

Exercise 6.1

1. (i) 0.5 = decimal five
 (ii) 0.17 = decimal one seven
 (iii) 0.006 = decimal zero zero six
 (iv) 0.37 = decimal three seven
 (v) 0.009 = decimal zero zero Nine
 (vi) 12.31 = Twelve decimal three one
 (vii) 1.728 = One decimal seven two eight
 (viii) 245.48 = Two hundred and forty five decimal four eight

2. (i) 0.76 (ii) 0.008 (iii) 12.86 (iv) 0.09

3. (i) $0.5 = \frac{5}{10} = \frac{1}{2}$

(ii) $0.27 = \frac{27}{100}$

(iii) $0.03 = \frac{03}{100} = \frac{3}{100}$

(iv) $0.79 = \frac{79}{100}$

(v) $10.7 = 10 + 0.7 = 10 + \frac{7}{10} = 10\frac{7}{10}$

(vi) $0.70 = \frac{705}{1000} = \frac{141}{200}$

(vii) $65.81 = 65 + 0.81 = 65 + \frac{81}{100}$

(viii) $0.089 = \frac{65\frac{81}{100}}{1000} = \frac{089}{1000} = \frac{89}{1000}$

(ix) $131.731 = 131 + 0.731 = 131 + \frac{731}{1000}$

(x) $0.001 = \frac{131\frac{731}{1000}}{1000} = \frac{1}{1000}$

4.

	Hun.	Ten.	One.	Dec.	Tenth.	Hundr.	Thou.
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- (i) 3 . 2 5
 (ii) 4 6 . 3 0 8
 (iii) 9 . 0 8 5
 (iv) 1 3 5 . 4 8 1

5. (i) 331.02

$$3 \frac{100}{100} + 3 \frac{10}{10} + 1 \frac{0}{10} + \frac{2}{100}$$

(ii) $49.25 = 4 \frac{10}{10} + 9 \frac{2}{10} + \frac{5}{100}$

(iii) $6.865 = 6 \frac{8}{10} + \frac{6}{100} + \frac{5}{1000}$

(iv) $27.639 = 2 \frac{10}{10} + 7 \frac{6}{10} + \frac{3}{100} + \frac{9}{1000}$

- (v) 685.321

$$6 \frac{100}{100} + 8 \frac{10}{10} + 5 \frac{3}{10}$$

$$\frac{2}{100} + \frac{1}{1000}$$

(vi) $9.837 = 9 \frac{8}{10} + \frac{3}{100} + \frac{7}{1000}$

6. (i) $3.7 = \frac{37}{10}$

(ii) $61.087 = \frac{6187}{100}$

(iii) $3.069 = \frac{3069}{1000}$

(iv) $4.017 = \frac{4017}{1000}$

7. (i) $6 \frac{3}{10} + \frac{5}{100} + \frac{7}{1000} = 6.357$

(ii) $15 \frac{4}{1000} = 15.004$

(iii) $15 \frac{7}{100} + \frac{9}{1000} = 15.079$

(iv) $10 \frac{3}{10} + \frac{4}{100} + \frac{7}{1000} = 13.407$

8. (i) $0.4 = \frac{4}{10} = \frac{2}{5}$

(ii) $2.5 = \frac{25}{10} = \frac{5}{2}$

(iii) $0.75 = \frac{75}{100} = \frac{3}{4}$

(iv) $6.4 = \frac{64}{10} = \frac{32}{5}$

(v) $8.25 = \frac{825}{100} = \frac{33}{4}$

9. (i) $5.02 < 5.12$ (ii) $3.60 > 3.06$
 (iii) $12.04 < 12.40$ (iv) $3.0 > 0.3$
 (v) $212.80 > 21.280$ (vi) $0.098 > 0.01$

10. Ascending order is

- (i) $0.465 < 0.613 < 0.722 < 0.812$
 (ii) $0.033 < 0.303 < 30.03 < 30.3$
 (iii) $0.552 < 5.52 < 55.20 < 522.1$

11. Descending order

- (i) $88.71 > 8.721 > 6.81 > 0.812$
 (ii) $64.7 > 8.31 > 0.647 > 0.064$
 (iii) $20.01 > 2.001 > 0.102 > 0.021$

Exercise 6.2

1. (i)
$$\begin{array}{r} 27.08 \\ 32.87 \\ 27.88 \\ + 29.9 \\ \hline 117.73 \end{array}$$

(ii)
$$\begin{array}{r} 234.7 \\ 325.86 \\ 25.360 \\ 21.015 \\ + 4.007 \\ \hline 610.942 \end{array}$$

(iii)
$$\begin{array}{r} 187.403 \\ 155.555 \\ 166.560 \\ 118.190 \\ + 15.067 \\ \hline 642.775 \end{array}$$

(iv)
$$\begin{array}{r} 13.189 \\ 145.660 \\ 156.614 \\ 12.005 \\ + 10.5641 \\ \hline 338.0321 \end{array}$$

(v)
$$\begin{array}{r} 121.21 \\ 125.67 \\ 136.09 \\ 10.184 \\ 15.607 \\ + 123.897 \\ \hline 532.658 \end{array}$$

2. (i)
$$\begin{array}{r} 105.84 \\ - 78.92 \\ \hline 26.92 \end{array}$$

(ii)
$$\begin{array}{r} 97.6 \\ - 93.91 \\ \hline 3.69 \end{array}$$

(iii)
$$\begin{array}{r} ₹ 20.75 \\ - ₹ 18.25 \\ \hline ₹ 2.50 \end{array}$$

(iv)
$$\begin{array}{r} 250.00 \text{ M} \\ - 202.54 \text{ M} \\ \hline 47.46 \text{ M} \end{array}$$

(v)
$$\begin{array}{r} 5.206 \text{ KM} \\ - 2.051 \text{ KM} \\ \hline 3.155 \text{ KM} \end{array}$$

(vi)
$$\begin{array}{r} 2.107 \text{ Kg} \\ - 0.314 \text{ Kg} \\ \hline 1.793 \text{ Kg} \end{array}$$

3. (i) $63.4 - 8.545 - 6.33$
 $63.4 - 14.875$
 48.525

$$\begin{array}{r} \therefore 63.400 \\ - 14.875 \\ \hline 48.525 \end{array}$$

(ii) $920.5 - 42.74 - 116.86 - 246.032$
 $= 920.5 - 405.632$
 $= 514.868$

$$\begin{array}{r} \therefore 42.74 \\ 116.86 \\ + 246.032 \\ \hline 405.632 \\ \therefore 920.5 \\ - 405.632 \\ \hline 514.868 \end{array}$$

(iii) $85.5 - 105.765 + 213.76 - 118.9$
 $= 85.5 + 213.76 - 105.765 - 118.9$
 $= 299.26 - 224.665$
 $= 74.595$

$$\begin{array}{r} \therefore 85.50 \\ + 213.76 \\ \hline 299.26 \\ \therefore 105.765 \\ + 118.9 \\ \hline 224.665 \\ \therefore 299.26 \\ - 224.665 \\ \hline 74.595 \end{array}$$

(iv) $1023.6 + 77.84 - 56.372 - 908$
 $= 1101.44 - 964.372 = 1.37068$

$$\begin{array}{r} \therefore 1023.60 \\ + 77.84 \\ \hline 1101.44 \\ \therefore 908.00 \\ + 56.372 \\ \hline 964.372 \end{array}$$

4. Cloth purchased for Shirt = 2.10 m
 Cloth purchased for Pant = 1.25 m
 Cloth purchased for other purpose = 1.65 m
 Total Cloth purchased = 2.10 m

$$\begin{array}{r} 2.10 \\ 1.25 \\ + 1.65 \\ \hline 5.00 \text{ m} \end{array}$$

5. Purchased books for ₹ 69.75
Purchased Notebook for ₹ 10.25
Purchased Pencil box for ₹ 12.30
Money spent ₹ 92.30
6. Milk took by Mohan = 7.5 l
Milk took by Sohan = 8.25 l
Milk took my Ashok = + 6.75 l
Total Milk taken 22.50 l
7. Height of Mother = 140.80 cm
Height of Shalini = 110.35 cm
Mother taller by 30.45 cm
8. Money in the bank = ₹ 545.50
Money withdrawn ₹ 295.00
Money remain ₹ 250.50

9. Vegetables bought = 5.50 kg
Vegetables given to brothers
= (1.25 + 2.50) kg
= 3.75 kg
Vegetable left with man 5.50 kg
- 3.75 kg
1.75 kg

10. Total distance travelled by Ashish = 68 km.
Distance travelled by bus and rickshaw
52.50 km
+ 8.75 km
61.25 km
Distance travelled on foot
68.00 km
- 61.25 km
6.75 km

7

Exercise 7.1

1. (i) $5x$ (ii) pq 10
(iii) $3y$ (iv) $\frac{x}{2}$ 3
(v) ab 5 (vi) b a
(vii) $(x - 5)$ 2 (viii) $(x - y)$ 3
(ix) $(p - q)$ $\frac{1}{3}m$ (x) $(b - 2c)$ $\frac{a}{6}$
2. (i) $5 - 2x + x^2 + 10x^4$
(ii) $(x - y)^3 + y^2$
(iii) $2a - a(b - b)^2 + 2a^2(b - b)^4$
(iv) $m^3 - m^2n + np^5$
(v) $\frac{3}{7}p^2 - p(q - r) + s$
 $\frac{3}{7}P^3 - (q)^2rs$
3. (i) $3^3P^4q^2 - 3^3P^3q^2 + 3^3P^2q^2$
(ii) $4x^2y^4z^2 - 2x^2y^4z^2 + 2x^2y^4z^2$

Algebraic Expressions

- (iii) $27a^4b^2c^3 - 3a^3b^3c^3 + a^3a^3b^3c^3$
(iv) $9x^3yz^2 - 3x^3yz^2 + 3x^3yz^2$
(v) $(-2)^3x^3z^4 - (-2)^3x^3z^4 + (-2)^3x^3z^4$
4. Meenakshi Marks
 $\frac{1}{2}(\text{Beena marks} + \text{Nidhi Marks})$
 $\frac{1}{2}(x - y)$
5. Rahul score = 2 (Sehwag's) - 5
 $(2x - 5)$ runs
6. Total number of trees $(2x - x^2)$
7. Marks in English
 $\frac{2}{3}(\text{Marks in Hindi}) + 15$
 $\frac{2}{3}(x) + 15$
 $\frac{2}{3}x + 15$ marks
8. length = 4 (breadth) - 2
 $4b - 2$

Exercise 7.2

1. (i) like terms are $(x^2, 5x^2), (xy, 7xy, xy)$
 - (ii) like terms are $(2a^2b, 4ba^2)$
 - (iii) like terms are $(a^2, 2a^2)$
 - (iv) like terms are $(4x^2y, 7yx^2)$
 - (v) like terms are $(6x^2y, 2yx^2)$
 - (vi) like terms are $(a^2, 9a^2), (3b^2, 7b^2)$
2. (i) $7a^2, 6b^2$ Binomials
 - (ii) 1 Monomials
 - (iii) $2x^4, 7x^3, 4x^2, 1$ Quadrinomials
 - (iv) x^3 Monomials
 - (v) $4x^3, x^2, x$ Trinomials
 - (vi) $17x^4, 11y$ Binomials
 - (vii) $15x^2y^2z^2$ Monomials
 - (viii) $3x^2, y, z$ Trinomials
 - (ix) $4x^2, 3xyz, 4z$ Trinomials
3. (i) Coefficient of a in $15ab$ 15b
 - (ii) Coefficient of x in $8x$ 8
 - (iii) Coefficient of x in $8xyz^2$ 8yz²
 - (iv) Coefficient of a in $8ab$ 8b
 - (v) Coefficient of x^2 in $8x^2yz$ 8yz
 - (vi) Coefficient of a^2 in a^2 1
 - (vii) Coefficient of x^2 in $\frac{5}{7}x^2y - \frac{5}{7}y$
 - (viii) Coefficient of x^3 in x^3 1 1
4. Given $x = 3, y = 2, z = 5$
 - (i) $3x^2y + 3$
 $3(3)^2(2) + 3$
 $9 \cdot 4 + 3$
 $12 \cdot 4 + 3$
 8
 - (ii) $5x^3 + 3y + 7$
 $5(3)^3 + 3(2) + 7$
 $15 \cdot 6 + 7$
 28
 - (iii) $3x^2 + 3xy + z$
 $3(3)^2 + 3(3)(2) + 5$
 $3(9) + 18 + 5$
 $27 + 18 + 5$
 $45 + 5$
 40
 - (iv) $4x^2y^3 + 3xy^2z + 7z$
 $4(3)^2(2)^3 + 3(3)(2)^2 + 7(5)$
 $4(9)(8) + 3(3)(4)(5) + 35$
 $288 + 180 + 35$
 $288 + 215$
 73
 - (v) $x^3 + y^3 + z^3 + 3xyz$
 $(3)^3 + (2)^3 + (5)^3 + 3(3)(2)(5)$
 $27 + 8 + 125 + 90$
 $242 + 8$
 234
5. (i) $a^2 + 2b^2 + 3c^2$
when $a = 0, b = 1, c = 1$
 $0^2 + 2(1)^2 + 3(1)^2$
 $0 + 2(1) + 3$
 $2 + 3$
 - (ii) $x^2 + y^2 + z^2$
when $x = 1, y = 2, z = 3$
 $1^2 + (2)^2 + (3)^2$
 $1 + 4 + 9$
 $1 + 13$
 12
 - (iii) $4xyz + 2xy + 3xyz$
when $x = 1, y = 2, z = 1$
 $4(1)(2)(1) + 2(1)(2) + 3(1)(2)(1)$
 $8 + 4 + 6$
 $14 + 4$
 10
 - (iv) $5 + 4x^3 + 4x + 2a$ when $x = 8, a = 6$
 $5 + 4(8)^3 + 4(8) + 2(6)$
 $5 + 4(512) + 32 + 12$
 $5 + 2048 + 32 + 12$

