

RAPID

# MATHS

Part

# 7

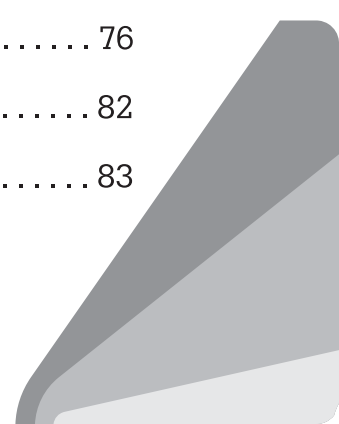
Teacher's Help Book (6-8)





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# SOLUTIONS

1

## Integers

### EXERCISE 1.1

- Given in answer sheet.
- Height of the plane above sea-level = 5000 m  
Depth of the submarine = 800 m  
So, total vertical distance between them  
=  $(5000 + 800) \text{ m} = 5800 \text{ m}$
- Temperature on Wednesday =  $-10^\circ\text{C} - 3^\circ\text{C} + 5^\circ\text{C}$   
=  $-8^\circ\text{C}$
- (a) 72 and -64  $\Rightarrow 72 + (-64) = 72 - 64 = 8$   
(b) -13 and -41  $\Rightarrow -13 + (-41) = -13 - 41 = -54$   
(c) -68 and 76  $\Rightarrow -68 + 76 = 8$   
(d) -81 and 103  $\Rightarrow -81 + 103 = 22$   
(e) 92 and -42  $\Rightarrow 92 + (-42) = 92 - 42 = 50$   
(f) -416 and -216  
 $\Rightarrow -416 + (-216) = -416 - 216 = -632$   
(g) -176 and 418  $\Rightarrow -176 + 418 = 242$   
(h) -56 and -93  
 $\Rightarrow -56 + (-93) = -56 - 93 = -149$
- (a) 16 from 23  $\Rightarrow 23 - 16 = 7$   
(b) 78 from 0  $\Rightarrow 0 - 78 = -78$   
(c) -96 from 42  $\Rightarrow 42 - (-96) = 42 + 96 = 138$   
(d) -68 from -42  $\Rightarrow (-42) - (-68) = -42 + 68 = 26$   
(e) 176 from -32  $\Rightarrow -32 + 176 = 144$   
(f) -412 from -516  
 $\Rightarrow (-516) - (-412) = -516 + 412 = -104$   
(g) -46 from -46  $\Rightarrow (-46) - (-46) = -46 + 46 = 0$   
(h) -68 from 302  $\Rightarrow 302 - (-68) = 302 + 68 = 370$
- Given in answer sheet.
- Sum of two integers = -68  
One integer = -62  
Other integer =  $-68 - (-62) = -68 + 62 = -6$
- Sum of two integers = 169  
One integer = -48  
Other integer =  $169 - (-48) = 169 + 48 = 217$
- Required number =  $(102 - 32) - (64 - 78)$   
=  $78 - (-14)$   
=  $78 + 14 = 92$
- Required number =  $102 - (-48 - 58)$   
=  $102 - (-106)$   
=  $102 + 106 = 208$
- Given in answer sheet.

### EXERCISE 1.2

- Given in answer sheet.
- Given in answer sheet.
- Given in answer sheet.
- (a)  $15 \times (-25 - 15) = 15 \times (-40) = -600$   
(b)  $15 \times (-4 - 6) = 15 \times (-10) = -150$   
(c)  $625 \times (-35 - 65) = 625 \times -100 = -62500$   
(d)  $18 \times (20 - 10) = 18 \times 10 = 180$   
(e)  $20 \times (-16 + 6) = 20 \times -10 = -200$   
(f)  $56 \times (-19 - 1) = 56 \times -20 = -1120$
- Initial room temperature =  $45^\circ\text{C}$   
Rate of decreasing temperature =  $6^\circ\text{C}$  per hour  
So, decrease in 9 hours =  $(9 \times 6)^\circ\text{C} = 54^\circ\text{C}$   
Hence, temperature after 9 hours =  $45^\circ\text{C} - 54^\circ\text{C}$   
=  $-9^\circ\text{C}$
- (a) Marks given for 4 correct answers =  $4 \times 4 = 16$   
Marks cancelled for 12 wrong answers  
=  $12 \times -2 = -24$   
So, total score of Manpreet =  $16 - 24 = -8$   
(b) Marks given for  $(14 - 2 = 12)$  correct answers  
=  $12 \times 4 = 48$   
Marks cancelled for 2 wrong answers  
=  $2 \times -2 = -4$   
So, total score of Kartik =  $48 - 4 = 44$
- Total blankets = 12000  
Defective blankets = 4000  
Right blankets =  $12000 - 4000 = 8000$   
Profit on right blankets = ₹  $(8000 \times 100)$   
= ₹ 800000  
Loss on defective piece = ₹  $(4000 \times 180)$   
= ₹ 720000  
So, profit on all = ₹  $(800000 - 720000)$   
= ₹ 80000
- Given in answer sheet.

### EXERCISE 1.3

- Given in answer sheet.
- Given in answer sheet.
- (a)  $-31 \div [-30 + (-1)] = -31 \div [-31] = 1$   
(b)  $[(-18) + 18] \div [12 \div 6] = 0 \div 2 = 0$   
(c)  $[(-48) \div 4] \div 3 = [-12] \div 3 = -4$   
(d)  $[(-72) \div (-12)] \div [36 \div 18] = 6 \div 2 = 3$   
(e)  $[(-6) + 8] \div 2 = 2 \div 2 = 1$   
(f)  $[(-6 + 5)] \div [(-2) + 1] = (-1) \div (-1) = 1$

4. Marks for 10 correct answers =  $10 \times 3 = 30$   
 Marks for given wrong answers  
 = Total score – marks for correct answer  
 =  $20 - 30 = -10$

Marks given for wrong answers =  $-2$   
 So, total wrong answers =  $\frac{-10}{-2} = 5$

5. Vertical difference between distance  
 =  $20 + 250 = 270$  m  
 Rate of descending is 5 m/min  
 So, time taken =  $\frac{270}{5} = 54$  min

6. Profit on 10 new registers = ₹  $(10 \times 2) = ₹ 20$   
 He incurs a loss of ₹ 4  
 So, total loss = ₹  $(4 + 20) = ₹ 24$   
 $\therefore$  He sold old registers =  $\frac{24}{1.20} = 20$

7. Temperature at 10 a.m. was  $12^\circ\text{C}$   
 Required temperature =  $-15^\circ\text{C}$   
 Difference between temperature =  $-15^\circ\text{C} - 12^\circ\text{C}$   
 =  $-27^\circ\text{C}$   
 Decreasing rate =  $-3^\circ\text{C}$  per hour  
 So, required time =  $\frac{-27}{-3} = 9$   
 So, time would be 10 a.m. + 9 hours = 7 p.m.  
 Temperature at mid night  
*i.e.*, at 12 p.m. =  $12^\circ\text{C} - (14 \times 3)$   
 =  $12^\circ\text{C} - 42^\circ\text{C} = -30^\circ\text{C}$   
 or  $30^\circ\text{C}$  below zero.

**⇒ HOTS** .....

1. Marks scored = 94  
 So, minimum correct answers =  $94 \div 2 = 47$   
 Now,

**Case 1 :**  
 Correct answers = 47  
 Marks for correct answer = 2  
 Marks for 47 correct answers =  $47 \times 2 = 94$   
 Marks obtained for incorrect answer = 0  
 So, no incorrect answers and 3 unattempted answers.

**Case 2 :**  
 Correct answers = 48  
 Marks for 48 correct answers =  $48 \times 2 = 96$   
 Marks scored = 94  
 Marks obtained for incorrect answer =  $94 - (96)$   
 =  $-2$

Marks for one incorrect answer =  $-2$   
 Number of incorrect answers =  $(-2) \div (-2) = 1$   
 So, 48 correct answer, 1 unattempted answer, 1 incorrect answer.

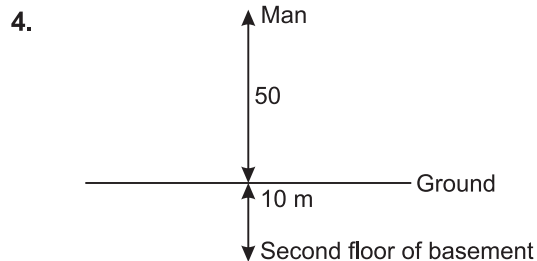
**Case 3 :**  
 Correct answer = 49  
 Marks for 49 correct answers =  $49 \times 2 = 98$   
 Marks scored = 94  
 Marks scored for incorrect answer =  $94 - (98)$   
 =  $-4$

Number of incorrect answers =  $(-4) \div (-2) = 2$   
 Thus, number of questions =  $49 + 2 = 51$ . Whereas total number of questions is 50. So, this case is not possible. So, possible ways are.  
 47 correct answers, 3 unattempted answers.  
 48 correct answers, 1 unattempted answer, 1 incorrect answer.

2. Firstly, we find the pair of integers whose product is  $-12$   
 (a) 1,  $-12$  (12 integers between 1 and  $-12$ )  
 (b) 2,  $-6$  (7 integers between 2 and  $-6$ )  
 (c) 3,  $-4$  (6 integers between 3 and  $-4$ )  
 (d) 12,  $-1$  (12 integers between 12 and  $-1$ )  
 (e)  $-2$ , 6 (7 integers between  $-2$  and 6)  
 (f)  $-3$ , 4 (6 integers between  $-3$  and 4)  
 Hence, (2,  $-6$ ) and ( $-2$ , 6) are two pair of integers with seven integers between them.

3. (i) We have,  
 $(-3) * (-5) = (-3) \times (-5) + [(-3) + (-3) \times (-5)]$   
 =  $3 \times 5 + [(3 \times 3) + (5 \times 5)]$   
 =  $15 + [9 + 25] = 15 + 34 = 49$

(ii) We have  
 $(-6) * 2 = (-6) \times 2 + [(-6) \times (-6) + 2 \times 2]$   
 =  $-(6 \times 2) + [(6 \times 6) + 4]$   
 =  $-12 + [36 + 4]$   
 =  $-12 + 40 = 28$



In the above figure, we can clearly see that man will have to cover 60 m to reach second floor of basement.

