1 Integers

Exercise 1.1

1. (i) $0, -7$
0 is greater than -7.

(ii) $6, -12$
6 is greater than -12.

(iii) $-20, -10$
-10 is greater than -20.

(iv) $35, -305$
35 is greater than -305.

2. (i) $-15 \square 9$

(ii) $-18 \square -88$

(iii) $-46 \square 46$

$-250 \square -520$

3. (i) $4 > 3 > 0 > -6 > -7 > -10$

(ii) $6 > 3 > 1 < 0 > -3 > -8$

4. (i) $|-53| = 53$ (ii) $|125| = 125$ (iii) $|-21| = 21$ (iv) $|-77| = 77$

5. (i) $(-41) + (-82) + 72$
$= -41 - 82 + 72$
$= -41 - 10 = -51.$

(ii) $59 + (-14) + (-73)$
$= 59 - 14 - 73$
$= 59 - 87 = -28.$

(iii) $382 + (-126) + (-464)$
$= 382 - 126 - 464$
$= 382 - 590 = -208.$

(iv) $(-623) + (235) + (745)$
$= -623 + 235 + 745$
$= -623 + 980 = 357.$

(v) $(-441) + (-354) + (-205)$
$= -441 - 354 - 205$
$= -1000.$

(vi) $(-625) + 925 + 100 + (-200)$
$= -625 + 925 + 100 - 200$
$= 300 - 100 = 200.$

6. (i) The additive inverse of 52 is -52.

(ii) The additive inverse of -86 is $-(-6) = 86$.

(iii) The additive inverse of -103 is $-(103) = 103$.

(iv) The additive inverse of -1 is $(-1) = 1$.

(v) The additive inverse of -23 is $-(-23) = 23$.

7. (i) $(-72) + (\mathbf{0}) = -72$

(ii) $\{-27 + 15\} + (-55) = (-27) + (15 + (\mathbf{-55}))$

(iii) $53 + (-45) = (-45) + (\mathbf{53})$

(iv) $-(-75) = \mathbf{75}$

8. Let the other integer be x.

Thus, $x + 65 = -20$

$x = -20 - 65$

$x = -85$

Hence, the other integer is -85.

9. Let, the other integer be x.

Thus, $x + 21 = 45$

$x = 45 - 21$

$x = 24$

Hence, the other integer is 24.

10. (i) 16 from -22
$= -22 - 16 = -38$
$= -67 + 31 = -36$

(ii) -31 from -67
$= -67 - (-31)$

(iii) -15 from 40
$= 40 - (-15) = 55.$

(iv) 65 from -98
$= -98 - 65 = -163.$

(v) -410 from 560
$= 560 - (-410)$
$= 560 + 410 = 970.$

(vi) -650 from 1750
$= 1750 - (-650)$
$= 1750 + 650 = 2400.$

(vii) 0 from -90
$= -90 - 0 = 90.$

(viii) -1020 from 0
$= 0 - (-1020)$
$= 0 + 1020 + 1020.$

11. Let, the other integer be x.

$$-21 + x = -17$$
$$x = -17 + 21$$
$$x = 4$$

Hence, the other integer is 4.

12. $\because$ $11 - (-3)$ and $-3 - 11 = -14$
$= 11 + 3 = 14$
$\because$ $14 \neq -14$
Thus, $11 - (-3) \neq -3 - 11.$

13. $(-36 + 42) - [(-7) + (-17)]$
$= 6 - [-7 - 17]$
$= 6 - (-24)$
$= 6 + 24 = 30.$

14. (i) $-5 + (5) = 8 + (-8)$

(ii) $-30 + (-70) < 30 + 70$

(iii) $-48 + 78 > -305 + 180$

(iv) $-15 + (-15) < -15 - (-15)$

(v) $-11 + (-9) < (-11) - (-9)$

15. (i) $-9 + \mathbf{(-5)} = -14$

(ii) $-27 + \mathbf{27} = 0$

(iii) To subtract 4 from an integer, we can add **(−4)** to it.

(iv) $0 + \mathbf{(-72)} = -72$

Exercise 1.2

1. (i) False (ii) True (iii) True (iv) True (v) False (vi) True

2. (i) $-5 \times \mathbf{-1} = 5$

(ii) $-17 \times \mathbf{1} = (-17)$

(iii) $(-7) \times (-8) = (-8) \times \mathbf{-7}$

(iv) $6 \times (-4) = (-4) \times \mathbf{6}$

(v) $\{(-4) \times 3) \times (-5)\} = \mathbf{-4} \times \{3 \times (-5)\}$

3. (i) $-8 \times 15 = 15 \times (-8)$

(ii) $(7 + 4) \times 6 > 7 + 4 \times (-6)$

(iii) $4 - 8 - 6 < 4 + (-8) - 6$

(iv) $(8 \times 7) \times (-3) < 45$

4. Multiply :

(i) $2 \times (-18) \times 5$
$= -18 \times 2 \times 5$
$= -18 \times 10 = -180.$

(ii) $(-4) \times 5 \times (-47)$
$= -20 \times (-47)$
$= +940.$

(iii) $(-881)\times(-441)\times(32)\times 0$
$= 0.$

(iv) $1\times(-43)\times(-4)\times(-50)$
$= -43\times(200) = -8600.$

(v) $(-1)\times(-3)\times(-5)\times(-7)$
$= (+3)\times(+35)$
$= 105.$

(vi) $(-3)\times(-2)\times(-2)\times(-3)$
$\times(-3)\times(-2)$
$= (+6)\times(+6)\times(+6) = 216.$

5. (i) $(-7)+(-7)+(-7)+(-7) = (-7)\times 4 = +28.$

(ii) $(-4)+(-4)+(-4)+(-4)+(-4) = (-4)\times 5 = -20.$

(iii) $(-8)+(-8)+(-8) = (-8)\times 3 = -24.$

(iv) $(-11)+(-11)+(-11)+(-11)+(-11)+(-11) = (-11)\times 6 = +66.$

6. (i) $17\times\{6+(-2)\} = (17\times 6)+\{17\times(-2)\}$

L.H.S. $= 17\times\{6+(-2)\}$
$= 17\times\{6-2\}$
$= 17\times 4$
$= 68.$

R.H.S. $= (17\times 6)+\{17\times(-2)\}$
$= 102+\{-34\}$
$= 102-34 = 68.$
Verify.

Hence, L.H.S. = R.H.S.

(ii) $(-20)\times\{(-3)+(-5)\} = \{(-20)\times(-3)\}++\{(-20)\times(-5)\}$

L.H.S. $= (-20)\times\{(-3)+(-5)\}$
$= -20\times\{-3-5\}$
$= -20\times(-8) = +160.$

R.H.S. $= \{(-20)\times(-3)\}+\{(-20)\times(-5)\}$
$= \{+60\}+\{+100\}$
$= 60+100 = 160.$

7. (i) $(-6)\times(-82)\times 14\times 0$
$= 0.$

(ii) $1999\times 4-1999\times 15$
$= 1999\times[4-15]$
$= 1999\times(-11)$
$= -21{,}989.$

(iii) $(-885)\times(-36)+(-885)\times(-64)$
$= -885\times[(-36)+(-64)]$
$= -885\times[-36-64] = -885\times(-100) = +88500.$

(iv) $25895-25895\times(-999)$
$= 25895\times[1-(-999)]$
$= 25895\times[1+999] = 25895\times 1000 = 2{,}58{,}95{,}000.$

(v) $345\times(99)+345$
$= 345\times[99+1] = 345\times 100 = 34{,}500.$

(vi) $(-423)\times(-22)+(-423)\times(-78)$
$= (-423)\times[(-22)+(-78)]$
$= -423\times[-22-78] = -423\times(-100) = 42{,}300$

8. $b\times b = -b$

$\Rightarrow \quad b = \dfrac{-b}{b}$

$b = -1$

Verify :

$\because \quad b \times b = -b$

L.H.S. $= b \times b = (-1) \times (-1)$ $= +1$

R.H.S. $= -b - (-1)$ $= +1$

L.H.S. = R.H.S.

Hence, the value of b is -1.

Exercise 1.3

1. (i) $45 \div (-5) = \dfrac{45}{(-5)} = -9$ (ii) $(-45) \div (-15) = \dfrac{-45}{-15} = 3$

(iii) $0 \div (-14) = \dfrac{0}{-14} = 0$ (iv) $(-16) \div (4) = \dfrac{-16}{4} = -4.$

(v) $-620 \div 1 = \dfrac{-620}{1} = -620$ (vi) $68925 \div (-1) = \dfrac{68925}{-1} = -68925$

(vii) $(-7533) \div (-81) = \dfrac{-7533}{-81} = 93$ (viii) $7872 \div (-123) = \dfrac{7872}{-123} = -64$

(ix) $(-2407) \div (-83) = \dfrac{-2407}{-83} = 29$ (x) $(-2407) \div (-83) = \dfrac{-2407}{-83} = 29$

2. $a \div (b + c) \neq (a \div b) + (a \div c)$

(i) $a = 10, b = -6, c = 4$

L.H.S. $= a \div (b + c) = 10 \div (-6 + 4)$

$= 10 \div (-2)$

$= \dfrac{10}{-2} = -5$

R.H.S. $= (a \div b) + (a \div c) = [10 \div (-6)] + [10 \div 4]$

$= \dfrac{10}{-6} + \dfrac{10}{4} = \dfrac{-20 + 60}{24} = \dfrac{20}{24} = \dfrac{5}{6}.$

$\because$ L.H.S. $\neq$ R.H.S.

Hence, $a \div (b + c) \neq (a \div b) + (a \div c)$ **Verify**.

(ii) $a = -12, b = 3, c = 1$

L.H.S. $= a \div (b + c) = -12 \div (3 + 1) = -12 \div 4 = \dfrac{-12}{4} = -3.$

R.H.S. $= (a \div b) + (a \div c) = [(-12) \div 3]\ [(-12) \div 1]$

$= \left(\dfrac{-12}{3}\right) + \left(\dfrac{-12}{1}\right)$

$= -4 + (-12) = -4 - 12 = -16.$

$\because$ L.H.S. $\neq$ R.H.S.

Hence, $a \div (b + c) \neq (a \div b) + (a \div c)$

3. (i) $\mathbf{(-45)} \div (-9) = 5$ (ii) $\mathbf{(-84)} \div 7 = -12$

(iii) $50 \div \mathbf{(-1)} = -50$ (iv) $-350 \div \mathbf{1} = -350$

4. If $a \div b = -4$ (given)

Then, $\frac{a}{b} = -4$

$a = -4b$

So,

If $b = 3$, then $Q = -4 \times 3 = -12$

If $b = 4$, then $Q = -4 \times 4 = -16$

If $b = 5$, then $Q = -4 \times 5 = -20$

If $b = 6$, then $a = -4 \times 6 = -24$

Hence, the four pairs of (a, b) are

$(-12) \div 3 = -4$; $(-16) \div 4 = -4$;

$(-20) \div 5 = -4$ and $(-24) \div 6 = -4$.

Exercise 1.4

1. Total number of sections of class VIII = 4

Total number of students in each section = 35

Monthly fee of each student = ₹ 230

Thus, total amount collected from the class VII = ₹ $230 \times 35 \times 4$

= ₹ 230×140

= ₹ 32,200.

2. Let, the required number be x.

Thus, $x \times x = x$

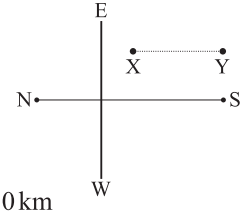
$x = \frac{x}{x} = 1$

Hence, teh required integer is 1.

3. ∵ Aeroplane leaving × flies due south for 380 km.

Thus, the distance of aeroplane from airport

$X = 380$ km.



And, the distance of aeroplane away from airport

$Y = 50$ km

Thus, the distance between X and Y

= 380 km + 50 km = 430 km

Hence, the airport X is 430 km far from the airport Y.

4. Harpreet travels for north of Delhi = 35 km

Then, she travels for south of Delhi = 85 km

Now, Harpreet for from Delhi = 35 km – 85 km = – 50 km.

Hence, Harpreet 50 km far from Delhi finally.

5. Kavita had money in her bank account = ₹ 550

She depostied on Monday = ₹ 250

She withdraw on Monday = ₹ 500

She deposited on Wednesday = 1500

She deposited on Saturday = ₹ 450

So, left money in her bank account

= ₹ 550 + ₹ 250 – ₹ 500 + ₹ 150 + ₹ 450

= ₹ 300 + ₹ 1950 = ₹ 2250

6. Cost of each skirt = ₹ 175

$\therefore$ Cost of 2 skirts = ₹ 175×2 = ₹ 350

and cost of each shirt = ₹ 80

$\therefore$ Cost of 3 shrts = ₹ 80×3 = ₹ 240

So, total money of cloths = ₹ 350 + ₹ 240 = ₹ 590

She gave money to the shopkeeper = ₹ 1000

Thus, shopkeeper gave back to her ₹ 1000 – ₹ 590 = ₹ 410

Hence, Jenifer will get back ₹ 410.

7. Monika had money = ₹ 550

She kept money with herself = ₹ 150

Thus, remaining money = ₹ 550 – ₹ 150 = ₹ 400

So, half of ₹ 400 = $\frac{₹\ 400}{2}$ = ₹ 200

Hence, each of her brother get ₹ 200.

8. Total number of houses in a Society = 250

Number of vacant houses = 185

Thus, rest occupied houses = 250 – 185 = 65

$\because$ Cost of construction of house = ₹ 2,45,000

$\therefore$ Cost of construction of 65 houses = ₹ $2,45,000 \times 65$

= ₹ 1,59,25,000

Hence, the housing society collected ₹ 1,59,25,000 from occupied houses.

9. Score of Akhil in first math = 60 runs

Score of Akhil in second match = 35 runs

Score of Akhil in third match = 75 runs

Score of Akhil in fourth match = 24 runs

And, score of Akhil in fifth match = 2×35 runs = 70 runs

Thus, total score of Akhil = (60 + 35 + 75 + 24 + 70) runs = 264 runs

10. Normal temperature of srinagar = 21° C

Thus, Actual temperature at 5 am = 21° C – 5° C = 16° C.

Actual temperature at 10 am = 21° C + 5° C = 26° C.

Actual temperature at 12 noon = 21° C + 7° C = 28° C.

And, Actual temperature at 3 pm = 21°C + 2° C = 23° C.

Multiple Choice Questions

1. (ii) **2.** (i) **3.** (ii) **4.** (i) **5.** (iii) **6.** (iii) **7.** (iii) **8.** (ii) **9.** (iv) **10.** (ii)

Mental Exercise

1. –14 **2.** –13 **3.** 4 and 0 **4.** 20 **5.** Negative **6.** –2.7° C

2 Fractions

Exercise 2.1

1. (i) $\frac{2}{3}, \frac{3}{4}, \frac{1}{2}, \frac{5}{6}$

2	3, 2, 6, 4
2	3, 1, 3, 2
3	3, 1, 3, 1
	1, 1, 1, 1

$\because$ L.C.M. of 3, 4, 2 and $6 = 2 \times 2 \times 3 = 12$

$\therefore \quad \frac{2}{3} = \frac{2 \times 4}{3 \times 4} = \frac{8}{12}, \frac{3}{4} = \frac{3 \times 3}{4 \times 3} = \frac{9}{12},$

$\frac{1}{2} = \frac{1 \times 9}{2 \times 6} = \frac{6}{12}$ and $\frac{5}{6} = \frac{5 \times 2}{6 \times 2} = \frac{10}{12}$

$\because \quad \frac{6}{12} < \frac{8}{12} < \frac{9}{12} < \frac{10}{12}$

So, $\frac{1}{2} < \frac{2}{3} < \frac{3}{4} < \frac{5}{6}$ are in ascending order.

(ii) $\frac{1}{2}, \frac{1}{6}, \frac{1}{3}, \frac{1}{10}$

$\because$ LCM of 2, 6, 3 and $10 = 2 \times 3 \times 5 = 30.$

2	2, 6, 3, 10
3	1, 3, 35
5	1, 1, 1, 5
	1, 1, 1, 1

$\therefore \quad \frac{1}{2} = \frac{1 \times 15}{2 \times 15} = \frac{15}{30}, \frac{1}{6} = \frac{1 \times 5}{6 \times 5} = \frac{5}{30},$

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

$\because \quad \frac{3}{30} < \frac{5}{30} < \frac{10}{30} < \frac{15}{30}$

So, $\frac{1}{10} < \frac{1}{6} < \frac{1}{3} < \frac{1}{2}$ are in ascending order.

(iii) $\frac{8}{9}, \frac{11}{9}, \frac{7}{9}, \frac{5}{9}$

$\because \quad 5 < 7 < 8 < 11$

So, $\frac{5}{9} < \frac{7}{9} < \frac{8}{9} < \frac{11}{9}$ are in ascending order.

(iv) $\frac{7}{10}, \frac{3}{5}, \frac{8}{5}, \frac{19}{30}$

2	10, 5, 15, 30
3	5, 5, 15, 15
5	5, 5, 5, 5
	1, 1, 1, 1

$\because$ L.C.M. of 10, 5, 15 and $30 = 2 \times 3 \times 5 = 30$.

$\therefore \frac{7}{10} = \frac{7 \times 3}{10 \times 3} = \frac{21}{30}, \frac{3}{5} = \frac{3 \times 6}{5 \times 6} = \frac{18}{30},$

$\frac{8}{15} = \frac{8 \times 2}{15 \times 2} = \frac{16}{30}$ and $\frac{19}{30} = \frac{19}{30}$

$\because \frac{16}{30} < \frac{18}{30} < \frac{19}{30} < \frac{21}{30}$

So, $\frac{8}{15} < \frac{3}{5} < \frac{19}{30} < \frac{7}{10}$ are in ascending order.

2. (i) $\frac{8}{13}$

$\because \frac{8}{13} = \frac{8 \times 2}{13 \times 2} = \frac{8 \times 3}{13 \times 3} = \frac{8 \times 4}{13 \times 4} = \frac{8 \times 5}{13 \times 5}$

$\therefore \frac{8}{13} = \frac{16}{26} = \frac{24}{39} = \frac{32}{52} = \frac{40}{65}$

Hence four equivalent fractions of $\frac{8}{13}$ are $\frac{16}{26}, \frac{24}{39}, \frac{32}{52}$ and $\frac{40}{65}$.

(ii) $\frac{9}{17}$

$\because \frac{9}{17} = \frac{9 \times 2}{17 \times 2} = \frac{9 \times 3}{17 \times 3} = \frac{9 \times 4}{17 \times 4} = \frac{9 \times 5}{17 \times 5}$

$\therefore \frac{9}{17} = \frac{18}{34} = \frac{27}{51} = \frac{36}{68} = \frac{45}{85}$

Hence, four equivalent fractions of $\frac{9}{17}$ are $\frac{18}{34}, \frac{27}{51}, \frac{36}{68}$ and $\frac{45}{85}$.

(iii) $\frac{5}{11}$

$\because \quad \frac{5}{11} = \frac{5\times 2}{11\times 2} = \frac{5\times 3}{11\times 3} = \frac{5\times 4}{11\times 4} = \frac{5\times 5}{11\times 5}$

$\therefore \quad \frac{5}{11} = \frac{10}{22} = \frac{15}{33} = \frac{20}{44} = \frac{25}{55}$

Hence, four equivalent fractions of $\frac{5}{11}$ are $\frac{10}{22}, \frac{15}{33}, \frac{20}{44}$ and $\frac{25}{55}$.

3. (i) $4 - \frac{3}{7}$

$= \frac{4\times 7 - 3}{7} = \frac{28-3}{7}$

$= \frac{25}{7} = 3\frac{4}{7}.$

(ii) $3\frac{3}{4} + 5\frac{1}{2}$

$= \frac{15}{4} + \frac{11}{2} = \frac{15\times 11\times 2}{4}$

$= \frac{15+22}{4} = \frac{37}{4} = 9\frac{1}{4}.$

(iii) $9 + \frac{5}{11}$

$= \frac{9\times 11 + 5}{11} = \frac{99+5}{11}$

$= \frac{104}{11} = 9\frac{5}{11}.$

(iv) $8\frac{1}{3} - 2\frac{5}{8}$

$= \frac{25}{3} - \frac{21}{8} = \frac{25\times 8 - 21\times 2}{24}$

$= \frac{200-63}{24} = \frac{137}{24} = 5\frac{17}{24}.$

(v) $\frac{13}{4} - \frac{16}{5} = \frac{13\times 5 - 16\times 4}{20} = \frac{65-64}{20} = \frac{1}{20}.$

(vi) $5\frac{1}{7} + 3\frac{1}{9}$

$= \frac{36}{7} + \frac{28}{9} = \frac{36\times 9 + 28\times 7}{9\times 7} = \frac{324+196}{63} = \frac{520}{63} = 8\frac{16}{63}.$

(vii) $\frac{8}{9} + \frac{3}{2} + \frac{5}{6}$

$= \frac{8\times 2 + 3\times 9 + 5\times 3}{18} = \frac{16+27+15}{18} = \frac{58}{18} = \frac{29}{9} = 3\frac{2}{9}.$

4. Let, the required number be x.

Thus, $8\frac{1}{7} + x = 14$

$x = 14 - 8\frac{1}{7}$

$= 14 - \frac{57}{7}$

$= \frac{98-57}{7} = \frac{41}{7} = 5\frac{6}{7}.$

Hence, $5\frac{6}{7}$ added to $8\frac{1}{7}$ to get 14.

5. Let, the required number be x.

Thus, $$12\frac{3}{5} - x = 7\frac{1}{5}$$

$$\frac{63}{5} - x = \frac{36}{5}$$

$$\frac{63}{5} - \frac{36}{5} = x$$

$$x = \frac{63-36}{5} = \frac{27}{5} = 5\frac{2}{7}$$

Hence, $5\frac{2}{7}$ subtracted from $12\frac{3}{5}$ to get $7\frac{1}{5}$.

6. Length of rectangular sheet $= 15\frac{1}{3}$ cm

Width of rectangular sheet $= 12\frac{1}{2}$ cm

Thus, Perimeter of rectangular sheet of paper $= 2(l + b)$

$$= 2 \times \left(15\frac{1}{3}\text{ cm} + 12\frac{1}{2}\text{ cm}\right)$$

$$= 2 \times \left(\frac{46}{3} \times \frac{25}{2}\right)\text{cm}$$

$$= 2 \times \left(\frac{92+75}{6}\right)\text{cm}$$

$$= \frac{2}{6} \times 167\text{ cm}$$

$$= \frac{167}{3} = 55\frac{2}{3}\text{ cm.}$$

7. Side of square picture frame $= 17\frac{2}{9}$ cm

Thus, perimeter of picture frame $= 4 \times$ side

$$= 4 \times 17\frac{2}{9}\text{ cm}$$

$$= 4 \times \frac{155}{9}\text{ cm} = \frac{620}{9}\text{ cm} = 68\frac{8}{9}\text{ cm}$$

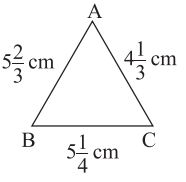
8. (i) Perimeter of triangle ABC

$= AB + BC + AC$

$= 5\frac{2}{3}\text{ cm} + 5\frac{1}{4}\text{ cm} + 4\frac{1}{3}\text{ cm}$

$= \left(\frac{17}{3} + \frac{21}{4} + \frac{13}{3}\right)\text{cm}$

$= \left(\frac{17}{3} + \frac{13}{3} + \frac{21}{4}\right)\text{cm}$



$$= \left(\frac{17\times 4 + 13\times 4 + 21\times 3}{12}\right)\text{cm}$$

$$= \left(\frac{68 + 52 + 63}{12}\right)\text{cm} = \frac{183}{12}\text{cm} = \frac{61}{4}\text{cm} = 15\frac{1}{4}\text{cm}$$

(ii) Perimeter of figure *ABCDEF*

$$= AB + BC + CD + DE + EF + AF$$

$$= \left(11\frac{1}{4}\text{cm} - 1\frac{1}{2}\text{cm}\right) + 3\,\text{cm} + 1\frac{1}{2}\text{cm} + 9\frac{1}{4}\text{cm} + 11\frac{1}{4}\text{cm} + 2\,\text{cm}$$

$$= 11\frac{1}{4}\text{cm} - 1\frac{1}{2}\text{cm} + 3\,\text{cm} + 1\frac{1}{2}\text{cm} + 9\frac{1}{4}\text{cm} + 11\frac{1}{4}\text{cm} + 2\,\text{cm}$$

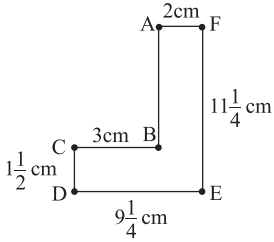
$$= \frac{45}{4}\text{cm} + 3\,\text{cm} + \frac{37}{4}\text{cm} + \frac{45}{4}\text{cm} + 2\,\text{cm}$$

$$= \left(\frac{45 + 37 + 45}{4}\right)\text{cm} + (3 + 2)\,\text{cm}$$

$$= \frac{127}{4}\text{cm} + 5\,\text{cm}$$

$$= \left(\frac{127 + 20}{4}\right)\text{cm}$$

$$= \frac{147}{4}\text{cm} = 36\frac{3}{4}\text{cm}.$$



9. Geeta solved maths exercise $= \frac{3}{5}$ part

And, Aditi solved maths exercise $= \frac{7}{9}$ part

$\because \quad \frac{3}{5} = \frac{3\times 9}{5\times 9} = \frac{27}{45}$ and $\frac{7}{9} = \frac{7\times 5}{9\times 5} = \frac{35}{45}$

$\because \quad \frac{35}{45} > \frac{27}{45}$

Hence, Aditi solved greater part of maths exercise.

10. Shagun ate the cake $= \frac{2}{7}$ part of a cake.

Thus, her brother ate the cake $= 1 - \frac{2}{7} = \frac{5}{7}$ part of cake

$\because \quad \frac{2}{7} < \frac{5}{7}$ and $\frac{5}{7} - \frac{2}{7} = \frac{3}{7}$

Hence, Shagun's brothers ate larger share of cake by $\frac{3}{7}$ part of cake then Shagun.

Exercise 2.2

1. (i) $\frac{8}{3} \times 4$

$= \frac{8 \times 4}{3} = \frac{32}{3} = 10\frac{2}{3}$

(ii) $13 \times \frac{2}{5}$

$= \frac{13 \times 2}{5} = \frac{26}{5} = 5\frac{1}{5}$

(iii) $\frac{3}{5} \times 7$

$= \frac{3 \times 7}{5} = \frac{21}{5} = 4\frac{1}{5}$

(iv) $20 \times \frac{3}{4}$

$= 5 \times 3 = 15$

(v) $\frac{9}{2} \times 10$

$= 9 \times 5 = 45.$

(vi) $17 \times \frac{4}{7}$

$= \frac{17 \times 4}{7} = \frac{68}{7} = 9\frac{5}{7}.$

2. (i) $\frac{4}{5}$ of 35

$= \frac{4}{5} \times 35$

$= 4 \times 7 = 28.$

(ii) $\frac{4}{5}$ of 60

$= \frac{4}{5} \times 60$

$= 4 \times 12 = 48.$

(iii) $\frac{4}{5}$ of 105

$= \frac{4}{5} \times 105 = 4 \times 21 = 84.$

3. (i) $\frac{1}{4}$ of an hour

$= \frac{1}{4} \times 60$ minute

$= 15$ minutes.

(ii) $\frac{2}{3}$ of a year

$= \frac{2}{3} \times 12$ months

$= 2 \times 4 = 8$ months.

(iii) $\frac{5}{6}$ of a day

$= \frac{5}{6} \times 24$ hr

$= 5 \times 4 = 20$ hours.

(iv) $\frac{3}{4}$ fo a rupee

$= \frac{3}{4} \times 100$ paise

$= 3 \times 25$ p $= 75$ paise

(v) $\frac{9}{14} \times 7$ days

$= \frac{9}{14} \times 7$ days

$= \frac{9}{2} = 4\frac{1}{2}$ days.

(vi) $\frac{2}{5}$ of a minute

$= \frac{2}{5} \times 60$ seconds

$= 2 \times 12 = 24$ seconds.

4. (i) $4 \times 8\frac{1}{8}$

(ii) $3 \times 5\frac{2}{7}$

$= 4 \times \frac{65}{8} = \frac{65}{2}$ $= 3 \times \frac{37}{7} = \frac{111}{7}$

$= 32\frac{1}{2}$. $= 15\frac{6}{7}$.

(iii) $9 \times 2\frac{4}{9}$

$= 9 \times \frac{22}{9} = 22$.

5. Total number of pages in book = 550

Preeti has read book = $\frac{4}{5}$ part of book

Thus, she read pages = $\frac{4}{5}$ of 550

$= \frac{4}{5} \times 550 = 440$

Hence, Preeti read 440 pages of the book.

6. Mohan covers the distance in 1 hour = $70\frac{1}{3}$ km

Thus, he cover the distance in 6 hours = $6 \times 70\frac{1}{3}$ km

$= 6 \times \frac{211}{3} = 2 \times 211\text{km} = 422$ km

Hence, Mohan covers a distance of 422 km in 6 hours by car.

7. Monthly income of Aman = ₹ 20,000

Thus, his monthly expenses = $\frac{4}{5}$ of ₹ 20,000

$= \frac{4}{5} \times$ ₹ 20,000

= ₹ 16,000

So, monthly saving = Income – expenses

= ₹ 20,000 – ₹ 16,000 = ₹ 4,000

Hence, Aman saves ₹ 4,000 every month.

8. Total number of students in a class = 50

(a) (i) The number of dram club = $\frac{1}{5}$ of $50 = \frac{1}{5} \times 50 = 10$ students.

(ii) The members of debating society = $\frac{1}{10}$ of $50 = \frac{1}{10} \times 50 = 5$ students.

(b) The member of mathematics and science club = 50 – 10 – 5

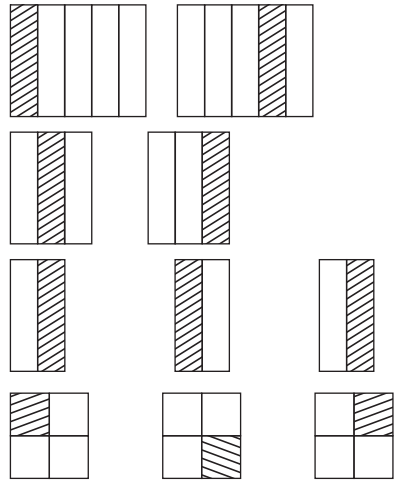
= 35 students.

Thus, fraction of the total number of students are the member of

mathematics or science club is $= \frac{35}{50} = \frac{7}{10}$.

9. (a) $2 \times \frac{1}{3}$ (b) $3 \times \frac{1}{2}$ (c) $2 \times \frac{1}{5}$ (d) $3 \times \frac{1}{4}$

(i) (ii) (iii) (iv)



Exercise 2.3

1. (i) $\frac{3}{4} \times 5\frac{2}{3}$

$= \frac{3}{4} \times \frac{17}{3} = \frac{3 \times 17}{4 \times 3}$

$= \frac{17}{4} = 4\frac{1}{4}$

(ii) $19\frac{1}{2} \times 1\frac{1}{4}$

$= \frac{39}{2} \times \frac{5}{4} = \frac{39 \times 5}{2 \times 4}$

$= \frac{195}{8} = 24\frac{3}{8}$

(iii) $\frac{13}{6} \times \frac{3}{26}$

$= \frac{13 \times 3}{6 \times 26} = \frac{1 \times 1}{2 \times 2} = \frac{1}{4}$.

(iv) $\frac{4}{5} \times \frac{12}{7}$

$= \frac{4 \times 12}{5 \times 7} = \frac{48}{35} = 1\frac{13}{35}$.

(v) $\frac{11}{12} \times \frac{144}{110}$

$= \frac{11 \times 144}{12 \times 110} = \frac{1 \times 12}{1 \times 10}$

$= \frac{12}{10} = 1\frac{1}{5}$.

(vi) $\frac{2}{5} \times 5\frac{1}{4}$

$= \frac{2}{5} \times \frac{21}{4} = \frac{2 \times 21}{5 \times 4}$

$= \frac{1 \times 21}{5 \times 2} = \frac{21}{10} = 2\frac{1}{10}$

(vii) $6\frac{2}{3} \times \frac{9}{5}$

$= \frac{20}{3} \times \frac{9}{5} = \frac{20 \times 9}{3 \times 5}$

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

(viii) $3\frac{4}{7} \times \frac{3}{5}$

$= \frac{25}{7} \times \frac{3}{5} = \frac{25 \times 3}{7 \times 5}$

$= \frac{5 \times 3}{7 \times 1} = \frac{15}{7} = 2\frac{1}{7}$.

2. (i) $\frac{1}{4}$ of $\frac{8}{35}$

$= \frac{1}{4} \times \frac{8}{35} = \frac{1 \times 8}{4 \times 35}$

$= \frac{1 \times 2}{1 \times 35} = \frac{2}{35}$.

(ii) $\frac{1}{4}$ of $\frac{16}{7}$

$= \frac{1}{4} \times \frac{16}{7} = \frac{1 \times 16}{4 \times 7}$

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

(iii) $\frac{1}{4}$ of $\frac{20}{3}$

$= \frac{1}{4} \times \frac{20}{3} = \frac{1 \times 20}{4 \times 3} = \frac{1 \times 5}{1 \times 3} = \frac{5}{3} = 1\frac{2}{3}$.

3. (i) $\frac{2}{3}$ of $\frac{9}{4} = \frac{2}{3} \times \frac{9}{4} = \frac{2 \times 9}{3 \times 4} = \frac{1 \times 3}{1 \times 2} = \frac{3}{2} = 1\frac{1}{2}$

(ii) $\frac{2}{3}$ of $\frac{6}{5} = \frac{2}{3} \times \frac{6}{5} = \frac{2 \times 6}{3 \times 5} = \frac{2 \times 2}{1 \times 5} = \frac{4}{5}$.

4. (i) $\frac{1}{3}$ of $\frac{3}{4}$ or $\frac{1}{2}$ of $\frac{4}{5}$

$\because$ $\frac{1}{3}$ of $\frac{3}{4}$ and $\frac{1}{2}$ of $\frac{4}{5}$

$\frac{1}{3} \times \frac{3}{4} = \frac{1}{4}$ $= \frac{1}{2} \times \frac{4}{5} = \frac{2}{5}$

$\because$ $\frac{1}{4}$

$= \frac{1 \times 5}{4 \times 5} = \frac{5}{20}$ and $\frac{2}{5} = \frac{2 \times 4}{5 \times 4} = \frac{8}{20}$

$\because$ $\frac{8}{20} > \frac{5}{20}$

Hence, $\frac{1}{2}$ of $\frac{4}{5}$ is greater.

(ii) $\frac{6}{7}$ of $\frac{49}{5}$ or $\frac{7}{8}$ of $\frac{48}{5}$

$\because$ $\frac{6}{7}$ of $\frac{49}{5}$ and $\frac{7}{8}$ of $\frac{48}{5}$

$= \frac{6}{7} \times \frac{49}{5} = \frac{6 \times 7}{5}$ $= \frac{7}{8} \times \frac{48}{5} = \frac{7 \times 6}{5}$

$= \frac{42}{5}$ $= \frac{42}{5}$

$\because$ $\frac{42}{5} = \frac{42}{5}$

Hence, $\frac{6}{7}$ of $\frac{49}{5}$ and $\frac{7}{8}$ of $\frac{48}{5}$ are equal.

5. Length of rectangular park $= 15\frac{1}{3}$ cm

Breadth of rectangular park $= 13\frac{1}{2}$ cm

Thus, Area of the rectangular park $= l \times b$

$$= 15\frac{1}{5}\text{ cm} \times 13\frac{1}{2}\text{ cm}$$

$$= \left(\frac{46}{3} \times \frac{27}{2}\right)\text{cm}^2 = 23 \times 9 = 207\,\text{cm}^2.$$

6. $\because$ Cost of 1 kg of tomatoes $= ₹\ 19\frac{1}{4}$

$\therefore$ Cost of $3\frac{1}{2}$ kg of tomatoes $= ₹\ 19\frac{1}{4} \times 3\frac{1}{2}$

$$= ₹\ \frac{77}{4} \times \frac{7}{2} = \frac{₹\ 539}{8} = ₹\ 67\frac{3}{8}.$$

7. Side of a square $= 13\frac{3}{4}$ m

So, Area of the square $=$ side $\times$ side

$$= 13\frac{3}{4}\text{ m} \times 13\frac{3}{4}\text{ m}$$

$$= \left(\frac{55}{4} \times \frac{55}{4}\right)\text{m}^2 = \frac{3025}{16}\text{ m}^2 = 189\frac{1}{16}\text{ m}^2.$$

8. Side of a equilateral triangle $= 7\frac{3}{8}$ cm

Thus, $\frac{1}{2}$ of the perimeter of triangle $= \frac{1}{2} \times 3 \times$ side $= \frac{1}{2} \times 3 \times 7\frac{3}{8}$ cm

$$= \frac{3}{2} \times \frac{59}{8}\text{ cm}$$

$$= \frac{177}{16}\text{ cm} = 11\frac{1}{16}\text{ cm}.$$

9. Neeru and Zara together had money $= ₹\ 2500$

$\because$ Neeru's share $= \frac{3}{5}$ of $₹\ 2500 = \frac{3}{5} \times ₹\ 2500 = ₹\ 1500$

Thus, Zara's share $= ₹\ 2500 - ₹\ 1500 = ₹\ 1000.$

10. Motorcycle run by using a litre of petrol $= 25$ km

Thus, the motorcyle run by using $3\frac{1}{5}$ litre of petrol $= 3\frac{1}{5} \times 25$ km

$$= \frac{16}{5} \times 25\,\text{km}$$

$$= 80\,\text{km}.$$

11. Leena reads a book everyday $= 1\frac{5}{7}$ hours

She read entire book = in one week

Thus, total hours she take to read the entire book $= 7 \times 1\frac{5}{7}$ hours

$= 7 \times \frac{12}{7} = 12$ hours.

12. Total number of students in a class = 50

Number of girls $= \frac{2}{5}$ of $50 = \frac{2}{5} \times 50 = 20$

Thus, number of boys $= 50 - 20 = 30$

Hence, there are 30 boys students in the class.

