# Mathematics Class 8

## Chapter-1

## Rational Numbers

### Exercise 1.1

**1.** (i) $\frac{-4}{5} \times 1 = 1 \times \frac{-4}{5} = \frac{-4}{5}$

1 is the multiplicative identity for rational numbers.

(ii) $\frac{-13}{17} \times \frac{-2}{7} = \frac{-2}{7} \times \frac{-13}{17}$

Commutative property for rational numbers.

(iii) $\frac{-19}{29} \times \frac{29}{-19} = 1$

Multiplicative inverse of a rational number exists.

**2.** The property used is associativity of multiplication for rational numbers.

**3.** Do your self.

## Chapter-2

## Linear Equations in One Variable

### Exercise 2.1

**1.** Given, $3x = 2x + 18$

$\Rightarrow \quad 3x - 2x = 18$ [Taking $x$ term on LHS]

$\Rightarrow \quad x = 18$

**Verification of solution**

Putting value $x = 18$ in equation to check if satisfying,

To check, $3 \times 18 = 2 \times 18 + 18$

$\Rightarrow \quad \text{LHS} = 3 \times 18 = 54$

$\text{RHS} = 2 \times 18 + 18 = 36 + 18 = 54$

$\therefore \quad \text{LHS} = \text{RHS}$

**2.** Given, $5t - 3 = 3t - 5$

$\Rightarrow \quad 5t - 3t = -5 + 3$ [Putting similar terms together]

$\Rightarrow \quad 2t = -2 \Rightarrow t = \frac{-2}{2} \Rightarrow t = -1$

**Verification of solution**

Putting value $t = -1$ in equation to check if satisfying.

$\therefore \quad \text{LHS} = 5 \times (-1) - 3 = -5 - 3 = -8$

$\text{RHS} = 3(-1) - 5 = -3 - 5 = -8$

$\therefore \quad \text{LHS} = \text{RHS}$

**3.** Given, $5x + 9 = 5 + 3x$

$\Rightarrow \quad 5x - 3x = 5 - 9$

$\Rightarrow \quad 2x = -4 \Rightarrow x = \frac{-4}{2} = -2$

**Verification of solution**

Putting value $x = -2$ in equation to check if satisfying.

$\therefore \quad \text{LHS} = 5 \times (-2) + 9 = -10 + 9 = -1$

$\text{RHS} = 5 + 3(-2) = 5 - 6 = -1$

$\therefore \quad \text{LHS} = \text{RHS}$

**4.** Given, $4z + 3 = 6 + 2z$

$\Rightarrow \quad 4z - 2z = 6 - 3 \Rightarrow 2z = 3 \Rightarrow z = \frac{3}{2}$

**Verification of solution**

Putting value $z = \frac{3}{2}$ in equation to check if satisfying,

$\therefore \quad \text{LHS} = 4\left(\frac{3}{2}\right) + 3 = 9$

$\text{RHS} = 6 + 2\left(\frac{3}{2}\right) = 9$

$\therefore \quad \text{LHS} = \text{RHS}$

**5.** Given, $2x - 1 = 14 - x \Rightarrow 2x + x = 14 + 1$

$\Rightarrow \quad 3x = 15 \Rightarrow x = \frac{15}{3} = 5$

**Verification of solution**

Putting value $x = 5$ in equation to check if satisfying.

$\therefore \quad \text{LHS} = 2(5) - 1 = 10 - 1 = 9$

$\text{RHS} = 14 - x = 14 - 5 = 9$

$\text{LHS} = \text{RHS}$

**6.** Given, $8x + 4 = 3(x - 1) + 7$

$\Rightarrow \quad 8x + 4 = 3x - 3 + 7$

$\Rightarrow \quad 8x - 3x = -3 - 4 + 7 \Rightarrow 5x = 0$

$x = 0$

**Verification of solution**

Putting value $x = 0$ in equation to check if satisfying,

$\therefore \quad \text{LHS} = 8(0) + 4 = 4$

$\text{RHS} = 3(0 - 1) + 7 = -3 + 7 = 4$

$\therefore$ LHS = RHS

**7.** Given, $x = \frac{4}{5}(x + 10)$

$\Rightarrow \quad x = \frac{4}{5}x + \frac{4}{5} \times 10$

$\Rightarrow \quad x - \frac{4}{5}x = 8$

$\Rightarrow \quad \frac{5x - 4x}{5} = 8 \quad \Rightarrow \frac{x}{5} = 8$

$\Rightarrow \quad x = 40$

**Verification of solution**

Putting value $x = 40$ in equation to check if satisfying,

$\therefore$ LHS = 40

RHS $= \frac{4}{5}(40 + 10) = \frac{4}{5} \times 50$

$= 4 \times 10 = 40$

$\therefore$ LHS = RHS

**8.** Given, $\frac{2x}{3} + 1 = \frac{7x}{15} + 3$

$\Rightarrow \quad \frac{2x}{3} - \frac{7x}{15} = 3 - 1$

$\Rightarrow \quad \frac{10x - 7x}{15} = 2 \quad \Rightarrow \frac{3x}{15} = 2$

$\Rightarrow \quad x = \frac{2 \times 15}{3} = 10$

$x = 40$

**Verification of solution**

Putting value $x = 10$ in equation to check if satisfying,

$\therefore$ LHS $= \frac{2}{3} \times 10 + 1 = \frac{20}{3} + 1 = \frac{20 + 3}{3} = \frac{23}{3}$

RHS $= \frac{7}{15} \times 10 + 3 = \frac{7 \times 2}{3} + 3 = \frac{14 + 9}{3} = \frac{23}{3}$

$\therefore$ LHS = RHS

**9.** Given, $2y + \frac{5}{3} = \frac{26}{3} - y$

$\Rightarrow \quad 2y + y = \frac{26}{3} - \frac{5}{3} \quad \Rightarrow 3y = \frac{21}{3}$

$\Rightarrow \quad 3y = 7 \quad \Rightarrow \quad y = \frac{7}{3}$

**Verification of solution**

Putting value $y = \frac{7}{3}$ in equation to check if satisfying,

$\therefore$ LHS $= 2 \times \frac{7}{3} + \frac{5}{3} = \frac{14}{3} + \frac{5}{3} = \frac{19}{3}$

RHS $= \frac{26}{3} - \frac{7}{3} = \frac{19}{3}$

$\therefore$ LHS = RHS

**10.** Given, $3m = 5m - \frac{8}{5}$

$\Rightarrow \quad 5m - 3m = \frac{8}{5} \quad \Rightarrow 2m = \frac{8}{5}$

$\Rightarrow \quad m = \frac{8}{5} \times \frac{1}{2} \quad \Rightarrow m = \frac{4}{5}$

**Verification of solution**

Putting value $m = \frac{4}{5}$ in equation to check if satisfying,

$\therefore$ LHS $= 3 \times \frac{4}{5} = \frac{12}{5}$

RHS $= 5 \times \frac{4}{5} - \frac{8}{5} = \frac{20}{5} - \frac{8}{5} = \frac{12}{5}$

$\therefore$ LHS = RHS

## Exercise 2.2

**1.** Given, $\frac{x}{2} - \frac{1}{5} = \frac{x}{3} + \frac{1}{4}$

$\Rightarrow \quad \frac{x}{2} - \frac{x}{3} = \frac{1}{5} + \frac{1}{4}$

$\Rightarrow \quad \frac{3x - 2x}{6} = \frac{4 + 5}{20} \quad \Rightarrow \frac{x}{6} = \frac{9}{20}$

$\Rightarrow \quad x = \frac{9}{20} \times 6 = \frac{9 \times 3}{10} = \frac{27}{10}$

**2.** Given, $\frac{n}{2} - \frac{3n}{4} + \frac{5n}{6} = 21$

$\Rightarrow \quad \frac{6n - 9n + 10n}{12} = 21 \quad \Rightarrow \frac{7n}{12} = 21$

$\Rightarrow \quad n = \frac{21 \times 12}{7} = 36$

**3.** Given, $x + 7 - \frac{8x}{3} = \frac{17}{6} - \frac{5x}{2}$

$\Rightarrow \quad x - \frac{8}{3}x + \frac{5}{2}x = \frac{17}{6} - 7$

$\Rightarrow \quad \frac{6x - 16x + 15x}{6} = \frac{17 - 42}{6}$

$\Rightarrow \quad \frac{5}{6}x = -\frac{25}{6}$

$\Rightarrow \quad x = -\frac{25}{6} \times \frac{6}{5} = -5$

**4.** Given, $\frac{x - 5}{3} = \frac{x - 3}{5}$

$\Rightarrow \quad 5(x - 5) = 3(x - 3)$

$\Rightarrow \quad 5x - 25 = 3x - 9$

$\Rightarrow \quad 5x - 3x = 25 - 9$

$\Rightarrow \quad 2x = 16 \quad \Rightarrow x = \frac{16}{2} = 8$

**5.** Given, $\left(\frac{3t - 2}{4}\right) - \left(\frac{2t + 3}{3}\right) = \frac{2}{3} - t$

$\Rightarrow \frac{3(3t - 2) - 4(2t + 3)}{12} = \frac{2 - 3t}{3}$

$\Rightarrow 3(3t-2)-4(2t+3)=4(2-3t)$

$\Rightarrow \quad 9t-6-8t-12=8-12t$

$\Rightarrow \quad t-18=8-12t$

$\Rightarrow \quad 12t+t=18+8$

$\Rightarrow \quad 13t=26 \Rightarrow t=\frac{26}{13}=2$

**6.** Given, $m-\left(\frac{m-1}{2}\right)=1-\left(\frac{m-2}{3}\right)$

$\Rightarrow \quad \frac{2m-(m-1)}{2}=\frac{3-(m-2)}{3}$

$\Rightarrow \quad \frac{2m-m+1}{2}=\frac{3-m+2}{3}$

$\Rightarrow \quad \frac{m+1}{2}=\frac{5-m}{3}$

[Cross multiplying]

$\Rightarrow \quad 3(m+1)=2(5-m)$

$\Rightarrow \quad 3m+3=10-2m$

$\Rightarrow \quad 3m+2m=10-3$

$\Rightarrow \quad 5m=7 \Rightarrow m=\frac{7}{5}$

# Chapter-3

## Quadrilaterals and its Basics

### Exercise 3.1

**1.** The figures can be classified as follows :

(a) Simple curve : 1, 2, 5, 6, 7

(b) Simple closed curve : 1, 2, 5, 6, 7

(c) Polygon : 1, 2, 4

(d) Convex polygon : 2

(e) Concave polygon : 1, 4

**2.** *ABCD* is a convex quadrilateral. By joining *B* and *D*, two triangles $\Delta ABD$ and $\Delta BCD$ are obtained.

Sum of interior angles of one triangle $=180°$. Similarly, interior angles of other triangle $=180°$ So, sum of interior angle of two triangles $=180°+180°=360°$

Sum of the measures of the angles of a convex quadrilateral is $360°$.

yes, this property holds in case the quadrilateral is not convex.

### Exercise 3.2

**1.** The sum of exterior angles by producing the sides of a convex polygon in same order is equal to $360°$. Thus,

(a) $x°+125°+125°=360°$

$\Rightarrow \quad x+250°=360°$

$\Rightarrow \quad x=360°-250°=110°$

(b) $x°+70°+90°+60°+90°=360°$

$\Rightarrow \quad x=360°-310°=50°$

**2.** (i) Each exterior angle of a regular polygon which has 9 sides $=\frac{360°}{n}$

Where $n=9$

$\therefore \quad \frac{360°}{9}=40°$

(ii) Each exterior angle of a regular polygon which has 15 sides $=\frac{360°}{n}$

Where $n=15$

$\therefore \quad \frac{360°}{15}=24°$

**3.** For an exterior angle of a polygon each angle $=\frac{360°}{n}$

(Where $n$ = Number of sides)

$\therefore$ Given, each exterior angle $=24°$

$\therefore \quad \frac{360°}{n}=24$

$\Rightarrow \quad \frac{360°}{24°}=n$

$\Rightarrow \quad n=15$

Thus number of sides $n=15$

**4.** For a $n$-sided regular polygon, each interior angle is given as $=\frac{(n-2)\times 180°}{n}$

(Where $n$ = Number of sides)

$\therefore \quad \frac{(n-2)\times 180°}{n}=165$

$\Rightarrow \quad 180n-360°=165n$

$\Rightarrow \quad 180n-165n=360°$

$\Rightarrow \quad 15n=360° \Rightarrow n=24$

$\therefore$ There are 24 sides in the regular polygon with each interior angle $165°$.

**5.** (a) Number of sides of a regular polygon

$=\frac{360°}{\text{Exterior angle}}$

$\therefore$ Number of sides of a regular polygon

$=\frac{360°}{22°}$

[$\because$ 22° is given to be exterior angle]

$= \frac{180°}{11°}$

$\therefore$ The result is not an exact divisor of $360°$.

$\therefore$ Exterior angle with 22° is not possible.

(b) Interior angle = 22°

Then, exterior angle = 180° – 22° = 158°

No. of sides of regular polygon

$= \frac{360°}{\text{Exterior angle}} = \frac{360°}{158°}$

But 158 does not divide $360°$ exactly.

Hence, the polygon is not possible.

**6.** (a) A regular polygon contains at least 3 sides.

Thus, minimum interior angle

$= \frac{(3-2) \times 180°}{3} = 60°$

Thus, possible interior angle = 60°

(b) The minimum interior angle possible $= 60°$ for a maximum exterior angle $= 180° - 60° = 120°$

## Exercise 3.3

**1.** (i) $AD = BC$

[For a parallelogram, opposite sides are equal]

(ii) $\angle DCB = \angle DAB$

[For a parallelogram, opposite angles are equal]

(iii) $OC = OA$

[Diagonals of a parallelogram bisect each other]

(iv) $m\angle DAB + m\angle CDA = 180°$

[Sum of two adjacent angles is $180°$]

**2.** (i) Sum of two adjacent angles in a parallelogram is 180°.

$\therefore \quad x + 100 = 180°$

$\Rightarrow \quad x = 180° - 100° = 80°$

$x + y = 180°$

$\Rightarrow \quad 80° + y = 180°$

$\Rightarrow \quad y = 180° - 80° = 100°$

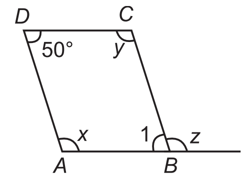
$y + z = 180°$

$\Rightarrow \quad 100° + z = 180°$

$\Rightarrow \quad z = 180° - 100° = 80°$

Thus, $x = 80°$, $y = 100°$, $z = 80°$

(ii) Given that $ABCD$ is a parallelogram.




Thus, $AB \parallel CD$ and $AD \parallel BC$.

Also, adjacent angles of a parallelogram have sum $180°$.

$\therefore \quad 50° + x = 180°$

$\Rightarrow \quad x = 180° - 50° = 130°$

$50° + y = 180°$

$\Rightarrow \quad y = 180° - 50° = 130°$

Angle 1 marked in figure.

$\therefore \quad \angle 1 + y = 180°$

(Adjacent angles of parallelogram)

$\therefore \quad \angle 1 + 130° = 180°$

$\Rightarrow \quad \angle 1 = 180° - 130° = 50°$

Now, $\angle 1$ and $\angle z$ form a linear pair.

$\therefore \quad \angle 1 + \angle z = 180°$

$\therefore \quad 50° + \angle z = 180°$

$\Rightarrow \quad \angle z = 180° - 50° = 130°$

Thus, $x = 130°$, $y = 130°$, $z = 130°$

(iii) Given in the figure,

$\angle x = 90°$

[$\because$ Vertically opposite angles are equal]

In $\Delta DOC$, Sum of angles = $180°$

$\therefore \quad \angle x + \angle y + 30° = 180°$

$\Rightarrow \quad 90° + 30° + \angle y = 180°$

$\Rightarrow \quad \angle y = 180° - 120°$

$\angle y = 60°$

$\therefore \quad \angle y = \angle z = 60°$

[Alternate angles of transversal of parallel lines are equal]

Thus, $x = 90°$, $y = 60°$, $z = 60°$

(iv) Sum of adjacent angles of a parallelogram is 180°.

$\therefore \quad x + 80° = 180°$

$\Rightarrow \quad x = 180° - 80°$

$\Rightarrow \quad x = 100°$

$x + y = 180°$

$\Rightarrow \quad 100 + y = 180°$

$\Rightarrow \qquad y = 180° - 100°$

$y = 80° = \angle D$

$\angle D + \angle C = 180°$

(Adjacent angles of a parallelogram)

$\therefore \qquad 80° + \angle C = 180°$

$\Rightarrow \qquad \angle C = 180° - 80° = 100°$

$\therefore$ $\angle C$ and $\angle Z$ form a linear pair.

$\therefore \qquad \angle C + \angle Z = 180°$

$\Rightarrow \qquad \angle Z = 180° - 100° = 80°$

Thus, $x = 100°$, $y = 80°$, $z = 80°$

(v) By using the property of parallelogram, opposite angles are equal.

$\therefore \qquad \angle y = \angle B = 112°$

Also, $\angle y$ and $(\angle z + 40°)$ form adjacent angles of a parallelogram.

$\therefore \qquad \angle y + \angle z + 40° = 180°$

$\therefore \qquad 112° + 40° + \angle z = 180°$

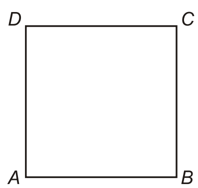
$\Rightarrow \qquad \angle z = 180° - 152° = 28°$

Now, $\angle x$ and $\angle z$ are alternate angles and are equal.

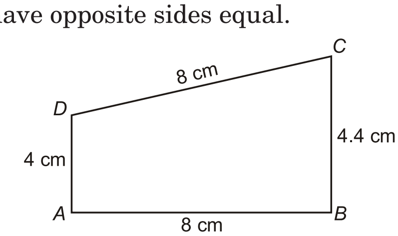
$\therefore \qquad x = z = 28°$

Thus, $x = 28°$, $y = 112°$ and $z = 28°$

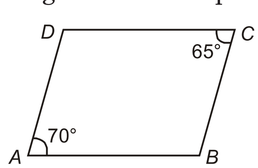
**3.** (i) If $\angle D + \angle B = 180°$ does not necessarily mean that quadrilateral *ABCD* is a parallelogram.



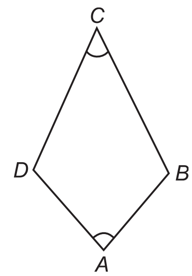

(ii) *AD* and *BC* two opposite sides are unequal. Thus, *ABCD* is not a parallelogram, as for it to be a parallelogram it has to have opposite sides equal.




(iii) $\angle A \neq \angle C$. Thus, *ABCD* is not a parallelogram. For it to be a parallelogram, opposite angles must be equal.

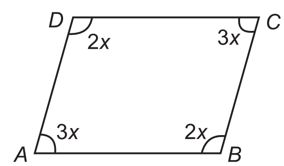



**4.**




$\angle A = \angle C$ in the given figure. Quadrilateral *ABCD* is not a parallelogram but a kite.

**5.** For illustration, parallelogram *ABCD* is drawn alongside.




Let the adjacent angles be *A* and *B*.

Given adjacent angles in the ratio $3 : 2$.

$\therefore \qquad \angle A = 3x$

$\angle B = 2x$

Sum of adjacent angles of a parallelogram is $180°$.

$\therefore \qquad 3x + 2x = 180°$

$\Rightarrow \qquad 5x = 180°$

$\Rightarrow \qquad x = \dfrac{180°}{5} = 36°$

$\therefore$ The measure of $\angle A = 3 \times 36° = 108°$

The measure of $\angle B = 2 \times 36° = 72°$

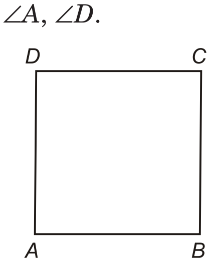
Also, further opposite angles of a parallelogram are equal.

$\therefore \qquad \angle A = \angle C = 108°$

$\angle B = \angle D = 72°$

**6.** Let parallelogram be *ABCD*.

Adjacent angles are $\angle A, \angle B$; $\angle B, \angle C$; $\angle C, \angle D$; $\angle A, \angle D$.



Now taking $\angle A$ and $\angle B$.
Let value of angle $A$ and $B$ be $x$.