Since, lift moves with a speed of 1 m/s  
Hence, time taken to reach second floor of basement  

$$= \frac{\text{Distance}}{\text{Speed}} = \frac{60 \text{ m}}{1 \text{ m/s}} = 60 \text{ s} \quad \text{or} \quad 1 \text{ min}$$

**NCERT CORNER** .....

1. Since, withdrawal of amount from account is represented by a negative integer, so amount deposited is represented by a positive integer.

Amount deposited by Mohan in his bank account  
 $= +₹ 2000$

He withdraws the amount from his bank account  
 $= -₹ 1642$

Balance in Mohan's account after the withdrawal  
 $= ₹ 2000 - ₹ 1642 = ₹ 358$

2. (i)  $a = 21, b = 18$

L.H.S.  $= a - (-b) = 21 - (-18) = 21 + 18 = 39$

R.H.S.  $= a + b = 21 + 18 = 39$

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

$\therefore a - (-b) = a + b$  is verified.

(ii)  $a = 118, b = 125$

L.H.S.  $= a - (-b) = 118 - (-125)$   
 $= 118 + 125 = 243$

R.H.S.  $= a + b = 118 + 125 = 243$

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

$\therefore a - (-b) = a + b$  is verified.

(iii)  $a = 75, b = 84$

L.H.S.  $= a - (-b) = 75 - (-84) = 75 + 84 = 159$

R.H.S.  $= a + b = 75 + 84 = 159$

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

$\therefore a - (-b) = a + b$  is verified.

(iv)  $a = 28, b = 11$

L.H.S.  $= a - (-b) = 28 - (-11) = 28 + 11 = 39$

R.H.S.  $= a + b = 28 + 11 = 39$

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

$\therefore a - (-b) = a + b$  is verified.

3. Total score of team

$A = (-40) + 10 + 0 = (-40) + 10 = -30$

Total score of team

$B = 10 + 0 + (-40) = 10 + (-40) = -30$

Therefore, the score of both teams are equal. Yes, we can say that we can add integers in any order.

4.  $(-1) \times 5 = -5$

$(-1) \times 4 = -4$

$(-1) \times 3 = -3$

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

$(-1) \times 1 = -1$

$(-1) \times 0 = 0$

$(-1) \times (-1) = 1$

5. Room temperature before the process  $= 40^\circ\text{C}$

Change in temperature during the process  $= -5^\circ\text{C}$  per hour

So, change in temperature in 10 hours

$= 10 \times (-5^\circ\text{C}) = -50^\circ\text{C}$

$\therefore$  Room temperature after 10 hours

$= 40^\circ\text{C} + (-50^\circ\text{C}) = -10^\circ\text{C}$

6. Temperature at 12 noon  $= 10^\circ\text{C}$

Temperature decrease at the rate  $= 2^\circ\text{C}$  per hour

$\therefore$  Temperature at 1 p.m.  $= 10^\circ\text{C} - 2^\circ\text{C} = 8^\circ\text{C}$

Temperature at 2 p.m.  $= 8^\circ\text{C} - 2^\circ\text{C} = 6^\circ\text{C}$

Temperature at 3 p.m.  $= 6^\circ\text{C} - 2^\circ\text{C} = 4^\circ\text{C}$

Temperature at 4 p.m.  $= 4^\circ\text{C} - 2^\circ\text{C} = 2^\circ\text{C}$

Temperature at 5 p.m.  $= 2^\circ\text{C} - 2^\circ\text{C} = 0^\circ\text{C}$

Temperature at 6 p.m.  $= 0^\circ\text{C} - 2^\circ\text{C} = -2^\circ\text{C}$

Temperature at 7 p.m.  $= (-2^\circ\text{C}) - (2^\circ\text{C}) = -4^\circ\text{C}$

Temperature at 8 p.m.  $= (-4^\circ\text{C}) - (2^\circ\text{C}) = -6^\circ\text{C}$

Temperature at 9 p.m.  $= (-6^\circ\text{C}) - (2^\circ\text{C}) = -8^\circ\text{C}$

So, the temperature was  $8^\circ\text{C}$  below zero at 9 p.m.

Temperature at 10 p.m.  $= (-8^\circ\text{C}) - (2^\circ\text{C}) = -10^\circ\text{C}$

Temperature at 11 p.m.  $= (-10^\circ\text{C}) - (2^\circ\text{C})$

$= -12^\circ\text{C}$

Temperature at 12 p.m.  $= (-12^\circ\text{C}) - (2^\circ\text{C})$

$= -14^\circ\text{C}$

So, the temperature at mid-night would be  $14^\circ\text{C}$  below zero.

7. Present position of the elevator is at 10 m above the ground level.

The elevator will move to cover the distance below the ground level  $= 350 \text{ m}$

$\therefore$  Total distance covered by the elevator

$= 350 \text{ m} + 10 \text{ m} = 360 \text{ m}$

Rate to descent  $= 6 \text{ m/min}$

Time taken  $= \frac{\text{Total distance}}{\text{Rate of descent}} = \frac{360}{6} = 60 \text{ min}$

So, the elevator will take 60 minutes or 1 hour to reach  $-350 \text{ m}$ .

**2 Fractions and Decimals**

**EXERCISE 2.1** .....

1. (a)  $\frac{85 \div 5}{105 \div 5} = \frac{17}{21}$  (b)  $\frac{-48 \div 48}{144 \div 48} = \frac{-1}{3}$

(c)  $\frac{35 \div 5}{120 \div 5} = \frac{7}{24}$  (d)  $\frac{60 \div 12}{96 \div 12} = \frac{5}{8}$

$$(e) \frac{142 \div 2}{180 \div 2} = \frac{71}{90} \quad (f) \frac{75 \div 5}{220 \div 5} = \frac{15}{44}$$

$$(g) \frac{-45 \div 15}{150 \div 15} = \frac{-3}{10} \quad (h) \frac{65 \div 13}{117 \div 13} = \frac{5}{9}$$

$$2. (a) \frac{5}{8} \times \frac{4}{7}$$

$$5 \times 7 = 35 \text{ and } 8 \times 4 = 32$$

$$\text{So } \frac{5}{8} > \frac{4}{7} \text{ since } 35 > 32$$

$$(b) \frac{4}{9} \times \frac{6}{13}$$

$$4 \times 13 = 52 \quad \text{and} \quad 6 \times 9 = 54$$

$$\text{So } \frac{4}{9} < \frac{6}{13} \text{ since } 52 < 54$$

$$(c) -\frac{6}{13} \times \frac{-4}{13}$$

$$-6 \times 13 = -78 \text{ and } -4 \times 13 = -52$$

$$-\frac{6}{13} < \frac{-4}{13} \quad \text{since} \quad -78 < -52$$

$$(d) \frac{5}{16} \times \frac{3}{8}$$

$$5 \times 8 = 40 \text{ and } 3 \times 16 = 48$$

$$\frac{5}{16} < \frac{3}{8} \text{ since } 40 < 48$$

$$(e) \frac{-4}{19} \times \frac{-3}{17}$$

$$-4 \times 17 = -68 \text{ and } -3 \times 19 = -57$$

$$\frac{-4}{19} < \frac{-3}{17} \text{ since } -68 < -57$$

$$(f) \frac{11}{12} \times \frac{14}{16}$$

$$11 \times 16 = 176 \text{ and } 14 \times 12 = 168$$

$$\frac{11}{12} > \frac{14}{16} \text{ since } 176 > 168$$

$$3. (a) \frac{2}{3}, \frac{5}{6}, \frac{7}{18}, \frac{1}{24}$$

$$\text{LCM of } 3, 6, 18 \text{ and } 24 = 3 \times 2 \times 3 \times 4 = 72$$

3	3, 6, 18, 24
2	1, 2, 6, 8
3	1, 1, 3, 4
4	1, 1, 1, 4
	1, 1, 1, 1

$$\text{Now, } \frac{2}{3} = \frac{2 \times 24}{3 \times 24} = \frac{48}{72}$$

$$\frac{5}{6} = \frac{5 \times 12}{6 \times 12} = \frac{60}{72}$$

$$\frac{7}{18} = \frac{7 \times 4}{18 \times 4} = \frac{28}{72}$$

$$\frac{1}{24} = \frac{1 \times 3}{24 \times 3} = \frac{3}{72}$$

So, ascending order

$$\frac{3}{72}, \frac{28}{72}, \frac{48}{72}, \frac{60}{72}$$

$$\text{i.e., } \frac{1}{24}, \frac{7}{18}, \frac{2}{3} \text{ and } \frac{5}{6}$$

$$(b) \frac{3}{4}, \frac{7}{8}, \frac{17}{32}, \frac{7}{16}$$

$$\text{LCM of } 4, 8, 32 \text{ and } 16 = 4 \times 2 \times 2 \times 2 = 32$$

4	4, 8, 32, 16
2	1, 2, 8, 4
2	1, 1, 4, 2
2	1, 1, 2, 1
	1, 1, 1, 1

Now,

$$\frac{3}{4} = \frac{3 \times 8}{4 \times 8} = \frac{24}{32}$$

$$\frac{7}{8} = \frac{7 \times 4}{8 \times 4} = \frac{28}{32}$$

$$\frac{17}{32} = \frac{17 \times 1}{32 \times 1} = \frac{17}{32}$$

$$\frac{7}{16} = \frac{7 \times 2}{16 \times 2} = \frac{14}{32}$$

So, ascending order

$$\frac{14}{32}, \frac{17}{32}, \frac{24}{32} \text{ and } \frac{28}{32}$$

$$\text{i.e., } \frac{7}{16}, \frac{17}{32}, \frac{3}{4} \text{ and } \frac{7}{8}$$

$$(c) \frac{3}{5}, \frac{3}{10}, \frac{9}{14}, \frac{14}{35}$$

$$\text{LCM of } 5, 10, 14 \text{ and } 35 = 5 \times 2 \times 7 = 70$$

5	5, 10, 14, 35
2	1, 2, 14, 7
7	1, 1, 7, 7
	1, 1, 1, 1

Now,

$$\frac{3}{5} = \frac{3 \times 14}{5 \times 14} = \frac{42}{70}$$

$$\frac{3}{10} = \frac{3 \times 7}{10 \times 7} = \frac{21}{70}$$

$$\frac{9}{14} = \frac{9 \times 5}{14 \times 5} = \frac{45}{70}$$

$$\frac{14}{35} = \frac{14 \times 2}{35 \times 2} = \frac{28}{70}$$

So, ascending order

$$\frac{21}{70}, \frac{28}{70}, \frac{42}{70}, \frac{45}{70}$$

*i.e.*,  $\frac{3}{10}, \frac{14}{35}, \frac{3}{5}$  and  $\frac{9}{14}$

(d)  $\frac{7}{18}, \frac{5}{12}, \frac{19}{21}, \frac{25}{36}$

LCM of 18, 12, 21

and  $36 = 2 \times 3 \times 3 \times 2 \times 7 = 252$

2	18, 12, 21, 36
3	9, 6, 21, 18
3	3, 2, 7, 6
2	1, 2, 7, 2
7	1, 1, 7, 1
	1, 1, 1, 1