Exercise 2.4

1. (i) $16 \div \frac{4}{5}$

$= 16 \times \frac{5}{4} = 4 \times 5 = 20.$

(ii) $14 \div \frac{5}{6}$

$= 14 \times \frac{6}{5} = \frac{84}{5} = 16\frac{4}{5}.$

(iii) $21 \div \frac{3}{7}$

$= 21 \times \frac{7}{3} = 7 \times 7 = 49.$

(iv) $4 \div \frac{8}{3}$

$= 4 \times \frac{3}{8} = \frac{12}{8}$

(v) $4 \div 2\frac{1}{5}$

$= 4 \div \frac{11}{5} = 4\frac{5}{11}$

$= \frac{20}{11} = 1\frac{9}{11}.$

(vi) $12 \div 5\frac{4}{9}$

$= 12 \div \frac{49}{9} = \frac{12 \times 9}{49}$

$= \frac{108}{49} = 2\frac{10}{49}.$

2. (i) $\frac{4}{9} \div 5$

$= \frac{4}{9} \times \frac{1}{5} = \frac{4}{45}.$

(ii) $\frac{2}{15} \div 8$

$= \frac{2}{15} \times \frac{1}{8} = \frac{2}{120} = \frac{1}{60}.$

(iii) $3\frac{1}{2} \div 4$

$= \frac{7}{2} \times \frac{1}{4} = \frac{7}{8}$

(iv) $5\frac{3}{7} \div 14$

$= \frac{38}{7} \times \frac{1}{14} = \frac{19 \times 1}{7 \times 7} = \frac{19}{49}$

(v) $\frac{2}{3} \div 5$

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

(vi) $\frac{8}{19} \div 6$

$= \frac{8}{19} \times \frac{1}{6} = \frac{4 \times 1}{19 \times 3} = \frac{4}{57}.$

3. (i) $\frac{2}{3} \div \frac{1}{6}$

$= \frac{2}{3} \times \frac{6}{1} = \frac{12}{3} = 4.$

(ii) $\frac{3}{8} \div \frac{3}{4}$

$= \frac{3}{8} \times \frac{4}{3} = \frac{12}{24} = \frac{1}{2}.$

(iii) $2\frac{1}{3} \div \frac{3}{5}$

$= \frac{7}{3} \times \frac{5}{3}$

$= \frac{35}{9} = 3\frac{8}{9}.$

(iv) $5\frac{1}{2} \div 6\frac{1}{5}$

$= \frac{11}{2} \div \frac{31}{5} = \frac{17}{2} \times \frac{5}{31}$

$= \frac{55}{62}.$

(v) $\frac{4}{7} \div \frac{8}{9}$

$= \frac{4}{7} \times \frac{9}{8} = \frac{1 \times 9}{7 \times 2}$

$= \frac{9}{14}.$

(vi) $8\frac{1}{3} \div \frac{4}{37}$

$= \frac{25}{3} \times \frac{37}{4}$

$= \frac{925}{12} = 77\frac{1}{12}.$

(vii) $4\frac{3}{8} \div 2\frac{5}{6}$

$= \frac{35}{8} \div \frac{17}{6} = \frac{35}{8} \times \frac{6}{17}$

$= \frac{35 \times 3}{4 \times 17} = \frac{105}{68} = 1\frac{37}{68}.$

(viii) $\frac{3}{5} \div \frac{9}{4}$

$= \frac{3}{5} \times \frac{4}{9} = \frac{1 \times 4}{5 \times 3}$

$= \frac{4}{15}.$

4. Let, the other number be x.

Thus, $14\frac{1}{3} \times x = \frac{91}{6}$

$\frac{43}{3} \times x = \frac{91}{6}$

$x = \frac{91 \times 3}{6 \times 43}$

$x = \frac{91 \times 1}{2 \times 43} = \frac{91}{86} = 1\frac{5}{86}$

Hence, the required other number is $1\frac{5}{86}$.

5. Let, the required number be x.

Thus, $5\frac{5}{6} \times x = 3\frac{1}{3}$

$\frac{35}{6} \times x = \frac{10}{3}$

$x = \frac{10 \times 6}{3 \times 35} = \frac{2 \times 2}{1 \times 7} = \frac{4}{7}$

Hence, $5\frac{5}{6}$ multiply by $\frac{4}{7}$ to get $3\frac{1}{3}$.

6. The cost of $7\frac{1}{2}$ kg of apples = ₹ 600

Thus, the crt of 1 kg of apples of 1 kg of apples $= ₹\ 600 + 7\frac{1}{2}$

$= ₹\ 600 \div \frac{15}{2}$

$= ₹\ 600 \times \frac{2}{15} = ₹\ 80.$

7. Total length of rope $= 8\frac{1}{3}$ m

Total number of equal cutting piece of rope = 5.

Thus, length of each piece $= 8\frac{1}{3} \div 5\text{ m} = \frac{25}{3} \times \frac{1}{5}\text{ m} = \frac{5}{3} = 1\frac{2}{3}$ m.

8. Brought rice every week = 250 kg

Each student consumes rice per week $= \frac{5}{2}$ kg

Thus, total number of students in the hostel $= \frac{250}{5/2} = 100$

Hence, there are 100 students in the hostel.

Multiple Choice Questions

1. (i) **2.** (ii) **3.** (ii) **4.** (iii) **5.** (ii)

Mental Maths

1. $\frac{4}{-9}$ **2.** $\frac{-16}{-7}$ **3.** $\frac{-24}{20}$ **4.** $\frac{-24}{52}$ **5.** $\frac{7}{229}$

3 Rational Numbers

Exercise 3.1

1. There are $\frac{-4}{5}$ and $\frac{8}{-9}$ are rational numbers but no fractions.

2. (i) $-1 = \frac{-1}{1}$ (ii) $5 = \frac{5}{1}$

(iii) $0.10 = \frac{0.10 \times 10}{10} = \frac{1}{10}$ (iv) $-3 = \frac{-3}{1}$

3. (ii) $\frac{2}{7}$, (iii) $\frac{-3}{5}$ and (v) $\frac{-1}{-3}$ are positive rational numbers.

4. (i) $\frac{1}{7}$

$\because\ \frac{1}{7} = \frac{1\times 2}{7\times 2} = \frac{1\times 3}{7\times 3} = \frac{1\times 4}{7\times 4}$

$\therefore\ \frac{1}{7} = \frac{2}{14} = \frac{3}{21} = \frac{4}{28}$

So, $\frac{2}{14}, \frac{3}{21}, \frac{3}{21}$ and $\frac{4}{28}$ are three equivalent rational of $\frac{1}{7}$.

(iii) $\frac{-2}{3}$

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

$\therefore \frac{-2}{3} = \frac{-4}{6} = \frac{-6}{9} = \frac{-8}{12}$

So, $\frac{-4}{6}, \frac{-6}{9}$ and $\frac{-8}{12}$ are tree equivalent rational numbers of $\frac{-2}{3}$.

(iii) $\frac{-1}{-2}$

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

$\therefore \frac{-1}{-2} = \frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8}$

So, $\frac{2}{4}, \frac{3}{6}$ and $\frac{4}{8}$ are three equivalent rational numbers of $\frac{-1}{-2}$.

5. (i) $\frac{64}{-80}$

$= \frac{64}{-80} = \frac{64\div(-16)}{-80\div(-16)} = \frac{-4}{5}$

(ii) $\frac{-72}{-324}$

$= \frac{-72}{324} = \frac{-72\div(-36)}{-324\div(-36)} = \frac{2}{9}$.

(iii) $\frac{110}{-700}$

$= \frac{100}{-700} = \frac{100\div(100)}{-700\div(-100)} = \frac{-1}{7}$

6. (i) $\frac{-2}{3} = \frac{-2}{3}$

(ii) $\frac{-3}{-5} = \frac{3}{5}$

(iii) $\frac{-4}{-1} = \frac{4}{1}$

(iv) $\frac{5}{-7} = \frac{-5}{7}$

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

7. (i) $\because 20\div(-2) = -10$

$\therefore \frac{-2}{-5} = \frac{-2\times(-10)}{-5\times(-10)} = \frac{20}{50}$

(ii) $-36\div(-2) = 18$

$\therefore \frac{-2}{-5} = \frac{-2\times 18}{-5\times 18} = \frac{-36}{-90}$

(iii) 2

$\because 2\div(-1) = -1$

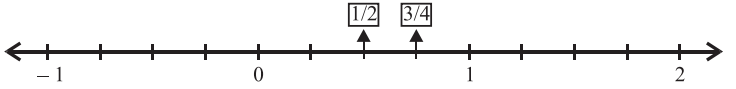
$\therefore \frac{-2}{-5} = \frac{-2\times(-1)}{-5\times(-1)} = \frac{2}{5}$.

8. (i) $\frac{2}{-3}=\frac{\mathbf{8}}{-12}=\frac{-10}{\mathbf{15}}$ (ii) $\frac{-28}{32}=\frac{7}{\mathbf{-8}}=\frac{56}{\mathbf{-64}}$

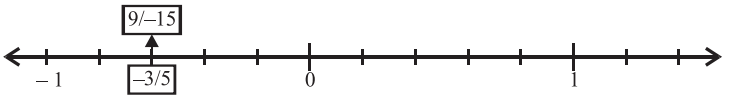
(iii) $\frac{-1}{-5}=\frac{20}{\mathbf{100}}=\frac{\mathbf{-10}}{-50}$

Exercise 3.2

1.



2.



3. $\frac{-2}{3}, \frac{5}{8}, \frac{2}{-5}$

$\because$ LCM of 3, 8 and 5

$= 2\times 2\times 2\times 3\times 5 = 120.$

2	3, 8, 5
2	3, 4, 5
2	3, 2, 5
3	3, 1, 5
5	1, 1, 5
	1, 1, 1

$\therefore \frac{-2}{3}=\frac{-2\times 40}{3\times 40}=\frac{-80}{120}, \frac{5}{8}=\frac{5\times 15}{8\times 15}=\frac{75}{120}$

and, $\frac{2}{-5}=\frac{2\times(-24)}{-5\times(-24)}=\frac{-48}{120}$

$\therefore \frac{-80}{120}<\frac{-48}{120}<\frac{75}{120}$

So, $\frac{-2}{3}<\frac{2}{-5}<\frac{5}{8}$ are in ascending order.

4. (i) $\frac{-3}{5}$ and $\frac{-2}{3}$

$\because \frac{-3}{5}=\frac{-3\times 3}{5\times 3}=\frac{-19}{15}$

and, $\frac{-2}{3}=\frac{-2\times 5}{3\times 5}=\frac{-10}{15}$

$\because \frac{-9}{15}>\frac{-10}{15}$

(ii) $\frac{7}{-3}$ and -2

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

and, $-2=\frac{-2\times 3}{3}=\frac{-6}{3}$

$\because \frac{-6}{3}>\frac{-7}{3}$

Hence, $\frac{-3}{5}$ is greater then $\frac{-2}{3}$. Hence, -2 is greater then $\frac{7}{-3}$.

5. (i) -2 and $\frac{-1}{2}$

$\because\ -2 = \frac{-2\times 2}{1\times 2} = \frac{-4}{2}$ and $\frac{-1}{2} = \frac{-1}{2}$

$\because\ \frac{-4}{2} < \frac{-1}{2}$

Hence, -2 is smaller than $\frac{-1}{2}$.

(ii) $\frac{-3}{5}$ and $\frac{5}{-6}$

$\because\ \frac{-3}{5} = \frac{-3\times 6}{5\times 6} = \frac{-18}{30}$

and, $\frac{5}{-6} = \frac{5\times(-5)}{(-6)\times(-5)} = \frac{-25}{30}$

$\because\ \frac{-25}{30} < \frac{-18}{30}$

Hence, $\frac{5}{-6}$ is smaller than $\frac{-3}{5}$.

6. (i) $\frac{1}{3}, -2, \frac{7}{-3}$

$\because\ \frac{1}{3} = \frac{1}{3}, \frac{-2}{1} = \frac{-2\times 3}{1\times 3} = \frac{-6}{3}$

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

$\because\ \frac{-7}{3} < \frac{-6}{3} < \frac{1}{3}$

So, $\frac{7}{-2} < -2 < \frac{1}{3}$ are in ascending order.

(ii) $0, \frac{-4}{5}, 4$

$\because\ 0 = \frac{0}{5}, \frac{-4}{5} = \frac{-4}{5}$ and $\frac{4}{1} = \frac{4\times 5}{1\times 5} = \frac{20}{5}$

$\because\ \frac{-4}{5}, \frac{0}{5} < \frac{20}{5}$

So, $\frac{-4}{5} < 0 < 4$ are in ascending order.

(iii) $\frac{-5}{8}, \frac{-1}{2}, \frac{-1}{3}$

$\because$ LCM of 8, 2 and 3 = 24

$\therefore \quad \frac{-5}{8} = \frac{-5\times 3}{8\times 3} = \frac{-15}{24}, = \frac{-1}{2} = \frac{-1\times 12}{2\times 12} = \frac{-12}{24}$

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

$\because \quad \frac{-15}{24} < \frac{-12}{24}, \frac{-8}{24}$

So, $\frac{-5}{8} < \frac{-1}{2} < \frac{1}{3}$ are in ascending order.

(iv) $\frac{-2}{7}, \frac{3}{-5}, \frac{2}{3}$

$\because$ LCM of 7, 5 and 3 = 105

$\therefore \quad \frac{-2}{7} = \frac{-2\times 15}{7\times 15} = \frac{-30}{105}, \frac{3}{-5} = \frac{3\times(-21)}{-5\times(-21)} = \frac{-63}{105}$

and, $\frac{2}{3} = \frac{2\times 35}{3\times 35} = \frac{70}{105}$

$\because \quad \frac{-63}{105} < \frac{-30}{105} < \frac{70}{105}$

So, $\frac{3}{-5} < \frac{-2}{7} < \frac{2}{3}$ are in ascending order.

7. (i) $\frac{1}{-2}, -3, 1$

$\because \quad \frac{1}{-2} = \frac{-1}{2}, -3 = \frac{-3\times 2}{1\times 2} = \frac{-6}{2}$

and, $1 = \frac{1\times 2}{1\times 2} = \frac{2}{2}$

$\because \quad \frac{2}{2} > \frac{-1}{2} > \frac{-6}{2}$

So, $1 > \frac{1}{-2} > -3$ are in descending order.

(ii) $\frac{-3}{5}, \frac{5}{-6}, \frac{1}{2}$

$\because$ LCM of 5, 6 and 2 = 30

$\therefore \quad \frac{-3}{5} = \frac{-3\times 6}{5\times 6} = \frac{-18}{30}, \frac{5}{-6} = \frac{5\times(-5)}{-6\times(-5)} = \frac{-25}{30}$

and, $\frac{1}{2} = \frac{1\times 18}{2\times 15} = \frac{15}{30}$

$\because \quad \frac{15}{30} > \frac{-18}{30} > \frac{-25}{30}$

So, $\frac{1}{2} > \frac{-3}{5} > \frac{5}{-6}$ are in descending order.

(iii) $\frac{9}{-13}, \frac{9}{-12}, \frac{9}{4}$

$\because$ LCM of 13, 12 and 4 = 156

$\therefore \frac{9}{-13} = \frac{9\times(-12)}{-13\times(-12)} = \frac{-108}{156}, \frac{9}{-12} = \frac{9\times(-13)}{-12\times(-13)} = \frac{-117}{156}$

and, $\frac{9}{4} = \frac{9\times 39}{4\times 39} = \frac{351}{156}$

$\because \frac{351}{156} > \frac{-108}{156} > \frac{-117}{156}$

So, $\frac{9}{4} > \frac{9}{-13} > \frac{9}{-12}$ are in descending order.

(iv) $0, \frac{-5}{9}, 6$

$\because \frac{-5}{9} < 0 < 6$

So, $6 > 0 > \frac{-5}{9}$ are in descending order.

8. $\because \frac{3}{7} = \frac{3\times 11}{7\times 11} = \frac{33}{77}$

and, $\frac{4}{7} = \frac{4\times 11}{7\times 11} = \frac{44}{77}$

$\because \frac{33}{77} < \frac{34}{77} < \frac{35}{77}, \frac{36}{77} < \ldots\ldots \frac{43}{77} < \frac{44}{77}$

Hence, $\frac{34}{77}, \frac{35}{77}, \frac{36}{77}, \frac{37}{77}, \frac{38}{77}, \frac{39}{77}, \frac{40}{77}, \frac{41}{77}, \frac{42}{77}$ and $\frac{43}{77}$ are ten rational number between $\frac{3}{7}$ and $\frac{4}{7}$.

9. $\because -3 = \frac{-3\times 6}{1\times 6} = \frac{-18}{6}$

and, $-4 = \frac{-4\times 6}{1\times 6} = \frac{-24}{6}$

$\because \frac{-24}{6} < \frac{-23}{6} < \frac{-22}{6} < \frac{-21}{6} < \frac{-20}{6} < \frac{-19}{6} < \frac{-18}{6}$

Hence, $\frac{-23}{6}, \frac{-22}{6}, \frac{-21}{6}, \frac{-20}{6}$, and $\frac{-19}{6}$ are five rational numbers between -3 and -4.

10. Fill in the blanks :

(i) $\frac{3}{-7} < \frac{-2}{5}$ (ii) $\frac{1}{2} > \frac{1}{3}$ (iii) $\frac{-1}{4} < \frac{-1}{5}$ (iv) $\frac{5}{6} > \frac{3}{5}$

(v) $\frac{14}{9} < \frac{7}{3}$ (vi) $\frac{3}{7} < \frac{5}{9}$ (vii) $\frac{-4}{7} > \frac{-5}{8}$ (viii) $\frac{-3}{8} < \frac{4}{5}$

(ix) $\frac{-5}{7} > \frac{-6}{8}$ (x) $\frac{-3}{9} < \frac{4}{7}$ (xi) $\frac{-5}{9} < \frac{-6}{11}$ (xii) $\frac{-2}{4} < \frac{4}{7}$

Exercise 3.3

1. (i) The additive inverse $\frac{2}{-3}$ is $-\left(\frac{-2}{3}\right) = \frac{2}{3}$.

(ii) The additive inverse of $\frac{-1}{-2}$ is $-\left(\frac{-1}{-2}\right) = \frac{-1}{2}$.

(iii) The additive inverse of $\frac{-1}{5}$ is $-\left(\frac{-1}{5}\right) = \frac{1}{5}$.

(iv) The additive inverse of $\frac{3}{5}$ is $\frac{-3}{5}$.

(v) The additive inverse of $\left(\frac{1}{2} - \frac{1}{3}\right)$ is $-\left(\frac{1}{2} - \frac{1}{3}\right)$

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

(vi) The additive inverse of $\left(\frac{1}{4} + \frac{1}{5}\right)$ is $-\left(\frac{1}{4} + \frac{1}{5}\right) = -\left(\frac{5+4}{20}\right) = \frac{-9}{20}$.

2. Let, he required number be x.

Thus, $\frac{-2}{7} + x = \frac{1}{5}$

$x = \frac{1}{5} + \frac{2}{7}$

$x = \frac{7+10}{35} = \frac{17}{35}$

Hence, $\frac{17}{35}$ added to $\frac{-2}{7}$ to get $\frac{1}{5}$.

3. Let, the requried number be x.

Thus, $\frac{3}{7} - x = \frac{1}{3}$

$\frac{3}{7} - \frac{1}{3} = x$

$\frac{9-7}{21} = x$

$x = \frac{2}{21}$

Hence, $\frac{2}{21}$ subtracted form $\frac{3}{7}$ to get $\frac{1}{3}$.

4. Let, the required number be x.

Thus, $\frac{4}{-5} + x = 0$

$x = 0 - \left(\frac{4}{-5}\right)$

$x = \frac{4}{5}$

Hence, $\frac{4}{5}$ added to $\frac{4}{-5}$ to gelt 0.

5. Let, the required number be x.

Thus, $\frac{6}{11} - x = 0$

$\frac{6}{11} = 0 + x$

$x = \frac{6}{11}$

Hence, $\frac{6}{11}$ subtracted from $\frac{6}{11}$ to get 0.

6. (i) $\frac{1}{3}$ and $\frac{2}{-3}$

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

$= \frac{1}{3} - \frac{2}{5} = \frac{5-6}{15}$

$= \frac{-1}{15}$.

(ii) $\frac{-2}{5}$ and $\frac{7}{3}$

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

$= \frac{-6+35}{15} = \frac{29}{15}$

or, $1\frac{14}{15}$.

(iii) $\frac{-11}{15}$ and $\frac{9}{-5}$

$= \frac{-11}{15} + \left(\frac{-9}{5}\right) = \frac{-11}{15} - \frac{9}{5}$

$= \frac{-11-27}{15} = \frac{-38}{15} = -2\frac{8}{15}$

(iv) $\frac{-2}{-9}$ and 1

$= \frac{-2}{-9} + 1 = \frac{2}{9} + 1$

$= \frac{2+9}{9} = \frac{11}{9} = 1\frac{2}{9}$.

7. Subtract :

(i) $\frac{4}{11}$ from $\frac{-1}{2}$

$= \frac{-1}{2} - \frac{4}{11} = \frac{-11-8}{22} = \frac{-19}{22}$.

(ii) $\frac{3}{5}$ from $\frac{-3}{5}$

$= \frac{-3}{5} - \frac{3}{5} = \frac{-3-5}{5} = \frac{-6}{5} = -1\frac{1}{5}$.

(iii) $\frac{-11}{15}$ from 2

$= 2 - \left(\frac{-11}{15}\right) = 2 + \frac{11}{15}$

(iv) 6 from $\frac{-1}{3}$

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

$= \frac{30+11}{15} = \frac{41}{15} = 2\frac{11}{15}.$

$= \frac{-19}{3} = -6\frac{1}{3}.$

8. Evaluate :

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

$= \frac{-1\times 10 + 1\times 15 + 1\times 6}{30}$

$= \frac{-10+15+6}{30} = \frac{11}{30}.$

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

$= \frac{2\times 4 - 3\times 3 - 1\times 6}{12}$

$= \frac{8-9-6}{12} = \frac{-7}{12}.$

(iii) $\frac{1}{5} + \frac{1}{6} - \frac{3}{10}$

$= \frac{1\times 6 + 1\times 5 - 3\times 3}{30}$

$= \frac{6+5-9}{30} = \frac{2}{30} = \frac{1}{15}.$

(iv) $\frac{3}{8} - \frac{4}{9} - \frac{5}{12}$

$= \frac{3\times 9 - 4\times 8 - 5\times 6}{72}$

$= \frac{27-32-30}{72} = \frac{-35}{72}.$

Exercise 3.4

1. (i) The reciprocal of $\frac{-3}{2}$ is $\frac{-2}{3}$.

(ii) The reciprocal of $\frac{1}{-4}$ is -4.

(iii) The reciprocal of $\frac{-5}{-3}$ is $\frac{3}{5}$.

(iv) The reciprocal of $\frac{-2}{5}$ is $\frac{-5}{2}$.

(v) The reciprocal of $\frac{1}{6}$ is 6.

(vi) The reciprocal of $\frac{13}{-15}$ is $\frac{-15}{13}$.

(vii) The reciprocal of -1 is -1.

(viii) The reciprocal of 1 is 1.

(ix) The reciprocal of 0 is ∞ (undefined).

(x) The reciprocal of $\frac{15}{17}$ is $\frac{17}{15}$.

(xi) The reciprocal of 4 is $\frac{1}{4}$.

(xii) The reciprocal of 9 is $\frac{1}{9}$.

2. Evaluate :

(i) $\frac{3}{5} \times \frac{-4}{7} \times \frac{1}{-2}$

$= \frac{-(3\times 4\times 1)}{-(5\times 7\times 2)} = \frac{12}{70} = \frac{6}{35}$

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

$= \frac{-(1\times 3\times 2)}{3\times 5\times 3} = \frac{-6}{45} = \frac{-2}{15}.$

(iii) $\frac{3}{5} \times \frac{1}{4} \times \frac{2}{-7}$

$= \frac{3\times 1\times 2}{-(5\times 4\times 7)} = \frac{6}{-140} = \frac{-3}{70}.$

3. Simplify :

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

(ii) $\frac{1}{3} \times \left(\frac{11}{12} - \frac{1}{6}\right)$

$= \frac{1}{5} \times \left(\frac{3+2}{4}\right)$ $= \frac{1}{3} \times \left(\frac{11-2}{12}\right)$

$= \frac{1}{5} \times \frac{5}{4} = \frac{1}{4}.$ $= \frac{1}{3} \times \frac{9}{12} = \frac{9}{36} = \frac{1}{4}.$

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

L.H.S. $= \frac{2}{5} \times \left(\frac{1}{2} - \frac{1}{3} - \frac{1}{4}\right) = \frac{2}{5} \times \left(\frac{6-4-3}{12}\right)$

$= \frac{2}{5} \times \left(\frac{-1}{12}\right) = \frac{-2}{60} = \frac{-1}{30}$

R.H.S. $= \frac{2}{5} \times \frac{1}{2} - \frac{2}{5} \times \frac{1}{3} - \frac{2}{5} \times \frac{1}{4} = \frac{2}{10} - \frac{2}{15} - \frac{2}{20}$

$= \frac{2 \times 6 - 2 \times 4 - 2 \times 3}{60}$

$= \frac{12 - 8 - 6}{60} = \frac{-2}{60} = \frac{-1}{30}$

So, L.H.S. = R.H.S. Verify

(ii) $\frac{3}{5} \times \left(\frac{7}{8} + \frac{1}{4}\right) = \frac{3}{5} \times \frac{7}{8} + \frac{3}{5} \times \frac{1}{4}$

L.H.S. $= \frac{3}{5} \times \left(\frac{7}{8} + \frac{1}{4}\right) = \frac{3}{5} \times \left(\frac{7+2}{8}\right) = \frac{3}{5} \times \frac{9}{8} = \frac{27}{40}.$

R.H.S. $= \frac{3}{5} \times \frac{7}{8} + \frac{3}{5} \times \frac{1}{4} = \frac{21}{40} + \frac{3}{20}$

$= \frac{21+6}{40} = \frac{27}{40}$

So, L.H.S. = R.H.S. **Verify.**

6. (i) $\frac{7}{8} \times \left(\frac{4}{5} - \frac{2}{3}\right) + \frac{5}{3} \times \frac{7}{8}$

$= \frac{7}{8} \times \left(\frac{12-10}{15}\right) + \frac{35}{24}$

$= \frac{7}{8} \times \frac{2}{15} + \frac{35}{24}$

$= \frac{7}{60} + \frac{35}{24} = \frac{7 \times 2 + 35 \times 5}{120}$

$= \frac{14 + 175}{120} = \frac{189}{120} = \frac{63}{40} = 1\frac{23}{40}.$

(ii) $\frac{3}{4} \times \frac{5}{6} - \frac{1}{2} \times \frac{1}{3}$

$= \frac{15}{24} - \frac{1}{6} = \frac{15-4}{24} = \frac{11}{24}.$

(iii) $\frac{5}{6}\times\frac{1}{2}+\frac{1}{3}$

$=\frac{5}{12}+\frac{1}{3}=\frac{5+4}{12}=\frac{9}{12}=\frac{3}{4}.$

7. If $a=2, b=-3, c=1$ and $d=5$

(i) $\frac{a}{b}-c$

Put the value of a, b and c :

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

(ii) $a-\frac{b}{c}-\frac{a}{d}$

Put the value of a, b, c and d :

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

$=5-\frac{1}{5}=\frac{25-1}{5}=\frac{24}{5}=4\frac{4}{5}.$

(iii) $\frac{a}{b}\times\frac{c}{d}$

Put the value of a, b, c and d :

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

(iv) $a\times\left(\frac{b}{c}-\frac{c}{d}\right)$

$=2\times\left[\frac{-3}{1}-\frac{1}{5}\right]=2\times\left[\frac{-15-1}{5}\right]$

$=2\times\left(\frac{-16}{5}\right)=\frac{-32}{5}=-6\frac{2}{3}$

(v) $\frac{a}{b}\times\frac{b}{c}\times\frac{c}{d}\times\frac{d}{a}$

Put the value of a, b, c and d :

$\frac{2}{-3}\times\frac{-3}{1}\times\frac{1}{5}\times\frac{5}{2}=1\times1\times1\times1=1.$

(vi) $\frac{a}{b}\times\frac{b}{a}+\frac{c}{d}\times\frac{d}{c}$

$=1\times1+1\times1=1+1=2.$

(vii) $\frac{c}{d}\times\frac{d}{c}+\frac{b}{c}\times\frac{c}{b}$

$=1\times1+1\times1=1+1=2.$

8. Let, the required number be x.

Thus, $\frac{-15}{28} \times x = \frac{-5}{7}$

$x = \frac{-5}{7} \times \frac{28}{-15}$

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

Hence, we multiply $\frac{-15}{28}$ by $1\frac{1}{3}$ so that the product be $\frac{-5}{7}$.

9. Let, the other number be x.

Thus, $\frac{-4}{15} \times x = \frac{-8}{9}$

$x = \frac{-8}{9} \times \frac{-15}{4}$

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

Hence, the other number is $3\frac{1}{3}$.

Exercise 3.5

1. Simplify :

(i) $\frac{-5}{13} \div \frac{3}{13}$

$= \frac{-5}{13} \times \frac{13}{3} = \frac{-5}{3} = -1\frac{2}{3}$

(ii) $\frac{1}{2} \div \frac{-3}{4}$

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

(iii) $\frac{25}{-30} \div \frac{-5}{6}$

$= \frac{25}{-30} \times \frac{6}{-5} = \frac{5}{5} = 1$

(iv) $10 \div \frac{-1}{2}$

$= 10 \times (-2) = -20$

(v) $-15 \div \frac{1}{-3}$

$= -15 \times (-3) = +45$

(vi) $35 \div \frac{-7}{8}$

$= 35 \times \frac{8}{-7} = -5 \times 8 = -40$

2. Let the other number be x.

Thus, $\frac{-3}{4} \times x = -5$

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

Hence, the other number is $6\frac{2}{3}$.

3. Let, the required number be x.

Thus, $\frac{7}{-9} \div x = -3$

$$\frac{7}{-9} \times \frac{1}{x} = -3$$

$$\frac{7}{-9} \times \frac{1}{-3} = x$$

$$x = \frac{7}{27}$$

Hence, $\frac{7}{-9}$ devided by $\frac{7}{27}$ to get -3 as quotient.

4. $\because$ Product of $\frac{4}{5}$ and $m = \frac{7}{8}$

$\therefore$ $\frac{4}{5} \times m = \frac{7}{8}$

$$m = \frac{7 \times 5}{8 \times 4}$$

$$m = \frac{35}{32} = 1\frac{3}{2}$$

Hence, the value of m is $1\frac{3}{32}$.

5. Let, the required number be x.

Thus, $\frac{3}{5} \times x = \frac{5}{6}$

$$x = \frac{5 \times 5}{6 \times 3} = \frac{28}{18}$$

$$x = 1\frac{7}{18}$$

Hence, $\frac{3}{5}$ multiplied by $1\frac{7}{18}$ to get $\frac{5}{7}$.

6. Let, the other number be x.

Thus, $\frac{11}{13} \times x = -1$

$$x = \frac{-1 \times 13}{11}$$

$$x = \frac{-13}{11}$$

Hence, the other number be $\frac{-13}{11}$.

7. If $\frac{15}{20} \div x = \frac{3}{2}$

Then,

$$\frac{15}{20} \times \frac{1}{x} = \frac{3}{2}$$

$\frac{15}{20} \times \frac{2}{3} = x$

$x = \frac{5}{10} = \frac{1}{2}$

So, the value of x is $\frac{1}{2}$.

8. (i) The absolute value of -3 is $|-3| = 3$.

(ii) The absolute value of $\frac{4}{-5}$ is $\left|\frac{-4}{5}\right| = \frac{4}{5}$.

(iii) The absolute value of -1 is $|-1| = 1$.

(iv) The absolute value of $\frac{-11}{-12}$ is $\left|\frac{-11}{-12}\right| = \frac{11}{12}$.

9. Evaluate :

(i) $\left|\frac{1}{2} - \frac{2}{3}\right|$

$= \left|\frac{3-4}{6}\right| = \left|\frac{-1}{6}\right| = \frac{1}{6}$.

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

$= \frac{2}{5} \times \left|\frac{-4+5}{20}\right|$

(iii) $\left(\frac{-1}{4}\right) \times \left|\frac{-1}{4}\right|$

$= \left(\frac{-1}{4}\right) \times \frac{1}{4} = \frac{-1}{16}$

(iv) $\left|\frac{3}{5} + \frac{1}{2}\right| - 2$

$= \left|\frac{6+5}{10}\right| - 2$

$= \frac{11}{10} - 2 = \frac{11-20}{10} = \frac{-9}{10}$

(v) $\left|\left(\frac{-7}{9}\right) + \frac{7}{9}\right|$

$= \left|\frac{-7}{9} + \frac{7}{9}\right| = |0| = 0$

(vi) $-\left|\frac{1}{2} - \frac{3}{4}\right|$

$= -\left|\frac{2-3}{4}\right| = -\left|\frac{-1}{4}\right| = \frac{1}{4}$.

10. If, $x + \frac{1}{3}$ and $y = \frac{-1}{4}$

Then, $|x - y| = \left|\frac{1}{3} - \left(-\frac{1}{4}\right)\right|$

$= \left|\frac{1}{3} + \frac{1}{4}\right| = \left|\frac{4+3}{12}\right|$

$= \left|\frac{7}{12}\right| = \frac{7}{12}$.

and,

$|x| - |y| = \left|\frac{1}{3}\right| - \left|\frac{-1}{4}\right|$

$= \frac{1}{3} - \frac{1}{4} = \frac{4-3}{12} = \frac{1}{12}.$

$\because \quad \frac{7}{12} > \frac{1}{12}$

Hence, $|x - y| > |x| - |y|$ **Proved.**

11. If, $x = \frac{2}{5}$ and $y = \frac{-1}{6}$

Then, $|x \times y| = \left|\frac{2}{5} \times \left(\frac{-1}{6}\right)\right|$

$= \left|\frac{-2}{30}\right| = \frac{2}{30} = \frac{1}{15}.$

and, $|x| \times |y| = \left|\frac{2}{5}\right| \times \left|\frac{-1}{6}\right|$

$= \frac{2}{5} \times \frac{1}{6}$

$= \frac{2}{30}$

$= \frac{1}{15}$

$\because$ L.H.S. = R.H.S.