[Given adjacent angles are equal]

$\therefore \quad x + x = 180°$

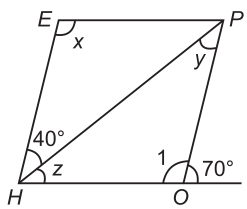
[Sum of adjacent angles are 180°]

$\Rightarrow \quad 2x = 180°$

$\Rightarrow \quad x = 90°$

$\therefore$ Each angle of the given parallelogram will be 90° as given adjacent angles are equal and explained as above.

**7.** In parallelogram $HOPE$ mark $\angle 1$ as given alongside.




$\angle 1 + 70° = 180°$ (Linear pair)

$\Rightarrow \quad \angle 1 = 180° - 70°$

$\angle 1 = 110° = \angle O$

Further $\quad \angle E = \angle O$

[Opposite angles of a parallelogram are equal]

$\therefore \quad \angle E = \angle O = x = 110°$

Now also, $\angle O + \angle z + 40° = 180°$

(Adjacent angles are supplementary)

$\angle z + 40° + 110° = 180°$

$\Rightarrow \quad \angle z = 180° - 150°$

$\Rightarrow \quad \angle z = 30°$

$\angle y = 40°$

[Alternate angles of parallel lines $HE, OP$]

$\therefore \ \angle x = 110°, \angle y = 40°, \angle z = 30°$

**8.** (i) For a parallelogram, opposite sides are equal.

$\therefore \quad GU = SN$

$\Rightarrow \quad 3y - 1 = 26$

$\Rightarrow \quad 3y = 27$

$y = \frac{27}{3}$

$y = 9$ cm

Also, $\quad 3x = 18$

$\Rightarrow \quad x = \frac{18}{3} = 6$ cm

Thus, $x = 6$ cm $y = 9$ cm

(ii) For parallelogram $RUNS$, it is known that diagonals bisect each other.

$\therefore$ Let $O$ be the mid-point of diagonal $SU$ and diagonal $RN$.

$\therefore \quad SO = OU$

$\Rightarrow \quad 20 = y + 7$

$\Rightarrow \quad y = 13$

Also, $\quad RO = ON$

$\Rightarrow \quad 16 = x + y$

But, $y = 13$

$\Rightarrow \quad x + y = 16$

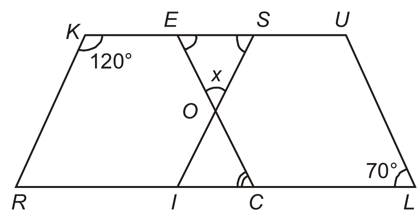
$\Rightarrow \quad x = 16 - 13 = 3$

Thus, $x = 3, y = 13$

**9.** For parallelogram $RISK$

$\angle K + \angle R = 180°$

(Adjacent angles of parallelogram have sum equal to 180°)




$\therefore \quad \angle R = 180° - 120°$

$\Rightarrow \quad \angle R = 60°$

Also, $\quad \angle R = \angle S = 60°$

(Opposite angles of a parallelogram are equal)

Now, consider parallelogram $CLUE$

$\angle L = \angle E = 70°$

(Opposite angles of parallelogram are equal)

Now, consider $\Delta OES$

$\therefore \quad \angle E = 70°$

$\angle S = 60°$

$\angle O = x = ?$

Now, sum of angles of a triangle is 180°.

$\therefore \quad x + 70° + 60° = 180°$

$\Rightarrow \quad x = 180° - 130° = 50°$

**10.** $\angle KLM + \angle NML = 180°$

The pair of interior angles on same side of transversal are supplementary.

$\therefore \quad KL \parallel NM$

Thus, $KLMN$ is a trapezium as it has one pair of opposite sides parallel.

**11.** In the figure, $AB \parallel DC$

$\therefore \quad \angle B + \angle C = 180°$

(Interior angles on same side of transversal of parallel lines are supplementary)

$\therefore \quad \angle C = 180° - 120° = 60°$

**12.** $SP \parallel RQ$ (Given parallel)

$\therefore \quad \angle P + \angle Q = 180°$

(Interior angles on same side of transversal)

$\therefore \quad \angle P = 180° - 130° = 50°$

Also, sum of angles of a quadrilateral is 360°.

$\therefore \quad \angle P + \angle Q + \angle R + \angle S = 360°$

$\Rightarrow \quad 50° + 130° + 90° + \angle S = 360°$

$\Rightarrow \quad \angle S = 360° - 270° = 90°$

Yes, we can find $m\angle P$ in another way.

$\angle R + \angle S = 180°$

(Interior angle on same side of transversal)

$\therefore \quad 90° + \angle S = 180°$

$\Rightarrow \quad \angle S = 90°$

Again, sum of angles of a quadrilateral is 360°.

$\Rightarrow 90° + 90° + 130° + \angle P = 360°$

$\Rightarrow \quad \angle P = 360° - 310° = 50°$

## Exercise 3.4

**1.** (a) False, (b) True, (c) True, (d) False, (e) False, (f) True, (g) True, (h) True

**2.** (a) Quadrilateral with four sides equal in length : Square or rhombus □◇.

(b) Quadrilateral with four right angles : Square or rectangle □▭

**3.** (i) A square is a four-sided, thus it is a quadrilateral.

(ii) A square has opposite sides parallel, thus it is a parallelogram.

(iii) A square has all sides equal, thus it is a rhombus.

(iv) A square has each of the angles 90°, thus it is a rectangle.

**4.** (i) Quadrilaterals whose diagonals bisect each other : Parallelogram, rectangle, rhombus, square

(ii) Quadrilaterals whose diagonals are perpendicular bisectors of each other : Rhombus, square

(iii) Quadrilaterals whose diagonals are equal : Square, rectangle

**5.** Rectangle has four sides, sum of interior angles = 360°

Therefore, it is a quadrilateral.

The convex nature can be observed by checking that line segment joining two interior points lies completely within the figure. For a rectangle taking two opposite vertices and joining them gives the diagonals. The diagonals of rectangles lies completely within the rectangle thus rectangle is convex.

**6.** By the dotted lines drawn additionally, it can be observed that $ABCD$ is a rectangle.

For a rectangle, diagonals bisect each other at $O$ and are equal.

$\therefore \quad AC = BD$

Also, $OA = OC$ and $OB = OD$

Thus, $\quad \frac{1}{2}AC = \frac{1}{2}BD$

$\Rightarrow \quad OA = OB$

Therefore, $\quad OA = OB = OC$

Thus, $O$ is equidistant from $A$, $B$ and $C$.

# Chapter-4

## Data Handling

### Exercise 4.1

**1.** (i) Assuming the number of young people surveyed is $x$.

$\therefore \quad 10\% \text{ of } x = 20$

$\Rightarrow \quad \frac{10}{100}x = 20$

$\Rightarrow \quad x = \frac{20 \times 100}{10} \Rightarrow x = 200$

The number of young people surveyed are 200.

(ii) Light music is liked by most young people.

(iii) Number of CD's that the CD company must make of each type is as follows :

$$\text{Classical music} = \frac{10}{100} \times 1000 = 100$$

$$\text{Semi-classical music} = \frac{20}{100} \times 1000 = 200$$

$$\text{Folk music} = \frac{30}{100} \times 1000 = 300$$

$$\text{Light music} = \frac{40}{100} \times 1000 = 400$$

**2.** (i) The most votes were obtained for the winter season.

(ii) Total number of votes = 360

∴ The proportion of the three seasons are as follows :

$$\text{Summer} = \frac{90}{360} = \frac{1}{4}$$

$$\text{Rainy} = \frac{120}{360} = \frac{1}{3}$$

$$\text{Winter} = \frac{150}{360} = \frac{5}{12}$$

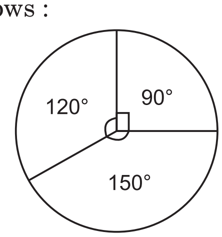
Thus, the central angle for each season is as follows :

$$\text{Summer} = \frac{1}{4} \times 360° = 90°$$

$$\text{Rainy} = \frac{1}{3} \times 360° = 120°$$

$$\text{Winter} = \frac{5}{12} \times 360° = 150°$$

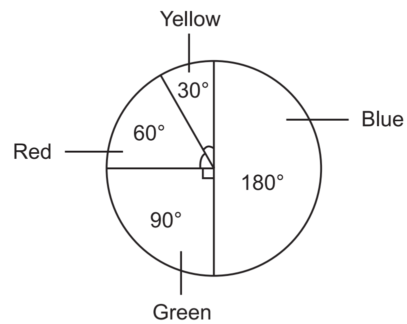
(iii) The pie chart for the given information is as follows :




**3.** To construct a pie chart the calculation of central angle for each colour is found as follows

| Colours | Number of people | Proportion of each sector | Central angle |
|---|---|---|---|
| Blue | 18 | $\frac{18}{36} = \frac{1}{2}$ | $\frac{1}{2} = 360 = 180°$ |
| Green | 9 | $\frac{9}{36} = \frac{1}{4}$ | $\frac{1}{4} \times 360 = 90°$ |
| Red | 6 | $\frac{6}{36} = \frac{1}{6}$ | $\frac{1}{6} \times 360 = 60°$ |
| Yellow | 3 | $\frac{3}{36} = \frac{1}{12}$ | $\frac{1}{12} \times 360 = 30°$ |
| **Total** | **36** | | |

The pie chart is as follows :




**4.** (i) Total marks obtained are 540.

Central angle for 540 marks is 360°.

Thus, for 1 mark central angle

$$= \left(\frac{360}{540}\right)^{\circ} = \left(\frac{2}{3}\right)^{\circ}$$

∴ For 105 marks central angle

$$= \left(\frac{2}{3} \times 105\right)^{\circ} = 70°$$

From the pie chart, subject in which student obtains 105 marks in Hindi.

(ii) The difference between central angle for Mathematics and Hindi is $90° - 70° = 20°$

For central angle 360°, total marks are 540.

For central angle 1°, marks are $\frac{540}{360} = \frac{3}{2}$

For central angle 20°, marks are $\frac{3}{2} \times 20 = 30$

Thus, student obtains 30 more marks in Mathematics than obtained in Hindi.

(iii) Sum of central angle of Social Science and Mathematics $= 90° + 65° = 155°$

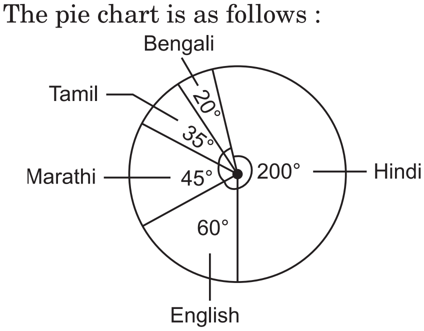
Sum of central angle of Science and Hindi $= 70° + 80° = 150°$

Since, sum of central angle of Social Science and Mathematics is greater than sum of central angle of Science and Hindi. *i.e.,* $155° > 150°$, thus marks obtained together of Social Science and Mathematics are greater than Science and Hindi.

**5.** Total students are 72, the proportion of students speaking different languages and the corresponding central angles for the pie chart are tabulated as follows :

| Language | Number of students | Fraction | Central angle |
|---|---|---|---|
| Hindi | 40 | $\frac{40}{72}=\frac{5}{9}$ | $\frac{5}{9}\times 360^\circ$ $= 200^\circ$ |
| English | 12 | $\frac{12}{72}=\frac{1}{6}$ | $\frac{1}{6}\times 360^\circ$ $= 60^\circ$ |
| Marathi | 9 | $\frac{9}{72}=\frac{1}{8}$ | $\frac{1}{8}\times 360^\circ$ $= 45^\circ$ |
| Tamil | 7 | $\frac{7}{72}$ | $\frac{7}{72}\times 360^\circ$ $= 35^\circ$ |
| Bengali | 4 | $\frac{4}{72}=\frac{1}{18}$ | $\frac{1}{18}\times 360^\circ$ $= 20^\circ$ |

The pie chart is as follows :




## Exercise 4.2

1. (a) Outcomes while spinning a wheel : A, B, C, D
   (b) Outcomes when tossing two coins together : HH, HT, TH, TT
2. (i) (a) Set of prime numbers for a die = (2, 3, 5)
   (b) Set of non-prime numbers for a die = (1, 4, 6)
   (ii) (a) Numbers greater than 5 is 6.
   (b) Numbers not greater than 5 are 1, 2, 3, 4 and 5.
3. (a) Total number of sectors = 5 (from Q.1 (a))
   $\therefore$ Probability of pointer stopping at D $= \frac{1}{5}$
   (b) Total number of ace cards in a deck of cards = 4
   Total number of cards in a deck = 52
   Probability of getting an ace card from well shuffled deck of 52 cards $= \frac{4}{52} = \frac{1}{13}$
   (c) Total number of apples = 7
   Total number of red apples = 4
   Probability of getting a red apple $= \frac{4}{7}$
4. Total number of outcomes = Total number of slips = 10
   (i) Probability of getting number 6 $= \frac{1}{10}$
   (ii) Numbers less than 6 are 1, 2, 3, 4, 5.
   $\therefore$ Total outcomes less than 6 are 5.
   $\therefore$ Probability of getting numbers less than 6 $= \frac{5}{10} = \frac{1}{2}$
   (iii) Numbers greater than 6 are 7, 8, 9, 10.
   $\therefore$ Total outcomes greater than 6 are 4.
   $\therefore$ Probability of getting number greater than 6 $= \frac{4}{10} = \frac{2}{5}$
   (iv) One-digit numbers from the chart are 1, 2, 3, 4, 5, 6, 7, 8, 9.
   $\therefore$ Probability of getting a one-digit number $= \frac{9}{10}$
5. Total number of sectors = Total number of outcomes = 5
   Total number of green sector = 3
   Probability of getting green sector
   $= \frac{\text{Number of green sector}}{\text{Total number of sectors}} = \frac{3}{5}$
   Total number of non-blue sectors = 4
   $\therefore$ Probability of getting non-blue sector
   $= \frac{\text{Number of non-blue sector}}{\text{Total number of sectors}} = \frac{4}{5}$
6. (i) (a) When a die is thrown, total number of outcomes are 6.
   Prime numbers outcomes = (2, 3, 5)
   Number of prime number = 3
   Probability of getting a prime number
   $= \frac{3}{6} = \frac{1}{2}$
   (b) When a die is thrown, total number of outcomes are 6.
   Non-prime number = (1, 4, 6)
   Number of non-prime number = 3

Probability of getting non-prime number $= \frac{3}{6} = \frac{1}{2}$

(ii) When a die is thrown, total number of outcomes are 6.

(a) In a die, number greater than 5 is 1.

Probability of getting a number greater than 5 $= \frac{1}{6}$

(b) Probability of getting a number not greater than 5

$= 1 -$ Probability of getting a number greater than $5 = 1 - \frac{1}{6} = \frac{5}{6}$.

# Chapter-5

## Squares and Square Roots

### Exercise 5.1

**1.** The unit's digit of the squares of the given numbers are shown as follows :

| S.No. | Numbers | Unit's digit in square number | Reason |
|---|---|---|---|
| (i) | 81 | 1 | $1 \times 1 = 1$ |
| (ii) | 272 | 4 | $2 \times 2 = 4$ |
| (iii) | 799 | 1 | $9 \times 9 = 81$ |
| (iv) | 3853 | 9 | $3 \times 3 = 9$ |
| (v) | 1234 | 6 | $4 \times 4 = 16$ |
| (vi) | 26387 | 9 | $7 \times 7 = 49$ |
| (vii) | 52698 | 4 | $8 \times 8 = 64$ |
| (viii) | 99880 | 0 | $0 \times 0 = 0$ |
| (ix) | 12796 | 6 | $6 \times 6 = 36$ |
| (x) | 55555 | 5 | $5 \times 5 = 25$ |

**2.** A number ending with 2, 3, 7 or 8 cannot be a perfect square.

A number ending with odd numbers of zero cannot be a perfect square.

(i) 1057 is not a perfect square as it ends with 7.

(ii) 23453 is not a perfect square as it ends with 3.

(iii) 7928 is not a perfect square as it ends with 8.

(iv) 222222 is not a perfect square as it ends with 2.

(v) 64000 is not a perfect square as it ends with odd number of zeros.

(vi) 89722 is not a perfect square as it ends with 2.

(vii) 222000 is not a perfect square as it ends with odd number of zeros.

(viii) 505050 is not a perfect square as it ends with odd number of zeros.

**3.** (i) 431 is an odd number, thus square will also be odd.

(ii) 2826 is an even number, thus square will also be even.

(iii) 7779 is an odd number, thus square will also be odd.

(iv) 8206 is an even number, thus square will also be even.

**4.** $100001^2 = 1\underline{0000}\,2\,\underline{0000}\,1$

$10000001^2 = 1\,\underline{000000\,2\,000000\,1}$

**5.** $1010101^2 = 1020304030201$

$101010101^2 = 10203040504030201$

**6.** $4^2 + 5^2 + \mathbf{20^2} = 21^2$

$5^2 + \mathbf{6^2} + 30^2 = 31^2$

$6^2 + 7^2 + \mathbf{42^2} = \mathbf{43^2}$

**7.** (i) $1 + 3 + 5 + 7 + 9$

= Sum of 1st five odd numbers

$= 5^2 = 25$

(ii) $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19$

= Sum of 1st ten odd numbers

$= 10^2 = 100$

(iii) $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21 + 23$

= Sum of 1st twelve odd numbers

$= 12^2 = 144$

**8.** (i) $49 = 7^2 = 1 + 3 + 5 + 7 + 9 + 11 + 13$

(ii) $121 = 11^2 = 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21$

**9.** (i) $12 \times 2 = 24$ numbers lie between $12^2$ and $13^2$

(ii) $2 \times 25 = 50$ numbers lie between $25^2$ and $26^2$

(iii) $2 \times 99 = 198$ numbers lie between $99^2$ and $100^2$

### Exercise 5.2

**1.** (i) $32^2 = (30 + 2)^2 = 30^2 + 2^2 + 2 \times 30 \times 2$

$= 900 + 4 + 120 = 1024$

(ii) $35^2 = (30 + 5)^2 = 30^2 + 5^2 + 2 \times 30 \times 5$

$= 900 + 25 + 300 = 1225$

(iii) $86^2 = (80+6)^2 = 80^2 + 2 \times 6 \times 80 + 6^2$

$= 6400 + 960 + 36 = 7396$

(iv) $93^2 = (90+3)^2 = 90^2 + 3^2 + 2 \times 90 \times 3$

$= 8100 + 9 + 540 = 8649$

(v) $71^2 = (70+1)^2 = 70^2 + 2 \times 1 \times 70 + 1^2$

$= 4900 + 140 + 1 = 5041$

(vi) $46^2 = (40+6)^2 = 40^2 + 2 \times 6 \times 40 + 6^2$

$= 1600 + 480 + 36 = 2116$

**2.** (i) Let $2m = 6$

$\therefore \quad m = 3$

Thus, members of pythagorean triplets are $2m, m^2 - 1, m^2 + 1$.

$= 2 \times 3, 3 \times 3 - 1, 3 \times 3 + 1 = 6, 8, 10$

$\therefore$ Pythagorean triplet is 6, 8, 10.

(ii) Let $2m = 14$

$m = 7$

Thus, members of pythagorean triplets are $2m, m^2 - 1, m^2 + 1$.

$= 2 \times 7, 7 \times 7 - 1, 7 \times 7 + 1$

$= 14, 48, 50$

$\therefore$ Pythagorean triplet is 14, 48, 50.

(iii) Let $2m = 16$

$m = 8$

Thus, members of pythagorean triplets are $2m, m^2 - 1, m^2 + 1$.

$= 2 \times 8, 8 \times 8 - 1, 8 \times 8 + 1 = 16, 63, 65$

$\therefore$ Pythagorean triplet is 16, 63, 65.

(iv) Let $2m = 18$

$m = 9$

Thus, members of pythagorean triplets are $2m, m^2 - 1, m^2 + 1$.

$= 2 \times 9, 9 \times 9 - 1, 9 \times 9 + 1$

$= 18, 80, 82$

$\therefore$ Pythagorean triplet is 18, 80, 82.

## Exercise 5.3

**1.** The possible 'one's' digits of square root of the numbers :

(i) 9801 is 1 or 9

(ii) 99856 is 4 or 6

(iii) 998001 is 1 or 9

(iv) 657666025 is 5

**2.** Numbers ending with 2, 3, 7 or 8 are definitely not perfect squares.

(i) 153 is not a perfect square.

(ii) 257 is not a perfect square.

(iii) 408 is not a perfect square.

(iv) 441 may be a perfect square.

153, 257, 408 are definitely not perfect squares.