- 2065 32
2033
6. (i) Terms are
 $6x^2, 2xy, 7y^2, 3xy^2, 9$
- (ii) Terms are
 $a^4, 5a^2b^2, 3a^3b, 3ab^3, 6$
- (iii) Terms are $p^4, q^4, 2pq$
- (iv) Terms are
 $xy^2, 4x^2y, 7x^2y, 3xy^2, 3$
7. Given $a = 3, b = \frac{1}{2}, c = 2\frac{1}{4} = \frac{9}{4}$

put in

$$\frac{2ab + bc}{3ac}$$

$$\frac{2 \cdot 3 + \frac{1}{2} \cdot \frac{9}{4}}{3 \cdot 3 \cdot \frac{9}{4}} = \frac{6 + \frac{9}{8}}{\frac{27}{4}} = \frac{\frac{48}{8} + \frac{9}{8}}{\frac{27}{4}} = \frac{\frac{57}{8}}{\frac{27}{4}} = \frac{57}{8} \cdot \frac{4}{27} = \frac{57}{54} = \frac{19}{18}$$

$$\frac{24}{8} = \frac{3}{1}$$

$$\frac{15/8}{81/4} = \frac{15}{81} \cdot \frac{4}{8} = \frac{15}{162} = \frac{5}{54}$$

8. Given $x = 1, y = 3$
- put in
- $$\frac{x^3 + y^3}{x^2 + xy + y^2} = \frac{1^3 + 3^3}{1^2 + 1 \cdot 3 + 3^2} = \frac{1 + 27}{1 + 3 + 9} = \frac{28}{13}$$

Exercise 7.3

1. (i) $(4x^2) + (5x^2) + (2x^2)$
 $(4 + 5 + 2)x^2$
 $(11)x^2$
- (ii) $(3a^2b) + (6a^2b) + (3a^2b)$
 $(3 + 6 + 3)a^2b$
 $(12)a^2b$

- $(3 + 6 + 3 + 11)a^2b$
 $(20)a^2b$
 $17a^2b$
- (iii) $(9xy) + (4xy) + (13xy) + (8xy)$
 $(9 + 4 + 13 + 8)xy$
 $(34)xy$
- (iv) $(6a^3) + (4a^3) + (10a^3)$
 $(6 + 4 + 10)a^3$
 $(20)a^3$
- (v) $(x^2 + a^2) + (5x^2 + 2a^2)$
 $(x^2 + 5x^2 + a^2 + 2a^2)$
 $(6x^2 + 3a^2)$
Collecting like terms

- $8x^2 + 5a^2$
- (vi) $(2xy) + (5xy) + (5xy) + (xy)$
 $(2 + 5 + 5 + 1)xy$
 $(13)xy$

2. (i) $a + b + c$
 $a + 2b + 3c$
 $3a + 4b + 5c$
 $5a + 3b + c$

- (ii) $x + 2y + 3z$
 $4x + 3y + 6z$
 $x + y + 3z$
 $4x + 0y + 6z$
- (iii) $x^2 + y^2 + z^2$
 $2x^2 + 3y^2 + 4z^2$
 $4x^2 + 5y^2 + 7z^2$
 $7x^2 + 3y^2 + 2z^2$
- (iv) $a^2 + 2ab + b^2$
 $a^2 + 2ab + b^2$
 $a^2 + b^2$
 $3a^2 + 0 + b^2$

(v) Arranging like terms one below another

$$\begin{array}{r} 2x \quad 2y^2 \quad 2z^2 \\ \quad y^2 \quad z^2 \quad 2yz \\ 3x^2 \quad 2y^2 \\ \hline 3x^2 \quad 2x \quad y^2 \quad 3z^2 \quad 2yz \end{array}$$

(vi) Arranging like terms one below another

$$\begin{array}{r} \quad \quad xy \quad y^2 \\ \quad \quad \quad yz \quad z^2 \\ x^2 \quad xy \quad y^2 \quad yz \\ \hline x^2 \quad 2xy \quad 2yz \quad z^2 \end{array}$$

3. (i)
$$\begin{array}{r} 3x \quad 4y \quad a \quad 1 \\ \quad \quad 6y \quad 2a \quad 3 \\ \quad \quad 5x \quad 2y \quad 9 \\ \hline 2x \quad 4y \quad 3a \quad 5 \end{array}$$

(ii)
$$\begin{array}{r} 5a^2b \quad 6ab^2 \quad 4a \\ 7a^2b \quad \quad \quad 6a \\ \quad \quad \quad 9ab^2 \quad 9y \\ \hline 2a^2b \quad 3ab^2 \quad 2a \quad 9y \end{array}$$

(iii)
$$\begin{array}{r} 8p^2 \quad 4pq \quad q^2 \\ 3p^2 \quad 7pq \\ \quad \quad 2pq \quad 3q^2 \\ \hline 5p^2 \quad pq \quad 2q^2 \end{array}$$

(iv)
$$\begin{array}{r} x^2 \quad y^2 \quad xy \quad x \quad y \\ 2x^2 \quad \quad 3xy \quad 2y \\ \quad \quad 3y^2 \quad 4x \\ \hline x^2 \quad xy^2 \quad 2xy \quad 5x \quad y \end{array}$$

4. (i)
$$3y^2 \quad 8y^2 \quad (3 \quad 8)y^2 \quad 5y^2$$

(ii)
$$\begin{array}{r} 12ab \quad 6ab \\ \quad \quad (12 \quad 6)ab \\ \quad \quad \quad 18ab \end{array}$$

(iii)
$$23a^2 \quad 17a^2 \quad (23 \quad 17)a^2 \quad 6a^2$$

(iv)
$$\begin{array}{r} a \quad b \quad c \\ a \quad b \quad c \\ (-) \quad (-) \quad (-) \\ \hline 2b \quad 2c \end{array}$$

(v)
$$\begin{array}{r} y^2x \quad x^2 \quad z \\ y^2x \quad x^2 \quad z \\ (+) \quad (-) \quad (-) \\ \hline 2y^2x \quad 2x^2 \quad 0 \end{array}$$

(vi)
$$\begin{array}{r} c^2 \quad 2a^2 \quad b^2 \quad abc \\ \quad \quad a^2 \quad b^2 \quad 3abc \\ (+) \quad (-) \quad (-) \\ \hline c^2 \quad 3a^2 \quad 2b^2 \quad 2abc \end{array}$$

(vii)
$$\begin{array}{r} 2x^2 \quad 4xy \quad 5y^2 \\ x^2 \quad 3xy \quad 2y^2 \\ (-) \quad (+) \quad (+) \\ \hline x^2 \quad 7xy \quad 3y^2 \end{array}$$

(viii)
$$\begin{array}{r} 3m^2 \quad 3mn \quad 8 \\ m^2 \quad 3mn \\ (+) \quad (-) \\ \hline 4m^2 \quad 6mn \quad 8 \end{array}$$

(ix)
$$\begin{array}{r} xy \quad yz \quad zx \\ 2x^2 \quad \quad yz \\ (-) \quad (-) \\ \hline 2x^2 \quad xy \quad 2yz \quad zx \end{array}$$

5.
$$\begin{array}{r} 2a^2 \quad 3b^2 \\ 5a^2 \quad 2b^2 \quad ab \\ 6a^2 \quad b^2 \quad 5ab \\ \hline a^2 \quad 2b^2 \quad 4ab \end{array}$$

6.
$$\begin{array}{r} 11x^2 \quad 5y^2 \quad 4xy \\ 4x^2 \quad 3y^2 \quad 5xy \\ (+) \quad (-) \quad (-) \\ \hline 15x^2 \quad 8y^2 \quad 9xy \end{array}$$

7. Let A should be added

$$(a^2 \quad 2ab \quad b^2) \quad A \quad 4ab \quad b^2$$

$$A \quad (4ab \quad b^2) \quad (a^2 \quad 2ab \quad b^2)$$

$$4ab \quad b^2$$

$$\begin{array}{r} a^2 \quad 2ab \quad b^2 \\ (-) \quad (-) \quad (-) \\ \hline a^2 \quad 2ab \end{array}$$

$a^2 \quad 2ab$ should be added to $a^2 \quad 2ab \quad b^2$ to get $4ab \quad b^2$

(iii) $x = 1$ is the solution of $8x - 2 = 10$
 $10 - x = 6$

x	LHS	RHS
2	8	6
3	7	6
4	6	6

when $x = 4$ LHS = RHS
 $x = 4$ is the solution of $10 - x = 6$

(iv) $2(a - 1) = a + 1$

a	LHS	RHS
1	0	2
2	2	3
3	4	4

when $a = 3$ LHS = RHS
 $a = 3$ is the solution of

(v) $2(a - 1) = a + 1$

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

x	LHS	RHS
1	4	5
2	4.5	5
3	5	5

when $x = 3$ LHS = RHS
 $x = 3$ is solution of $\frac{x - 7}{2} = 5$

(vi) $x - 3 = 4x - 3$

x	LHS	RHS
0	3	3
1	4	1
2	5	5

when $x = 2$ LHS = RHS
 $x = 2$ is solution of $x - 3 = 4x - 3$

(vii) $2x - 9 = 5x - 12$

x	LHS	RHS
2	13	2
5	19	13
7	23	23

for $x = 7$ LHS = RHS
 $x = 7$ is the solutions of

(viii) $2x - 9 = 5x - 12$
 $5 - x = 7$

x	LHS	RHS
0	5	7
1	6	7
2	7	7

for $x = 2$ LHS = RHS
 $x = 2$ is the solution by $5 - x = 7$.

(ix) $4z - 2 = 6$

z	LHS	RHS
0	2	6
1	2	6
1	6	6

for $z = 1$ LHS = RHS
 $z = 1$ is the solution of $4z - 2 = 6$

2. (i) $3x - 5 = 7, x = 4$

putting $x = 4$ in LHS
 $3(4) - 5 = 7$
 $2 - 5 = 7$
 $7 = 7$

$x = 4$ is solution of $3x - 5 = 7$

(ii) putting $x = 3$ in LHS

$$3 - 2(3) = 9$$

$$3 - 6 = 9$$

$$9 = 9$$

$x = 3$ is the solution of $2 - 3x = 9$.

(iii) Putting $x = 2$ in LHS and RHS

$$5(2) - 8 = 2(2) - 2$$

$$10 - 8 = 4 - 2$$

$$2 = 2$$

$x = 2$ is the solution of $5x - 8 = 2x - 2$

(iv) putting $x = 6$ in LHS

$$\frac{6}{2} - 5 = 8$$

$$3 - 5 = 8$$

$$8 = 8$$

$x = 6$ is the solution of $\frac{x}{2} - 5 = 8$

(v) Putting $y = 10$ in LHS

$$\frac{10}{4} - \frac{1}{2} = 3$$

$$\frac{10 - 1 \cdot 2}{4} = 3$$

$$\frac{10 - 2}{4} = 3$$

$$\frac{12}{4} = 3$$

3 = 3

$y = 10$ is the solution of $\frac{y}{4} - \frac{1}{2} = 3$.

