 5(-3) + 4 = 9 - 15 + 4$$

$$[\because 5(-3) = 5 \times (-3) \neq 5 - 3]$$

$$= 13 - 15 = -2.$$

16. Given dimensions of cuboid

$$= 35 \text{ cm} \times 30 \text{ cm} \times 24 \text{ cm}$$

Volume $= lbh$

$$= 35 \text{ cm} \times 30 \text{ cm} \times 24 \text{ cm}$$

Changing cm to m,

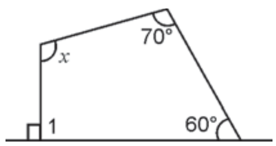
$$= \frac{35}{100} \times \frac{30}{100} \times \frac{24}{100}$$

$$= \frac{25200}{1000000} = 0.0252 \text{ m}^3.$$

17. From given figure,

$\angle 1 + 90° = 180°$

(Using linear pair axiom)



$$\angle 1 = 180° - 90° = 90°$$

Now, using angle sum property of a quadrilateral, we have,

$$\angle 1 + x + 70° + 60° = 360°$$

$$\Rightarrow \quad 90° + x + 70° + 60° = 360°$$

$$\Rightarrow \quad x + 220° = 360°$$

$$\therefore \quad x = 360° - 220° = 140°.$$

18. For a polyhedron we have

F = 10, E = 20 and V = 15.

Putting these values in Euler's formula

$$F + V - E = 2.$$

i.e., $10 + 15 - 20 = 25 - 20 = 5 \neq 2$.

Thus, a polyhedron cannot have the given values.

SECTION-C

19. **Given**: P = ₹ 5000, r = 8% per annum

t = 2 years, C.I. = ?

Using formula,

$$A = P\left(1+\frac{r}{100}\right)^t = 5000\left(1+\frac{8}{100}\right)^2$$

$$= 5000\left(\frac{100+8}{100}\right)^2$$

$$= 5000\left(\frac{108}{100}\right)^2 = 5000 \times \frac{108}{100} \times \frac{108}{100}$$

= ₹ 5832

∴ C.I. = A – P = ₹ 5832 – ₹ 5000 = ₹ 832.

20. $\text{L.H.S.} = \frac{7}{11} \times \left(\frac{11}{12}\times\frac{-15}{22}\right)$

$$= \frac{7}{11} \times \left(\frac{-15}{12\times 2}\right) = \frac{7}{11}\times\frac{-15}{24}$$

$$= \frac{-105}{264}$$

$\text{R.H.S.} = \left(\frac{7}{11}\times\frac{11}{12}\right) \times \frac{-15}{22}$

$$= \left(\frac{7}{12}\right) \times \frac{-15}{22} = \frac{7}{12} \times \frac{-15}{22}$$

$$= \frac{-105}{264}$$

Thus, L.H.S. = R.H.S. **Proved**.

21. Given number = 432

Taking prime factorization,

∴ $432 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{3 \times 3} \times 3$

$= 2^2 \times 2^2 \times 3^2 \times 3$

2	432
2	216
2	108
2	54
3	27
3	9
	3

In above factorization, 3 is not in pair, so to make 432 perfect square we should multiply it by 3.

22. Consider 1728

Taking prime factorization,

∴ $1728 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3}$

$= 2^3 \times 2^3 \times 3^3$

2	1728
2	864
2	432
2	216
2	108
2	54
3	27
3	9
	3

Thus, we observe that every factors have exponent 3.

Therefore, 1728 is a perfect cube.

23. Let cost price of an article be ₹ 100.

So, from question marked price

= ₹ 100 + 20% of ₹ 100

$= 100 + 100 \times \frac{20}{100}$

= 100 + 20 = ₹ 120

Also discount = 12%

∴ Selling price = ₹ 120 – 12% of ₹ 120

$= 120 - 120 \times \frac{12}{100}$

= 120 – 14.40 = ₹ 105.60

Now gain = S.P. – C.P.

= 105.60 – 100 = ₹ 5.60

∴ Gain % = $\frac{5.60}{100} \times 100 = 5.6\%$.

24. (*i*) $3x + \frac{1}{2} = \frac{3}{8} + x$

Transposing,

$$3x - x = \frac{3}{8} - \frac{1}{2} \Rightarrow 2x = \frac{3-4}{8} = \frac{-1}{8}$$

Dividing both sides, by 2

$$\frac{2x}{2} = -\frac{1}{8\times 2} \quad\Rightarrow\quad x = \frac{-1}{16}.$$

(*ii*) $2x + 3(x - 7) = \frac{5}{2}$

$\Rightarrow\ 2x + 3x - 21 = \frac{5}{2}$

$\Rightarrow\ 5x - 21 = \frac{5}{2}$

Transposing,

$5x = \frac{5}{2} + 21 \Rightarrow 5x = \frac{5+42}{2} = \frac{47}{2}$

Dividing by 5 both sides,

$\frac{5x}{5} = \frac{47}{2\times 5} \Rightarrow x = \frac{47}{10} = 4.7.$

25. Distance covered

$= 1.6 \text{ km} = 1.6 \times 1000 \text{ m}$

($\because$ 1 km = 1000 m)

$= 1600 \text{ m}$

Time taken = 5 minutes 20 seconds

$= 5 \times 60 + 20 = 300 + 20$

$= 320$ seconds

$$\text{Speed} = \frac{\text{Distance covered}}{\text{Time taken}}$$

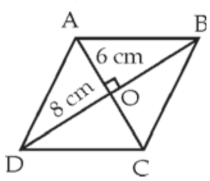
$$= \frac{1600 \text{ m}}{320 \text{ s}} = 5 \text{ m/s}$$

To convert m/s into km/h, we have to multiply the speed obtained by $\frac{18}{5}$.

Therefore, speed $= 5 \times \frac{18}{5}$ km/h

$= 18$ km/h.

26. Let ABCD be a rhombus whose diagonals AC and BD bisect each other at O.



Also let AC = 6 cm, BD = 8 cm

We know that area of a rhombus

$= \frac{1}{2}$ product of diagonals

$= \frac{1}{2} \times AC \times BD = \frac{1}{2} \times 6 \times 8$

$= 24 \text{ cm}^2$.

Again, in right triangle AOB,

$AB^2 = AO^2 + BO^2$

[By Pythagoras theorem]

$= 3^2 + 4^2 = 9 + 16$

$\therefore\ AB = \sqrt{25} = 5$ cm.

27. (*i*) $\frac{25 \times t^{-4}}{5^{-3} \times 10 \times t^{-8}}$ $(t \neq 0)$

$$= \frac{5^2 \times t^{-4}}{5^{-3} \times 2 \times 5 \times t^{-8}}$$

$$= \frac{5^{2-(-3)-1} \times t^{-4-(-8)}}{2}$$

$\left[\because \frac{a^m}{a^n} = a^{m-n}\right]$

$$= \frac{5^{2+3-1} \times t^{-4+8}}{2} = \frac{5^4 \times t^4}{2}$$

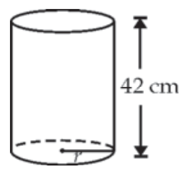
$$= \frac{625\ t^4}{2}.$$

(*ii*) $(3^0 + 4^{-1}) \times 2^2$

$= \left(1 + \frac{1}{4}\right) \times 4$ $\left[\because a^0 = 1, a^{-1} = \frac{1}{a}\right]$

$= \left(\frac{4+1}{4}\right) \times 4 = \frac{5}{4} \times 4 = 5.$

28. We have circumference of base of a cylinder = 88 cm.



$\Rightarrow\ 2\pi r = 88$

$\Rightarrow\ r = \frac{88}{2\pi} = \frac{88 \times 7}{2 \times 22}$

$= 14$ cm

$\therefore$ Volume of the cylinder

$= \pi r^2 h$

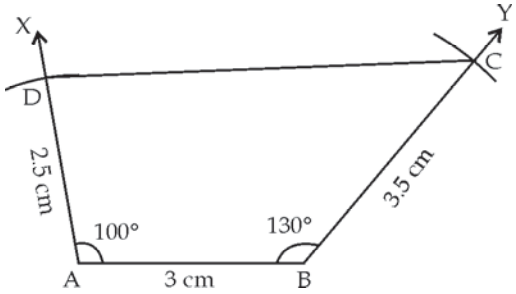
$= \frac{22}{7} \times (14)^2 \times 42$

($\because$ Given $h = 42$ cm)

$= 22 \times 196 \times 6 = 25872 \text{ cm}^3$.

SECTION-D

29.



Steps of construction:

1. Take a line segment AB = 3 cm.
2. Using protractor, make an angle of measure 100° at A and another angle of measure 130° at B.
3. Draw two rays AX and BY.
   $\therefore$ ∠BAX = 100° and ∠ABY = 130°.
4. Taking 3.5 cm radius with centre B, draw an arc that intersects the ray BY at C.
5. Again, taking 2.5 cm radius with centre A, draw another arc that intersects the ray AX at D.
6. Now Join CD.
   Thus, we obtain the quadrilateral ABCD.