**3.** From 100, subtract odd numbers successively starting from 1 to find square root.

$100 - 1 = 99$, $99 - 3 = 96$, $96 - 5 = 91$,
$91 - 7 = 84$, $84 - 9 = 75$, $75 - 11 = 64$,
$64 - 13 = 51$, $51 - 15 = 36$, $36 - 17 = 19$,
$19 - 19 = 0$

0 is obtained at $10^{th}$ step.

$\therefore \quad \sqrt{100} = 10$

From 169, subtract odd numbers successively starting from 1 to find square root.

$169 - 1 = 168$, $168 - 3 = 165$,
$165 - 5 = 160$, $160 - 7 = 153$,
$153 - 9 = 144$, $144 - 11 = 133$,
$133 - 13 = 120$, $120 - 15 = 105$,
$105 - 17 = 88$, $88 - 19 = 69$, $69 - 21 = 48$,
$48 - 23 = 25$, $25 - 25 = 0$

0 is obtained at $13^{th}$ step.

$\therefore \quad \sqrt{169} = 13$

**4.** (i) By prime factorisation method, the square root of 729 is

$\therefore \quad 729 = 3 \times 3 \times 3 \times 3 \times 3 \times 3$

$\sqrt{729} = 3 \times 3 \times 3 = 27$

| | |
|---|---|
| 3 | 729 |
| 3 | 243 |
| 3 | 81 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

(ii) By prime factorisation method, the square root of 400 is

$\therefore \quad 400 = 2 \times 2 \times 2 \times 2 \times 5 \times 5$

$\sqrt{400} = 2 \times 2 \times 5 = 20$

| | |
|---|---|
| 2 | 400 |
| 2 | 200 |
| 2 | 100 |
| 2 | 50 |
| 5 | 25 |
| 5 | 5 |
| | 1 |

(iii) By prime factorisation method, the square root of 1764 is

$\therefore \quad 1764 = 2 \times 2 \times 3 \times 3 \times 7 \times 7$

$\sqrt{1764} = 2 \times 3 \times 7 = 42$

| | |
|---|---|
| 2 | 1764 |
| 2 | 882 |
| 3 | 441 |
| 3 | 147 |
| 7 | 49 |
| 7 | 7 |
| | 1 |

(iv) By prime factorisation method, the square root of 4096 is

$\therefore \quad 4096 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$

$\sqrt{4096} = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 64$

| | |
|---|---|
| 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 |

(v) By prime factorisation method, the square root of 7744 is

$\therefore \quad 7744 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 11 \times 11$

$\sqrt{7744} = 2 \times 2 \times 2 \times 11 = 88$

| | |
|---|---|
| 2 | 7744 |
| 2 | 3872 |
| 2 | 1936 |
| 2 | 968 |
| 2 | 484 |
| 2 | 242 |
| 11 | 121 |
| 11 | 11 |
| | 1 |

(vi) By prime factorisation method, the square root of 9604 is

$\therefore \quad 9604 = 2 \times 2 \times 7 \times 7 \times 7 \times 7$

$\sqrt{9604} = 2 \times 7 \times 7 = 98$

| | |
|---|---|
| 2 | 9604 |
| 2 | 4802 |
| 7 | 2401 |
| 7 | 343 |
| 7 | 49 |
| 7 | 7 |
| | 1 |

(vii) By prime factorisation method, the square root of 5929 is

$\therefore \quad 5929 = 7 \times 7 \times 11 \times 11$

$\sqrt{5929} = 7 \times 11 = 77$

| | |
|---|---|
| 7 | 5929 |
| 7 | 847 |
| 11 | 121 |
| 11 | 11 |
| | 1 |

(viii) By prime factorisation method, the square root of 9216 is

$\therefore \quad 9216 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3$

$\sqrt{9216} = 2 \times 2 \times 2 \times 2 \times 2 \times 3 = 96$

| | |
|---|---|
| 2 | 9216 |
| 2 | 4608 |
| 2 | 2304 |
| 2 | 1152 |
| 2 | 576 |
| 2 | 288 |
| 2 | 144 |
| 2 | 72 |
| 2 | 36 |
| 2 | 18 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

(ix) By prime factorisation method, the square root of 529 is

$\therefore \quad 529 = 23 \times 23$

$\sqrt{529} = 23$

| | |
|---|---|
| 23 | 529 |
| 23 | 23 |
| | 1 |

(x) By prime factorisation method, the square root of 8100 is

$\therefore \quad 8100 = 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 5 \times 5$

$\sqrt{8100} = 2 \times 3 \times 3 \times 5 = 90$

| | |
|---|---|
| 2 | 8100 |
| 2 | 4050 |
| 3 | 2025 |
| 3 | 675 |
| 3 | 225 |
| 3 | 75 |
| 5 | 25 |
| 5 | 5 |
| | 1 |

**5.** (i) By prime factorisation, we get

$252 = 2 \times 2 \times 3 \times 3 \times 7$

| | |
|---|---|
| 2 | 252 |
| 2 | 126 |
| 3 | 63 |
| 3 | 21 |
| 7 | 7 |
| | 1 |

Thus, 7 is the smallest number to be multiplied to get a perfect square.

$\therefore \quad 252 \times 7 = 1764$

$1764 = 2 \times 2 \times 3 \times 3 \times 7 \times 7$

$\therefore \quad \sqrt{1764} = 2 \times 3 \times 7 = 42$

(ii) By prime factorisation, we get

$180 = 2 \times 2 \times 3 \times 3 \times 5$

| | |
|---|---|
| 2 | 180 |
| 2 | 90 |
| 3 | 45 |
| 3 | 15 |
| 5 | 5 |
| | 1 |

Thus, 5 is the smallest number to be multiplied to 180 to get a perfect square.

$\therefore$ $180 \times 5 = 900$ becomes a perfect square.

$\therefore \quad 900 = 2 \times 2 \times 3 \times 3 \times 5 \times 5$

$\sqrt{900} = 2 \times 3 \times 5 = 30$

(iii) By prime factorisation, we get

$\therefore \quad 1008 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 7$

Thus, 7 is the he smallest number to be multiplied to 1008 to make it a perfect square is 7.

$\therefore$ $1008 \times 7 = 7056$ is the resultant perfect square.

$\therefore 7056 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 7 \times 7$

| | |
|---|---|
| 2 | 1008 |
| 2 | 504 |
| 2 | 252 |
| 2 | 126 |
| 3 | 63 |
| 3 | 21 |
| 7 | 7 |
| | 1 |

$\sqrt{7056} = 2 \times 2 \times 3 \times 7 = 84$

(iv) By prime factorisation, we get

$2028 = 2 \times 2 \times 3 \times 13 \times 13$

| | |
|---|---|
| 2 | 2028 |
| 2 | 1014 |
| 3 | 507 |
| 13 | 169 |
| 13 | 13 |
| | 1 |

The smallest number to be multiplied to 2028 to make it a perfect square is 3.

$\therefore$ $2028 \times 3 = 6084$ is the resultant perfect square.

$\therefore \quad 6084 = 2 \times 2 \times 3 \times 3 \times 13 \times 13$

$\sqrt{6084} = 2 \times 3 \times 13 = 78$

(v) By prime factorisation, we get

$1458 = 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$

| | |
|---|---|
| 2 | 1458 |
| 3 | 729 |
| 3 | 243 |
| 3 | 81 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

The smallest number to be multiplied to 1458 to make it a perfect square is 2.

$\therefore$ $1458 \times 2 = 2916$ is the resultant perfect square.

$\therefore$ $2916 = 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$

$\sqrt{2916} = 2 \times 3 \times 3 \times 3 = 54$

(vi) By prime factorisation, we get

$768 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3$

| | |
|---|---|
| 2 | 768 |
| 2 | 384 |
| 2 | 192 |
| 2 | 96 |
| 2 | 48 |
| 2 | 24 |
| 2 | 12 |
| 2 | 6 |
| 3 | 3 |
| | 1 |

Thus, the smallest number to be multiplied to 768 to make it a perfect square is 3.

$\therefore$ $768 \times 3 = 2304$

$\therefore$ $2304 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3$

$\sqrt{2304} = 2 \times 2 \times 2 \times 2 \times 3 = 48$

**6.** (i) By prime factorisation,

$\therefore$ $252 = 2 \times 2 \times 3 \times 3 \times 7$

| | |
|---|---|
| 2 | 252 |
| 2 | 126 |
| 3 | 63 |
| 3 | 21 |
| 7 | 7 |
| | 1 |

The smallest whole number by which 252 must be divided to make it a perfect square is 7.

$\therefore$ $\frac{252}{7} = \frac{2 \times 2 \times 3 \times 3 \times 7}{7}$

$= 2 \times 2 \times 3 \times 3$

$= 36$ is a perfect square

$\therefore$ $\sqrt{36} = \sqrt{2 \times 2 \times 3 \times 3} = 2 \times 3 = 6$

(ii) By prime factorisation,

$\therefore$ $2925 = 5 \times 5 \times 3 \times 3 \times 13$

| | |
|---|---|
| 5 | 2925 |
| 5 | 585 |
| 3 | 117 |
| 3 | 39 |
| 13 | 13 |
| | 1 |

The smallest whole number by which 2925 must divided, to make it a perfect square is 13.

$\therefore$ $\frac{2925}{13} = \frac{5 \times 5 \times 3 \times 3 \times 13}{13}$

$= 5 \times 5 \times 3 \times 3$

$= 225$ is a perfect square

$\therefore$ $\sqrt{225} = \sqrt{5 \times 5 \times 3 \times 3} = 3 \times 5 = 15$

(iii) By prime factorisation,

$\therefore$ $396 = 2 \times 2 \times 3 \times 3 \times 11$

| | |
|---|---|
| 2 | 396 |
| 2 | 198 |
| 3 | 99 |
| 3 | 33 |
| 11 | 11 |
| | 1 |

The smallest whole number by which 396 must be divided to make it a perfect square is 11.

$\therefore$ $\frac{396}{11} = \frac{2 \times 2 \times 3 \times 3 \times 11}{11}$

$= 2 \times 2 \times 3 \times 3$

$= 36$ is a perfect square

$\therefore$ $\sqrt{36} = \sqrt{2 \times 2 \times 3 \times 3} = 2 \times 3 = 6$

(iv) By prime factorisation,

$\therefore$ $2645 = 5 \times 23 \times 23$

| | |
|---|---|
| 5 | 2645 |
| 23 | 529 |
| 23 | 23 |
| | 1 |

The smallest whole number by which 2645 must be divided to make it a perfect square is 5.

$\therefore$ $\frac{2645}{5} = \frac{5 \times 23 \times 23}{5}$

$= 23 \times 23 = 529$ is a perfect square

$\sqrt{529} = \sqrt{23 \times 23} = 23.$

(v) By prime factorisation,

$\therefore \quad 2800 = 2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 7$

| | |
|---|---|
| 2 | 2800 |
| 2 | 1400 |
| 2 | 700 |
| 2 | 350 |
| 5 | 175 |
| 5 | 35 |
| 7 | 7 |
| | 1 |

Thus, the smallest number by which 2800 must be divided to make it a perfect square is 7.

$\therefore \quad \frac{2800}{7} = \frac{2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 7}{7}$

$= 2 \times 2 \times 2 \times 2 \times 5 \times 5 = 400$

$\therefore \quad \sqrt{400} = \sqrt{2 \times 2 \times 2 \times 2 \times 5 \times 5}$

$= 2 \times 2 \times 5 = 20$

(vi) By prime factorisation,

$\therefore \quad 1620 = 2 \times 2 \times 5 \times 3 \times 3 \times 3 \times 3$

| | |
|---|---|
| 2 | 1620 |
| 2 | 810 |
| 5 | 405 |
| 3 | 81 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

Thus, the smallest number by which 1620 must be divided to make it a perfect square is 5.

$\therefore \quad \frac{1620}{5} = \frac{2 \times 2 \times 5 \times 3 \times 3 \times 3 \times 3}{5}$

$= 2 \times 2 \times 3 \times 3 \times 3 \times 3 = 324$

$\sqrt{324} = \sqrt{2 \times 2 \times 3 \times 3 \times 3 \times 3}$

$= 2 \times 3 \times 3 = 18$

**7.** Let the number of students be $x$.

Let contribution by each student = ₹ $x$

$\therefore \quad (x \times x) = 2401 \quad \Rightarrow x^2 = 2401$

$x = \sqrt{2401}$

By factorisation method,

$\therefore \quad x = \sqrt{2401}$

$= \sqrt{7 \times 7 \times 7 \times 7} = 7 \times 7 = 49$

| | |
|---|---|
| 7 | 2401 |
| 7 | 343 |
| 7 | 49 |
| 7 | 7 |
| | 1 |

The number of students in the class is 49.

**8.** Let $x$ be numbers of rows.

Let $x$ be number of plants in each row.

$\therefore$ Total number of plants $= (x \times x) = x^2$

$\therefore \quad x^2 = 2025$

By factorisation,

$\therefore \quad x = \sqrt{2025}$

$= \sqrt{5 \times 5 \times 3 \times 3 \times 3 \times 3}$

$= 5 \times 3 \times 3 = 45$

| | |
|---|---|
| 5 | 2025 |
| 5 | 405 |
| 3 | 81 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

Number of row = 45 and Number of plants in each row = 45

**9.** The smallest number divisible by 4, 9, 10 is the LCM of 4, 9, 10 = 180

$\therefore \quad 180 = 5 \times 3 \times 3 \times 2 \times 2$

| | |
|---|---|
| 5 | 180 |
| 3 | 36 |
| 3 | 12 |
| 2 | 4 |
| 2 | 2 |
| | 1 |

The smallest number to be multiplied to 180 to make it a perfect square is 5.

$\therefore$ $180 \times 5 = 900$ is the required number.

**10.** The smallest number divisible by each of the numbers 8, 15 and 20 is their LCM.

LCM of 8, 15, 20 is 120.

By prime factorisation,

$\therefore \quad 120 = 2 \times 2 \times 2 \times 3 \times 5$

| | |
|---|---|
| 2 | 120 |
| 2 | 60 |
| 2 | 30 |
| 5 | 15 |
| 3 | 3 |
| | 1 |

$\therefore$ The number to be multiplied to 120 to make it a perfect square is 30.

$\therefore$ Required number is $120 \times 30 = 3600$

## Exercise 5.4

**1.** (i) According to long division,

$\therefore \quad \sqrt{2304} = 48$

| | 48 |
|---|---|
| 4 | $\overline{23}\,\overline{04}$ |
| | 16 |
| 88 | 704 |
| | 704 |
| | 0 |

(ii) According to long division,

$\therefore \quad \sqrt{4489} = 67$

| | 67 |
|---|---|
| 6 | $\overline{44}\,\overline{89}$ |
| | 36 |
| 127 | 889 |
| | 889 |
| | 0 |

(iii) According to long division,

$\therefore \quad \sqrt{3481} = 59$

| | 59 |
|---|---|
| 5 | $\overline{34}\,\overline{81}$ |
| | 25 |
| 109 | 981 |
| | 981 |
| | 0 |

(iv) According to long division,

$\therefore \quad \sqrt{529} = 23$

| | 23 |
|---|---|
| 2 | $\overline{5}\,\overline{29}$ |
| | 4 |
| 43 | 129 |
| | 129 |
| | 0 |

(v) According to long division,

$\therefore \quad \sqrt{3249} = 57$

| | 57 |
|---|---|
| 5 | $\overline{32}\,\overline{49}$ |
| | 25 |
| 107 | 749 |
| | 749 |
| | 0 |

(vi) According to long division,

$\therefore \quad \sqrt{1369} = 37$

| | 37 |
|---|---|
| 3 | $\overline{13}\,\overline{64}$ |
| | 9 |
| 67 | 469 |
| | 469 |
| | 0 |

(vii) According to long division,

$\therefore \quad \sqrt{5776} = 76$

| | 76 |
|---|---|
| 7 | $\overline{57}\,\overline{76}$ |
| | 49 |
| 146 | 876 |
| | 876 |
| | 0 |

(viii) According to long division,

$\therefore \quad \sqrt{7921} = 89$

| | 89 |
|---|---|
| 8 | $\overline{79}\,\overline{21}$ |
| | 64 |
| 169 | 1521 |
| | 1521 |
| | 0 |

(ix) According to long division,

$\therefore \quad \sqrt{576} = 24$

| | 24 |
|---|---|
| 2 | $\overline{5}\,\overline{76}$ |
| | 4 |
| 44 | 176 |
| | 176 |
| | 0 |

(x) According to long division,

$\therefore \quad \sqrt{1024} = 32$

| | |
|---|---|
| | 32 |
| 3 | $\overline{10}\,\overline{24}$ |
| | 9 |
| 62 | 124 |
| | 124 |
| | 0 |

(xi) According to long division,

$\therefore \quad \sqrt{3136} = 56$

| | |
|---|---|
| | 56 |
| 5 | $\overline{31}\,\overline{36}$ |
| | 25 |
| 106 | 636 |
| | 636 |
| | 0 |

(xii) According to long division,

$\therefore \quad \sqrt{900} = 30$

| | |
|---|---|
| | 30 |
| 3 | $\overline{9}\,\overline{00}$ |
| | 9 |
| 60 | 000 |
| | 000 |
| | 0 |

**2.** The square root of perfect square of $n$ digits will have

(a) $\frac{n}{2}$ digits if $n$ is even.

(b) $\frac{n+1}{2}$ digits if $n$ is odd.

(i) Number is 64; a 2-digit number.

Square root of 64 will has $\frac{2}{2} = 1$ digit

(ii) Number is 144, a 3-digit number.

Square root of 144 will have $\frac{3+1}{2} = 2$ digits

(iii) Number is 4489 a 4-digit number.

Square root of 4489 will have $\frac{4}{2} = 2$ digits

(iv) Number is 27225, a 5-digit number.

Square root of 27225 will have $\frac{5+1}{2} = 3$ digits

(v) Number is 390625, a 6-digit number.

Square root of 390625 will have $\frac{6}{2} = 3$ digits

**3.** (i) Number of decimal places is even, put bars and find the square root.

$\therefore \quad \sqrt{2.56} = 1.6$

| | |
|---|---|
| | 1.6 |
| 1 | $\overline{2}.\overline{56}$ |
| | 1 |
| 26 | 156 |
| | 156 |
| | 0 |

(ii) Number of decimal places is even, put bars and find the square root.

$\therefore \quad \sqrt{7.29} = 2.7$

| | |
|---|---|
| | 2.7 |
| 2 | $\overline{7}.\overline{29}$ |
| | 4 |
| 47 | 329 |
| | 329 |
| | 0 |

(iii) Number of decimal places is even, put bars and find the square root.

$\therefore \quad \sqrt{51.84} = 7.2$

| | |
|---|---|
| | 7.2 |
| 7 | $\overline{51}.\overline{84}$ |
| | 49 |
| 142 | 284 |
| | 284 |
| | 0 |

(iv) Number of decimal places is even, put bars and find the square root.

$\therefore \quad \sqrt{42.25} = 6.5$

| | |
|---|---|
| | 6.5 |
| 6 | $\overline{42}.\overline{25}$ |
| | 36 |
| 125 | 625 |
| | 625 |
| | 0 |

(v) Number of decimal places is even, put bars and find the square root.

$\therefore \quad \sqrt{31.36} = 5.6$

$$\begin{array}{r|l} & 5.6 \\ \hline 5 & \overline{31}.\overline{36} \\ & 25 \\ \hline 106 & 636 \\ & 636 \\ \hline & 0 \end{array}$$

**4.** (i) By long division try to find square root of 402.

$$\begin{array}{r|l} & 20 \\ \hline 2 & \overline{4}\,\overline{02} \\ & 4 \\ \hline 40 & 002 \\ & 000 \\ \hline & 2 \end{array}$$

$(20)^2$ is less than 402 by 2.

To make 402 a perfect square, the least number to be subtracted from it will be 2.

∴ Required square number

$= 402 - 2 = 400$

$\sqrt{400} = 20$

(ii) By long division try to find square root of 1989.

$$\begin{array}{r|l} & 44 \\ \hline 4 & \overline{19}\,\overline{89} \\ & 16 \\ \hline 84 & 389 \\ & 336 \\ \hline & 53 \end{array}$$

$44^2$ is less than 1989 by 53.

∴ Required square number

$= 1989 - 53 = 1936$

∴ $\sqrt{1936} = 44$

(iii) By long division, try to find square root of 3250.

$$\begin{array}{r|l} & 57 \\ \hline 5 & \overline{32}\,\overline{50} \\ & 25 \\ \hline 107 & 750 \\ & 749 \\ \hline & 1 \end{array}$$

$57^2$ is less than 3250 by 1.