(vi) Putting $x = 5$ in LHS

$$2(5) - \frac{3}{2} = \frac{23}{2}$$

$$10 - \frac{3}{2} = \frac{23}{2}$$

$$\frac{20 - 3}{2} = \frac{23}{2}$$

$$\frac{23}{2} = \frac{23}{2}$$

$x = 5$ is the solution of $2x - \frac{3}{2} = \frac{23}{2}$

Exercise 8.2

1. $x = 7$ 49

$$x = 49 - 7$$

$$x = 42$$

Checking : putting $x = 42$ in LHS in

$$x = 7 - 49$$

$$42 - 7 = 49$$

$$49 = 49 \text{ verified}$$

2. $7x = 49$

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

$$x = 7$$

putting $x = 7$ in LHS of $7x = 49$

$$7(7) = 49$$

$$49 = 49 \text{ verified}$$

3. $x = \frac{3}{2} - \frac{7}{2}$

$$x = \frac{7}{2} - \frac{3}{2}$$

$$x = \frac{7 - 3}{2}$$

$$x = \frac{10}{2}$$

$$x = 5$$

putting $x = 5$ in LHS of $x = \frac{3}{2} - \frac{7}{2}$

$$5 = \frac{3}{2} - \frac{7}{2}$$

$$\frac{10}{2} = \frac{3 - 7}{2}$$

$$\frac{10}{2} = \frac{-4}{2}$$

$$\frac{10}{2} = -2$$

4. $3x = 5 - 13$

$$3x = 13 - 5$$

$$3x = 18$$

$$x = \frac{18}{3}$$

Checking : putting $x = 6$ in LHS of

$$3x = 5 - 13$$

$$3(6) = 5 - 13$$

$$18 = 5 - 13$$

$$18 = 13 \text{ verified}$$

5. $4x = 7 - 15$

$$4x = 15 - 7$$

$$4x = 8$$

$$x = \frac{8}{4}$$

$$x = 2$$

Checking : putting $x = 2$ in $4x = 7 - 15$

$$4(2) = 7 - 15$$

$$8 = 7 - 15$$

$$15 = 15 \text{ verified}$$

6. $\frac{x}{5} = 12$

$$x = 12 \cdot 5$$

$$x = 60$$

Checking : putting $x = 60$ in $\frac{x}{5} = 12$

$$\frac{60}{5} = 12$$

$$12 = 12 \text{ verified}$$

7. $\frac{3x}{5} = 15$

$$3x = 15 \cdot 5$$

$$3x = 75$$

$$x = \frac{75}{3}$$

Checking : putting $x = 25$ in $\frac{3x}{5} = 15$

$$\frac{3(25)}{5} = 15$$

$$\frac{75}{5} = 15$$

$$15 = 15 \text{ verified}$$

$$8. \quad 5x - 3 = x - 17$$

$$\begin{array}{r} 5x - x = 17 - 3 \\ 4x = 20 \\ x = 5 \end{array}$$

Checking : putting $x = 5$ in

$$\begin{array}{r} 5x - 3 = x - 17 \\ 5(5) - 3 = 5 - 17 \\ 25 - 3 = 22 \\ 22 = 22 \quad \text{verified} \end{array}$$

$$9. \quad 2x - \frac{1}{2} = 3$$

$$\begin{array}{r} 2x - 3 = \frac{1}{2} \\ 2x = \frac{3 + 1}{2} \\ 2x = \frac{6 + 1}{2} \\ 2x = \frac{7}{2} \\ x = \frac{7}{4} \end{array}$$

Checking : putting $x = \frac{7}{4}$ in $2x - \frac{1}{2} = 3$

$$\begin{array}{r} 2 \left(\frac{7}{4} - \frac{1}{2} \right) = 3 \\ \frac{7}{2} - \frac{1}{2} = 3 \\ \frac{7 - 1}{2} = 3 \\ \frac{6}{2} = 3 \\ 3 = 3 \quad \text{verified} \end{array}$$

$$10. \quad 7 - 3(x - 5) = 3$$

$$\begin{array}{r} 7 - 3x + 15 = 3 \\ 3x = 22 - 3 \\ 3x = 19 \\ x = \frac{19}{3} \end{array}$$

Checking : putting $x = \frac{19}{3}$ in

$$\begin{array}{r} 7 - 3(x - 5) = 3 \\ 7 - 3 \left(\frac{19}{3} - 5 \right) = 3 \\ 7 - 3 \left(\frac{19 - 15}{3} \right) = 3 \\ 7 - 3 \left(\frac{4}{3} \right) = 3 \\ 7 - 4 = 3 \\ 3 = 3 \end{array}$$

$$\begin{array}{r} 7 - (19 - 15) = 3 \\ 7 - (4) = 3 \\ 7 - 4 = 3 \\ 3 = 3 \quad \text{verified} \end{array}$$

$$11. \quad 3x - 4 = x - 8$$

$$\begin{array}{r} 3x - x = 8 - 4 \\ 2x = 4 \\ x = 2 \end{array}$$

Checking : putting $x = 2$ in

$$\begin{array}{r} 3x - 4 = x - 8 \\ 3(2) - 4 = 2 - 8 \\ 6 - 4 = 10 \\ 2 = 10 \quad \text{verified} \end{array}$$

$$12. \quad 5x - 7 = 2x - 5$$

$$\begin{array}{r} 5x - 2x = 5 - 7 \\ 3x = 12 \\ x = 4 \end{array}$$

Checking : putting $x = 4$ in

$$\begin{array}{r} 5x - 7 = 2x - 5 \\ 5(4) - 7 = 2(4) - 5 \\ 20 - 7 = 8 - 5 \\ 13 = 13 \quad \text{verified} \end{array}$$

$$13. \quad 8x - 2(x - 2) = 3x - 35$$

$$\begin{array}{r} 8x - 2x + 4 = 3x - 35 \\ 6x + 4 = 3x - 35 \\ 3x = 39 \\ x = 13 \end{array}$$

Checking : putting $x = 13$ in

$$\begin{array}{r} 8x - 2(x - 2) = 3x - 35 \\ 8(13) - 2(13 - 2) = 3(13) - 35 \\ 104 - 2(11) = 39 - 35 \\ 104 - 22 = 4 \\ 82 = 4 \quad \text{verified} \end{array}$$

$$14. \quad 4x - 8(x - 3) = 3x - 36$$

$$\begin{array}{r} 4x - 8x + 24 = 3x - 36 \\ -4x + 24 = 3x - 36 \\ -7x = -60 \\ x = 60/7 \end{array}$$

Checking :

$$\begin{array}{r} \text{putting } x = 60/7 \text{ in } 4x - 8(x - 3) = 3x - 36 \\ 4 \left(\frac{60}{7} \right) - 8 \left(\frac{60}{7} - 3 \right) = 3 \left(\frac{60}{7} \right) - 36 \\ \frac{240}{7} - 8 \left(\frac{60 - 21}{7} \right) = \frac{180}{7} - 36 \\ \frac{240}{7} - 8 \left(\frac{39}{7} \right) = \frac{180}{7} - 36 \\ \frac{240}{7} - \frac{312}{7} = \frac{180}{7} - 36 \\ \frac{-72}{7} = \frac{180}{7} - 36 \\ -72 = 180 - 36 \times 7 \\ -72 = 180 - 252 \\ -72 = -72 \quad \text{verified} \end{array}$$

$$15. \quad 8x - 4 = 4x - 5x + 13x - 1$$

$$\begin{array}{r} 8x - 4x = 5x - 5x + 13x - 1 + 4 \\ 4x = 13x - 1 + 4 \\ 4x = 13x + 3 \\ -9x = 3 \\ x = -1/3 \end{array}$$

$$\frac{4x}{x} = \frac{8}{2}$$

Checking : putting $x = 2$ in

$$\begin{array}{r} 8x - 4 = 4x - 5x + 5 = 13x - 1 \\ 8(2) - 4 = 4(2) - 5(2) + 5 \\ 16 - 4 = 8 - 10 + 5 \\ 12 = 3 \end{array}$$

$$\begin{array}{r} 16 - 4 = 8 - 10 + 5 \\ 12 = 3 \end{array}$$

$$\frac{25}{34} = \frac{25}{25} \text{ verified}$$

16. $7(x - 2) = 2(3x - 1) = 5(x - 4) = 8$

$$\begin{array}{r} 7x - 14 = 6x - 2 = 5x - 20 = 8 \\ 7x - 6x = 5x - 20 + 14 \\ 7x - 11x = 5x - 20 + 14 \\ 4x = 5x - 6 \\ x = 6 \end{array}$$

Checking :

putting $x = 6$ in LHS and RHS

$$\begin{array}{r} 7(6 - 2) = 2[3(6) - 1] \\ 7(4) = 2(18 - 1) \\ 28 = 34 \end{array}$$

$$\begin{array}{r} 5[6 - 4] = 8 \\ 5(2) = 8 \\ 10 = 8 \end{array}$$

$$\begin{array}{r} 56 - 38 = 18 \\ 18 = 18 \text{ verified} \end{array}$$

17. $2(x - 4) = 3(x - 2) = 4(2x - 1)$

$$\begin{array}{r} 2x - 8 = 3x - 6 = 8x - 4 = 5x - 30 \\ 2x - 3x = 8x - 5x - 6 + 8 \\ 7x - 11x = 8x - 5x - 6 + 8 \\ 4x = 3x - 2 \\ x = 5 \end{array}$$

Checking :

putting $x = 5$ in LHS and RHS

$$\begin{array}{r} 2(5 - 4) = 3(5 - 2) = 4[2(5) - 1] \\ 2(1) = 3(3) = 4(10 - 1) \\ 2 = 9 = 36 \end{array}$$

$$\begin{array}{r} 2(1) = 3(7) = 4(10 - 1) = 5(11) \\ 2 = 21 = 36 = 55 \end{array}$$

$$\frac{19}{19} = \frac{19}{19} \text{ verified}$$

18. $\frac{x}{2} = \frac{x}{3} = \frac{x}{4} = 5$

$$\frac{6x}{12} = \frac{4x}{12} = \frac{3x}{12} = 5$$

$$\frac{13x}{12} = 5$$

$$13x = 5 \cdot 12$$

$$13x = 60$$

$$x = \frac{60}{13}$$

Checking : putting $x = \frac{60}{13}$ in LHS

$$\frac{60}{13} = \frac{60}{13} = \frac{60}{13} = 5$$

$$\frac{60}{6} = \frac{60}{4} = \frac{60}{3} = 5$$

$$\frac{13 \cdot 12}{360} = \frac{240}{360} = \frac{180}{360} = 5$$

$$\frac{5}{2} = \frac{5}{2} \text{ verified}$$

19. $\frac{6x}{2} = 9 = \frac{2x}{2} = x = 1$

$$3x - 9 = x - x = 1$$

$$3x - x = x - 1 + 9$$

$$3x - 2x = 10$$

$$x = 10$$

Checking :

putting $x = 10$ in LHS and RHS

$$\frac{6 \cdot 10}{2} = 9 = \frac{2 \cdot 10}{2} = 10 = 1$$

$$3 \cdot 10 - 9 = 10 - 10 = 11$$

$$30 - 19 = 11$$

$$11 = 11 \text{ verified}$$

20. $\frac{x}{8} = \frac{1}{2} = \frac{x}{6} = 2$

$$\frac{x}{8} = \frac{x}{6} = 2 = \frac{1}{2}$$

$$\frac{3x}{24} = \frac{4x}{24} = \frac{4}{24} = 1$$

$$\frac{x}{24} = \frac{3}{24}$$

$$x = \frac{3}{24} = \frac{12}{24}$$

$$x = 36$$

Checking :

putting $x = 36$ in LHS and RHS

$$\frac{36}{8} = \frac{1}{2} = \frac{36}{6} = 2$$

$$\frac{9}{2} = \frac{1}{2} = 6 = 2$$

$$\frac{8}{2} = 4$$

$$4 = 4 \text{ verified}$$

21. $\frac{n}{4} = 5 = \frac{n}{6} = \frac{1}{2}$

$$\frac{\frac{n}{4} \cdot \frac{n}{6} \cdot \frac{1}{2}}{3n \cdot 2n \cdot \frac{1}{2}} = \frac{5}{10}$$

$$\frac{\frac{n}{12} \cdot \frac{11}{2}}{n \cdot 66} = \frac{6}{12}$$

Checking :

putting $n = 66$ in LHS and RHS

$$\frac{\frac{66}{4} \cdot \frac{66}{6} \cdot \frac{1}{2}}{66 \cdot 20 \cdot \frac{1}{2}} = \frac{5}{10}$$

$$\frac{\frac{46}{4} \cdot \frac{22}{2}}{\frac{23}{2} \cdot \frac{23}{2}} = \frac{1}{1}$$

verified

$$22. \frac{\frac{2m}{3} \cdot 8 \cdot \frac{m}{2}}{\frac{2m}{3} \cdot \frac{m}{2} \cdot 1} = \frac{1}{8}$$

$$\frac{4m \cdot 3m}{6} = 9$$

$$\frac{m}{6} = 9$$

$$m = 54$$

Checking :

putting $m = 54$ in LHS and RHS

$$\frac{2(54)}{3} \cdot 8 \cdot \frac{54}{2} = 1$$

$$2(18) \cdot 8 \cdot 27 = 1$$

$$\frac{36 \cdot 8 \cdot 28}{28 \cdot 28} = \text{verified}$$

9

Ratio, Proportion and Unitary Method

Exercise 9.1

- $\frac{10}{6} : \frac{5}{3} = 5:3$ Ratio of matches played and won.
 - Ratio of girls and boys $\frac{3}{4} = 3:4$.
 - Ratio of villages and school = $5:1$.
 - Ratio of Marks of Gaurav and Raman $\frac{80}{75} : \frac{16}{15} = 16:15$
 - Ratio of Income of Mr. Sandhu and Mr. Lal = $2:1$.

- $65:39$ or $\frac{65}{39} = \frac{5}{3}$ or $5:3$
 - $350:725$ or $\frac{350}{725} = \frac{14}{29}$ or $14:29$.
 - $900:1500$ or $\frac{900}{1500} = \frac{3}{5}$ or $3:5$

- $\frac{250}{3000} : \frac{25}{300} = \frac{1}{12}$ or $1:12$.