Now,  $\frac{7}{18} = \frac{7 \times 14}{18 \times 14} = \frac{98}{252}$

$$\frac{5}{12} = \frac{5 \times 21}{12 \times 21} = \frac{105}{252}$$

$$\frac{19}{21} = \frac{19 \times 12}{21 \times 12} = \frac{228}{252}$$

$$\frac{25}{36} = \frac{25 \times 7}{36 \times 7} = \frac{175}{252}$$

So, ascending order

$$\frac{98}{252}, \frac{105}{252}, \frac{175}{252}, \frac{228}{252}$$

*i.e.*,  $\frac{7}{18}, \frac{5}{12}, \frac{25}{36}, \frac{19}{21}$

4. (a)  $\frac{11}{12}, \frac{5}{9}, \frac{3}{4}, \frac{1}{6}$

LCM of 12, 9, 4 and 6 =  $2 \times 2 \times 3 \times 3 = 36$

2	12, 9, 4, 6
2	6, 9, 2, 3
3	3, 9, 1, 3
3	1, 3, 1, 1
	1, 1, 1, 1

Now,  $\frac{11}{12} = \frac{11 \times 3}{12 \times 3} = \frac{33}{36}$

$$\frac{5}{9} = \frac{5 \times 4}{9 \times 4} = \frac{20}{36}$$

$$\frac{3}{4} = \frac{3 \times 9}{4 \times 9} = \frac{27}{36}$$

$$\frac{1}{6} = \frac{1 \times 6}{6 \times 6} = \frac{6}{36}$$

So, descending order

$$\frac{33}{36}, \frac{27}{36}, \frac{20}{36}, \frac{6}{36}$$

*i.e.*,  $\frac{11}{12}, \frac{3}{4}, \frac{5}{9}, \frac{1}{6}$

(b)  $\frac{3}{25}, \frac{1}{5}, \frac{7}{20}, \frac{4}{15}$

LCM of 25, 5, 20 and 15 =  $5 \times 5 \times 4 \times 3 = 300$

5	25, 5, 20, 15
5	5, 1, 4, 3
4	1, 1, 4, 3
3	1, 1, 1, 3
	1, 1, 1, 1

Now,  $\frac{3}{25} = \frac{3 \times 12}{25 \times 12} = \frac{36}{300}$

$$\frac{1}{5} = \frac{1 \times 60}{5 \times 60} = \frac{60}{300}$$

$$\frac{7}{20} = \frac{7 \times 15}{20 \times 15} = \frac{105}{300}$$

$$\frac{4}{15} = \frac{4 \times 20}{15 \times 20} = \frac{80}{300}$$

So, descending order

$$\frac{105}{300}, \frac{80}{300}, \frac{60}{300}, \frac{36}{300}$$

*i.e.*,  $\frac{7}{20}, \frac{4}{15}, \frac{1}{5}$  and  $\frac{3}{25}$

(c)  $\frac{7}{18}, \frac{5}{12}, \frac{6}{24}, \frac{3}{10}$

LCM of 18, 12, 24 and 10 =  $2 \times 2 \times 3 \times 3 \times 2 \times 5 = 360$

2	18, 12, 24, 10
2	9, 6, 12, 5
3	9, 3, 6, 5
3	3, 1, 2, 5
2	1, 1, 2, 5
5	1, 1, 1, 5
	1, 1, 1, 1

Now,  $\frac{7}{18} = \frac{7 \times 20}{18 \times 20} = \frac{140}{360}$

$$\frac{5}{12} = \frac{5 \times 30}{12 \times 30} = \frac{150}{360}$$

$$\frac{6}{24} = \frac{6 \times 15}{24 \times 15} = \frac{90}{360}$$

$$\frac{3}{10} = \frac{3 \times 36}{10 \times 36} = \frac{108}{360}$$

So, descending order

$$\frac{150}{360}, \frac{140}{360}, \frac{108}{360} \text{ and } \frac{90}{360}$$

*i.e.*,  $\frac{5}{12}, \frac{7}{18}, \frac{3}{10} \text{ and } \frac{6}{24}$

(d)  $\frac{5}{14}, \frac{3}{7}, \frac{13}{28}, \frac{10}{35}$

LCM of 14, 7, 28 and 35 =  $7 \times 2 \times 2 \times 5 = 140$

7	14, 7, 28, 35
2	2, 1, 4, 5
2	1, 1, 2, 5
5	1, 1, 1, 5
	1, 1, 1, 1

Now,  $\frac{5}{14} = \frac{5 \times 10}{14 \times 10} = \frac{50}{140}$

$$\frac{3}{7} = \frac{3 \times 20}{7 \times 20} = \frac{60}{140}$$

$$\frac{13}{28} = \frac{13 \times 5}{28 \times 5} = \frac{65}{140}$$

$$\frac{10}{35} = \frac{10 \times 4}{35 \times 4} = \frac{40}{140}$$

So, descending order

$$\frac{65}{140}, \frac{60}{140}, \frac{50}{140} \text{ and } \frac{40}{140}$$

*i.e.*,  $\frac{13}{28}, \frac{3}{7}, \frac{5}{14} \text{ and } \frac{10}{35}$

5. (a)  $3\frac{1}{4} - 2\frac{2}{5} + 1\frac{1}{10} = (3 - 2 + 1) + \left(\frac{1}{4} - \frac{2}{5} + \frac{1}{10}\right)$   
 $= 2 + \left(\frac{5 - 8 + 2}{20}\right) = 2 - \frac{1}{20} = 1\frac{19}{20}$

(b)  $7\frac{5}{6} - 4\frac{3}{8} + 1\frac{5}{12} = (7 - 4 + 1) + \left(\frac{5}{6} - \frac{3}{8} + \frac{5}{12}\right)$   
 $= 4 + \left(\frac{5 \times 4 - 3 \times 3 + 5 \times 2}{24}\right)$   
 $= 4 + \left(\frac{20 - 9 + 10}{24}\right)$   
 $= 4 + \frac{21}{24} = 4 + \frac{7}{8} = 4\frac{7}{8}$

(c)  $4\frac{1}{3} + 2\frac{5}{12} - 5\frac{1}{6} = (4 + 2 - 5) + \left(\frac{1}{3} + \frac{5}{12} - \frac{1}{6}\right)$   
 $= 1 + \left(\frac{4 + 5 - 2}{12}\right)$   
 $= 1 + \frac{7}{12} = 1\frac{7}{12}$

(d)  $5 - 3\frac{1}{7} + 2\frac{3}{14} = (5 - 3 + 2) + \left(\frac{-1}{7} + \frac{3}{14}\right)$   
 $= 4 + \left(\frac{-2 + 3}{14}\right)$   
 $= 4 + \frac{1}{14} = 4\frac{1}{14}$

(e)  $3\frac{1}{5} + 2\frac{1}{10} - 1\frac{1}{2} - \frac{1}{4}$   
 $= (3 + 2 - 1) + \left(\frac{1}{5} + \frac{1}{10} - \frac{1}{2} - \frac{1}{4}\right)$   
 $= 4 + \left(\frac{4 + 2 - 10 - 5}{20}\right) = 4 + \left(\frac{-9}{20}\right)$   
 $= 3 + \left(1 - \frac{9}{20}\right) = 3 + \frac{11}{20} = 3\frac{11}{20}$

(f)  $6\frac{1}{10} - 3\frac{2}{5} - 2\frac{1}{6} + 3$   
 $= (6 - 3 - 2 + 3) + \left(\frac{1}{10} - \frac{2}{5} - \frac{1}{6}\right)$   
 $= 4 + \left(\frac{3 - 12 - 5}{30}\right) = 4 - \frac{14}{30}$   
 $= 3 + \left(1 - \frac{14}{30}\right) = 3 + \frac{16}{30} = 3\frac{8}{15}$

6. Required number =  $7\frac{2}{5} - 5\frac{1}{4}$   
 $= \frac{37}{5} - \frac{21}{4} = \frac{35 \times 4 - 21 \times 5}{20}$   
 $= \frac{148 - 105}{20} = \frac{43}{20} = 2\frac{3}{20}$

7. Required number =  $10\frac{1}{14} - 9\frac{2}{7}$   
 $= \frac{141}{14} - \frac{65}{7} = \frac{141 - 65 \times 2}{14}$   
 $= \frac{141 - 130}{14} = \frac{11}{14}$

8. Required number =  $5\frac{2}{3} - 2\frac{1}{5}$   
 $= \frac{17}{3} - \frac{11}{5} = \frac{17 \times 5 - 11 \times 3}{15}$   
 $= \frac{85 - 33}{15} = \frac{52}{15} = 3\frac{7}{15}$