∴ Required square number

$= 3250 - 1 = 3249$

∴ $\sqrt{3249} = 57$

(iv) By long division try to find square root of 825.

$$\begin{array}{r|l} & 28 \\ \hline 2 & \overline{8}\,\overline{25} \\ & 4 \\ \hline 48 & 425 \\ & 384 \\ \hline & 41 \end{array}$$

$(28)^2$ is less than 825 by 41.

∴ Required square number

$= 825 - 41 = 784$

∴ $\sqrt{784} = 28$

(v) By long division, try to find square root of 4000.

$$\begin{array}{r|l} & 63 \\ \hline 6 & \overline{40}\,\overline{00} \\ & 36 \\ \hline 123 & 400 \\ & 369 \\ \hline & 31 \end{array}$$

Thus, $63^2$ is less than 4000 by 31.

∴ Required square number

$= 4000 - 31 = 3969$

∴ $\sqrt{3969} = 63$

**5.** (i) Try to find out the square root of 525 by long division.

$$\begin{array}{r|l} & 22 \\ \hline 2 & \overline{5}\,\overline{25} \\ & 4 \\ \hline 42 & 125 \\ & 84 \\ \hline & 41 \end{array}$$

Thus, 525 is such that $22^2 < 525 < 23^2$.

The number to be added will be

$23^2 - 525 = 529 - 525$

$= 4$

Required perfect square number

$= 525 + 4 = 529$

Also, $\sqrt{529} = 23$

(ii) Try to find out the square root of 1750 by long division.

| | 41 |
|---|---|
| 4 | $\overline{17}\,\overline{50}$ |
| | 16 |
| 81 | 150 |
| | 81 |
| | 69 |

Thus, $41^2 < 1750 < 42^2$

The number to be added to 1750 to make it a perfect square is $42^2 - 1750$

$= 1764 - 1750 = 14$

$\therefore$ Required perfect square number

$= 1750 + 14 = 1764$

$\therefore \quad \sqrt{1764} = 42$

(iii) Try to find out the square root of 252 by long division.

| | 15 |
|---|---|
| 1 | $\overline{2}\,\overline{52}$ |
| | 1 |
| 25 | 152 |
| | 125 |
| | 27 |

Thus, $15^2 < 252 < 16^2$

The number to be added to 252 to make it a perfect square is $16^2 - 252$.

$= 256 - 252 = 4$

$\therefore$ Required perfect square number

$= 252 + 4 = 256$

$\therefore \quad \sqrt{256} = 16$

(iv) Try to find out the square root of 1825.

| | 42 |
|---|---|
| 4 | $\overline{18}\,\overline{25}$ |
| | 16 |
| 82 | 225 |
| | 164 |
| | 61 |

Thus, $42^2 < 1825 < 43^2$

$\therefore$ Required number to be added to 1825 to make it a square number is $43^2 - 1825$.

$= 1849 - 1825 = 24$

Required perfect square number

$= 1825 + 24 = 1829$

$\therefore \quad \sqrt{1829} = 43$

(v) Try to find out the square root of 6412

| | 80 |
|---|---|
| 8 | $\overline{64}\,\overline{12}$ |
| | 64 |
| 160 | 012 |
| | 000 |
| | 12 |

Thus, $80^2 < 6412 < 81^2$

$\therefore$ Required number to be added to 6412 to make it a square number is $(81)^2 - 6412$.

$= 6561 - 6412 = 149$

$\therefore$ Required perfect square number

$= 6412 + 149 = 6561$

$\therefore \quad \sqrt{6561} = 81$

**6.** Area of square = 441 $m^2$

We know that,

Area of square = $(\text{Side})^2$

$(\text{Side})^2 = 441$

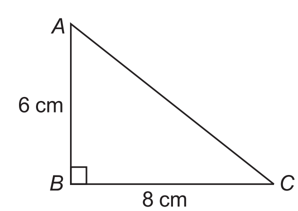
$\therefore \quad \text{Side} = \sqrt{441}$ m

By long division method, find square root of 441.

| | 21 |
|---|---|
| 2 | $\overline{4}\,\overline{41}$ |
| | 4 |
| 21 | 41 |
| | 41 |
| | 0 |

Side $= \sqrt{441}$ m = 21 m

**7.** (a)




In $\Delta ABC$ $\angle B = 90°$, given and $AB = 6$ cm, $BC = 8$ cm

By Pythagoras theorem,

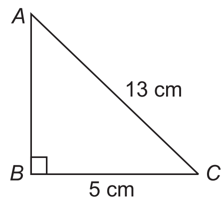
$AC^2 = AB^2 + BC^2$

$= 6^2 + 8^2 = 36 + 64$

$AC^2 = 100$

$\therefore \quad AC = \sqrt{100}$ cm = 10 cm

(b) In $\Delta ABC$ with $\angle B = 90°$




$AC^2 = AB^2 + BC^2$

$\therefore \quad AB^2 = AC^2 - BC^2 = 13^2 - (5)^2$

$= 169 - 25$

$AB^2 = 144$

$\therefore \quad AB = \sqrt{144}$ cm = 12 cm

**8.** Find the square root of 1000 by long division method.

| | |
|---|---|
| | 31 |
| 3 | $\overline{10}\,\overline{00}$ |
| | 9 |
| 61 | 100 |
| | 61 |
| | 39 |

$31^2$ is less than 1000 by 39 and $32^2 = 1024$

Thus, the gardener requires $1024 - 1000 = 24$ more plants so that number of rows and columns remain the same.

**9.** Find the square root of 500 by long division method.

| | |
|---|---|
| | 22 |
| 2 | $\overline{5}\,\overline{00}$ |
| | 4 |
| 42 | 100 |
| | 84 |
| | 16 |

Now $22^2 = 484$ is less than 500 by 16.

$\therefore$ 16 students must be left out of the P.T. practice.

# Chapter-6

## Cubes and Cube Roots

### Exercise 6.1

**1.** (i) By prime factorisation,

$216 = \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3}$

| | |
|---|---|
| 2 | 216 |
| 2 | 108 |
| 2 | 54 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

216 can be grouped into triples of prime factors, thus 216 is a perfect cube.

(ii) By prime factorisation,

$128 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times 2$

| | |
|---|---|
| 2 | 128 |
| 2 | 64 |
| 2 | 32 |
| 2 | 16 |
| 2 | 8 |
| 2 | 4 |
| 2 | 2 |
| | 1 |

128 cannot be grouped into triples of prime factors, thus 128 is not a perfect cube.

(iii) By prime factorisation,

$1000 = \underline{2 \times 2 \times 2} \times \underline{5 \times 5 \times 5}$

| | |
|---|---|
| 2 | 1000 |
| 2 | 500 |
| 2 | 250 |
| 5 | 125 |
| 5 | 25 |
| 5 | 5 |
| | 1 |

1000 can be grouped as triples of prime factors, thus 1000 is a perfect cube.

(iv) By prime factorisation,

$100 = 2 \times 2 \times 5 \times 5$

| | |
|---|---|
| 2 | 100 |
| | 50 |
| | 25 |
| | 5 |
| | 1 |

100 cannot be grouped as triples of prime factors, thus 100 is not a perfect cube.

(v) By prime factorisation,

$46656 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3} \times \underline{3 \times 3 \times 3}$

| | |
|---|---|
| 2 | 46656 |
| 2 | 23328 |
| 2 | 11664 |
| 2 | 5832 |
| 2 | 2916 |
| 2 | 1458 |
| 3 | 729 |
| 3 | 243 |
| 3 | 81 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

46656 can be grouped as triples of prime factors, thus 46656 is a perfect cube.

**2.** (i) By prime factorisation,

$243 = \underline{3 \times 3 \times 3} \times 3 \times 3$

| | |
|---|---|
| 3 | 243 |
| 3 | 81 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

To make 243 a perfect cube, it must be multiplied by 3.

(ii) By prime factorisation,

$256 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times 2 \times 2$

| | |
|---|---|
| 2 | 256 |
| 2 | 128 |
| 2 | 64 |
| 2 | 32 |
| 2 | 16 |
| 2 | 8 |
| 2 | 4 |
| 2 | 2 |
| | 1 |

To make 256 a perfect cube, it must be multiplied by 2.

(iii) By prime factorisation,

$72 = \underline{2 \times 2 \times 2} \times 3 \times 3$

| | |
|---|---|
| 2 | 72 |
| | 36 |
| | 18 |
| | 9 |
| | 3 |
| | 1 |

Thus, 72 must be multiplied by 3 to make it a perfect cube.

(iv) By prime factorisation,

$675 = 5 \times 5 \times \underline{3 \times 3 \times 3}$

| | |
|---|---|
| 5 | 675 |
| | 135 |
| | 27 |
| | 9 |
| | 3 |
| | 1 |

Thus, 675 must be multiplied by 5 to make it a perfect cube.

(v) By prime factorisation,

$100 = 2 \times 2 \times 5 \times 5$

| | |
|---|---|
| 2 | 100 |
| | 50 |
| | 25 |
| | 5 |
| | 1 |

Thus, 100 must be multiplied by $2 \times 5 = 10$ to make it a perfect cube.

**3.** (i) By prime factorisation,

$81 = \underline{3 \times 3 \times 3} \times 3$

| | |
|---|---|
| 3 | 81 |
| | 27 |
| | 9 |
| | 3 |
| | 1 |

Thus, 81 must be divided by 3 to make it a perfect cube.

(ii) By prime factorisation,

$128 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times 2$

| | |
|---|---|
| 2 | 128 |
| 2 | 64 |
| 2 | 32 |
| 2 | 16 |
| 2 | 8 |
| 2 | 4 |
| 2 | 2 |
| | 1 |

Thus, 128 must be divided by 2 to make it a perfect cube.

(iii) By prime factorisation,

$$135 = 5 \times \underline{3 \times 3 \times 3}$$

| | |
|---|---|
| 5 | 135 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

Thus, 135 must be divided by 5 to make it a perfect cube.

(iv) By prime factorisation,

$$192 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times 3$$

| | |
|---|---|
| 2 | 192 |
| 2 | 96 |
| 2 | 48 |
| 2 | 24 |
| 2 | 12 |
| 2 | 6 |
| 3 | 3 |
| | 1 |

Thus, 192 must be divided by 3 to make it a perfect cube.

(v) By prime factorisation,

$$704 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times 11$$

| | |
|---|---|
| 2 | 704 |
| 2 | 352 |
| 2 | 176 |
| 2 | 88 |
| 2 | 44 |
| 2 | 22 |
| 11 | 11 |
| | 1 |

Thus, 704 must be divided by 11 to make it a perfect cube.

**4.** Volume of cuboid $= 2 \times 5 \times 5$

Thus, to make it a cube, Parikshit would require $= 2 \times 2 \times 5 = 20$ cuboids

## Exercise 6.2

**1.** (i) By prime factorisation,

$$64 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2}$$

$$\sqrt[3]{64} = 2 \times 2 = 4$$

| | |
|---|---|
| 2 | 64 |
| | 32 |
| | 16 |
| | 8 |
| | 4 |
| | 2 |
| | 1 |

(ii) By prime factorisation,

$$512 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2}$$

$$\sqrt[3]{512} = 2 \times 2 \times 2 = 8$$

| | |
|---|---|
| 2 | 512 |
| | 256 |
| | 128 |
| | 64 |
| | 32 |
| | 16 |
| | 8 |
| | 4 |
| | 2 |
| | 1 |

(iii) By prime factorisation,

$$10648 = \underline{2 \times 2 \times 2} \times \underline{11 \times 11 \times 11}$$

$$\sqrt[3]{10648} = 2 \times 11 = 22$$

| | |
|---|---|
| 2 | 10648 |
| | 5324 |
| | 2662 |
| | 1331 |
| | 121 |
| | 11 |
| | 1 |

(iv) By prime factorisation,

$$27000 = \underline{3 \times 3 \times 3} \times \underline{5 \times 5 \times 5} \times \underline{2 \times 2 \times 2}$$

$$\sqrt[3]{27000} = 3 \times 2 \times 5 = 30$$

| | |
|---|---|
| 3 | 27000 |
| 3 | 9000 |
| 3 | 3000 |
| 5 | 1000 |
| 5 | 200 |
| 5 | 40 |
| 2 | 8 |
| 2 | 4 |
| 2 | 2 |
| | 1 |

(v) By prime factorisation,

$$15625 = \underline{5 \times 5 \times 5} \times \underline{5 \times 5 \times 5}$$

$$\sqrt[3]{15625} = 5 \times 5 = 25$$

| | |
|---|---|
| 5 | 15625 |
| 5 | 3125 |
| 5 | 625 |
| 5 | 125 |
| 5 | 25 |
| 5 | 5 |
| | 1 |

(vi) By prime factorisation,

$$13824 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3}$$

$$\sqrt[3]{13824} = 2 \times 2 \times 2 \times 3 = 24$$

| | |
|---|---|
| 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 |

(vii) By prime factorisation,

$$110592 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3}$$

$$\sqrt[3]{110592} = 2 \times 2 \times 2 \times 2 \times 3 = 48$$

| | |
|---|---|
| 2 | 110592 |
| 2 | 55296 |
| 2 | 27648 |
| 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 |

(viii) By prime factorisation,

$$46656 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3} \times \underline{3 \times 3 \times 3}$$

$$\sqrt[3]{46656} = 2 \times 2 \times 3 \times 3 = 36$$

| | |
|---|---|
| 2 | 46656 |
| | 23328 |
| | 11664 |
| | 5832 |
| | 2916 |
| | 1458 |
| | 729 |
| | 243 |
| | 81 |
| | 27 |
| | 9 |
| | 3 |
| | 1 |

(ix) By prime factorisation,

$$175616 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{7 \times 7 \times 7}$$

$$\sqrt[3]{175616} = 2 \times 2 \times 2 \times 7 = 56$$

| | |
|---|---|
| 2 | 175616 |
| 2 | 87808 |
| 2 | 43904 |
| 2 | 21952 |
| 2 | 10976 |
| 2 | 5488 |
| 2 | 2744 |
| 2 | 1372 |
| 2 | 686 |
| 7 | 343 |
| 7 | 49 |
| 7 | 7 |
| | 1 |

(x) By prime factorisation,

$$91125 = \underline{5 \times 5 \times 5} \times \underline{3 \times 3 \times 3} \times \underline{3 \times 3 \times 3}$$

$$\sqrt[3]{91125} = 5 \times 3 \times 3 = 45$$

| | |
|---|---|
| 5 | 91125 |
| 5 | 18225 |
| 5 | 3645 |
| 3 | 729 |
| 3 | 243 |
| 3 | 81 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

2. (i) False
(ii) True
(iii) False $15^2 = 225, 15^3 = 3375$
(iv) False $8 = 2^3, 1728 = 12^3$
(v) False $10^3 = 1000, 12^3 = 1728$
(vi) False $10^3 = 1000, 99^3 = 970299$
(vii) True $1^3 = 1, 2^3 = 8$

# Chapter-7

## Comparing Quantities

### Exercise 7.1

1. (a) Speed of a cycle 15 km per hour to speed of scooter 30 km per hour

$= 15 : 30 = 1 : 2$

(b) 1000 m = 1 km

$\Rightarrow \quad 5 \text{ m} = \frac{1}{1000} \times 5 \text{ km} \Rightarrow = \frac{5}{1000} \text{ km}$

$\therefore$ Ratio of 5 m to 10 km

$= \frac{5}{1000} \text{ km to } 10 \text{ km} = 1 : 2000$

(c) ₹ 1 = 100 paise, ₹ 5 = 500 paise

$\therefore$ Ratio of 50 paise to ₹ 5 = 50 : 500 = 1 : 10

2. (a) $3 : 4 = \frac{3}{4} \times \frac{100}{100} = 3 \times \frac{25}{100} = 75\%$

(b) $2 : 3 = \frac{2}{3} \times \frac{100}{100} = \frac{2 \times \frac{100}{3}}{100} = 66\frac{2}{3}\%$

3. No. of students good in mathematics

$= \frac{72}{100} \times 25 = 18$

$\therefore$ Number of students not good in mathematics = 25 – 18 = 7

4. Let $x$ be total number of matches played.

$\therefore \quad \frac{40}{100} x = 10 \quad \Rightarrow x = \frac{10 \times 100}{40} = 25$

Number of matches played were 25.

5. Let amount of money in beginning with Chameli be $x$.

$\therefore \quad \frac{25}{100} x = 600$

[Money left after spending = (100 – 75)% = 25%]

$\Rightarrow \quad x = \frac{600 \times 100}{25} = 2400$

Chameli had ₹ 2400 in the beginning.

6. People who like cricket = 60%

People who like football = 30%

People who like other games

= (100 – 60 – 30)% = 10%

Number of people like cricket

$= \frac{60}{100} \times 50,00,000 = 30,00,000$ lakh

Number of people like football

$= \frac{30}{100} \times 50,00,000 = 15,00,000$

Number of people who like other games

$= \frac{10}{100} \times 50,00,000 = 5,00,000$

### Exercise 7.2

1. For a pair of jeans,

Marked price = ₹ 1450

Discount% = 10%

$\therefore$ Discount = 10% of 1450

$$= \frac{10}{100} \times 1450 = ₹\,145$$

$\therefore$ Selling price = ₹ (1450 – 145)

= ₹ 1305

For two shirts,

Marked price of two shirts = ₹ (850 × 2)

= ₹ 1700

$\therefore$ Discount% = 10% of Marked Price

$$\therefore \text{ Discount} = \frac{10}{100} \times 1700 = ₹\,170$$

Selling price for two shirts

= ₹ (1700 – 170) = ₹ 1530

Hence, the customer has to pay total amount = ₹ (1305 + 1530) = ₹ 2835

**2.** List price of TV = ₹ 13000

Sales tax% = 12%

$$\text{Sales tax} = \frac{12}{100} \times 13000 = ₹\,1560$$

Thus, the total amount to be paid by Vinod for TV

= ₹ (13000 + 1560) = ₹ 14560

**3.** Let marked price be $x$.

Discount% = 20%

$$\therefore \quad \text{Discount} = \frac{20}{100}x$$

$$\therefore \quad x - \frac{20}{100}x = ₹\,1600$$

$$\Rightarrow \quad \left(\frac{100-20}{100}\right)x = ₹\,1600$$

$$\Rightarrow \quad \frac{80}{100}x = 1600$$

$$x = \frac{1600}{80} \times 100 = 2000$$

Marked price for pair of skates = ₹ 2000

**4.** Let the price of hair dryer without VAT be $x$.

$$\therefore \quad \left(x + \frac{8}{100}x\right) = ₹\,5400$$

$$\therefore \quad \frac{108}{100}x = 5400$$

$$\Rightarrow \quad x = \frac{5400 \times 100}{108} = 5000$$

Price of hair dryer without VAT is ₹ 5000.

**5.** Let the price of the article before adding GST be $x$.

$$\text{GST} = 18\% = ₹\,\frac{18}{100} \times x$$

$$x + \frac{18}{100}x = 1239$$

$$\frac{100x + 18x}{100} = 1239$$

$$\frac{(100+18)}{100}x = 1239$$

$$\frac{118x}{100} = 1239$$

$$118x = 1239 \times 100$$

$$118x = 123900$$

$$x = \frac{123900}{118} = 1050$$

Hence, the price of the article before adding GST was ₹ 1050.

## Exercise 7.3

**1.** (i) The population of 2003 is amount of population on increase of population from 2001.

Let $P$ = Population of 2001

$$\therefore \quad 54000 = P\left(1 + \frac{5}{100}\right)^2$$

$$54000 = P\left(\frac{105}{100}\right)^2$$

$$\Rightarrow \quad P = \frac{54000 \times 100 \times 100}{105 \times 105}$$

$$= 48979.59$$

$\therefore$ Population of 2001 was 48980 approximately.

(ii) Let population of 2005, *i.e.,* 54000 be base population.

$\therefore$ Population of place in 2005

$$= 54000 \times \left(1 + \frac{5}{100}\right)^2$$

$$= 54000 \times \left(\frac{105}{100}\right)^2 = 59535$$

**2.** $P$ = Original count of bacteria = 506000

$R$ = 2.5% per hour, $n$ = 2 hours

$\therefore$ Bacteria after 2 hours

$$= 506000 \times \left(1 + \frac{2.5}{100}\right)^2$$

$$= 506000 \times \left(\frac{102.5}{100}\right)^2$$

$$= 506000 \times \left(\frac{102.5}{100}\right) \times \left(\frac{102.5}{100}\right)$$

$= 531616.25 = 531616$ approx.