30. (*i*) $\frac{x}{3} + \frac{4}{3} = \frac{2}{3}(4x - 1) - \left(2x - \frac{x+1}{3}\right)$

$\Rightarrow \frac{x+4}{3} = \frac{2(4x-1)}{3} - \frac{6x-(x+1)}{3}$

$\Rightarrow \frac{x+4}{3} = \frac{8x-2}{3} - \frac{6x-x-1}{3}$

$\Rightarrow \frac{x+4}{3} = \frac{8x-2-(5x-1)}{3}$

Multiplying both sides by 3,

$x + 4 = 8x - 2 - (5x - 1)$

$\Rightarrow x + 4 = 8x - 2 - 5x + 1$

$\Rightarrow x + 4 = 3x - 1$

$\Rightarrow x - 3x = - 1 - 4$ (Transposing)

$\Rightarrow - 2x = - 5$

$\therefore \quad x = \frac{5}{2}.$

(*ii*) $\frac{1}{a+2} + \frac{1}{a+1} = \frac{2}{a+10}$

$\Rightarrow \frac{a+1+a+2}{(a+2)(a+1)} = \frac{2}{a+10}$

$\Rightarrow \frac{2a+3}{a^2+3a+2} = \frac{2}{a+10}$

Cross-multiplying,

$(2a + 3)(a + 10) = 2(a^2 + 3a + 2)$

$\Rightarrow 2a^2 + 23a + 30 = 2a^2 + 6a + 4$

$\Rightarrow \quad 23a - 6a = 4 - 30$ (Transposing)

$\Rightarrow \quad 17a = - 26$

$\therefore \quad a = \frac{-26}{17}.$

31. (*i*) The horizontal (x) axis shows the time. The vertical (y) axis shows the distance of the car from City A.

(*ii*) The car started from City A at 8 a.m.

(*iii*) The speed of the car was not the same all the time.

(*iv*) We find that the car was 200 km away from City A when the time was 11 a.m. and also at 12 noon. This shows that the car did not travel during the interval 11 a.m. to 12 noon. The horizontal line segment representing "travel" during this period is illustrative of this fact.

(*v*) The car reached to City B at 2 p.m.

32. When two dice are thrown together then total possible outcomes are follows:

(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6)
(2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6)
(3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6)
(4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6)
(5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6)
(6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)

$\therefore$ The total number of outcomes is 36.

(*i*) Getting the sum as an even number, the favourable outcomes are:

(1, 1), (1, 3), (1, 5), (2, 2), (2, 4), (2, 6), (3, 1), (3, 3), (3, 5), (4, 2), (4, 4), (4, 6), (5, 1), (5, 3), (5, 5), (6, 2), (6, 4), (6, 6).

$\therefore$ The total number of favourable outcomes is 18.

$\because$ P (getting an even number as the sum)

$$= \frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}}$$

$$= \frac{18}{36} = \frac{1}{2}.$$

(*ii*) Getting a total of at least 6 means the sum $\geq$ 6.

$\therefore$ Favourable outcomes are:

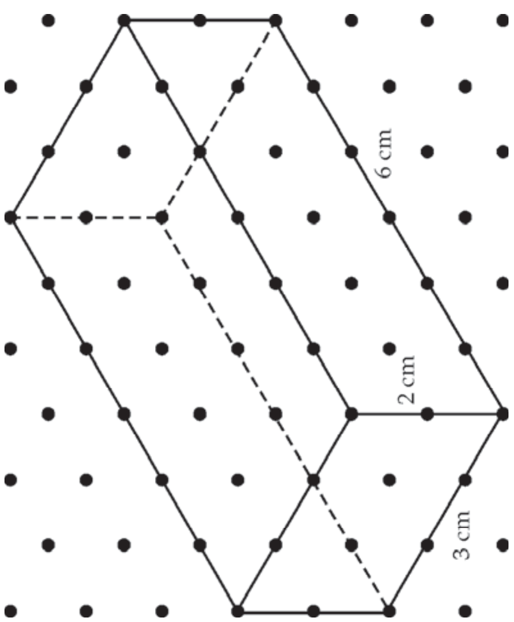
(1, 5), (1, 6), (2, 4), (2, 5), (2, 6), (3, 3), (3, 4), (3, 5), (3, 6), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6), (5, 1),... (5, 6), (6, 1),... ,(6, 6)

$\therefore$ Total number of favourable outcomes is 26.

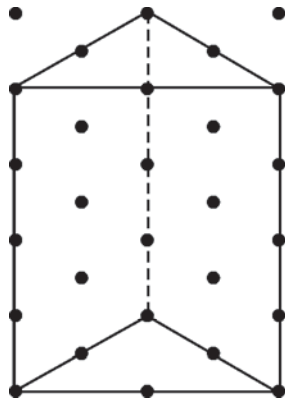
$\therefore$ P(getting total of at least 6)

$$= \frac{26}{36} = \frac{13}{18}.$$

33. (*i*)



(*ii*)



34. (*i*) $(a + 7) \times (a^2 + 3a + 5) - 10a\left(a + \frac{13}{5}\right)$

$= a(a^2 + 3a + 5) + 7(a^2 + 3a + 5)$
$\quad - 10a \times a - 10a \times \frac{13}{5}$

[Distributive property]

$= a^3 + 3a^2 + 5a + 7a^2 + 21a + 35$
$\quad - 10a^2 - 26a$

[Distributive property]

$= a^3 + (3a^2 + 7a^2 - 10a^2)$
$\quad + (5a + 21a - 26a) + 35$

$= a^3 + 0 + 0 + 35 = a^3 + 35.$

(*ii*) $(a + b)(2a - 3b + c) - (2a - 3b)c$

$= a(2a - 3b + c) + b(2a - 3b + c)$
$\quad - 2ac + 3bc$

[Distributive property]

$= 2a^2 - 3ab + ac + 2ab - 3b^2 + bc$
$\quad - 2ac + 3bc$

[Distributive property]

$= 2a^2 - 3b^2 - 3ab + 2ab + bc + 3bc$
$\quad + ac - 2ac$

[Rearranging]

$= 2a^2 - 3b^2 - ab + 4bc - ac.$

Practice Paper-3

SECTION-A

1. (C) Since x and y are in direct proportion, the ratio of x to y is always constant.

i.e., $\frac{x}{y} = k$ where k is constant

$\therefore \quad x = ky$.

2. (A) $(a-b)^2 - c^2 = (a-b+c)(a-b-c)$

[Using $x^2 - y^2 = (x+y)(x-y)$]

3. (C) The perpendicular distance of a point is denoted by x-coordinate. In this case, that is a.

4. (C) Consider the number

$$100 \times 2 + 10 \times 7 + 1 \times 9 = 279$$

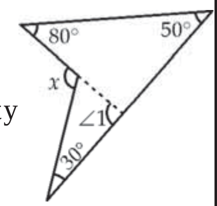
Here, ones digit 9 is not divisible by 2, 5 and 10 (also). So only option 9 may be its factor. Let us check the sum of digits *i.e.*, 2 + 7 + 9 = 18 which is divisible by 9. Hence the given number also divisible by 9.

5. (D) $\frac{x-3}{2} = \frac{y}{4} \Rightarrow 2(x-3) = y$

[Multiplying both sides by 4]

$\Rightarrow 2x - 6 = y \quad \therefore \quad 2x - y = 6$.

6. (C) In the given figure, producing a side, we get



$\angle 1 = 50° + 80°$

[Exterior angle property

$\Rightarrow \quad \angle 1 = 130°$

Again, $x = \angle 1 + 30°$

$= 130° + 30° = 160°$.

7. (C) The spinning wheel has total five sectors but the letters inserted are P, Q, R (only three). So the number of all possible outcomes is 3.

8. (B) $\sqrt{4^3} = \sqrt{4 \times 4 \times 4} = \sqrt{2^2 \times 2^2 \times 2^2}$

$[\because 4 = 2 \times 2 = 2^2]$

$= 2 \times 2 \times 2 = 8$.

9. (D) 9% of $x = 9$

$\Rightarrow \quad x \times \frac{9}{100} = 9$

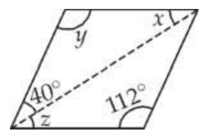
$\therefore \quad x = \frac{9 \times 100}{9} = 100$.

10. (A) We know that variables are represented by small letters of English Alphabet.

In the given expression, we observe that those are three namely x, y and z.

SECTION-B

11. Let A, B, C, D be the vertices of given quadrilateral.



We know that opposite angles of a parallelogram are equal.

$\therefore \angle B = \angle D \quad \Rightarrow \quad y = 112°$

Using angle sum property in ΔADC,

$40° + x + y = 180°$

$\Rightarrow 40° + x + 112° = 180°$

$\therefore \quad x = 180° - 152° = 28°$.

Now DC$\parallel$AB and Ac is transversal.

$\therefore \quad \angle BAC = \angle ACD$

(Alternate interior angle)

$\Rightarrow \quad z = x = 28°$.

12. Square root of $\frac{256}{441} = \sqrt{\frac{256}{441}}$

$= \frac{\sqrt{256}}{\sqrt{441}} = \frac{\sqrt{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2}}{\sqrt{3 \times 3 \times 7 \times 7}}$

$= \frac{\sqrt{2^2 \times 2^2 \times 2^2 \times 2^2}}{\sqrt{3^2 \times 7^2}} = \frac{2 \times 2 \times 2 \times 2}{3 \times 7}$

$= \frac{16}{21}$.