9. English book is costlier by =  $35\frac{1}{5} - 32\frac{4}{5}$   
 $= \frac{176}{5} - \frac{164}{5}$   
 $= \frac{12}{5} = ₹2\frac{2}{5}$



$$\begin{aligned}
 \text{10. Time for other subjects} &= 5\frac{2}{3} - 2\frac{4}{5} \text{ hrs} \\
 &= \frac{17}{3} - \frac{14}{5} = \frac{17 \times 5 - 14 \times 3}{15} \\
 &= \frac{85 - 42}{15} = \frac{43}{15} = 2\frac{13}{15} \text{ hrs}
 \end{aligned}$$

$$\begin{aligned}
 \text{11. Remaining length} &= 7 - 4\frac{3}{5} \\
 &= 7 - \frac{23}{5} = \frac{35 - 23}{5} = \frac{12}{5} = 2\frac{2}{5} \text{ m}
 \end{aligned}$$

$$\text{12. Shama is longer by} = 1\frac{3}{5} - 1\frac{2}{5} = \frac{1}{5} \text{ m}$$

$$\text{13. Dinu ate} = 1 - \frac{3}{5} = \frac{5 - 3}{5} = \frac{2}{5}$$

$$\text{Renu ate more by} = \frac{3}{5} - \frac{2}{5} = \frac{1}{5} \text{ part}$$

$$\begin{aligned}
 \text{14. Required trimming} &= 8\frac{3}{6} - 8\frac{3}{10} = (8 - 8) + \left(\frac{3}{6} - \frac{3}{10}\right) \\
 &= 0 + \left(\frac{1}{2} - \frac{3}{10}\right) \\
 &= \frac{5 - 3}{10} = \frac{2}{10} = \frac{1}{5} \text{ cm}
 \end{aligned}$$

### EXERCISE 2.2

$$\text{1. (a) } 2\frac{4}{15} \times 20 = \frac{34}{15} \times 20 = \frac{136}{3} = 45\frac{1}{3}$$

$$\text{(b) } 5\frac{5}{6} \times 1\frac{5}{7} = \frac{35}{6} \times \frac{12}{7} = 10$$

$$\text{(c) } 9\frac{1}{2} \times 1\frac{9}{19} = \frac{19}{2} \times \frac{28}{19} = 14$$

$$\text{(d) } 2\frac{1}{8} \times 1\frac{13}{51} = \frac{17}{8} \times \frac{64}{51} = \frac{8}{3} = 2\frac{2}{3}$$

$$\text{(e) } 5\frac{3}{5} \times 42\frac{1}{2} = \frac{28}{5} \times \frac{85}{2} = 238$$

$$\text{(f) } 4\frac{2}{3} \times 3\frac{6}{7} = \frac{14}{3} \times \frac{27}{7} = 18$$

$$\text{(g) } 5\frac{1}{16} \times \frac{4}{9} = \frac{81}{16} \times \frac{4}{9} = \frac{9}{4} = 2\frac{1}{4}$$

$$\text{(h) } 18\frac{3}{5} \times 41\frac{2}{3} = \frac{93}{5} \times \frac{125}{3} = 775$$

$$\text{2. (a) } \frac{3}{8} \text{ of } 40 = \frac{3}{8} \times 40 = 15$$

$$\text{(b) } \frac{3}{25} \text{ of } 150 = \frac{3}{25} \times 150 = 18$$

$$\text{(c) } \frac{7}{15} \text{ of } 120 = \frac{7}{15} \times 120 = 56$$

$$\text{(d) } \frac{5}{14} \text{ of } 84 = \frac{5}{14} \times 84 = 30$$

$$\text{(e) } \frac{6}{17} \text{ of } 85 = \frac{6}{17} \times 85 = 30$$

$$\text{(f) } \frac{7}{11} \text{ of } 220 = \frac{7}{11} \times 220 = 140$$

$$\text{(g) } \frac{17}{19} \text{ of } 95 = \frac{17}{19} \times 95 = 85$$

$$\text{(h) } \frac{3}{8} \text{ of } 240 = \frac{3}{8} \times 240 = 90$$

$$\text{3. (a) } \frac{9}{18} \text{ of } ₹ 90 = ₹ \frac{9}{18} \times 90 = ₹ 45$$

$$\text{(b) } \frac{4}{7} \text{ of a week} = \left(\frac{4}{7} \times 7\right) \text{ days} = 4 \text{ days}$$

$$\text{(c) } \frac{3}{10} \text{ of a litre} = \left(\frac{3}{10} \times 1000\right) \text{ ml} = 300 \text{ ml}$$

$$\text{(d) } \frac{5}{8} \text{ of } 40 \text{ m} = \left(\frac{5}{8} \times 40\right) \text{ m} = 25 \text{ m}$$

$$\text{(e) } \frac{3}{15} \text{ of } ₹ 120 = ₹ \left(\frac{3}{15} \times 120\right) = ₹ 24$$

$$\text{(f) } \frac{9}{18} \text{ of } 108 \text{ kg} = \left(\frac{9}{18} \times 108\right) \text{ kg} = 54 \text{ kg}$$

$$\begin{aligned}
 \text{(g) } \frac{14}{24} \text{ of } 3 \text{ hours} &= \frac{14}{24} \times 3 = \frac{7}{4} \text{ hour} \\
 &= \frac{7}{4} \times 60 = 105 \text{ minutes}
 \end{aligned}$$

$$\text{(h) } \frac{5}{12} \text{ of a year} = \frac{5}{12} \times 12 = 5 \text{ months}$$

$$\text{4. (a) } \frac{22}{25} \times \frac{10}{27} \times \frac{36}{55} = \frac{16}{75}$$

$$\text{(b) } \frac{46}{65} \times \frac{10}{23} \times \frac{26}{45} = \frac{8}{45}$$

$$\text{(c) } \frac{12}{25} \times \frac{15}{28} \times \frac{35}{36} = \frac{1}{4}$$

$$\text{(d) } 2\frac{2}{17} \times 1\frac{33}{52} \times 7\frac{2}{9} = \frac{36}{17} \times \frac{85}{52} \times \frac{65}{9} = 25$$

$$\text{(e) } 1\frac{2}{3} \times 2\frac{2}{5} \times 4\frac{3}{5} = \frac{5}{3} \times \frac{12}{5} \times \frac{23}{5} = \frac{92}{5} = 18\frac{2}{5}$$

$$\text{(f) } 1\frac{4}{7} \times 1\frac{1}{15} \times 1\frac{13}{22} = \frac{11}{7} \times \frac{16}{15} \times \frac{35}{22} = \frac{8}{3} = 2\frac{2}{3}$$

$$\text{(g) } 3\frac{1}{16} \times 7\frac{3}{7} \times 1\frac{25}{39} = \frac{49}{16} \times \frac{52}{7} \times \frac{64}{39} = \frac{112}{3} = 37\frac{1}{3}$$

$$\text{(h) } 4\frac{1}{16} \times 3\frac{5}{13} \times 1\frac{1}{5} = \frac{65}{16} \times \frac{44}{13} \times \frac{6}{5} = \frac{33}{2} = 16\frac{1}{2}$$

5. S.P. of 1 kg orange = ₹  $20\frac{2}{5}$   
 S.P. of  $1\frac{2}{3}$  kg orange = ₹  $\left(20\frac{2}{5} \times 1\frac{2}{3}\right)$   
 = ₹  $\left(\frac{102}{5} \times \frac{5}{3}\right)$  = ₹ 34
6. Cost of 8 l milk = ₹  $\left(24\frac{1}{2} \times 8\right)$  = ₹  $\left(\frac{49}{2} \times 8\right)$  = ₹ 196
7. Bus will go in  $2\frac{3}{4}$  l =  $\left(8 \times 2\frac{3}{4}\right)$  km  
 =  $\left(8 \times \frac{11}{4}\right)$  km = 22 km
8. Fare of  $4\frac{1}{2}$  tickets = ₹  $\left(160 \times 4\frac{1}{2}\right)$   
 = ₹  $\left(160 \times \frac{9}{2}\right)$  = ₹ 720
9. Distance covered in  $3\frac{1}{3}$  hours =  $\left(2\frac{2}{5} \times 3\frac{1}{3}\right)$  km  
 =  $\left(\frac{12}{5} \times \frac{10}{3}\right)$  = 8 km
10. Spend on education =  $\frac{1}{5} \times 30000$  = ₹ 6000  
 So, savings = ₹  $(30000 - 6000)$  = ₹ 24000
11. She read =  $\frac{3}{4}$  of 340 =  $\frac{3}{4} \times 340 = 3 \times 85 = 255$
12. Total hours required to read book  
 =  $2\frac{3}{4} \times 16 = \frac{11}{4} \times 16 = 44$  hours

⇒ **EXERCISE 2.3** .....