**3.** Principal $(P) =$ ₹ 42000, Rate $(R) = 8\%$ p.a., $n = 1$ year

$\therefore$ Value after depreciation of 1 year

$$= ₹\left[42000 \times \left(1 - \frac{8}{100}\right)\right]$$

$$= ₹\left[42000 \times \frac{92}{100}\right] = ₹\,38640$$

# Chapter-8

## Algebraic Expressions and Identities

### Exercise 8.1

**1.** (i) Writing expressions one below the other, we have

$$\begin{array}{r} ab - bc \\ + bc - ca \\ \underline{-ab \qquad + ca} \\ 0 + 0 + 0 \end{array}$$

$\therefore\ (ab - bc) + (bc - ca) + (ca - ab) = 0$

(ii) Writing expressions one below the other, we have

$$\begin{array}{l} a - b + ab \\ \quad +b \qquad - c + bc \\ \underline{-a \qquad\qquad + c + ac} \\ 0 + 0 + ab + 0 + bc + ac \end{array}$$

$\therefore\ (a - b + ab) + (b - c + bc) + (-a + c + ac)$

$= ab + bc + ac$

(iii) Writing expression one below the other, we have

$$\begin{array}{l} 2p^2q^2 - 3pq + 4 \\ \underline{-3p^2q^2 + 7pq + 5} \\ -p^2q^2 + 4pq + 9 \end{array}$$

(iv) Writing expressions one below the other, we have

$$\begin{array}{l} l^2 + m^2 \\ \quad + m^2 + n^2 \\ \underline{l^2 \qquad + n^2 + 2lm + 2mn + 2nl} \\ 2l^2 + 2m^2 + 2n^2 + 2lm + 2mn + 2nl \end{array}$$

**2.** (a) $12a - 9ab + 5b - 3$

$$\begin{array}{l} 4a - 7ab + 3b + 12 \\ \underline{(-) \quad (+) \quad (-) \quad (-)} \\ 8a - 2ab + 2b - 15 \end{array}$$

(b) $5xy - 2yz - 2zx + 10xyz$

$$\begin{array}{l} 3xy + 5yz - 7zx \\ \underline{(-) \quad (-) \quad (+)} \\ 2xy - 7yz + 5zx + 10xyz \end{array}$$

(c) $18 - 3p - 11q + 5pq - 2pq^2 + 5p^2q$

$$\begin{array}{l} -10 - 8p + 7q - 3pq + 5pq^2 + 4p^2q \\ \underline{(+) \quad (+) \quad (-) \quad (+) \quad (-) \quad (-)} \\ 28 + 5p - 18q + 8pq - 7pq^2 + p^2q \end{array}$$

### Exercise 8.2

**1.** (i) $4 \times 7p = (4 \times 7)p = 28p$

(ii) $-4p \times 7p = (-4 \times 7) \times (p \times p) = -28p^2$

(iii) $-4p \times 7pq = (-4 \times 7) \times (p \times p \times q)$
$= -28p^2q$

(iv) $4p^3 \times -3p = (4 \times -3) \times (p^3 \times p)$
$= -12p^4$

(v) $4p \times 0 = 0$

**2.** Let the first term be length and second term be breadth.

Area of rectangle = Length $\times$ Breadth

$\therefore$ Area of rectangles of given sides

$$p \times q = pq$$
$$10m \times 5n = 50mn$$
$$20x^2 \times 5y^2 = 100x^2y^2$$
$$4x \times 3x^2 = 12x^3$$
$$3mn \times 4np = 12mn^2p$$

**3.**

| First monomial → <br> Second monomial ↓ | $2x$ | $-5y$ | $3x^2$ | $-4xy$ | $7x^2y$ | $-9x^2y^2$ |
|---|---|---|---|---|---|---|
| $2x$ | $4x^2$ | $-10xy$ | $6x^3$ | $-8x^2y$ | $14x^3y$ | $-18x^3y^2$ |
| $-5y$ | $-10xy$ | $25y^2$ | $-15x^2y$ | $20xy^2$ | $-35x^2y^2$ | $45x^2y^3$ |
| $3x^2$ | $6x^3$ | $-15x^2y$ | $9x^4$ | $-12x^3y$ | $21x^4y$ | $-27x^4y^2$ |
| $-4xy$ | $-8x^2y$ | $20xy^2$ | $-12x^3y$ | $16x^2y^2$ | $-28x^3y^2$ | $36x^3y^3$ |
| $7x^2y$ | $14x^3y$ | $-35x^2y^2$ | $21x^4y$ | $-28x^3y^2$ | $49x^4y^2$ | $-63x^4y^3$ |
| $-9x^2y^2$ | $-18x^3y^2$ | $45x^2y^3$ | $-27x^4y^2$ | $36x^3y^3$ | $-63x^4y^3$ | $81x^4y^4$ |

**4.** (i) Volume of rectangular box

$= 5a \times 3a^2 \times 7a^4$

$= (5 \times 3 \times 7) \times (a \times a^2 \times a^4)$

$= 105a^7$

(ii) Volume of rectangular box

$= 2p \times 4q \times 8r$

$= (2 \times 4 \times 8) \times (p \times q \times r)$

$= 64\ pqr$

(iii) Volume of rectangular box

$= xy \times 2x^2y \times 2xy^2$

$= (1 \times 2 \times 2) \times (x \times x^2 \times x \times y \times y \times y^2)$

$= 4x^4y^4$

(iv) Volume of rectangular box

$= a \times 2b \times 3c$

$= (1 \times 2 \times 3) \times (a \times b \times c) = 6abc$

**5.** (i) $xy \times yz \times zx = x^2y^2z^2$

(ii) $a \times -a^2 \times a^3 = -a^6$

(iii) $2 \times 4y \times 8y^2 \times 16y^3 = (2 \times 4 \times 8 \times 16) \times (y \times y^2 \times y^3) = 1024y^6$

(iv) $a \times 2b \times 3c \times 6abc = (1 \times 2 \times 3 \times 6) \times (a \times b \times c \times a \times b \times c) = 36a^2b^2c^2$

(v) $m \times -mn \times mnp = -m^3n^2p$

## Exercise 8.3

**1.** (i) $4p \times (q + r) = 4p \times q + 4p \times r$

$= 4pq + 4pr$

(ii) $ab \times (a - b) = ab \times a - ab \times b$

$= a^2b - ab^2$

(iii) $(a + b) \times 7a^2b^2 = a \times 7a^2b^2 + b \times 7a^2b^2$

$= 7a^3b^2 + 7a^2b^3$

(iv) $(a^2 - 9) \times 4a = a^2 \times 4a - 9 \times 4a$

$= 4a^3 - 36a$

(v) $(pq + qr + rp) \times 0 = 0$

**2.**

| | First expression | Second expression | Product |
|---|---|---|---|
| (i) | $a$ | $b + c + d$ | $ab + ac + ad$ |
| (ii) | $x + y - 5$ | $5xy$ | $5x^2y + 5xy^2 - 25xy$ |
| (iii) | $p$ | $6p^2 - 7p + 5$ | $6p^3 - 7p^2 + 5p$ |
| (iv) | $4p^2q^2$ | $p^2 - q^2$ | $4p^4q^2 - 4p^2q^4$ |
| (v) | $a + b + c$ | $abc$ | $a^2bc + ab^2c + abc^2$ |

**3.** (i) $(a^2) \times (2a^{22}) \times (4a^{26}) = (1 \times 2 \times 4) \times a^{2+22+26}$

$= 8a^{50}$

(ii) $\left(\frac{2}{3}xy\right) \times \left(\frac{-9}{10}x^2y^2\right) = -\frac{3}{5}x^3y^3$

(iii) $\left(\frac{-10}{3}pq^3\right) \times \left(\frac{6}{5}p^3q\right) = -4p^4q^4$

(iv) $x \times x^2 \times x^3 \times x^4 = x^{1+2+3+4} = x^{10}$

**4.** (a) $3x \times (4x - 5) + 3 = 12x^2 - 15x + 3$

(i) When $x = 3$

$= 12(3)^2 - 15(3) + 3$

$= 12 \times 9 - 45 + 3$

$= 108 - 45 + 3 = 66$

(ii) When $x = \frac{1}{2}$

$= 12\left(\frac{1}{2}\right)^2 - 15\left(\frac{1}{2}\right) + 3$

$= 12 \times \frac{1}{4} - \frac{15}{2} + 3$

$= 3 - \frac{15}{2} + 6 = -\frac{3}{2}$

(b) $a(a^2 + a + 1) + 5 = a^3 + a^2 + a + 5$

(i) When $a = 0 = 0^3 + 0^2 + 0 + 5 = 5$

(ii) When $a = 1 = 1^3 + 1^2 + 1 + 5 = 3 + 5 = 8$

(iii) When $a = -1 = (-1)^3 + (-1)^2 + (-1) + 5$

$= -1 + 1 - 1 + 5 = 4$

**5.** (a) $p(p - q) + q(q - r) + r(r - p)$

$= p^2 - pq + q^2 - qr + r^2 - rp$

$= p^2 + q^2 + r^2 - pq - qr - rp$

(b) $2x(z - x - y) + 2y(z - y - x)$

$= 2xz - 2x^2 - 2xy + 2yz - 2y^2 - 2yx$

$= -2x^2 - 2y^2 + 2xz + 2yz - 4xy$

(c) $4l(10n - 3m + 2l) - 3l(l - 4m + 5n)$

$= 40ln - 12lm + 8l^2 - (3l^2 - 12lm + 15ln)$

$= 40ln - 12lm + 8l^2 - 3l^2 + 12lm - 15ln$

$= (40 - 15)ln + (-12 + 12)lm + (8 - 3)l^2$

$= 25ln + 5l^2$

(d) $4c(-a + b + c)$

$- [3a(a+b+c) - 2b(a-b+c)]$

$= -4ac + 4cb + 4c^2$

$- [3a^2 + 3ab + 3ac - 2ba + 2b^2 - 2bc]$

$= -4ac + 4bc + 4c^2 - 3a^2 - 3ab$

$- 3ac + 2ab - 2b^2 + 2bc$

$= -3a^2 - 2b^2 + 4c^2 - ab + 6bc - 7ca$

## Exercise 8.4

**1.** (i) $(2x+5) \times (4x-3)$

$= 2x(4x-3) + 5(4x-3)$

$= 8x^2 - 6x + 20x - 15 = 8x^2 + 14x - 15$

(ii) $(y-8) \times (3y-4)$

$= y(3y-4) - 8(3y-4)$

$= 3y^2 - 4y - 24y + 32 = 3y^2 - 28y + 32$

(iii) $(2.5l - 0.5m) \times (2.5l + 0.5m)$

$= 2.5l(2.5l + 0.5m) + (-0.5m)(2.5l + 0.5m)$

$= 6.25l^2 + 1.25lm - 1.25lm - 0.25m^2$

$= 6.25l^2 - 0.25m^2$

(iv) $(a+3b) \times (x+5) = a(x+5) + 3b(x+5)$

$= ax + 5a + 3bx + 15b$

(v) $(2pq + 3q^2) \times (3pq - 2q^2)$

$= 2pq(3pq - 2q^2) + 3q^2(3pq - 2q^2)$

$= 6p^2q^2 - 4pq^3 + 9pq^3 - 6q^4$

$= 6p^2q^2 + 5pq^3 - 6q^4$

(vi) $\left(\frac{3}{4}a^2 + 3b^2\right) \times 4\left(a^2 - \frac{2}{3}b^2\right)$

$= \left(\frac{3}{4}a^2 + 3b^2\right) \times \left(4a^2 - \frac{8}{3}b^2\right)$

$= \frac{3}{4}a^2\left(4a^2 - \frac{8}{3}b^2\right) + 3b^2\left(4a^2 - \frac{8}{3}b^2\right)$

$= 3a^4 - 2b^2a^2 + 12a^2b^2 - 8b^4$

$= 3a^4 + 10a^2b^2 - 8b^4$

**2.** (i) $(5-2x)(3+x) = (5-2x) \times 3$

$+ (5-2x) \times x$

$= 15 - 6x + 5x - 2x^2$

$= -2x^2 - x + 15$

(ii) $(x+7y)(7x-y)$

$= (x+7y) \times 7x + (x+7y) \times (-y)$

$= 7x^2 + 49xy - xy - 7y^2$

$= 7x^2 + 48xy - 7y^2$

(iii) $(a^2+b)(a+b^2)$

$= (a^2+b)a + (a^2+b)b^2$

$= a^3 + ab + a^2b^2 + b^3$

(iv) $(p^2 - q^2)(2p+q)$

$= (p^2-q^2)2p + (p^2-q^2)q$

$= 2p^3 - 2pq^2 + p^2q - q^3$

**3.** (i) $(x^2-5)(x+5) + 25$

$= (x^2-5)x + (x^2-5)5 + 25$

$= x^3 - 5x + 5x^2 - 25 + 25$

$= x^3 + 5x^2 - 5x$

(ii) $(a^2+5)(b^3+3) + 5$

$= a^2(b^3+3) + 5(b^3+3) + 5$

$= a^2b^3 + 3a^2 + 5b^3 + 15 + 5$

$= a^2b^3 + 3a^2 + 5b^3 + 20$

(iii) $(t+s^2)(t^2-s)$

$= t(t^2-s) + s^2(t^2-s)$

$= t^3 - st + s^2t^2 - s^3$

(iv) $(a+b)(c-d) + (a-b)(c+d)$

$+ 2(ac+bd)$

$= ac + bc - ad - bd + ac - bc$

$+ ad - bd + 2ac + 2bd$

$= 4ac - 2bd + 2bd = 4ac$

(v) $(x+y)(2x+y) + (x+2y)(x-y)$

$= 2x^2 + 2xy + xy + y^2 + x^2 + 2xy$

$- xy - 2y^2$

$= 3x^2 + 4xy - y^2$

(vi) $(x+y)(x^2 - xy + y^2)$

$= x(x^2 - xy + y^2) + y(x^2 - xy + y^2)$

$= x^3 - x^2y + xy^2 + yx^2 - xy^2 + y^3$

$= x^3 + y^3$

(vii) $(1.5x - 4y)(1.5x + 4y + 3)$

$- 4.5x + 12y$

$= 1.5x(1.5x + 4y + 3) - 4y(1.5x$

$+ 4y + 3) - 4.5x + 12y$

$= 2.25x^2 + 6xy + 4.5x - 6xy - 16y^2$

$- 12y - 4.5x + 12y$

$= 2.25x^2 + (6-6)xy + (4.5-4.5)x$

$- 16y^2 - (12-12)y$

$= 2.25x^2 - 16y^2$

(viii) $(a+b+c)(a+b-c)$

$= a^2 + ab + ac + ab + b^2$

$+ bc - ac - bc - c^2$

$= a^2 + b^2 - c^2 + 2ab$

# Chapter-9

## Mensuration

### Exercise 9.1

**1.** Area of top surface of a table

$= \text{Area of the trapezium}$

$= \frac{1}{2} \times \text{(sum of parallel sides)} \times \text{(Distance between them)}$

$= \left[\frac{1}{2} \times (1 + 1.2) \times 0.8\right] \text{m}^2$

$= \left[\frac{1}{2} \times 2.2 \times 0.8\right] \text{m}^2$

$= (1.1 \times 0.8) \text{ m}^2 = 0.88 \text{ m}^2$

**2.** Let the length of the squared sides be $x$ cm.

Area of the trapezium

$= \left[\frac{1}{2} \times (10 + x) \times 4\right] \text{cm}^2 = 2(10 + x) \text{ cm}^2$

But the area of the trapezium $= 34 \text{ cm}^2$

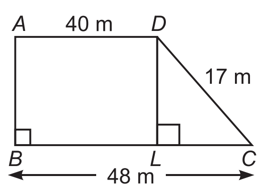
$\therefore \; 2(10 + x) = 34$

or $\quad 10 + x = 17$

$x = 17 - 10 = 7$

Hence, length of other parallel side is 7 cm.

**3.** Let $ABCD$ be the given trapezium in which $BC = 48$ m, $CD = 17$ m and $AD = 40$ m.




Through $D$, draw $DL \perp BC$.

Now, $\quad BL = AD = 40$ m

$LC = BC - BL$

$= (48 - 40)$ m

$= 8$ m

Applying Pythagoras theorem in right $\Delta DLC$, we get

$DL^2 = DC^2 - LC^2$

$= 17^2 - 8^2 = 289 - 64 = 225$

So, $\quad DL = \sqrt{225} = 15$ m

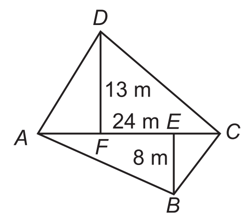
Now, area of the trapezium $ABCD$

$= \frac{1}{2} \times (BC + AD) \times DL$

$= \frac{1}{2} \times (48 + 40) \times 15 \text{ m}^2$

$= (44 \times 15) \text{ m}^2 = 660 \text{ m}^2$

**4.** Let $ABCD$ be the given quadrilateral in which $BE \perp AC$ and $DF \perp AC$.




Given, $AC = 24$ m, $BE = 8$ m, $DF = 13$ m

Area of quadrilateral $ABCD$

$= \text{Area of } \Delta ABC + \text{Area of } \Delta ACD$

$= \frac{1}{2} \times AC \times BE + \frac{1}{2} \times AC \times DF$

$= \left(\frac{1}{2} \times 24 \times 8\right) + \left(\frac{1}{2} \times 24 \times 13\right) \text{m}^2$

$= (12 \times 8 + 12 \times 13) \text{ m}^2$

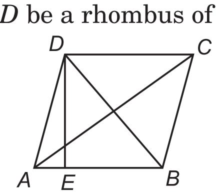
$= (96 + 156) \text{ m}^2 = 252 \text{ m}^2$

**5.** Area of a rhombus

$= \frac{1}{2} \times \text{Product of diagonals}$

$= \left(\frac{1}{2} \times 7.5 \times 12\right) \text{cm}^2 = 45 \text{ cm}^2$

**6.** Let $ABCD$ be a rhombus of side 6 cm.




Let $DE$ be height $= 4$ cm

Let one diagonal $BD = 8$ cm

Area of rhombus $ABCD$

$= b \times h = (6 \times 4) \text{ cm}^2$

$= 24 \text{ cm}^2$

Area of rhombus $ABCD$

$= \frac{1}{2} \times AC \times BD$

Thus, $\quad 24 = \frac{1}{2} \times AC \times BD$

$\Rightarrow \quad \frac{24 \times 2}{8} = AC \quad \Rightarrow 3 \times 2 = AC$

$\therefore$ Other diagonal $AC = 6$ cm

**7.** Area of floor $= 3000 \times$ Area of one tile

$= 3000 \times \frac{1}{2} \times 45 \times 30 \text{ cm}^2$

$= 1500 \times 45 \times 30$

$= \dfrac{1500 \times 45 \times 30}{100 \times 100}\ \text{m}^2 = 202.5\ \text{m}^2$

Cost of polishing at rate of ₹ 4 per $\text{m}^2$

$= ₹(4 \times 202.5) = ₹810$

**8.** Let the parallel side of trapezium field be $x$ and $2x$ m.

Area of trapezium field

$= \dfrac{1}{2}(x + 2x) \times 100\ \text{m}^2$

$= 50 \times 3x = 150x\ \text{m}^2$

Given, Area of field $= 10500\ \text{m}^2$

$\Rightarrow \quad 150x = 10500$

$x = \dfrac{10500}{150} = 70$

Length of side along river

$= 2 \times 70 = 140$ m

**9.** Area of octagonal surface $ABCDEFGH$

= Area of trapezium $ABCH$

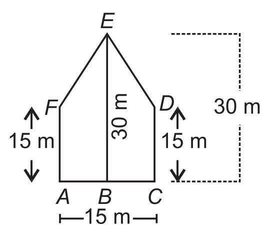
+ Area of rectangle $HCDG$

+ Area of trapezium $GDEF$

$= \left[\dfrac{1}{2}(5+11)\times 4 + 11\times 5 + \dfrac{1}{2}(11+5)\times 4\right]\text{m}^2$

$= (32 + 55 + 32) = 119\ \text{m}^2$

**10.** As per Jyoti's diagram



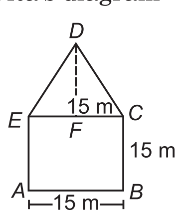

Area of pentagonal park

$= 2 \times$ Area of trapezium $ABEF$

$= 2 \times \dfrac{1}{2}(15 + 30) \times \dfrac{15}{2}\ \text{m}^2$

$= \left(45 \times \dfrac{15}{2}\right)\text{m}^2 = 337.5\ \text{m}^2$

Taking Kavita's diagram



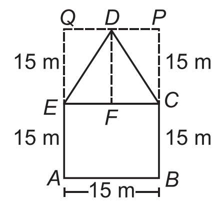

Area of pentagonal park

= Area of square $ABCE$ + Area of $\Delta DEC$

$= 15 \times 15 + \dfrac{1}{2} \times 15 \times 15$

$= (225 + 112.5)\ \text{m}^2 = 337.5\ \text{m}^2$

Yes, there is another way of finding area as given below.