13. (*i*) $(a+b)^2 = (a+b)(a+b)$

$= a(a+b) + b(a+b)$

$= a^2 + ab + ab + b^2$

$= a^2 + 2ab + b^2$.

(*ii*) $(x+a)(x+b) = x(x+b) + a(x+b)$

$= x^2 + bx + ax + ab$

$= x^2 + (b + a)x + ab$
$= x^2 + (a + b)x + ab.$

14. Let a man's original salary be ₹ x.

After 10% increament his new salary is ₹ 154000.

$\Rightarrow \quad x + 10\% \text{ of } x = 154000$

$\Rightarrow \quad x + x \times \frac{10}{100} = 154000$

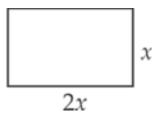
$\Rightarrow \quad \frac{100x + 10x}{100} = 154000$

$\Rightarrow \quad \frac{110x}{100} = 154000$

$\therefore \quad x = 154000 \times \frac{100}{110} = 14000 \times 10$

$= ₹\ 1,40,000.$

15. Let breadth of a rectangle be x. So length of the rectangle be $2x$.



From question, Area = 288 cm^2

$\Rightarrow 2x \times x = 288 \quad [\because \text{ Area} = lb]$

$\Rightarrow \quad 2x^2 = 288 \Rightarrow x^2 = \frac{288}{2} = 144$

$\therefore \quad x = \sqrt{144}$

$= \sqrt{2 \times 2 \times 2 \times 2 \times 3 \times 3}$

$= \sqrt{2^2 \times 2^2 \times 3^2}$

$= 2 \times 2 \times 3$

$= 12$ cm.

$\therefore$ Length $= 2x = 2 \times 12 = 24$ cm,

breadth $= x = 12$ cm.

16. Given number is 629.

Sum of the digits in the given number $= 6 + 2 + 9 = 17$ which is not divisible by 3 as well as 9.

Thus, 629 is not divisible by 3 and 9.

17. Cube of $1.1 = (1.1)^3 = 1.1 \times 1.1 \times 1.1$

$= 1.331.$

18. $\frac{10^7 \times 10^3}{(2 \times 5)^6} = \frac{10^{7+3}}{(10)^6} \quad [\because a^m \times a^n = a^{m+n}]$

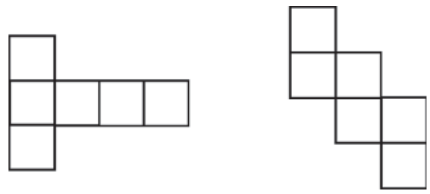
$= \frac{10^{10}}{10^6}$

$= 10^{10-6} \quad \left(\because \frac{a^m}{a^n} = a^{m-n}\right)$

$= 10^4.$

SECTION-C

19.



20. $\because$ In 10 days, Rinku can make 1 dress.

$\therefore$ In 1 day, Rinku can make $\frac{1}{10}$ part of a dress.

$\because$ In 5 days, Rinku and Teena together can make 1 dress.

$\therefore$ In 1 day, Rinku and Teena together can make $\frac{1}{5}$ part of the dress.

So, in 1 day, Teena alone can make $\left(\frac{1}{5} - \frac{1}{10}\right)$ part of the dress

$= \frac{2-1}{10} = \frac{1}{10}$ part

Now, Teena alone can make $\frac{1}{10}$ part of a dress in 1 day

So, Teena alone can make 1 full dress

in $\frac{1}{\frac{1}{10}} = 1 \times \frac{10}{1} = 10$ days.

21. (*i*) $10x^2yz - 20xy^3 + 5x^3$

$= 2 \times 5 \times x^2 \times y \times z - 2^2 \times 5 \times x \times y^3 + 5 \times x^3$

$= 5x(2 \times x \times y \times z - 2^2 \times y^3 + x^2)$

$= 5x(2xyz - 4y^3 - x^2)$

(ii) $x^3 + x^2 + x + 1 = (x^3 + x^2) + (x + 1)$
$= x^2(x + 1) + 1(x + 1)$
$= (x + 1)(x^2 + 1)$

22. $x^2 + 7x - 30 \div (x - 3)$

Let us perform long division,

$$\begin{array}{r|l} & x+10 \\ \hline x-3 & x^2+7x-30 \\ & x^2-3x \\ & -\quad + \\ \hline & \quad 10x-30 \\ & \quad 10x-30 \\ & \quad -\quad + \\ \hline & \qquad 0 \end{array}$$

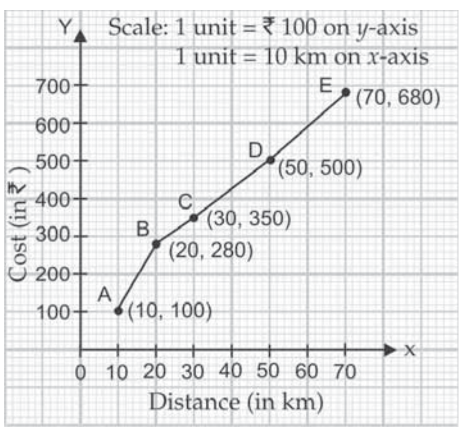
$\therefore$ Quotient $= x + 10$.

23. We have to draw a graph to show the reading related to the distance travelled by a car and its average cost. For this, we choose suitable axes on which the given data can be taken and also choose their scales.

Let us take distance travelled (in km) on x-axis (since it is independent) and average cost (in ₹) on y-axis (since it depends on the distance travelled).

On x-axis, 1 unit = 10 km and on y-axis, 1 unit = ₹ 100.

Now plot the points (10, 100), (20, 280), (30, 350), (50, 500), (70, 680) as shown in the graph. Then join them with free hand curve.



24. From the situation given in question, we will have to perform the operation of subtraction for algebraic expression.

$\therefore$ Required expression
$= (2x^2 + 4x + 1) - (x^2 - 4x + 3)$
$= 2x^2 + 4x + 1 - x^2 + 4x - 3$
$= (2x^2 - x^2) + (4x + 4x) + (1 - 3)$
$= x^2 + 8x - 2$.

25. (i) $999^2 = (1000 - 1)^2$
$= (1000)^2 - 2(1000)(1) + (1)^2$
[Using $(a - b)^2 = a^2 - 2ab + b^2$]
$= 1000000 - 2000 + 1$
$= 1000001 - 2000 = 998001$.

(ii) $(1.2)^2 = (1 + 0.2)^2$
$= (1)^2 + 2(1)(0.2) + (0.2)^2$
[Using $(a + b)^2 = a^2 + 2ab + b^2$]
$= 1 + 0.4 + 0.04 = 1.44$.

26. Given: Area of a square = 60025 m^2

$\Rightarrow$ $(\text{Side})^2 = 60025$

$\Rightarrow$ Side $= \sqrt{60025} = 245$ m

$\therefore$ Perimeter of the square = 4 × side
= 4 × 245 m
= 980 m.

Let us find square root.

	245
2	60025
2	–4
44	200
4	– 176
485	2425
5	– 2425
490	0

27. The given number is 10,224. Applying prime factorization method.

$\therefore$ $10224 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{3 \times 3} \times 71$
$= 2^2 \times 2^2 \times 3^2 \times 71$

2	10224
2	5112
2	2556
2	1278
3	639
3	213
	71

Observing the above factors, we find that 71 appears only once. Therefore, we have to eliminate it to become 10224 a perfect square.

Thus, 71 is the least number by which the given number must be divided.

28. (*i*) $\left(\frac{2}{7}\right)^{-6} \times \left(\frac{14}{9}\right)^{-6} = \left(\frac{x}{y}\right)^{-6}$

$\Rightarrow \quad \left(\frac{2}{7} \times \frac{14}{9}\right)^{-6} = \left(\frac{x}{y}\right)^{-6}$

$[\because a^m \times b^m = (a \times b)^m]$

$\Rightarrow \quad \left(\frac{2 \times 2}{9}\right)^{-6} = \left(\frac{x}{y}\right)^{-6}$

Since exponents are same of both sides, base also be same.

i.e., $\frac{x}{y} = \frac{4}{9}$.

(*ii*) (*a*) Standard form of 7240000

$= 7.24 \times 10^6$

(Transfer decimal point from end to 6 places to the left)

(*b*) Standard form of 0.00088

$= 8.8 \times 10^{-4}$

(Transfer decimal point from right to 4 places to the left)

SECTION-D

29. (*i*) $\frac{5m+4}{8-8m} = \frac{2}{3}$

Cross-multiplying,

$3(5m + 4) = 2(8 - 8m)$

$\Rightarrow 15m + 12 = 16 - 16m$

Transposing,

$15m + 16m = 16 - 12$

$\Rightarrow \quad 31m = 4 \therefore m = \frac{4}{31}$.