Hence, $|x \times y| = |x| \times |y|$ **Proved.**

12. Fill in the boxes :

(i) $\frac{-15}{17} \div 1 = \mathbf{\frac{-15}{17}}$ (ii) $-1 \div \mathbf{\frac{-4}{3}} = \frac{3}{4}$

(iii) $\left|\left(\frac{-3}{4}\right) + \frac{3}{4}\right| = \mathbf{0}$ (iv) $\mathbf{0} \div \frac{7}{9} = 0$

(v) $\frac{3}{5} \times \mathbf{\frac{-5}{3}} = -1$ (vi) $\frac{4}{5} \times \mathbf{0} = 0$

(vii) $|-1| = \mathbf{1}$ (viii) $\frac{1}{2} \times \mathbf{-1} = \frac{-1}{2}$

(ix) $|1| + |-1| = \mathbf{2}$ (x) $-|1| + |1| = \mathbf{0}$

(xi) $\left|\frac{5}{7} + \left(\frac{-5}{7}\right)\right| = \mathbf{0}$ (xii) $\left|\frac{-3}{4} + \left(\frac{-3}{4}\right)\right| = \mathbf{\frac{3}{2}}$

Multiple Choice Questions

1. (iii) **2.** (ii) **3.** (iv) **4.** (i) **5.** (ii)

Mental Exercise

1. $0 \times \frac{8}{5} = 0$ **2.** 1 **3.** -1 **4.** $\frac{-5}{3}$ **5.** Number itself

4 Decimals

Exercise 4.1

1. (i) 0.9×6

$= \frac{9}{10} \times 6 = \frac{54}{10} = 5.4$

(ii) 23×6.5

$= 23 \times \frac{65}{10} = \frac{1495}{10} = 149.5$

(iii) 8.71×19

$= \frac{871}{100} \times 10 = \frac{16,549}{100}$

$= 165.49$

(iv) 58.10×10

$= \frac{5810}{100} \times 10$

$= 58$

(v) 8×0.375

$= 8 \times \frac{375}{1000}$

$= \frac{3000}{1000} = 3$

(vi) 405.07×4

$= \frac{40507}{100} \times 4$

$= \frac{162028}{100} = 1620.28$

2. (i) 0.8×0.9

$= \frac{18}{10} \times \frac{9}{10}$

$= \frac{72}{100} = 0.72$

(ii) 0.4×2.5

$= \frac{4}{10} \times \frac{25}{10}$

$= \frac{100}{100} = 1$

(iii) 0.4×0.04

$= \frac{4}{4} \times \frac{4}{100}$

$= \frac{16}{1000} = 0.016$

(iv) 12.3×0.15

$= \frac{123}{10} \times \frac{15}{100}$

$= \frac{1845}{1000} = 1.845$

(v) 700.07×7.7

$= \frac{70007}{100} \times \frac{77}{10}$

$= \frac{5390539}{1000} = 5390.539$

(vi) 100.01×1.1

$= \frac{10001}{100} \times \frac{11}{10}$

$= \frac{110011}{1000} = 1110.011$

(vii) 0.3×416.8

$= \frac{3}{10} \times \frac{4168}{10}$

$= \frac{12504}{100} = 125.04$

(viii) 1.5×5.1

$= \frac{15}{10} \times \frac{51}{10}$

$= \frac{765}{100} = 7.65$

(ix) 20.05×2.05

$= \frac{2005}{100} \times \frac{205}{100}$

$= \frac{411025}{10000} = 41.1025$

3. (i) 2.5×10

$= \frac{25}{10} \times 10 = 25$

(ii) 3.57×10

$= \frac{357}{100} \times 10 = 35.7$

(iii) 637.1×10

$= \frac{6371}{10} \times 10 = 6371$

(iv) 2.397×100

$= \frac{2397}{1000} \times 100$

(v) 156.1×100

$= \frac{1562}{10} \times 100 = 15610$

(vi) 57.08×100

$= \frac{5708}{100} \times 100 = 5708$

(vii) 0.05×1000

$= \frac{5}{100} \times 1000 = 50$

(viii) 25.02×1000

$= \frac{2502}{100} \times 1000 = 25020$

(ix) 0.2571×1000

$= \frac{2571}{10000} \times 1000 = \frac{2571}{10} = 257.1$

4. (i) $0.4 \times 0.4 \times 0.04$

$= \frac{4}{10} \times \frac{4}{10} \times \frac{4}{100}$

$= \frac{64}{10000} = 0.0064$

(ii) $0.1 \times 0.01 \times 0.001$

$= \frac{1}{10} \times \frac{1}{100} \times \frac{1}{10000}$

$= \frac{1}{10000000} = 0.0000001$

(iii) $2.5 \times 0.25 \times 5$

$= \frac{25}{10} \times \frac{25}{100} \times 5$

$= \frac{3125}{1000} = 3.125$

(iv) $0.8 \times 3.5 \times 0.05$

$= \frac{8}{10} \times \frac{35}{10} \times \frac{5}{100}$

$= \frac{1400}{10000} = 0.14$

5. Length of rectangle $= 6.7$ m

Breadth of rectangle $= 4.5$ m

So, the area of rectangle $=$ length $\times$ breadth

$= 6.7 \text{ m} \times 4.5 \text{ m}$

$= \left(\frac{67}{10} \times \frac{45}{10}\right) \text{m}^2$

$= \frac{3015}{100} = 30.15 \text{ m}^2.$

6. (i) Each side of square $= 2.5$ cm

Thus, area of square $=$ side $\times$ side

$= 2.5 \text{ cm} \times 2.5 \text{ cm}$

$= \left(\frac{25}{10} \times \frac{25}{10}\right) \text{cm}^2$

$= \frac{625}{100} = 6.25 \text{ cm}^2.$

(ii) Each side of square $= 3.4$ cm

Thus, area of square $= \text{side} \times \text{side}$

$= 3.4 \text{ cm} \times 3.4 \text{ cm}$

$= \left(\frac{34}{10} \times \frac{34}{10}\right) \text{cm}^2$

$= \frac{1156}{100} = 11.56 \text{ cm}^2$

7. Each side of equilateral triangle $= 3.8$ cm

Thus, Perimeter of triangle $= 3 \times \text{side}$

$= 3 \times 3.8 \text{ cm}$

$= 11.4 \text{ cm}$

8. Distance cover by car in 1 litre of petrol $= 19.5$ km

Thus, distance cover by car in 20 litre of petrol $= 20 \times 19.5$ km

$= 390$ km

9. $\because$ Cost of 1 metre of ribbon $= ₹\ 18.75$

$\therefore$ Cost of 7.5 metre of ribbon $= ₹\ 18.75 \times 7.5$

$= ₹\ 140.625$

10. $\because$ Cost of 1 kg of apples $= ₹\ 64.50$

$\therefore$ Cost of 10.5 kg of apples $= ₹\ 64.50 \times 10.5$

$= ₹\ 377.25$

Exercise 4.2

1. Find :

(i) $6.7 \div 10$

$= \frac{67}{10} \times \frac{1}{10}$

$= \frac{67}{100} = 0.67$

(ii) $65.7 \div 100$

$= \frac{657}{10} \times \frac{1}{100}$

$= \frac{657}{1000} = 0.657$

(iii) $561 \div 100$

$= 561 \times \frac{1}{100} = 5.61$

(iv) $97.42 \div 1000$

$= \frac{9742}{100} = \frac{1}{1000}$

$= \frac{9742}{100} \times 0.09742$

(v) $6.36 \div 1000$

$= \frac{636}{100} \times \frac{1}{1000}$

$= \frac{636}{100000} = 0.00636$

(vi) $0.7 \div 1000$

$= \frac{7}{10} \times \frac{1}{1000}$

$= \frac{7}{10000} = 0.0007$

(vii) $0.082 \div 100$

$= \frac{82}{1000} \times \frac{1}{100}$

$= \frac{82}{100000} = 0.00082$

(viii) $528.6 \div 1000$

$= \frac{5286}{10} \times \frac{1}{1000}$

$= \frac{5286}{10000} = 0.5286$

(ix) $0.5 \div 1000$

$= \frac{5}{10} \times \frac{1}{100} = \frac{1}{10000} = 0.0005$

2. Find :

(i) $9.6 \div 4$

$= \frac{96}{10} \times \frac{1}{4} = \frac{24}{10} = 2.4$

(ii) $5.72 \div 2$

$= \frac{572}{100} \times \frac{1}{2} = \frac{286}{100} = 2.86$

(iii) $1.53 \div 9$

$= \frac{153}{100} \times \frac{1}{9}$

$= \frac{17}{100} = 0.17$

(iv) $0.90 \div 15$

$= \frac{90}{100} \times \frac{1}{15}$

$= \frac{6}{100} = 0.06$

(v) $43.2 \div 6$

$= \frac{432}{10} \times \frac{1}{6}$

$= \frac{72}{10} = 7.2$

(vi) $117.6 \div 21$

$= \frac{1176}{10} \times \frac{1}{21}$

$= \frac{56}{10} = 5.6$

(vii) $5.080 \div 8$

$= \frac{5080}{1000} \times \frac{1}{8}$

$= \frac{635}{1000} = 0.635$

(viii) $8.28 \div 9$

$= \frac{828}{100} \times \frac{1}{9}$

$= \frac{92}{100} = 0.92$

(ix) $3.468 \div 24$

$= \frac{3468}{1000} \times \frac{1}{24}$

$= \frac{144.5}{1000} = 0.1445$

3. Find :

(i) $8 \div 0.4$

$= 8 \div \frac{4}{10} = 8 \times \frac{10}{4}$

$= 2 \times 10 = 20$

(ii) $95 \div 0.2$

$= 95 \div \frac{2}{10} = 95 \times \frac{10}{2}$

$= \frac{950}{2} = 475$

(iii) $3.28 \div 0.8$

$= \frac{328}{100} \div \frac{8}{10} = \frac{328}{100} \times \frac{10}{8}$

$= \frac{41}{10} = 4.1$

(iv) $16.9 \div 13$

$= \frac{169}{10} \times \frac{1}{13}$

$= \frac{13}{10} = 1.3$

(v) $2.25 \div 0.15$

$= \frac{225}{100} \div \frac{15}{100}$

(vi) $30.94 \div 0.7$

$= \frac{3094}{100} \div \frac{7}{10}$

$$= \frac{225}{100} \times \frac{100}{15}$$

$$= \frac{225}{15} = 15$$

(vii) $4.03 \div 1.3$

$$= \frac{403}{100} \div \frac{13}{10}$$

$$= \frac{403}{100} \times \frac{10}{13}$$

$$= \frac{31}{10} = 3.1$$

(viii) $6.82 \div 0.22$

$$= \frac{682}{100} \div \frac{22}{100}$$

$$= \frac{682}{100} \times \frac{100}{22}$$

$$= \frac{682}{22} = 31$$

(ix) $0.5 \div 0.25$

$$= \frac{5}{10} \div \frac{25}{100}$$

$$= \frac{5}{10} \times \frac{100}{25} = \frac{10}{5} = 2$$

4. Let, the other decimal number be x.

Thus, $0.74 \times x = 5.92$

$$x = \frac{5.92}{0.74} = \frac{592}{74}$$

$$x = 8.0$$

Hence, the other decimal number is 8.0.

5. Each side of a regular polygon = 8.1 cm

And, Perimeter of the Polygon = 72.9 cm

Thus, Number of sides $= \dfrac{\text{Perimeter of regular polygon}}{\text{Each side of regular polygon}}$

$$= \frac{72.9\,\text{cm}}{8.1\,\text{cm}} = 9$$

Hence, the number of sides of regular polygon is 9.

6. Distance cover by vehicle in 1.1 litre of petrol = 16.5 km

Thus, Distance cover by vehicle in 1 litre of petrol = $6.5 \div 1.1$ km

$$= \frac{16.5}{1.1} = \frac{165}{11} = 15\,\text{km}.$$

7. $\because$ Cost of 25 pens = ₹ 337.50

$\therefore$ Cost of 1 pen $= \dfrac{₹\ 33750}{25} = 13.50$

8. Weight of 12 bags of potatoes = 784 kg 320 g

Thus, weight of 1 bag of potatoes $= \dfrac{784.320}{12}$ kg = 65.360 kg

Hence, the weight of each bag of tomatoes is 65 kg 360 g.

Multiple Choice Questions

1. (iii) **2.** (iii) **3.** (ii) ₹ 0.05 **4.** (iv) **5.** (i) **6.** (i)

5 Exponents

Exercise 5.1

1. (i) $\left(\frac{-1}{2}\right)\times\left(\frac{-1}{2}\right)\times\left(\frac{-1}{2}\right)\times\left(\frac{-1}{2}\right)=\left(\frac{-1}{2}\right)^4$

(ii) $\left(\frac{2}{3}\right)\times\left(\frac{2}{3}\right)\times\left(\frac{2}{3}\right)=\left(\frac{2}{3}\right)^3$

(iii) $x\times x\times x\times y\times y\times y\times z\times z=x^3y^3z^2$

(iv) $10\times10\times10\times4\times4\times4=(10)^3\times(4)^3=(40)^3$

(v) $(-4)\times(-4)\times(-4)\times(-4)\times(-4)\times(-4)=(-4)^6$

(vi) $25\times25\times25\times25\times25\times25\times25\times25\times25=(25)^9$

2. (i) $\frac{16}{81}=\frac{2\times2\times2\times2}{3\times3\times3\times3}=\left(\frac{2}{3}\right)^4$

(ii) $\frac{1}{64}=\frac{1\times1\times1\times1\times1\times1}{2\times2\times2\times2\times2\times2}=\left(\frac{1}{2}\right)^6$

(iii) $\frac{64}{729}=\frac{2\times2\times2\times2\times2\times2}{3\times3\times3\times3\times3\times3}=\left(\frac{2}{3}\right)^6$

(iv) $\frac{-1}{343}=\frac{(-1)\times(-1)\times(-1)}{7\times7\times7}=\left(\frac{-1}{7}\right)^3$

(v) $\frac{27}{-125}=\frac{3\times3\times3}{(-5)\times(-5)\times(-5)}=\left(\frac{3}{-5}\right)^3$

3. (i) 7^{18}
Base = 7
Exponent = 18

(ii) $\left(\frac{5}{9}\right)^6$
Base = $\frac{5}{9}$
Exponent = 6

(iii) $(789)^{-6}$
Base = 789
Exponent = – 6

(iv) $(4.28)^5$
Base = 4.28
Exponent = 5

(v) $(-95)^4$
Base = – 95
Exponent = 4

(vi) $(11)^{13}$
Base = 11
Exponent = 13

(vii) $(-37)^{12}$

(viii) $\left(\frac{7}{3}\right)^7$

Base = -37 Base = $\frac{7}{7}$

Exponent = 12 Exponent = 7

4. (i) $\left(\frac{1}{5}\right)^{-2} = \left(\frac{5}{1}\right)^{2} = \frac{5\times 5}{1\times 1} = 25$

(ii) $\left(\frac{-1}{2}\right)^{4} = \left(\frac{-1}{2}\right)\times\left(\frac{-1}{2}\right)\times\left(\frac{-1}{2}\right)\times\left(\frac{-1}{2}\right) = \frac{1}{16}$

(iii) $\left(\frac{2}{-3}\right)^{3} = \left(\frac{2}{-3}\right)\times\left(\frac{2}{-3}\right)\times\left(\frac{2}{-3}\right) = \frac{8}{-27} = \frac{-8}{27}$

(iv) $\left(\frac{-3}{4}\right)^{6} = \left(\frac{-3}{4}\right)\times\left(\frac{-3}{4}\right)\times\left(\frac{-3}{4}\right)\times\left(\frac{-3}{4}\right)\times\left(\frac{-3}{4}\right)\times\left(\frac{-3}{4}\right) = \frac{729}{4096}$

(v) $\left(\frac{3}{4}\right)^{-3} = \left(\frac{4}{3}\right)^{3} = \left(\frac{4}{3}\right)\times\left(\frac{4}{3}\right)\times\left(\frac{4}{3}\right) = \frac{64}{27}$

(vi) $\left(\frac{2}{5}\right)^{3} = \left(\frac{2}{5}\right)\times\left(\frac{2}{5}\right)\times\left(\frac{2}{5}\right) = \frac{8}{125}$

5. (i) $\left(\frac{2}{3}\right)^{2}\times\left(\frac{3}{5}\right)^{2}$

$= \left(\frac{2}{5}\times\frac{3}{5}\right)^{2}$

$= \left(\frac{2}{5}\right)^{2} = \frac{4}{25}$

(ii) $\left(\frac{-1}{4}\right)^{3}\times\left(\frac{2}{-3}\right)^{4}$

$= \frac{-1}{64}\times\frac{16}{81}$

$= \frac{-1\times 1}{4\times 81} - \frac{-1}{324}$

(iii) $\left(\frac{7}{-16}\right)\times\left(\frac{4}{3}\right)^{2}$

$= \frac{7}{-16}\times\frac{16}{9}$

$= \frac{7\times 1}{-1\times 9} = \frac{-7}{9}$

(iv) $\left(\frac{-1}{2}\right)^{3}\times\left(\frac{-1}{3}\right)^{3}$

$= \frac{-1}{8}\times\frac{-1}{27}$

$= \frac{+1}{8\times 27}\, lk = \frac{1}{216}$

(v) $\left(\frac{3}{5}\right)^{3}\times\left(\frac{3}{5}\right)^{-3}\times\left(\frac{1}{5}\right)^{2}$

$= \left(\frac{3}{5}\right)^{3-3}\times\left(\frac{1}{5}\right)^{2} = 1\times\frac{1}{25} = \frac{1}{25}$

(vi) $(-1)^{111}\times(-1)^{65}$

$= (-1)\times(-1) = +1$

Exercise 5.2

1. (i) $\left(\frac{1}{3}\right)^{2}\times\left(\frac{1}{3}\right)^{3}$

$= \left(\frac{1}{3}\right)^{2+3} = \left(\frac{1}{3}\right)^{5} = \frac{1}{243}$

(ii) $\left(\frac{-3}{4}\right)^{5}\times\left(\frac{-3}{4}\right)^{10}$

$= \left(\frac{-3}{4}\right)^{5+10} = \left(\frac{-3}{4}\right)^{15}$

(iii) $\left(\frac{2}{5}\right)^{-3} + \left(\frac{5}{2}\right)^{2}$

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

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

(iv) $\left(\frac{1}{7}\right)^{-4} + \left(\frac{1}{7}\right)^{-5}$

$= \left(\frac{7}{1}\right)^{4} + \left(\frac{7}{1}\right)^{5}$

$= (7)^{4+5} = 7^{9}$

2. (i) $\left(\frac{3}{5}\right)^{10} \div \left(\frac{3}{5}\right)^{15}$

$= \left(\frac{3}{5}\right)^{10} \times \left(\frac{5}{3}\right)^{15}$

$= \left(\frac{3}{5}\right)^{10} \times \left(\frac{5}{3}\right)^{-15}$

$= \left(\frac{3}{5}\right)^{10-15} = \left(\frac{3}{5}\right)^{-5} = \left(\frac{5}{3}\right)^{5}$

(ii) $\left(\frac{3}{7}\right) \div \left(\frac{3}{7}\right)^{3}$

$= \left(\frac{3}{7}\right) \times \left(\frac{7}{3}\right)^{3}$

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

$= \left(\frac{3}{7}\right)^{1-3} = \left(\frac{3}{7}\right)^{-2} = \left(\frac{7}{3}\right)^{2}$

(iii) $\left(\frac{2}{5}\right)^{10} \div \left(\frac{2}{5}\right)^{10}$

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

$= \left(\frac{2}{5}\right)^{10-10}$

$= \left(\frac{2}{5}\right)^{0} = 1$

(iv) $\left(\frac{-1}{4}\right)^{3} \div \left(\frac{-1}{4}\right)^{5}$

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

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

$= \left(\frac{4}{-1}\right)^{2} = 16$

3. (i) $\left[\left(\frac{2}{7}\right)^{3}\right]^{3}$

$= \left(\frac{2}{7}\right)^{3\times 3} = \left(\frac{2}{7}\right)^{9}$

(ii) $\left[\left(\frac{-2}{3}\right)^{4}\right]^{2}$

$= \left(\frac{-2}{3}\right)^{4\times 2} = \left(\frac{-2}{3}\right)^{8}$

(iii) $\left[\left(\frac{3}{5}\right)^{-3}\right]^{2}$

$= \left(\frac{3}{5}\right)^{-3\times 2}$

$= \left(\frac{3}{5}\right)^{-6} = \left(\frac{5}{3}\right)^{6}$

(iv) $\left[\left(\frac{-1}{5}\right)\right]^{-3}$

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

$= \left(\frac{5}{-1}\right)^{6} = 5^{6}$

4. (i) $(12^6)^3$
$= (12)^{6\times 3} = (12)^{18}$

(ii) $(8^4)^9$
$= (4\times 9) = (8)^{36}$

(iii) $(15^2)^4$
$= (15)^{2\times 4} = (15)^8$

(iv) $(7^3)^4$
$= (7)^{3\times 4} = (7)^{12}$

(v) $(20^3)^5$
$= (20)^{3\times 5} = (20)^{15}$

5. (i) $(3^2)^3 \times (3^3)^3 \times (3^4)^3$
$= (3)^{2\times 3} \times (3)^{3\times 2} \times (3)^{4\times 3}$
$= 3^6 \times 3^6 \times 3^{12}$
$= (3)^{6+6+12} = 3^{24}.$

(ii) $(2^4)^3 \times (2^3)^2 \times (2^2)^4$
$= (2)^{4\times 3} \times (2)^{3\times 2} \times (2)^{2\times 4}$
$= (2)^{12} \times (2)^6 \times (2)^8$
$= (2)^{12+6\ 8} = (2)^{26}.$

(iii) $(7^2)^5 \times (7^3)^6$
$= (7)^{2\times 5} \times (7)^{3\times 6}$
$= (7)^{10} \times (7)^{18}$
$= (7)^{10+18} = (7)^{28}$

(iv) $(2^{10})^3 \times (2^5)^4$
$= (2)^{10\times 3} \times (2)^{5\times 4}$
$= (2)^{30} \times (2)^{20} = (2)^{30+20} = (2)^{50}$

(v) $(3^3)^5 \times (3^4)^2$
$= (3)^{3\times 5} \times (3)^{4\times 2}$
$= (3)^{15} \times (3)^8 = (2)^{15+8} = (2)^{23}$

6. (i) $(-2)^5 \times (-4)^5$
$= [(-2)\times(-4)]^5$
$= [+8]^5 = [2^3]^5$

(ii) $10^5 \times 7^5$
$= [10\times 7]^5$
$= [70]^5$

(iii) $(-9)^3 \times (-4)^3$
$= [(-9)\times(-4)]^3$
$= [+36]^3 = [6^2]^3$
$= (6)^{2\times 3} = 6^6.$

(iv) $5^2 \times 4^2$
$= [5\times 4]^2$
$= [20]^2 = 20\times 20$
$= 400.$

(v) $(-6)^5 \times 4^5$
$= [-6\times 4]^5 = (-24)^5$

(vi) $(7)^{12} \times (7)^{12}$
$= (7)^{12+12} = (7)^{24}$

7. (i) $(-3)^6 \times \left(\frac{1}{4}\right)^2 \times (-3)^4 \times \left(\frac{1}{3}\right)^8$

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

$= (-1)^{10} \times (3)^{10} \times \left(\frac{1}{4}\right)^2 \times \left(\frac{1}{3}\right)^8$

$= 1\times (3)^{10} \times (4)^{-2} \times (3)^{-8}$

$= (4)^{-2} \times (3)^{10-8} = \left(\frac{1}{4}\right)^2 \times (3)^2$

$= \left(\frac{1}{4}\times 3\right)^2 = \left(\frac{3}{4}\right)^2 = \frac{9}{16}.$

(ii) $(2^3)^2 \times 2^7 \times \left(\frac{-1}{2}\right)^{10}$

$= (2)^6 \times 2^7 \times (-1)^{10} \times (2)^{10}$

$= (2)^{6+7} \times 1 \times (2)^{-10}$

$= (2)^{13-10} = (2)^3 = 8.$

(iii) $\left[\left(\frac{3}{4}\right)^3\right]^2 \times \left(\frac{1}{4}\right)^{-2} \times (4)^2 \times \frac{1}{12}$

$= \left(\frac{3}{4}\right)^{3\times 2} \times (4)^2 \times (4)^2 \times \frac{1}{12}$

$= (3)^6 \times (4)^{-6} \times (4)^{2+2} \times \frac{1}{12}$

$= (3)^6 \times (4)^{4-6} \times \frac{1}{3\times 4}$

$= (3)^{6-1} \times (4)^{-2-1}$

$= (3)^5 \times (4)^{-3} = \frac{(3)^5}{(4)^3} = \frac{243}{64}$

(iv) $(5^{-1} - 7^{-1})^{-2} + (7^{-1} - 5^2)$

$= \left(\frac{1}{5} - \frac{1}{7}\right)^{-2} + \left(\frac{1}{7} - 25\right)$

$= \left(\frac{7-5}{35}\right)^{-2} + \left(\frac{1-175}{7}\right)$

$= \left(\frac{2}{35}\right)^{-2} + \left(\frac{-174}{7}\right)$

$= \left(\frac{35}{2}\right)^2 - \frac{174}{7} = \frac{1225}{4} - \frac{174}{7}$

$= \frac{8575 - 696}{28} = \frac{7879}{28}.$

Exercise 5.3

1. (i) 115000000000

$= 115 \times 10^8$

$= \frac{115}{100} \times 10^{10}$

$= 1.15 \times 10^{10}$

(ii) 0.00000052

$= 52 \times 10^{-8}$

$= \frac{52}{10} \times 10^{-7}$

$= 5.2 \times 10^{-7}$

(ii) 110000000

$= 11 \times 10^7$

$= \frac{11}{10} \times 10^8$

$= 1.1 \times 10^8$

(iv) 0.000325

$= 325 \times 10^{-6}$

$= \frac{325}{100} \times 10^{-4}$

$= 3.25 \times 10^{-4}$

(v) 1250000000
$= 125 \times 10^9$
$= \frac{125}{100} \times 10^{11} = 1.25 \times 10^{-11}$

(vi) 0.00000000014
$= 14 \times 10^{-11}$
$= \frac{14}{10} \times 10^{-10} = 1.4 \times 10^{-10}$

(vii) 0.00037500
$= 375 \times 10^{-6}$
$= \frac{375}{100} \times 10^{-4}$
$= 3.75 \times 10^{-4}$

2. (i) 3.53×10^7
$= \frac{353}{100} \times 10000000$
$= 35300000$

(ii) 1.414×10^6
$= \frac{1414}{1000} \times 1000000$
$= 1414000$

(iii) 2.8×10^{-5}
$= \frac{28}{10} \times \frac{1}{100000}$
$= 0.000028$

(iv) 5.5×10^{-8}
$= \frac{55}{10} \times \frac{1}{100000000}$
$= 0.000000055$

(v) 1.1×10^{-9}
$= \frac{11}{10} \times \frac{1}{1000000000}$
$= 0.0000000011$

(vi) 3.05×10^7
$= \frac{305}{100} \times 10000000$
$= 30500000$

3. Distance of moon from earth = 384400000 km
$= 3844 \times 10^5$ km
$= 3.844 \times 1000 \times 10^5$ km
$= 3.844 \times 10^8$ km

4. The speed fo light = 300000000 m/sec = 3.0×10^8 m/sec

5. The mass of earth = 5.98×10^{14} kg
$= \frac{598}{100} \times 1000000000000000000000000$ kg
$= 5970000000000000000000000$ kg.

6. The diameter of sun = 1384000000 meter
$= 1384 \times 10^6$ meter
$= 1.384 \times 1000 \times 10^6$ meter
$= 1.384 \times 10^9$ meter.

Multiple Choice Questions

1. (iii) **2.** (ii) **3.** (ii) **4.** (ii) **5.** (ii)

Mental Exercise

1. Base = 5, Exponent = 13

2. $\left(\frac{5}{7}\right)^4$

3. 1

4. 1.15×10^{13}

6 Algebraic Expressions

1. (i) $(x^2 + y^3)$ (ii) $(3x - 2y)$

(iii) $(3x + 14 = 47)$ (iv) ₹ $(70x + 9c)$

(v) $(y^3 - x^3) \times \frac{2}{3} t$ (vi) $(x + y) - rs$

(vii) $(3n - 4 = 24)$

2. (i) The constant term in $(4x + 6)$ is 6.

(ii) Then constant term in $(6p^2 + 7q - 9pq)$ is 0.

(iii) The constant term in $(8x^2y^2 + 4xy^3 - 3x^3y - 6)$

(iv) The constnat term in $(5 - y^2 - y + y^3)$ is 5.

3. (i) $9m^2n$

Term $= 9m^2n$ Factors $= 3 \times 3 \times m \times m \times n$

(ii) $-6xy^3 + 4x^2y^2$ Terms $= -6xy^3, 4x^2y^2$

Factors $= -2 \times 3 \times x \times y \times y \times y$ and $2 \times 2 \times x \times x \times y \times y$

(iii) $\frac{7}{5}x^3y^3 - 8p^4q$

Terms $= \frac{7}{5}x^3y^3, -8p^4q$

Factors $= \frac{7}{5} \times x \times x \times x \times x \times y \times y \times y$

and, $-2 \times 2 \times 2 \times p \times p \times p \times p \times q$

4. (i) $(8x - 7)$ is a binomial expression

(ii) $\frac{5y^2 - \frac{9}{5}y + 8}{y^2} = 5 - \frac{9}{5}y^{-1} + 8y^{-2}$

It is not a polynomial expression.

(iii) $\left(\frac{1}{5} - 4x\right)$ is a binomial expression.

(iv) $\frac{x^2 - 4x + 3}{x} = x - + 3x^{-1}$

It is not a polynomial expression.

(v) $(7r^2 - 4r + 2)$ is a trinomial expression.

(vi) $\left(6 - 3x + \frac{7}{4}x^2 - \frac{2}{9}x^3\right)$ is polynomial expression.

5. (i) $4x - 3y$ is a binomial. (ii) $\frac{-9}{5}x$ is a monomial.

(iii) 4 is a monomial. (iv) $\frac{7}{4}p^2 - \frac{1}{7}pq + rq$ is a trinimial.

(v) $4x^3 - \frac{4}{3}x + \frac{7}{4}$ is a trinomial. (vi) $\frac{3}{2}pqr$ is a monomial.

(vii) $\frac{4}{6}a^2bc + 3$ is a binomial.

6. (i) $2 \times 4 \times r \times s = 2 \times 2 \times 2 \times r \times r = 2^3 rs$

(ii) $9 \times m \times m \times m \times n \times n = 3^2 m^3 n^2$

(iii) $4 \times 6 \times x \times y \times y = 24 \times x \times y \times y = 2^3 \times 3xy^2$

(iv) $\frac{-1}{2} \times 7 \times x \times x \times x \times y \times y \times y - 4 \times p \times p \times p \times p \times q \times q$

$= \frac{-7}{2}x^2y^3 - 2^2p^4q^2$

7. (i) $21x^2 - 4xy - 5z^2$

Numerical coefficient of $21x^2$ is 21,
Numerical coefficient of $-4xy$ is -4,
Numerical coefficient of $-5z^2$ is -5.

(ii) $11y^2 - 9xy^2 + 3xy + 8$

Numerical coefficient of $11y^3$ is 11,
Numerical coefficient of $-9xy^2$ is -9,
Numerical coefficient of $3xy$ is 3,
Numerical coefficient of 8 si 8.

(iii) $7x^2 - y^2 + xy^3 + 9x^3y - 3$

Numerical coefficient of $7x^2$ is 7,
Numerical coefficient of $-y^2$ is -1,
Numerical coefficient of xy^3 is 1,
Numerical coefficient of $9x^3y$ is 9,
Numerical coefficient of -3 is -3.

(iv) $7x^2y - 5xy^2 - 4xy$

Numerical coeffient of $7x^2y$ is 7,
Numerical coefficient of $-5xy^2$ is -5,
Numerical coefficient of $-4xy$ is -4.

8. (i) $3x^2$ The degree of $3x^2$ is 2.

(ii) $\frac{3}{5} - 4x + x^2 - 6^3$ The degree of $\frac{3}{5}$ is 0, $-4x$ is 1, x^2 is 2, $-6x^3$ is 3.

And, the degree of $\left(\frac{3}{5} - 4x + x^2 - 6x^3\right)$ is 3.

(iii) $4x^3 - 3x^2y^2 + 7xy + 5z$

The degree of $4x^3$ is 3, $-3x^2y^2$ is 4, $7xy$ is 2, 52 is 1.
And, the degree of $(4x^3 - 3x^2y^2 + 7xy + 5x)$ is 4.

(iv) $11x^4 + 7x^3 - 5x^2 - 1$

The degree of $11x^4$ is 4, $7x^3$ is 3, $-5x^2$ is 2, -1 is 0.
And, the degree of polynomial $(11x^4 + 7x^3 - 5x^2 - 1)$ is 4.

(v) $2x^3 - 3x + 6$

The degree of $2x^3$ is 3, $-3x$ is 1, 6 is 0.
And the degree of $(2x^3 - 3x + 6)$ is 3.

(vi) $p^2 + pq$
The degree of p^2 is 2, pq is 2.
And, the degree of $(p^2 + pq)$ is 2.

(vii) $p^2 + 4pq - 5p^2q + 7pq$
The degree of p^2 is 2, $4pq$ is 2, $-5p^2q$ is 3, $7pq$ is 2.
And, the degree of polynomial $(p^2 + 4pq - 5p^2q + 7pq)$ is 3.

(viii) $9 + 3x^2y - 7xy^2 + 4xy$
The degree of 9 is 0, $3x^2y$ is 3, $-7xy^2$ is 3, $4xy$ is 2.
And, the degree of polynomial $(9 + 3x^2y - 7xy^2 + 4xy)$ is 3.

Exercise 6.2

1. Add :

(i) $2x + 5x = 7x$

(ii) $4ab + (-3ab) + 9ab$
$= 13ab - 3ab = 10ab$

(iii) $8xyz + (-2zyx) + (-6xzy)$
$= 8xyz - 2xyz - 6xyz = 0.$

2. (i) $7m + n + 2m + 3n$
$= 9m + 4n$

(ii) $4xy + (-xy) + 3x^2y$
$= 4xy - 2xy - xy + 3x^2y$
$= xy + 3x^2y$

(iii) $4x^2y + (-3xy^2) + (-5xy^2) + 2x^2y$
$= 4x^2y + 2x^2y - 3xy^2 - 5xy^2 = 6x^2y - 8xy^2$

3. (i) $15x - 3x + 7x$
$= 22x - 3x = 19x$

(ii) $4a + 5a - 3a - 2a$
$= 9a - 5a = 4a$

(iii) $3x^3 - 2x^2 + 3x^3 - x^2$
$= 6x^3 - 3x^2$

(iv) $3x^2 + 4x^2 - 2x^2$
$= 7x^2 - 2x^2 = 5x^2$

(v) $a^3 + 3a^2 + 4a^3 + a^2 + a^2$
$= 5a^3 + 5a^2$

(vi) $xy - yz + yz - zx + zx - xy$
$= 0 + 0 + 0 = 0$

(vii) $3x^2 - x + 1 + 3x^2 - 5x^3 + 2 + 4x - 3^2 + x^3 = -4x^3 + 3x^2 + 3x + 3$

(viii) $c^2d^3 + 6c^3d^3 + c^2d^3 - 3c^3d^3 = 2c^2d^3 + 3c^3d^3$

4. Add :

(i) $(2a - 3b + 4c) + (a - b - 2c)$
$= 2a - 3b + 4c + a - b - 2c = 3a - 4b + 2c$

(ii) $(8a - 7ab + 56) + (-6a - ab - 8b) + (5a - 2b + 3b)$
$= 8a - 7ab + 5b - 6a - ab - 8b - 5a - 2ab + 3b$
$= -3a - 10ab + 0 = -3a - 10ab$

(iii) $(4x^2 - 5xy + 3y^2) + (-6x^2 - 4xy + 2y^2 - 2xy - 4y^2 - 3x^2)$
$= 4x^2 - 5xy + 3y^2 + (-9x^2 - 6xy - 2y^2)$
$= 4x^2 - 5xy + 3y^2 - 9x^2 - 6xy - 2y^2 = -5x^2 - 11xy + y^2$

(iv) $(4a^3 - 3a^2 + 2) + (2a^2 - a - 1) + (a^3 + 2a + 3)$
$= 4a^3 - 3a^2 + 2 + 2q^2 - a - 1 + a^3 + 2a + 3 = 5a^3 - a^2 + 4.$

(v) $(3x^3 - 2x^2 - 7x + 8) + (-5x^3 + 4x^2 + 6x - 10) + (3 - 4x - 5x^2 + x^2)$

$= 3x^3 - 2x^2 - 7x + 8 - 5x^3 + 4x^2 + 6x - 10 + 3 - 4x - 5x^2 + x^3$
$= -x^3 - 3x^2 - 5x + 1$

(vi) $(3x^2y + 2xy - 3y^2) + (2y^2 - xy + 2x^2y) + (xy - 2y^2 - 3x^2y)$
$= 3x^2y + 2xy - 3y^2 + 2y^2 - xy + 2x^2y + xy - 2y^2 - 3x^2y$
$= 2x^2y + 2xy - 3y^2$

5. (i) $9x$ from $14x$
$= 14x - 9x = 5x.$

(ii) $4xy$ from $7xy$
$= 7xy - 4xy = 3xy$

(iii) $4xy$ from $-xy$
$= -xy - 4xy = -5xy$

(iv) $11x$ from $13y$
$= 13y - 11x$

(v) $-6b$ from $11b$
$= 11b - (-6b)$
$= 11b + 6b = 17b$

(vi) $-3ab$ from $-2ab$
$= -2ab - (-3ab)$
$= -2ab + 3ab = 9b$

6. (i) $10p^2$ from $3p^2$
$= 3p^2 - 10p^2 = -7p^2$

(ii) $4x^2y$ from $11x^2y$
$= 11x^2y - 4x^2y = 7x^2y$

(iii) $9x^3$ from $3x^3$
$= 3x^3 - 9x^3 = -6x^3$

(iv) $-5ab^2$ from $-7ab^2$
$= -7ab^2 - (-5ab^2)$
$= -7ab^2 + 5ab^2 = -2ab^2$

(v) $7x^3$ from $12x^2$
$= 12x^2 - 7x^3$

(vi) $14x^3$ from $-6x^3$
$= -6x^3 - 14x^3 = -20x^3$

7. (i) $5 + p^2 - 6pq + q^2$ from $4 + 6p - 5pq - 6q^2$
$= (4 + 6p^2 - 5pq - 6q^2) - (5 - p^2 - 6pq + q^2)$
$= 4 + 6p^2 - 5pq - 6q^2 - 5 - p^2 + 6pq - q^2$
$= -1 + 5p^2 + pq - 7q^2 = 5p^2 + pq - 7q^2 - 1.$

(ii) $x - 4y - 5z$ from $3x - 6y + 3z$
$= (3x - 6y + 3z) - (x - 4y - 5z)$
$= 3x - 6y + 3z - x + 4y + 5z = 2x - 2y + 8z$

(iii) $x^4 - y^4 - x^2y^2$ from $2x^4 - 3x^2y^2 + 4y^4$
$= (2x^4 - 3x^2y^2 + 4y^4) - (x^4 - y^4 - x^2y^2)$
$= 2x^4 - 3x^2y^2 + 4y^4 - x^4 + y^4 + x^2y^2 = x^4 - 2x^2y^2 + 5y^4$

(iv) $5a + 6b + 4c$ from $10a + 15b + 9c$
$= (10a + 15b + 9c) - (5a + 6b + 4c)$
$= 10a\ \ 15b + 9c - 5a - 6b - 4c = 5a + 9b + 5c$

(v) $3x^2 - 5y^2 - 4xy$ from $5xy - 4x^2 + 3y^2$
$= (5xy - 4x^2 + 3y^2) - (3x^2 - 5y^2 - 4xy)$
$= 5xy - 4x^2 + 3y^2 - 3x^2 + 5y^2 + 4xy = 9xy - 7x^2 + 8y^2$

(vi) $7 + 4x - 5x^2 + 6x^3$ from $10 - x + 4x^2 + x^3$
$= (10 - x + 4x^2 + x^3) - (7 + 4x - 5x + 6x^3)$
$= 10 - x + 4x^2 + x^3 - 7 - 4x + 5x^2 - 6x^3 = 3 - 5x + 9x^2 - 5x^3$

8. $(a^2 + a + 1) + (a^2 - a + 1) - (-a^2 - a + 1)$
$= a^2 + a + 1 + a^2 - a + 1 + a^2 + a - 1$
$= 3a^2 + a + 1.$

9. Let, we subtract M.
Thus, $(2x^2 - xy + 5y^2) - M = -5x^2 - 3xy - 2y^2$
$2x^2 - xy + 5y^2 - (-5x^2 - 3xy - 2y^2) = M$
$M = 2x^2 - xy + 5y^2 + 5x^2 + 3xy + 2y^2 = 7x^2 + 2xy + 7y^2$
Hence, $7x^2 + 2xy + 7y^2$ is to be subtracted.

10. Let, we added M.
Thus, $(3x^2 - 2x^2 + 5x + 1) + M = x^3 - 2x^2 + 4x - 1$
$M = (x^3 - 2x^2 + 4x - 1) - (3x^3 - 2x^2 + 5x + 1)$
$= x^3 - 2x^2 + 4x - 1 - 3x^3 + 2x^2 - 5x - 1$
$= -2x^3 + 0 - x - 2$
Hence, $-2x^3 - x - 2$ is to be added.