Area of $ABCDE$

= Area of rectangle $ABPQ - 2$

$\times$ Area of $\Delta CPD$

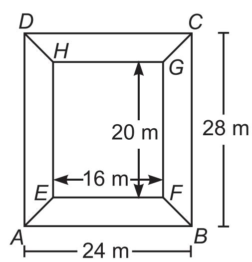
$= (15 \times 30)\ \text{m}^2 - 2 \times \dfrac{1}{2} \times \dfrac{15}{2} \times 15\ \text{m}^2$

$= \left(450 - \dfrac{225}{2}\right)\text{m}^2 = \dfrac{900 - 225}{2}\ \text{m}^2$

$= \dfrac{675}{2} = 337.5\ \text{m}^2$

**11.** It can be seen that width of frame

$= \dfrac{AB = EF}{2} = \dfrac{24 - 16}{2} = \dfrac{8}{2} = 4$ cm




Area of section $DCGH$

= Area of section $ABEF$

$= \dfrac{1}{2} \times (AB + EF) \times 4\ \text{cm}^2$

$= 2(24 + 16)\ \text{cm}^2$

$= 2 \times 40\ \text{cm}^2 = 80\ \text{cm}^2$

Area of section $CBFG$ = Area of section $AEHD$

$= \dfrac{1}{2} \times (AD + EH) \times 4\ \text{cm}^2$

$= 2 \times (28 + 20)\ \text{cm}^2$

$= 2 \times 48\ \text{cm}^2 = 96\ \text{cm}^2$

## Exercise 9.2

**1.** Total surface area of box (a)

$= 2(lb + bh + lh)$

$= 2(60 \times 40 + 40 \times 50 + 60 \times 50)\ \text{cm}^2$

$= 200(24 + 20 + 30)$

$= 200 \times 74\ \text{cm}^2 = 14800\ \text{cm}^2$

Total surface area of second box (b)

$= 6\ (\text{edge})^2 = 6 \times 50 \times 50\ \text{cm}^2$

$= 15000\ \text{cm}^2$

Total surface area of box (a) is less than box (b), thus (a) requires lesser amount of material.

**2.** Total surface area of suitcase

$= 2(80 \times 48 + 48 \times 24 + 80 \times 24)\ \text{cm}^2$

$= 2(3840 + 1152 + 1920)\ \text{cm}^2$

$= 2 \times 6912\ \text{cm}^2 = 13824\ \text{cm}^2$

Surface area of 100 suitcases

$= 100 \times 13824\ \text{cm}^2$

Width of tarpaulin is 96 cm.

Thus, tarpaulin required to cover 100 suitcases

$= \dfrac{\text{Total surface area of 100 suitcases}}{96}\ \text{cm}$

$= \dfrac{100 \times 13824}{96}\ \text{cm}$

$= \dfrac{100 \times 13824}{96 \times 100}\ \text{m} = 144\ \text{m}$

**3.** Let the side of a cube be $x$.

The surface area of cube $= 6x^2$

$\therefore \quad 6x^2 = 600$

$x^2 = 100 \Rightarrow x = 10\ \text{cm}$

**4.** Area to be painted

$= 2bh + 2lh + lb$

$= 2 \times 1 \times 1.5 + 2 \times 2 \times 1.5 + 2 \times 1$

$= (3 + 6 + 2)\ \text{m}^2 = 11\ \text{m}^2$

**5.** $l = 15$ m, $b = 10$ m, $h = 7$ m

Area to be painted

$= 2bh \times 2lh + lb$

$= (2 \times 10 \times 7 + 2 \times 15 \times 7 + 15 \times 10)\ \text{m}^2$

$= (140 + 210 + 150)\ \text{m}^2 = 500\ \text{m}^2$

Since, each can will cover $100\ \text{m}^2$.

$\therefore$ Number of cans required $= \dfrac{500}{100} = 5$

**6.** The differences in the figures are

(i) One is named cylinder, the other is a cube.

(ii) Cylinder is a solid obtained by revolving a rectangular piece about one of its sides. Cube has six congruent squares.

(iii) Cylinder has two circular faces, cube has 6 faces.

The similarity is that their height is same.

Lateral surface area of cylinder $= 2\pi rh$,

Where $r = \dfrac{7}{2}$ cm and $h = 7$ cm

$= 2 \times \dfrac{22}{7} \times \dfrac{7}{2} \times 7 = 154\ \text{cm}^2$

Lateral surface area of cube = Perimeter of Base × Height

$= (4 \times 7 \times 7)\ \text{cm}^2 = 196\ \text{cm}^2$

Hence, cube has larger lateral surface area.

**7.** $r = 7$ m, $h = 3$ m

Sheet of metal required to make a closed cylinder

= Total surface area of the cylinder

$= (2\pi rh + 2\pi r^2)$ sq, units

$= \left(2 \times \dfrac{22}{7} \times 7 \times 3 + 2 \times \dfrac{22}{7} \times 7 \times 7\right)\ \text{m}^2$

$= (132 + 308)\ \text{m}^2 = 440\ \text{m}^2$

**8.** The length of sheet = Circumference of base of cylinder

Breadth of sheet = Height of cylinder

Lateral surface area of cylinder

= Area of sheet

$\therefore \quad l \times 33 = 4224$

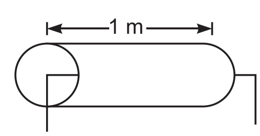
$\therefore \quad l = \dfrac{4224}{33} = 128\ \text{cm}$

Perimeter of rectangular sheet

$= 2(l + b) = 2(128 + 33)\ \text{cm}$

$= 2 \times 161 = 322\ \text{cm}$

**9.**



Radius of road roller = $\frac{84}{2}$ = 42 cm = 0.42 m

Height = 1 m

∴ Curved surface area of the road roller

$$= 2\pi rh$$

$$= \left(2 \times \frac{22}{7} \times 0.42 \times 1\right) \text{m}^2$$

$$= 2.64 \text{ m}^2$$

∴ Area levelled by the road roller is 750 revolutions

$$= 2.64 \times 750 \text{ m}^2 = 1980 \text{ m}^2$$

Area of road to be levelled = 1980 $\text{m}^2$

**10.** Since, label is placed 2 cm from top and bottom.

Thus, surface area has to be found for cylinder with height (20 – 4) cm = 16 cm

Curved surface area

$$= \left(2 \times \frac{22}{7} \times 7 \times 16\right) \text{cm}^2$$

$$= 704 \text{ cm}^2$$

## Exercise 9.3

**1.** (a) Volume

(b) Surface area

(c) Volume

**2.** Cylinder $B$ has more volume by observation.

Surface area of cylinder $A$

$= (2\pi rh + 2\pi r^2)$ units$^2$

$$\left(r = \frac{7}{2} \text{ cm } h = 14 \text{ cm}\right)$$

$$= \left(2\times\frac{22}{7}\times\frac{7}{2}\times 14 + 2\times\frac{22}{7}\times\frac{7}{2}\times\frac{7}{2}\right) \text{cm}^2$$

$$= (308 + 77) = 385 \text{ cm}^2$$

Surface area of cylinder B

$= (2\pi rh + 2\pi r^2)$ units$^2$ $(r = 7$ cm), $h = 7$ cm

$$= \left(2 \times \frac{22}{7} \times 7 \times 7 + 2 \times \frac{22}{7} \times 7 \times 7\right) \text{cm}^2$$

$$= (308 + 308) = 616 \text{ cm}^2$$

Volume of cylinder A = $\pi r^2 h$

$$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 14 \text{ cm}^3 = 539 \text{ cm}^3$$

Volume of cylinder $B = \pi r^2 h$

$$= \frac{22}{7} \times 7 \times 7 \times 7 \text{ cm}^3 = 1078 \text{ cm}^3$$

The cylinder with high volume has higher surface area.

**3.** Volume of cuboid = 900 $\text{cm}^3$

Area of base × Height = 900 $\text{cm}^3$

180 × Height = 900 $\text{cm}^3$

∴ Height = $\frac{900}{180}$ = 5

Height of cuboid = 5 cm

**4.** Edge of each cube = 6 cm

Volume of each cube = $6^3$ = 216 $\text{cm}^3$

Volume of cuboid = 60 × 54 × 30 $\text{cm}^3$

$$= 97200 \text{ cm}^3$$

$$\therefore \text{Number of cube} = \frac{\text{Volume of cuboid}}{\text{Volume of cube}}$$

$$= \frac{97200}{216} = 450 \text{ cubes}$$

**5.** Let $h$ be the height of the cylinder whose radius $r = \frac{140}{2}$ cm = 70 cm = $\frac{70}{100}$ m = 0.7 m

Volume = 1.54 $\text{m}^3$

$$\therefore \quad \pi r^2 h = 1.54$$

$$\Rightarrow \frac{22}{7} \times 0.7 \times 0.7 \times h = 1.54$$

$$h = \frac{1.54 \times 7}{22 \times 0.7 \times 0.7} = 1$$

Height of cylinder = 1 meter

**6.** Quantity of milk that can be stored

= Volume of tank = $\pi r^2 h$

$$= \frac{22}{7} \times 1.5 \times 1.5 \times 7 \text{ m}^3 = 49.5 \text{ m}^3$$

= (49.5 × 1000) litres

[1 $\text{m}^3$ = 1000 litres]

= 49500 litres

**7.** Let $a$ be length of side of cube.

Thus, surface area will be $6a^2$.

Volume of cube = $a^3$

(i) If length of edge/side is doubled.

∴ Surface area = $6\,(2a)^2$

$$= 6\,(4a)^2 = 24a^2$$

Surface area will increase four times.

(ii) If length of side/edge is doubled.

Volume of cube $= (2a)^3 = 8a^3$

Volume will increase eight times.

**8.** Volume of reservoir $= 108\text{ m}^3$

$= 108 \times 1000$ litres

$= 108000$ litres

Water is pouring at rate 60 litres per minute.

$\therefore$ Time taken to fill reservoir

$$= \frac{108000}{60 \times 60} = 30 \text{ hours}$$

# Chapter-10

## Exponents

### Exercise 10.1

**1.** (i) $3^{-2} = \frac{1}{3^2} = \frac{1}{3 \times 3} = \frac{1}{9}$

(ii) $(-4)^{-2} = \frac{1}{(-4)^2} = \frac{1}{(-1)^2 \times 4^2} = \frac{1}{1 \times 16} = \frac{1}{16}$

(iii) $\left(\frac{1}{2}\right)^{-5} = \frac{1}{2^{-5}} = 2^5 = 32$

**2.** (i) $(-4)^5 \div (-4)^8 = \frac{(-4)^5}{(-4)^8} = \frac{1}{(-4)^{8-5}} = \frac{1}{(-4)^3}$

$= \frac{1}{(-1)^3 \times 4^3} = -\frac{1}{4^3}$

(ii) $\left(\frac{1}{2^3}\right)^2 = \frac{1}{2^{3 \times 2}} = \frac{1}{2^6}$

(iii) $(-3)^4 \times \left(\frac{5}{3}\right)^4 = (-3)^4 \times \frac{5^4}{3^4}$

$= (-1)^4 \times \frac{5^4 \times 3^4}{3^4} = 1 \times 5^4 = 5^4$

(iv) $(3^{-7} \div 3^{-10}) \times 3^{-5} = \frac{3^{-7}}{3^{-10}} \times 3^{-5}$

$= 3^{-7+10} \times 3^{-5}$

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

(v) $2^{-3} \times (-7)^{-3} = \frac{1}{2^3} \times \frac{1}{(-7)^3}$

$= \frac{1}{[2 \times (-7)]^3} = \frac{1}{(-14)^3}$

**3.** (i) $(3^0 + 4^{-1}) \times 2^2 = \left(1 + \frac{1}{4}\right) \times 4$

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

(ii) $(2^{-1} \times 4^{-1}) \div 2^{-2} = \left(\frac{1}{2} \times \frac{1}{4}\right) \div \frac{1}{4}$

$= \frac{1}{8} \div \frac{1}{4} = \frac{1}{8} \times 4 = \frac{1}{2}$

(iii) $\left(\frac{1}{2}\right)^{-2} + \left(\frac{1}{3}\right)^{-2} + \left(\frac{1}{4}\right)^{-2}$

$= 2^2 + 3^2 + 4^2 = 4 + 9 + 16 = 29$

(iv) $(3^{-1} + 4^{-1} + 5^{-1})^0 = 1 \Rightarrow m^0 = 1$

(v) $\left\{\left(\frac{-2}{3}\right)^{-2}\right\}^2 = \left(\frac{-2}{3}\right)^{-4}$

$= (-1)^{-4} \times \left(\frac{2}{3}\right)^{-4} = 1 \times \left(\frac{3}{2}\right)^4 = \frac{81}{16}$

**4.** (i) $\frac{8^{-1} \times 5^3}{2^{-4}} = \frac{1}{8} \times 5^3 \times 2^4 = \frac{5^3 \times 2^4}{2^3}$

$= 5^3 \times 2 = 125 \times 2 = 250$

(ii) $(5^{-1} \times 2^{-1}) \times 6^{-1} = \left(\frac{1}{5} \times \frac{1}{2}\right) \times \frac{1}{6}$

$= \frac{1}{10} \times \frac{1}{6} = \frac{1}{60}$

**5.** Given, $5^m \div 5^{-3} = 5^5$

$\Rightarrow \quad 5^m \div \frac{1}{5^3} = 5^5$

$\Rightarrow \quad 5^m \times 5^3 = 5^5$

$\therefore \quad (5)^{m+3} = 5^5$

Equating powers on same base,

$m + 3 = 5$

$m = 5 - 3 = 2$

**6.** (i) $\left\{\left(\frac{1}{3}\right)^{-1} - \left(\frac{1}{4}\right)^{-1}\right\}^{-1}$

$= (3-4)^{-1} = (-1)^{-1} = \frac{1}{-1} = -1$

(ii) $\left(\frac{5}{8}\right)^{-7} \times \left(\frac{8}{5}\right)^{-4} = \left(\frac{8}{5}\right)^7 \times \left(\frac{5}{8}\right)^4$

$= \frac{8^7}{5^7} \times \frac{5^4}{8^4} = \frac{8^{7-4}}{5^{7-4}} = \frac{8^3}{5^3} = \frac{512}{125}$

**7.** (i) $\frac{25 \times t^{-4}}{5^{-3} \times 10 \times t^{-8}} = \frac{5^2 \times t^{-4}}{5^{-3} \times 10 \times t^{-8}}$

$= \frac{5^{2+3} \times t^{-4+8}}{5 \times 2} = \frac{5^5 \times t^4}{5 \times 2} = \frac{5^4 \times t^4}{2} = \frac{625}{2} t^4$

(ii) $\frac{3^{-5} \times 10^{-5} \times 125}{5^{-7} \times 6^{-5}} = \frac{125 \times 5^7 \times 6^5}{3^5 \times 10^5}$

$= \frac{5^3 \times 5^7 \times (2 \times 3)^5}{3^5 \times (2 \times 5)^5} = \frac{5^3 \times 5^7 \times 2^5 \times 3^5}{3^5 \times 2^5 \times 5^5}$

$= 5^{3+7-5} = 5^{10-5} = 5^5 = 3125$

## Exercise 10.2

**1.** (i) 0.0000000000085

$= \frac{85}{10^{13}} = 8.5 \times 10 \times 10^{-13}$

$= 8.5 \times 10^{-12}$

(ii) 0.00000000000942

$= \frac{942}{10^{14}} = 9.42 \times 10^2 \times 10^{-14}$

$= 9.42 \times 10^{-12}$

(iii) $6020000000000000 = 602 \times 10^{13}$

$= 6.02 \times 10^2 \times 10^{13} = 6.02 \times 10^{15}$

(iv) $0.00000000837 = \frac{837}{10^{11}}$

$= 8.37 \times 10^2 \times 10^{-11} = 8.37 \times 10^{-9}$

(v) $31860000000 = 3186 \times 10^7$

$= 3.186 \times 10^3 \times 10^7 = 3.186 \times 10^{10}$

**2.** (i) $3.02 \times 10^{-6} = \frac{302}{100} \times 10^{-6} = \frac{302}{100} \times \frac{1}{10^6}$

$= \frac{302}{100000000} = 0.00000302$

(ii) $4.5 \times 10^4 = \frac{45}{10} \times 10^4 = 45 \times 10^3 = 45000$

(iii) $3 \times 10^{-8} = \frac{3}{10^8} = \frac{3}{100000000}$

$= 0.00000003$

(iv) $1.0001 \times 10^9 = \frac{10001}{10^4} \times 10^9$

$= 10001 \times 10^5 = 1000100000$

(v) $5.8 \times 10^{12} = \frac{58}{10} \times 10^{12}$

$= 58 \times 10^{11} = 5800000000000$

(vi) $3.61492 \times 10^6 = \frac{361492}{100000} \times 10^6$

$= 361492 \times 10 = 3614920$

**3.** (i) 1 micron $= \frac{1}{1000000}$ m $= 1 \times 10^{-6}$ m

(ii) Charge of an electron

$= \frac{16}{100000000000000000000}$

$= 16 \times 10^{-20} = 1.6 \times 10 \times 10^{-20}$

$= 1.6 \times 10^{-19}$ coulomb

(iii) Size of bacteria = 0.0000005 m

$= \frac{5}{10000000} = 5 \times 10^{-7}$ m

(iv) Size of a plant cell = 0.00001275 m

$= \frac{1275}{10^8} = 1275 \times 10^{-8}$

$= 1.275 \times 10^3 \times 10^{-8}$ m

$= 1.275 \times 10^{-5}$ m

(v) Thickness of a thick paper = 0.07 mm

$= \frac{7}{100}$ mm $= 7 \times 10^{-2}$ mm

**4.** Thickness of book = 20 mm

Thickness of 5 books = $(5 \times 20)$ mm

= 100 mm

Thickness of 1 sheet of paper = 0.06 mm

Thickness of 5 sheets of paper

$= (5 \times 0.016)$ mm = 0.08 mm

Total thickness = 100 mm + 0.08 mm

$= 100.08$ mm $= 1.0008 \times 10^2$ mm

# Chapter-11

## Direct and Inverse Proportions

## Exercise 11.1

**1.** $\frac{4}{60} \neq \frac{8}{100} \neq \frac{12}{140} \neq \frac{24}{100}$

$\therefore$ The parking charges are not in direct proportion to the parking time.

**2.** Given that part of red pigments be $x$.

Part of base be $y$.

Ratio of $x$ to $y$ is $\frac{1}{8}$.

Thus, $x$ is $\frac{1}{8}$ of $y$ and $y$ is 8 times of $x$.

**3.** Let $x$ be part of base to be added with 1800 ml of base.

For 1 part of red pigment, 75 ml of base is required.

$\therefore$ $x$ part of red pigment, 1800 ml of base is required.

$\therefore \quad \frac{1}{75} = \frac{x}{1800}$

$\Rightarrow \quad \frac{1800}{75} = x \Rightarrow x = 24$

Hence, 24 parts of red pigment should be mixed with 1800 ml of base.

**4.** Let $x$ be number of bottles to be filled in 5 hours, 840 is number filled in six hours.

$\therefore \quad \frac{840}{6} = \frac{x}{5}$

$\Rightarrow \quad \frac{840}{6} \times 5 = x \Rightarrow x = 700$

Thus, 700 bottles will be filled in 5 hours.

**5.** The actual length of the bacteria would be as calculated as follows

$$\frac{5}{50000}\text{ cm} = \frac{1}{10000}\text{ cm}$$

$$= 10^{-4}\text{ cm}$$

Let the length of enlarged bacteria, when enlarged by 20000 times be $x$.

Then from the above calculation, one can find out value of $x$.

$$\frac{5}{50000} = \frac{x}{20000}$$

$\Rightarrow \quad x = \frac{5 \times 20000}{50000} = 2\text{ cm}$

Enlarged length of bacteria would be 2 cm.