1. (a)  $\frac{5}{8} \div \frac{15}{16} = \frac{5}{8} \times \frac{16}{15} = \frac{2}{3}$   
 (b)  $\frac{5}{7} \div 20 = \frac{5}{7} \times \frac{1}{20} = \frac{1}{28}$   
 (c)  $48 \div 3\frac{3}{5} = 48 \div \frac{18}{5} = 48 \times \frac{5}{18} = \frac{40}{3} = 13\frac{1}{3}$   
 (d)  $\frac{7}{15} \div \frac{21}{25} = \frac{7}{15} \times \frac{25}{21} = \frac{5}{9}$   
 (e)  $\frac{11}{24} \div \frac{7}{8} = \frac{11}{24} \times \frac{8}{7} = \frac{11}{21}$   
 (f)  $9\frac{4}{5} \div 42 = \frac{49}{5} \times \frac{1}{42} = \frac{7}{30}$   
 (g)  $6\frac{2}{9} \div 4\frac{2}{3} = \frac{56}{9} \div \frac{14}{3} = \frac{56}{9} \times \frac{3}{14} = \frac{4}{3} = 1\frac{1}{3}$   
 (h)  $20\frac{1}{4} \div \frac{3}{4} = \frac{81}{4} \div \frac{3}{4} = \frac{81}{4} \times \frac{4}{3} = 27$

2. (a)  $\frac{5}{6} \div \frac{25}{32} = \frac{5}{6} \times \frac{32}{25} = \frac{16}{15} = 1\frac{1}{15}$   
 (b)  $\frac{6}{17} \div \frac{16}{51} = \frac{6}{17} \times \frac{51}{16} = \frac{9}{8} = 1\frac{1}{8}$   
 (c)  $3\frac{3}{7} \div \frac{8}{21} = \frac{24}{7} \times \frac{21}{8} = 9$   
 (d)  $20\frac{2}{3} \div 7\frac{3}{4} = \frac{62}{3} \div \frac{31}{4} = \frac{62}{3} \times \frac{4}{31} = \frac{8}{3} = 2\frac{2}{3}$   
 (e)  $69\frac{3}{4} \div 7\frac{3}{4} = \frac{279}{4} \div \frac{31}{4} = \frac{279}{4} \times \frac{4}{31} = 9$   
 (f)  $45 \div 1\frac{4}{5} = 45 \div \frac{9}{5} = 45 \times \frac{5}{9} = 25$   
 (g)  $72 \div 2\frac{1}{4} = 72 \div \frac{9}{4} = 72 \times \frac{4}{9} = 32$   
 (h)  $9\frac{2}{7} \div 13 = \frac{65}{7} \times \frac{1}{13} = \frac{5}{7}$
3. Product of two numbers = 63  
 One number =  $2\frac{1}{4}$   
 Other number =  $63 \div 2\frac{1}{4} = 63 \div \frac{9}{4} = 63 \times \frac{4}{9} = 28$
4. Product of two numbers = 12  
 One number =  $4\frac{1}{8}$   
 Other number =  $12 \div 4\frac{1}{8}$   
 =  $12 \div \frac{33}{8} = 12 \times \frac{8}{33} = \frac{32}{11} = 2\frac{10}{11}$
5. Required number =  $18 \div 3\frac{6}{7} = 18 \times \frac{7}{36} = \frac{7}{2} = 3\frac{1}{2}$
6. Required number =  $4\frac{2}{9} \div \frac{19}{27} = \frac{38}{9} \times \frac{27}{19} = 6$
7. Oranges sold = ₹ 840 ÷ ₹  $3\frac{3}{4}$   
 =  $840 \div \frac{15}{4} = 840 \times \frac{4}{15} = 224$
8. Cost of one pen = ₹  $15\frac{3}{4} \div 12 = \frac{63}{4} \times \frac{1}{12} = \frac{21}{16} = ₹ 1\frac{5}{16}$
9. Quantity of mangoes =  $255 \div 25\frac{1}{2}$   
 =  $255 \div \frac{51}{2} = 255 \times \frac{2}{51} = 10$  kg
10. Length of each piece =  $10\frac{2}{5} \div 13$   
 =  $\frac{52}{5} \times \frac{1}{13} = \frac{4}{5}$  m

11. Length of each piece =  $17\frac{1}{2} \div 7$   
 $= \frac{35}{2} \times \frac{1}{7} = \frac{5}{2} = 2\frac{1}{2}$  m

12. Distance cover in one hour =  $50\frac{1}{4} \div 5\frac{1}{2}$   
 $= \frac{201}{4} \div \frac{11}{2}$   
 $= \frac{201}{2} \times \frac{2}{11}$   
 $= \frac{201}{11} = 18\frac{3}{11}$  km

(d)	$\begin{array}{r} 10.0670 \\ +8.3054 \\ \hline 18.3724 \end{array}$	$\begin{array}{r} 3.783 \\ +9.618 \\ \hline 13.401 \end{array}$	$\begin{array}{r} 18.3724 \\ -13.4010 \\ \hline 4.9714 \end{array}$
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(e)	$\begin{array}{r} 63.70 \\ +78.96 \\ \hline 142.66 \end{array}$	$\begin{array}{r} 23.48 \\ +92.78 \\ \hline 116.26 \end{array}$	$\begin{array}{r} 142.66 \\ -116.26 \\ \hline 26.40 \end{array}$
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(f)	$\begin{array}{r} 50.600 \\ +14.912 \\ \hline 65.512 \end{array}$	$\begin{array}{r} 15.620 \\ +28.912 \\ \hline 44.532 \end{array}$	$\begin{array}{r} 65.512 \\ -44.532 \\ \hline 20.980 \end{array}$
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4. Total money paid = ₹ 125.50 + ₹ 12.35  
= ₹ 137.85

5. Total money spend = ₹ 65.90 + ₹ (48.80) = ₹ 114.70  
Given money = ₹ 200

So, she got = ₹ (200 - 114.70) = ₹ 85.30

6. She needs more money = ₹ 426.78 - ₹ 400  
= ₹ 26.78

➤ EXERCISE 2.4

1. (a)	$\begin{array}{r} 3.7120 \\ 5.1200 \\ 8.1900 \\ 15.1700 \\ +13.9128 \\ \hline 46.1048 \end{array}$	(b)	$\begin{array}{r} 23.080 \\ 8.960 \\ 7.168 \\ 4.321 \\ 2.600 \\ +14.000 \\ \hline 60.129 \end{array}$
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(c)	$\begin{array}{r} 91.6780 \\ 4.1230 \\ 9.8130 \\ 3.1968 \\ +13.4100 \\ \hline 122.2208 \end{array}$	(d)	$\begin{array}{r} 0.0060 \\ 0.6000 \\ 6.6660 \\ 0.0006 \\ +6.0000 \\ \hline 13.2726 \end{array}$
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2. (a)	$\begin{array}{r} 42.90 \\ -39.41 \\ \hline 3.49 \end{array}$	(b)	$\begin{array}{r} 20.000 \\ -19.678 \\ \hline 0.322 \end{array}$
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(c)	$\begin{array}{r} 18.100 \\ -15.176 \\ \hline 2.924 \end{array}$	(d)	$\begin{array}{r} 40.123 \\ -36.740 \\ \hline 3.383 \end{array}$
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(e)	$\begin{array}{r} 10.000 \\ -2.374 \\ \hline 7.626 \end{array}$	(f)	$\begin{array}{r} 200.00 \\ -192.68 \\ \hline 07.32 \end{array}$
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3. (a)	$\begin{array}{r} 17.628 \\ + 4.186 \\ \hline 21.814 \end{array}$	$\begin{array}{r} 9.168 \\ + 2.912 \\ \hline 12.080 \end{array}$	$\begin{array}{r} 21.814 \\ -12.080 \\ \hline 9.734 \end{array}$
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(b)	$\begin{array}{r} 50.060 \\ 13.912 \\ + 9.160 \\ \hline 73.132 \end{array}$	$\begin{array}{r} 73.132 \\ -60.006 \\ \hline 13.126 \end{array}$
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(c)	$\begin{array}{r} 15.178 \\ +30.000 \\ \hline 45.178 \end{array}$	$\begin{array}{r} 14.6382 \\ +19.4160 \\ \hline 34.0542 \end{array}$	$\begin{array}{r} 45.1780 \\ -34.0542 \\ \hline 11.1238 \end{array}$
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➤ EXERCISE 2.5

- Given in answersheet.
- Given in answersheet.

3. (a)	$\begin{array}{r} 6.082 \\ \times 23 \\ \hline 18246 \\ +121640 \\ \hline 139.886 \end{array}$	(b)	$\begin{array}{r} 3.617 \\ \times 18 \\ \hline 28936 \\ +36170 \\ \hline 65.106 \end{array}$
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(c)	$\begin{array}{r} 8.164 \\ \times 46 \\ \hline 48984 \\ +326560 \\ \hline 375.544 \end{array}$	(d)	$\begin{array}{r} 9.63 \\ \times 42 \\ \hline 1926 \\ +38520 \\ \hline 404.46 \end{array}$
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(e)	$\begin{array}{r} 14.187 \\ \times 14 \\ \hline 56748 \\ +141870 \\ \hline 198.618 \end{array}$	(f)	$\begin{array}{r} 15.628 \\ \times 64 \\ \hline 62512 \\ +937680 \\ \hline 1000.192 \end{array}$
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(g)	$\begin{array}{r} 23.912 \\ \times 48 \\ \hline 191296 \\ +956480 \\ \hline 1147.776 \end{array}$	(h)	$\begin{array}{r} 0.0638 \\ \times 52 \\ \hline 1276 \\ +31900 \\ \hline 3.3176 \end{array}$
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4. (a)	$\begin{array}{r} 7.12 \\ \times 3.6 \\ \hline 4272 \\ +21360 \\ \hline 25.632 \end{array}$	(b)	$\begin{array}{r} 15.238 \\ \times 0.052 \\ \hline 30476 \\ +761900 \\ \hline 0.792376 \end{array}$
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$$\begin{array}{r} \text{(c)} \quad 0.0138 \\ \times 0.012 \\ \hline 276 \\ +1380 \\ \hline 0.0001656 \end{array}$$

$$\begin{array}{r} \text{(d)} \quad 1.245 \\ \times 3.67 \\ \hline 8715 \\ +74700 \\ \hline 373500 \\ \hline 4.56915 \end{array}$$

$$\begin{array}{r} \text{(c)} \quad 8)125 \quad (15.625 \\ \underline{-8} \phantom{00} \\ 45 \\ \underline{-40} \phantom{00} \\ 50 \\ \underline{-48} \phantom{00} \\ 20 \\ \underline{-16} \phantom{00} \\ 40 \\ \underline{-40} \phantom{00} \\ 00 \end{array}$$

$$\begin{array}{r} \text{(d)} \quad 5) 56 \quad (11.2 \\ \underline{-5} \phantom{00} \\ 06 \\ \underline{-5} \phantom{00} \\ 10 \\ \underline{-10} \phantom{00} \\ 00 \end{array}$$

$$\begin{array}{r} \text{(e)} \quad 6.617 \\ \times 8.012 \\ \hline 13234 \\ 66170 \\ 000000 \\ +52936000 \\ \hline 53.015404 \end{array}$$

$$\begin{array}{r} \text{(f)} \quad 9.62 \\ \times 3.178 \\ \hline 7696 \\ 67340 \\ 96200 \\ +2886000 \\ \hline 30.57236 \end{array}$$

$$\begin{array}{r} \text{(e)} \quad 12) 712 \quad (59.333 \\ \underline{-60} \phantom{00} \\ 112 \\ \underline{-108} \phantom{00} \\ 40 \\ \underline{-36} \phantom{00} \\ 40 \\ \underline{-36} \phantom{00} \\ 40 \\ \underline{-36} \phantom{00} \\ 4 \end{array}$$

$$\begin{array}{r} \text{(f)} \quad 25) 913 \quad (36.52 \\ \underline{-75} \phantom{00} \\ 163 \\ \underline{-150} \phantom{00} \\ 130 \\ \underline{-125} \phantom{00} \\ 50 \\ \underline{-50} \phantom{00} \\ 00 \end{array}$$

$$\begin{array}{r} \text{(g)} \quad 18.562 \\ \times 3.612 \\ \hline 37124 \\ 185620 \\ 11137200 \\ +55686000 \\ \hline 67.045944 \end{array}$$

$$\begin{array}{r} \text{(h)} \quad 0.542 \\ \times 3.62 \\ \hline 1084 \\ 32520 \\ +162600 \\ \hline 1.96204 \end{array}$$