Verification:

$$\text{L.H.S.} = \frac{5m+4}{8-8m} = \frac{5 \times \frac{4}{31} + 4}{8 - 8 \times \frac{4}{31}}$$

$$= \frac{\frac{5 \times 4 + 31 \times 4}{31}}{\frac{8 \times 31 - 8 \times 4}{31}} = \frac{20+124}{248-32}$$

$$= \frac{144}{216} = \frac{2}{3} = \text{R.H.S.}$$

(*ii*) $\frac{2x+1}{3x-2} = \frac{8}{9}$

Cross-multiplying,

$9(2x + 1) = 8(3x - 2)$

$\Rightarrow \quad 18x + 9 = 24x - 16$

Transposing,

$18x - 24x = -16 - 9$

$\Rightarrow \quad -6x = -25 \quad \therefore x = \frac{25}{6}$

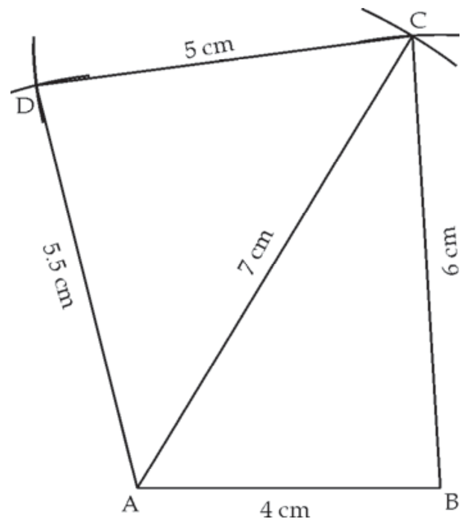
Verification:

$$\text{L.H.S} = \frac{2x+1}{3x-2} = \frac{2 \times \frac{25}{6} + 1}{3 \times \frac{25}{6} - 2}$$

$$= \frac{\frac{2 \times 25 + 1 \times 6}{6}}{\frac{3 \times 25 - 2 \times 6}{6}} = \frac{50+6}{75-12}$$

$$= \frac{56}{63} = \frac{8}{9} = \text{R.H.S.}$$

30.



Steps of construction:

1. Take a line segment AB = 4 cm.
2. Taking radii 6 cm and 7 cm with centres B and A respectively, draw two arcs which cut each other at C.
3. Again, taking radii 5 cm and 5.5 cm with centres C and A respectively, draw two arcs which cut each other at D.
4. Join AC, AD, BC and CD.

   Thus, a quadrilateral ABCD is formed.

31. We know that central angle

$$= \frac{\text{Particular item}}{\text{Sum of total items}} \times 360°$$

In this case, central angle

$$= \frac{\text{No. of students in a single game}}{\text{No. of total students in all games}} \times 360°$$

∴ Number of students in a single game

$$= \frac{\text{Central angle}}{360°} \times \text{Total number of students.}$$

Therefore, number of students in different games as:

In Cricket, $= \frac{100°}{360°} \times 180$

$= 50$ students.

In Badminton, $= \frac{120°}{360°} \times 180$

$= 60$ students

In Basket ball $= \frac{60°}{360°} \times 180$

$= 30$ students

In Tennis $= \frac{80°}{360°} \times 180$

$= 40$ students

(*i*) The number of students playing cricket $= 50$.

(*ii*) The sum of number of students playing tennis and badminton

$= 40 + 60 = 100$.

(*iii*) The difference between the number of students who play badminton to cricket

$= 60 - 50 = 10$

(*iv*) The ratio of students playing badminton to tennis

$= 60 : 40 = 3 : 2$.

(*v*) The number of students who play neither basket ball nor cricket

= The number of students who play either badminton or tennis

$= 60 + 40 = 100$.

32. (*i*) We know that the general form of Pythagorean triplet be $m^2 - 1$, $2m$, $m^2 + 1$

Let us take $m^2 - 1 = 12$

$\Rightarrow \quad m^2 = 12 + 1 = 13$

So m is not an integer.

Now let us take, $2m = 12$

$\Rightarrow \quad m = \frac{12}{2} = 6$

$\therefore \quad m^2 - 1 = 6^2 - 1 = 36 - 1 = 35$

and $m^2 + 1 = 6^2 + 1 = 36 + 1 = 37$.

Again let us try, $m^2 + 1 = 12$

$\Rightarrow \quad m^2 = 12 - 1 = 11$

Here also m has not integral value.

Thus, the Pythagorean triplet is 12, 35, 37.

[**Note:** All Pythagorean triplets may not be obtained using this general form. e.g., another triplet 5, 12, 13 also has 12 as a member.]

(*ii*) Square root of 28 = $\sqrt{28}$

Let us find its square root up to two decimal places using long division method.

	5.291
5	28.00 00 00
5	– 25
102	300
2	– 204
1049	9600
9	– 9441
10581	15900
	– 10581
	5319

$\therefore \sqrt{28} = 5.291 \approx 5.29.$

33. (*i*) In the graph, time is taken on x-axis.

Scale: 1 unit on x-axis = 1 hour.

(*ii*) The person started the journey at 8 am and reached at 11.30 am to the place of merchant.

So taken time

= 11.30 – 8.00

= 3 hours 30 minutes

or $3\frac{1}{2}$ hour.

(*iii*) The place of the merchant is 22 km apart from town.

(*iv*) Yes. During the period of 10 am to 10.30 am, line graph is parallel to x-axis. That means he was stoped.

(*v*) From graph, we observe that the person rode the cycle with different speeds but he covered most distance in his first hour between 8 am to 9 am.

34. Front view Side view Top view

Practice Paper-4

SECTION-A

1. (A) The given rationals are $\frac{1}{6}$ and $\frac{1}{4}$.

Let us find their equivalent fractions with the denominator 24.

$\frac{1\times 4}{6\times 4}$ and $\frac{1\times 6}{4\times 6}$ *i.e.*, $\frac{4}{24}$ and $\frac{6}{24}$

Now $4 < 5 < 6 \Rightarrow \frac{4}{24} < \frac{5}{24} < \frac{6}{24}$

$\Rightarrow \frac{1}{6} < \frac{5}{24} < \frac{1}{4}.$

2. (B) We have $0.3 = 0.15x$

$\Rightarrow \quad x = \frac{0.3}{0.15} = \frac{30}{15} = 2.$

3. (C) It is given that sum of any two angles of a quadrilateral is 170°. We know that the sum of all four angles of a quadrilateral is 360°.

$\therefore$ The sum of remaining two angles

= 360° – 170° = 190°.

4. (B) By the property of perfect square numbers ending with different digits, we know that a perfect square number ending with 5 ends with itself *i.e.*, 5.

5. (D) Cube of $7^3 = (7^3)^3 = 7^{3\times 3} = 7^9$

$[\because (a^m)^n = a^{m\times n}]$

6. (C) Before VAT charged, the price of a double bed = ₹ 10,000

Rate of VAT = 10%

∴ After VAT charged, the price of the double bed

$= 10000 + 10\% \text{ of } 10000$

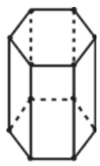
$= 10000 + 10000 \times \frac{10}{100}$

$= 10000 + 1000 = ₹\ 11,000.$

7. (D) An algebraic expression having only two terms joined with sign + or – is called binomial.

Here, we find that the expression $6xy - 5y$ contained two terms $6xy$ and $5y$ joined with –ve sign. Therefore, it is a binomial.

8. (A) Counting the vertices of a hexagonal prism drawn to the right, we get that its total number is 12.



Vertices

9 (D) We know that

area of a parallelogram = base × height

$= r \times h = rh.$

10. (B) $7^{-15} \times 7^5 \times 7^4 \times 7^3 \times 7^2 \times 7^1 \times 7^0$

$= 7^{-15+5+4+3+2+1+0}$

$[\because a^m \times a^n \times ... = a^{m+n+...}]$

$= 7^{-15+15} = 7^0 = 1.$ $[\because a^0 = 1]$

SECTION-B

11. We know that ratio is a comparission between two quantities with same units.

So, firstly, we convert the given quantities in same units then find their ratios.

(*i*) 7 minutes to 120 seconds

$$= \frac{7 \text{ minutes}}{120 \text{ seconds}} = \frac{7 \times 60 \text{ seconds}}{120 \text{ seconds}}$$

[∵ 1 minute = 60 seconds]

$$= \frac{7 \times 60}{120} = \frac{7}{2} = 7 : 2.$$

(*ii*) 75 paise to ₹ 2

$$= \frac{75 \text{ paise}}{₹\ 2} = \frac{75 \text{ paise}}{2 \times 100 \text{ paise}}$$

[∵ ₹ 1 = 100 paise]

$$= \frac{75}{200} = \frac{3}{8} = 3 : 8.$$

12. P = ₹ 5000, r = 8% per annum,

t = 2 years, C.I. = ?

C.I. = A – P

$$= P\left(1+\frac{r}{100}\right)^t - P$$

$$\left[\because A = P\left(1+\frac{r}{100}\right)^t\right]$$

$$= P\left[\left(1+\frac{r}{100}\right)^t - 1\right]$$

$$= 5000\left[\left(1+\frac{8}{100}\right)^2 - 1\right]$$

$$= 5000\left[\left(\frac{108}{100}\right)^2 - 1\right] = 5000\left[\frac{108^2}{100^2} - 1\right]$$

$$= 5000\left[\frac{108^2 - 100^2}{100^2}\right]$$

$$= 5000\left[\frac{(108+100)(108-100)}{100 \times 100}\right]$$

$$= 5000 \times \frac{208 \times 8}{100 \times 100} = 208 \times 4$$

= ₹ 832.