**6.** Let the length of model ship be $x$ cm.

$\therefore \quad \frac{\text{Height of mast in model}}{\text{Length of ship in model}}$

$$= \frac{\text{Height of mast in actual}}{\text{Length of ship in actual}}$$

$\therefore \quad \frac{9}{x} = \frac{12}{28} \quad \Rightarrow \quad \frac{9 \times 28}{12} = x$

$\Rightarrow \quad 21 = x \Rightarrow x = 21\text{ cm}$

Length of ship is 21 cm.

**7.** (i) Let $x$ be the number of crystals in 5 kg of sugar.

$\therefore$ 1 kg of sugar contains the crystals $= \frac{x}{5}$

$\therefore \quad \frac{9 \times 10^6}{2} = \frac{x}{5}$

$\Rightarrow \quad \frac{9 \times 10^6 \times 5}{2} = x$

$\Rightarrow \quad \frac{45 \times 10^6}{2} = x$

$\Rightarrow \quad 22.5 \times 10^6 = x$

$\Rightarrow \quad x = 2.25 \times 10^7$ crystals

(ii) Let $x$ be the number of crystals in 1.2 kg of sugar.

$\therefore \quad \frac{9 \times 10^6}{2} = \frac{x}{1.2}$

$\Rightarrow \quad x = \frac{9 \times 1.2 \times 10^6}{2}$

$x = 5.4 \times 10^6$ crystals

**8.** Let the distance covered on map be $x$.

$\therefore \quad \frac{1}{18} = \frac{x}{72}$

$\Rightarrow \quad \frac{72}{18} = x \Rightarrow x = 4\text{ cm}$

**9.** (i) Let length of shadow cast by pole of height 10 m 5 cm be $x$.

$\therefore \quad \frac{5.6\text{ m}}{3.2\text{ m}} = \frac{10.5\text{ m}}{x\text{ m}}$

$\Rightarrow \quad x = \frac{10.5 \times 3.2}{5.6} = 6\text{ m}$

Length of shadow cast by pole of height 10 m 5 cm = 6 m

(ii) Let height of pole casting shadow of 5 m be $x$.

$\therefore \quad \frac{5.6\text{ m}}{3.2\text{ m}} = \frac{x}{5}$

$\Rightarrow \quad x = \frac{5.6 \times 5}{3.2} = 8.75\text{ m}$

The length of pole is 8.75 m.

**10.** Let the distance travelled by truck in 5 hours be $x$.

$\therefore \quad \frac{14}{(25/60)} = \frac{x}{5}$ minutes

$\because$ 25 minutes $= \frac{25}{60}$ hours

$\therefore \quad x = \frac{14 \times 60}{25} \times 5 = 168\text{ km}$

The truck travels 168 km in 5 hours.

## Exercise 11.2

**1.** (i) More number of workers, less time it takes to complete job.

Thus, it is a case of inverse proportion.

(ii) Time taken increases the distance travelled with uniform speed.
It is a case of direct proportion.

(iii) More area cultivated and more harvested.
It is case of direct proportion.

(iv) More the speed less time to cover fixed distance.
It is case of inverse proportion.

(v) More population, less area of land per person.

It is case of inverse proportion.

**2.** Clearly, more the number of winners less is the prize per winner. Thus, it is inversely proportion.

$\therefore \quad 4 \times x = 1 \times 100000$

$$x = \frac{100000}{4} = ₹\ 25000$$

Each person gets ₹ 25000 if there are 4 winners.

$5 \times x = 1 \times 100000$

$$x = \frac{100000}{5} = ₹\ 20000$$

Each person gets ₹ 20000 if there are 5 winners.

$8 \times x = 1 \times 100000$

$$x = \frac{100000}{8} = ₹\ 12500$$

Each person gets ₹12500 if there are 8 persons.

$10 \times x = 1 \times 100000\ x = ₹10000$

Each person gets ₹ 10000 if there are 10 persons.

$20 \times x = 100000$

$$x = \frac{100000}{20} = 5000$$

Each person gets ₹ 5000 if there are 20 persons.

**3.** Clearly, more the number of spokes, the measures by angle between a pair of spokes becomes less.

$\therefore$ Also, $4 \times 90° = 6 \times 60° = 360°$

So, it is a case of inverse proportion.

$\therefore \quad 8 \times x = 4 \times 90$

$\therefore \quad x = \frac{4 \times 90}{8} = 45°$

Thus for 8 spokes angles is 45°.

$10 \times x = 4 \times 90$

$\Rightarrow \quad x = \frac{4 \times 90}{10} = 36°$

Thus for 10 spokes angles is 36°.

$12 \times x = 4 \times 90$

$$x = \frac{4 \times 90°}{12} = 30°$$

$\because \quad 24 \times 5 = 20 \times x$

$\therefore \quad x = \frac{24 \times 5}{20} = 6$

Each child gets 6 sweets.

(i) Yes, numbers of spokes and the angles formed between the pairs of consecutive spokes are in inverse proportion.

(ii) Let $x°$ be the angle between a pair of consecutive spokes on a wheel with 15 spokes.

$15 \times x = 4 \times 90$

$$x = \frac{4 \times 90}{15} = 24$$

Thus, required angle = 24°

(iii) Let $x$ be number of spokes on a wheel if angle between a pair of consecutive spokes is 40°.

$\therefore \quad x \times 40 = 4 \times 90$

$\Rightarrow \quad x = \frac{4 \times 90}{40} = 9$

Thus, there are 9 numbers of spokes.

**4.** The number of children is reduced by 4.

$\therefore$ The number of children is $24 - 4 = 20$

Let each child gets $x$ sweets when number is 20.

Thus, we have the following table :

| | | |
|---|---|---|
| **Number of children** | 24 | 20 |
| **Number of sweets** | 5 | $x$ |

Since less children, get more sweets.

So, it is case of inverse porportion.

$24 \times 5 = 20 \times x$

$$x = \frac{24 \times 5}{20} = 6$$

Hence, each child will get 6 sweets.

**5.** Let the food last for $x$ numbers of days.

Number of animals are increased by 10.

Thus, total number of cattle

$= 20 + 10 = 30$

$\therefore \quad 20 \times 6 = 30 \times x$

$\Rightarrow \quad \frac{20 \times 6}{30} = x \Rightarrow x = 4$ days

The food will last for 4 days.

**6.** Let the rewiring be completed by 4 persons in $x$ days.

$\therefore$ Thus, more the numbers of persons less the number of days required.

It is case of inverse proportion.

$\therefore \quad 4 \times 3 = x \times 4$

$\Rightarrow \quad x = \frac{4 \times 3}{4} = 3$

Thus, job will be completed in 3 days.

**7.** Let $x$ be the numbers of boxes.

$\therefore \quad 25 \times 12 = x \times 20$

$\Rightarrow \quad x = \frac{25 \times 12}{20} = 15$

Thus, boxes needed for packing is 15.

**8.** Let $x$ machines be required to produce articles in 54 days.

Less number of days, thus more number of machines are required.

$\therefore \quad 42 \times 63 = x \times 54$

$\Rightarrow \quad x = \frac{42 \times 63}{54} = 49$

Thus, number of machines required is 49.

**9.** Let the car takes $x$ hours to reach a destination by travelling at a speed of 80 km/h.

Clearly, more speed, less time taken.

$\therefore \quad 60 \times 2 = 80 \times x$

$\Rightarrow \quad x = \frac{60 \times 2}{80}$

$\Rightarrow \quad x = \frac{3}{2} = 1\frac{1}{2}$ hours

Time taken will be $1\frac{1}{2}$ hours.

**10.** (i) Let $x$ be days taken to fix the windows.

$\therefore$ More number of persons, less days, thus case of inverse proportion.

$\therefore \quad 2 \times 3 = 1 \times x$

$\Rightarrow \quad x = \frac{2 \times 3}{1} = 6$ days

Hence, 1 person will take 6 days.

(ii) Let $x$ be number of persons required to fit windows in one day.

$\therefore \quad 2 \times 3 = x \times 1$

$\Rightarrow \quad x = \frac{2 \times 3}{1} = 6$

$\therefore$ 6 persons are required to fit the windows in one day.

**11.** Let $x$ minute be duration of peroid when school has 9 periods a day.

Then clearly, more the number of periods, less will be duration. Thus, case of inverse proportion.

$\therefore \quad 45 \times 8 = x \times 9$

$\Rightarrow \quad x = \frac{45 \times 8}{9} = 40$ minutes

Hence, each period will be of 40 minutes duration if the number of periods is increased to 9.

# Chapter-12

## Factorisation

### Exercise 12.1

**1.** (i) The common factor of 12 and 36 is 12.

No common literal.

$\therefore$ The highest common factor of $12x$ and $36 = 12$

(ii) The common factor of 2 and 22 is 2

The common literal of $y$ and $xy = y$.

$\therefore$ The highest common factor of $2y$ and $22xy = 2y$

(iii) The common factor of 14 and 28 = 14

The common literal of $pq$ and $p^2q^2 = pq$

$\therefore$ The highest common factor of $14pq$ and $28p^2q^2 = 14pq$

(iv) The common factor of 2, 3 and 4 is 1.

No common literal.

Highest common factor of $2x, 3x^2$ and 4 = 1

(v) Common factor of 6, 24, 12 is 6

Common literal of $abc$, $ab^2$, and $a^2b = ab$

$\therefore$ The highest common factor of

$6abc$, $24ab^2$ and $12a^2b = 6ab$

(vi) The common factor of 16, – 4 and 32 is 4.
The common literal of $x^3$, $x^2$ and $x = x$

$\therefore$ The highest common factor of

$16x^3, -4x^2, 32x = 4x$

(vii) The common factor of 10, 20 and 30 is 10.
No common literal of $pq$, $qr$, $rp$.

$\therefore$ The highest common factor of

$10pq, 20qr, 30rp = 10$

(viii) The common factor of 3, 10, 6 is 1.
The common literal of $x^2y^3, x^3y^2, x^2y^2z$ is $x^2y^2$.

$\therefore$ The highest common factor $= x^2y^2$

**2.** (i) $7x - 42 = 7x - 7 \times 6$

$= 7(x - 6)$

$\therefore 7x - 42 = 7(x - 6)$

(ii) $6p - 12q = 2 \times 3 \times p - 2 \times 3 \times 2 \times q$

$= 2 \times 3(p - 2 \times q)$

$= 6(p - 2q)$

$\therefore 6p - 12q = 6(p - 2q)$

(iii) $7a^2 + 14a = 7 \times a \times a + 7 \times 2 \times a$

$= 7a(a + 2)$

$\therefore 7a^2 + 14a = 7a(a + 2)$

(iv) $-16z + 20z^3 = -2 \times 2 \times 2 \times 2 \times z$

$+ 2 \times 2 \times 5 \times z \times z \times z$

$= 2 \times 2 \times z(-2 \times 2 + 5 \times z \times z)$

$= 4z(-4 + 5z^2)$

$\therefore -16z + 20z^3 = 4z(-4 + 5z^2)$

(v) $20l^2m + 30alm = 2 \times 2 \times 5 \times l \times l \times m$

$+ 2 \times 3 \times 5 \times a \times l \times m$

$= 2 \times 5 \times l \times m(2 \times l + 3 \times a)$

$= 10lm(2l + 3a)$

$\therefore 20l^2m + 30alm = 10lm(2l + 3a)$

(vi) $5x^2y - 15xy^2 = 5 \times x \times x \times y$

$- 5 \times 3 \times x \times y \times y$

$= 5x \times y(x - 3 \times y)$

$= 5xy(x - 3y)$

$\therefore 5x^2y - 15xy^2 = 5xy(x - 3y)$

(vii) $10a^2 - 15b^2 + 20c^2 = 2 \times 5 \times a \times a$

$- 5 \times 3 \times b \times b + 2 \times 2 \times 5 \times c \times c$

$= 5(2 \times a \times a - 3 \times b \times b + 2 \times 2 \times c \times c)$

$= 5(2a^2 - 3b^2 + 4c^2)$

$\therefore 10a^2 - 15b^2 + 20c^2$

$= 5(2a^2 - 3b^2 + 4c^2)$

(viii) $-4a^2 + 4ab - 4ca$

$= -2 \times 2 \times a \times a + 2 \times 2 \times a \times b$

$- 2 \times 2 \times c \times a$

$= 2 \times 2 \times a(-a + b - c) = 4a(-a + b - c)$

(ix) $x^2yz + xy^2z + xyz^2 = x \times x \times y \times z$

$+ x \times y \times y \times z + x \times y \times z \times z$

$= xyz(x + y + z)$

$\therefore x^2yz + xy^2z + xyz^2 = xyz(x + y + z)$

(x) $ax^2y + bxy^2 + cxyz$

$= a \times x \times x \times y + b \times x$

$\times y \times y + c \times x \times y \times z$

$= xy(a \times x + b \times y + c \times z)$

$= xy(ax + by + cz)$

$\therefore ax^2y + bxy^2 + cxyz = xy(ax + by + cz)$

**3.** (i) $x^2 + xy + 8x + 8y$

$= (x^2 + xy) + (8x + 8y)$

$= x(x + y) + 8(x + y)$

$= (x + y)(x + 8)$

(ii) $15xy - 6x + 5y - 2$

$= 15xy + 5y - 6x - 2$

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

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

(iii) $ax + bx - ay - by$

$= ax - ay + bx - by$

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

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

(iv) $15pq + 15 + 9q + 25p$

$= 15pq + 25p + 9q + 15$

$= 5p(3q + 5) + 3(3q + 5)$

$= (3q + 5)(5p + 3)$

(v) $z - 7 + 7xy - xyz$

$= 1(z - 7) + xy(7 - z)$

$= (z - 7) - xy(z - 7)$

$= (z - 7)(1 - xy)$

## Exercise 12.2

**1.** (i) $a^2 + 8a + 16$

[Using $a^2 + 2ab + b^2 = (a + b)^2$]

$a = a, b = 4$

$\therefore \; (a)^2 + 2(a)(4) + 4^2$

$= (a+4)^2 = (a+4)(a+4)$

(ii) $p^2 - 10p + 25$

[Using $a^2 - 2ab + b^2 = (a-b)^2$]

$a = p, b = 5$

$\therefore \; p^2 - 2(p)(5) + 5^2$

$= (p-5)^2 = (p-5)(p-5)$

(iii) $25m^2 + 30m + 9$

[Using $a^2 + 2ab + b^2 = (a+b)^2$]

$\therefore a = 5m, b = 3$

$\therefore \; (5m)^2 + 2(5m)(3) + (3)^2$

$= (5m+3)^2 = (5m+3)(5m+3)$

(iv) $49y^2 + 84yz + 36z^2$

[Using $a^2 + 2ab + b^2 = (a+b)^2$]

$a = 7y, b = 6z$

$\therefore \; (7y)^2 + 2(7y)(6z) + (6z)^2$

$= (7y+6z)^2 = (7y+6z)(7y+6z)$

(v) $4x^2 - 8x + 4$

[Using $a^2 - 2ab + b^2 = (a-b)^2$]

$a = 2x, b = 2$

$\therefore \; (2x)^2 - 2(2x)(2) + 2^2 = (2x-2)^2$

$= (2x-2)(2x-2)$

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

$= 4(x-1)(x-1)$

(vi) $121b^2 - 88bc + 16c^2$

$= (11b)^2 - 2(11b)(4c) + (4c)^2$

$= (11b - 4c)^2$

[Using $a^2 - 2ab + b^2 = (a-b)^2$]

$= (11b-4c)(11b-4c)$

(vii) $(l+m)^2 - 4lm$

$= l^2 + 2lm + m^2 - 4lm$

$= l^2 - 2lm + m^2$

$= (l-m)^2 = (l-m)(l-m)$

(viii) $a^4 + 2a^2b^2 + b^4$

$= (a^2)^2 + 2(a^2)(b^2) + (b^2)^2$

using $(a^2 + b^2 + 2ab) = (a+b)^2$

$= (a^2 + b^2)^2$

$= (a^2 + b^2)(a^2 + b^2)$

**2.** (i) $4p^2 - 9q^2 = (2p)^2 - (3q)^2$

$= (2p-3q)(2p+3q)$

[Using $a^2 - b^2 = (a-b)(a+b)$]

Here, $a = 2p, b = 3q$

(ii) $63a^2 - 112b^2$

$= 7(9a^2 - 16b^2)$

$= 7[(3a)^2 - (4b)^2]$

$= 7[(3a-4b)(3a+4b)]$

[Using $a^2 - b^2 = (a-b)(a+b)$]

Here $a = 3a, b = 4b$

(iii) $49x^2 - 36 = (7x)^2 - 6^2$

$= (7x-6)(7x+6)$

[Using $a^2 - b^2 = (a-b)(a+b)$]

(iv) $16x^5 - 144x^3 = x^3(16x^2 - 144)$

$= x^3[(4x)^2 - (12)^2]$

$= x^3[(4x-12)(4x+12)]$

[Using $a^2 - b^2 = (a-b)(a+b)$]

(v) $(l+m)^2 - (l-m)^2$

$= [(l+m) - (l-m)][(l+m) + (l-m)]$

[Using $a^2 - b^2 = (a-b)(a+b)$

Here, $a = l+m, b = l-m$

$= (2m)(2l) = 4lm$

(vi) $9x^2y^2 - 16 = (3xy)^2 - (4)^2$

$= (3xy-4)(3xy+4)$

[Using $a^2 - b^2 = (a+b)(a-b)$]

(vii) $(x^2 - 2xy + y^2) - z^2$

$= (x-y)^2 - z^2$

$= [(x-y) - z][(x-y) + z]$

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

[using $a^2 - b^2 = (a-b)(a+b)$]

(viii) $25a^2 - 4b^2 + 28bc - 49c^2$

$= 25a^2 - (4b^2 - 28bc + 49c^2)$

$= 25a^2 - [(2b)^2 - 2 \times 2b \times 7c + (7c)^2]$

$= 25a^2 - (2b - 7c)^2$

$= (5a)^2 - (2b-7c)^2$

$= [5a - (2b-7c)][5a + (2b-7c)]$

$= (5a - 2b + 7c)(5a + 2b - 7c)$

**3.** (i) $ax^2 + bx = x(ax + b)$

(ii) $7p^2 + 21q^2 = 7(p^2 + 3q^2)$

(iii) $2x^3 + 2xy^2 + 2xz^2 = 2x(x^2 + y^2 + z^2)$

(iv) $am^2 + bm^2 + bn^2 + an^2$

$= (a+b)m^2 + n^2(a+b)$

$= (a+b)(m^2 + n^2)$

(v) $(lm + l) + m + 1 = l(m + 1) + 1(m + 1)$
$= (m + 1)(l + 1)$

(vi) $y(y + z) + 9(y + z) = (y + z)(y + 9)$

(vii) $5y^2 - 20y - 8z + 2yz$
$= 5y(y - 4) - 2z(4 - y)$
$= 5y(y - 4) + 2z(y - 4)$
$= (y - 4)(5y + 2z)$

(viii) $10ab + 4a + 5b + 2$
$= (10ab + 5b) + (4a + 2)$
$= 5b(2a + 1) + 2(2a + 1)$
$= (5b + 2)(2a + 1)$

(ix) $6xy - 4y + 6 - 9x$
$= 6xy - 4y - 9x + 6$
$= 2y(3x - 2) - 3(3x - 2)$
$= (3x - 2)(2y - 3)$

**4.** (i) $a^4 - b^4 = (a^2)^2 - (b^2)^2$
$= (a^2 - b^2)(a^2 + b^2)$
$= (a - b)(a + b)(a^2 + b^2)$

(ii) $p^4 - 81 = (p^2)^2 - 9^2$
$= (p^2 - 9)(p^2 + 9)$
$= (p^2 - 3^2)(p^2 + 9)$
$= (p - 3)(p + 3)(p^2 + 9)$

(iii) $x^4 - (y + z)^4 = (x^2)^2 - [(y + z)^2]^2$
$= [x^2 - (y + z)^2][x^2 + (y + z)^2]$
$= [x - (y + z)][x + (y + z)][x^2 + (y + z)^2]$
$= (x - y - z)(x + y + z)[x^2 + (y + z)^2]$

(iv) $x^4 - (x - z)^4$
$= (x^2)^2 - [(x - z)^2]^2$
$= [x^2 - (x - z)^2][x^2 + (x - z)^2]$
$= [x - (x - z)][x + (x - z)][x^2 + (x - z)^2]$
$= z(2x - z)[x^2 + x^2 + z^2 - 2xz]$
$= z(2x - z)[2x^2 + z^2 - 2xz]$