5. (a)  $3.6 \times 1.6 \times 8.32 \Rightarrow 3.6 \times 1.6 = 5.76$   
 Now,  $5.76 \times 8.32 = 47.9232$   
 (b)  $6.9 \times 1.2 \times 2.5 \Rightarrow 6.9 \times 1.2 = 8.28$   
 Now,  $8.28 \times 2.5 = 20.7$   
 (c)  $0.8 \times 4.25 \times 0.005 \Rightarrow 0.8 \times 4.25 = 3.4$   
 Now,  $3.4 \times 0.005 = 0.017$   
 (d)  $13 \times 1.3 \times 0.13 \Rightarrow 13 \times 1.3 = 16.9$   
 Now,  $16.9 \times 0.13 = 2.197$   
 (e)  $0.3 \times 0.003 \times 0.003 \Rightarrow 0.3 \times 0.003 = 0.0009$   
 Now,  $0.0009 \times 0.0003 = 0.00000027$   
 (f)  $2.4 \times 1.5 \times 1.86 \Rightarrow 2.4 \times 1.5 = 3.6$   
 Now,  $3.6 \times 1.86 = 6.696$   
 (g)  $40.4 \times 4.04 \times 4.1 \Rightarrow 40.4 \times 4.04 = 163.216$   
 Now,  $163.216 \times 4.1 = 669.1856$   
 (h)  $0.21 \times 2.1 \times 0.0021 \Rightarrow 0.21 \times 2.1 = 0.441$   
 Now,  $0.441 \times 0.0021 = 0.0009261$

$$\begin{array}{r} \text{(g)} \quad 12) 163 \quad (13.583 \\ \underline{-12} \phantom{00} \\ 43 \\ \underline{-36} \phantom{00} \\ 70 \\ \underline{-60} \phantom{00} \\ 100 \\ \underline{-96} \phantom{00} \\ 40 \\ \underline{-36} \phantom{00} \\ 4 \end{array}$$

$$\begin{array}{r} \text{(h)} \quad 18) 678 \quad (37.666 \\ \underline{-54} \phantom{00} \\ 138 \\ \underline{-126} \phantom{00} \\ 120 \\ \underline{-108} \phantom{00} \\ 120 \\ \underline{-108} \phantom{00} \\ 120 \\ \underline{-108} \phantom{00} \\ 12 \end{array}$$

**EXERCISE 2.6** .....

1-2. Given in answersheet.

$$\begin{array}{r} \text{3. (a)} \quad 5) 23 \quad (4.6 \\ \underline{-20} \phantom{00} \\ 30 \\ \underline{-30} \phantom{00} \\ 0 \end{array}$$

$$\begin{array}{r} \text{(b)} \quad 4) 467 \quad (116.75 \\ \underline{-4} \phantom{00} \\ 6 \\ \underline{-4} \phantom{00} \\ 27 \\ \underline{-24} \phantom{00} \\ 30 \\ \underline{-28} \phantom{00} \\ 20 \\ \underline{-20} \phantom{00} \\ 00 \end{array}$$

$$\begin{array}{r} \text{4. (a)} \quad 4) 76.8 \quad (19.2 \\ \underline{-4} \phantom{00} \\ 36 \\ \underline{-36} \phantom{00} \\ -8 \\ \underline{-8} \phantom{00} \\ 0 \end{array}$$

$$\begin{array}{r} \text{(b)} \quad 8) 6.08 \quad (0.76 \\ \underline{-56} \phantom{00} \\ 48 \\ \underline{-48} \phantom{00} \\ 0 \end{array}$$

$$\begin{array}{r} \text{(c)} \quad 21) 117.6 \quad (5.6 \\ \underline{-105} \phantom{00} \\ 126 \\ \underline{-126} \phantom{00} \\ 00 \end{array}$$

$$\begin{array}{r} \text{(d)} \quad 6) 1.236 \quad (0.206 \\ \underline{-12} \phantom{00} \\ 036 \\ \underline{-36} \phantom{00} \\ 00 \end{array}$$

$$(e) \begin{array}{r} 25 \overline{) 1.625} \quad (0.065) \\ \underline{-1 \ 50} \\ 125 \\ \underline{-125} \\ 00 \end{array}$$

$$(f) \begin{array}{r} 12 \overline{) 60.48} \quad (5.04) \\ \underline{-60} \\ 48 \\ \underline{-48} \\ 00 \end{array}$$

$$(e) \frac{18.08}{800} = \frac{18.08}{8 \times 100} = \frac{0.1808}{8}$$

$$8 \overline{) 0.1808} \quad (0.0226) \\ \underline{-16} \\ 20 \\ \underline{-16} \\ 48 \\ \underline{-48} \\ 00$$

$$(g) \begin{array}{r} 18 \overline{) 217.44} \quad (12.08) \\ \underline{-18} \\ 37 \\ \underline{-36} \\ 1 \ 44 \\ \underline{-1 \ 44} \\ 00 \end{array}$$

$$(h) \begin{array}{r} 8 \overline{) 19.2} \quad (2.4) \\ \underline{-16} \\ 32 \\ \underline{-32} \\ 00 \end{array}$$

$$(f) \frac{1.25}{500} = \frac{1.25}{5 \times 100} = \frac{0.0125}{5}$$

$$5 \overline{) 0.0125} \quad (0.0025) \\ \underline{-10} \\ 25 \\ \underline{-25} \\ 0$$

$$5. (a) \frac{718.6}{200} = \frac{718.6}{2 \times 100} = \frac{7.186}{2}$$

$$2 \overline{) 7.186} \quad (3.593) \\ \underline{-6} \\ 1 \ 1 \\ \underline{-1 \ 0} \\ 18 \\ \underline{-18} \\ 6 \\ \underline{-6} \\ 0$$

$$(g) \frac{12.8}{500} = \frac{12.8}{5 \times 100} = \frac{0.128}{5}$$

$$5 \overline{) 0.128} \quad (0.0256) \\ \underline{-10} \\ 28 \\ \underline{-25} \\ 30 \\ \underline{-30} \\ 00$$

$$(b) \frac{156.8}{40} = \frac{156.8}{4 \times 10} = \frac{15.68}{4}$$

$$4 \overline{) 15.68} \quad (3.92) \\ \underline{-12} \\ 3 \ 6 \\ \underline{-3 \ 6} \\ 8 \\ \underline{-8} \\ 0$$

$$(h) \frac{3.969}{300} = \frac{3.969}{3 \times 100} = \frac{0.03969}{3}$$

$$3 \overline{) 0.03969} \quad (0.01323) \\ \underline{-3} \\ 9 \\ \underline{-9} \\ 6 \\ \underline{-6} \\ 9 \\ \underline{-9} \\ 0$$

$$(c) \frac{6.25}{200} = \frac{6.25}{2 \times 100} = \frac{0.0625}{2}$$

$$2 \overline{) 0.0625} \quad (0.03125) \\ \underline{-6} \\ 02 \\ \underline{-2} \\ 05 \\ \underline{-4} \\ 10 \\ \underline{-10} \\ 00$$

$$6. (a) \frac{6.612}{0.012} \times \frac{1000}{1000} = \frac{6612}{12}$$

$$12 \overline{) 6612} \quad (551) \\ \underline{-60} \\ 61 \\ \underline{-60} \\ 12 \\ \underline{-12} \\ 00$$

$$(d) \frac{403.8}{30} = \frac{403.8}{3 \times 10} = \frac{40.38}{3}$$

$$3 \overline{) 40.38} \quad (13.46) \\ \underline{-3} \\ 10 \\ \underline{-9} \\ 1 \ 3 \\ \underline{-1 \ 2} \\ 18 \\ \underline{-18} \\ 0$$

$$(b) \frac{0.076}{0.19} \times \frac{1000}{1000} = \frac{76}{190}$$

$$190 \overline{) 760} \quad (0.4) \\ \underline{-760} \\ 0$$

$$(c) \frac{0.8085}{0.35} \times \frac{100}{100} = \frac{80.85}{35}$$

$$\begin{array}{r} 35 \overline{) 80.85} \quad (2.31 \\ -70 \phantom{00} \\ \hline 108 \phantom{00} \\ -105 \phantom{00} \\ \hline 35 \phantom{00} \\ -35 \phantom{00} \\ \hline 00 \end{array}$$

$$(d) \frac{16.578}{5.4} \times \frac{10}{10} = \frac{165.78}{54}$$

$$\begin{array}{r} 54 \overline{) 165.78} \quad (3.07 \\ -162 \phantom{00} \\ \hline 378 \phantom{00} \\ -378 \phantom{00} \\ \hline 00 \end{array}$$

$$(e) \frac{0.00639}{2.13} \times \frac{100}{100} = \frac{0.639}{213}$$

$$\begin{array}{r} 213 \overline{) 0.639} \quad (0.003 \\ -639 \phantom{00} \\ \hline 00 \end{array}$$

$$(f) \frac{0.076}{0.19} \times \frac{100}{100} = \frac{7.6}{19}$$

$$\begin{array}{r} 19 \overline{) 7.6} \quad (0.4 \\ -7.6 \phantom{00} \\ \hline 00 \end{array}$$

$$(g) \frac{0.87976}{0.035} \times \frac{1000}{1000} = \frac{879.76}{35}$$

$$\begin{array}{r} 35 \overline{) 879.76} \quad (25.136 \\ -70 \phantom{00} \\ \hline 179 \phantom{00} \\ -175 \phantom{00} \\ \hline 47 \phantom{00} \\ -35 \phantom{00} \\ \hline 126 \phantom{00} \\ -105 \phantom{00} \\ \hline 210 \phantom{00} \\ -210 \phantom{00} \\ \hline 0 \end{array}$$

$$(h) \frac{0.3564}{0.27} \times \frac{100}{100} = \frac{35.64}{27}$$

$$\begin{array}{r} 27 \overline{) 35.64} \quad (1.32 \\ -27 \phantom{00} \\ \hline 86 \phantom{00} \\ -81 \phantom{00} \\ \hline 54 \phantom{00} \\ -54 \phantom{00} \\ \hline 00 \end{array}$$