- $186:403$
 \therefore HCF of 186 and 403 is 31.
 or $\frac{186}{403} = \frac{31}{31} = \frac{6}{13}$ or $6:13$

- $384:480$ or $\frac{384}{480} = \frac{96}{120}$
 \therefore HCF of 384 and 480 is 96
 $\frac{4}{5}$ or $4:5$

- $20 P$ and Re or $20 P$ and $100 P$
 Ratio is $\frac{20}{100} = \frac{1}{5}$ or $1:5$
 - 3 kg to 200 g or 3000 g to 200 g
 Ratio is $\frac{3000}{200} = \frac{15}{1}$ or $15:1$
 - 30 min to 40 sec . or $30 \cdot 60 \text{ sec}$ to 40 sec
 or 1800 sec to 40 sec
 Ratio is $\frac{1800}{40} = \frac{90}{2} = \frac{45}{1}$ or $45:1$

(iv) 1 hr. to 45 min or 60 min to 45 min

$$\text{Ratio is } \frac{60}{45} \frac{4}{3} \text{ or } 4 : 3$$

(v) 15 cm to 1 m or 15 cm to 100 cm

$$\text{Ratio } \frac{15}{100} \frac{3}{20} \text{ or } 3 : 20$$

(vi) 21 days to 2 weeks

21 days to 14 days

$$\text{Ratio } \frac{21}{14} \frac{3}{2} \text{ or } 3 : 2$$

(viii) 5 lit to 15 lit

$$\text{Ratio } \frac{5}{15} \frac{1}{3} \text{ or } 1 : 3$$

4. (i) 1 : 7 and 5 : 22

$$\text{or } \frac{1}{7} \text{ and } \frac{5}{22}$$

LCM of 7, 22 =

2	7, 22
7	7, 11
11	1, 11
	1, 1

$$\begin{array}{r} 2 \quad 7 \quad 11 \quad 154 \\ 1 \quad 22 \text{ and } 5 \quad 7 \\ \hline 154 \end{array}$$

$$\frac{22, 35}{154}$$

$$\therefore 22 : 35$$

$$5 : 22 > 1 : 7$$

(ii) 11 : 14 or 2 : 5

$$\frac{11}{14} \text{ or } \frac{2}{5} \text{ LCM of 14 and 5}$$

2	14, 5
5	7, 5
7	7, 1
	1, 1

$$\text{LCM } \begin{array}{r} 2 \quad 5 \quad 7 \quad 70 \\ 11 \quad 5, 2 \quad 14 \quad 55, 28 \\ \hline 70 \quad 70 \end{array}$$

$$\therefore 55 : 28$$

$$11 : 14 > 2 : 5$$

(iii) 3 : 11 and 2 : 15

$$\frac{3}{11} \text{ and } \frac{2}{15}$$

LCM of 11 and 15 is 165

$$\begin{array}{r} 3 \quad 15, 2 \quad 11 \quad 45, 22 \\ \hline 165 \quad 165 \end{array}$$

$$\therefore 45 > 22$$

$$3 : 11 > 2 : 15$$

(iv) 10 : 5 and 14 : 9

$$\frac{10}{5} \text{ and } \frac{14}{9}$$

LCM of 5 and 9 = 45

$$\begin{array}{r} 10 \quad 9 \text{ and } 14 \quad 5 \\ \hline 45 \end{array}$$

$$\frac{90, 70}{45}$$

$$90 > 70$$

$$10 : 5 > 14 : 9$$

5. (i) $\frac{12}{\square} \frac{\square}{5} \therefore \frac{12}{20} \frac{5}{3}$

(ii) $\frac{25}{\square} \frac{5}{4} \therefore \frac{5}{25} \frac{20}{4}$

(iii) $\frac{\square}{50} \frac{5}{\square} \therefore \frac{5}{10} \frac{50}{25}$

(iv) $\frac{72}{\square} \frac{36}{47} \therefore \frac{72}{36} \frac{47}{94}$

6. Ratio of marks of Rakesh and Rajesh

$$\frac{560}{480} = \frac{56}{48} = \frac{7}{6}$$

$$\text{or } 7 : 6$$

7. Stoppage time = 1 hr

total journey time = 10 hr 30 min

$$10 \frac{1}{2} \text{ hr}$$

$$\text{Ratio } \frac{1}{10 \frac{1}{2}} \frac{1}{21} \frac{2}{21} \text{ or } 2 : 21$$

8. Speed of Car $\frac{d}{t} \frac{120}{3} = 40 \text{ km/hr}$

Speed of train $\frac{d}{t} \frac{100}{2} = 50 \text{ km/hr}$

$$\text{Ratio of Speed } \frac{40}{50} \frac{4}{5} \text{ or } 4 : 5$$

9. Earning of Mr. Das ₹ 1350

Earning of Mr. Rao ₹ 1200

$$\text{Ratio of earnings } \frac{1350}{1200} \frac{135}{120} \frac{9}{8}$$

or 9 : 8

10. Income ₹ 9500, spends ₹ 7600

Savings ₹ 1900

(i) Ratio to income and expenditure

$$\frac{\frac{45}{9500} \frac{5}{7600}}{\frac{45}{7600} \frac{5}{4}} 5 : 4$$

(ii) Ratio to saving and income

$$\frac{1900}{9500} \frac{19}{15} \frac{1}{5} \text{ or } 1 : 5$$

11. 3 : 5 or 5 : 4

$$\frac{3}{5} \text{ or } \frac{5}{4} \text{ LCM of 5 and 4} = 20$$

$$\frac{3 \quad 4, 5 \quad 5}{20} \\ \frac{12, 25}{20}$$

$$\therefore 12 < 25$$

$$5 : 4 > 3 : 5$$

12. Milk to water = 2 : 5

Sugar to water = 2 : 3

Salt to water = 2 : 7

We have to find which ratio is greatest

$$\frac{2}{5} \frac{2}{3} \frac{2}{7} \therefore \text{Numerator is same}$$

$\frac{2}{3}$ is greatest because its denominator

is least.

ratio of sugar to water is greatest.

Exercise 9.2

1. (i) 2, 3, 4, 5

Product of Extremes 2 5 10

Product of Means 3 4 12

\therefore Product of Extremes = Product of means

2, 3, 4, 5 are not in proportion

(ii) 4, 6, 8, 10

product of extremes 4 10 40

product of means 6 8 48

\therefore Product of extremes = product of means

4, 6, 8, 10 are not in proportion.

(iii) 4, 6, 8, 12

Product of extremes 4 12 48

Product of means 6 8 48

\therefore Product of Extremes = Product of means

4, 6, 8, 12 are in proportion

(iv) 20, 45, 70, 95

Product of Extremes

$$20 \quad 95 \quad 1900$$

Product of means 45 70 3150

\therefore Product of means

Product of Extremes

20, 45, 70, 95 are not in proportions.

(v) 15, 45, 75, 125

Product of Extremes

$$15 \quad 125 \quad 1875$$

Product of means 45 75 3375

\therefore Product of extremes product of means

15, 45, 75, 125 are not in proportions.

(vi) 33, 44, 75, 150

Product of Extremes 33 150 4950

Product of means 44 75 3300

\therefore Product of Extremes Product of means

33, 44, 75, 150 are not in proportion.

(vii) 6, 24, 18, 72

Product of Extremes 6 72 432

Product of means 24 18 432

\therefore Product of Extremes

= Product of means

6, 24, 18, 72 are in proportion.

(viii) 150, 200, 250, 300

Product of Extremes 150 300 45000

Product of Means 200 250 50000

\therefore Product of Extremes

Product of means

150, 200, 250, 300 are not in proportion.

(ix) 40, 10, 50, 200

Product of Extremes 40 200 8000

Product of means 10 50 500

\therefore Product of Extreme Product of means

40, 10, 50, 200 are not in proportion.

2. (i) $3 : 4 = 75 : 100$ or $\frac{3}{4}, \frac{75}{100}$
 or $\frac{3 \quad 25, 75 \quad 1}{100}$
 or $\frac{75, 75}{100}$
 Yes $3 : 4 = 75 : 100$ (True)
- (ii) $18 : 81 = 2 : 9$ or $\frac{18}{81}, \frac{2}{9}$
 or $\frac{18 \quad 1, 2 \quad 9}{81}$
 or $\frac{18, 18}{81} \quad \therefore 18 = 18$
 Yes $18 : 81 = 2 : 9$ (true)
- (iii) $9 : 11 = 13 : 15$ or $\frac{9}{11}, \frac{13}{15}$
 or $\frac{9 \quad 15, 13 \quad 11}{165}$
 or $\frac{135, 143}{165} \quad \therefore 135 \neq 143$
 $9 : 11 = 13 : 15$ (false)
- (iv) $20 : 100 = 5 : 25$ or $\frac{20}{100}, \frac{5}{25}$
 or $\frac{20 \quad 1, 5 \quad 4}{100}$
 or $\frac{20, 20}{100} \quad \therefore 20 = 20$
 $20 : 100 = 5 : 25$ (true)
- (v) $4 : 8 = 32 : 64$ or $\frac{4}{8}, \frac{32}{64}$
 or $\frac{4 \quad 8, 32 \quad 1}{64}$
 or $\frac{32, 32}{64} \quad \therefore 32 = 32$
 $4 : 8 = 32 : 64$ (true)
- (vi) $16 : 9 = 14 : 7$ or $\frac{16}{9}, \frac{14}{7}$
 $\frac{16 \quad 7, 14 \quad 9}{63}$
 $\frac{112, 126}{63} \quad \therefore 112 \neq 126$
 $16 : 9 = 14 : 7$ (false)
3. (i) $140 : x :: 80 : 32$
 $x \quad 80 \quad 40 \quad 32$
 [\therefore product of means = product of extremes]

- $x \quad \frac{40 \quad 16}{80} \quad \frac{32}{2}$
 $x \quad 16$
- (ii) $4 : 10 :: x : 70$
 $10 \quad x \quad 4 \quad 70$
 [\therefore product of means = product of extremes]
 $x \quad \frac{4 \quad 70}{10}$
 $x \quad \frac{4 \quad 70}{10}$
 $x \quad \frac{28}{6}$
 $x \quad 4$
- (iv) $x : 210 :: 20 : 280$
 $x \quad 280 \quad 210 \quad 20$
 [\therefore product of means = product of extremes]
 $x \quad \frac{210 \quad 20}{280}$
 $x \quad 15$
- (v) $x : 7 :: 11 : 77$
 $x \quad 77 \quad 7 \quad 11$
 [\therefore product of means = product of extremes]
 $x \quad \frac{7 \quad 11}{77}$
 $x \quad 1$
- (vi) $8 : x :: 104 : 117$
 $x \quad 104 \quad 117 \quad 8$
 [\therefore product of means = product of extremes]
 $x \quad \frac{117 \quad 8}{104}$
 $x \quad 9$
4. If b is mean proportion
 than $b^2 = a \cdot c$
 $8^2 = 4 \cdot c$
 $\frac{64}{4} = c$
 $16 = c$
5. If $9, x, x, 49$ are in proportion
 $9 : x = x : 49$

$$\begin{array}{r}
 x \quad x \quad 9 \quad 49 \\
 x^2 \quad 9 \quad 49 \\
 x^2 \quad 441 \\
 x^2 \quad 21^2 \\
 x \quad 21
 \end{array}$$

6. (i) If x , 3 and 9 are in proportion

$$\begin{array}{r}
 x:33 \quad 33:9 \\
 x \quad 9 \quad 33 \quad 33 \\
 \quad \quad 11 \quad 11 \\
 x \quad \frac{33 \quad 33}{3} \\
 \quad \quad 3 \\
 x \quad 11 \quad 11 \\
 x \quad 121
 \end{array}$$

- (ii) If 25, 35 and y are in proportion

$$\begin{array}{r}
 25:35 \quad 35:y \\
 25 \quad y \quad 35 \quad 35 \\
 [\because \text{product of means} = \text{product} \\
 \text{of extremes}]
 \end{array}$$

$$\begin{array}{r}
 y \quad \frac{7 \quad 7}{35 \quad 35} \\
 \quad \quad 25 \\
 \quad \quad 5
 \end{array}$$

$$y \quad 49$$

- (iii) If 12, z and 27 are in proportion

$$\begin{array}{r}
 12:z \quad z:27 \\
 z \quad z \quad 27 \quad 12 \\
 [\because \text{product of means} = \text{product} \\
 \text{of extremes}]
 \end{array}$$

$$z^2 \quad 27 \quad 12$$

$$z^2 \quad 3 \quad 3 \quad 3 \quad 2 \quad 2 \quad 3$$

$$z^2 \quad 324$$

$$z^2 \quad 18^2$$

$$z \quad 18$$

7. Let fourth proportion be x

$$7:14 \quad 25:x$$

$$7 \quad x \quad 14 \quad 25$$

$$[\because \text{product of extremes} = \text{product} \\
 \text{of means}]$$

$$x \quad \frac{14 \quad 25}{7}$$

$$x \quad 50$$

\therefore fourth proportion is 50.