11. (i) $P - Q - R$ $(3x^2 - 7x - 8) - (x^2 + 8x - 3) - (5x^2 - 3x + 2)$
$= 3x^2 - 7x - 8 - x^2 - 8x + 3 + 5x^2 + 3x - 2$
$= 7x^2 - 12x - 7.$

(ii) $P + Q - R = (3x^2 - 7x - 8) + (x^2 + 8x - 3) - (-5x^2 - 3x + 2)$
$= 3x^2 - 7x - 8 + x^2 + 8x - 3 + 5x^2 + 3x - 2$
$= 9x^2 + 4x - 13$

12. $(6x + 5y - 12) + (52x - 9y + 5) - [(7x - 12y - 4) + (-6x + 11y + 10)]$
$= [6x + 5y - 12 + 52x - 9y + 5] - [7x - 12y - 4 - 6x + 11y + 10]$
$= (58x - 4y - 7) - (-x - y + 6)$
$= 58x - 4y - 7 + x + y - 6$
$= 59x - 3y - 13$

Exercise 6.3

1. (i) $\frac{3}{2}a + 1$
Put, $a = 3$
$= \frac{3}{2} \times 3 + 1 = \frac{9}{2} + 1 = \frac{11}{2} = 5\frac{1}{2}.$

(ii) $2a^2 - a + 1$
Put, $a = 3$
$= 2 \times (3) - 3 + 1 = 18 - 2 = 16.$

(iii) $3a - 2$
Put, $(a = 3)$
$= 3 \times 3 - 2 = 7.$

(iv) $7 - 2a$
Put, $(a = 3)$
$= 7 - 2 \times 3 = 1.$

2. (i) $-x^3 + 1$
Put, $(x = -1)$
$= -(-1)^3 + 1$
$= -(-1) + 1 = 2.$

(ii) $3x^3 + 2x - 1$
Put, $(x = -1)$
$= 3 \times (-1)^3 + 2 \times (-1) - 1$
$= -3 - 2 - 1 = -6.$

(iii) $2x^2 - x + 6$
Put, $(x = -1)$
$= 2 \times (-1)^2 - (-1) + 6 = 2 \times 1 + 6 = 9.$

3. (i) $x^2 + xy - 2$
Put, $x = 3, y = 5$
$= (3)^2 + 3 \times 5 - 2$
$= 9 + 15 - 2 = 22$

(ii) $3x^2y + 2xy - xy^2$
Put, $x = 3, y = 5$
$= 3 \times (3)^2 \times 5 + 2 \times 3 \times 5$
$- 3 \times (5)^2$

$5 = 135 + 30 - 75 = 90.$

(iii) $x^3 - y^3$

Put, $x = 3,\ y = 5$

$= (3)^3 - (5)^3$

$= 27 - 125 = -98$

4. (i) $ab - b^2 + c^2$

Put, $a = -1, b = 2$ and $c = -3$

$= (-1) \times 2 - (2)^2 + (-3)^2$

$= -2 - 4 + 9 = 3.$

(ii) $a^2 - b^2 + ac$

Put, $a = -1, b = 2$ and $c = -3$

$= (-1)^2 - (2)^2 + (-1) \times (-3)$

$= 1 - 4 + 3 = 0.$

(iii) $a^2 + b - 5 + c^2$

Put, $a = -1, b = 2$ and $c = -3$

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

$= 1 + 2 - 5 + 9 = 7$

(iv) $3a + 2 - a - 1$

Put, $a = -1, b = 2$ and $c = -3$

$= 3 \times (-1) + 2 - (-1) - 1$

$= -3 + 2 + 1 - 1 = -1$

(v) $a^2 + 2(b^2 - 3) + a^2c^2$

Put, $a = -1, b = 2$ and $c = -3$

$= (-1)^2 + 2[(2)^2 - 3] + (-1)^2 \times (-3)^2$

$= 1 + 2[4 - 3] + 1 \times 9$

$= 1 + 2 + 9 = 12.$

(vi) $3b^2 + 2b - b^2 + 2$

Put, $a = -1, b = 2$ and $c = -3$

$= 3 \times (2)^2 + 2 \times 2 - (2)^2 + 2$

$= 12 + 4 - 4 + 2 = 14.$

Exercise 6.4

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

2. $3x - (2y - 5x + 3z)$

$= 3x - 2y + 5x - 3z$

$= 8x - 2y - 3z$

3. $x - [2y - \{3x - (2y - 3z)\}]$

$= x - [2y - \{3x - 2y + 3z\}]$

$= x - [2y - 3x + 2y - 3z]$

$= x - [4y - 3x - 3z]$

$= x - 4y + 3x + 3z = 4x - 4y + 3z$

4. $(x^2 - xy) - (xy - y^2)$

$= x^2 - xy - xy + y^2 = x^2 - 2xy + y^2 = (x - y)^2$

5. $-[(5x^2 - 3y^2) - (3y^2 - 4z^2) - (4z^2 - 5x^2)]$

$= -[5x^2 - 3y^2 - 3y^2 + 4z^2 - 4z^2 + 5x^2]$

$= -[10x^2 - 6y^2]$

$-10x^2 + 6y^2$

6. $-x + [3y - \{x - (4y + 4z)\}]$

$= -x + [3y - \{4y - 4z)\}]$

$= -x + [3y - x + 4y + 4z]$

$= -x + [7y - x + 4z]$

$= -x + 7y - x + 4z$

7. $(3x^2 - 4y + 3x) - [x^2 - (x^2 + y) - 2y + 4]$

$= (3x^2 - 4y + 3x) - [x^2 - x^2 - y - 2y + 4]$

$= (3x^2 - 4y + 3x) - [-3y + 4]$

$= 3x^2 - 4y + 3x + 3y - 4$

$= 3x^2 - y + 3x - 4$

8. $5x^3 + x^2 - \{3x^2 - (2x^2 - 3x^3 + 1)\}$

$= 5x^3 + x^2 - \{3x^2 - 2x^2 + 3x^3 - 1\}$

$= 5x^3 + x^2 - \{x^2 + 3x^3 - 1\}$

$= 5x^3 + x^2 - x^2 - 3x^3 + 1 = 2x^3 + 1.$

Multiple Choice Questions

1. (iii) **2.** (ii) **3.** (ii) **4.** (iii) **5.** (i) **6.** (iv) **7.** (ii) **8.** (iii)

Mental Exercise

1. $3x$ and $-4y$ **2.** $7 \times x \times y$ **3.** Yes **4.** $(a = 3)$ **5.** 5 **6.** degree = 3

7 Linear Equations in One Variable

Exercise 7.1

1. $8 - 7y = -6$

$8 + 6 = 7y$

$7y = 14$

$y = \frac{14}{7} = 2$

$y = 2$

2. $2x - 10 = -3x$

$2x + 3x = 10$

$5x = 10$

$x = \frac{10}{5} = 2$

$x = 2$

3. $5x + 2 = 10 + 3x$

$5x + 3x = 10 - 2$

$8x = 8$

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

$x = 1$

4. $2 - 3a + 7 = 8a + 3 - a$

$2 + 7 - 3 = 8a - a + 3a$

$6 = 10a$

$10a = 6$

$a = \frac{6}{10} = \frac{3}{5} \Rightarrow a = \frac{3}{5}$

5. $\frac{y}{3} - \frac{7}{2} = \frac{-y}{4}$

$\frac{y}{3} + \frac{y}{4} = \frac{7}{2}$

$\frac{4y + 3y}{12} = \frac{7}{2}$

$\frac{7y}{12} = \frac{7}{2}$

6. $0.2a = 46 - 0.03a$

$0.2a + 0.3a = 46$

$0.23a = 46$

$a = \frac{46}{0.23}$

$$y = \frac{7 \times 12}{7 \times 2}$$

$$y = \frac{12}{2} = 6$$

$$y = 6$$

7. $\frac{5}{8}y - 1 = 1 + \frac{7}{10}y$

$$\frac{5}{8}y - \frac{7}{10}y = 1 + 1$$

$$\frac{25y - 28y}{40} = 2$$

$$\frac{-3y}{40} = 2$$

$$y = \frac{2 \times 40}{-3} = \frac{-80}{3}$$

$$y = -26\frac{2}{3}$$

$$a = \frac{46 \times 100}{0.23 \times 100}$$

$$a = \frac{4600}{23}$$

$$a = 200$$

8. $25m - 10 = 21m + 14$

$$25m - 21m = 14 + 10$$

$$4m = 24$$

$$m = \frac{24}{4}$$

$$m = 6$$

9. $4(2x - 3) - 37 = 5(4 - 3x)$

$$8x - 12 - 37 = -20 - 15x$$

$$8x + 15x = 20 + 12 + 37$$

$$23x = 69$$

$$x = \frac{69}{23} = 3$$

$$x = 3$$

10. $8 - 5(3 - 2n) = n - 4(n + 9)$

$$8 - 15 + 10n = n - 4n - 36$$

$$-7 + 10n = -3n - 36$$

$$10n + 3n = -36 + 7$$

$$13n = -29$$

$$n = \frac{-29}{13}$$

11. $9(6 - x) - 36 = 9(6 + x)$

$$54 - 9x - 36 = 54 + 9x$$

$$54 - 36 - 54 = 9x + 9x$$

$$-36 = 18x$$

$$18x = -36$$

$$x = \frac{-36}{18}$$

$$x = -2$$

12. $\frac{2x - 3}{35} - \frac{1}{10} = \frac{4 - 3x}{28}$

$$\frac{2x - 3}{35} - \frac{4 - 3x}{28} = \frac{1}{10}$$

$$\frac{4(2x - 3) - 5(4 - 3x)}{140} = \frac{1}{10}$$

$$\frac{8x - 12 - 20 + 3x}{140} = \frac{1}{10}$$

$$= 11x - 32 = \frac{1}{10} \times 140$$

$$11x - 32 = 14$$

$$11x = 14 + 32$$

$$x = \frac{46}{11}$$

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

13.
$$3(1+y)+7(3+y)=11y$$
$$3+3y+21+7y=11y$$
$$24+10y=11y$$
$$11y=10y+24$$
$$11y-10y=24$$
$$y=24$$

14.
$$6-\frac{a-1}{2}-\frac{a-2}{3}=\frac{3-a}{4}$$
$$6=\frac{3-a}{4}+\frac{a-1}{2}+\frac{a-2}{3}$$
$$6=\frac{3(3-a)+6(a-1)+4(a-2)}{12}$$
$$6\times 12=9-3a+6a-6+4a-8$$
$$72=-5+7a$$
$$7a-5=72$$
$$7a=72+5$$
$$a=\frac{77}{7}$$
$$a=11$$

15.
$$0.02x-0.13x+0.11=0.103-0.1$$
$$0.02x-0.13x+0.1x=0.103-0.11$$
$$-0.01x=-0.07$$
$$x=\frac{-0.07}{-0.01}=7$$
$$x=7$$

16.
$$\frac{2}{3}(x+3)=4$$
$$x+3=\frac{4\times 3}{2}$$
$$x+3=6$$
$$x=6-3$$
$$x=3$$

17.
$$4+3x=31-6x$$
$$3x+6x=31-4$$
$$9x=27$$
$$x=\frac{27}{9}$$

18.
$$\frac{1}{2}x+\frac{1}{3}x=15$$
$$\frac{3x+2x}{6}=15$$
$$5x=15\times 6$$
$$x=\frac{90}{5}$$

$x = 3$ $x = 18$

19. $\frac{x}{5} + 5 - \frac{x}{6} + \frac{x}{4} = 0$

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

$\frac{12x - 10x + 15x}{60} = -5$

$17x = -5 \times 60$

$x = \frac{-300}{17}$

$x = -17\frac{11}{17} = 12 + 3$

20. $\frac{3(m-4)}{15} - \frac{(m-5)}{10}$

$\frac{(m-4)}{5} - \frac{(m-5)}{10} = \frac{2(3-m)}{5}$

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

$2m - 8 - m + 5$

$= \frac{10 \times (6-2m)}{5}$

$m - 3 = 2(6 - 2m)$

$m - 3 = 12 - 4m$

$m + 4m$

$5m = 15$

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

$m = 3$

Exercise 7.3

1. Let, three consecutive number are x, $(x + 1)$ and $(x + 2)$.

Thus, $x + (x + 1) + (x + 2) = 72$

$x + x + 1 + x + 2 = 72$

$3x + 3 = 72$

$3x = 72 - 3$

$x = \frac{69}{3} = 23$

Hence, three consecutive numbers are 23, 24 and 25.

2. Let, the requried number be x.

$6 \times x + 19 = 109$

$6x = 109 - 19$

$6x = 90$

$$x = \frac{90}{6}$$

$$x = 15$$

Hence, the required number is 15.

3. Let, the number are x and y.

Thus, their difference, $x - y = 7 \ldots(1)$

and, their sum, $x + y = 53 \ldots(2)$

Add, Eqn. (1) and Eqn. (2)

$$x + y + x - y = 53 + 7$$

$$2x = 60$$

$$x = \frac{60}{2}$$

$$x = 30$$

Put, the value of x in Eqn. (2)

$$3x + y = 53$$

$$y = 53 - 30$$

$$y = 23$$

Hence, teh required numbers are 30 and 23.

4. Let, the required number be x.

Thus, $x + 3x = 88$

$$4x = 88$$

$$x = \frac{88}{4} = 22$$

Hence, the required number is 22.

5. Let, the angles of triangle are x, $2x$ and $6x$.

Thus, Sum of angles $= 180°$

$$x + 2x + 6x = 180°$$

$$9x = 180°$$

$$x = \frac{180°}{9} = 20°$$

So, $2x = 2 \times 20° = 40°$

and, $6x = 6 \times 20° = 120°$

Hence, hall the three angles of the triangle are 20°, 40° and 120°.

6. Let the required number be x.

Thus, $\frac{2}{3}x = \frac{1}{4}x + 10$

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

$$\frac{8x - 3x}{12} = 10$$

$$5x = 10 \times 12$$

$$x = \frac{120}{5} = 24$$

7. Let, the number be x.

Thus, $$\frac{x \times 5 + 10}{8} = x - 1$$

$$5x + 10 = 8(x - 1)$$
$$5x + 10 = 8x - 8$$
$$5x - 8x = -8 - 10$$
$$-3x = -18$$
$$x = \frac{-18}{-3} = \frac{18}{3} = 6$$

Hence, the required number is 6.

8. Let, teh number be x.

Thus, $$4x - 15 = 3x + 20$$
$$4x - 3x = 20 + 15$$
$$x = 35$$

Hence, the required number is 35.

9. Number of 50 paise coins = x

Number of 1 rupee coins = $2x$

Number of 2 rupee coins = $3x$

Total value of all coins = ₹ 68

Thus, $\frac{1}{2} \times x + 1 \times 2x + 2 \times 3x = 68$

$$\frac{x}{2} + 2x + 6x = 68$$
$$\frac{x + 4x + 12x}{2} = 68$$
$$17x = 68 \times 2$$
$$x = \frac{68 \times 2}{17} = 4 \times 2$$
$$x = 8$$

Hence, the value of x is 8.

10. Water in 40 litres of milk = $10x$.

Thus, percent of pure milk = 90%

So, quantity of pure milk = 90% of $40l$

$$= \frac{90}{100} \times 40\, l = 36\, l.$$

If water contain 20% in mixture.

Thus, Percent of pure milk = 80%

So, $$80\% \text{ of } x = 36\, l$$
$$\frac{80 \times x}{100} = 36\, l$$

$$x = \frac{36 \times 100\, l}{80}$$

$$x = 45\, l$$

$\because$ $45\, l - 40\, l = 5\, l$

Hence, 5*l* of water to added the milk so that it may contain 20% of water.

11. Let, each of the equal side of isosceles triangle be *x*.

Thus, Perimeter of triangle $= 50\,\text{cm}$

$$x + x + (x + 11) = 50$$

$$3x + 11 = 50$$

$$3x = 50 - 11$$

$$3x = 39$$

$$x = \frac{39}{3} = 13$$

Hence, all the three sides of triangle are 13 cm, 13 cm and 24 cm.

12. Let, one part of 16 be *x*.

Thus, other part $= 3x$

So, $x + 3x = 16$

$$4x = 16$$

$$x = \frac{16}{4} = 4$$

and, $3x = 3 \times 4 = 12$

hence, 16 is divide into 4 and 12.

13. Let, teh number are *x* and *y*.

Thus $x + y = 19$ …(1)

and, $2x + 3y = 45$

From Eqn. (1),

$$y = 19 - x$$

Put, the value of *y* in Eqn. (2),

$$2x + 3(19 - x) = 45$$

$$2x + 57 - 3x = 45$$

$$2x - 3x = 45 - 57$$

$$-x = -12$$

$$x = 12$$

Put, the value of *x* in Eqn. (1),

$$12 + y = 19$$

$$y = 19 - 12$$

$$y\ l = 7$$

Hence, teh required numbers are 12 and 7.

14. Let, the village of Birju is *x* km far from the town.

Thus, $\frac{3}{4}x + \frac{1}{8}x + \frac{1}{12}x + 4\ \text{km} = x$

$$\frac{18x + 3x + 2x}{24} + 4\text{ km} = x$$

$$\frac{23x}{24} + 4\text{ km} = x$$

$$x - \frac{23}{24}x = 4\text{ km}$$

$$\frac{24x - 23x}{24} = 4\text{ km}$$

$$x = 24 \times 4\text{ km}$$

$$x = 96\text{ km}$$

Hence, the village of Birju is 96 km far from the town.

15. Let, the total cost of flat be x.

Thus, $\frac{5}{8}x + \frac{1}{4}x + 4\text{ lakh} = x$

$$x - \frac{5}{8}x - \frac{1}{4}x = ₹\ 4{,}00{,}000$$

$$\frac{8x - 5x - 2x}{8} = ₹\ 4{,}00{,}000$$

$$8x - 7x = ₹\ 8 \times 4{,}00{,}000$$

$$x = ₹\ 32{,}00{,}000$$

Hence, the total cost of flat of Dinesh is ₹ 32 lakh.

16. let, the cost of a pencil be x.

Thus, the cost of a pen = $7x$

So, the cost of a pen = $7x$

So, cost of 3 pencils and 2 pens

$$3 \times x + 2 \times 7x = ₹\ 34$$

$$3x + 14x = ₹\ 34$$

$$17x = ₹\ 34$$

$$x = \frac{₹\ 34}{17} = ₹\ 2$$

hence, the cost of a pencil is ₹ 2 and a pen is ₹ 14.

17. Let, the present age of Meena be x.

Thus, present age of her mother = $9x$.

After 3 years, the age of Meena = $x + 3$

and After 3 years, the age of her mother = $9x + 3$

So, $9x + 3 = 5 \times (x + 3)$

$$9x + 3 = 5x + 15$$

$$9x - 5x = 15 - 3$$

$$4x = 12$$

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

Hence, the present age of Meena is 3 years and the present age of her mother is $(9 \times 3) = 27$ years.

18. Let, the number of 50-paise coins be x.

Thus, the number of 25-paisa coins = $3x$

So, $x \times 50\,\text{p} + 3x \times 25\,\text{p} = ₹\ 45$

$$(50x + 75x)\ \text{paise} = 45 \times 100\ \text{paise}$$

$$125x = 4500$$

$$x = \frac{4500}{125} = 36$$

Hence, Tom have 36 coins of 50-paisa and 108 coins of 25 paisa.

19. Present age of Ram = 30 years

and present age of his son = 5 years

Let, x years later, Ram ble twise as old as his son.

Thus, $2 \times (5 + x) = 30 + x$

$$10 + 2x = 30 + x$$

$$2x - x = 30 - 10$$

$$2x - x = 30 - 10$$

$$x = 20$$

Hence, 20 years later, Ram be twice as old as his son.

20. Let, teh numerator of fraction be x.

Thus, the denominator of fraction = $x + 8$

So, $$\frac{x+1}{(x+8)-4} = \frac{4}{7}$$

$$\frac{x+1}{x+4} = \frac{4}{7}$$

$$7(x+1) = 4(x+4)$$

$$7x + 7 = 4x + 16$$

$$7x - 4x = 16 - 7$$

$$3x = 9$$

$$x = \frac{9}{3} = 3$$

Hence, the original fraction is

$$\frac{x}{3+x} = \frac{3}{8+3} = \frac{3}{11}.$$

Multiple Choice Questions

1. (i) **2.** (iii) **3.** (ii) **4.** (i) **5.** (ii) **6.** (i)

Mental Exercise

1. $\frac{x}{4}$ **2.** Transposing **3.** 2 **4.** Systematic Method **5.** numbers **6.** R.H.S.

8 Lines and Angles

Exercise 8.1

1. (i) The complement of $53°$ is $(90° - 53°) = 37°$

(ii) The complement of $28°$ is $(90° - 28°) = 62°$

(iii) The complement of $35°$ is $(90° - 35°) = 55°$

(iv) The complement of $69°$ is $(90 - 69°) = 21°$

(v) The complement of $45°$ is $(90° - 45°) = 45°$

(vi) The complement of $1°$ is $(90° - 1°) = 89°$

(vii) The complement of $46°$ is $(90° - 46°) = 44°$

(viii) The complement of 81 is $(90° - 81°) = 9°$

2. (i) The supplement of $5°$ is $(180° - 5°) = 175°$

(ii) The supplement of $62°$ is $(180° - 62°) = 118°$

(iii) The supplement of $148°$ si $(180° - 148°) = 32°$

(iv) The supplement of $86°$ is $(180° - 86°) = 94°$

(v) The supplement of $73°$ is $(180° - 73°) = 107°$

(vi) The supplement of $121°$ is $(180° - 121°) = 59°$

(vii) The supplement of $92°$ is $(180° - 92°) = 88°$

(viii) The supplment of $36°$ is $(180° - 36°) = 144°$

3. (i) $18°, 72° \Rightarrow$ Complementary Angles,

(ii) $129°, 51° \Rightarrow$ Supplementary Angles,

(iii) $63°, 117° \Rightarrow$ Supplementary Angles,

(iv) $45°, 45° \Rightarrow$ Complementary Angles,

(v) $135°, 45° \Rightarrow$ Supplementary Angles,

(vi) $155°, 25° \Rightarrow$ Supplementary Angles,

(vii) $0°, 90° \Rightarrow$ Complementary Angles,

(viii) $169°, 11° \Rightarrow$ Supplementary Angles.

4. (i) Yes, $\angle SOT$ and $\angle TOU$ are adjacent angles.

(ii) No, $\angle ROS$ and $\angle SOT$ are not adjacent angles.

(iii) No, $\angle ROS$ and $\angle TOU$ are not adjacent angles.

(iv) No, $\angle SOT$ and $\angle SOU$ are not adjacent angles.

(v) yes, $\angle ROS$ and $\angle SOU$ form a linear pair.

5. (a) The complement of $15°$ is $(90° - 15°) = 75°$.

(b) The complement of $47°$ is $(90° - 47°) = 43°$.

(c) The complement of $56°$ is $(90° - 56°) = 34°$.

6. (i) Pair of linear pair angles are $(\angle 8, \angle 5), (\angle 5, \angle 6), (\angle 6, \angle 7), (\angle 7, \angle 8), (\angle 1, \angle 2), (\angle 2, \angle 3), (\angle 3, \angle 1)$ and $(\angle 3, \angle 4)$.

(ii) Pair of vertically opposite angles are $(\angle 7, \angle 5), (\angle 6, \angle 8), (\angle 4, \angle 1)$ and $(\angle 3, \angle 2)$.

7. Let, the angle be x.

Thus, its complement $= x$

So, $x + x = 90°$ (Complementary)

$2x = 90°$

$x = \frac{90°}{2} = 45°$

Hence, the magnitude of angle is 45°.

8. Let, the complement of a angle be x.

Thus, the angle $= \frac{4}{5}x$

So, $x + \frac{4}{5}x = 90°$ (Complementary)

$\frac{5x + 4x}{5} = 90°$

$9x = 90° \times 5$

$x = \frac{90° \times 5}{9} = 50°$

Hence, the magnitude of the angle is $\frac{4}{5} \times 50° = 40°$.

9. Let, the supplement of angle be x.

Thus, the angle $= \frac{2}{3}x$

So, $x + \frac{2}{3}x = 180°$ (Supplementary)

$\frac{3x + 2x}{3} = 180°$

$5x = 180° \times 3$

$x = \frac{180° \times 3}{5} = 108°$.

Hence the magnitude of the angle is $\frac{2}{3} \times 108° = 72°$.

10. Let, the angle be x.

Thus, its supplement $= x$

So, $x + x = 180°$ (Supplementary)

$2x = 180°$

$x = \frac{180°}{2} = 90°$

Hence the magnitude of angle is 90°.

11. Let, the first angle be x.

Thus, other angle $= 2x$

So, $x + 2x = 90°$ (Complementary)

$3x = 90°$

$x = \frac{90°}{3} = 30°$

Hence, the measurement of the complementary angles are 30° and 60°.

12. Let, the supplement of angle be x.

Thus, $\text{the angle} = \frac{1}{3}x$

So, $x + \frac{1}{3}x = 180°$ (Supplementary)

$$\frac{3x + x}{3} = 180°$$

$$\frac{4x}{3} = 180°$$

$$x = \frac{3}{4} \times 180° = 135°$$

Hence, the measurement of angle is $\frac{1}{3} \times 135° = 45°$.

13. $\because \quad \angle m + \angle n = 360°$

(i) If $\angle m = 105°$

Thus, $105° + \angle n = 360°$

$\angle n = 360° - 105°$

$\angle n = 255°$

(ii) If $\angle n = 195°$

Thus, $\frac{5}{3} \times 90° + \angle n = 360°$

$150° + \angle n = 360°$

$\angle n = 360° - 150°$

$\angle n = 210°$

14. (i) No, $\angle AOB$ and $\angle BOC$ do not form a linear pair.

(ii) Yes, $\angle AOB$ and $\angle COD$ are vertically opposite angles.

(iii) No, $\angle AOD$ and $\angle DOC$ do not form a linear pair.

Exercise 8.2

1. (i) Yes, x is a transversal.

(ii) Yes, x is transversal.

(iii) Yes, x is a transversal.

(iv) No, x is not a transversal.

2. (i) Interior angles in fig. 8.24 (a) are $\angle APQ$, $\angle PQC$, $\angle PQD$ and $\angle QPB$.
And, Exterior angles in fig. 8.24 (b) are $\angle RPA$, $\angle CQS$, $\angle SQD$ and $\angle RPB$.

(ii) AInterior angles in fig. 8.24 (b) are $\angle 4$, $\angle 3$, $\angle 5$ and $\angle 6$.
And, Exterior angles in fig. 8.24 (b) ar;e $\angle 1$, $\angle 2$, $\angle 7$ and $\angle 8$.

(iii) Corresponding angle of $\angle 2$ is $\angle 6$.
Corresponding angle of $\angle 8$ is $\angle 4$.
And, Corresponding angle of $\angle 3$ is $\angle 7$.

3. (i) $\because EF \parallel GH$ and $\angle 1 = 45°$

$\therefore \quad \angle 3 = \angle 1$ {Vertically opposite angle}

$\angle 3 = 45°$

$\angle 5 = 1$ {Corresponding angles}

$\angle 5 = 45°$

and, $\angle 7 = \angle 3$ {Corresponding angles}

$\angle 7 = 45°$

$\angle 1 + \angle 4 = 180°$ {Linear pair}

$45° + \angle 4 = 180°$

$\angle 4 = 180° - 45°$

$\angle 4 = 135°$

$\angle 2 = \angle 4$ {Vertically opposite angles)

$\angle 2 = 135°$

$\angle 6 = \angle 4$ {Corresponding angles}

$\angle 6 = 135°$

and, $\angle 8 = \angle 2$ {Corresponding angles}

$\angle 8 = 135°$

Hence, $\angle 1 = \angle 3 = \angle 5 = \angle 7 = 45°$,

and, $\angle 2 = \angle 4 = \angle 6 = \angle 8 = 135°$.

4. $\because \quad PQ \parallel RS$ and $\angle 1l = 55°$

$\therefore \quad \angle 3 = \angle 1$ {Vertically opposite angle}

$\angle 3 = 55°$

$\angle 5 = \angle 1$ {Corresponding angles}

$\angle 5 = 55°$

and, $\angle 7 = \angle 3$ {Corresponding angles}

$\angle 7 = 55°$

Now, $\angle 1 + \angle 4 = 180°$ {Linear pair}

$55° + \angle 4 = 180°$

$\angle 4 = 180° - 55°$

$\angle 4 = 125°$

$\angle 2 = \angle 4$ {Vertically opposite angles}}

$\angle 2 = 125°$

$\angle 6 = \angle 4$ {Corresponding angles}

$\angle 6 = 125°$

$\angle 8 = \angle 2$ {Corresponding angles}

$\angle 8 = 125°$

Hence, $\angle 1 = \angle 3 = \angle 5 = \angle 7 = 55°$

and, $\angle 2 = \angle 4 = \angle 6 = \angle 8 = 125°$.

5. $\because \quad PQ \parallel BC$ and AC is a transversal.

Thus, $\angle OAC = \angle ACB$ {Corresponding angle}

So, $x = 50°$

$\because PQ \parallel BC$ and AB is a transversal.

Thus, $\angle PAB = \angle ABC$ {Corresponding angles}

So, $y = 60°$

6. $\because$ $AB \parallel DE$ and $BC \parallel EF$

Thus, $\angle ABC = \angle DOC$ …(1) {Corresponding angle}

and, $\angle DEF = \angle DOC$ …(2) {Corresponding angle}

By Eqn. (1) and (2)

$$\angle ABC = \angle DEF$$
$$\angle 1 = \angle 2$$
$$70° = \angle 2$$

Hence, $\angle 2 = 70°$

7. $\because$ $AB \parallel CD$ and BE is a transversal.

Thus, $\angle ABC = \angle DCE$ {Corresponding angle}

$$x = 60°$$

and $\angle ACB + \angle ACD + \angle DCE = 180°$ {Linear pair}

$$z + 40° + 60° = 180°$$
$$z = 180° - 100°$$
$$z = 80°$$

In ΔABC, $\angle A + \angle B + \angle C = 180°$ {Sum of all angles of a triangle}

$$y + x + z = 180°$$
$$y + 140° = 180°$$
$$y = 180° - 140°$$
$$y = 40°$$

Hence, $x = 60°$, $y = 40°$ and $z = 80°$.

8. $\because$ $AB \parallel CD$ and AC is a transversal.

Thus, $\angle BAC + \angle ACD = 180°$

$$120° + p = 180°$$
$$p = 180° - 120°$$
$$p = 60°$$

and $\angle ACD + \angle ACF + \angle FCG = 180°$ {Linear pair}

$$p + q + 90° = 180°$$
$$60° + q + 90° = 180°$$
$$q + 150° = 180°$$
$$q = 180° - 150°$$
$$q = 30°$$

$\because$ $AE \parallel CF$ and AC is a transversal.

Thus, $\angle EAC + \angle ACF = 180°$

$$r + q = 180°$$
$$r + 30° = 180°$$
$$r = 180° - 30°$$
$$r = 150°$$

Hence, $P = 60°$, $q = 30°$ and $r = 150°$.

9. $\because$ $AB \parallel CD$

$\therefore$ $\angle 2 + \angle 1 = 180°$ {Linear pair}

$$(7x + 5) + (3x + 5) = 180°$$

$$7x + 5 + 3x + 5 = 180°$$
$$10x + 10° = 180°$$
$$10x = 180° - 10°$$
$$x = \frac{170°}{10} = 17$$
$$x = 17°$$

Hence, $\angle 1 = \angle 3 = 3 \times 17° + 5° = 56°$,
and, $\angle 2 = \angle 4 = 7 \times 17° + 5° = 124°$.

10. $\because$ $PQ \parallel RS$

Thus, $\angle a = 120°$ {Vertically opposite angles}
and, $\angle b = 65°$ {Vertically opposite angles}
and, $\angle c = \angle a$ {Corresponding angles}
$\angle c = 120°$
and, $\angle d = \angle b$ {Alternate angles}
$\angle d = 65°$

11. $\because$ $PQ \parallel RS$

$\therefore$ $\angle C = 70°$ {Alternate angles}
and, $\angle d = \angle$ {Corresponding angles}
$\angle d = 70°$
$\because$ $m \parallel n$
$\therefore$ $\angle b = \angle d$ {Corresponding angles}
$\angle b = 70°$
and, $\angle a = \angle c$ {Corresponding angles}
$\angle a = 70°$

13. $\because AB \parallel CD$ and PQ is a transversal.

Thus, $\angle 8 = \angle 1$ {Corresponding angles}
$\angle 8 = 65°$
and, $\angle 2 = \angle 8$ {Alternate angles}
$\angle 2 = 65°$
and, $\angle 3 = \angle 2$ {Corresponding angles}
$\angle 3 = 65°$
$\because$ $\angle 1 = \angle 5 = 180°$ {Linear pair}
$65° + \angle 5 = 180°$
$\angle 5 = 180° - 65°$
$\angle 5 = 115°$
and, $\angle 7 = \angle 5$ {Corresponding angles}
$\angle 7 = 115°$
and, $\angle 6 = \angle 7$ {Alternate angles}
$\angle 6 = 115°$
and, $\angle 4 = \angle 6$ {Corresponding angles}
$\angle 4 = 115°$

Hence, $\angle 1 = \angle 2 = \angle 3 = \angle 8 = 65°$

and, $\angle 4 = \angle 5 = \angle 6 = \angle 7 = 115°$.

Multiple Choice Questions

1. (i) **2.** (ii) **3.** (i) **4.** (iv)

Mental Exercise

1. 121° **2.** 45° **3.** cuts two or more lines of different points. **4.** parallel lines **5.** parallel.

9 The Triangle and its Properties

1. (i) 90°, 30°, 90°
$\because$ Sum = 90° + 30° + 90° = 210°
$\therefore$ We could not construct this type of triangle.

(ii) 45°, 60°, and 73°.
$\because$ Sum = 45° + 60° + 73° = 178°
$\therefore$ We could not construct this type of triangle.

(iii) 70°, 48° and 62°
$\because$ Sum = 70° + 48° + 62° = 180°
$\therefore$ Yes, we can construct this type of triangle.

(iv) 50°, 68° and 62°
$\because$ Sum = 50° + 68° + 62° = 180°
$\therefore$ Yes, we can construct this type of triangle.

2. Let, the angles of a triangle are x, $2x$ and $3x$.

$\because$ Sum of a angles of triangle $= 180°$

$\therefore$ $x + 2x + 3x = 180°$

$6x = 180°$

$x = \frac{180°}{6}$

$x = 30°$

$2x = 2 \times 30° = 60°$

and, $3x = 3 \times 30° = 90°$

Hence, the angles of the triangle are 30°, 60° and 90°. It is a right angled triangle.

3. $\because$ Two sides of isosceles triangle are same.

$\therefore$ Let, each of the equal side of isoscle triangle be x.

Thus, $x + x + 110° = 180°$ {Sum of all angles of a triangle}

$2x = 180° - 110°$

$x = \frac{70°}{2} = 35°$

Hence, all the angles of the triangle are 35° , 35° and 110°.

4. $\because$ Sum of all the angles of a triangle = 180°

In ΔADE,

$$\angle A + \angle D + \angle E = 180°$$
$$\angle 9 + \angle 7 + \angle 8 = 180° \quad \ldots(1)$$

In ΔADC,

$$\angle A + \angle D + \angle C = 180°$$
$$\angle 4 + \angle 6 + \angle 5 = 180° \quad \ldots(2)$$

In ΔABC,

$$\angle A + \angle B + \angle C = 180°$$
$$\angle 1 + \angle 2 + \angle 3 = \angle 180° \quad \ldots(3)$$

Add, Eqn. (1) + Eqn. (2) +Eqn. (3)

$$\angle 9 + \angle 7 + \angle 8 + \angle 4 + \angle 6 + \angle 5 + \angle 1 + \angle 2 + \angle 3$$
$$= 180° + 180° + 180°$$
$$\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5 + \angle 6 + \angle 7 + \angle 8 + \angle 9 = 540°$$

Hence, teh sum of $\angle 1, \angle 2, \angle 3, \angle 4, \angle 5, \angle 6, \angle 7, \angle 8$ and $\angle 9$ is 540°.

5. (i) $\because$ Sum of all the angles of a triangle = 180°

$$\angle A + \angle B + \angle C = 180°$$
$$51° + b + 90° = 180°$$
$$b + 141° = 180°$$
$$b = 180° - 141$$
$$b = 39°$$

(ii) $\because$ $AC = BC$

$\therefore$ $\angle A = \angle B = a = b$

$\because$ Sum of all the angles of a triangle = 180°

$$\angle A + \angle B + \angle C = 180°$$
$$a + a + 90° = 180°$$
$$2a = 180° - 90°$$
$$a = \frac{90°}{2} = 45°$$

Thus, $a = b = 45°$

(iii) In ΔABO,

$$\angle A + \angle B + \angle O = 180°$$
$$38° + 35° + q = 180°$$
$$73° + q = 180°$$
$$q = 107°$$
$$r = q \quad \{\text{Vertically opposite angle}\}$$
$$r = 107°$$
$$t = 30° \quad \{\text{Alternate angle}\}$$
$$s = 35° \quad \{\text{Alternate angle}\}$$

(iv) In Quadrilateral $ABCE$,

$$\angle A + \angle B + \angle C + \angle E = 360°$$
$$35° + P + P + 67° = 360°$$
$$102° + 2p = 360°$$

$$2p = 360° - 102°$$
$$p = \frac{258°}{2} = 129°$$
$$p = 129°$$
$$\angle BCE + \angle ECD = 180° \quad \{\text{Linear pair}\}$$
$$p + q = 180°$$
$$129° + q = 180°$$
$$q = 180° - 129°$$
$$q = 51°$$
$$\angle AEC + \angle CFD = 180°$$
$$67° + \angle CED = 180°$$
$$\angle CED = 180° - 67° = 113°$$

In $\Delta ACDE$,

$$\angle C + \angle E + \angle D = 180°$$
$$q + \angle CED + r = 180°$$
$$51° + 113° + r = 180°$$
$$164° + r = 180°$$
$$r = 180° - 164°$$
$$r = 16°$$

(v) In ΔABD,

$$\angle A + \angle B + \angle D = 180°$$
$$60° + 38° + x = 180°$$
$$98° + x = 180°$$
$$x = 180° - 98°$$
$$x = 82°$$
$$\angle ADB + \angle BDC = 180° \quad \{\text{Linear pair}\}$$
$$x + y = 180°$$
$$82° + y = 180°$$
$$y = 180° - 82°$$
$$y = 98°$$

In ΔBDC,

$$\angle B + \angle D + \angle C = 180°$$
$$28° + y + z = 180°$$
$$28° + 98° + z = 180°$$
$$126° + z = 180°$$
$$z = 180° - 126°$$
$$z = 54°$$

(vi) $\because$ $AB \parallel CD$

$\therefore$ $\angle A = \angle C$

$$\angle C = 90°$$
$$x = 90°$$

In Quadrilateral $ABCD$,

$$\angle A + \angle C + \angle D + \angle B = 360°$$

$$90° + 90° + (80° + z) + 47° = 360°$$
$$180° + 80° + z + 47° = 360°$$
$$307° + z = 360°$$
$$z = 360° - 307°$$
$$z = 53°$$

In ΔEBD,

$$\angle E + \angle D + \angle B = 180°$$
$$y + z + 47° = 180°$$
$$y + 53° + 47° = 180°$$
$$y + 100° = 180°$$
$$y = 180° - 100°$$
$$y = 80°$$

6. (i) False (ii) False (iii) False (iv) True
(v) False (vi) False

Exercise 9.2

1. (i) $2m, 4m, 5m$

$\because (2m + 4m) > 5m$

So, $2m, 5m, 4m$ are the possible lengths of a triangle.

(ii) 2 cm, 3 cm, 5 cm

$\because (2\,\text{cm} + 3\,\text{cm}) = 5\text{cm}$

So, 2 cm, 3 cm, 5 cm are not the possibles length of a triangle.

(iii) 3 cm, 4 cm, 5 cm

$\because (3\,\text{cm} + 4\,\text{cm}) > 5$ cm

So, 3 cm, 4 cm, 5 cm are the possible lengths of a triangle.

(iv) 2.8 cm, 1.4 cm, 4 cm

$\because$ (2.8 cm + 1.4 cm) > 4 cm

So, 2.8 cm, 1.4 cm and 4 cm a;re the possible length of a triangle.

(v) 17 cm, 7 cm, 8 cm

$\because (7\,\text{cm} + 8\,\text{cm}) < 17$ cm

So, 17 cm, 7 cm and 8 cm are not possible lengths of a triangle.

(vi) 45 mm, 50 mm, 135 mm

$\because$ (45 mm + 50 mm) < 135 mm

So, 45 mm, 50 mm and 135 mm are not the possible lengths of a triangle.

(vii) 1.5 cm, 6 cm, 3.5 cm

$\because$ (1.5 cm + 3.5 cm) < 6 cm

So, 1.5 cm, 3.5 cm and 6 cm are not the possible lengths of a triangle.

(viii) 5.6 cm, 6.8 cm, 7.8 cm

$\because$ (5.6 cm + 6.8 cm) > 7.8 cm

So, 5.6 cm, 6.8 cm and 7.8 cm are the possible lengths of a triangle.