(v) $a^4 - 2a^2b^2 + b^4$
$= (a^2)^2 - 2a^2b^2 + (b^2)^2$
$= (a^2 - b^2)^2 = [(a + b)(a - b)]^2$
$= (a + b)^2(a - b)^2$
$= (a - b)(a + b)(a - b)(a + b)$

**5.** (i) $p^2 + 6p + 8 + 1 - 1$
$= (p^2 + 6p + 9) - 1$
$= (p^2 + 2(p)(3) + 3^2) - 1$
$= (p + 3)^2 - (1)^2$
$= (p + 3 - 1)(p + 3 + 1)$
$= (p + 2)(p + 4)$

(ii) $q^2 - 10q + 21$
$= q^2 - 10q + 21 + 4 - 4$
$= (q^2 - 10q + 25) - 4$
$= [q^2 - 2(q)(5) + 5^2] - 2^2$
$= (q - 5)^2 - 2^2$
$= (q - 5 + 2)(q - 5 - 2)$
$= (q - 3)(q - 7)$

(iii) $p^2 + 6p - 16$
$= p^2 + 6p - 16 + 9 - 9$
$= p^2 + 6p + 9 - 25$
$= [P^2 + 2p \times 3 + 3^2] - 25$
$= [p + 3]^2 - (5)^2$
$= [(p + 3) + 5][(p + 3) - 5]$
$= (p + 8)(p - 2)$

## Exercise 12.3

**1.** (i) $28x^4 \div 56x = \dfrac{28 \times x^4}{56 \times x}$
$= \dfrac{28x^{4-1}}{56} = \dfrac{28 \times x^{4-1}}{28 \times 2} = \dfrac{x^3}{2}$

(ii) $-36y^3 \div 9y^2 = \dfrac{-36y^3}{9y^2}$
$= \dfrac{-9 \times 4 \times y \times y^2}{9 \times y^2} = -4y$

(iii) $66pq^2r^3 \div 11qr^3 = \dfrac{66pq^2r^3}{11qr^2}$
$= \dfrac{11 \times 6 \times p \times q \times q \times r \times r^2}{11 \times q \times r^2}$
$= 6pqr$

(iv) $34x^3y^3z^3 \div 51xy^2z^3 = \dfrac{34x^3y^3z^3}{51xy^2z^3}$
$= \dfrac{17 \times 2 \times x^3y^3z^3}{3 \times 17 \times x \times y^2 \times z^3}$
$= \dfrac{2}{3}x^{3-1}y^{3-2}z^{3-3}$
$= \dfrac{2}{3}x^2y$

(v) $12a^8b^8 \div (-6a^6b^4)$
$= \dfrac{12a^8b^8}{-6a^6b^4} = -2a^{8-6}b^{8-4} = -2a^2b^4$

**2.** (i) $(5x^2 - 6x) \div 3x = \dfrac{5x^2}{3x} - \dfrac{6x}{3x}$

$= \dfrac{5}{3}x - 2 = \dfrac{5x-6}{3} = \dfrac{1}{3}(5x-6)$

(ii) $(3y^8 - 4y^6 + 5y^4) \div y^4$

$= \dfrac{3y^8 - 4y^6 + 5y^4}{y^4}$

$= \dfrac{3y^8}{y^4} - \dfrac{4y^6}{y^4} + \dfrac{5y^4}{y^4}$

$= 3y^4 - 4y^2 + 5$

(iii) $8(x^3y^2z^2 + x^2y^3z^2 + x^2y^2z^3) \div 4x^2y^2z^2$

$= \dfrac{8x^3y^2z^2 + 8x^2y^3z^2 + 8x^2y^2z^3}{4x^2y^2z^2}$

$= \dfrac{8x^3y^2z^2}{4x^2y^2z^2} + \dfrac{8x^2y^3z^2}{4x^2y^2z^2} + \dfrac{8x^2y^2z^3}{4x^2y^2z^2}$

$= 2x + 2y + 2z = 2(x + y + z)$

(iv) $(x^3 + 2x^2 + 3x) \div 2x$

$= \dfrac{x^3 + 2x^2 + 3x}{2x}$

$= \dfrac{x^3}{2x} + \dfrac{2x^2}{2x} + \dfrac{3x}{2x}$

$= \dfrac{x^2}{2} + x + \dfrac{3}{2}$

$= \dfrac{1}{2}(x^2 + 2x + 3)$

(v) $(p^3q^6 - p^6q^3) \div p^3q^3 = \dfrac{p^3q^6 - p^6q^3}{p^3q^3}$

$= \dfrac{p^3q^6}{p^3q^3} - \dfrac{p^6q^3}{p^3q^3} = q^3 - p^3$

**3.** (i) $(10x - 25) \div 5$

$= \dfrac{10x - 25}{5} = \dfrac{10x}{5} - \dfrac{25}{5}$

$= 2x - 5$

(ii) $(10x - 25) \div (2x - 5) = \dfrac{10x - 25}{(2x - 5)}$

$= \dfrac{5(2x-5)}{2x-5} = 5$

(iii) $10y(6y + 21) \div 5(2y + 7)$

$= \dfrac{10y(6y+21)}{5(2y+7)}$

$= \dfrac{10y \times 3(2y+7)}{5(2y+7)}$

$= 2y \times 3 = 6y$

(iv) $9x^2y^2(3z - 24) \div 27xy(z - 8)$

$= \dfrac{9x^2y^2(3z-24)}{27xy(z-8)}$

$= \dfrac{9x^2y^2 \times (3)(z-8)}{27xy \times (z-8)} = xy$

(v) $96abc(3a - 12)(5b - 30) \div 144(a - 4)(b - 6)$

$= \dfrac{96abc(3a-12)(5b-30)}{144(a-4)(b-6)}$

$= \dfrac{96abc \times 3(a-4) \times 5(b-6)}{144(a-4)(b-6)}$

$= 10abc$

**4.** (i) $5(2x + 1)(3x + 5) \div (2x + 1)$

$= \dfrac{5(2x+1)(3x+5)}{(2x+1)}$

$= 5(3x + 5)$

(ii) $26xy(x + 5)(y - 4) \div 13x(y - 4)$

$= \dfrac{26xy(x+5)(y-4)}{13x(y-4)}$

$= 2y(x + 5)$

(iii) $52pqr(p + q)(q + r)(r + p) \div 104pq(q + r)(r + p)$

$= \dfrac{52pqr(p+q)(q+r)(r+p)}{104pq(q+r)(r+p)}$

$= \dfrac{1}{2}r(p + q)$

(iv) $20(y + 4)(y^2 + 5y + 3) \div 5(y + 4)$

$= \dfrac{20(y+4)(y^2+5y+3)}{5(y+4)}$

$= 4(y^2 + 5y + 3)$

(v) $x(x + 1)(x + 2)(x + 3) \div x(x + 1)$

$= \dfrac{x(x+1)(x+2)(x+3)}{x(x+1)}$

$= (x + 2)(x + 3)$

**5.** (i) $(y^2 + 7y + 10) \div (y + 5)$

Now, $y^2 + 7y + 10$ on factorising, we get

$y^2 + 5y + 2y + 10$

$= y(y + 5) + 2(y + 5)$

$= (y + 5)(y + 2)$

$\therefore \dfrac{(y^2 + 7y + 10)}{(y+5)} = \dfrac{(y+5)(y+2)}{(y+5)}$

$= (y + 2)$

(ii) $(m^2 - 14m - 32) \div (m + 2)$

Now, $m^2 - 14m - 32$ on factorising, we get

$m^2 + 2m - 16m - 32$

$= m(m + 2) - 16(m + 2)$

$= (m + 2)(m - 16)$

$\therefore \dfrac{(m^2 - 14m - 32)}{(m + 2)}$

$= \dfrac{(m + 2)(m - 16)}{(m + 2)} = m - 16$

(iii) $(5p^2 - 25p + 20) \div (p - 1)$

Now, $5p^2 - 25p + 20$ on factorising, we get

$= 5(p^2 - 5p + 4)$

$= 5(p^2 - p - 4p + 4)$

$= 5[p(p - 1) - 4(p - 1)]$

$= 5(p - 1)(p - 4)$

$\therefore \dfrac{(5p^2 - 25p + 20)}{(p - 1)} = \dfrac{5(p - 1)(p - 4)}{(p - 1)}$

$= 5(p - 4)$

(iv) $4yz(z^2 + 6z - 16) \div 2y(z + 8)$

Now, $z^2 + 6z - 16$ on factorising, we get

$= z^2 - 2z + 8z - 16$

$= z(z - 2) + 8(z - 2)$

$= (z - 2)(z + 8)$

$\therefore \dfrac{4yz(z^2 + 6z - 16)}{2y(z + 8)}$

$= \dfrac{(z - 2)(z + 8) \times 4yz}{2y(z + 8)}$

$= 2z(z - 2)$

(v) $5pq(p^2 - q^2) \div 2p(p + q)$

Now, $p^2 - q^2 = (p - q)(p + q)$

$\therefore \dfrac{5pq(p^2 - q^2)}{2p(p + q)} = \dfrac{5pq(p - q)(p + q)}{2p(p + q)}$

$= \dfrac{5}{2} q(p - q)$

(vi) $12xy(9x^2 - 16y^2) \div 4xy(3x + 4y)$

Now, $9x^2 - 16y^2 = (3x)^2 - (4y)^2$

$= (3x - 4y)(3x + 4y)$

[Using $a^2 - b^2 = (a - b)(a + b)$]

$\therefore \dfrac{12xy(9x^2 - 16y^2)}{4xy(3x + 4y)}$

$= \dfrac{12xy(3x - 4y)(3x + 4y)}{4xy(3x + 4y)}$

$= 3(3x - 4y)$

(vii) $39y^3(50y^2 - 98) \div 26y^2(5y + 7)$

Now, $50y^2 - 98 = 2(25y^2 - 49)$

$= 2[(5y)^2 - 7^2]$

$= 2[(5y - 7)(5y + 7)]$

$\therefore \dfrac{39y^3(50y^2 - 98)}{26y^2(5y + 7)}$

$= \dfrac{39y^3 \times 2 \times (5y - 7) \times (5y + 7)}{26y^2(5y + 7)}$

$= \dfrac{3y \times 2 \times (5y - 7)}{2}$

$= 3y(5y - 7)$

# Chapter-13

## Introduction to Graphs

### Exercise 13.1

**1.** The $x$-axis gives the time and $y$-axis gives the temperature of patient's at different times.

$\therefore$ By observing graph, the answer can be given for the questions as follows :

(a) The temperature of patient at 1 pm is 36.5°C.

(b) The temperature of patient was 38.5°C at 12 noon.

(c) The temperature of patient was same at 1 pm and 2 pm

(d) The temperature of patient at 1.30 pm is 36.5°C.

The answer is obtained as between 1 pm and 2 pm on $x$-axis is mid-point which represents 1:30 pm, as 1 pm and 2 pm are equidistant from it.

Similarly, on $y$-axis, mid-point of 36°C and 37°C is 36.5°C, thus answer is obtained.

(e) During period 9 am to 10 am and 10 am to 11 am and 2 pm to 3 pm, the temperature of the patient's has an upward trend.

**2.** By observing the line graph, the answer can be given as follows :

(a) (i) The sales in 2002 is ₹ 4 crores.

(ii) The sales in 2006 is ₹ 8 crores.

(b) (i) The sales in 2003 is ₹ 7 crores.
(ii) The sales in 2005 is ₹ 10 crores.

(c) The difference in sales of year 2002 and 2006 is 8 crores – 4 crores = 4 crores

(d) The year in which the difference was greatest as compared to previous year is year 2005.

**3.** By observing the graph, the answers can be obtained as follows :

(a) The height of the plant $A$ after
(i) 2 weeks is 7 cm.
(ii) 3 weeks is 9 cm.

(b) The height of plant $B$ after
(i) 2 weeks is 7 cm.
(ii) 3 weeks is 10 cm.

(c) The plant $A$ grew 2 cm during 3rd week.

(d) The plant $B$ grows 3 cm from end of 2nd week to end of 3rd week.

(e) Plant $A$ grows most during the second week.

(f) Plant $B$ grows the least during the first week.

(g) At the end of 2nd week, heights of two plants is same.

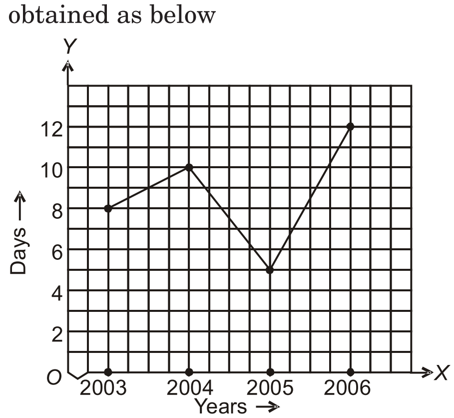
**4.** (a) The days on which forecast temperature was same as actual temperature are Tuesday, Friday and Sunday.

(b) The maximum forecast temperature during the week was 35°C.

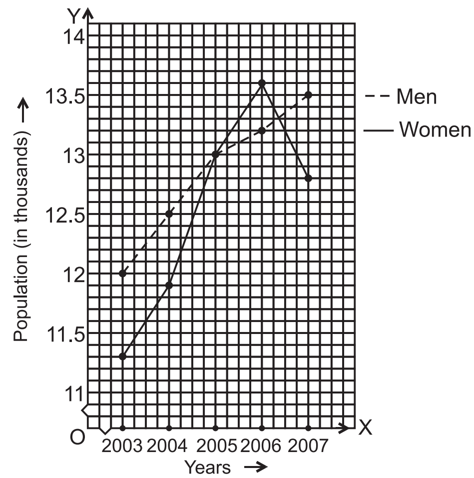
(c) The minimum actual temperature during the week was 15°C.

(d) The actual temperature differed the most from forecast temperature on Thursday.

**5.** (a) By using the data given, the line graph is obtained as below




(b) By using the data given, the line graph is obtained as below :




**6.** As observed in the graph, the answers can be obtained as follows :

(a) Scale taken on time axis is 4 cm = 1 hour

(b) The person took $3\frac{1}{2}$ hours to cover the travel.

(c) The merchant's place from the town is 22 km.

(d) Yes, the person stop on his way from 10 am to 10:30 am as horizontal line for distance is shown, thus he did not travel any distance.

(e) He rode the fastest during 8 am to 9 am.

**7.** (i) This represents a time temperature graph as it shows a rise in temperature depicted by the line graph.

(ii) This represents a time temperature graph, as it shows a small fall in temperature depicted by the line graph.

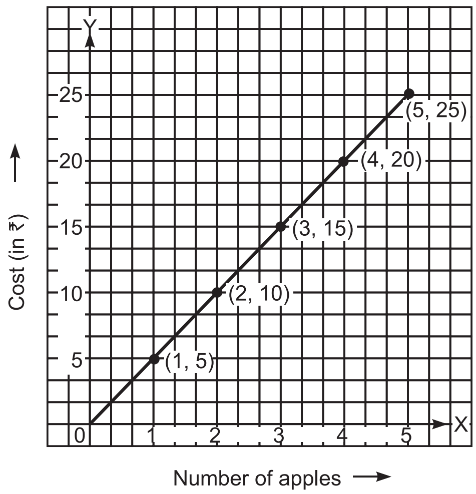
(iii) This does not represent a time temperature graph, as it shows different temperature at the same time.

(iv) This represents a time temperature graph because it shows a constant temperature at different time and is a line graph.

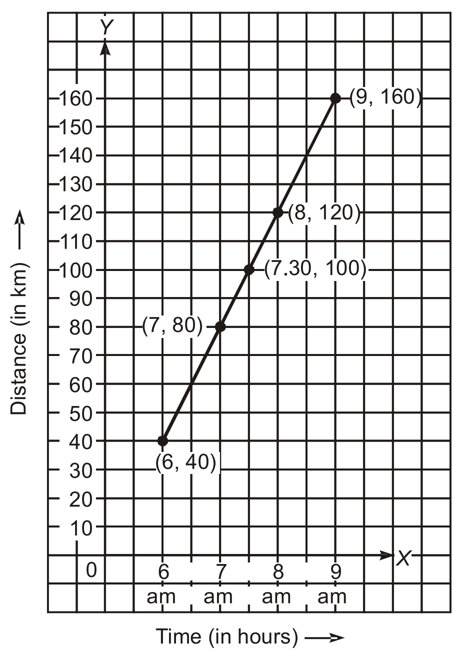
## Exercise 13.2

**1.** (a) $x$-axis : Number of apples
$y$-axis : Cost of apples (in ₹)

Scale : 3 units = 1 apple ($x$-axis)
3 units = ₹ 5 ($y$-axis)

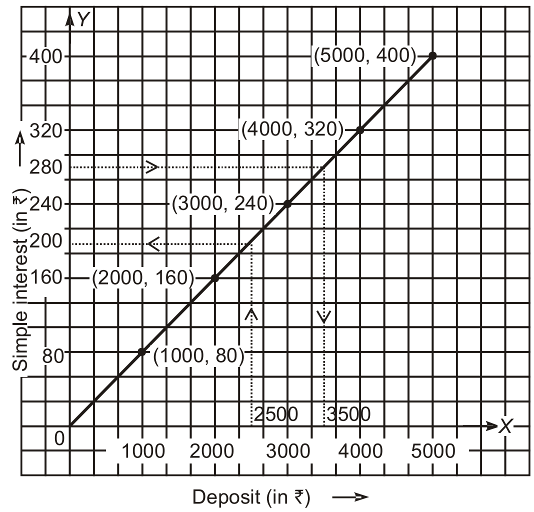



(b) $x$-axis : Time (in hours)
$y$-axis : Distance (in kms)
Scale : 2 units = 1 hour ($x$-axis)
1 unit = 10 km ($y$-axis)
The required graph is as follows :



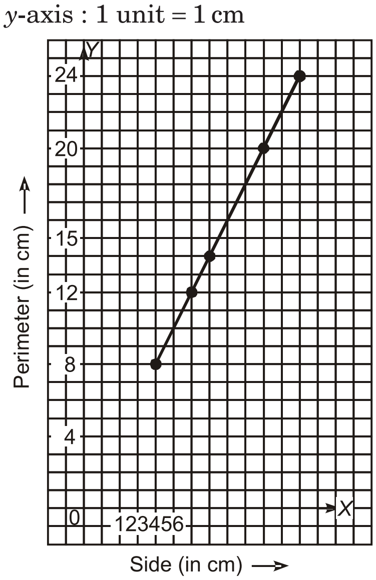

(i) Distance covered between 7:30 am and 8 am = 120 – 100 = 20 km
(ii) Time when the car had covered 100 km from start is 7:30 am

(c) For the graph :
$x$-axis : Deposit (in ₹)
$y$-axis : Simple interest (in ₹)
Scale : 1 unit = ₹ 1000 ($x$-axis)
1 unit = ₹ 80 ($y$-axis)
The graph is as follows




(i) Yes, the graph passes through the origin.
(ii) For ₹ 2500, interest received is ₹ 200.
(iii) For ₹ 280, interest per year the amount deposited must be ₹ 3500.

**2.** (i) $x$-axis = side of square (in cm)
$y$-axis : perimeter (in cm)
Scale $x$-axis : 1 unit = 1 cm
$y$-axis : 1 unit = 1 cm



Yes, It is a linear graph.

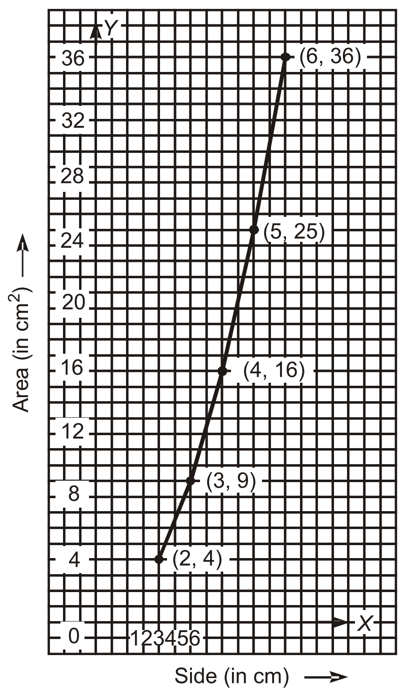
(ii) $x$-axis : Side of square (in cm)

$y$-axis : Area of square (in $cm^2$)

Scale : $x$-axis : 1 cm = 1 unit

$y$-axis = 1 unit = 1 cm

The following is the graph :




It is not a linear graph.

∴ The graph is not a straight line.

□□□