8. Let third proportion be x

$$18:27 \quad x:3$$

$$27 \quad x \quad 18 \quad 3$$

$$[\because \text{product of extremes} = \text{product} \\
 \text{of means}]$$

$$x \quad \frac{18 \quad 3}{27}$$

$$x \quad 2$$

third proportion is 2.

9. Let number of boys be x

$$\text{Boys} : \text{Girls} = \text{Boys} : \text{Girls}$$

$$4:6 \quad x:102$$

$$6 \quad x \quad 102 \quad 4$$

$$[\because \text{product of means} = \text{product} \\
 \text{of extremes}]$$

$$x \quad \frac{17}{102} \quad 4$$

$$x \quad 17 \quad 4$$

$$x \quad 68$$

Number of boys are 68.

10. Let the length be x

$$\text{length} : \text{breadth} = \text{length} : \text{breadth}$$

$$3:2 \quad x:28$$

$$2 \quad x \quad 3 \quad 28$$

$$[\because \text{product of means} = \text{product} \\
 \text{of extremes}]$$

$$x \quad \frac{3 \quad 28}{2}$$

$$x \quad 42$$

length is 42 metres.

11. Let packets of biscuits be x

$$\text{Biscuits} : \text{pencils} = \text{Biscuits} : \text{pencils}$$

$$1:3 \quad x:18$$

$$3 \quad x \quad 1 \quad 18$$

$$[\because \text{product of means} = \text{product} \\
 \text{of extremes}]$$

$$x \quad \frac{18}{3}$$

$$x \quad 6$$

Number of biscuits packets = 6.

12. Let height of second by x cm

$$7:6 \quad 161:x$$

$$7 \quad x \quad 161 \quad 6$$

$$[\because \text{product of extremes} = \text{product} \\
 \text{of means}]$$

$$x \frac{161}{7} 6$$

$$x 23 6$$

$$x 138$$

height of second boy = 138 cm.

13. Let income be ₹ x

Income : savings = Income : savings

$$12:1 \quad x:15000$$

$$1 \quad x \quad 15000 \quad 12$$

$$x \quad 180000$$

Income ₹ 1,80,000.

14. Let the mean proportion be x

(i) $16:x \quad x:25$

$$x \quad x \quad 16 \quad 25$$

[∵ product of means = product of extremes]

$$x^2 = 400$$

$$x^2 = 20^2$$

$$x = 20$$

Mean proportion is 20.

(ii) Let mean proportion be x

$$49:x \quad x:100$$

$$x \quad x \quad 100 \quad 49$$

[∵ product of means = product of extremes]

$$x^2 = 4900$$

$$x^2 = 70^2$$

$$x = 70$$

Mean proportion = 70

(iii) Let mean proportion be x

$$36:x \quad x, 225$$

$$x \quad x \quad 225 \quad 36$$

[∵ product of means = product of extremes]

$$x^2 = 15^2 \cdot 6^2$$

$$x^2 = (15 \cdot 6)^2$$

$$x^2 = (90)^2$$

$$x = 90$$

Mean proportion is 90.

15. Let English books be x

$$3:2 \quad 3801:x$$

$$3 \quad x \quad 3801 \quad 2$$

$$x \quad \frac{3801}{3} \quad 2$$

$$x = 1267 \quad 2$$

$$x = 2534$$

Number of English books = 2534.

Exercise 9.3

1. 5 kg of Jam costs ₹ 260

$$1 \text{ kg of Jam costs } ₹ \frac{260}{5}$$

$$2 \text{ kg of Jam costs } ₹ \frac{260}{5} \cdot 2$$

$$₹ 52 \cdot 2$$

$$₹ 104$$

2. 24 apples costs ₹ 80

$$1 \text{ apple costs } ₹ \frac{80}{24}$$

$$15 \text{ apples costs } ₹ \frac{80}{24} \cdot 15$$

$$15 \text{ apples costs } ₹ 50$$

3. 5 bars of soaps costs ₹ 31

$$1 \text{ bars of soaps costs } ₹ \frac{31}{5}$$

$$24 \text{ bars of soaps costs } = ₹ \frac{31}{5} \cdot 24$$

$$24 \text{ bars of soaps costs } = ₹ 148.80$$

4. Cost of 25 metres of cloth is ₹ 912.50

$$\text{Cost of 1 metres of cloth is } ₹ \frac{912.50}{25}$$

$$\text{Cost of 8 metres of cloth is } ₹ \frac{912.50}{25} \cdot 8$$

$$\text{Cost of 25 metres of cloth is } ₹ \frac{7300}{25}$$

$$\text{Cost of 25 metres of cloth is } ₹ 292$$

5. For 4 days work labourer paid ₹ 114

$$\text{for 1 days work labourer paid } ₹ \frac{114}{4}$$

for 30 days work labourer paid

$$₹ \frac{114}{4} \cdot 30$$

$$₹ \frac{3420}{4}$$

for 30 days work labourer paid ₹ 855

6. (i) Car travel 180 km in 4 hours

$$\text{Car travel 1 km in } \frac{4}{180} \text{ hours}$$

Car travel 400 km in

$$\frac{24}{180} \cdot 400 \text{ hours}$$

$$\frac{80}{9} \text{ hours}$$

$$8\frac{8}{9} \text{ hours}$$

(ii) In 4 hours car travels = 180 km.

$$\text{In 1 hours car travels } \frac{180}{4} \text{ km}$$

$$\text{In } 7\frac{1}{2} \text{ car travels } \frac{180}{4} \times 7\frac{1}{2}$$

$$\frac{180}{4} \times 7\frac{1}{2} \text{ km}$$

$$\frac{180}{4} \times \frac{15}{2} \text{ km}$$

$$\frac{2700}{8}$$

$$337\frac{1}{2} \text{ km}$$

$$\text{In } 7\frac{1}{2} \text{ hours car travels}$$

7. For ₹ 6825 number of chairs = 13

$$\text{For ₹ 1 number of chairs } \frac{13}{6825}$$

For ₹ 5250 number of chairs

$$\frac{13}{6825} \times 5250 = \frac{68250}{6825}$$

For ₹ 6825 number of chairs = 10

8. (i) Weight of 15 bags of rice = 112.5 kg

$$\text{Weight of 1 bag of rice } \frac{112.5}{15} \text{ kg}$$

$$\text{Weight of 10 bags } \frac{112.5}{15} \times 10 \text{ kg}$$

$$\frac{1125}{15} \text{ kg}$$

$$75 \text{ kg}$$

(ii) For 112.5 kg of rice number of bags = 15

For 1 kg of rice number of bags

$$\frac{15}{112.5}$$

For 750 kg of rice number of bags

$$\frac{15}{112.5} \times 750$$

$$\frac{11250}{112.5}$$

$$100$$

Number of bags = 100

9. Price of $2\frac{1}{2}$ metres of cloth is ₹ 200

$$\text{Price of 1 metres of cloth is } ₹ \frac{200}{2\frac{1}{2}}$$

$$\text{Price of 1 metres of cloth is } ₹ \frac{200}{\frac{5}{2}}$$

$$₹ \frac{200 \times 2}{5}$$

Price of 15 metres of cloth is

$$₹ \frac{200 \times 2 \times 15}{5}$$

Price of 15 metres of cloth is ₹ 1200

10. Consumption of 400 students = 5200 kg

$$\text{Consumption of 1 students } \frac{5200}{400} \text{ kg}$$

Consumption of 260 students

$$\frac{5200}{400} \times 260 \text{ kg}$$

Consumption of 260 students = 3380 kg

11. 60 oil tankers can be filled in 45 hours

$$1 \text{ oil tankers can be filled in } \frac{45}{60} \text{ hours}$$

$$8 \text{ oil tankers can be filled in } \frac{45}{60} \times 8$$

8 oil tankers can be filled in = 6 hours

12. In 6 hours auto parts manufactured

$$= 24 \text{ parts}$$

In 1 hours auto parts manufactured

$$\frac{24}{6} \text{ parts}$$

In 24 hours auto parts manufactured

$$\frac{24}{6} \times 24$$

In 24 hours auto parts manufactured

$$= 96 \text{ parts.}$$

13. For 192 litres of milk, milkpot needed = 24

For 1 litres of milk, milkpot needed

$$\frac{24}{192}$$

$$\frac{1}{8}$$

For 360 litres of milk, milkpot needed

$$\frac{24}{192} \times 360 = \frac{8640}{192}$$

For 360 litres of milk, milkpot needed

$$= 45.$$

14. For 35 days provision is for = 260 men
 For 1 days provision is for 260 35 men
 For 65 days provision is for $\frac{260 \times 35}{65}$
 $\frac{6100}{65}$
 For 35 days provision is for = 140 men.
15. 24 litres of mixture contain 18 litres milk

1 litres of mixture contain $\frac{18}{24}$ litres milk
 32 litres of mixture contain $\frac{18}{24} \times 32$
 $\frac{3}{4} \times 32$
 32 litres of mixture contain = 24 litres milk.

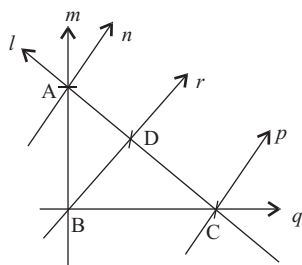
10

Basic Concepts in Geometry

Exercise 10.1

- (i) two (ii) infinite (iii) line segment (iv) point (v) point (vi) non-collinear.
- (i) Point has a position but no dimensions.
 (ii) A line is straight and extends endless on both sides.
 (iii) A sphere has no plane surface.
 (iv) Line is a collection of points.
 (v) Three or more lines on a plane intersect at a common point and they are called concurrent lines.
 (vi) If three or more points lie on a same line then the points are called collinear points.
 (vii) A plane is a flat surface that extends indefinitely in all directions.

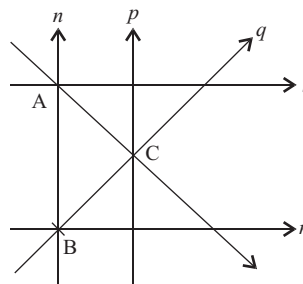
3.



- l, m and n intersect at A .
- l, m and r intersect at B .
- q, l and p intersect at C .
- r and l intersect at D .

- Con-current lines l, m and n at A .
 Concurrent lines q, p and l at C .
 Con-current lines m, q and r at B .

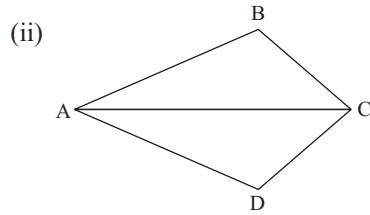
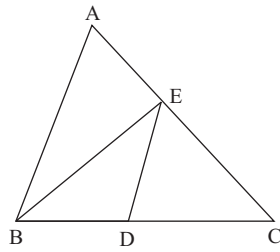
4.



- Concurrent lines l, n, r at A (concurrent point)
 Concurrent lines m, q, n at B (concurrent point)
 Concurrent lines p, q, r at C (concurrent point)
5. (i) A dot gives us an idea of a **Point**.
 (ii) Floor of a room gives us an idea of a **Part of a line**.
 (iii) The meeting of length, breadth and height of a room gives us an idea of a **Point**.
 (iv) The meeting of two walls of a room gives us an idea of portion of a **line**.
6. (i) False (ii) True (iii) False (iv) True (v) False (vi) True.

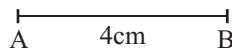
Exercise 10.2

- (i) line segments are $AB, AC, AE, EC, BD, BC, BE, DE, DC$

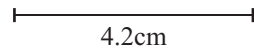


line segments are
 AB, BC, CD, DA, AC

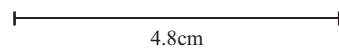
2. (i) 4 cm



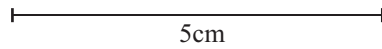
- (ii) 4.2 cm



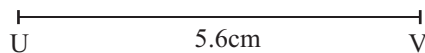
- (iii) 4.8 cm



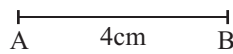
- (iv) 5 cm



- (v) 5.6 cm

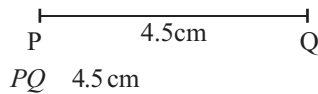


3. (i) 4 cm

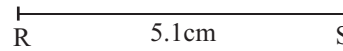


$AB = 4 \text{ cm}$

- (ii) 4.5 cm

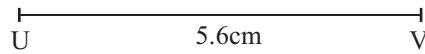


- (iii) 5.1 cm



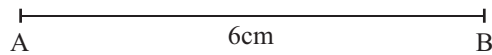
$RS = 5.1 \text{ cm}$

- (iv) 5.6 cm



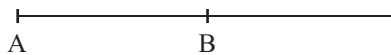
$UV = 5.6 \text{ cm}$

- (v) 6 cm

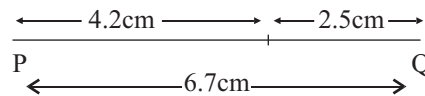


$AB = 6 \text{ cm}$

4. line segments AB line segment PQ given.