### EXERCISE 2.7

- Cost of one pen = ₹ 15.45  
So, cost of 15 pens = ₹ (15.45 × 15) = ₹ 231.75
- Cost of one book = ₹ 85.70  
So, cost of 85 books = ₹ (85.70 × 85) = ₹ 7284.50
- Cost of a toy-car = ₹ 56.95  
So, cost of 34 toy cars = ₹ (56.95 × 34) = ₹ 1936.30

- Cost of 1 kg sugar = ₹ 18.49  
So, cost of 27 kg sugar = ₹ (18.49 × 27) = ₹ 499.23
- Cost of one table fan = ₹ 1078.56  
So, cost of 19 table fan = ₹ (1078.56 × 19) = ₹ 20492.64
- Cost of 1 kg desi ghee = ₹ 195.18  
So, cost of 34 kg desi ghee = ₹ (195.18 × 34) = ₹ 6636.12
- A tin can hold oil = 15.5 l  
So, 39 tins can hold oil = (15.5 × 39) l = 604.5 l
- Cost of 48 calculators = ₹ 4722.24  
So, cost of one calculator = ₹ 4722.24 ÷ 48 = ₹ 98.38
- Total cost of 68 chairs = ₹ 9231.68  
So, cost of one chair = ₹ 9231.68 ÷ 68 = ₹ 135.76
- Cost of 35 wall clocks = ₹ 39397.05  
So, cost of one wall clock = 39397.05 ÷ 35 = ₹ 1125.63
- A tin holds = 16.5 l ghee  
So, tins need for 3349.5 l  
Ghee = 3349.5 ÷ 16.5 = 203 l
- Weight of 32 bags of rice = 939.936 kg  
So, weight of one bag = 939.936 ÷ 32 = 29.373 kg

### HOTS

- Raj travels 360 km on  $\frac{3}{5}$ th of his petrol tank.  
Let the distance travelled with full tank is  $x$  km.  
According to the question,  
 $\frac{3}{5}$  of  $x$  km = 360 km  
On multiplying by  $\frac{5}{3}$  both sides  $\frac{3}{5} \times \frac{5}{3} \times x = 360 \times \frac{5}{3}$   
 $x = 600$  km  
If tank is full, the Raj can travel 600 km.
- (a) Diameter = 14.35 cm  
Side of square is 0.707 times of diameter, then  
side = 0.707 of 14.35  
= 0.707 × 14.35  
=  $\frac{707}{1000} \times \frac{1435}{100}$   
=  $\frac{707 \times 1435}{100000} = \frac{1014545}{100000}$   
10.14545 cm = 10.15 cm  
(b) Diameter = 8.63 cm

$$\begin{aligned}
\text{Side of square} &= 0.707 \text{ of } 8.63 \text{ cm} \\
&= 0.707 \times 8.63 \text{ cm} \\
&= \frac{707}{1000} \times \frac{863}{100} \\
&= \frac{707 \times 863}{100000} \\
&= \frac{610141}{100000} = 6.10 \text{ cm}
\end{aligned}$$

3. Time taken in the five races was 3.20 min, 3.37 min, 3.29 min, 3.17 min and 3.32 min.

$$\begin{array}{r}
\text{Total time taken} = 3.20 \text{ min} \\
3.37 \text{ min} \\
3.29 \text{ min} \\
3.17 \text{ min} \\
+ 3.32 \text{ min} \\
\hline
16.35 \text{ min}
\end{array}$$

Average time taken

$$= \frac{\text{Total time taken}}{\text{Number of frequency}} = \frac{16.35}{5} = 3.27 \text{ min}$$

Hence, the average time taken by Rohan in the races is 3.27 min.

4. We have,

$$\begin{aligned}
&\left(1 + \frac{2}{9}\right) + \left(1 + 3\frac{1}{5}\right) + \left(1 + 2\frac{2}{3}\right) \\
&= \left(1 + \frac{2}{9}\right) + \left(1 + \frac{16}{5}\right) + \left(1 + \frac{8}{3}\right) \\
&= \left(\frac{1}{2}\right) + \left(\frac{1}{5}\right) + \left(\frac{1}{3}\right) \\
&= \left(1 \times \frac{9}{2}\right) + \left(1 \times \frac{5}{16}\right) + \left(1 \times \frac{3}{8}\right) \\
&= \left(\frac{9}{2}\right) + \left(\frac{5}{16}\right) + \left(\frac{3}{8}\right)
\end{aligned}$$

Taking LCM of 2, 16, 8 =  $2 \times 2 \times 4 = 4 \times 4 = 16$

2	2, 16, 8
4	1, 8, 4
2	1, 2, 1
	1, 1, 1

$$\begin{aligned}
\text{So,} &= \frac{9 \times 8 + 5 \times 1 + 3 \times 2}{16} \\
&= \frac{72 + 5 + 6}{16} = \frac{83}{16}
\end{aligned}$$

Now, dividing 83 by 16, we get

$$\begin{array}{r}
16 \overline{) 83.0000} \quad (5.1875 \text{ (adding four zeros)}) \\
\underline{-83} \phantom{0000} \\
30 \phantom{000} \\
\underline{-16} \phantom{00} \\
140 \phantom{0} \\
\underline{-128} \phantom{0} \\
120 \\
\underline{-112} \\
80 \\
\underline{-80} \\
0
\end{array}$$

$$\therefore \left(1 + \frac{2}{9}\right) + \left(1 + 3\frac{1}{5}\right) + \left(1 + 2\frac{2}{3}\right) = 5.1875$$

### NCERT CORNER

1. Length of rectangular paper sheet =  $12\frac{1}{2}$  cm  
 $= \frac{25}{2}$  cm

Breadth of rectangular paper sheet =  $10\frac{2}{3}$  cm  
 $= \frac{32}{3}$  cm

Perimeter of the rectangular paper sheet

$$\begin{aligned}
&= 2 \times (\text{Length} + \text{Breadth}) \\
&= 2 \times \left(\frac{25}{2} + \frac{32}{3}\right) = 2 \times \frac{(25 \times 3) + (32 \times 2)}{6} \\
&\quad [\because \text{LCM of 2 and 3 is 6}] \\
&= 2 \times \left(\frac{75}{6} + \frac{64}{6}\right) = 2 \times \left(\frac{75 + 64}{6}\right) \\
&= 2 \times \left(\frac{139}{6}\right) = \frac{139}{3} = 46\frac{1}{3} \text{ cm.}
\end{aligned}$$

2. (i)  $\frac{1}{2}$  of 24 =  $\frac{1 \times 24}{2} = \frac{24}{2} = 12$

(ii)  $\frac{1}{2}$  of 46 =  $\frac{1 \times 46}{2} = \frac{46}{2} = 23$

3. (i)  $\frac{2}{7}$  of  $\frac{3}{4}$  =  $\frac{2}{7} \times \frac{3}{4} = \frac{2 \times 3}{7 \times 4} = \frac{6}{28} = \frac{3}{14}$

$\frac{3}{5}$  of  $\frac{5}{8}$  =  $\frac{3}{5} \times \frac{5}{8} = \frac{3 \times 5}{5 \times 8} = \frac{15}{40} = \frac{3}{8}$

L.C.M. of 14 and 8 is 56

$$\therefore \frac{3}{14} = \frac{3 \times 4}{14 \times 4} = \frac{12}{56} \quad \text{and} \quad \frac{3}{8} = \frac{3 \times 7}{8 \times 7} = \frac{21}{56}$$

$$\therefore \frac{21}{56} > \frac{12}{56} \quad \therefore \frac{3}{5} \text{ of } \frac{5}{8} > \frac{2}{7} \text{ of } \frac{3}{4}$$

$$(ii) \frac{1}{2} \text{ of } \frac{6}{7} = \frac{1}{2} \times \frac{6}{7} = \frac{1 \times 6}{2 \times 7} = \frac{6}{14} = \frac{3}{7}$$

$$\frac{2}{3} \text{ of } \frac{3}{7} = \frac{2}{3} \times \frac{3}{7} = \frac{2 \times 3}{3 \times 7} = \frac{6}{21} = \frac{2}{7}$$

$$\therefore \frac{3}{7} > \frac{2}{7} \quad \therefore \frac{1}{2} \text{ of } \frac{6}{7} > \frac{2}{3} \text{ of } \frac{3}{7}$$

4.  $42.6 \text{ km} - 28 \text{ km} = 14.6 \text{ km}$ .

So, 28 km is less than 42.6 km by 14.6 km.

5. A two-wheeler covers the distance in 1 L petrol  
 $= 55.3 \text{ km}$

It will cover the distance in 10 L petrol  
 $= 55.3 \times 10 = 553 \text{ km}$

6. The vehicle covers the distance in 2.4 L petrol  
 $= 43.2 \text{ km}$

The vehicle covers the distance in 1 L petrol  
 $= 43.2 \div 2.4$   
 $= \frac{432}{10} \div \frac{24}{10} = \frac{432}{10} \times \frac{10}{24}$   
 $= \frac{4320}{240} = \frac{180}{10} = 18 \text{ km}$

### 3 Collection and Organisation of Data (Mean, Median and Mode)

#### EXERCISE 3.1

1. **Array** : Arranging the numerical figures of the data in ascending or descending order is called an array.