13. Addition

$= (l^2 + n^2) + (m^2 + n^2) + (l^2 + m^2) + (2mn + 2lm + 2nl)$

$= l^2 + n^2 + m^2 + n^2 + l^2 + m^2 + 2mn + 2lm + 2nl$

$= (l^2 + l^2) + (m^2 + m^2) + (n^2 + n^2) + 2mn + 2lm + 2nl$

$= 2l^2 + 2m^2 + 2n^2 + 2mn + 2lm + 2nl$

$= 2(l^2 + m^2 + n^2 + lm + mn + nl).$

14. $4x(8x - 3) - 2 = 4x \times 8x - 4x \times 3 - 2$ [Distributive property]

$= 32x^2 - 12x - 2.$

Putting $x = 2$,

$32x^2 - 12x - 2 = 32(2)^2 - 12(2) - 2$

$= 32 \times 4 - 12 \times 2 - 2$

$= 128 - 24 - 2$

$= 128 - 26 = 102.$

15. It is given that side of a square $= 2x - y$

So, area of the square

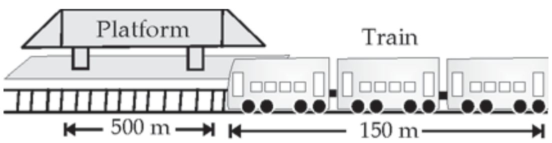
$= (\text{side})^2 = (2x - y)^2$

$= (2x)^2 - 2(2x)(y) + (y)^2$

[Using identity $(a - b)^2 = a^2 - 2ab + b^2$]

$= 4x^2 - 4xy + y^2.$

16. When a train passes a platform (bridge, etc) then it covers the distance equals to the sum of lengths of train and platform.



So the total distance is to be covered

$= 500 \text{ m} + 150 \text{ m} = 650 \text{ m}$

Speed of the train = 45 km / h

$= 45 \times \frac{5}{18}$ m / s [Changing into m / s]

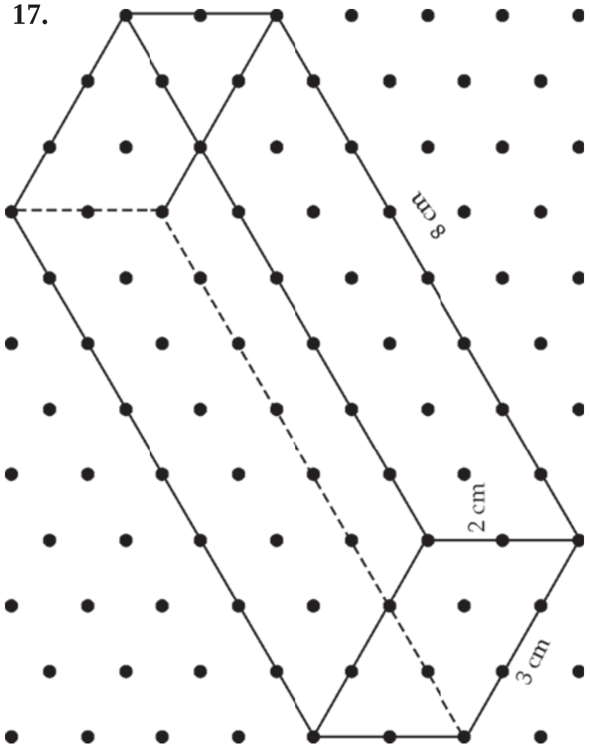
$= \frac{25}{2}$ m / s

$\therefore$ The time required $= \frac{\text{Distance}}{\text{Speed}}$

$= \frac{650 \text{ m}}{\frac{25}{2} \text{ m/s}} = \frac{650 \times 2}{25}$ sec.

$= 26 \times 2 = 52$ sec.

17.



18. For a polyhedron, given that

Number of edges = 30,

Number of vertices = 20

We have to find the number of faces the polyhedron has.

Using Euler's formula,

$F + V - E = 2$

$\Rightarrow \quad F + 20 - 30 = 2$

$\Rightarrow \quad F - 10 = 2$

$\therefore \quad F = 2 + 10 = 12.$

SECTION-C

19. Additive inverse of $\left(3\frac{1}{2} \times \frac{8}{21} \div \frac{2}{3}\right)$

$= -\left(3\frac{1}{2} \times \frac{8}{21} \div \frac{2}{3}\right) = -\left(\frac{7}{2} \times \frac{8}{21} \times \frac{3}{2}\right)$

$= -(2) = -2.$

20. Let Seema's age $= x$ years.

According to question,

Reema's age $= (x - 7)$ years

Given that sum of their ages is 8 years

$\Rightarrow \quad x + x - 7 = 8 \Rightarrow 2x - 7 = 8$

$\Rightarrow \quad 2x = 8 + 7 = 15$

$\therefore \quad x = \frac{15}{2} = 7\frac{1}{2}$ years

$= 7$ years $+ \frac{1}{2} \times 12$ months

$= 7$ years and 6 months

and $\quad x - 7 = 7\frac{1}{2} - 7 = \frac{1}{2}$ years

$= \frac{1}{2} \times 12$ months $= 6$ months

Hence, Reema's age = 6 months Seema's age = 7 years and 6 months or 7.5 years.

21. We know that a number is divisible by 11 when the difference between the sums of digits at odd places and even places is 0 or multiple of 11.

So, 276 ∗ is divisible by 11 if

$|(2 + 6) - (7 + *)| = 0$ or 11 or 22...

$\Rightarrow \quad |8 - 7 - *| = 0$ or 11 or ...

$\Rightarrow \quad |1 - *| = 0$ or 11

(Rest neglecting)

$\Rightarrow \quad 1 - * = 0$ or $\pm$ 11

$\Rightarrow \quad 1 - * = 0$ or $1 - * = \pm 11$

$\Rightarrow \quad * = 1$ or

$* = -10$ or 12

[Not possible]

$\therefore \quad * = 1.$

22. Length of the room = 3.2 m

Breadth of the room = 2.8 m

Height of the room = 2.4 m

We know that area of four walls

= Perimeter of floor × height

$= 2(l + b) \times h = 2(3.2 + 2.8) \times 2.4$

$= 2 \times 6.0 \times 2.4 = 28.8 \text{ m}^2.$

Rate of painting the walls

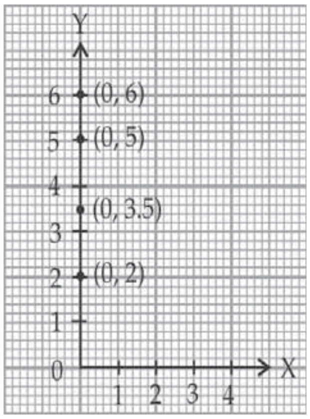
= ₹ 15 per m^2

∴ Total cost of painting the four walls

= Rate × Area

= ₹ 15 × 28.8 = ₹ 432.

23.



From graph, we find that the given points lie on the same vertical line.

This line is named as y-axis.

24. On the basis of given information, the spinning wheel may be as shown to the right.

It has total number of sectors 5.

Number of green sectors is 3

∴ The probability of getting a green sector $= \frac{\text{Number of green sector}}{\text{Total number of sector}} = \frac{3}{5}$.

Further, number of blue sector = 1

So total number of non-blue sectors

$= 5 - 1 = 4$

The probability of getting a non-blue sector $= \frac{\text{Number of non-blue sectors}}{\text{Total number of sectors}}$

$= \frac{4}{5}$.

25. We know that the least number which exactly divisible by given number is their LCM.

∴ Let us find L.C.M. of 4, 8 and 12.

Using division method,

∴ LCM = 4, 8 and 12

$= 2 \times 2 \times 2 \times 3$

$= 24$

2	4, 8, 12
2	2, 4, 6
	1, 2, 3

Since we have to find least square number which is exactly divisible by 4, 8 and 12. But observing factors con-tained in LCM, we see that 24 is not a perfect square. So multiplying 24 by 2 × 3 *i.e.* 6, we get 24 × 6 = 144 which is the required number.

26. Principal = ₹ 7,000,

Rate of interest = 7% yearly,

Time = 3 years, Simple Interest = ?,

Amount = ?

Using formula,

$$\text{S.I.} = \frac{P \times R \times T}{100} = \frac{7000 \times 7 \times 3}{100} = ₹\ 1470$$

∴ Amount = P + S.I.

= ₹ 7000 + ₹ 1470 = ₹ 8,470.

Thus, Geeta will have to pay her friend ₹ 1,470 as simple interest and ₹ 8,470 as amount.