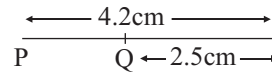


5. (i) $AB = CD$



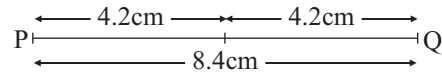
here $PQ = AB = CD = 6.7 \text{ cm}$

- (ii) $AB = CD$



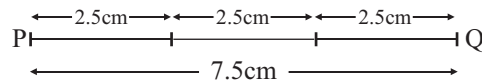
here $PQ = AB = CD$

- (iii) $2AB$



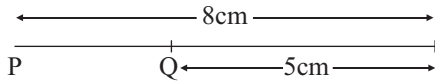
here $PQ = 2AB = 8.4 \text{ cm}$

- (iv) $3CD$

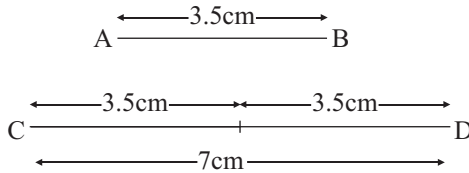


here $PQ = 3CD = 7.5 \text{ cm}$

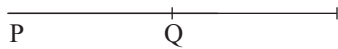
6. $AB = 8\text{ cm}$, $CD = 5\text{ cm}$
 we have to draw $PQ \parallel AB \parallel CD$
 $PQ \parallel AB \parallel CD = 3\text{ cm}$



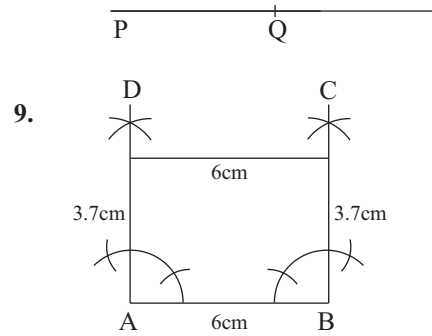
7. $AB = 3.5\text{ cm}$



8. (i) here $PQ \parallel AB \parallel AC$ of given ABC



- (ii) here $PQ \parallel AB \parallel AC$ of given Quadrilateral.



$ABCD$ is a given Rectangle
 $AB = CD = 6\text{ cm}$
 $AD = BC = 3.7\text{ cm}$

10. Length of Desk is 90 cm
 and breadth of Desk is 70 cm.

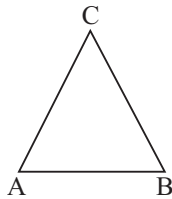
11

Angles

Exercise 11.1

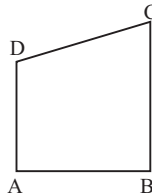
1. Vertex arms
 (i) M ML, MN
 (ii) P PQ, PR
 (iii) Y YX, YZ

2. (i)



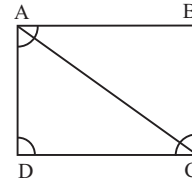
angles are ABC, ACB, BAC

- (ii)



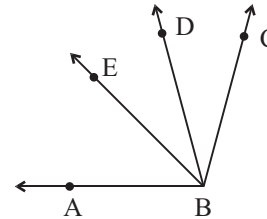
angles are ABC, BCD, CDA, DAB

- (iii)



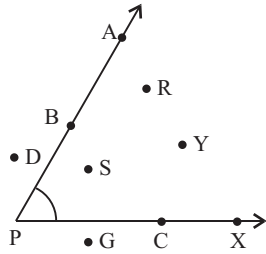
angles are $ABC, BCD, ADC, DAB, CAB, CAD, DCA$ and ACB

- (iv)



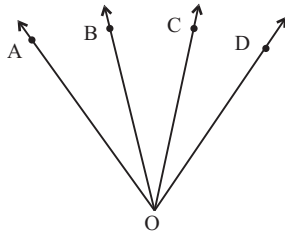
angles are ABC, ABD, ABE, EBC and DBC

3. (i) Point in the interior of APX are S, R, Y
 (ii) Point in the exterior of APX are D, G



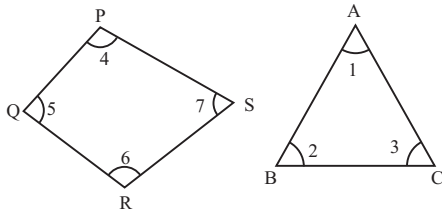
(iii) point on the boundary of APX are A, B, P, C, X

4.



- (i) Point B is in the interior of AOC and AOD
- (ii) Point C is in the interior of BOD and AOD
- (iii) Point C and D lie in the exterior of AOB .
- (iv) Point A and B lie in the exterior of COD .
- (v) Point C lies on AOC and COD .
- (vi) Point B and C lie in the interior of AOD .

5.



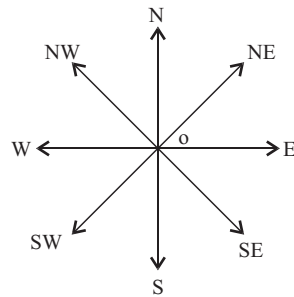
- (i) 1 BAC
- (ii) 2 ABC
- (iii) 3 ACB
- (iv) 4 QPS
- (v) 5 PQR
- (vi) 6 QRS
- (vii) 7 PSR

Exercise 11.2

1. (i) Right angle
(ii) Acute Angle (iii) Obtuse angle
(iv) Acute angle (v) Reflex angle
(vi) Straight angle
2. (i) 60° (ii) 60° (iii) 120° (iv) 50°

3. (i) $a = 75, b = 65$ $a > b$
(ii) $a = 130, b = 115$ $a > b$
(iii) $a = 90, b = 100$ $b > a$
4. (i) Obtuse angle
(ii) Right angle (iii) Acute angle
(iv) Acute angle
(v) Complete angle
(vi) Straight angle (vii) Obtuse angle
(viii) Zero angle (ix) Acute angle
(x) Obtuse angle
5. (i) angle between hour hand and minute hand 90
(ii) angle between hour hand and minute hand 180
(iii) angle between hour hand and minute hand 0

6.

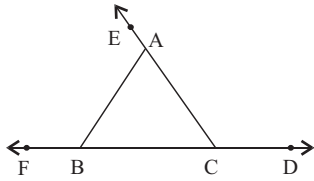


- (i) N and S 180°
- (ii) E and W 180°
- (iii) E and N $90^\circ, 270^\circ$
- (iv) E and SW $135^\circ, 225^\circ$
- (v) W and NW $45^\circ, 315^\circ$
- (vi) W and NE $135^\circ, 225^\circ$

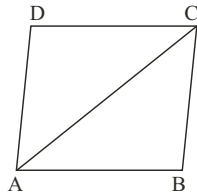
Exercise 11.3

1. (i) Complementary of 25 $90 - 25 = 65$
(ii) Complementary of 60 $90 - 60 = 30$
(iii) Complementary of 80 $90 - 80 = 10$
2. (i) supplementary of 135 $180 - 135 = 45$
(ii) supplementary of 75 $180 - 75 = 105$
(iii) supplementary of 30 $180 - 30 = 150$

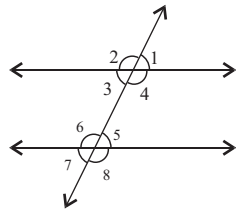
3. (i) Pairs of adjacent angles are
 (ACB, ACD), (BAC, BAE),
 (ABC, ABF)



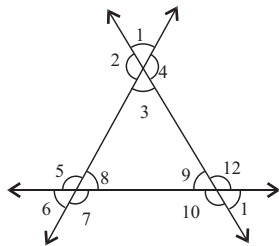
- (ii) Pairs of adjacent angles are
 (CAB, CAD), (ACD, ACB)



4. (i) Linear pairs ($1, 2$), ($2, 3$),
 ($3, 4$), ($1, 4$), ($5, 6$),
 ($6, 7$), ($7, 8$), ($8, 5$)



- (ii) Linear pairs ($1, 2$), ($2, 3$),
 ($3, 4$), ($4, 1$), ($5, 6$),
 ($6, 7$), ($7, 8$), ($8, 5$),
 ($9, 10$), ($10, 11$), ($11, 12$),
 ($12, 9$)



Vertically opposite angles :
 ($1, 3$), ($2, 4$), ($5, 7$), ($6, 8$),
 ($9, 11$), ($10, 12$)

5. (i) 15 75 90 Complementary angles
 (ii) 80 100 180 Supplementary angles
 (iii) 36 54 90 Complementary angles
 (iv) 90 90 180 Supplementary angles
 (v) 42 138 180 Supplementary angles
 (vi) 89 1 90 Complementary angles

6. Pairs of adjacent angles are
 (AOB, BOC), (AOC, COD),
 (BOC, COD)
 (i) AOD and AOB are not adjacent angles.
 (ii) AOB and BOC are not supplementary to each other.

7. (i) $x = 64$ 180 Linear pairs
 $x = 180 - 64$
 $x = 116$
 (ii) $x = 112$ 180 Linear pair
 $x = 180 - 112$
 $x = 68$
 (iii) $x = 30$ $x = 180$ Linear pair
 $2x = 30$ 180
 $2x = 150$
 $x = 75$
 (iv) $5x = 3x$ $x = 180$ Linear pair
 $9x = 180$
 $x = 20$
 (v) $x = 90$ $x = 180$ Linear pairs
 $2x = 90$ 180
 $2x = 180 - 90$
 $2x = 90$
 $x = 45$
 (vi) $25 = x = 65$ 180 Linear pair
 $x = 90$ 180
 $x = 90$

8. $90 = 1 = 25$ 180 Linear pair
 $115 = 1 = 180$
 $1 = 180 - 115$
 $1 = 65$
 $2 = 25$
 (Vertically opposite angles)
 $1 = 25 = 4 = 180$
 (Linear pair)
 $65 = 25 = 4 = 180$
 $90 = 4 = 180$
 $4 = 90$
 $3 = 4 = 2 = 180$ Linear pair
 $3 = 90 = 25 = 180$
 $3 = 115 = 180$

3 180 115
65
1 65 , 2 25 , 3 65 ,
4 90
(ii) 7 45 90 180 Linear pair
7 135 180
7 180 135
7 45
6 7 45 V.O.A
5 45

8 45
(iii) 75 9 90
Complementary angle
9 90 75
9 15
9 10 75 25 360
15 10 75 25 360
10 105 360
10 360 105
10 255

12

Pairs of Lines and Transversals

Exercise 12

- Yes l is transversal.
 - No, l is not a transversal.
 - Yes, l is transversal.
 - No, l is not a transversal.
- $AB \parallel EF, AC \parallel BD$
 - $AB \parallel ED, BC \parallel FE, CD \parallel FA$
 - $BC \parallel AD, AB \parallel CD, CF \parallel DE, CD \parallel FE, AB \parallel FE$
 - $BC \parallel PQ, AB \parallel QR, AC \parallel PR$
- given : 1 70, 8 55

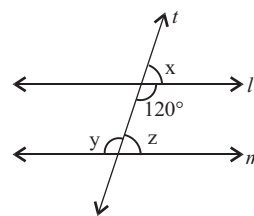
 - B 1 70 V.O.A.
 \therefore 3 8 70 55
125 180
 AB is not parallel to CD .
- given : 1 120 , 5 60

3 1 120 V.O.A.
3 5 120 60
180

Yes $P \parallel Q$.
- given : $l \parallel m$, 1 65

3 1 65 V.O.A.
5 1 65 Corresponding angles
7 5 65 V.O.A.
1 2 180 Linear pair
65 2 180
2 115
4 2 115 V.O.A.
8 4 115
Corresponding angles
6 4 115 alternate angles
3 5 65

- 1 65 , 2 115 , 3 65 ,
4 115 5 65 , 6 115 ,
7 65 , 8 115
 - 75 V.O.A.
 - 75 alternate angles.

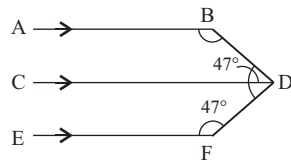


- x 120 180 Linear angles
 x 180 120
 x 60
 y 120 alternate angles
 z x 60 corresponding angles.
- x 60
 y 50 alternate angles
- given : $l \parallel m, P \parallel q$
 C 70 V.O.A.
 d 70 alternate angles
 b 70 alternate angles
 a b 70 Corresponding angles
- a 50 Corresponding angles
 - DEF a Corresponding angles
 DEF 50
- Let 1 $5x$, 2 $4x$
1 2 180 Linear pair
 $5x$ $4x$ 180
 $9x$ 180

x 20

1	5x	2	4x
	5	20	4(20)
1	100	2	80
5	1	100	Corresponding angles
6	2	80	Corresponding angles
4	2	80	Corresponding angles
3	1	100	V.O.A.
8	4	80	Corresponding angles
7	3	100	

12. FDC BDC 47 bisectors



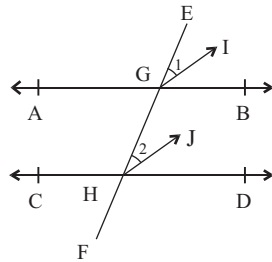
Now

ABD	BDC	180
ABD	47	180
ABD	80	47
ABD		133

Similarly

DEF	FDC	180
DFE	47	180
DFE	180	47
DFE		133

13.