(ix) 30 cm, 15 cm, 11 cm

$\because$ (11 cm + 11 cm) $<$ 15 cm

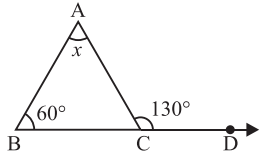
So, 30 cm, 15 cm and 11 cm are not the possible lengths of a triangle.

2. Let, the other interior angle be x.

Thus, $x + 60° = 130°$

$x = 130° - 60°$

$x = 70°$



$\because$ Sum of all the angles of triangle = 180°

$\therefore$ $60° + 70° + \angle C = 180°$

$130° + \angle C = 180°$

$\angle C = 180° - 130°$

$\angle C = 50°$

Hence, the remaining angles of the triangle are 70° and 50°.

3. $\because$ Sum of the angles of a triangle = 180°

$\angle L + \angle M + \angle N = 180°$

$35° + 70° + \angle N = 180°$

$\angle N = 180° - 105°$

$\angle N = 75°$

$\because$ Sum of two interior angles is equal to the opposite exterior angle.

$\therefore$ $\angle L + \angle M = 105°$

and, $\angle L + \angle N = \angle LMP$

$35° + 75° = \angle LMP$

Hence, $\angle LMP = 110°$

4. $\because$ Sum of two sides of a triangle is always greater than the third side.

$\because$ (i) No, $(OB + OC\ \angle BC)$ is not possible.

(ii) No, $= AC)$ is not possible.

(iii) Yes, $(OA + OB > AB)$ is possible.

5. $\because$ Sum of two sides of a triangle is always greater than the third side.

$\therefore$ $AC + CM > AM$ …(1)

and, $AB + MB > AM$ …(2)

Adding (1) and (2),

$AC + CM + AB + MB > AM + AM$

$AC + (CM + MB) + AB = 2AM$

$AC + CB + AB > 2AM$ $\{\because CM + MB = CB\}$

Yes, $AB + BC + CA > 2AM$

6. The length of two sides of a triangle = 6 cm and 10 cm.

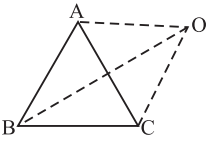
$\because$ $10\,\text{cm} + 6\,\text{cm} = 16\,\text{cm}$

and, $10\,\text{cm} - 6\,\text{cm} = 4\,\text{cm}$

Hence, the third side of the triangle is lies between 4 cm and 16 cm.

7. The shortest path is (i). D to A direct.

8. $\because$ Sum of two sides of triangle is always greater than the third side.



$\therefore$ (i) $OA + OB > AB$ …(1)

(ii) $OB + OC > BC$ …(2)

(iii) $OA + OC > AC$ …(3)

Adding (1), (2) and (3)

$(OA + OB) + (OB + OC) + (OA + OC) > AB + BC + AC$

$OA + OB + OB + OC + OA + OC > AB + BC + AC$

$2OA + 2OB + 2OC > AB + BC + AC$

Now, $2(OA + OB + OC) > AB + BC + AC$

Exercise 9.3

1. (i) 15, 20, 25

$\because (15)^2 + (20)^2 = 225 + 400$

$= 625$

and, $(25)^2 = 625$

$\therefore (15)^2 + (20)^2 = (25)^2$

Hence, 15, 20 and 25 are the triplets of a right-angled triangle.

(ii) 2.5, 6.5, 6

$\because (2.5)^2 + (6)^2 = 6.25 + 36$

$= 42.25$

and, $(6.5)^2 = 42.25$

$\therefore (2.5)^2 + (6)^2 = (6.5)^2$

Hence, 2.5, 6.5 and 6 are the triplets of a right-angled triangle.

(iii) 8, 7, 12

$\because (8)^2 + (7) = 64 + 49$

$= 113$

and, $(12)^2 = 144$

$\therefore (8)^2 + (7)^2 \neq (12)^2$

Hence, 8, 7 and 11 are not the triplets of a right-angled triangle.

(iv) 17, 15, 8

$\because (15)^2 + (8)^2 = 225 + 64 = 289$

and, $(17)^2 = 289$

$\therefore (15)^2 + (8)^2 = (17)^2$

Hence, 15, 8 and 17 are the triplets of a right angled triangle.

(v) 8, 9, 10

$\because (8)^2 + (9)^2 = 64 + 81 = 145$

and, $(10)^2 = 100$

$\therefore (8)^2 + (9)^2 \neq (10)^2$

Hence, 8, 9 and 10 are not the triplets of a right angled triangle.

(vi) 7, 24, 25

$\because (7)^2 + (24)^2 = 49 + 576 = 625$

and, $(25)^2 = 625$

$\therefore (7)^2 + (24)^2 = (25)^2$

Hence, 7, 24 and 25 are the triplets of a; right angled triangle.

(vii) 16, 12, 20

$\because (16)^2 + (12)^2 = 256 + 144 = 400$

and, $(20)^2 = 400$

$\therefore \quad (16)^2 + (12)^2 = (20)^2$

Hence, 16, 12 and 20 are the triplets of a right angled triangle.

(viii) 13, 14, 8

$\because \quad (13)^2 + (8)^2 = 169 + 64$

$= 233$

and, $(14)^2 = 196$

$\therefore \quad (13)^2 + (8)^2 = (14)^2$

Hence, 13, 14 and 8 are not the triplets of a triangle.

2. Two sides a right-angled triangle are 12 cm and 9 cm.

$\because$ (Base)^2 + (Perpendicular)^2 = (hypotenuse)^2

$\therefore \quad$ (Hypotenuse)^2 $= (12\,\text{cm})^2 + (9\,\text{cm})^2$

$= 144\,\text{cm}^2 + 81\,\text{cm}^2$

$= 225\,\text{cm}^2$

So, Hypotenuse $= \sqrt{225}\,\text{cm} = 15\,\text{cm}$

3. (i) $AB = 7\,\text{cm}, BC = 24\,\text{cm}$

$\because$ (Hypotenuse)^2 = (Base)^2 + (Perpendicular)^2

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

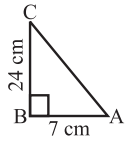
$= (7\,\text{cm})^2 + (24\,\text{cm})^2$

$= 49\,\text{cm}^2 + 576\,\text{cm}^2$

$= 625\,\text{cm}^2$

So, $AC = \sqrt{625}\,\text{cm}$

$= 25\,\text{cm}$



(ii) $AB = 10\,\text{cm}, BC = 24\,\text{cm}$

$\because$ (Hypotenuse)^2 = (Perpendicular)^2 + (Base)^2

$\therefore \quad (AC)^2 = (AB)^2 + (BC)^2$

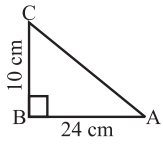
$= (10\,\text{cm})^2 + (24\,\text{cm})^2$

$= 100\,\text{cm}^2 + 576\,\text{cm}^2$

$= 676\,\text{cm}^2$

So, $AC = \sqrt{676}\,\text{cm}$

$= 26\,\text{cm}$



4. (i) 0.7, 2.4, 2.5

$\because \quad (0.7)^2 + (2.4)^2 = 0.49 + 5.76 = 6.25$

and, $(2.5)^2 = 6.25$

$(0.7)^2 + (2.4) = (6.25)$

Hence, (0.7, 2.4 and 2.5) are the triplets of a triangle.

(ii) 16, 63, 65

$\because \quad (16)^2 + (63)^2 = 256 + 3969 = 4225$

and, $(65)^2 = 4225$

$\therefore \quad (16)^2 + (63)^2 = (65)^2$

Hence, (16, 63 and 65) are the triplets of a triangle.

(iii) 27, 36, 45

$\because \quad (27)^2 + (36)^2 = 729 + 1296 = 2025$

and, $(45)^2 = 2025$

$\therefore \quad (27)^2 + (36)^2 = (45)^2$

Hence, (27, 36 and 45) are the triplets of a triangle.

5. Let, AB represent the distance of ladder from the wall and, BC represent the height of wall.

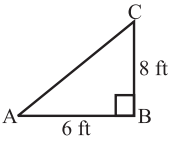
Thus, $(AC)^2 = (AB)^2 + (BC)^2$

$= (6\text{ ft})^2 + (8\text{ ft})^2$

$= 36\text{ ft}^2 + 64\text{ ft}^2$

$= 100\text{ ft}^2$

$AC = \sqrt{100}\text{ ft} = 10\text{ ft}$



Hence, the length of ladder is 10 ft.

6. Let, AB and BC represents the lengths of pole and its shadow.

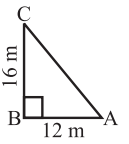
Thus, $(AC)^2 = (AB)^2 + (BC)^2$

$= (16\text{ m})^2 + (12\text{ m})^2$

$= 256\text{ m}^2 + 144\text{ m}^2$

$= 400\text{ m}^2$

$AC = \sqrt{400}\text{ m} = 20\text{ m}.$



Hence, the distance between the top of pole and the top of shadow is 20 m.

7. Let, BC is the distance from the foot and the top of pole.

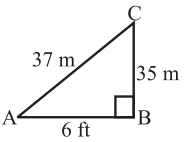
And, A is the bent point of the pole.

Thus, $(AC)^2 = (AB)^2 + (BC)^2$

$(37)^2 = (35\text{ m})^2 + (BC)^2$

$(BC)^2 = 1369\text{ m}^2 - 1225\text{ m}^2$

$BC = \sqrt{144}\text{ m} = 12\text{ m}$



Hence, the distance from the foot and the top of pole is 12 metre.

8. Let, OA and OB are the distance travel by A and B resspectively.

And, O is the starting point.

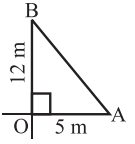
Thus, $(AB)^2 = (OA)^2 + (OB)^2$

$= (5\text{ m})^2 + (12\text{ m})^2$

$= 25\text{ m}^2 + 144\text{ m}^2$

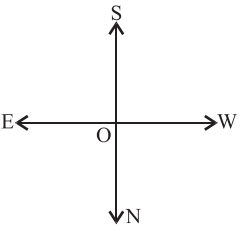
$= 169\text{ m}^2$

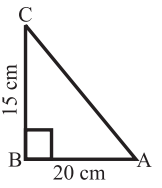
$AB = \sqrt{169}\text{ m} = 13\text{ m}$



Hence, A is 13 metre for from B now.

9. Let, A be the starting point C is the terminal point of the man.





Thus, $(AC)^2 = (AB)^2 + (BC)^2$

$= (20\text{ m})^2 + (15\text{ m})^2$

$= 400\text{ m}^2 + 225\text{ m}^2$

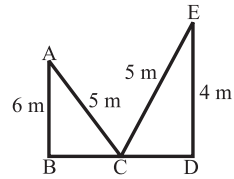
$= 625\text{ m}^2$

$AC = \sqrt{625}\text{ m} = 25\text{ m}$

Hence, the distance between the starting point and the terminal point is 25 m.

10. Let, AB and DF are the heights of windows.

In ΔABC,



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

$(5\text{ m})^2 = (3\text{ m})^2 + (BC)^2$

$(BC)^2 = 25\text{ m}^2 - 9\text{ m}^2$

$(BC)^2 = 16\text{ m}^2$

$BC = \sqrt{16}\text{ m} = 4\text{ m}$

In ΔECD,

$(EC)^2 = (CD)^2 + (ED)^2$

$(5\text{ m})^2 = (CD)^2 + (4\text{ m})^2$

$(CD)^2 = 25\text{ m}^2 - 16\text{ m}^2$

$(CD)^2 = 9\text{ m}^2$

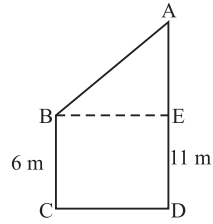
$CD = \sqrt{9}\text{ m} = 3\text{ m}$

$BD = BC + CD$

$= 4\text{ m} + 3\text{ m} = 7\text{ m}.$

Hence, the width of the read is 7 m.

11. Let, AD and BC are the height of two poles.



$\because$ $AE + ED = AD$

$AE + 6\text{ m} = 11\text{ m}$

$AE = 11\text{ m} - 6\text{ m} = 5\text{ m}$

Thus, $(AB)^2 = (BE)^2 + (AE)^2$

$= (12\text{ m})^2 + (5\text{ m})^2$

$= 144\text{ m}^2 + 25\text{ m}^2$

$AB = \sqrt{169}\text{ m} = 13\text{ m}$

Hence, the distance between the tops of two poles is 13 metre.

12. $\because$ $ABCD$ is a square.

Thus, $\angle D = 90°$

Now, In ΔADE,

$(AE)^2 = (AD)^2 + (DE)^2$

$= (10\text{ m})^2 + (10\text{ m} + 14\text{ m})^2$

$= 100\text{ m}^2 + 576\text{ m}^2$

$= 676\text{ m}^2$

$AE = \sqrt{676}\text{ m} = 26\text{ m}$

Hence, the length of AE is 26 metre.

Multiple Choice Questions

1. (iii) **2.** (ii) **3.** (iii) **4.** (i) **5.** (iii) **6.** (iii)

Mental Exercise

1. Sides, Angles, Median **2.** 75° **3.** 360° **4.** No **5.** opposite interior angles.

10 Congruence of Triangle

Exercise 10.1

1. Figures (i), (ii), (iii) and (iv) are congruent.

2. (ii), (iv) and (v) are congruent.

3. (i) True (ii) False (iii) False (iv) True (v) False

4. $\angle EFG \cong \angle RST$ (given)

and, $\angle EFG = 87°$

Thus, $\angle RST = \angle EFG$

$\angle RST = 87°$

Thus, $\angle RST = \angle EFG$

$\angle RST = 87°$

5. $\because$ $\angle POQ = \angle QOR = \angle ROS$

Thus, $\angle POQ + \angle QOR = \angle ROS + \angle QOR$

$\therefore$ $\angle POR = QOS$

Hence, $\angle POR \cong QOS$

Exercise 10.2

1. (i) $\because$ $\angle PMN = 60°$

and $\angle AMB = 60°$

So, $\angle PMN \cong \angle AMB.$

(ii) $\because$ $\angle ABC = 50°$

and, $\angle CBD = 50°$

So, $\angle ABC \cong \angle CBD.$

(iii) $\because$ $\angle QMS = 60°$

and, $\angle PMR = 60°$

So, $\angle QMS \cong \angle PMR.$

(iv) $\because$ $AC = DF$

$= 4\,\text{cm}$

$AB = ED$

$= 5\,\text{cm}$

and, $CB = EF$

$= 7\,\text{cm}$

Hence, $\Delta ABC \cong \Delta EF$ {By SSS}

2. Figures (ii), (iv) and (v) are congruent.

3. $\because$ $ABCD$ is a square.

Thus, $AB = BC = CD = DA$

And AC is the diagonal.

$\because$ $AB = AD$ (given)

$BC = DC$ (given)

and, $AC = AC$ (common)

So, $\Delta ABC \cong \Delta ADC$ {By SSS}

$\because$ $\angle DAB = 90°$ {Angle of square}

Thus, $\angle DAC = \angle CAB$

$= \frac{90°}{2}$

$= 45°$

Hence, $\angle CAB = 45°$.

4. $AB = BD$

$= 4.8$ cm

$AC = DC$

$= 3.5$ cm

and, $BC = BC$ (common)

So, $\Delta ABC \cong \Delta DBC$

$\because$ $\Delta ABC \cong \Delta DBC$

$\therefore$ $\angle ABC = \angle DBC$

Hence, BC bisects $\angle ABD$.

5. $\because$ D is the mid-point of BC.

Thus, $CD = BD$

$AD = AD$ (Common)

and, $\angle ADB = \angle ADC$ {90° each}

So, $\Delta ADB \cong \Delta ADC$ {By SAS}

6. $\because$ $CA = CB$ (given)

and, $\angle DCB = \angle DCA$ (given)

$CD = CD$ (common)

So, $\Delta ACD \cong \Delta BCD$

Thus, $AD = DB$

$\because$ $AB = AD + DB$

$= AD + AD$

$= 2AD$

Hence, $AD = \frac{1}{2} AB$

7. $BD = AC, EB = AE$

and, $\angle ADB = \angle ACB$

(i)$\because$ $BD = AC$ (given)

$AB = AB$ (common)

$\angle ADB = \angle ACD$ (given)

So, $\Delta ABD \cong \Delta BAC$

Thus, $AD = BC$

$\because$ $BD = AC$ and $AE = EB$

Thus, $DE = EC$

(ii) $\because$ $AD = BC$ (given)

$DE = EC$ (given)

and, $AE = EB$ (given)

So, $\Delta AED \cong \Delta BEC$ {By SSS}

8. (i) $\because$ $AB = DF$

$= 5\,\text{cm}$

$BC = EF$

$= 6\,\text{cm}$

and, $\angle ABC = \angle DFE$

$= 70°$

So, $\Delta ABC = \Delta DFE$ {By SAS}

(ii) $\because$ $AC = PQ$

$= 5.8$ cm

$\angle BAC = \angle PQR$

$= 85°$

$AB = 3.5$ cm

$QR = 4.5$ cm

Thus, $AB \neq QR$

So, ΔABC and ΔPQR are not congruent.

$\because$ $LM = PQ$

$= 2.6$ cm

$MN = PR$

$= 9.2$ cm

and, $\angle LMN = \angle PRQ$

$= 40°$

So, $\Delta NML \cong PQR$

9. $\because$ $AB = AC$ and $\angle 1 = \angle 2$

$\because$ $AB = AC$ (given)

$\angle 1 = \angle 2$ (given)

Thus, $\angle BAD = \angle CAD$

and, $AD = AD$ (common)

So, $\Delta ABD \cong \Delta ACD$

(i) Thus, $\angle ABD = \angle ACD$ and

(ii) $BD = CD$

(iii) $\because$ $AB = AC$ (given)

$BD = CD$

$BC = BC$ (common)

and, $\angle ABD = \angle ACD$

$\therefore$ $\angle DBC = \angle DCB$

10. If ABC is a equilateral triangle.

Thus, $AB = BC = CA$

and, $\angle A = \angle B = \angle C$

$\because$ $AB = AC$ {each side of equilateral triangle}

$\angle BAE = \angle ACD$ {each angle of equilateral triangle}

and, $\angle BEA = \angle ADC$ {each 90°}

So, $\Delta BEA \cong \Delta ADC$ {By ASA}

11. Let, ΔABC is a equilateral traingle.

Thus, $AB = BC = AC$

and, $\angle A = \angle B = \angle C$

$\because$ $AB = AB$ (common)

$\angle ABE = \angle ADB = 90°$

So, $\Delta ABE \cong \Delta B\text{A}\Delta$

$\because$ $\Delta ABE \cong \Delta BAD$

$\therefore$ $BD = AE$ **Proved.**

Hence, to altitudes of a equilateral triangle are of equal length.

12. If, $\Delta ABC = \Delta EDF$

Thus, $\angle E = 40°$,

$\angle D = 80°$ and

$\angle F = 60°$

Side, $ED = 5\,\text{cm}$

$DF = 4\,\text{cm}$ and $EF = 7\,\text{cm}$

13. (i) $\because$ $AB = DE = 5.3$ cm,

$\angle A = \angle D = 80°$ and

$\angle B = \angle E = 50°$

So, $\Delta ABC \cong \Delta DEF$ {By ASA}

(ii) $\because$ $\angle DAC = \angle BAC = 45°$,

$\angle DCA = \angle BCA = 30°$

and, $AC = AC$ (common)

So, $\Delta ABC \cong \Delta ADC$ {By ASA}

(iii) $\because$ $\angle ABC = \angle PRQ = 70°$,

$\angle BCA = \angle RQP = 30°$,

and, $AB = PR = 2.3$ cm

So, $\Delta ABC \cong \Delta PRQ$ {By ASA}

(iv) $\because$ $AB = BA$ {common}

$\angle ABD = \angle BAC = 145°$

and, $\angle BAD = \angle ABC = 35°$

So, $\Delta ABC \cong BAD$ {By ASA}

14. $\because$ Point E is the mid-point of AC and BD.

Thus, $AE = EC = \dfrac{AC}{2}$

and, $BE = ED = \frac{BD}{2}$

(i) $AB \parallel CD$

Thus, $\angle CDB = \angle DBA$

(ii) No, $\angle CDB \neq \angle CAB$,

(iii) Yes, $DC \parallel AB$,

(iv) No, $DC \neq AB$.

15. (i) ΔCDE is congruent to the ΔABE.

(ii) ΔAED is congruent to the ΔCEB.

16. If, $ABCD$ is a rectangle.

(i) Thus, $AC = BD$.

(ii) $\because$ $\angle A = \angle B = \angle C = \angle D = 90°$

Thus, $\angle DAB = \angle DCB$,

$AD = BC$ and $AB = CD$

So, $\Delta DAB \cong \Delta BCD$

(iii) $\because$ $\angle DAB = \angle CBA$,

$AD = BC$ and $AB = CD$

So, $\Delta DAB \cong \Delta CBA$

17. (i) $\because$ $\Delta ABD \cong \Delta CDB$

and, $\angle ADB = \angle DBC = 80°$

Thus, $AD = BC$

(ii) $\because$ $\Delta ABD \cong \Delta CDB$

and, $\angle BDC = \angle ABD = 40°$

Thus, $BC = AB$

(iii) $\because$ $\angle D = \angle B = 120°$

and, $AD = BC$

Thus, $AB \parallel CD$

and, $AB = CD$

Thus, $AD \parallel BC$

So, $ABCD$ is parallelogram.

Multiple Choice Questions

1. (i) **2.** (ii) **3.** (i) **4.** (i)

Mental Exercise

1. If, $\Delta EFG \cong \Delta XYZ$

Thus,` $EF = XY, FG = YZ$ and $EG = XZ$,

$\angle E = \angle X, \angle F = \angle Y$ and $\angle G = \angle Z$

2. $\because$ $\Delta \boldsymbol{ABC} \cong \Delta \boldsymbol{PQR}$

$\therefore$ $\angle A = \angle P$

$(x + 5)° = 50°$

$x = 50° - 5°$

$x = 45°$

and, $\angle R = \angle C$

$$(y + 10^\circ) = 70^\circ$$
$$y = 70^\circ - 10^\circ$$
$$y = 60^\circ$$

3. If, $\angle F = \angle S, EF = RS$

and, $FG = ST$

$\therefore$ Yes, $\Delta EFG = 90^\circ, AB = 4\text{ cm}$

and, $BC = 3\text{ cm}$

Then, $(XZ)^2 = (XY)^2 + (XZ)^2$

$= (AB)^2 + (BC)^2$

$= (4\text{ cm})^2 + (3\text{ cm})^2$

$= 16\text{ cm}^2 + 9\text{ cm}^2$

$= 25\text{ cm}^2$

So, $XZ = \sqrt{25}\text{ cm}$

$XZ = 5\text{ cm}$

5. $\because$ $\Delta LMN \cong \Delta RST$, by ASA

and, $\angle M = 50^\circ, \angle T = 70^\circ$ and $ST = 5\text{ cm}$

Thus, $\angle N = \angle T$ and $\angle S = \angle n$

$\angle N = 70 \qquad \angle s = 50^\circ$

$\because$ $\angle L + \angle M + \angle N = 180^\circ$

$\angle L + 50^\circ + 70^\circ = 180^\circ$

$\angle L = 180^\circ - 120^\circ$

So, $\angle L = 60^\circ$

Thus, $\angle R = \angle L$

$\angle R = 60^\circ$

$\because$ $MN = ST$

So, $MN = 5\text{ cm}$

6. $\because$ $\Delta LMN \cong \Delta XYZ$ (by RHS)

and, $\angle M = \angle Y = 90^\circ, \angle N = 10\text{ cm}$ and $XY = \text{cm}$

$\because$ $\angle n = XY$

$\therefore$ $\angle M = 6\text{ cm}$

Then, $(\angle N)^2 = (\angle M)^2 + (MN)^2$

$(10\text{ cm})^2 = (6\text{ cm})^2 + (MN)^2$

$(MN)^2 = 100\text{ cm}^2 - 36\text{ cm}^2$

$(MN)^2 = 64\text{ cm}^2$

$MN = \sqrt{64}\text{ cm}$

$MN = 8\text{ cm}$

$\because$ $\angle N = XZ$

$\therefore$ $\angle N = 10\text{ cm}$

and, $\angle MN = YZ$

$\therefore$ $YZ = 8\text{ cm}$

11 Comparing Quantities

Exercise 11.1

1. (i) 3 hrs to 5 hrs 20 min

$\Rightarrow$ 3 hrs : 5 hrs 20 min $= 3\,\text{hrs} : 5\,\text{hrs}\,20\,\text{min}$

$$= \frac{3\times 60\,\text{min}}{5\times 60+20\,\text{min}}$$

$$= \frac{180}{320} = \frac{18}{32} = 9:16.$$

(ii) ₹ to 90 paise $= ₹\ 3 : 90\,\text{paise}$

$$= \frac{3\times 100\,\text{paise}}{90\,\text{paise}}$$

$$= \frac{300}{90} = \frac{10}{3} = 10:3.$$

(iii) 12.80 m to 320 cm $= 12.80\ \text{m} : 320\ \text{cm}$

$$= \frac{12.80\times 100\,\text{cm}}{320\,\text{cm}} = \frac{1280}{320} = \frac{4}{1} = 4:1.$$

(iv) $1035\ \text{ml} : 5\ l\ 40\ \text{m}l = \dfrac{1035\ \text{m}l}{(5\times 1000+40)\ \text{m}l} = \dfrac{1035}{5040} = \dfrac{23}{112} = 23:112.$

2. (i) $5:8 = \dfrac{5}{8}$ and $11:15 = \dfrac{11}{15}$

$$\frac{5}{8} = \frac{5\times 15}{8\times 15} = \frac{75}{120}, \frac{11}{15} = \frac{11\times 8}{15\times 8} = \frac{88}{120}$$

$\because \quad \dfrac{88}{120} > \dfrac{75}{120}$

$\therefore$ (11 : 15) is greater then (5 : 8).

(ii) $12:25 = \dfrac{12}{25}$ and $25:48 = \dfrac{25}{48}$

$$\frac{12}{25} = \frac{12\times 48}{25\times 48} = \frac{576}{1200}$$

and, $\dfrac{25}{48} = \dfrac{25\times 25}{48\times 25} = \dfrac{625}{1200}$

$\because \quad \dfrac{625}{1200} > \dfrac{576}{1200}$

So, (25 : 48) is greater than j(12 : 25).

3. Let, the new salary of the employee is x.

Thus, $2:3 = ₹\ 15000 : x$

$$\frac{2}{3} = \frac{₹\ 15{,}000}{x}$$

$$2x = ₹\ 15{,}000\times 3$$

$$x = ₹\ 22{,}500$$

Hence, the new salary of the employee is ₹ 32,500.

4. Monthly salary of Kavita = ₹ 12,500

Her monthly saving = ₹ 2,500

Thus, her expenditure = ₹ 12,500 – ₹ 2,5000

= ₹ 10,000

(i) Ratio of her saving to her salary

$$= \frac{₹\ 2,500}{₹\ 12,500} = \frac{25}{125} = \frac{1}{5} = 1 : 5.$$

(ii) Ratio of her expenditure to her salary $= \frac{₹\ 10,000}{₹\ 12,500} = \frac{100}{125} = 4 : 5.$

(iii) Ratio of her expenditure to her savings $= \frac{₹\ 10,000}{₹\ 2,500} = \frac{100}{25} = 4 : 1.$

5. Total number of students = 800

Number of boys = 550

Thus, number of girls = 800 – 550

= 250

(i) Ratio of number of boys to number of girls = 550 : 250

$$= \frac{550}{250} = \frac{11}{5} = 11 : 5$$

(ii) Ratio of number of girls to number of boys = 250 : 550 $= \frac{250}{550}$

= 5 : 11.

(iii) Ratio of total numbr of students to the number of girls

$$= 800 : 250 = \frac{800}{250} = \frac{16}{5} = 16 : 5.$$

6. Total number of students = 30

Month like = 12 students,

English like = 6 students,

Thus, Hindi like = (30 – 12 – 6) = 12 students

(i) Ratio of number of students liking English to the number of students liking Hindi = 6 : 12 $= \frac{6}{12} = \frac{1}{2} = 2 : 5.$

7. Cost of a dozen of balls = ₹ 186

Thus, the cost of a ball $= \frac{₹\ 186}{12} = ₹\ 15.5$

And, Cost of a score of shuttle cock = ₹ 90

Thus, the cot of a shuttle cock $= \frac{₹\ 90}{20} = ₹\ 4.5$

So, Ratio of the price of a ball to that of a shuttle cock

$$= \frac{₹\ 15.5}{₹\ 4.5} = \frac{155}{45} = \frac{31}{9} = 31 : 9$$

8. $\because$ $\text{Speed} = \dfrac{\text{Distance}}{\text{Time}}$

Thus, Speed of cycle $= \dfrac{35}{5} = 7$ km/hr

and, Speed of bike $= \dfrac{130}{2} = 65$ km/hr

So, Ratio of the speed of bike to the speed of cycle = 65 : 7.

9. Let Candidate 'B' got votes = x

Thus, Candidate 'A' got votes = $x + 400$

$\because$ Total number of polled votes = 30,000

So, $x + x + 400 = 30{,}000$

$2x = 30{,}000 - 400$

$2x = 29{,}600$

$x = \dfrac{29{,}600}{2}$

$x = 14{,}800$

Hence, the ratio of votes polled candidate 'A' to candidate 'b'

$= \dfrac{14{,}800}{(14{,}800 + 400)} = \dfrac{148}{152} = \dfrac{37}{38} = 37 : 38.$

10. Strength of students last year = 720 enrolments.

Strength of students this year = 800 enrolments

So, the ratio of enrolments of last year to this year $= \dfrac{720}{800} = \dfrac{9}{10} = 9 : 10.$

and, the ratio of increase of strength to the strength of this yea r

$= \dfrac{(800 - 720)}{800} = \dfrac{80}{800} = 1 : 10.$

11. Let, Kabir got money $= 3x$

Vijay got money $= 4x$

and, Joseph got money $= 5x$

So, $3x + 4x + 5x = ₹\ 1560$

$12x = ₹\ 1560$

$x = \dfrac{₹\ 1560}{12} = ₹\ 130$

Hence, Kabir got $= ₹\ 130 \times 3 = ₹\ 390,$

Vijay got $= ₹\ 130 \times 4 = ₹\ 520$

and, Joseph got $= ₹\ 130 \times 5 = ₹\ 650.$

Exercise 11.2

1. (i) 18, 24, 9, 12

Product of extremes $= 18 \times 12 = 216$

and, Product of means $= 24 \times 9 = 216$

$\because$ Product of extremes = Product of means

$\therefore$ (18, 24, 9, 12) are in proportion.

(ii) 15, 16, 20, 21

Product of extremes $= 15 \times 21 \Rightarrow 315$

Product of means $= 16 \times 20 = 320$

$\because$ Product of extremes $\neq$ Product of means

$\therefore$ (15, 16, 20 and 21) are not in proportion.

(iii) 4, 7, 5, 9

Product of extremes $= 4 \times 9 = 36$

Product of means $= 7 \times 5 = 35$

$\therefore$ Product of extremes $\neq$ Product of means

$\therefore$ (4, 7, 5 and 9) are not in proportion.

(iv) 12, 36, 18, 25

Product of extremes $= 12 \times 25 = 300$

Product of means $= 36 \times 18 = 648$

$\because$ Product of extremes $\neq$ Product of means

$\therefore$ (12, 36, 18 and 25) are not in proportion.

(v) 1.2, 2.7, 0.7, 0.9

Product of extremes $= 1.2 \times 0.9 = 1.08$

Product of means $= 2.7 \times 0.7 = 1.89$

$\because$ Product of extremes $\neq$ Product of means.

$\therefore$ (1.2, 2.7, 0.7 and 0.9) are not in proportion.

(vi) 8, 12, 10, 15

Product of extremes $= 8 \times 15 = 120$

Product of means $= 12 \times 10 = 120$

$\because$ Product of extremes $=$ Product of means

$\therefore$ (8, 12, 10 and 15) are in proportion.

2. (i) False (ii) Flase (iii) True (iii) False

3. (i) 30, 105, 42

Let, the forth proportion be x.

Thus, $30 \times x = 105 \times 42$

$$x = \frac{105 \times 42}{30} = 21 \times 7$$

$$x = 147$$

Hence, the fourth proportion is 147.

(ii) 57, 76, 108

Let, the fourth proportion be x.

Thus, $57 \times x = 76 \times 108$

$$x = \frac{76 \times 108}{57} = 4 \times 36$$

$$x = 144$$

Hence, the fourth proprotion is 144.

(iii) $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$

Le t, the fourth proportion be x.

Thus, $\frac{1}{2} \times x = \frac{1}{3} \times \frac{1}{4}$

$$\frac{x}{2} = \frac{1}{12}$$

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

Hence, the fourth proportion is $\frac{1}{6}$.

4. (i) $80 : 32 :: x : 16$

$$\frac{80}{32} = \frac{x}{16}$$

$$\frac{80 \times 16}{32} = x$$

$$x = \frac{80}{2} = 40$$

$$x = 40$$

(ii) $2\frac{1}{2} : x :: 3\frac{1}{2} : 4$

$$\frac{5}{2} : x = \frac{7}{2} : 4$$

$$\frac{5}{2x} = \frac{7}{2 \times 4}$$

$$5 \times 8 = 7 \times 2x$$

$$\frac{40}{14} = x$$

$$x = 2\frac{6}{7}$$

(iii) $x : 3 :: 4 : 6$

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

$$x = \frac{4 \times 3}{6}$$

$$x = 2$$

(iv) $33 : 132 :: x : 16$

$$\frac{33}{132} = \frac{x}{16}$$

$$\frac{33 \times 16}{132} = x$$

$$x = \frac{11 \times 16}{44} = \frac{16}{4}$$

$$x = 4$$

(v) $0.9 : 0.6 :: x : 3$

$$\frac{0.9}{0.6} = \frac{x}{3}$$

$$\frac{9}{6} \times 3 = x$$

$$x = \frac{9}{2}$$

$$x = 4.5$$

(iv) $80 : 32 :: 40 : X$

$$\frac{80}{32} = \frac{40}{x}$$

$$80x = 40 \times 32$$

$$x = \frac{40 \times 32}{80}$$

$$x = 16$$

5. (i) 2.5 and 8.5

Let the third proportion be x.

$\because$ $2.5 : 8.5 : x$

Thus, $2.5 \times x = 8.5 \times 8.5$

$$x = \frac{8.5 \times 8.5}{2.5}$$

$$x = \frac{85 \times 85}{250} = \frac{17 \times 17}{10}$$
$$x = 28.9$$

(ii) 8 and 12

Let, the third proportion be x.

$\because$ $8 : 12 : x$

Thus, $8 \times x = 12 \times 12$

$$x = \frac{12 \times 12}{8} = 3 \times 6$$
$$x = 18$$

(iii) $\frac{1}{2}$ and $\frac{3}{4}$

$\because$ $\frac{1}{2} : \frac{3}{4} : x$

Thus, $\frac{1}{2} \times x = \frac{3}{4} \times \frac{3}{4}$

$$x = \frac{3 \times 3 \times 2}{4 \times 4} = \frac{3 \times 3}{4 \times 2}$$
$$x = \frac{9}{8}$$

(iv) 16 and 20

Let, the third proportion be x.

$\because$ $16 : 20 : x$

Thus, $16 \times x = 20 \times 20$

$$x = \frac{20 \times 20}{16} = 5 \times 5$$
$$x = 25$$

(v) 3.6 and 1.8

Let, the third proportion be x.

$\because$ $3.6 : 1.8 : x$

Thus, $3.6 \times x = 1.8 \times 1.8$

$$x = \frac{1.8 \times 1.8}{3.6} = \frac{18 \times 18}{360} = \frac{18}{20}$$
$$x = 0.9$$

(vi) $2\frac{1}{4}$ and 9

$\because$ $\frac{9}{4} : 9 : x$

Thus, $\frac{9}{4} \times x = 9 \times 9$

$$x = \frac{9 \times 9 \times 4}{9}$$

$$x = 36$$

6. $\because$ a, b and c are in continued proportion.

Thus, $a : b :: b : c$

$$\Rightarrow \quad b^2 = ac$$

Put, the value of b and c.

So, $$(15)^2 = a \times 40$$

$$40a = 225$$

$$a = \frac{225}{40}$$

$$a = 5.625$$

7. Let, the fourth proportional be x.

Thus, $15 : 20 :: 30 : x$

$$\frac{15}{12} = \frac{30}{x}$$

$$15 \times x = 30 \times 12$$

$$x = \frac{30 \times 12}{15} = 2 \times 12$$

$$x = 24$$

8. (i) $6, 9, x$

Thus, $6 : 9 :: 9 : x$

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

$$6 \times x = 9 \times 9$$

$$x = \frac{9 \times 9}{6} = \frac{27}{2}$$

$$x = 13.5$$

(ii) $14, 21, x$

Thus, $14 : 21 :: 21 : x$

$$\frac{14}{21} = \frac{21}{x}$$

$$14 \times x = 21 \times 21$$

$$x = \frac{21 \times 21}{14} = \frac{3 \times 21}{2}$$

$$x = 31.5$$

(iii) $12, 48, x$

Thus, $12 : 48 : 48 : x$

$$\frac{12}{48} = \frac{48}{x}$$

$$12 \times x = 48 \times 48$$

$$x = \frac{48 \times 48}{12} = 4 \times 48$$

$$x = 192$$

9. Ratio of boys to girls in class = 3 : 4

Let, the number of boys be x.

Thus, $x : 20 = 3 : 4$

$$\frac{x}{20} = \frac{3}{4}$$

$$x = \frac{3 \times 20}{4} = 15$$

Hence, there are 15 boys in the class.

10. Let the height of three is x meter.

Thus, $x : 8 :: 3 : 2$

$$\frac{x}{8} = \frac{3}{2}$$

$$x = \frac{3 \times 8}{2} = 12$$

Hence, the height of the tree is 12 metre.

11. Ratio of female teachers to that of male teachers in a school = 4 : 5.

Let, the number of male teachers be x.

Thus, $40 : x :: 4 : 5$

$$\frac{40}{x} = \frac{4}{5}$$

$$40 \times 5 = 4x$$

$$x = \frac{40 \times 5}{4} = 50$$

Hence, there are 50 male teachers in the school.

12. Ratio of men to women passengers in a aeroplane = 4 : 7.

Let, the number of men be x.

Thus, $x : 147 :: 4 : 7$

$$\frac{x}{147} = \frac{4}{7}$$

$$x = \frac{4 \times 147}{7} = 4 \times 21$$

$$x = 84$$

So, Total passengers = 147 + 84 = 231

Hence, there are (84 men, 147 women) and 231 total passengers in the aeroplaen.

13. Ratio of njmber of dogs to cats = 5 : 4

Let, the number of dogs be x.

Thus, $x : 60 :: 5 : 4$

$$\frac{x}{60} = \frac{5}{4}$$

$$x = \frac{5 \times 60}{4} = 5 \times 15$$

$$x = 75$$

Hence, there are 75 dogs they have.