27. $$\frac{2}{3}(4x - 1) - \left(4x - \frac{1-3x}{2}\right) = \frac{x-7}{2}$$

$$\Rightarrow \frac{2(4x-1)}{3} - \frac{8x-(1-3x)}{2} = \frac{x-7}{2}$$

$$\Rightarrow \frac{8x-2}{3} - \frac{8x-1+3x}{2} = \frac{x-7}{2}$$

$$\Rightarrow \frac{8x-2}{3} - \frac{11x-1}{2} = \frac{x-7}{2}$$

Multiplying both sides by the LCM of denominators, *i.e.*, by 6 (L.C.M. of 2, 3)

$$2(8x - 2) - 3(11x - 1) = 3(x - 7)$$

$$\Rightarrow 16x - 4 - 33x + 3 = 3x - 21$$

Transposing variables and constants,

$$16x - 33x - 3x = -21 + 4 - 3$$

$$\Rightarrow 16x - 36x = 4 - 24$$

$$\Rightarrow -20x = -20$$

$$\therefore x = \frac{20}{20} = 1.$$

28. Suppose Kishore's wife's salary be ₹ 100.

So Kishore's salary

= ₹ 100 + 10% of ₹ 100

= ₹ 100 + ₹ 10 = ₹ 110.

So the difference between their salaries

= ₹ 110 – ₹ 100 = ₹ 10.

Since Kishore's salary is ₹ 110 then his wife's salary is ₹ 10 less

So Kishore's salary is ₹ 1 then his wife's salary is $\frac{10}{110}$ less

So Kishore's salary is ₹ 100 then his wife's salary is $\frac{10}{110} \times 100$ less

$$= \frac{100}{11} = 9\frac{1}{11}\%.$$

SECTION-D

29. (*i*) Total number of tossing a coin = 50

Percentage chance of occurring a Tail = 60%

Percentage chance of occurring a Head = 100 – 60 = 40%

So the number of times Head has occurred = 40% of 50

$$= 50 \times \frac{40}{100} = 5 \times 4 = 20.$$

(*ii*) We know that the outcomes when an unbiased die is tossed two times is equal to the outcomes when two dice together are tossed one time.

Therefore, the total 36 outcomes are:

(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6), (2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6), (3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6), (4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6), (5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6), (6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6).

30. (*i*) No.

Since, $13^2 + 17^2 = 169 + 289$
$= 458 \neq 361$

i.e., 19^2

(*ii*) The smallest four-digit number = 1000

Taking prime factorization, 1000

$= 2 \times 2 \times 2 \times 5 \times 5 \times 5$

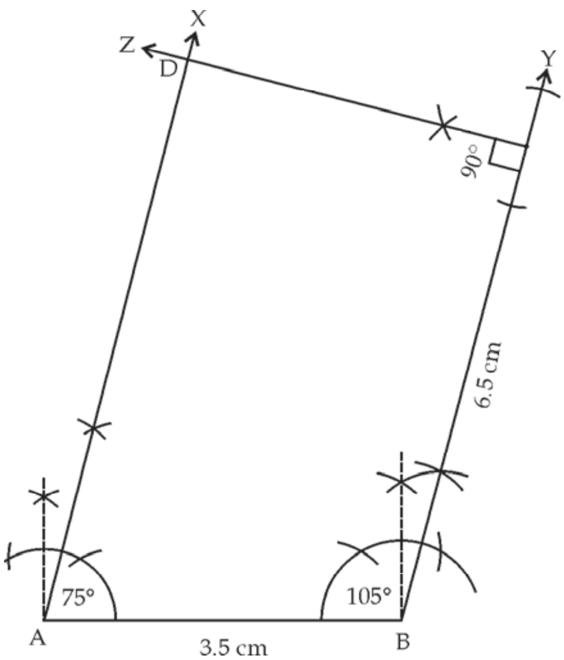
$= 2^3 \times 5^3$

2	1000
2	500
2	250
5	125
5	25
	5

Thus, we observe that each factor has an exponent 3 so we conclude that 1000 is a perfect cube.

Therefore, The least 4-digit perfect cube = 1000.

31.

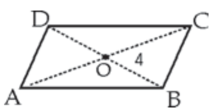


Steps of construction:

1. Take a line segment AB = 3.5 cm.
2. Using ruler and compass, make an angle of measure 75° at A and draw a ray AX.
3. Again, make another angle of measure 105° at B and draw a ray BY.
4. Taking 6.5 cm as radius with centre B, draw an arc that cut BY at point C.
5. Further, make a right angle at C using ruler and compass and draw a third ray CZ.
6. Extend rays AX and CZ till they cross each other at a point D.

Thus, a quadrilateral ABCD is formed.

32. (*i*) Since ABCD is a parallelogram, diagonals AC and BD bisect each other at O.



i.e., $AO = OC = \frac{AC}{2}$

and $BO = OD = \frac{BD}{2}$.

Given: OB = 4 cm,

AC = BD + 5 cm

So $AC = 2 \times OB + 5$

$(\because OB = \frac{BD}{2})$

$\Rightarrow AC = 2 \times 4 + 5$

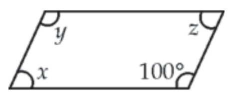
$= 8 + 5 = 13$ cm.

$\therefore OA = \frac{AC}{2} = \frac{13}{2} = 6.5$ cm.

(*ii*) Since given figure is a parallelogram, opposite angles are equal.

i.e., $x = z$

and $y = 100°$



Also adjacent (consecutive) angles are supplementary.

$\therefore x + 100° = 180°$

$\Rightarrow x = 180° - 100° = 80.$

Thus, $x = 80°, y = 100°,$
$z = 80°.$

33. (*i*) Let us find the sum of digits contained in number 21436587.

Sum of the digits
$= 2 + 1 + 4 + 3 + 6 + 5 + 8 + 7$
$= 36$ which is divisible by 9

∴ The given number also divisible by 9.

(*ii*) By the divisibility test of 11, a number is divisible by 11 if the difference between the sum of digits at odd places and even places is either 0 or a multiple of 11.

Now, consider the number
$729 * 654$

$|(7 + 9 + 6 + 4) - (2 + * + 5)| = 0$ or 11 or 22...

$\Rightarrow |26 - 7 - *| = 0$ or 11 or 22 or...

$\Rightarrow |19 - *| = 0$ or 11 or 22 or...

$\Rightarrow 19 - * = 0$ or ± 11 or ± 22 or...

$\Rightarrow 19 - * = 0$ or $19 - * = \pm 11$
or $19 - * = \pm 22$ or ...

Neglecting $* = 19$ or
$19 - * = \pm 22$ or soon...
$19 - * = \pm 11$
$19 - * = 11$
(Neglect –ve sign)

∴ $* = 19 - 11 = 8.$

34. Since a rectangular paper of width 14 cm is rolled along its width to form a cylinder, height of the cylinder is equal to 14 cm.

Given radius = 20 cm

Volume of the cylinder
$= \pi r^2 h$
$= \frac{22}{7} \times (20)^2 \times 14$
$= \frac{22}{7} \times 400 \times 14$
$= 22 \times 400 \times 2 = 17600 \text{ cm}^3.$

Practice Paper-5

SECTION-A

1. (B) Curved surface area
= base perimeter × height
= circumference of circular base × height
$= 2\pi r \times h = 2\pi rh.$

2. (B) $(1^{-1} + 2^{-1} + 3^{-1} + 4^{-1} + 5^{-1})^0$

$= \left(1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}\right)^0 \quad (\because a^{-1} = \frac{1}{a})$

$= \left(\frac{60+30+20+15+12}{60}\right)^0$

$= \left(\frac{137}{60}\right)^0 = 1. \quad (\because a^0 = 1)$

3. (A) By the definition of direct variation, two variables are always in constant ratio. So, true equation is $x \div y = 11$.

4. (D) Observing all the pairs, we conclude that one such pair whose both members having 3 or its multiple as a coefficient is $3xy$, 27.

5. (C) Origin is the intersecting point of axes where x and y-coordinate are zero. So the coordinates of origin are (0, 0).

6. (B) Expanded form of 801
= 8 hundreds + 0 tens + 1 ones
$= 8 \times 100 + 0 \times 10 + 1 \times 1$
i.e., $100 \times 8 + 10 \times 0 + 1 \times 1$.

7. (B) Multiplicative inverse of a^{-1}

$= (a^{-1})^{-1} = \left(\frac{1}{a}\right)^{-1} = a$

8. (C) By the definition, linear equation in one variable must has a variable of degree 1. But we observe that $3 + 2x^2 = 5$ has its variable of degree x.

9. (C) A convex quadrilateral has two of its diagonals in interior region.

10. (A) In the given data, 122 is appeared frequently four times. So its frequency is 4.

SECTION-B

11. (*i*) Consider 4×10^{-5}

We see that the number containing 10 raised to –5.That means decimal point will move 5 places from right to left.

$\therefore\ 4 \times 10^{-5} = 0.00004.$

(*ii*) Here, 1.54×10^5 has 10 raised to 5 (+ve). So decimal point will move 5 places from left to right.

$\therefore\ 1.54 \times 10^5 = 154000.$

12. $\because$ In 6 hours, Reema completes knitting 1 full sweater.

$\therefore$ In 1 hour, Reema completes knitting $\frac{1}{6}$ part of the sweater.

$\therefore$ In 4 hours, Reema completes knitting $\frac{1}{6} \times 4 = \frac{2}{3}$ part of the sweater.

13. $\sqrt[3]{74088}$

Let us find prime factors of 74088.