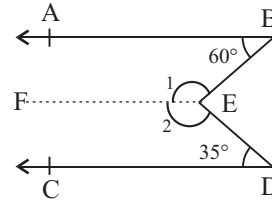


given : $AB \parallel CD$ and GI, HJ are bisectors
Proof

(i) EGB GHD
Corresponding angles
2 1 2 2 bisectors
1 2
 $GI \parallel HJ$

\therefore Corresponding angles are =

14. Given : $AB \parallel CD$



Construction : Draw $EF \parallel CD$

(i) 1 60 180 Sum of co-interior angles are 180°

1	180	60
1	120	

Similarly,

2	35	180
2	180	35
2	145	

BED	1	2
	120	145
BED		265

15. $\therefore p \parallel q$

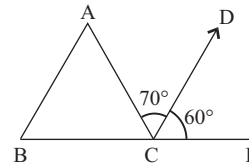
(x 15)	(2x 30)	180
3x	15	180
3x	180	15
3x	165	
x	165	3
x	55	

angles are x 15 2x 30

55	15,	2(55)	30
40		110	30
140			

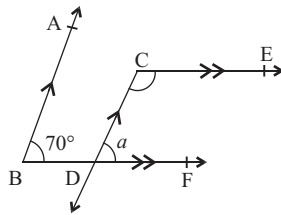
angles are 40°, 140°

16. Given : $CD \parallel AB$



B	DCE	60
		Corresponding angles
A	ACD	70
		alternate angles
C	180	(70 70)
		Linear pair
180	130	

17. Given : $AB \parallel CD$



$$\begin{aligned}
 &CE \parallel DF \\
 &a = 70 \\
 &\text{Corresponding angles} \\
 &a = \angle ECD = 180 \\
 &70 = \angle ECD = 180 \\
 &\text{co-interior angles are} \\
 &\text{supplementary} \\
 &\angle ECD = 110
 \end{aligned}$$

13

Polygons and Curves

Exercise 13.1

- Not closed
 - Closed
 - Closed
 - Closed
 - Closed
 - Closed
 - Not closed
 - Not closed
- Polygon
 - Not a polygon
 - Polygon
 - Not a polygon
 - Polygon
-
- Sides are PQ, OR, RS, ST, TU and UP
 - vertices are P, Q, R, S, T and U
 - Pairs of adjacent sides $(PQ, QR), (QR, RS), (RS, ST), (ST, TU), (TU, UP), (UP, PQ)$
 - diagonals are $PR, PS, PT, QU, QT, QS, RT, SU, UR$
 - Hexagon.
- A figure which ends at the starting point is called a **Closed** figure.
 - A Quadrilateral has **4** sides and **4** angles.
 - A triangle has **3** sides and **3** angles.
 - A polygon formed by four line segments is called a **Quadrilateral**.

- A polygon formed by three line segments is called a **triangle**.

Exercise 13.2

- Equilateral triangle
 - Isosceles triangle
 - Scalene
 - Equilateral triangle
 - Scalene triangle
 - Isosceles triangle
- Right angled triangle
 - Acute angled triangle
 - Obtuse angle triangle
 - Acute angled triangle
 - Obtuse angled triangle
 - Acute angled triangle
- \therefore

A	B	C	180
50	85	C	180
	135	C	180
	C	180	135
	C	45	
 - \therefore

A	B	C	180
	A	20	180
		A	40
	A	180	40
	A	140	
 - | | | | |
|-----|-----|-----|-----|
| A | B | C | 180 |
| A | 80 | 90 | 180 |
| | A | 170 | 180 |
| | A | 180 | 170 |
| | A | 10 | |
 - | | | | |
|-----|-----|-----|-----|
| A | B | C | 180 |
| 10 | B | 110 | 180 |

$$\begin{array}{r}
 B \ 120 \ 180 \\
 B \ 180 \ 120 \\
 B \ 60 \\
 4. \ (i) \ A \ B \ C \\
 \quad \quad \quad 50 \ 60 \ 70 \\
 \quad \quad \quad 180
 \end{array}$$

Yes triangle is possible

$$\begin{array}{r}
 (ii) \ A \ B \ C \ 45 \ 110 \ 75 \\
 \quad \quad \quad 230 \ 180 \\
 \quad \quad \quad 230 \ 180
 \end{array}$$

triangle is not possible.

$$\begin{array}{r}
 (iii) \ A \ B \ C \ 37 \ 73 \ 88 \\
 \quad \quad \quad 198 \ 180
 \end{array}$$

triangle is not possible.

$$\begin{array}{r}
 (iv) \ A \ B \ C \ 11 \ 79 \ 90 \\
 \quad \quad \quad 180
 \end{array}$$

Yes triangle is possible.

$$5. \ (i) \ AB \ 3.5, BC \ 5.3, AC \ 6 \text{ cm}$$

$$\therefore AB \ BC \ 3.5 \ 5.3 \\
 \quad \quad \quad 8.8 \ AC$$

$$\therefore AB \ AC \ 3.5 \ 6 \\
 \quad \quad \quad 11.5 \ BC$$

$$\text{and } BC \ AC \ 5.3 \ 6$$

$$\quad \quad \quad 11.3 \ AB$$

ABC is possible.

$$(ii) \ AB \ 2 \text{ cm } BC \ 3 \text{ cm } AC \ 5 \text{ cm}$$

$$\therefore AB \ BC \ 2 \ 3 \ 5$$

$$\text{and } AB \ BC \text{ not } AC$$

ABC is not possible.

$$(iii) \ AB \ 8.1 \text{ cm } BC \ 6.0 \text{ cm } AC \ 2.0 \text{ cm}$$

$$\therefore BC \ AC \ 6.0 \ 2 \\
 \quad \quad \quad 8.0 \text{ cm}$$

$$BC \ AC \text{ not } AB$$

ABC is not possible.

$$(iv) \ AB \ 4 \text{ cm } BC \ 14.2 \text{ cm } AC \ 11 \text{ cm}$$

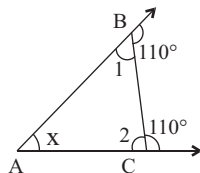
$$\therefore AB \ BC \ 4 \ 14.2 \ 18.2 \ AC$$

$$\quad \quad \quad AB \ AC \ 4 \ 11 \ 15 \ BC$$

$$\quad \quad \quad BC \ AC \ 14.2 \ 11 \ 25.2 \ AB$$

ABC is possible.

$$6. \ (i)$$



$$\begin{array}{r}
 1 \ 180 \ 110 \ \text{Linear pair} \\
 \quad \quad \quad 70
 \end{array}$$

$$\begin{array}{r}
 2 \ 180 \ 110 \\
 \quad \quad \quad 70 \ \text{Linear pair}
 \end{array}$$

$$\begin{array}{r}
 1 \ 2 \ x \ 180
 \end{array}$$

$$\begin{array}{r}
 70 \ 70 \ x \ 180
 \end{array}$$

$$\begin{array}{r}
 140 \ x \ 180
 \end{array}$$

$$\quad \quad \quad x \ 180 \ 140$$

$$\quad \quad \quad x \ 40$$

(ii) $ACD \ x \ B \therefore$ Exterior angle $125 \ x \ 90$ equal to sum of interior opposite angles

$$\begin{array}{r}
 125 \ 90 \ x \\
 \quad \quad \quad 35 \ x
 \end{array}$$

(iii) $1 \ 108 \ 180$ Linear pair

$$\begin{array}{r}
 1 \ 180 \ 108
 \end{array}$$

$$\begin{array}{r}
 1 \ 72
 \end{array}$$

$2 \ 110 \ 180$ Linear pair

$$\begin{array}{r}
 2 \ 180 \ 110
 \end{array}$$

$$\begin{array}{r}
 2 \ 70
 \end{array}$$

In ABC

$$\begin{array}{r}
 x \ 1 \ 2 \ 180
 \end{array}$$

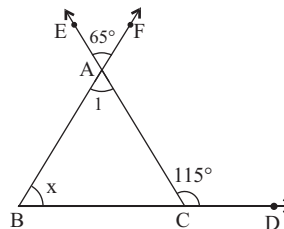
$$\begin{array}{r}
 x \ 72 \ 70 \ 180
 \end{array}$$

$$\begin{array}{r}
 x \ 142 \ 180
 \end{array}$$

$$\begin{array}{r}
 x \ 180 \ 142
 \end{array}$$

$$\begin{array}{r}
 x \ 38
 \end{array}$$

(iv)



$$\begin{array}{r}
 1 \ 65 \ \text{V.O.A.}
 \end{array}$$

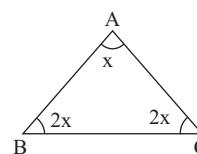
$$\begin{array}{r}
 ACD \ 1 \ x \\
 115 \ 65 \ x
 \end{array}$$

$$\begin{array}{r}
 115 \ 65 \ x
 \end{array}$$

Exterior angle equal to sum of interior opposite angles

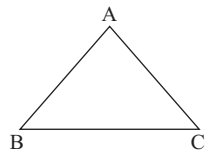
$$\begin{array}{r}
 50 \ x
 \end{array}$$

7. Let third $A \ x$



$$\begin{array}{r}
 \text{equal angles } B \quad C \quad 2x \\
 \therefore \quad A \quad B \quad C \quad 180 \\
 \quad \quad x \quad 2x \quad 2x \quad 180 \\
 \quad \quad \quad \quad 5x \quad 180 \\
 \quad \quad \quad \quad \quad \quad x \quad \frac{180}{5} \\
 \quad \quad \quad \quad \quad \quad x \quad 36 \\
 A \quad 36 \quad B \quad C \quad 2 \quad 36 \\
 \quad \quad \quad \quad \quad \quad \quad \quad 72
 \end{array}$$

8. given: $A \quad B \quad C$



$$\begin{array}{r}
 \therefore \quad A \quad (B \quad C) \quad 180 \\
 \quad \quad \quad \quad A \quad A \quad 180 \\
 \quad \quad \quad \quad \quad \quad 2 \quad A \quad 180 \\
 \quad \quad \quad \quad \quad \quad \quad \quad A \quad \frac{180}{2} \\
 \quad \quad \quad \quad \quad \quad \quad \quad A \quad 90
 \end{array}$$

that angle is 90°

9. Let acute angle be $2x, 3x$

$$\begin{array}{r}
 2x \quad 3x \quad 90 \quad 180 \\
 \quad \quad 5x \quad 180 \quad 90 \\
 \quad \quad \quad \quad x \quad 90 \quad 5 \\
 \quad \quad \quad \quad \quad \quad x \quad 18
 \end{array}$$

acute angles are $2 \quad 18, 3 \quad 18$
 $36, 54$

10. In ABC
 $1 \quad 3 \quad 5 \quad 180 \quad \dots(1)$

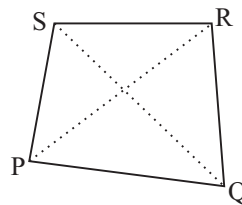
In DEF
 $2 \quad 4 \quad 6 \quad 180 \quad \dots(2)$

Adding step (1) (2)
 $1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6$
 $180 \quad 180$
 360

Exercise 13.3

- (i) Parallelogram
(ii) Rectangle
(iii) Trapezium
(iv) Rhombus
- (i) Vertices are P, Q, R, S
(ii) pairs of opposite sides are $(PQ, RS), (SP, RQ)$
(iii) Pairs of adjacent sides are

$(PQ, QR), (QR, RS), (RS, SP), (SP, PQ)$



- Pairs of opposite angles
(P, R), (S, Q)
 - Pairs of adjacent angles
(P, Q), (Q, R), (R, S),
(S, P)
 - diagonals are PR, SQ
- (i) Pairs of equal sides are $(WZ, XY), (WX, ZY)$
(ii) pairs of equal angles are $(x, z), (w, y)$
 - (i) $MN \quad 6.3 \text{ cm}$
(ii) $PM \quad 4.2 \text{ cm}$
(iii) $M \quad 90$
(iv) $N \quad 90$
 - (i) False (ii) True (iii) True (iv) True (v) False (vi) False.