14. Cost of 12 kg of onions = ₹ 60

$\therefore$ Cost of 1 kg of onions = $₹ \frac{60}{12} = ₹ 5$

So, cost of 42 kg of onions = $₹ 5 \times 42 = ₹ 210$.

15. Let, the wages of Vivek = $3x$

The wages of Raghu = $4x$

and, the wages of Murad = $7x$

Thus, wages of Raghu, $4x = ₹ 20$

$x = \frac{₹ 20}{4} - ₹ 5$

Hence, the wages of Vivek = $3 \times ₹ 5 = ₹ 15$.

and, the wages of Murad = $7 \times ₹ 5 = ₹ 35$.

Exercise 11.3

1. Price of 10 soap cakes = ₹ 62

$\therefore$ Price of 1 soap cake = $\frac{₹ 62}{10}$

So, Price of one dozen (12) soap cakes = $\frac{₹ 62}{10} \times 12 = ₹ 74.40$

2. Time taken to iron 12 cloths = 36 minutes

$\therefore$ Time taken to iron 1 cloth = $\frac{36}{12} = 3$ minutes

So, Time taken to iron 9 cloths = $3 \times 9 = 27$ minutes.

3. Earning by man in 20 days = ₹ 500

$\therefore$ Earning by man in 1 day = $\frac{₹ 500}{20}$

So, Earning by man in 30 days = $\frac{₹ 500}{20} \times 30 = ₹ 750$.

4. Thickness of a pile of 400 sheets = 6 cm

$\therefore$ Thickness of the pile of 1 sheet = $\frac{6}{400}$ cm

So, Thickness of the pile of 150 sheets = $\frac{6}{400} \times 150 = 2.25$ cm.

5. Weight of nine packets of cereal = 4500 g

$\therefore$ Weight of one packet of cereal = $\frac{4500}{9}$ g

So, Weight of four packets of cereal = $\frac{4500}{9} \times 4$ g

= 2000 g or 2 kg.

6. Plane travels in 6 hours = 5100 km

$\therefore$ Plane travels in 1 hour = $\frac{5100}{6}$ km

Thus, Plane travels in 4 hours $= \frac{5100}{6} \times 4\,\text{km} = 3400\,\text{km}.$

and, Plane travels in 1 minute $= \frac{5100}{6 \times 60}\,\text{km}$

and, Plane travels in 36 minutes $= \frac{5100}{6 \times 60} \times 36\,\text{km} = 510\,\text{km}$

So, the plane travel in 4 hours 36 minutes $= (3400 + 510)\,\text{km} = 3910\,\text{km}.$

7. Let, x number of boxes will needed to pack 900 brass plates.

Thus, $1440 : 16 :: 900 : x$

$$\frac{1440}{6} = \frac{900}{x}$$

$$x = \frac{900 \times 16}{1440} = 10$$

Hence, 10 boxes will be needed to pack 900 brass plates.

8. The average rainfall in 4 weeks = 19.6 cm

$\therefore$ The average rainfall in a day $= \frac{19.6}{7 \times 4}$ cm

So, the average rainfall in 17 days $= \frac{19.6}{28} \times 17\,\text{cm}$

$= 11.9$ cm.

9. (i) 4 containers can hold milk = 101 litre

$\therefore$ One container hold milk $= \frac{101}{4}$ litre

So, 7 containers will hold milk $= \frac{101}{4} \times 7l = 176.75$ litre.

(ii) $\because$ 101 litres of milk hold $= 4$ containers

$\therefore$ 1 litre of milk hold $= \frac{4}{101}$ containers

So, 252.5 litres of milk hold $= \frac{4}{101} \times 252.5$

$$= \frac{1010}{101} = 10 \text{ containers.}$$

10. (i) Time taken to print 150 sheets = 3 minutes.

$\therefore$ Time taken to print 1 sheet $= \frac{3}{150}$ minutes

So, Time taken to print 3000 sheets $= \frac{3}{150} \times 3000$

$= 60$ minutes

$= 1$ hour

(ii) $\because$ Print in 3 minutes $= 150$ sheets

$\therefore$ Print in 1 minute $= \frac{150}{3}$ sheets

So, Print in $1\frac{1}{2}$ hours $= \frac{150}{3} \times \frac{3}{2} \times 60$

$= 4500$ sheets.

Exercise 11.4

1. (i) $20\% = \frac{20}{100} = \frac{1}{5}$.

(ii) $0.35\% = \frac{0.35}{100} + \frac{35}{10000} = \frac{7}{2000}$.

(iii) $16\frac{2}{3}\% = \frac{50}{3}\% = \frac{50}{3 \times 100} = \frac{1}{3 \times 2} = \frac{1}{6}$.

(iv) $31.25\% = \frac{31.25}{100} = \frac{3125}{10000} = \frac{5}{16}$

2. (i) $\frac{1}{4} = \frac{1}{4} \times 100\% = 25\%$

(ii) $\frac{4}{25} = \frac{4}{25} \times 100\% = (4 \times 4)\% = 16\%$

(iii) $\frac{1}{25} = \frac{1}{25} \times 100\% = 4\%$

(iv) $1\frac{3}{25} = \frac{28}{25} = \frac{28}{25} \times 100\% = (28 \times 4)\% = 112\%$

3. Find :

(i) 5% of ₹ 40

$= ₹\ 40 \times \frac{5}{100}$

$= ₹\ \frac{200}{100} = ₹\ 2$

(ii) 15% of 30 metre

$= 30\ \text{m} \times \frac{15}{100}$

$= \frac{450}{100}\ \text{m} = 4.5$ metre

(iii) 90% of 2.5 kg

$= 2.5\ \text{kg} \times \frac{90}{100} = 2.25\ \text{kg}$

(iv) 3.75% of 1000 litres

$= 1000\ l \times \frac{3.75}{100} = 37.50$ litre

4. (i) Let, x% of ₹ 11.40 is 38 paisa.

Thus, $\frac{₹\ 11.40 \times x}{100} = 38$ paisa

$\frac{₹\ 11.40 \times x}{100} = ₹\ 0.38$

$x = \frac{0.38 \times 100}{11.40} = \frac{38}{11.4}$

$x = 3\frac{1}{3}\%$

Hence, $3\frac{1}{3}$% of ₹ 11.40 is 38 paisa.

(ii) Let, x% of 1 kg is 7 g.

Thus, $1\text{ kg} \times \frac{x}{100} = 7\text{g}$

$\frac{1000}{100}\text{g} \times x = 7\text{g}$

$x = \frac{7}{10} = 0.7\%$

Hence, 0.7% of 1 kg is 7 gram.

(iii) Let, x% of 40 km is 800 m.

Thus, $\frac{40\text{ km} \times x}{100} = 800\text{ m}$

$\frac{40{,}000\text{ m} \times x}{100} = 800\text{ m}$

$x = \frac{800}{400} = 2\%$

Hence, 2% of 4 km is 800 metre.

(iv) Let, x% of 2 litres is 250 ml.

Thus, $2l \times \frac{x}{100} = 250\text{ ml}$

$\frac{2000\text{ ml} \times x}{100} = 250\text{ ml}$

$x = \frac{250}{20} = 12.5\ \%$

Hence, 12.5% of 2 litres is 250 ml.

5. (i) $25\% = \frac{25}{100} = \frac{1}{4} = 1 : 4.$ (ii) $150\% = \frac{150}{100} = \frac{3}{2} = 3 : 2.$

(iii) $16\frac{2}{3}\% = \frac{50}{3}\% = \frac{50}{300} = \frac{1}{6} = 1 : 6$

(iv) $16.25\% = \frac{16.25}{100} = \frac{1625}{10000} = \frac{13}{80} = 13 : 80.$

6. (i) $0.23 = (0.23 \times 100)\% = 23\%$ (ii) $0.4 = (0.4 \times 100)\%$

(iii) $0.04 = (0.04 \times 100)\% = 4\%$ (iv) $8.75 = (8.75 \times 100)\% = 875\%$

7. (i) $0.9\% = \frac{0.9}{100} = 0.009$

(ii) $6\frac{1}{4}\% = \frac{25}{4}\% = \frac{25}{4 \times 100} = 0.0625$

(iii) $20\% = \frac{20}{100} = 0.2$ (iv) $148.6\% = \frac{148.6}{100} = 1.486$

8. (i) $7 : 5 = \frac{7}{5} \times 100\% = (7 \times 20)\% = 140\%$

(ii) $8 : 50 = \frac{8}{50} \times 100\% = (8 \times 2)\% = 16\%$

(iii) $200:300=\frac{200}{300}\times 100\%=\frac{200}{3}\%=198\frac{2}{3}\%$

(iv) $10:25=\frac{10}{25}\times 100\%=(10\times 4)\%=40\%$

9. $\because$ $x\%$ of $350 = 21$

$\therefore$ $350\times\frac{x}{100}=21$

$x=\frac{21\times 100}{350}=\frac{3\times 10}{5}=6$

So, $x=6$

10. Let, 8% of x is 50.

Thus, $x\frac{8}{100}=50$

$x=\frac{50\times 100}{8}$

$x=25\times 25=625$

Hence, the required number is 625 whose 8% is 50.

Exercise 11.5

1. Let, the total length of be x.

Thus, 22% of $x = 33$ m

$\frac{22}{100}\times x = 33$ m

$x=\frac{33\times 100}{22}=\frac{3\times 100}{2}$ m

$x = 150$ m

Hence, the total length is 1`k50 metre.

2. Let, the monthly income of a man be x.

Thus, $(100-69)$ of $x = ₹\ 2108$

$31\% \times x = ₹\ 2108$

$\frac{31}{100}\times x = ₹\ 2108$

$x=\frac{₹\ 21008\times 1000}{31}$

Hence, the monthly income of the man is ₹ 6800.

3. Let, the total number of marks be x.

Thus, 45% of $x = 135$ marks

$x\times\frac{45}{100}=135$

$x=\frac{135\times 100}{45}=3\times 100$

$x = 300$ marks

Hence, the total number of marks is 300.

4. Total number of marks in maths = 80

Simi obtained marks = 40

Thus, percentage of marks obtained by her

$$= \frac{40}{800} \times 10 = 50\%.$$

5. Let, total number of marks be x.

And, passing marks $= 262 + 200 = 462$

Thus, 33% of $x = 462$

$$\frac{33}{100} \times x = 462$$

$$x = \frac{462 \times 100}{33}$$

$$x = 1400$$

Hence, the total marks is 1400.

6. Let, total number of marks be x.

Thus, Ramesh get marks $= 28\%$ of $x = \frac{28x}{100}$

And, Suresh get marks $= 37\%$ of x

$$= \frac{37}{100}$$

$\because$ Ramesh failed by 55 marks while Suresh gets 17 more than the passing marks.

$\therefore$ Passing marks $= \frac{28x}{100} + 55$

$$= \frac{37}{100} - 17$$

$$\frac{37x}{100} - \frac{28x}{100} = 55 + 17$$

$$\frac{(37 - 28)x}{100} = 72$$

$$9x = 72 \times 100$$

$$x = \frac{72 \times 100}{9}$$

$$x = 800$$

So, passing marks $= \frac{28 \times 800}{100} + 55$

$$= 224 + 55 = 279 \text{ marks}$$

or $= \frac{37 \times 800}{100} - 17$

$$= 296 - 17 = 279 \text{ marks}$$

Hence, the total marks is 800.
and, the passing marks is 279.

7. Let, the income of B be x.

Thus, income of $A = x + 26\frac{2}{6}\%$ of x

$$= x + \frac{80}{3} \times \frac{x}{300}$$

$$= x + \frac{8x}{30} = \frac{38x}{30}$$

So, income of B less than that of income of

$$A = \frac{\left(\frac{38x}{30} - x\right)}{\frac{38x}{30}} \times 100\%$$

$$= \frac{\frac{8x}{30}}{\frac{38x}{30}} \times 100\% = \frac{8x}{38x} \times 100$$

$$= \frac{400}{19} = 21\frac{1}{19}\%$$

8. Population of the town = 8000

After 1st year, the population of town

$$= 8000 + 10\% \text{ of } 8000$$

$$= 8000 + \frac{10}{100} \times 8000$$

$$= 8000 + 800 = 800.$$

After, second year, the population of town

$$= 8800 + 20\% \text{ of } 8800$$

$$= 8800 + 20 \times 8800$$

$$= 8800 + 1760 = 10{,}560$$

Hence, the population of twon will be 10,560 after 2 years.

9. Let total number of students be x.

And, Percentag of passed students = 65%

Thus, Percentage of failture students = $(100 - 65)\% = 35\%$

So, $35\% \text{ of } x = 420$

$$\frac{35}{100} \times x = 420$$

$$x = \frac{420 \times 100}{35}$$

Hence, total number of students is 1200.

10. Let, the required number be x.

Thus, $25\% \text{ of } x + 19 = 18\% \text{ of } 650$

$$\frac{25}{100} \times x + 19 = \frac{18}{100} \times 650$$

$$\frac{1}{4}x + 19 = 117$$

$$\frac{1}{4}x = 117 - 19$$

$$x = 98 \times 74$$

$$x = 392$$

Hence, the required number is 392.

11. Percent of nitrogen in gun powder = 75%

Percent of sulphur in gun powder = 10%

And, Percent of charcoal in gun powder = $(100 - 75 - 10)\% = 15\%$

Thus, quantity of charcoal in 24 kg of gun powder = 15% of 24 kg

$$= \frac{15}{100} \times 24 \text{ kg}$$

$$= \frac{360}{100} = 3.60 \text{ kg}$$

12. A candidate secure votes = 40%

Thus, other candidate secure votes = $(100 - 40)\%$

$= 60\%$

Let, total number of votes be x.

Thus, $(60\% - 40\%)$ of $x = 298$

$$20\% \text{ of } x = 298$$

$$\frac{20}{100} \times x = 298$$

$$x = \frac{298 \times 100}{20}$$

$$x = 1490$$

Hence, total number of votes is 1490.

13. Let, Mr. Khanna had initially total money be x.

Percent of total spend money by Mr. Khanna = $(40 + 25 + 15)\% = 80\%$

Thus, left money with Mr Khanna = $(100 - 80)\% = 20\%$

So, $20\% \text{ of } x = ₹\ 1305$

$$\frac{20}{100} \times x = ₹\ 1305$$

$$x = \frac{₹\ 1305 \times 100}{20}$$

$$x = ₹\ 6525$$

Hence, Mr Khanna had total initially money ₹ 6525.

14. Water is the 40 litre of mixture = 10% of 40 litre

$$= \frac{10}{100} \times 40\, l = 4 \text{ litre}$$

Thus, quantity of milk in the mixture = $40 - 4 = 36$ litre

Let, x litre of water added to the new mixture.

Thus, $80\% \text{ of } (40 + x) = 36$ litre

$$\frac{80}{100} \times (40 + x) = 36$$

$$40 + x = \frac{36 \times 100}{80}$$

$$40 + x = 9 \times 5 \text{ litre}$$

$$x = (45 - 40) \text{ litre}$$

$$x = 5 \text{ litre}$$

Hence, 5 litre of water should be added to the mixture of that the water may be 20% in the new mixture.

15. Let, the original price of the washing machine be x.

Thus, $x - 10\% \text{ of } x = 11700$

$$x - \frac{10}{100} \times x = ₹\ 11700$$

$$\frac{90}{100} x = ₹\ 11700$$

$$x = \frac{₹\ 11700 \times 100}{90}$$

$$= ₹\ 13{,}000$$

Hence, the original price of the washing machien is ₹ 13,000.

16. Percentage of aluminium in an alloy = $(100 - 25 - 30)\% = 45\%$

So, mass of aluminium in 720 gram of the alloy

$$= 45\% \text{ of } 720 \text{ g}$$

$$= \frac{45}{100} \times 720 \text{ g}$$

$$= 324 \text{ grm.}$$

17. Total number of students in an examination is 900.

Percent of failed students = 70%.

Thus, Percent of passed students = $(100 - 17)\% = 83\%$

So, Number of passed studfents = 83% of 900

$$= \frac{83}{100} \times 900 = 747.$$

18. Total number of students took the examination = 150.

Thus, number of students get 1st division

$$= 70\% \text{ of } 150$$

$$= \frac{70}{100} \times 150 = 105 \text{ students.}$$

Number of students get 2nd division

$$= 10\% \text{ of } 150$$

$$= \frac{20}{100} \times 150 = 30 \text{ students.}$$

Hence, 105 students get 1st division, 15 students get 2nd division and 30 students get 3rd division.

Exercise 11.6

1. (i) C.P. = ₹ 5090; S.P. = ₹ 6325

$\because$ C.P. < S.P.

$\therefore$ It is a profit.

So, Profit = S.P. – C.P.
= ₹ 6325 – ₹ 5090
= ₹ 1235.

(ii) C.P. = ₹ 12348; S.P. = ₹ 4236

$\because$ C.P. > S.P.

$\therefore$ It is a loss.

So, Loss = C.P. – S.P.
= ₹ 12348 – ₹ 4236
= ₹ 8112.

(iii) C.P. = ₹ 516; S.P. = ₹ 423

$\because$ C.P. > S.P.

$\therefore$ It is a loss.

So, Loss = C.P. – S.P.
= ₹ 516 – ₹ 423
= ₹ 93.

(iv) C.P. = ₹ 2100; S.P. = ₹ 3450

$\because$ C.P. < S.P.

$\therefore$ It is a profit.

So, Profit = S.P. – C.P.
= ₹ 3450 – ₹ 2100
= ₹ 1350

2. (i) C.P. = ₹ 230; loss = ₹ 8

So, $\text{Loss \%} = \frac{\text{loss}}{\text{C.P.}} \times 100\%$

$= \frac{₹\ 8}{₹\ 230} \times 100\%$

$= \frac{80}{23} = 3\frac{11}{23}\%$.

(ii) C.P. = ₹ 24; Profit = ₹ 6

So, $\text{Profit} = \frac{\text{Profit}}{\text{C.P.}} \times 100\%$

$= \frac{₹\ 6}{₹\ 24} \times 100\%$

$= \frac{100}{4} = 25\%$

(iii) C.P. = ₹ 720; loss = ₹ 36

So, $\text{Profit} = \frac{\text{Profit}}{\text{C.P.}} \times 100\%$

$$= \frac{₹\ 36}{₹\ 720} \times 100\%$$

$$= \frac{10}{2} = 5\%$$

(iv) C.P. = ₹ 50; loss = ₹ 12

So, $$\text{Profit} = \frac{\text{Profit}}{\text{C.P.}} \times 100\%$$

$$= \frac{₹\ 12}{₹\ 50} \times 100\%$$

$$= (12 \times 2)\% = 24\%$$

3. Let, the cost price of watch be x.

Thus, $$x - 5\% \text{ of } x = ₹\ 1140$$

$$x - \frac{5}{100} \times x = ₹\ 1140$$

$$\frac{95x}{100} = ₹\ 1140$$

$$x = \frac{₹\ 1140 \times 100}{95}$$

$$x = ₹\ 1200$$

So, S.P. of watch at 5% of gain

$$= ₹\ 1200 + 5\% \text{ of } ₹\ 1200$$

$$= ₹\ 1200 + \frac{5}{100} \times ₹\ 1200$$

$$= ₹\ 1200 + ₹\ 60 = ₹\ 1260.$$

4. Cost price of the toy = ₹ 120

Thus, S.P. of toy at 10% of profit

$$= ₹\ 120 + 10\% \text{ of } ₹\ 120$$

$$= ₹\ 120 + \frac{10}{100} \times ₹\ 120$$

$$= ₹\ 120 + ₹\ 12 = ₹\ 132$$

5. Let, the C.P. of 1 article be x.

Thus, the C.P. of 10 articles = $10x$.

and, the C.P. of 9 articles = $9x$.

So, S.P. of 9 articles $= 10x$.

$\because$ S.P. $>$ C.P.

$\therefore$ It is a profit.

So, $$\text{Profit} = \text{S.P.} - \text{C.P.}$$

$$= 10x - 9x = x$$

and, $$\text{Profit \%} = \frac{\text{Profit}}{\text{C.P.}} \times 100$$

$$= \frac{x}{9x} \times 100 = \frac{100}{9} = 11\frac{1}{9}\%$$

6. Let, the C.P. of transistor be x.

Thus, S.P. of transistor at 20% of gain $= x + 20\%$ of x

$$= x + \frac{20x}{100} = \frac{120x}{100}$$

And, S.P. of transistor at 16% of gain

$$= x + 16\% \text{ of } x$$

$$= x + \frac{16x}{100} = \frac{116x}{100}$$

So,
$$\frac{116}{100}x + ₹\ 20 = \frac{120}{100}x$$

$$\frac{120}{100}x - \frac{116}{100}x = ₹\ 20$$

$$\frac{120x - 116x}{100} = ₹\ 20$$

$$4x = ₹\ 20 \times 100$$

$$x = \frac{₹\ 20 \times 100}{4}$$

$$x = ₹\ 500$$

Hence, the cost price of the transistor is ₹ 500.

7. Cost price of 20 kg of potatoes $= ₹\ 6 \times 20 = ₹\ 120$

Cost price of 30 kg of potatoes $= ₹\ 7 \times 30 = ₹\ 210$

Total cost price of the potatoes $= ₹\ 120 + ₹\ 210 = ₹\ 330$

Selling price of mixing tomatoes $= ₹\ 330 + 25\%$ of ₹ 330

$$= ₹\ 330 + \frac{25}{100} \times ₹\ 330$$

$$= ₹\ 330 + ₹\ 82.5 = ₹\ 412.50$$

$$\text{Selling rate of tomatoes} = \frac{₹\ 412.50}{(20 + 30)}$$

$$= \frac{₹\ 412.50}{50} = ₹\ 8.$$

Hence, the green gracer sold mixing tomatoes at ₹ 8.25 per kg to gain 25% on them.

8. Let, the cost price of Rahul's watch be x.

Thus, Selling price of his watch $= x + 5\%$ of x

$$= x + \frac{5}{100} \times x$$

$$= x + \frac{5x}{100} = \frac{105}{100}x$$

And, Selling price of Mohit's watch $= \frac{105x}{100} + 4\%$ of $\frac{105}{100}x$

$$= \frac{105x}{100} + \frac{4}{100} \times \frac{105}{100}x$$

$$= \frac{105}{100}x\left(1+\frac{4}{100}\right)$$

So, $\frac{1092x}{1000} = ₹\ 91$

$$x = \frac{₹\ 91 \times 1000}{1092}$$

$$= \frac{₹\ 1000}{12} = ₹\ 83.33$$

Hence, the cost price of Rahul's watch is ₹ 83.33.

9. Cost price of 25 kg of rice = ₹ $6.00 \times 25 =$ ₹ 150

Cost price of 35 kg of rice = ₹ $7.00 \times 35 =$ ₹ 245

Total cost price of the rice = ₹ 150 + ₹ 245 = ₹ 395

Selling price of $(25 + 35)$ kg of rice = ₹ $6.75 \times 60 =$ ₹ 405

$\because$ C.P. < S.P.

$\therefore$ It is a gain (Profit).

So, Gain = S.P. − C.P.

= ₹ 405 − ₹ 395 = ₹ 10

and, $\text{Gain\%} = \frac{\text{Gain}}{\text{C.P.}} \times 100\%$

$$= \frac{₹\ 10}{₹\ 395} \times 100\%$$

$$= \frac{200}{79} = 2\frac{42}{79}\%$$

Hence, the dealer get $2\frac{42}{79}\%$ gain.

10. Let, the cost price of a article be x.

Thus, the cost price of 20 articles = $20x$.

Thus, the cot price of 25 articles = $25x$.

So, Selling price of 25 articles = $20x$.

$\because$ Loss = C.P. − S.P.

$= 25x - 20x = 5x$

So, $\text{Loss\%} = \frac{\text{loss}}{\text{C.P.}} \times 100 = \frac{5x}{25x} \times 100\% = 20\%$

11. Cost price of 250 ice-cream cups = ₹ $7 \times 250 =$ ₹ 1750

$\because$ Spoiled cups = 10

$\therefore$ Good cupts of ice-cream = 250 − 10 = 240

Selling price of 240 ice-cream cupts at 20% of gain

= ₹ 1750 + 20% of ₹ 1750

$$= ₹\ 1750 + \frac{20}{100} \times ₹\ 1750$$

= ₹ 1750 + ₹ 350 = ₹ 2100

$\because$ Cost of 240 ice-cream cups = ₹ 2100

$\therefore$ Cost of one ice-cream cup $= \dfrac{₹\ 2100}{240}$

$= ₹\ 8.75$

Hence, he must sell each cup at the rate of ₹ 8.75 per cup.

12. Cost price of 11 books = ₹ 10

Thus, Cost price of 1 book = $₹\ \dfrac{10}{11}$

And, Selling price of 10 books = ₹ 11

Thus, Selling price of 1 books = $₹\ \dfrac{11}{10}$

$\because$ S.P. > C.P.

$\therefore$ Profit = S.P. – C.P.

$= ₹\ \dfrac{11}{10} - ₹\ \dfrac{10}{11}$

$= \dfrac{₹\ 121 - ₹\ 100}{110} = \dfrac{₹\ 21}{110}$

So, Profit % $= \dfrac{\text{Profit}}{\text{C.P.}} \times 100\%$

$= \dfrac{₹\ \frac{21}{110}}{₹\ \frac{10}{11}} \times 100 = \dfrac{21 \times 11}{10 \times 110} \times 100\% = 21\%$

Hence, the book seller got 21% of profit.

13. Let, the cot price of tea = x

Thus, cost price of tea at 6% of loss = x – 6% of x

$= x - \dfrac{6}{100} \times x = \dfrac{94}{100}x$

$\because$ He use a weight of 900 gm instead of 1 kg.

$\therefore$ Selling price of 900 gm of tea $= \dfrac{94x}{100}$

and, Selling price of 1 kg of tea $= \dfrac{94x}{100} \times \dfrac{1000}{900} = \dfrac{94}{90}x$

$\because$ Profit = S.P. – C.P.

$\therefore$ Profit $= \dfrac{94}{90}x - x$

$= \dfrac{94x - 90x}{90} = \dfrac{4x}{90}$

So, Profit % $= \dfrac{\text{Profit}}{\text{C.P.}} \times 100\%$

$= \dfrac{\frac{4x}{90}}{x} \times 100 = \dfrac{400}{90} = 4\dfrac{4}{9}\%$

Hence, the tea merchant got a profit of $4\frac{4}{9}\%$.

14. Cost price of sugar = ₹ 400

Cost price of $\left(\frac{3}{4}\right)$th of sugar = ₹ $40 \times \frac{3}{4}$ = ₹ 300

And, Cost price of remaining sugar = ₹ 400 – ₹ 300
= ₹ 100

Now, Selling price of $\left(\frac{3}{4}\right)$th of sugar

= ₹ 300 – 10% of ₹ 300
= ₹ $300 - \frac{10}{100} \times$ ₹ 300
= ₹ 300 – ₹ 30 = ₹ 270

And, Selling price of remaining $\left(\frac{1}{4}\right)$th of sugar

= ₹ 100 + 10% of 100
= ₹ 100 + ₹ 10*l* = ₹ 110.

Total selling price of sugar = ₹ 270 + ₹ 110 = ₹ 380

∵ C.P. > S.P.

∴ It is a loss.

So, Loss = C.P. – ?S.P.
= ₹ 400 – ₹ 380 = ₹ 20

Hence, Loss = $\frac{\text{Loss}}{\text{C.P.}} \times 100\% = \frac{₹\ 20}{₹\ 400} \times 100\% = 5\%$

15. Cost price of 100 watches = ₹ 400×100
= ₹ 40,000

Selling price of all the watches at 20% of gain = ₹ 40,000 + 20% of ₹ 40,000.

= ₹ $40{,}000 + ₹\ 40{,}000 \times \frac{20}{100}$
= ₹ 40,000 + ₹ 8,000 = ₹ 48,000

∵ Cost price of 20 watches = ₹ 400×20
= ₹ 8,000

and, Selling price of 20 watches = ₹ 8,000 + 5% of ₹ 8,000

= ₹ $8{,}000 + ₹\ 8{,}000 \times \frac{5}{100}$
= ₹ 8,000 + ₹ 400 = ₹ 8,400

∵ Selling price of 80 watches = ₹ 48,000 – ₹ 8,400
= ₹ 39,600

∵ Selling price of 80 watches = ₹ 39,600.

∴ Selling price of each watch = $\frac{₹\ 39{,}600}{80}$ = ₹ 495

Hence, he sell the remaining watches at ₹ 495 per watch, so as to gain 20% on the whole transaction.

Exercise 11.7

1. (i) $P = ₹\ 212.50, R = 15\%, T = 4$ yrs.

Thus, $$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$= \frac{₹\ 212.50 \times 15 \times 4}{100} = ₹\ 127.50$$

(ii) $P = ₹\ 8500, R = 9\frac{1}{2}\%, A = ₹\ 15767.50$

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$A - P = \frac{P \times R \times T}{100}$$

$$₹\ 15767.50 - ₹\ 8500 = \frac{₹\ 8500 \times 9\frac{1}{2} \times T}{100}$$

$$\frac{7267.50 \times 2}{85 \times 19} = T$$

$$T = 4.5 \times 2$$

$$T = 9 \text{ years}$$

2. $P_1 = ₹\ 4200, R_1 = 8\%$ (p.a.)

$P_2 = ₹\ 1400, R_2 = 6\%$ (p.a.)

Thus, $$\text{S.I.}_2 = \frac{P_1 \times R_1 \times T_1}{100} = \frac{₹\ 4200 \times 8 \times 1}{100} = ₹\ 336$$

And, $$\text{S.I.}_2 = \frac{P_2 \times R_2 \times T_2}{100}$$

$$= \frac{₹\ 1400 \times 6 \times 1}{100} = ₹\ 84$$

So, $$\text{Total S.I.} = \text{S.I.}_1 + \text{S.I.}_2$$

$$= ₹\ 336 + ₹\ 84 = ₹\ 420$$

$\because$ $$\frac{P \times R \times T}{100} = \text{S.I.}$$

$$\frac{(₹\ 4200 + ₹\ 1400) \times R \times 1}{100} = ₹\ 420$$

$$\frac{5600 \times R}{100} = 420$$

$$R = \frac{420}{56} = \frac{30}{4}$$

$$R = \frac{15}{2} = 7.5\%$$

Hence, the rate of interest for the whole sum is 7.5%.

3. Let, ₹ x lent at 5% per annum.

Thus, ₹ $(4000 - x)$ lent at 4% per annum.

$$\text{Whole interest} = ₹\ 199$$

$$\because \quad \text{S.I.} = \frac{P \times R \times T}{100}$$

Thus, $$\text{S.I.}_1 = \frac{P_1 \times R_1 \times T_1}{100} = \frac{x \times 5 \times 1}{100} = \frac{5x}{100}$$

And, $$\text{S.I.}_2 = \frac{P_2 \times R_2 \times T_2}{100}$$

$$= \frac{(4000 - x) \times 4 \times 1}{100} = \frac{4(4000 - x)}{100}$$

$$\because \quad \text{S.I.} = \text{S.I.}_1 + \text{S.I.}_2$$

$$₹\ 199 = \frac{5x}{100} + \frac{4(4000 - x)}{100}$$

$$= \frac{5x + 16{,}000 - 4x}{100} = \frac{x + 16{,}000}{100}$$

$$x + 16{,}000 = 199 \times 100$$

$$x = 19{,}900 - 16{,}000$$

$$x = 3{,}900$$

Hence, ₹ 3900 lent at 5% per annum and ₹ 100 lent at 4% per annum.

4. Let, the sum of money be P.

Thus, $$\text{S.I.}_1 = \frac{P \times R \times T_1}{100}$$

$$A_1 - P = \frac{PR \times 2}{100}$$

$$₹\ 2990 - P = \frac{PR \times 2}{100}$$

$$PR = (₹\ 2990 - P) \times \frac{100}{2} \qquad \ldots(1)$$

And, $$\text{S.I.}_2 = \frac{P \times R \times T_2}{100}$$

$$A_2 - P = \frac{PR \times 3\frac{1}{2}}{100}$$

$$₹\ 3282.50 - P = \frac{\frac{7}{2}PR}{100}$$

$$PR = (₹\ 3282.50 - P) \times \frac{200}{7} \qquad \ldots(2)$$

By Eqn. (1) and Eqn. (2)

$$(₹\ 2990 - P) \times \frac{100}{2} = (₹\ 3282.50 - P) \times 2007$$

$$₹\ 2990 - P = (₹\ 3282.50 - P) \times \frac{200 \times 2}{7 \times 100}$$

$$(₹\ 2990 - P) \times 7 = (₹\ 3282.l50 - P) \times 4$$

$$₹\ 20{,}930 - 7P = ₹\ 13{,}130 - 4P$$

$$₹\ 20{,}930 - ₹\ 13{,}130 = -4P + 7P$$

$$₹\ 7800 = 3P$$

$$P = \frac{₹\ 7800}{3}$$

$$P = ₹\ 2600$$

Put, the value of P in Eqn. (1),

$$₹\ 2990 - ₹\ 2600 = \frac{₹\ 2600 \times 2R}{100}$$

$$₹\ 390 = ₹\ 52R$$

$$R = \frac{390}{52} = \frac{30}{4}$$

$$R = 7.5\% \text{ or } 7\frac{1}{2}\%$$

Hence, the sum of money is ₹ 2600 and the rate of interest is $7\frac{1}{2}\%$.

5. Let, the sum of money be P.

Thus, S.I. of 6 yrs and 3 months $= \frac{3}{8}P$

So, $$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$\frac{3}{8}P = \frac{P \times R \times \left(6 + \frac{3}{12}\right)}{100}$$

$$\frac{3}{8} \times 100 = R \times 6\frac{1}{4}$$

$$\frac{300}{8} = \frac{25}{4}R$$

$$R = \frac{300 \times 4}{25 \times 8}$$

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

$$R = 6\%$$

Hence, the rate of interest be 6% per annum.

6. $P = ₹\ 5000, T = 4$ years, $R = ?$

$\because$ $A = P + ₹\ 1000$ more

$\therefore$ S.I. $= ₹\ 1000$

So, $$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$₹\ 1000 = \frac{₹\ 5000 \times R \times 4}{100}$$

$$₹\ 1000 = ₹\ 50 \times 4 \times R$$

$$\frac{₹\ 1000}{₹\ 50 \times 4} = R$$

$$R = \frac{20}{4} = 5\%$$

Hence, the rate of interest is 5% per annum.

7. $P = ₹\ 200, R = 5$ paise per rupee per month and $T = 7$ months.

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$= \frac{₹\ 200 \times 5 \times 7}{100}$$

$$\text{S.I.} = ₹\ 70$$

Hence, the S.I. is ₹ 70.

8. Let, the sum of money be P.

$\because$ Rate percent and time is equal.

$\therefore$ Let, the rate percent and time be x.

Thus, $$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$\frac{16}{25} \times P = \frac{P \times x \times x}{100}$$

$$\frac{16}{25} \times 100 = x^2$$

$$x^2 = 16 \times 4 = 64$$

$$x = \sqrt{64} = 8$$

Hence, the rate percent of interest is 8% and time is 8 years.

Exercise 11.7

9. Donated money by Razia = ₹ 4,00,000

Earning money per year = $₹\ 4{,}00{,}000 \times \frac{10}{100} = ₹\ 40{,}000$

$\because$ 5 students get every year = ₹ 40,000

$\therefore$ Each student get every year = $\frac{₹\ 40{,}000}{5} = ₹\ 8000.$

10. Let, Dimple invest ₹ x.

Thus, $$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$₹\ 147 = \frac{x \times 7 \times 3}{100}$$

$$₹\ \frac{147 \times 100}{21} = x$$

$$x = ₹\ 7 \times 100$$

$$x = ₹\ 700$$

hence, Dimple invest ₹ 700.

11. Let, the value of scooter be x.

$P = ₹\ 15{,}000$; $R = 13\%$ and $T = 3$ years

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$\text{S.I.} = \frac{₹\ 15{,}000 \times 13 \times 13}{100}$$

$$= ₹\ 5{,}850$$

$$\text{Payed amount} = P + \text{S.I.}$$

$$= ₹\ 15{,}000 + ₹\ 5{,}850$$

$$= ₹\ 20{,}850$$

$\because$ ₹ 8000 + Value of scooter = ₹ 20,850

$$₹\ 8000 + x = ₹\ 20{,}850 - ₹\ 8{,}000$$

$$x = ₹\ 12{,}850$$

Hence, the value of scooter is ₹ 12,850.

12. $P = ₹\ 800$, Time = 3 years, S.I. = ₹ 96

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$₹\ 96 = \frac{₹\ 800 \times R \times 3}{100}$$

$$₹\ 96 = ₹\ 24R$$

$$R = \frac{96}{24} = 4\%$$

Hence, the rate of interest is 4% per annum.

13. Let, the sum of money be P the rate of interest be R.

Thus,
$$\text{S.I.}_1 = \frac{P \times R \times T_1}{100}$$

$$A - P = \frac{P \times R \times 5}{100}$$

$$2P - P = \frac{PR}{20}$$

$$P = \frac{PR}{20}$$

$$R = \frac{20P}{P}$$

$$R = l20\%$$

Now,
$$\text{S.I.}_2 = \frac{P \times R \times T_2}{100}$$

$$A - P = \frac{P \times 20 \times T_2}{100}$$

$$4P - P = \frac{20P \times T_2}{100}$$

$$\frac{3P}{20P} \times 100 = T_2$$

$$T_2 = 3 \times 5$$

$$T_2 = 15 \text{ years}$$

Hence, the sum of money on S.I. will be 4 times of itself in 15 years.

14. $P = ₹\ 6050, R = 6.5\%$ p.a.

and, $A = ₹\ 7229.75$

$\because$ S.I. $= A - P$ and S.I. $= \frac{P \times R \times T}{100}$

Thus, $A - P = \frac{P \times R \times T}{100}$

$$₹\ 7229.75 - ₹\ 6050 = \frac{₹\ 6050 \times 6.5 \times T}{100}$$

$$₹\ 1179.75 = \frac{₹\ 39325 \times T}{100}$$

$$\frac{1179.75}{39325} \times 100 = T$$

$$T = \frac{117975}{39325} = 3$$

$$T = 3 \text{ years}$$

Hence, the required time is 3 years.

15. $P = ₹\ 8000, A = ₹\ 8800, T = 2$ years.

Thus, $A - P = \frac{P \times R \times T}{100}$

$$₹\ 8800 - ₹\ 8000 = \frac{₹\ 8000 \times R \times 2}{100}$$

$$₹\ 800 = ₹\ 160 \times R$$

$$R = \frac{800}{160} = 5\%$$

$$R = 5\%$$

Hence, the rate of interest is 5% per annum.