2	74088
2	37044
2	18522
3	9261
3	3087
3	1029
7	343
7	49
	7

$\therefore\ \sqrt[3]{74088}$

$$= \sqrt[3]{\underline{2\times2\times2}\times\underline{3\times3\times3}\times\underline{7\times7\times7}}$$

$$= \sqrt[3]{2^3\times3^3\times7^3}$$

$$= 2 \times 3 \times 7 = 42.$$

14. Dividend $= \left(\frac{3}{5}\right)^{-2}$, Divisor = ?,

Quotient = 25

Using Algorithm Theorem,

Dividend = Divisor × Quotient

[$\because$ Remainder = 0]

$$\Rightarrow \left(\frac{3}{5}\right)^{-2} = \text{Divisor} \times 25$$

$$\Rightarrow \left(\frac{3}{5}\right)^{-2} \div 25 = \text{Divisor}$$

$$\Rightarrow \text{Divisor} = \left(\frac{5}{3}\right)^{2} \div 25 = \frac{5^2}{3^2} \div 5^2$$

$$= \frac{5^2}{3^2} \times \frac{1}{5^2} = \frac{5^{2-2}}{3^2}$$

$$= \frac{5^0}{9} = \frac{1}{9}.$$

15. Consider

$$\begin{array}{r} 2\ A\ 7 \\ +\ A\ 7\ 1 \\ \hline 7\ 1\ 8 \\ \hline \end{array}$$

This puzzle has two letters A and B whose values are to be found.

We observe the sum of ones column and find that

B + 1 = 8 $\therefore$ B = 7.

Now puzzle seems to be

$$\begin{array}{r} 2\ A\ B \\ +\ A\ B\ 1 \\ \hline B\ 1\ 8 \\ \hline \end{array}$$

We study the addition in tens column and find that sum A + 7 = a two digit number may be, 11

$\Rightarrow$ A + 7 = 11 $\therefore$ A = 4.

Putting A = 4 in hundreds column and carry 1 forwarded to this column satisfies the addition.

Therefore, A = 4 and B = 7.

16. $(4^{-1} \div 8^{-1}) \div \left(\frac{2}{3}\right)^{-2} = \left(\frac{1}{4} \div \frac{1}{8}\right) \div \left(\frac{3}{2}\right)^{2}$

[Taking reciprocals]

$$= \left(\frac{1}{4} \times \frac{8}{1}\right) \div \left(\frac{3^2}{2^2}\right)$$

$$= 2 \div \frac{9}{4} = 2 \times \frac{4}{9}$$

$$= \frac{8}{9}.$$

17. Side of a cubic wooden block = 10 cm

$\therefore$ Volume of one block

$= (10)^3$

$= 10 \times 10 \times 10 \text{ cm}^3$

Dimensions of a cuboidal wooden block are 1 m, 40 cm and 20 cm

$\therefore$ Volume of the block $= l \times b \times h$

$= 100 \times 40 \times 20 \text{ cm}^3$

[$\therefore$ 1 m = 100 cm]

$\therefore$ The number of small cubic blocks that can be cut from the big block

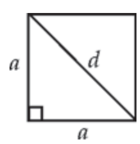
$$= \frac{\text{Volume of cuboidal block}}{\text{Volume of one cubic block}}$$

$$= \frac{100 \times 40 \times 20}{10 \times 10 \times 10}$$

$= 10 \times 4 \times 2 = 80.$

18. In a square, diagonal (d) = 90 m (Given)

From figure, it is clear that $d = \sqrt{2}a$



$\Rightarrow \sqrt{2}a = 90$

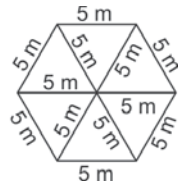
$\therefore \quad a = \frac{90}{\sqrt{2}}$ m

$\therefore$ Area of the square $= a^2$

$$= \left(\frac{90}{\sqrt{2}}\right)^2 = \frac{8100}{2} = 4050 \text{ m}^2.$$

SECTION-C

19. We observe the given figure and find that it is a regular hexagon that contains six equil-ateral triangles.



So, area of the regular hexagon

$= 6 \times$ Area of an equilateral triangle

$$= 6 \times \frac{\sqrt{3}}{4} (\text{side})^2$$

$$= 6 \times \frac{\sqrt{3}}{4} \times (5)^2$$

$$= 6 \times \frac{\sqrt{3}}{4} \times 25$$

$$= \frac{75}{2}\sqrt{3} \text{ m}^2.$$

20. Cost price of a second-hand refrigerator

= ₹ 2500

Additional cost on its repairing

= ₹ 500

$\therefore$ Total pure cost = 2500 + 500

= ₹ 3000

Selling price of the refrigerator = ₹ 3300

Since, Selling price > Total pure cost

$\therefore$ Rajesh gained his transection.

Gain = ₹ 3300 – ₹ 3000

= ₹ 300

$$\text{Gain \%} = \frac{\text{Gain}}{\text{Total cost}} \times 100$$

$$= \frac{300}{3000} \times 100$$

= 10%.

21. Yes.

Since the product of 0.3 and $3\frac{1}{3}$

$= 0.3 \times 3\frac{1}{3}$

$= \frac{3}{10} \times \frac{10}{3}$

$= 1.$

Therefore, we conclude that 0.3 and $3\frac{1}{3}$ are the multiplicative inverse of each other.

22. (*i*) $x^4 - y^4 = (x^2)^2 - (y^2)^2$

$= (x^2 + y^2)(x^2 - y^2)$

$[\because a^2 - b^2 = (a + b)(a - b)]$

$= (x^2 + y^2)(x + y)(x - y).$

(*ii*) $8p^2 + 24q^2 = 8(p^2 + 3q^2)$

[$\because$ Taking H.C.F. of both terms in common]

23. Side of a cube = 5 cm.

Total surface area of the cube $= 6a^2$

$= 6 \times (5)^2$

$= 6 \times 25$

$= 150 \text{ cm}^2$

Volume of the cube $= a^3$

$= (5 \text{ cm})^3$

$= 125 \text{ cm}^3.$

24. We have given two adjacent sides of a rectangle. We know that, in a rectangle adjacent sides are length and breadth.

So, perimeter = 2 × (length + breadth)

(*i*) Let $l = 8x^2 + 10$, $b = 5x^2 - 3$

$\therefore$ Perimeter $= 2(l + b)$

$= 2(8x^2 + 10 + 5x^2 - 3)$

$= 2(13x^2 + 7)$

$= 26x^2 + 14.$

(*ii*) Let $l = m^2 + n^2$,

$b = m^2 - 3n^2 - 5$

$\therefore$ Perimeter $= 2(l + b)$

$= 2(m^2 + n^2 + m^2 - 3n^2 - 5)$

$= 2(2m^2 - 2n^2 - 5)$

$= 4m^2 - 4n^2 - 10.$

25. $(-3)^{n+1} \times (-3)^5 = (-3)^7$

$\Rightarrow \quad (-3)^{n+1+5} = (-3)^7$

$[\because a^m \times a^n = a^{m+n}]$

$\Rightarrow \quad (-3)^{n+6} = (-3)^7$

Since bases are equal, exponents also be equal.

$n + 6 = 7$

$\therefore \quad n = 7 - 6 = 1.$

26. Expression $= 8(p - q - s^2) - 2(r - s^2)$

$= 8p - 8q - 8s^2 - 2r + 2s^2$

$= 8p - 8q - 2r - 6s^2.$

Putting the values $p = -1$, $q = -3$, $r = 2$, $s = -1$; we get

Value of expression $8p - 8q - 2r - 6s^2$

$= 8(-1) - 8(-3) - 2(2) - 6(-1)^2$

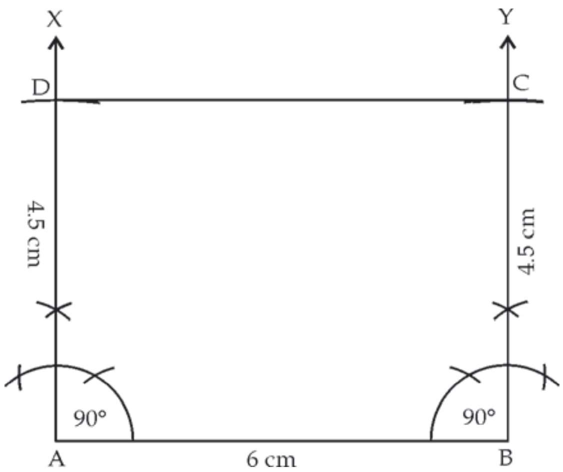
$= -8 + 24 - 4 - 6 \times (1)$

$= 24 - 8 - 4 - 6$

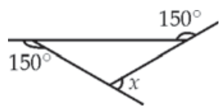
$= 24 - 18$

$= 6.$

27. The figure drawn shows a rectangle with sides 4.5 cm and 6 cm.



28. (*i*) We know that the sum of all exterior angles of a polygon is 360°.



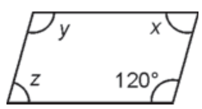
So, $x + 150° + 150° = 360°$

$\Rightarrow \quad x + 300° = 360°$

$\therefore \quad x = 360° - 300°$

$= 60°.$

(*ii*) Since the given figure is a parallelogram, opposite angles are equal.