Exercise 13.4

- (i) (ii)
- (iii) Try your self (iv) Try your self
- (i) diameter 12 cm
radius $\frac{1}{2}(\text{diameter})$
 $\frac{1}{2} \quad 12 \quad 6 \text{ cm}$
(ii) diameter 4 cm
radius $\frac{1}{2}(\text{diameter})$
 $\frac{1}{2} \quad (4) \quad 2 \text{ cm}$
(iii) diameter 8.4 cm

$$\text{radius} = \frac{1}{2}(\text{diameter})$$

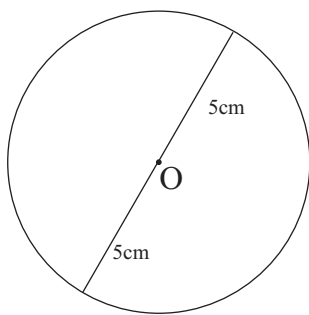
$$= \frac{1}{2}(8.4) = 4.2 \text{ cm}$$

(iv) diameter = 9.6 cm
radius = $\frac{1}{2}(\text{diameter}) = \frac{1}{2}(9.6) = 4.8 \text{ cm}$

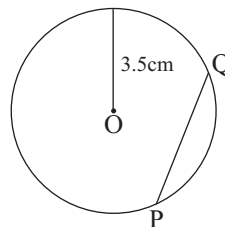
3. radius = 2.4 cm
 \therefore diameter = 2 radius
= 2 \times 2.4 cm = 4.8 cm

4. diameter = 7 cm
 \therefore radius = $\frac{1}{2}(\text{diameter})$
= $\frac{1}{2}(7) \text{ cm}$
radius = 3.5 cm

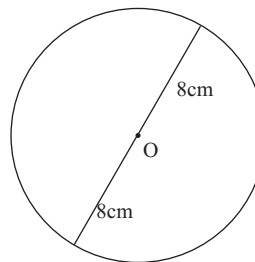
5. diameter $AB = 10$



6. PQ is a chord



7. AB is longest chord = 16 cm



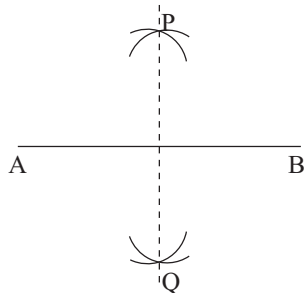
8. (i) A line segment that joins points on the circle is a **Chord**.
(ii) An **arc** is a part of the circle.
(iii) **Diameter** is the longest chord of the circle.
(iv) Radius is **half** of the diameter.
(v) A sector is bounded by two radii and an **arc**.
(vi) All points on the circle are equidistant from the **centre** of the circle.
(vii) The diameter divides a circle into two **semi circle**.

14

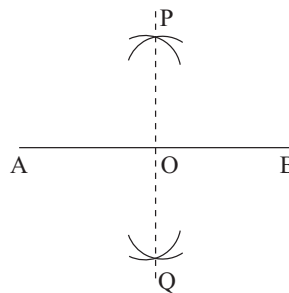
Practical Geometry

Exercise 14.1

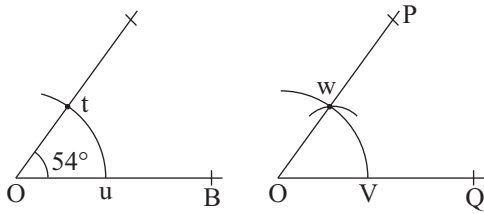
1. Given $AB = 9 \text{ cm}$ and PQ is bisector of AB



2. $AB = 4.8 \text{ cm}$ O is mid point of AB

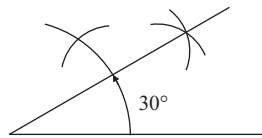


3. Steps of constructions

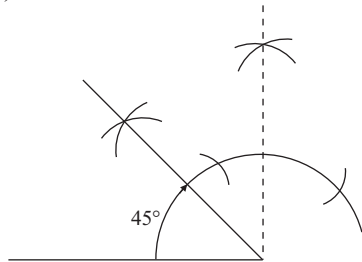


- (i) Draw $\angle AOB = 54^\circ$ using protector.
- (ii) Draw line OQ at O of $\angle AOB$, draw an arc of suitable radius cutting OA at t and OB at u .
- (iii) Draw OQ and with same radius draw an arc cutting OQ at V .
- (iv) With radius tu and centre V cut the previous arc at W .
- (v) Join OW and produce it to P
 $\angle POQ$ is required angle equal to $\angle AOB$

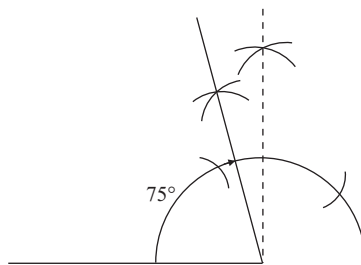
4. (i) 30°



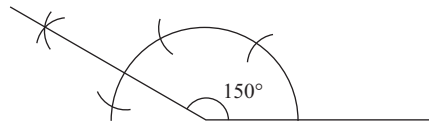
(ii) 45°



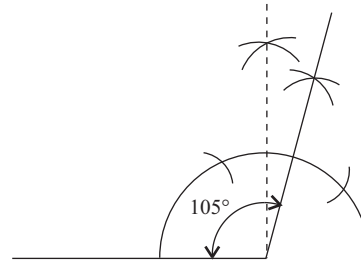
(iii) 75°



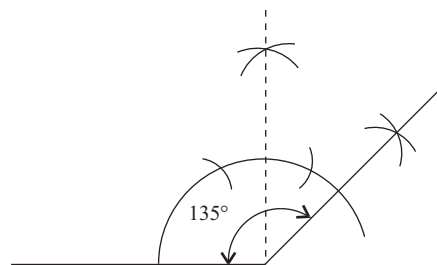
(iv) 150°



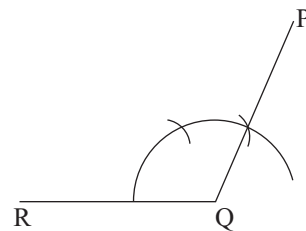
(v) 105°



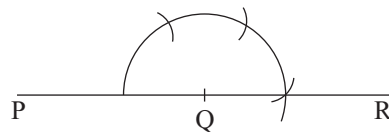
(vi) 135°



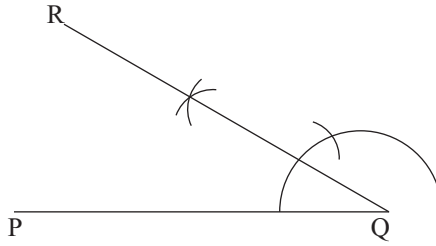
5. (i) here $\angle PQR = 2 \angle AOB$



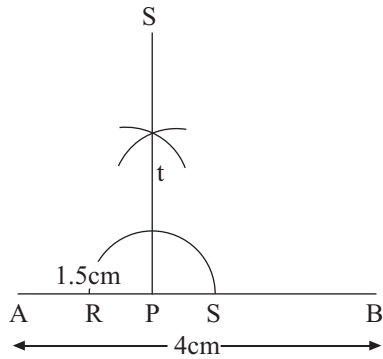
(ii) here $\angle PQR = 3 \angle AOB$



(iii) here $\angle PQR = \frac{1}{2} \angle AOB$



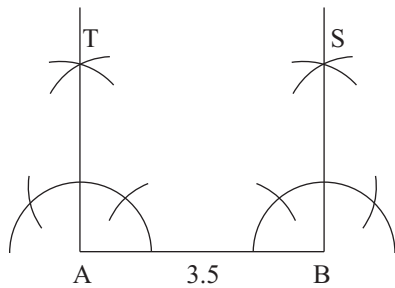
6.



Steps of construction :

1. Draw $AB = 4$ cm and mark a point P on AB such that $AP = 1.5$ cm.
2. At P draw an arc intersecting AB at R and S .
3. With R as centre and radius equal to more than half of RS cut an arc.
4. With S as centre and same radius cut the previous arc at t .
5. Join Pt perpendicular to PS .
 PS is \perp to AB

7.

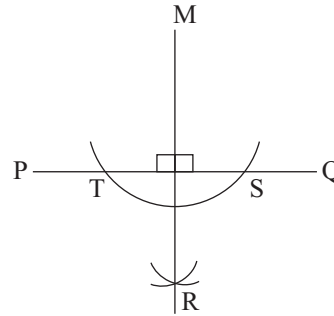


Steps of construction :

1. Draw $AB = 3.5$ cm

2. At A draw perpendicular at A . Name it AT .
3. At B draw perpendicular at B . Name it BS .
Yes AT Parallel to BS .

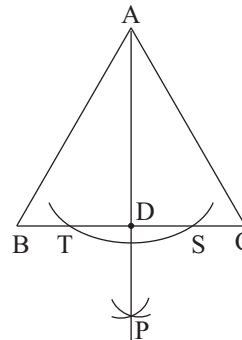
8.



Steps of constructions :

1. Draw a line segment PQ .
2. Take a point M not lying on it.
3. With M as centre and suitable radius draw an arc cutting PQ at T and S .
4. With S as centre and radius equal to more than half of ST draw an arc.
5. With T as centre and same radius cut the previous arc at R .
6. Join MR
 MR is \perp to PQ

9.



Steps of constructions

1. Draw any ABC .

2. With A as centre and suitable radius draw an arc cutting BC at T and S .
3. With S at centre and draw more than half of TS draw an arc.

4. With T as centre and same radius cut the previous arc at P .
5. Join AP meeting BC at D .

$AD \perp BC$

10. Same as Q.8 try yourself.

15

1. (i) sphere (ii) cube (iii) cylinder (iv) cuboid (v) square pyramid (vi) cone (vii) Triangular (viii) Triangular pyramid
2. (i) A cuboid example book.
(ii) A cone example birthday cap.
(iii) Cylinder example pillars.
3. (i) A cuboid has 6 faces 12 edges and 8 vertices.
(ii) A sphere has no vertex and no edge.
(iii) A square pyramid has 4 lateral triangular faces and 8 edges.

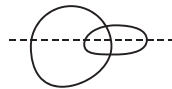
Three Dimensional Shapes

- (iv) A triangular prism has 6 vertices 3 rectangular lateral faces 2 triangular bases and 9 edges.
- (v) A triangular pyramid has 3 triangular lateral faces and 6 edges.
4. (i) A tennis ball sphere
(ii) A New pencil Cylinder
(iii) A dice Cube
(iv) A birthday Cap Cone
(v) A garden roller Cylinder
(vi) A kaleidoscope prism.

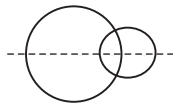
16

Linear Symmetry

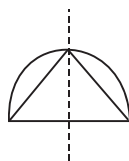
1. (i) line of symmetry



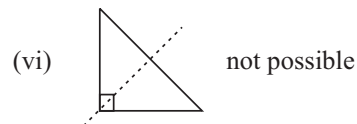
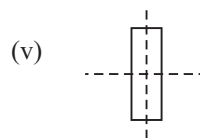
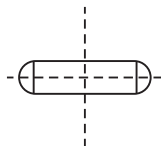
- (ii) line of symmetry



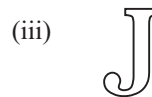
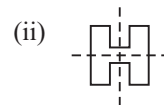
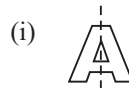
- (iii) line of symmetry



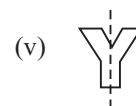
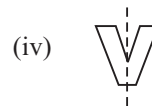
- (iv)

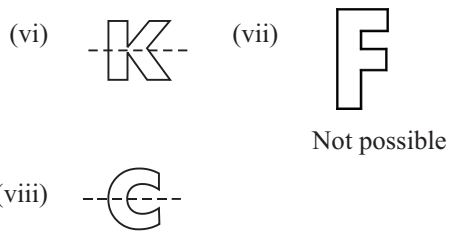


2. Draw all lines of symmetry, if possible, for each of the following letters :

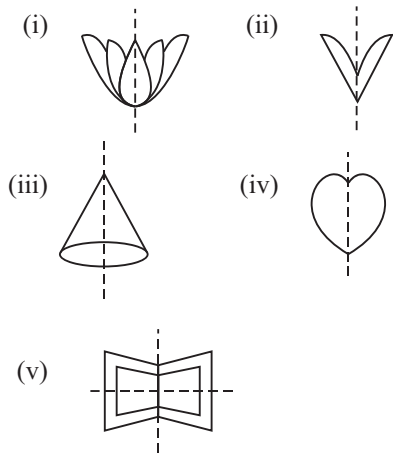


Not possible

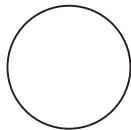




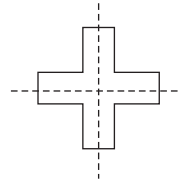
3. Draw a line of symmetry through each of the following figures :



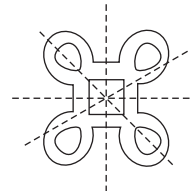
4. How many lines of symmetry can you draw through the given figures?
(i) Infinite



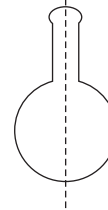
(ii) two



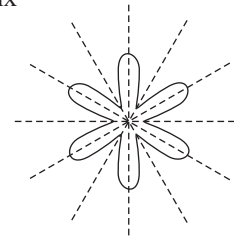
(iii) four



(iv) One



(v) Six



5. How many lines of symmetry can you draw through the given figures?
(i) Four (ii) Five
(iii) Six (iv) Eight

17

Perimeter And Area

Exercise 17.1

1. (i) Perimeter (4 2 4 2)
12 cm
(ii) Perimeter 10 10 10 10
40 mm
(iii) Perimeter 2 4 3 9 cm

- (iv) Perimeter
[5 1.2 1.5 1 2 1 1.5 1.2]
14.4 cm
(v) Perimeter 10 1.5 10 1.5
23 m
(vi) Perimeter 2 2 2 2 2 2 2
16 cm