16. Let the principle sum be P, and the rate of interest ble R.

$$T = 2 \text{ years}$$

$\because$ $\text{S.I.} = \frac{P \times R \times T}{100}$

$\therefore$ $\text{S.I.} = \frac{P \times R \times 2}{100}$

$$\text{S.I.} = \frac{PR}{50} \quad \ldots(1)$$

By second condition,

$$\text{S.I.} + ₹\ 24 = \frac{P \times (R+1) \times 2}{100}$$

$$\text{S.I.} + ₹\ 24 = \frac{P(R+1)}{50}$$

$$\text{S.I.} = \frac{P(R+1)}{50} - ₹\ 24 \quad \ldots(2)$$

By Eqn. (1) and Eqn. (2)

$$\frac{PR}{50} = \frac{P(R+1)}{50} - ₹\ 24$$

$$PR = P(R+1) - ₹\ 1200$$

$$PR = PR + P - ₹\ 1200$$

$$P = ₹\ 1200$$

Hence, the principle sum is ₹ 1200.

17. Let, the rate percent of interest be R.

$\because$ $$\text{S.I.} = \frac{P \times R \times T}{100}$$

$\therefore$ $$\text{S.I.} = \frac{₹\ 1200 \times R \times 3}{100}$$

$$\text{S.I.} = 36R - 50 \quad \ldots(2)$$

By Eqn. (1) and (2)

$$30R = 36R - 50$$

$$50 = 36R - 30R$$

$$50 = 6R$$

$$R = \frac{50}{6} = \frac{25}{3}$$

$$R = 8\frac{1}{3}\%$$

Hence, the rate of intersect is $8\frac{1}{3}\%$ p.a.

18. $P = ₹\ 10{,}000, R = 5\%$ p.a., $T = 2$ years 3 months $= 2 + \frac{3}{12} \Rightarrow 2\frac{1}{4}$ years

Thus, $$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$\text{S.I.} = \frac{₹\ 10{,}000 \times 5 \times 2\frac{1}{4}}{100}$$

$$= ₹\ 100 \times 5 \times \frac{9}{4}$$

$$= ₹\ 25 \times 5 \times 9$$

$= ₹\ 1125$

$\because \quad A = P + \text{S.I.}$

$= ₹\ 10{,}000 + ₹\ 1125$

$= ₹\ 11{,}125$

Hence, the farmer will return ₹ 11,125 to the money lender.

19. $P = ₹\ 8000, R = 6\%$ p.a.

$$\text{Time} = 15\text{th March} + 21\text{st October}$$
$$= 16 + 30 + 31 + 30 + 31 + 31 + 30 + 20$$
$$= 229 \text{ days}$$
$$= \frac{219}{365} \text{ yr}$$
$$= \frac{3}{5} \text{ years}$$

So, $$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$= \frac{₹\ 8000 \times 6 \times \frac{3}{5}}{100}$$

$$= ₹\ 80 \times \frac{18}{5}$$

$$= ₹\ 16 \times 18$$

Hence, the man pay ₹ 288 of interest.

20. $P = ₹\ 5000, R_1 = 5\%, R_2 = 7\%$ and $T = 2$ years.

$\because \quad \text{S.I.} = \frac{P \times R \times T}{100}$

$\therefore \quad \text{S.I.}_1 = ₹\ \frac{5000 \times 5 \times 2}{100} = ₹\ 500$

and, $$\text{S.I.}_2 = \frac{P \times R_2 \times T}{100}$$

$$= \frac{₹\ 5000 \times 7 \times 2}{100} = ₹\ 700$$

So, Money earned by Anand $= \text{S.I.}_2 - \text{S.I.}_1$

$= ₹\ 700 - ₹\ 500 = ₹\ 200$

Hence, Anand earn ₹ 200 after final transaction.

Multiple Choice Questions

1. (ii) **2.** (iii) **3.** (ii) **4.** (iv) **5.** (ii) **6.** (i) **7.** (i) **8.** (i) **9.** (iii) **10.** (iii) **11.** ( ) **12.** ( )

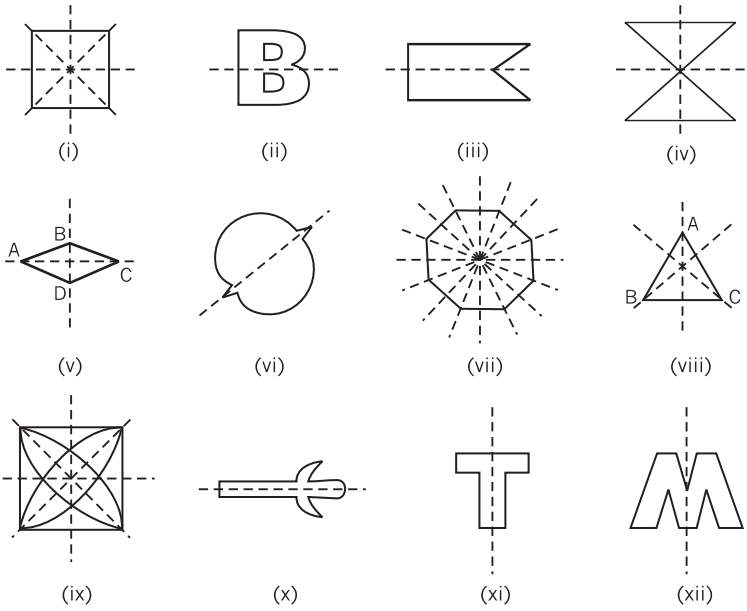
Mental Exercise

1. is 1 : 3 **2.** Product of means **3.** every hundred, hundred, per hundred **4.** ₹ 1800 or 18%, **5.** selling price **6.** ₹ 100 **7.** cost.

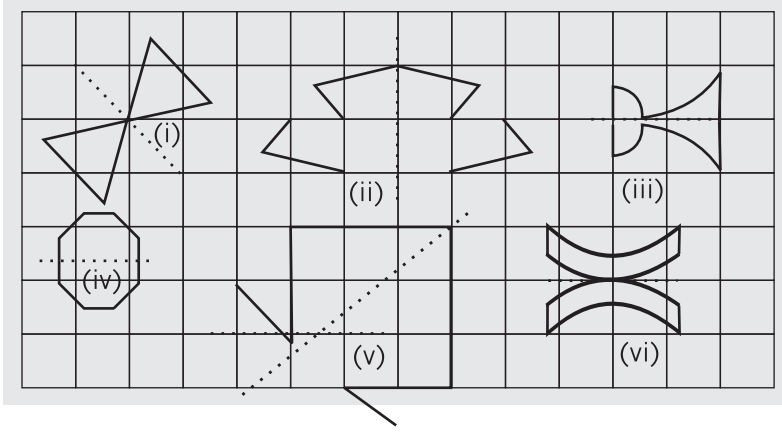
12 Symmetry

Exercise 12.1

1. Draw as many lines of symmetry as possible in each of the following :

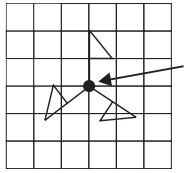


2. Trace each figure on a squared paper and using dotted line as the line symmetry, draw the other half of the shape :



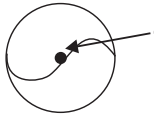
Exersie 12.2

1. (i)



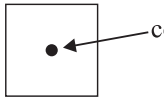
order of rotation symmetry = 3

(ii)



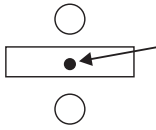
order of rotation symmetry = 2

(iii)



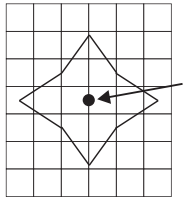
order of rotation symmetry = 4

(iv)



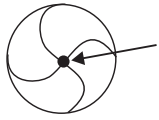
order of rotation symmetry = 2

(v)



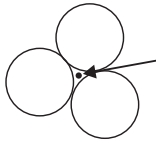
order of rotation symmetry = 4

(vi)



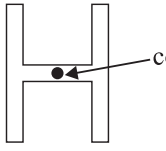
order of rotation symmetry = 4

(vii)



order of rotation symmetry = 3

(viii)



order of rotation symmetry = 2

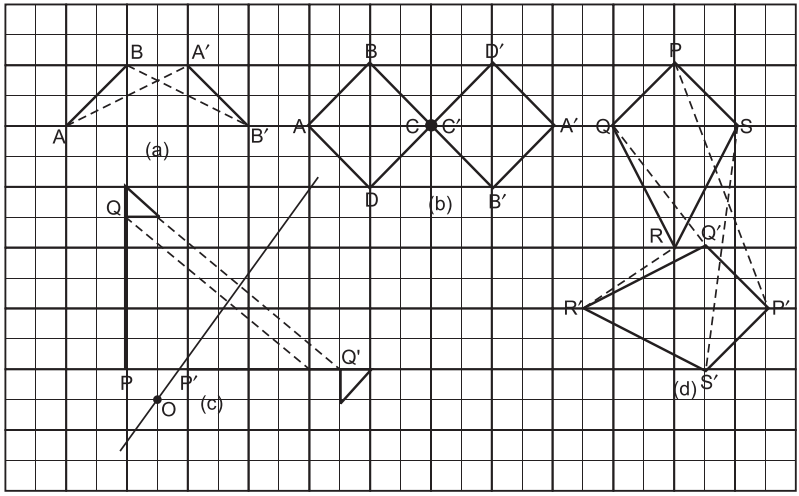
2. (a) Angle of rotation = 0° (b) Angle of rotation = 180°

(c) Angle of rotation = 180° (d) Angle of rotation = 60°

(e) Angle of rotation = 90°

3. Do it yourself.

4.



(a) In fig. (a), join AA' and BB'. They intersect at O. Thus, O is the centre of rotation.

(b) In fig. (b), point C and C' are the same point. Thus, this point is the centre of rotation.

(c) In fig. (c), join PP' and QQ'. They does not intersect.
Thus, the right bisector of PP' and QQ' intersect at O. Thus, O is the centre of rotation.

(d) In fig. (d), join PP' and SS'. They intersect at O. Thus, O is the centre of rotation.

Exercise 12.3

1. The number, '8' and '0' have both reflection and rotational symmetry.

2. The letter, 'H' has both reflection and rotational symmetry.

3. The figures, (i), (ii) and (iv) have both reflection and rotational symmetry.

Multiple Choice Questions

1. (ii) **2.** (ii) **3.** (iii) **4.** (iii) kite **5.** (iii) **6.** (i) **7.** (i) **8.** (i)

Mental Exercise

1. line of **2.** Circle, Square **3.** line of symmetry **4.** rectangle **5.** 360°.

13 3-D Shapes

1. (i) Book → Cuboid (ii) Carrot → Cone
(iii) Bangle → Circle (iv) Dice → Cube
(v) Unsharpened Pencil → Cylinder
(vi) TV → Cuboid, and Tennis ball → Sphere.

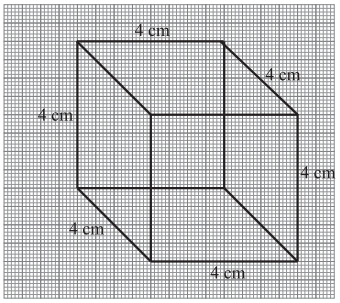
2. Solid figure → (iv) sphere, (v) square pyramid, (vi) Cylinder, and (vii) tetrahedron.

3. (i) Number of vertices in a cone is 1.
(ii) Number of vertices in a cuboid is 8.
(iii) Number of vertices in a cube is 8.
(iv) Number of vertices in a Triangular prism is 6.
(v) Number of vertices in a Rectangular pyramid is 5.
(vi) Number of vertices in a Tetrahedron is 4.

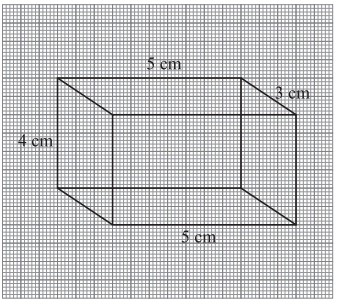
4. (i) Number of edges in a cylinder is 2.
(ii) Numbe of edges in a cuboid is 12.
(iii) Number of edges in a sphere is 0.
(iv) Number of edges in a Triangularal Pyramid is 6.

5. (i) Triangular prism (ii) Cube
(iii) Cone (iv) Square pyramid

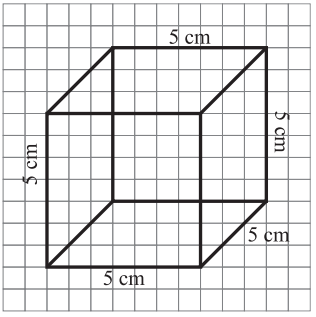
6. (i)



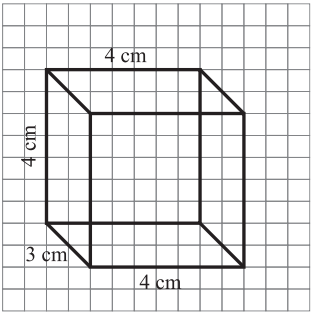
(ii)



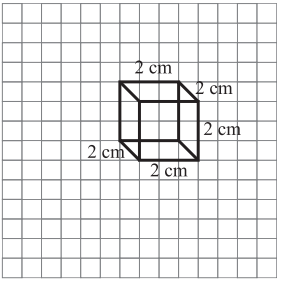
7. (i)



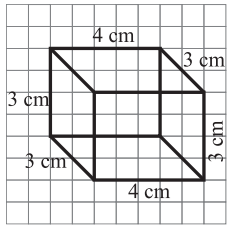
(ii)



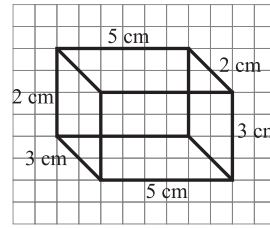
(iii)



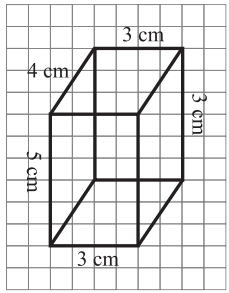
8. (i)



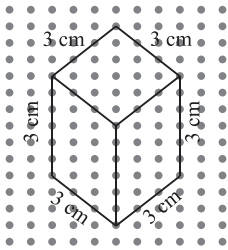
(ii)



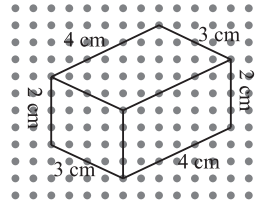
(iii)



9. (i)



(ii)



10. Do it yourself.

11. (i) True (ii) False (iii) False (iv) False (v) False (vi) False (vii)True (viii) True (ix) True (x) True

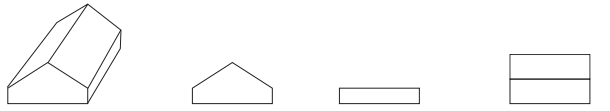
Exercise 13.2

1. (i) The number of cubes in fig. (i) is 6

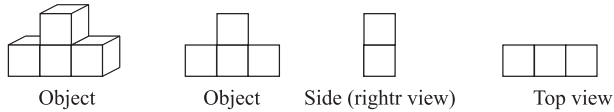
(ii) The number of cubes in fig. (ii) is 10

2.

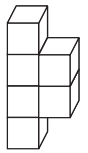
(i)



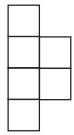
(ii)



(iii)



Object

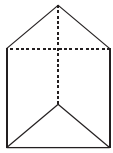


Object

Side (rightr view)

Top view

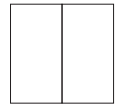
(iv)



Object

Object

Side (rightr view)



Top view

Multiple Choice Questions

1. (i) **2.** (i) **3.** (iii) **4.** (iv) **5.** (i)

Mental Exercise

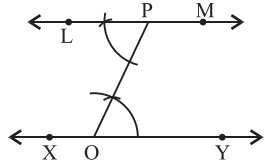
1. breadth, height **2.** triangular **3.** tetrahedron **4.** one **5.** sphere

14 Practical Geometry

Exercise 14.1

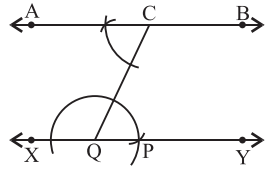
1. Steps :

(i) Draw a line XY.
(ii) Mark a point P above XY.
(iii) From P draw a line segment OP.
(iv) At P, draw $\angle YOP$ $\angle OPL$.
(v) Produce LP to M.
So, LM is the required line through P parallel to XY.



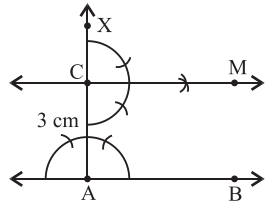
2. Steps :

(i) Draw a line AB.
(ii) Mark a point Q below AB.
(iii) From$Q$ draw a l ine segment QC.
(iv) At Q, draw $\angle ACQ = \angle CQY$.
(v) Produce QY to X.
So, XY is the required line through Q parallel to AB.



3. Steps :

(i) Draw a line segment AB.
(ii) At A, draw $AX \perp AB$.
(iii) From AX cut off $AC = 3$ cm.
(iv) At C, draw $CM \perp AX$.
(v) Produce CM to L.
So, LM is the required line through C parallel to AB.



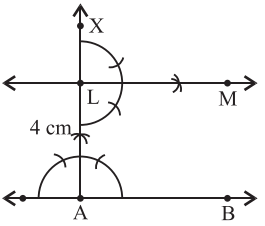
4. Steps :

(i) Draw a line AB and at A draw $AX \perp AB$.

(ii) From AX cut $AL = 4$ cm.

(iii) At L draw $LM \perp AX$.

So, LM is parallel to AB.



5. Steps :

(i) Draw a line segment $AB = 4$ cm.

(ii) At A draw $AX \perp AB$.

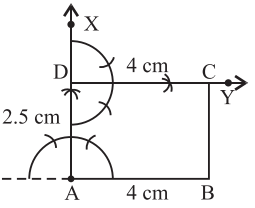
(iii) From AX, cut $AD = 2.5$ cm.

(iv) At D draw $DY \perp AX$.

(v) From DY, cut $DC = 4$ cm.

(vi) Join CB.

Then, $CB = 2.5$ cm and this figure called a rectangle $ABCD$.



Exercise 14.2

1. (i) **Steps :**

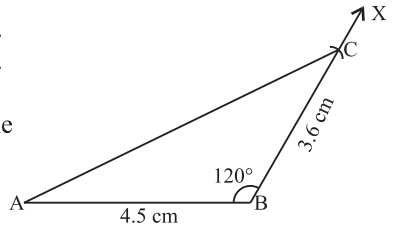
(i) Draw a line segment $AB = 4.5$ cm.

(ii) Draw an angle $\angle ABX = 120°$ at B.

(iii) With B at centre and radius equal to 3.6 cm, mark are intersecting the ray $\overrightarrow{BX}$ at C.

(iv) Join AC.

So, ΔABC is the required triangle.



(ii) Steps :

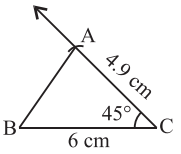
(i) Draw a line segment $BC = 6$ cm.

(ii) Draw an angle $\angle BCX = 45°$ at C.

(iii) With C as centre and radius equal to 4.9 cm, mark an arc interesting the ray $\overrightarrow{CX}$ at A.

(iv) Join AB.

So, ΔABC is the required triangle.



2. Steps :

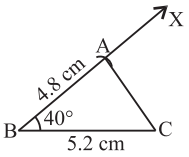
(i) Draw a line segment $BC = 5.2$ cm.

(ii) Draw an angle $\angle CBX = 40°$ at B.

(iii) With B as centre and radius equal to 4.8 cm, mark an arc intersecting the ray $\overrightarrow{BX}$ at A.

(iv) Join AC.

So, ΔABC is the required triangle.



3. Steps :

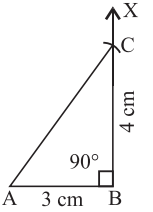
(i) Draw a line segment $AB = 3$ cm.

(ii) Draw an angle $\angle ABX = 90°$ at B.

(iii) With B as centre and radius equal to 4 cm, mark an arc intersecting the ray $\overrightarrow{BX}$ at C.

(iv) Join AC.

So, ΔABC is the required triangle and the measure of hypotenuse of triangle is 5 cm.



4. Steps :

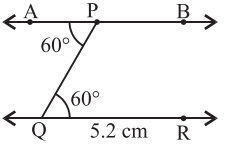
(i) Draw any line QR.

(ii) Draw an angle $\angle RQP = 60°$ at Q.

(iii) Draw an another angle $\angle QPA = 60°$ at P.

(iv) Produce AP to B.

So, AB is required line through P parallel to QR.



5. Steps :

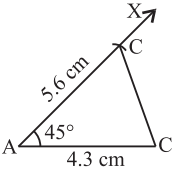
(i) Draw a line segment $AB = 4.3$ cm.

(ii) Draw an angle $\angle BAX = 45°$ at A.

(iii) With A as centre and radius equal to 5.6 cm, mark an arc intersecting the ray AX at C.

(iv) Join BC.

So, ΔABC is the required triangle.



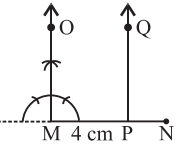
6. Steps :

(i) Draw a l ine segment $MN = 4$ cm.

(ii) At M, draw $OM \perp MN$.

(iii) Let, P any point on MN and at P, draw $PQ \perp MN$.

Thus, PQ is parallel to OM.



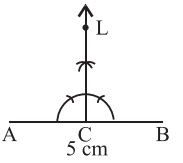
7. Steps :

(i) Draw a line segment $AB = 5$ cm.

(ii) With A as centre and radius equal to 2 cm, mark on arc intersecting the line segment AB at C.

(iiii) At point C, draw $CL \perp AB$.

So, line CL is perpendicular to line AB passing through C.



8. Steps :

(i) Draw a line segment $MN = 6$ cm.

(ii) Draw $\angle NMA = 50°$ at M.

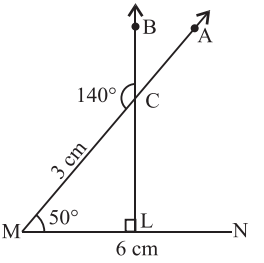
(iii) With M as centre and radius equal to 3 cm, mark an arc intersecting the ray MA at C.

(iv) Draw $\angle MCB = 140°$ at C.

(v) Produce BC to L.

Thus, line BL is perpendicular to MN.

Passing through point C.



9. Steps :

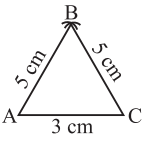
(i) Draw a line segment $AB = 3$ cm.

(ii) With A as centre and radius equal to 5 cm, mark an arc.

(iii) With B as centre and radius equal to 5 cm, mark an another arc and intersecting it previous arc at point C.

(iv) Join AC and BC.

So, ΔABC is the required triangle.



10. Steps :

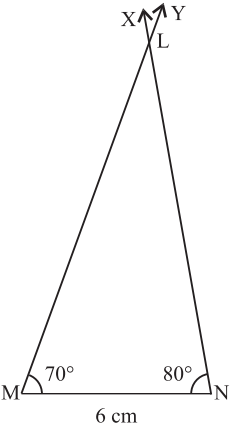
(i) Draw a line segment $MN = 6$ cm.

(ii) Draw $\angle NMY = 70°$ at M.

(iii) Draw $\angle MNX = 80°$ at N.

(iv) Ray $\overrightarrow{MN}$ and $\overrightarrow{NX}$ cut each other at point L.

So, ΔLMN is the required triangle.



11. Steps :

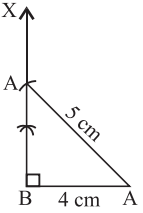
(ii) Draw a line segment $BC = 4$ cm.

(ii) Draw any angle $\angle CBX = 90°$ at B.

(iii) With C as centre and radius equal to $AC = 5$ cm, mark an arc intersecting the ray BX at A.

(iv) Join AC.

So, ΔABC is the required triangle.



12. Steps :

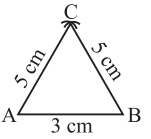
(i) Draw a line segment $AB = 5$ cm.

(ii) With A as centre and radius equal to 5 cm, mark an arc.

(iii) With B as centre and radius equal to 5 cm, mark an arc intersecting the previous arc at C.

(iv) Join AC and BC.

So, ΔABC is the required triangle.



13. Steps :

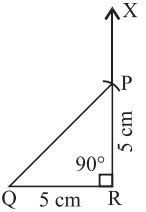
(i) Draw a line segment $QR = 5$ cm.

(ii) Draw any angle $\angle QRX = 90°$ at R.

(iii) With R as centre and radius equal to $PR = 5$ cm, mark arc intersecting the ray $\overrightarrow{RX}$ at P.

(iv) Join QP.

So, ΔPQR is the required triangle.



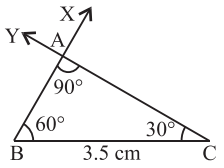
14. $\because$ Sum of all the angles of a triangle $= 180°$

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

$90° + 60° + \angle C = 180°$

$\angle C = 180° - 150°$

$\angle C = 30°$



Steps :

(i) Draw a line segment $BC = 3.5$ cm.

(ii) Draw an angle $\angle CBX = 60°$.

(iii) Draw an another angle $\angle BCY = 30°$.

(iv) Ray $\overrightarrow{BX}$ and $\overrightarrow{CY}$ intersect each other point A.
So, ΔABC is the required triangle.

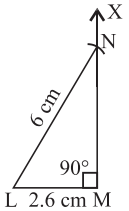
15. **Steps :**

(i) Draw a line segment $LM = 2.6$ cm.

(ii) Draw any angle $\angle LMX = 90°$ at M.

(iii) With L as centre and radius equal to $LM = 6$ cm, mark an arct intersecting the ray $\overrightarrow{MX}$ at N.

(iv) Join LN.
So, ΔLMN is the required triangle.



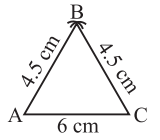
16. **Steps :**

(i) Draw a line segment $AC = 6$ cm.

(ii) With A as centre and radius equal to 4.5 cm, mark an arc.

(iii) With C as centre and radius equal to 4.5 cm, mark an another arc intersecting the previous arc at B.

(iv) Join AB and BC.
So, ΔABC is the required triangle.



17. **Steps :**

(i) Draw any angle $\angle AOB = 50°$.

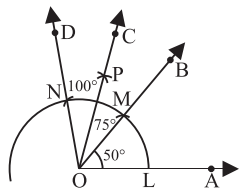
(ii) With O as centre and any radius draw an arc LMN.

(iii) With M as centre and radius equal to ML, mark an arc cutting the previous arc at N.

(iv) Draw a ray $\overrightarrow{OD}$ through N.
So, $\angle AOD = 100°$ is the required angle.

(v) With M as centre and any radius draw an arc then, with N as centre and equal radius draw an another arc, cutting the previous arc at P.

(vi) Draw a ray $\overrightarrow{OC}$ through P.
So, $\angle AOC = 75°$ is the required angle.



18. **Steps :**

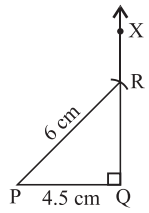
(i) Draw a line segment $PQ = 4.5$ cm.

(ii) Draw an angle $\angle PQX = 90°$ at Q.

(iii) With P as centre and radius equal to $PR = 6$ cm, mark on arc intersecting the ray $\overrightarrow{QX}$ at R.

(iv) Join PR.

So, ΔPQR is the required triangle.



Exercise 14.3

1. (i) $\because PQ = PR = 4$ cm

$\therefore \quad \angle Q = \angle R$

[Angles opposite to equal sides of a Δ are equal].

(ii) $\because VW = UW = 3.5$ cm

$\therefore \quad \angle V = \angle U$

[Angles opposite to equal side of a Δ are equal].

(iii) $\because \quad XY = YZ$

$\therefore \quad \angle X = \angle Z$

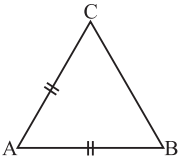
[Angles opposite to equal sides of a Δ are equal].

2. In ΔABC,

$$AB = AC$$

Thus, $$\angle C = \angle B$$

[$\because$ Angles opposite to equal sides of a Δ are equal].



3. (i) $\because \quad \angle P = \angle R = 60°$

$\therefore \quad PQ = RR$

[Sides opposite to equal angles of a Δ are equal].

(ii) $\because \quad \angle X = \angle Z = 50°$

$\therefore \quad XY = YZ$

[Sides opposite to equal angles of a Δ are equal].

(iii) $\because \quad \angle U = \angle V = 80°$

$\therefore \quad UM = VW$

[Sides opposite to equal angles of a Δ are equal].

4. In ΔABC,

$$\angle A = \angle C$$

Thus, $$AB = BC$$

[$\because$ Sides opposite to equal angles of a Δ are equal].

5. $\because \quad AC = CB$ (given)

$\therefore \quad \angle CAB = \angle ABC$

$30° = x$

$x = 30°$

In ΔABC,

$$\angle A + \angle B + \angle C = 180°$$
$$30° + 30° + \angle C = 180°$$
$$\angle C = 180° - 60°$$
$$\angle C = 120°$$

$$\angle ACB + \angle BCD = 180° \quad \{\text{Linear pair}\}$$
$$120° + z = 180°$$
$$z = 180° - 120°$$
$$z = 60°$$
$\because$ $CD = BD$
$\therefore$ $\angle ACB = CBD$
$$z = y$$
$$60° = y$$
$$y = 60°$$

6. (i) $\because$ $PR = QR$
$\therefore$ $\angle QPR = \angle PQR$
$$80° = \angle PQR$$
$$\angle PQR = 80°$$
In ΔPQR,
$$\angle QPR + \angle PQR + \angle PRQ = 180°$$
$$80° + 80° + \angle PRQ = 180°$$
$$\angle PRQ = 180° - 160°$$
$$\angle PRQ = 20°$$
So, $\angle PQR = 80°$ and $\angle PRQ = 20°$

(ii) $\angle PQR + \angle m = 180°$ {Linear pair}
$$80° + \angle m = 180°$$
$$\angle m = 180° - 80°$$
$$\angle m = 100°$$
and, $\angle PRQ + \angle n = 180°$ {Linear pair}
$$20° + \angle n = 180°$$
$$\angle n = 180° - 20°$$
$$\angle n = 160°$$
So, $\angle m = 100°$ and $\angle n = 160°$

7. (i) $\because$ $PQ = PR$
$\therefore$ $\angle PQR = \angle QRP$
In ΔPQR,
$$\angle PQR + \angle QPR + \angle QRP = 180°$$
$$\angle PQR + 60° + \angle PQR = 180° \quad \{\because \angle QPR = 60°\}$$
$$\angle PQR = 180° - 60°$$
$$\angle PQR = \frac{120°}{2}$$
So, $\angle PQR = \angle PRQ = 60°$

(ii) $\because$ $QS = RS$
$\therefore$ $\angle SQR = \angle SRQ$
In ΔQRS,
$$\angle SQR + \angle SRQ + \angle QSR = 180°$$
$$\angle SQR + 40° + \angle SQR = 180° \quad \{\because \angle QSR = 40°\}$$
$$2 \cdot \angle SQR = 180°$$

$$\angle SQR = \frac{140^\circ}{2}$$

$$\angle SQR = 70^\circ$$

So, $\angle SQR = \angle SRQ = 70^\circ$

(iii) $\because$ $\angle PQS = \angle PQR + \angle SQR$

$= 60^\circ + 70^\circ$

$\angle PQS = 130^\circ$

and, $\angle PRS = \angle PRQ + \angle QRS$

$= 60^\circ + 70^\circ$

$\angle PRS = 130^\circ$

So, $\angle PQS = \angle PRS = 130^\circ$

8. (i) $\because$ $AB = AC$

$\therefore$ $\angle ABC = \angle ACB$

In ΔABC,

$\angle ABC + \angle ACB + \angle BAC = 180^\circ$

$\angle ABC + \angle ABC + 30^\circ = 180^\circ$ $\{\because \angle BAC = 30^\circ\}$

$2 \cdot \angle ABC = 180^\circ - 30^\circ$

$$\angle ABC = \frac{150^\circ}{2}$$

$\angle ABC = 75^\circ$

So, $\angle ABC = \angle ACB = 70^\circ$

(ii) $\because$ $BD = DC$

$\therefore$ $\angle DBC = \angle DCB$

In ΔDBC,

$\angle DBC + \angle DCB + \angle BDC = 180^\circ$

$\angle DBC + \angle DBC + 80^\circ = 180^\circ$ $\{\because \angle BDC = 80^\circ\}$

$2 \cdot \angle DBC = 180^\circ - 180^\circ$

$$\angle DBC = \frac{100^\circ}{2}$$

$\angle DBC = 50^\circ$

So, $\angle DBC = \angle DCB = 50^\circ$.

(iii) $\angle ABC = \angle ABD + \angle DBC$

$75^\circ = x + 50^\circ$

$x = 75^\circ - 50^\circ = 25^\circ$

So, $x = 25^\circ$

9. (i) $\because$ $AB = AC$

$\therefore$ $\angle B = \angle C$

So, $x = 45^\circ$

(ii) $\because$ $PQ = PR$

$\therefore$ $\angle Q = \angle R$

So, $x = 60^\circ$

(iii) $\because$ $DE = DF$

$\therefore$ $\angle E = \angle F = 55^\circ$

$\because$ $\angle E + \angle F + \angle D = 180^\circ$

$$55^\circ + 55^\circ + y = 180^\circ$$
$$y = 180^\circ - 110^\circ$$

So, $y = 70^\circ$

(iv) $\because$ $PQ = QR$

$\therefore$ $\angle P = \angle R = 45^\circ$

$\because$ $\angle P + \angle Q + \angle R = 180^\circ$

$z = 180^\circ - 90^\circ$

So, $z = 90^\circ$

(v) $\because$ $AB = BC = AC$

$\therefore$ $\angle A = \angle B = \angle C = x$

$\because$ $\angle A + \angle B + \angle C = 180^\circ$

$\therefore$ $x + x + x = 180^\circ$

$3x = 180^\circ$

$x = \frac{180^\circ}{3}$

So, $x = 60^\circ$

(vi) $\because$ $DE = DF$

$\therefore$ $\angle E = \angle F = 62^\circ$

$\because$ $\angle GDF = \angle E + \angle F$ {exterior opposite angles}

$y = 62^\circ + 62^\circ$

So, $y = 124^\circ$

vii) $\because$ $PQ = PR$

$\therefore$ $\angle Q = \angle R$

$\because$ $\angle P + \angle Q + \angle R = 180^\circ$

$80^\circ + \angle Q + \angle Q = 180^\circ$

$2\angle Q = 180^\circ - 80^\circ$

$\angle Q = \frac{100^\circ}{2} = 50^\circ$

$\angle Q = \angle R = 50^\circ$

$\because$ $\angle R + x = 180^\circ$ {Linear pair}

$50^\circ + x = 180^\circ$

$x = 180^\circ - 50^\circ$

So, $x = 130^\circ$

(viii) $\because$ $AB = AC$

$\therefore$ $\angle B = \angle C$

$\because$ $\angle A + \angle B + \angle C = 180^\circ$

$30^\circ + \angle VB + \angle B = 180^\circ$

$2 \cdot \angle B = 180^\circ - 30^\circ$

$\angle B = \frac{150^\circ}{2} = 75^\circ$

$\angle B = \angle C = 75^\circ$

$\because$ $\angle DBC = \angle A + \angle C$ {Exterior opposite angles}

$y = 30^\circ + 75^\circ$

So, $y = 105^\circ$

10. (i) $\because \quad PR = QR$

$\therefore \quad \angle P = \angle Q$

$\because \quad \angle P + \angle Q = 98^\circ$ {Exterior opposite angles}

$2 \cdot \angle P = 98^\circ$

$\angle P = \frac{98^\circ}{2} = 49^\circ$

$\angle P = \angle Q = 49^\circ$

$\because \quad \angle Q = x$ {Opposite angles}

So, $x = 49^\circ$

(ii) $\because \quad PR = QR$

$\therefore \quad \angle P = \angle Q = x$

$\because \quad \angle P + \angle Q = \angle PRS$ {Exterior opposite angle}

$x + x = 106^\circ$

$2x = 106^\circ$

$x = 106^\circ$

$x = \frac{106^\circ}{2}$

So, $x = 54^\circ$

$\because \quad \angle P + \angle Q + \angle R = 180^\circ$

$x + x + y = 180^\circ$

$54 + 54 + y = 180^\circ$

$y = 180^\circ - 106^\circ$

So, $y = 74^\circ$

(iii) $\because \quad AB = BD$

$\therefore \quad \angle A = \angle D$

$40^\circ = z$

$z = 40^\circ$

$\because \quad BD = BC$

$\therefore \quad \angle D = \angle C = y$

$\because \quad \angle D + \angle C + \angle B = 180^\circ$

$y + y + x = 180^\circ$

$2y + (40^\circ + 40^\circ) = 180^\circ$

$2y = 180^\circ - 80^\circ$

$y = \frac{100^\circ}{2}$

So, $y = 50^\circ$

$\because \quad x = z + 40^\circ$ {Exterior opposite angle}

$x = 40^\circ + 40^\circ$

So, $x = 80^\circ$

(iv) $\because \quad AB = AC$

$\therefore \quad \angle B = \angle C$

$\because \quad \angle A + \angle B + \angle B = 180^\circ$

$30^\circ + \angle B + \angle B = 180^\circ$

$2 \cdot \angle B = 180^\circ - 30^\circ$

$$\angle B = \frac{150^\circ}{2} = 75^\circ$$

So, $\angle B = \angle C = 75^\circ$

$\because$ $x = 180^\circ - \angle B$ {Linear pair}

$x = 180^\circ - 75^\circ$

$x = 105^\circ$

So, $x = y = 105^\circ$

15 Perimeter and Area

Exercise 15.1

1. (i) $\because$ $S = \dfrac{PQ + QR + PR}{2}$

$= \dfrac{8.5 + 6.2 + 4.8}{2} = \dfrac{19.6}{2} = 9.8$ cm

$\therefore$ Area of $\Delta PQR = \sqrt{S(S-PQ)(S-QR)(S-PR)}$

$= \sqrt{\dfrac{9.8(9.8-8.5)(9.8-6.2)}{(9.8-4.9)}}\ \text{cm}^2$

$= \sqrt{9.8 \times 1.3 \times 3.6 \times 4.9}\ \text{cm}^2$

$= \sqrt{224.75}\ \text{cm}^2$

$= 14.99 \approx 15\,\text{cm}^2$

(ii) Side of a square $= 7.9\,\text{cm}$

So, Area of the square $= (7.9 \times 7.9)\ \text{cm}^2$

$= 62.41\ \text{cm}^2$.

(iii) Length of rectangular park $= 46\dfrac{1}{2} = \dfrac{93}{2}$ m

Breadth of rectangular park $= 23\dfrac{1}{2} = \dfrac{47}{2}$ m

So, Area of the rectangular park = length $\times$ breadth

$= \dfrac{93}{2} \times \dfrac{47}{2}\ \text{cm}^2$

$= \dfrac{4371}{4} = 1092\dfrac{1}{4}\ \text{cm}^2$.