$\Rightarrow$ $x = z$ and $y = 120°$

Also, adjacent angles of a parallelogram are supplementary.

$\Rightarrow \quad x + 120° = 180°$

$\Rightarrow \quad x = 180° - 120° = 60$

Thus, $x = 60°$, $y = 120°$ and $z = 60°$.

SECTION-D

29. (*i*) The greatest three-digit number = 999

Let us try to find the greatest three-digit perfect square number.

At first, we try to find square root of 999 using division method.

	31
3	$\overline{9}\,\overline{99}$
3	−9
61	99
	−61
	38

Subtracting remainder 38 from 999, 999 – 38 = 961 which is the required number.

(*ii*) Given number = 11,664

Applying prime fact-orization method.

2	11664
2	5832
2	2916
2	1458
3	729
3	243
3	81
3	27
3	9
	3

$\therefore \sqrt{11664}$

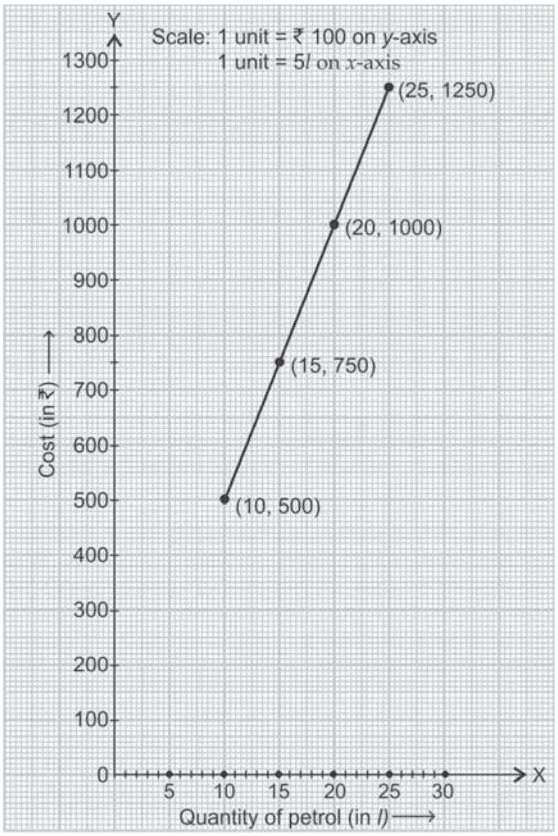
$= \sqrt{\underline{2\times2}\times\underline{2\times2}\times\underline{3\times3}\times\underline{3\times3}\times\underline{3\times3}}$

$= \sqrt{2^2\times2^2\times3^2\times3^2\times3^2}$

$= 2 \times 2 \times 3 \times 3 \times 3$

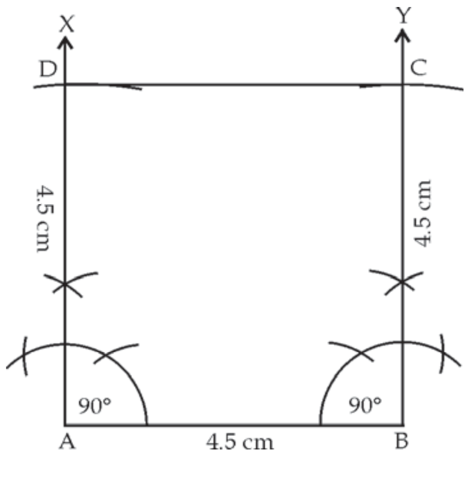
$= 108.$

30. To plot the given data on a graph, firstly, we choose the suitable axes for the quantity of petrol and its cost. Since cost of petrol depend on the quantity of petrol, we take quantity of petrol in litre on x-axis and cost in ₹ on y-axis. Also we take the scale 1 unit = ₹ 100 on y-axis and 1 unit = 5 litres on x- axis. Then plot the points (10, 500), (15, 750), (20, 1000), (25, 1250) as shown on the graph.



31. (*i*) **Steps of construction:**

1. Take a line segment of measure 4.5 cm and name it AB.



2. Using ruler and compass, make an angle of 90° at A and B. Then draw two rays AX and BY.

3. Taking radius as 4.5 cm and centres as A and B, draw two arcs that cut the rays AX at D and BY at C.

4. Join CD.

Thus, the square ABCD is obtained.

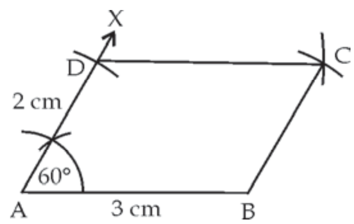
(*ii*) **Steps of construction:**

1. Take a line segment of measure 3 cm and name it AB.

2. Using ruler and compass, make an angle of 60° at A and draw a ray AX.

3. Further, taking 2 cm as radius and A as centre, draw an arc that cuts ray AX at D.

4. Now taking radii of lengths 2 cm and 3 cm with respectively centres B and D, draw two arcs that intersect each other at C.



5. Join BC and DC.

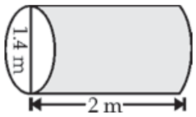
Thus, a parallelogram ABCD is obtained.

32. (*i*) Diameter of a rod roller = 1.4 m

$\therefore$ Radius (r) of a rod roller

$$= \frac{1.4}{2} \text{ m}$$

$$= 0.7 \text{ m}$$



Length (*i.e.*, height) of the rod roller

$= 2$ m

$\therefore$ Curved surface area $= 2\pi rh$

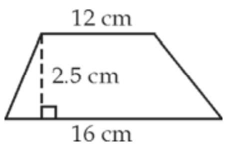
$$= 2 \times \frac{22}{7} \times 0.7 \times 2$$

$$= 8.8 \text{ m}^2$$

Since in 1 revolution the rod roller covers the area = 8.8 m

So in 10 revolution the rod roller covers the area = $8.8 \times 10 = 88$ m^2.

(*ii*) Lengths of the parallel sides are 12 cm and 16 cm.



Distance between the parallel sides

i.e., altitude = 2.5 cm

$\therefore$ Area of the trapezium

$$= \frac{1}{2} \times (\text{Sum of parallel sides}) \times \text{Altitude}$$

$$= \frac{1}{2} \times (12 + 16) \times 2.5$$

$$= \frac{1}{2} \times 28 \times 2.5$$

$$= 14 \times 2.5 = 35 \text{ cm}^2.$$

33. (*i*) Consider

$$\begin{array}{r} 6\,x\,x\,5\,x \\ +\,7\,y\,y\,y\,z \\ \hline 1\,3\,8\,8\,6\,9 \end{array}$$

This puzzle has three letters x, y and z whose values are to be found.

We study the sum in the ones column. The sum of two letters x and z is 9 so it is clear that the carry cannot be forwarded to the tens column.

When we study the tens column, the sum of 5 and y is 6 *i.e.*, $5 + y = 6$

[$\because$ The sum 16 is not possible if 5 is added to a digit out of 0 to 9]

$\therefore \; y = 1$

Therefore, studying in hundreds and thousands columns, we find that

$x + y = 8$

($\because$ Carry is not forwarded to ten thousands column)

i.e., $x + 1 = 8 \quad \therefore \; x = 7$.

Now putting $x = 7$ in ones column, we get

$x + z = 9$ *i.e.*, $7 + z = 9 \;\therefore\; z = 2$

Thus, $x = 7$, $y = 1$, $z = 2$.

(*ii*) $$\left(\frac{7}{8}\right)^{-3} \times \left(\frac{7}{8}\right)^{2x} = \left(\frac{7}{8}\right)^{x}$$

$$\Rightarrow \left(\frac{7}{8}\right)^{-3+2x} = \left(\frac{7}{8}\right)^{x} \quad (\because a^m \times a^n = a^{m+n})$$

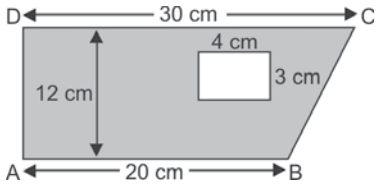
Since bases are equal, exponents also be equal. That means

$$-3 + 2x = x$$

$$\Rightarrow \quad 2x - x = 3 \qquad \text{(Transposing)}$$

$$\therefore \quad x = 3.$$

34. From figure, we observe that ABCD is a trapezium whose parallel sides AB = 20 cm, DC = 30 cm and distance between them is 12 cm (= AD).



∴ Area of trapezium ABCD

$$= \frac{1}{2} \times (AB + DC) \times AD$$

$$= \frac{1}{2} \times (20 + 30) \times 12$$

$$= \frac{1}{2} \times 50 \times 12$$

$$= 50 \times 6$$

$$= 300 \text{ cm}^2$$

The region unshaded in interior of trapezium ABCD is a rectangle with dimensions 4 cm × 3 cm.

∴ Area of the rectangle

$$= 4 \text{ cm} \times 3 \text{ cm} \quad (\because A = lb)$$

$$= 12 \text{ cm}^2.$$

∴ The area of shaded region

$$= 300 \text{ cm}^2 - 12 \text{ cm}^2$$

$$= 288 \text{ cm}^2.$$

❑❑