2. Perimeter of $\Delta ABC = AB + BC + AC$

$62\,\text{cm} = 19\,\text{cm} + 23\,\text{cm} + (x+5)\,\text{cm}$

$62 = (19 + 23 + x + 5)$

$62 = 47 + x$

$x + 47 = 62$

$x = 62 - 47$

So, $x = 15\,\text{cm}$

3. $\because$ Perimeter of Rectangle $= 2 \times (\text{length} + \text{breadth})$

$$91 \text{ cm} = 2[(2x - 1) + (x + 9)] \text{ cm}$$

$$\frac{91}{2} = 2x - 1 + x + 9$$

$$\frac{91}{2} = 3x + 8$$

$$3x = \frac{91}{2} - 8$$

$$x = \frac{91 - 16}{3 \times 2} = \frac{75}{6}$$

So, $x = 12.5$ cm

4. (i) Perimeter of fig. (i) $= \left(7\frac{1}{4} + 7\frac{1}{4} + 7\frac{1}{4} + 7\frac{1}{4}\right)$ sq. unit

$$= 4 \times \frac{29}{4} = 29 \text{ sq. unit}$$

(ii) Perimeter of fig. (ii)
$= (13.6 + 9 + 2.5 + 4.3 + 8.6 + 4.3 + 2.5 + 9)$ sq. unit
$= (22.2 + 18 + 5 + 8.6)$ sq. unit
$= 53.8$ sq. unit

(iii) Perimeter of fig. (iii) $= (9 + 3 + 3 + 6 + 3 + 6 + 3 + 3)$ sq. unit
$= 36$ sq. unit

(iv) Perimeter of fig. (iv) $= (9 + 10 + 5 + 3 + 2 + 3 + 2 + 4)$ sq. unit
$= 38$ sq. unit

Exercise 15.2

1. (i) $\because$ Diameter of the circle $= 14$ cm

$\therefore$ Circumference of the circle $= \pi d$

$$= \frac{22}{7} \times 14 \text{ cm}$$

$$= 22 \times 2 = 44 \text{ cm}.$$

(ii) $\because$ Diameter of the circle $= 3.5$ cm

$\therefore$ Circumference of the circle $= \pi d$

$$= \frac{22}{7} \times 3.5 \text{ cm}$$

$$= 22 \times 0.5 = 11 \text{ cm}.$$

(iii) $\because$ Diameter of the circle $= 56$ m

$\therefore$ Circumference of the circle $= \pi d$

$$= \frac{22}{7} \times 56 \text{ m}$$

$$= 22 \times 8 = 176 \text{ m}.$$

2. (i) $\because$ Radius of the circle $= 28$ cm

$\therefore$ Circumference of the circle $= 2\pi r$

$$= 2 \times \frac{22}{7} \times 28\,\text{cm}$$

$$= 44 \times 4 = 176\,\text{cm}.$$

(ii) $\because$ Radius of the circle $= 14$ m

$\therefore$ Circumference of the circle $= 2\pi r$

$$= 2 \times \frac{22}{7} \times 14\,\text{m}$$

$$= 44 \times 2 = 88\,\text{m}.$$

(iii) $\because$ Radius of the circle $= 24.5$ cm

$\therefore$ Circumference of the circle $= 2\pi r$

$$= 2 \times \frac{22}{7} \times 24.5\,\text{cm}$$

$$= 2 \times \frac{22}{7} \times 24.5\,\text{cm}$$

$$= 2 \times 22 \times 3.5\,\text{cm}$$

$$= 22 \times 7 = 154\,\text{cm}.$$

3. (i) $\because$ Circumference of the circle $= 308$ m

$\therefore$ $2\pi r = 308$ m

$$2 \times \frac{22}{7} \times r = 308\,\text{m}$$

$$r = \frac{308 \times 7}{2 \times 22}\,\text{m} = 7 \times 7\,\text{m}$$

So, $r = 49$ m.

(ii) $\because$ Circumference of the circle $= 880$ cm

$\therefore$ $2\pi r = 880$ cm

$$2 \times \frac{22}{7} \times r = 880\,\text{cm}$$

$$r = \frac{880 \times 7\,\text{cm}}{2 \times 22}\,\text{cm} = 20 \times 7\,\text{cm}$$

So, $r = 140$ cm.

(iii) $\because$ Circumference of the circle $= 132$ cm

$\therefore$ $2\pi r = 132$ cm

$$2 \times \frac{22}{7} \times r = 132\,\text{cm}$$

$$r = \frac{132 \times 7}{2 \times 22}\,\text{cm}$$

$$r = 21\,\text{cm}$$

4. Radius of driving wheel $= 2.1$ m

Thus, circumference of driving wheel $= 2\pi r$

$$= 2 \times \frac{22}{7} \times 2.1\,\text{m}$$

$$= 13.2\,\text{m}$$

$\because$ Distance covered by wheel in one revolution $= 13.2$ m

$\therefore$ Distance covered by wheel in 8000 revolution $= 8000 \times 13.2$

$= 105{,}600$ m

$= \dfrac{105600}{1000}$ km $= 105.6$ km

5. Distance of sprays water from spinkler $= 5$ cm

Thus, distance of edge of wet grass $= 2\pi r$

$= 2 \times 3.14 \times 5$ m

$= 31.4$ m

6. Let, the radius of outer circle is R.

and, the radius of inner circle is r.

Thus, width of road $= R - r$

$\because$ Circumference of outer circle $= 110$ m

$\therefore$ $2\pi R = 110$ m

$2 \times \dfrac{22}{7} \times R = 110$ m

$R = \dfrac{110 \times 7}{2 \times 22}$ m

$R = \dfrac{70}{4} = 17.5$ m

and, Circumference of inner circle $= 88$ m

$\therefore$ $2\pi r = 88$ m

$2 \times \dfrac{22}{7} \times r = 88$ m

$r = \dfrac{88 \times 7}{2 \times 22}$ m

$r = 14$ m

So, the width of the road $= R - r$

$= (17.5 - 17)$ m

$= 3.5$ m

7. Let, the radius of carriage wheel $=$ r

Thus, Circumference of wheel $= 2\pi r$

$\because$ Distance covered by wheel in 150 revolution $= 4.5$ km $= 4500$ m

$\therefore$ Distance covered by wheel in one revolution $= \dfrac{4500}{1500}$ m

$= 3$ m

$\therefore$ $2\pi r = 3$ m

$2 \times 3.4 \times r = 3$ m

$r = \dfrac{3}{6.28}$ m $= 0.47$ m

$= 0.478 \times 100$ cm $= 47.8$ cm

So, the radius of carriage wheel is 47.8 cm.

8. Diameter of table cover $= 3.5$ m

Circumference of table cover $= \pi d$

$$= \frac{22}{7} \times 3.5 \text{ m}$$
$$= 22 \times 0.5 \text{ m}$$
$$= 11 \text{ m}$$

$\because$ Cost of one metre of lace = ₹ 30

$\therefore$ Cost of 11 metre of lace = ₹ 30×11 = ₹ 330

Hence, teh length of required lace is 11 metre and the cost of lace is ₹ 330.

9. Length of rectangular part of park = 112 m

Breadth of rectangular part of park = 56 m

Thus, diameter of circular part of park = 56 m

So, the perimeter of the park $= 2[l + b] + 2 \times \frac{1}{2} \times \pi d$

$$= 2[112 + 56] + \frac{22}{7} \times 56 \text{ m}$$
$$= 2 \times 168 + 22 \times 8 \text{ m}$$
$$= (336 + 176) \text{ m} = 512 \text{ m}.$$

10. (i) Perimeter of fig. (i) $= r + r + \frac{1}{4} \times 2\pi r$

$$= (21 + 21) + \frac{1}{2} \times \frac{22}{7} \times 21 \text{ m}$$
$$= (42 + 11 \times 3) \text{ m}$$
$$= 75 \text{ metre}.$$

(ii) Perimeter of fig. (ii) $= r + r + \frac{3}{4} \times 2\pi r$

$$= (0.7 + 0.7) + \frac{3}{2} \times \frac{22}{7} \times 0.7 \text{ m}$$
$$= (1.4 + 33 \times 0.1) \text{ m}$$
$$= 4.7 \text{ metre}.$$

(iii) Perimeter of fig. (iii) $= (7 \text{ m} + 7 \text{ m}) + \frac{1}{2} \times 2\pi r$

$$= 14 \text{ m} + \frac{22}{7} \times 7 \text{ m}$$
$$= 14 \text{ m} + 22 \text{ m}$$
$$= 36 \text{ metre}.$$

Exercise 15.3

1. (i) Area of rectangular field = length $\times$ breadth

$$= 15.5 \text{ m} \times 5 \text{ m}$$
$$= 77.5 \text{ m}^2.$$

(ii) Area of rectangular field = length $\times$ breadth

$$= 10 \text{ m} \times 30 \text{ m}$$
$$= 300 \text{ m}^2.$$

(iii) Area of rectangular field = length $\times$ breadth

$= 12\text{ m} \times 13\text{ m}$

$= 156\text{ m}^2$.

2. $\because$ Area of a square field $= 100\text{ m}^2$

Thus, sdie of square field $= \sqrt{100\text{ m}^2}$

$= 10\text{ m}$.

3. Let, the breadth of rectangular field $= b$

and, the length of the rectangular field $= 60$ m

$\because$ Cost of fencing the rectangular field at ₹ 3.50 per metre is ₹ 595.

$\therefore$ Perimeter of rectangular field $= \frac{595}{3.50}$ m

$= 170\text{ m}$

$\because$ Perimerter of rectangualr field $= 2[l + b]$

$\therefore \quad 2[l + b] = 170\text{ m}$

$60\text{ m} + b = \frac{170}{2}\text{ m}$

$b = 85\text{ m} - 60\text{ m}$

$b = 25\text{ m}$

Hence, the breadth of rectangular field is 25 metre.

4. Let, the height of triangular field be h.

Thus, the base of triangular field $= 3h$

$\because$ Cost of cultivating the field at ₹ 36.72 per hectare is ₹ 495.72.

$\therefore$ Area of triangular field $= \frac{495.72}{36.72}$ hectare

$= 13.5$ hectare

$\because$ Area of triangular field $= \frac{1}{2} \times \text{base} \times \text{height}$

$\therefore \quad \frac{1}{2} \times \text{base} \times \text{height} = 13.5$ hectare

$\frac{1}{2} \times 3h \times h = 13.5 \times 10{,}000\text{ m}^2$

$h^2 = \frac{2}{3} \times 1{,}35{,}000\text{ m}^2$

$h^2 = 90{,}000\text{ m}^2$

$h = \sqrt{90{,}000}\text{ m}$

$h = 300\text{ m}$

Hence, the heiht of triangualr field is 300 metre and the base of field is 900 metre.

5. Let, the breadth of rectangular field is x.

Thus, the length of rectangular field $= 2x$.

$\because$ Perimeter of rectangular field $= 2[l + b]$

$\therefore \quad 2[x + 2x] = 0.6\text{ km}$

$2 \times 3x = 0.6 \times 1000\text{ m}$

$$6x = 600\text{ m}$$
$$x = \frac{600}{6}\text{ m} = 100\text{ m}$$

Thus, the length of rectangular field is 200 m and the breadth of rectangular field is 100 m.

So, Area of rectangular field $= l \times b$
$$= 200\text{ m} \times 100\text{ m}$$
$$= 20000\text{ m}^2$$
$$= \frac{20000}{10000}\text{ hectare}$$
$$= 2\text{ hectare}$$

6. Let, the base of parallelogram be x.

Thus, the height of parallelogram $= 2x$.

$\because$ Area of parallelogram $= 338$ sq. m

$\therefore$ base $\times$ height $= 338\text{ m}^2$

$$x \times 2x = 338\text{ m}^2$$
$$2x^2 = 338\text{ m}^2$$
$$x^2 = \frac{338}{2} = 169\text{ m}^2$$
$$x = \sqrt{169}\text{ m}$$
$$x = 13\text{ m}$$

Hence, the base of parallelogram is 13 metre and the height of parallelogram is 26 metre.

7. $\because$ Ratio of length and breadth of room $= 4 : 3$

$\therefore$ Let, the length of room is $4x$ and the breadth is $3x$.

$\because$ Cost of decorating the four walls of room at ₹ 6.60 per sq. m is ₹ 5082.

$\therefore$ Area of four walls of room $= \frac{5082}{6.60}$ sq. m $= 770\text{ m}^2$

Thus, area of four walls of the room
$$= 2 \times [l \times b] \times h$$
$$770\text{ m}^2 = 2 \times [4x + 3x] \times 5.5\text{ m}$$
$$\frac{770}{2 \times 5.5}\text{ m} = 7x$$
$$7x = \frac{770}{11}\text{ m}$$
$$x = \frac{70}{7} = 10\text{ m}.$$

$\therefore$ length $= 4x = 4 \times 10\text{ m} = 40\text{ m}$

and breadth $= 3x = 3 \times 10\text{ m} = 30\text{ m}$

Hence, the length of room is 40 metre and the breadth of boom is 30 metre.

8. Area of square $= (\text{side})^2$

$= X^2$

and, Area of triangle $= \frac{1}{2} \times \text{base} \times \text{altitude}$

$= \frac{1}{2} \times X \times \text{altitude}$

$\because$ Area of square is = Area of traignel

$\therefore \quad \frac{1}{2} \times X \times \text{altitude} = X^2$

$$\text{altitude} = \frac{X^2}{X} \times 2$$

$$\text{altitude} = 2X$$

Hence, the altitude of the triangle is twice of base X.

9. Base of triangular tent = 1.5 m

Height of triangular tent = 2m

Thus, Area of triangular tent $= \frac{1}{2} \times \text{base} \times \text{height}$

$= \frac{1}{2} \times 1.5 \text{ m} \times 2 \text{ m}$

$= 1.5 \text{ m}^2$

So, the required material to make a cover for this front of tent is 1.5 sq. metre.

10. Let, the length of room be l.

$\because$ Area of four walls of room $= 168 \text{ m}^2$

$\therefore \quad 2 \times [l + b] \times h = 168 \text{ m}^2$

$2 \times [l + 8 \text{ m}] \times 6 \text{ m} = 168 \text{ m}^2$

$$l + 8 \text{ m} = \frac{168}{2 \times 6 \text{ m}} \text{ m}^2$$

$l + 8\text{m} = 14 \text{ m}$

$l = 14 \text{ m} - 8 \text{ m}$

$l = 6 \text{ m}$

hence, the length of room is 6 metre.

11. Let, the side of the square is x.

Thus, the area of the square $= x^2$

$\because$ Side of square increased by 50% $= x + \frac{x \times 50}{100}$

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

Thus, Area of new square $= \left(\frac{3}{2}x\right)^2$

$= \frac{9}{4}x^2$

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

$$= x + \frac{5}{4} \times 100\%$$

$$= x + 125\%$$

Hence, if the side of square is increased by 50%. Thus, the area of square is increased by 125%.

12. Ratio of the sides of rectangular park = 3 : 2

Let, the sides of rectangular park be $3x$ and 3x.

Area of rectangular park $= l \times b$

$3750\ \text{m}^2 = 3x \times 2x$

$3750\ \text{m}^2 = 6x^2$

$x^2 = \frac{3750}{6}\ \text{m}^2$

$x^2 = 625\ \text{m}^2$

$x = \sqrt{625}\ \text{m}$

$x = 25\ \text{m}$

$\therefore$ length $= 3x = 3 \times 25\ \text{m} = 75\ \text{m}$

and, breadth $= 2x = 2x \times 25\ \text{m} = 50\ \text{m}$

Thus, Perimeter of the rectangular park $= 2[l + b]$

$= 2 \times [75 + 50]\ \text{m}$

$= 2 \times 125\ \text{m}$

$= 250\ \text{m}$

$\because$ Cost of fencing 1 metre of park = ₹ 0.50

$\therefore$ Cost of fencing 250 metre of park = ₹ $0.50 \times 250 =$ ₹ 125

13. (i) Area of rectangle $ABCD$ = length × breadth

$= (219 + 2 + 2)\ \text{m} \times (120 + 2 + 2)\ \text{m}$

$= 223 \times 124\ \text{m}^2$

$= 27{,}652\ \text{m}^2$

Area of rectangle = length × breadth

$= 219\ \text{m} \times 120\ \text{m}$

$= 26{,}280\ \text{m}^2$

So, the area of path = area of $ABCD$ – Area of $PQRS$

$= 27{,}652\ \text{m}^2 - 26{,}280\ \text{m}^2$

$= 1372\ \text{m}^2$

(ii) Area of rectangle $PQRS$ = length × breadth

$= 12\ \text{m} \times 9\ \text{m}$

$= 108\ \text{m}^2$

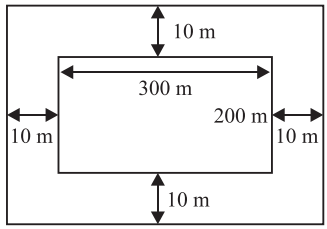
Area of rectangle $KLMN$ = length × breadth

$= (12 - 1.5 - 1.5)\ \text{m} \times (9 - 1.5 - 1.5)\ \text{m}$

$= 9\ \text{m} \times 6\ \text{m}$

$= 54\ \text{m}^2$

14.



Area of the piece of land $= \text{length} \times \text{breadth}$
$= 300\text{ m} \times 200\text{ m}$
$= 60{,}000\text{ m}^2$

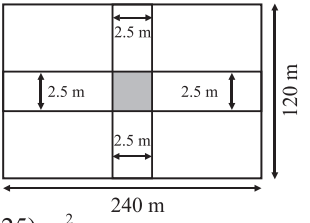
Area of land with road $= \text{length} \times \text{breadth}$
$= (300 + 10 + 10)\text{ m} \times (20 + 10 + 10)\text{ m}$
$= 320\text{ m} \times 220\text{ m}$
$= 70{,}400\text{ m}^2$

Thus, the area of road $=$ Area of land with road $-$ Area of piece of land
$= 70{,}400\text{ m}^2 - 60{,}000\text{ m}^2$
$= 10{,}400\text{ m}^2$

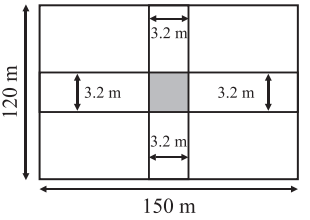
$\because$ Cost of levelling 1 m^2 of road $= ₹\ 1.50$
$\therefore$ Cost of levellign $10{,}400\text{ m}^2$ of road $= ₹\ 1.50 \times 10{,}400 = ₹\ 15{,}600.$

Exercise 15.4

1. Area of the road parallel to the length
$= 240\text{ m} \times 2.5\text{ m} = 600\text{ m}^2$
Area of the road parallel to the breadth
$= 120\text{ m} \times 2.5\text{ m} = 300\text{ m}^2$
Area of middle square road $= 2.5\text{ m} \times 2.5\text{ m}$
$= 6.25\text{ m}^2$
So, Area of the roads
$= (600 + 300 - 6.25)\text{ m}^2$
$= 893.75\text{ m}^2$

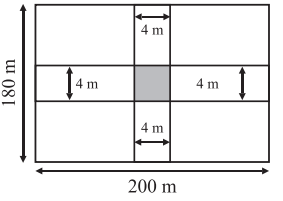


2. Area of the road parallel to the length
$= 150\text{ m} \times 3.2\text{ m}$
$= 480\text{ m}^2$
Area of the road parallel to the breadth
$= 120\text{ m} \times 3.2\text{ m}$
$= 384\text{ m}^2$
Area of middle square road $= 3.2\text{ m} \times 3.2\text{ m}$
$= 10.24\text{ m}^2$
So, Area of the road $= (480 + 384 - 10.24)\text{ m}^2$
$= 853.76\text{ m}^2$



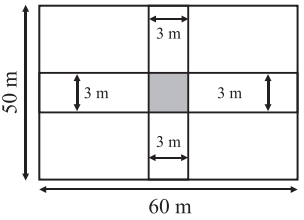
3. Length of each corner field $= \dfrac{(200 - 4)}{2}\text{ m}$

Breadth of each corner field $= \dfrac{(180 - 4)}{2}\text{ m}$
$= 88\text{ m}$



So, Area of each corner field = 98 m × 88 m
= 8624 m^2
Total Area of field without road = 4 × 8624 m^2
= 34,496 m^2
∵ Cost of grassing on 1 m^2 of field = ₹ 0.30
∴ Cost of grassing on 34,406 m^2 of field
= ₹ 0.30 × 34,496
= ₹ 10,348.80

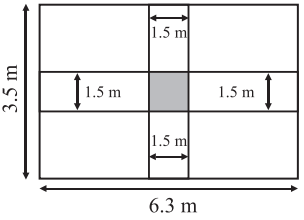
4. Area of the road parallel to the length
= 60 m × 3 m
= 180 m^2



Area of the road parallel to the breadth
= 50 m × 3 m
= 150 m^2
Area of middle square road = 3 m × 3 m
= 9 m^2
So, Area of the road = 180 m^2 + 150 m^2 − 9 m^2
= 321 m^2
∵ Cost of gravelling the road per m^2 = ₹ 4.50
∴ Cost of gravelling the 321 m^2 of road = ₹ 4.50 × 321
= ₹ 1,444.50

5. Length of each corner graden = $\frac{(120-3)}{2}$ m
= 58.50 m
Breadth of each corner garden = $\left(\frac{90-3}{2}\right)$ m
= 43.50 m
Area of each corner garden = 58.50 m × 43.50 m
= 2544.75 m^2
So, the total area of garden without roads = 4 × 2544.77 m^2
= 10,179 m^2.

6. Area of the road parallel to the length
= 63 m × 1.5 m
= 94.5 m^2



Area of the road parallel to the breadth
= 35 m × 1.5 m
= 52.5 m^2
Area of middle square road = 1.5 m × 1.5 m
= 2.25 m^2
So, Area of the roads = (94.5 + 52.5 − 2.25) m^2
= 144.75 m^2

Exercise 15.5

1. (i) Radius of the circle = 10.5 m
Thus, Area of the circle = πr^2

$$= \frac{22}{7} \times (10.5\ \text{m})^2$$
$$= \frac{22}{7} \times 110.25\ \text{m}^2$$
$$= 346.50\ \text{m}^2$$

(ii) Radius of the circle = 14 cm
thus, Area of the circle = πr^2
$$= \frac{22}{7} \times 14 \times 14\ \text{cm}^2$$
$$= \frac{22}{7} \times 14 \times 14\ \text{cm}^2$$
$$= 616\ \text{cm}^2.$$

2. (i) Diameter of the circle = 56 m

Thus, Area of the circle = $\pi \left(\frac{d}{2}\right)^2$
$$= \frac{22}{7} \times \left(\frac{56}{2}\ \text{m}\right)^2$$
$$= \frac{22}{7} \times 28 \times 28\ \text{m}^2$$
$$= 2464\ \text{m}h2$$

(ii) Diameter of the circle = 28 cm

Thus, Area of the circle = $\pi \left(\frac{d}{2}\right)^2$
$$= \frac{22}{7} \times \left(\frac{28}{2}\ \text{cm}\right)^2$$
$$= \frac{22}{7} \times 14 \times 14\ \text{cm}^2$$
$$= 616\ \text{cm}^2$$

3. (i) Circumference of the circle = 66 cm
$$2\pi r = 66\ \text{cm}$$
$$r = \frac{66}{2\pi}\ \text{cm}$$
$$= \frac{66}{2} \times \frac{7}{22} = 10.5\ \text{cm}$$

So, Area of the circle $= \pi r^2$
$$= \frac{22}{7} \times (10.5\ \text{cm})^2$$
$$= \frac{22}{7} \times 110.25\ \text{cm}$$
$$= 346.50\ \text{cm}^2$$

(ii) Circumference of the circle = 44 m

$$2\pi r = 44 \text{ m}$$

$$r = \frac{44}{2\pi} \text{ m}$$

$$= \frac{44}{2} \times \frac{7}{22} = 7 \text{ m}$$

Thus, Area of the circle $= \pi r^2$

$$= \frac{22}{7} \times (7 \text{ m})^2$$

$$= \frac{22}{7} \times 7 \times 7 \text{ m}^2$$

$$= 154 \text{ m}^2.$$

4. (i) Area of the circle = 616 sq. m

$\therefore$ $\pi r^2 = 616 \text{ m}^2$

$$\frac{22}{7} r^2 = 616 \text{ m}^2$$

$$r^2 = \frac{616 \times 7}{22} \text{ m}^2$$

$$r^2 = 196 \text{ m}^2$$

$$r = \sqrt{196} \text{ m}$$

$$r = 14 \text{ m}$$

So, the radius of circle is 14 m.

(ii) Area of the circle = 308 sq. cm

$\therefore$ $\pi r^2 = 308 \text{ cm}^2$

$$\frac{22}{7} r^2 = 308 \text{ cm}^2$$

$$r^2 = \frac{308 \times 7}{22} \text{ cm}^2$$

$$r^2 = 98 \text{ cm}^2$$

$$r = \sqrt{98} \text{ cm}$$

$$r = 7\sqrt{2} \text{ cm}$$

So, the radius of the circle is $7\sqrt{2}$ cm.

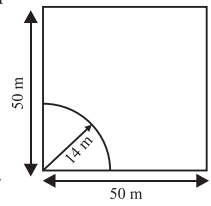
5. Area of the square field $= 50 \text{ m} \times 50 \text{ m} = 2500 \text{ m}^2$

Area of graze by goat $= \frac{1}{4} \times \pi r^2$

$$= \frac{1}{4} \times \frac{22}{7} \times (14 \text{ m})^2$$

$$= \frac{1}{4} \times \frac{22}{7} \times 14 \times 14 \text{ m}h2$$

$$= 22 \times 7 = 154 \text{ m}^2$$



Thus, the remaining Area $= 2500 \text{ m}^2 - 154 \text{ m}^2$

$$= 2346 \text{ m}^2$$

So, the goat cannot graze 2346 sq. meter area of square field.

Multiple Choice Questions

1. (ii) **2.** (iii) **3.** (i) **4.** (ii) **5.** (ii) **6.** (i)

Mental Exercise

1. 3.1416 **2.** π **3.** Diameter, $2(l+b)$ **4.** πr^2 **5.** Perpendicular.

16 Data Handling

Exercise 16.1

1. By arranging the data in ascending order :

12, 13, 13, 14, 15, 16, 17, 18, 18, 21

Range $= 21 - 12 = 9$

$$\text{Mean} = \frac{\text{Sum}}{\text{Number}}$$

$$= \frac{12+13+13+14+15+16+17+18+18+21}{10}$$

$$= \frac{157}{10} = 15.7$$

2. First seven even numbers = 2, 4, 6, 8, 10, 12, 14

$$\text{Mean} = \frac{\text{Sum of all numbers}}{7}$$

$$= \frac{56}{7} = 8.$$

3. Do it yourself.

4. First seven multiple of 7 = 7, 14, 21, 28, 35, 42, 49

$$\text{Mean} = \frac{\text{Sum of all numbers}}{7}$$

$$= \frac{7+14+21+28+35+42+49}{7}$$

$$= \frac{196}{7} = 28$$

5. First ten two-digit number =10, 11, 12, 13, 14, 15, 16, 17, 18, 19

$$\text{Mean} = \frac{\text{Sum of all numbers}}{10}$$

$$= \frac{10+11+12+13+14+15+16+17+18+19}{10}$$

$$= \frac{145}{10} = 14.5$$

6. $\because$ $\text{Mean} = \dfrac{\text{Sum of observations}}{\text{Number of observations}}$

$$\therefore \quad 8 = \frac{7+9+X+13+6}{5}$$

$$8 \times 5 = X + 34$$

$$40 = X + 35$$

$$X = 40 - 35$$

$$X = 5$$

Hence, the value of X is 5.

7. $\because$ $$\text{Mean} = \frac{\text{Sum of observations}}{\text{Number of observations}}$$

$$9 = \frac{10+12+8+X+11+9}{6}$$

$$9 \times 6 = 50 + X$$

$$54 = 50 + X$$

$$X = 54 - 50$$

$$X = 4$$

Hence, the value of X is 4.

8. By arranging ages (years) in ascending order

$$= 22, 23, 25, 32, 33, 35, 36, 40, 42, 45$$

(i) The age of the oldest teacher is 45 years.

(ii) The age of the youngest teacher is 22 yeas.

(iii) $$\text{Range} = \text{Max. age} - \text{Min. age}$$

$$= 45 - 22 = 23 \text{ years}$$

(iv) $$\text{Mean age of teacher} = \frac{\text{Sum of ages of the teachers}}{\text{Number of the teachers}}$$

$$= \frac{22+23+25+32+33+35+36+40+42+45}{10}$$

$$= \frac{333}{10} = 33.3 \text{ years}$$

(v) There are five teachers having age less than the mean age.

9. By arranging marks in ascending order = 59, 63, 70, 72, 75, 83, 85, 86, 90, 91

(i) The highestscore is 91 marks.

(ii) The lowest score is 59 marks.

(iii) Range of marks = Max. marks – min. marks

= 91 – 59

= 32 marks

(iv) $$\text{Mean of marks} = \frac{\text{Sum of marks obtained}}{\text{Number of students}}$$

$$= \frac{59+63+70+782+75+83+85+86+90+91}{10}$$

$$= \frac{774}{10} = 77.4 \text{ marks}$$

10. Do it yourself.

Exercise 16.2

1. (i) 15, 19, 15, 14, 15, 16, 14, 21, 15

By arranging the data in ascending order

= 14, 14, 15, 15, 15, 15, 16, 19, 21

$$\text{Mean} = \frac{\text{Sum of observations}}{\text{Number of observations}}$$

$$= \frac{14+14+15+15+15+15+16+9+21}{9}$$

$$= \frac{144}{9} = 16$$

$\because$ $n = 9$, is an odd number

$\therefore$ $$\text{Median} = \left(\frac{n+1}{2}\right)\text{th observation}$$

$$= \left(\frac{9+1}{2}\right)\text{th observation}$$

$$= 5\text{th observation} = 15.$$

Here, 15 is occur 4 times.

Hence, the mode is 15.

2. 10, 11, 11, 13, 10, 10, 10, 16, 15, 14

By arranging the data in ascending order = 10, 10, 10, 10, 11, 11, 13, 14, 15, 16

$$\text{Mean} = \frac{\text{Sum of observation}}{\text{Number of observation}}$$

$$= \frac{10+10+10+10+11+11+13+14+15+16}{10}$$

$$= \frac{120}{10} = 12$$

$\because$ $(n = 10)$ is an even number.

$\therefore$ $$\text{Median} = \frac{\left(\frac{n}{2}\right)\text{th observation} + \left(\frac{n}{2}+1\right)\text{th observation}}{2}$$

$$= \frac{\left(\frac{10}{2}\right)\text{th observation} + \left(\frac{10}{2}+1\right)\text{th}}{2}$$

$$= \frac{5\text{th observation} + 6\text{th observation}}{2} = \frac{11+11}{2} = 11$$

$\therefore$ Here, 10 is occur 4 times.

Hence, the mode is 10.

(iii) 2, 3, 5, 7, 8, 9

Arranging the data in ascedning order = 2, 3, 5, 7, 8, 9

$$\text{Mean} = \frac{\text{Sum of observations}}{\text{Number of observations}}$$

$$= \frac{2+3+5+7+8+9}{6}$$

$$= \frac{34}{6} = 5.67$$

$\because$ $(n = 6)$ is an even number.

$$\therefore \quad \text{Median} = \frac{\left(\frac{n}{2}\right)\text{th observation} + \left(\frac{n}{2}+1\right)\text{th observation}}{2}$$

$$= \frac{\left(\frac{6}{2}\right)\text{th observation} + \left(\frac{6}{2}+1\right)\text{th observation}}{2}$$

$$= \frac{3\text{rd observation} + 4\text{th observation}}{2}$$

$$= \frac{5+7}{2} = 6.$$

$\because$ Any number did not repeat.

So, there is no mode of numbers.

(iv) 5, 6, 7, 7, 7, 9, 9, 9, 12, 10

Arranging the data in ascending order = 5, 6, 7, 7, 7, 9, 9, 9, 10, 12

$$\text{Mean} = \frac{\text{Sum of observations}}{\text{Number observation}}$$

$$= \frac{5+6+7+7+7+9+9+9+10+12}{10}$$

$$= \frac{81}{10} = 8.1$$

$\because$ $(n = 10)$ is an odd number.

$$\therefore \quad \text{Median} = \frac{\left(\frac{n}{2}\right)\text{th observation} + \left(\frac{n}{2}+1\right)\text{th observation}}{2}$$

$$= \frac{\left(\frac{10}{2}\right)\text{th observation} + \left(\frac{10}{2}+1\right)\text{th observation}}{2}$$

$$= \frac{5\text{th observation} + 6\text{th observation}}{2}$$

$$= \frac{7+9}{2} = 8.$$

$\because$ Here, 7 and 9 both occur 3 times.

Hence, both are the mode of the data.

2. Let, he should get x marks in last tet.

Thus,

$$\text{Means} = \frac{\text{Sum of marks obtained by student}}{\text{Number}}$$

$$85 = \frac{87+76+95+88+x}{5}$$

$$85 \times 5 = 346 + x$$

$$425 - 346 = x$$

$$x = 79$$

Hence, he should get 79 marks in last test to achieve that the average an 85.

3. Let, the sum of first eight observation x.

Thus,

$$\text{Mean} = \frac{\text{Sum of observation}}{\text{Number of observation}}$$

$$35 = \frac{x+18}{9}$$

$$35 \times 9 = x + 18$$

$$315 - 18 = x$$

$$x = 297$$

So, $\text{Correct mean} = x + 9\text{th observation (correct)}$

$$= \frac{297+81}{9}$$

$$= \frac{378}{9} = 42$$

Hence, the correct mean of observations is 42.

4. (i) False (ii) False (iii) True (iv) False

5. Score of a test = 5, 6, 6, 6, 4, 7, 7, 7, 7, 8, 9

Here, 6 and 7 both occur 3 times.

Hence, both are the mode of the data.

6. $\because$ $$\text{Mean} = \frac{\text{Sum of observations}}{\text{Number of observations}}$$

$\therefore$ $$8 = \frac{6+7+11+8+X+3+8+14}{8}$$

$$8 \times 8 = 57 + X$$

$$64 - 57 = X$$

$$X = 7$$

Hence, the value of X is 7.

7. Let, the sum of a observation is x.

Thus, $$\text{Mean} = \frac{\text{Sum of observation}}{\text{Number of observation}}$$

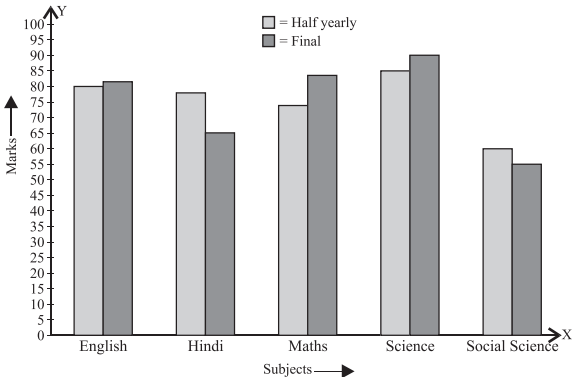
$$51 = \frac{x + 10\text{th observation}}{10}$$

$$51 = \frac{x+72}{10}$$
$$51 \times 10 = x + 72$$
$$510 = x + 72$$
$$x = 510 - 72$$
$$x = 438$$

So, $$\text{Correct mean} = \frac{x + 10\text{th observation}}{10} \text{ (correct)}$$
$$= \frac{438 + 62}{10}$$
$$= \frac{500}{10} = 50.$$

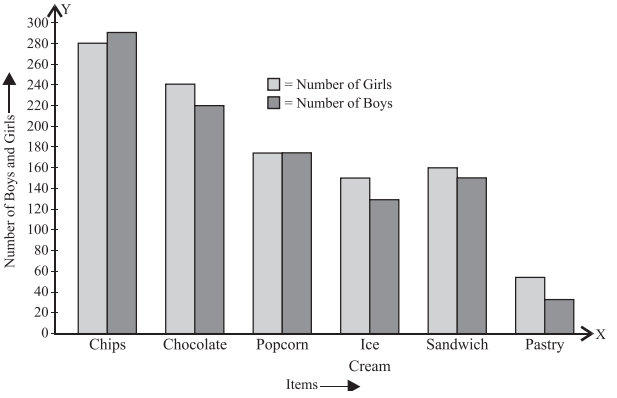
Exercise 16.3

1.



(i) In Science, the improvlement of marks is maximum.
(ii) In Social Studies, the performance has gone down.

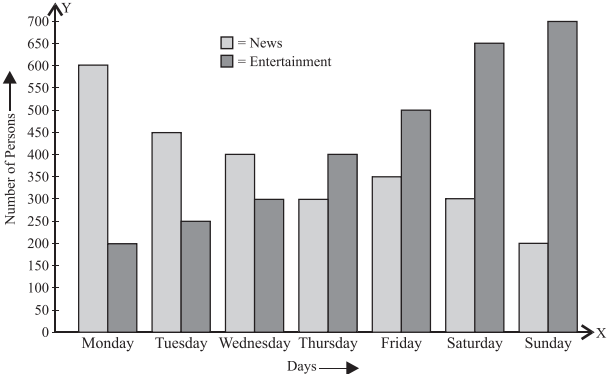
2.



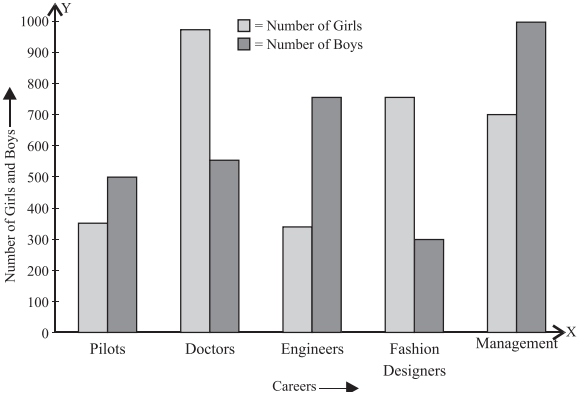
(i) This bar graph showing favourite shocks of girls and Boys.
(ii) Pastry was least preferred by the Boys.

(iii) Popcorn was preferred equally both Boys and Girls.

3.



4.



Exercise 16.4

A.

1. (iv) All of the above.

2. (i) Getting head on tossing a cin.

3. (iii) You are older today than yesterday.

4. (iv) None of the above.

5. (iii) $\frac{5}{10} = \frac{1}{2}$.

6. (ii) $\frac{5}{26}$.

B. (i) Impossible (ii) Impossible

(iii) Can happen but not certain (iv) Impossible

(v) Can happen but nto certain (vi) Can happen but not certain

Multiple Choice Questions

1. (i) **2.** (iii) **3.** (ii) **4.** (i) **5.** (ii) **6.** (ii) **7.** (i) **8.** (iii)

Mental Exercise

1. observation
2. frequency distribution
3. frequency
4. Arithmetic mean
5. Number of all observations
6. Median
7. Made or Modal value
8. impossible event