**Observation** : The term raw data indicates that the collected information cannot be used as such, but requires processing. Each entry in raw data is known as an observation.

**Frequency** : The number of times a particular observation occurs is called its frequency.

**Range** : The difference between the highest and the lowest observation of the data gives us an idea of the spread of observations. It is called range.

2. Mean of 10 whole numbers

$$= \frac{0+1+2+3+4+5+6+7+8+9}{10} = \frac{45}{10} = 4.5$$

3. Mean of 10 even natural numbers

$$= \frac{2+4+6+8+10+12+14+16+18+20}{10}$$

$$= \frac{110}{10} = 11$$

4. Mean of first 10 prime numbers

$$= \frac{2+3+5+7+11+13+17+19+23+29}{10}$$

$$= \frac{129}{10} = 12.9$$

5. Mean height of 10 students

$$\frac{140+136+165+149+145}{10} + \frac{139+160+158+170+135}{10}$$

$$= \frac{1497}{10} = 149.7 \text{ cm}$$

6. (a) Minimum wages = ₹ 150

Maximum wages = ₹ 300

So range =  $300 - 150 = ₹ 150$

(b) Mean =  $\frac{\text{Sum of all}}{12}$   
 $= \frac{2560}{12} = ₹ 213$

7. Mean of marks =  $\frac{\text{Sum of marks}}{22} = \frac{961}{22} = 43.68$

8. (a) Range =  $12.2 - 2.2 = 10 \text{ mm}$

(b) Mean =  $\frac{\text{Sum of rainfall}}{7} = \frac{49.7}{7} = 7.1 \text{ mm}$

(c) 4 days

(d) 3 days

9.

Age ( $x_i$ )	Students ( $f_i$ )	$f_i x_i$
16	2	32
18	4	72
20	5	100
22	6	132
24	2	48
30	1	30
	<b>20</b>	<b>414</b>

$$\therefore \text{Mean} = \frac{\sum f_i x_i}{\sum f_i} = \frac{414}{20} = 20.7 \text{ years}$$

10. (a) Range =  $160 - 140 = 20 \text{ cm}$

Height ( $x_i$ )	Students ( $f_i$ )	$f_i x_i$
140	6	840
145	12	1740
150	15	2250
155	12	1860
160	5	800
	<b>50</b>	<b>7490</b>

$$\text{Mean} = \frac{7490}{50}$$

$$= 149.8 \text{ cm}$$



11.

Daily Wages ( $x_i$ )	Workers ( $f_i$ )	$f_i x_i$
140	14	1960
150	16	2400
160	15	2400
180	7	1260
190	8	1520
	<b>60</b>	<b>9540</b>

$$\text{Mean} = \frac{9540}{60}$$

$$\text{Wages} = ₹ 159$$

12.

C.I.	( $x_i$ )	( $f_i$ )	$f_i x_i$
0-20	10	7	70
20-40	30	8	240
40-60	50	12	600
60-80	70	10	700
80-100	90	8	720
100-120	110	5	550
		<b>50</b>	<b>2880</b>

$$\text{Mean} = \frac{2880}{50} = 57.6$$

13.

C.I.	( $x_i$ )	( $f_i$ )	$f_i x_i$
0-10	5	7	35
10-20	15	8	120
20-30	25	12	300
30-40	35	13	455
40-50	45	10	450
		<b>50</b>	<b>1360</b>

$$\text{Mean} = \frac{1360}{50} = 27.2$$

14.

C.I.	( $x_i$ )	( $f_i$ )	$f_i x_i$
10-15	12.5	5	62.5
15-20	17.5	6	105
20-25	22.5	8	180
25-30	27.5	12	330
30-35	32.5	6	195
35-40	37.5	3	112.5
		<b>40</b>	<b>985</b>

$$\text{Mean} = \frac{985}{40} = 24.625$$

### EXERCISE 3.2

1. (a) On arranging in increasing order

1, 2, 3, 3, 4, 5, 6, 7, 8, 9, 10

Here  $n = 11$  (odd)

$$\text{Median} = \left(\frac{11+1}{2}\right)^{\text{th}} \text{ term} = 6^{\text{th}} \text{ term} = 5$$

(b) On arranging in increasing order

2, 4, 5, 6, 6, 9, 11, 12, 15, 16, 18

Here  $n = 11$  (odd)

$$\text{Median} = \left(\frac{11+1}{2}\right)^{\text{th}} \text{ term} = 6^{\text{th}} \text{ term} = 9$$

(c) On arranging in increasing order

15, 16, 16, 18, 23, 23, 26, 28, 29, 31, 32, 36

Here  $n = 12$  (even)

$$\text{Median} = \frac{1}{2} \left\{ \left(\frac{12}{2}\right)^{\text{th}} \text{ term} + \left(\frac{12}{2} + 1\right)^{\text{th}} \text{ term} \right\}$$

$$= \frac{1}{2} (6^{\text{th}} \text{ term} + 7^{\text{th}} \text{ term})$$

$$= \frac{1}{2} \times (23 + 26) = \frac{1}{2} \times 49 = 24.5$$

(d) On arranging in increasing order

4, 5, 6, 8, 9, 15, 16, 18, 22, 23, 30, 36, 38, 40

Here  $n = 14$  (even)

$$\text{Median} = \frac{1}{2} (7^{\text{th}} \text{ term} + 8^{\text{th}} \text{ term})$$

$$= \frac{1}{2} (16 + 18) = \frac{1}{2} \times 34 = 17$$

2. 11 prime numbers

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31

$$\text{Median} = \left(\frac{11+1}{2}\right)^{\text{th}} \text{ term}$$

$$= 6^{\text{th}} \text{ term} = 13$$

3. First 13 even numbers

2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26

$$\text{Median} = \left(\frac{13+1}{2}\right)^{\text{th}} \text{ term} = 7^{\text{th}} \text{ term} = 14$$

4. First 18 odd numbers

1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 29, 31, 33, 35, 37

$$\text{Median} = \frac{1}{2} \left\{ \left(\frac{18}{2}\right)^{\text{th}} \text{ term} + \left(\frac{18}{2} + 1\right)^{\text{th}} \text{ term} \right\}$$

$$= \frac{1}{2} (9^{\text{th}} \text{ term} + 10^{\text{th}} \text{ term})$$

$$= \frac{1}{2} (17 + 19) = \frac{1}{2} \times 36 = 18$$

5. On arranging the ages in increasing order

7, 8, 9, 10, 10, 11, 12, 14, 15, 16

$$\begin{aligned} \text{Median age} &= \frac{1}{2} \left\{ \left( \frac{10}{2} \right)^{\text{th}} \text{ term} + \left( \frac{10}{2} + 1 \right)^{\text{th}} \text{ term} \right\} \\ &= \frac{1}{2} (5^{\text{th}} \text{ term} + 6^{\text{th}} \text{ term}) \\ &= \frac{1}{2} \times (10 + 11) \\ &= 10.5 \text{ years} \end{aligned}$$

6. On arranging the heights in increasing order

132, 138, 142, 145, 145, 146, 148, 149, 150, 151, 158, 159, 160, 162, 165

$$\begin{aligned} \text{Median height} &= \left( \frac{15+1}{2} \right)^{\text{th}} \text{ term} \\ &= 8^{\text{th}} \text{ term} = 149 \text{ cm} \end{aligned}$$

7. On arranging runs in increasing order

0, 3, 4, 5, 6, 14, 32, 32, 43, 45, 98

$$\begin{aligned} \text{Median} &= \left( \frac{11+1}{2} \right)^{\text{th}} \text{ term} \\ &= 6^{\text{th}} \text{ term} = 14 \end{aligned}$$

8. On arranging the marks in increasing order

14, 38, 39, 48, 49, 52, 63, 64, 75, 85, 88, 89, 90, 90, 94, 96, 98

Median marks

$$\begin{aligned} &= \frac{1}{2} \left\{ \left( \frac{18}{2} \right)^{\text{th}} \text{ term} + \left( \frac{18}{2} + 1 \right)^{\text{th}} \text{ term} \right\} \\ &= \frac{1}{2} (9^{\text{th}} + 10^{\text{th}}) = \frac{1}{2} \times (75 + 85) \\ &= \frac{1}{2} \times 160 = 80 \end{aligned}$$

9. On arranging the weight in increasing order

10, 15, 54, 60, 65, 70, 78, 80, 82

$$\text{Median weight} = \left( \frac{9+1}{2} \right)^{\text{th}} \text{ term} = 5^{\text{th}} \text{ term} = 65 \text{ kg}$$

10. On arranging the wages

100, 110, 120, 120, 120, 140, 140, 150, 150, 160, 200, 250

$$\begin{aligned} \text{Median wages} &= \frac{1}{2} \left\{ \left( \frac{12}{2} \right)^{\text{th}} + \left( \frac{12}{2} + 1 \right)^{\text{th}} \right\} \\ &= \frac{1}{2} (6^{\text{th}} + 7^{\text{th}}) \\ &= \frac{1}{2} (140 + 140) = ₹ 140 \end{aligned}$$

- 11.

$(x_i)$	$(f_i)$	C.F.
4	8	8
12	10	18
20	16	34
<u>28</u>	24	58
36	15	73
44	7	80

$$x = 80$$

So, Median

$$\begin{aligned} &= \frac{1}{2} \left\{ \text{value of } \left( \frac{80}{2} \right)^{\text{th}} \text{ term} + \text{value of } \left( \frac{80}{2} + 1 \right)^{\text{th}} \right\} \text{ term} \\ &= \frac{1}{2} (40^{\text{th}} + 41^{\text{th}}) = \frac{1}{2} (28 + 28) = 28 \end{aligned}$$

- 12.

$(x_i)$	$(f_i)$	C.F.
45	8	8
46	5	13
48	6	19
<u>50</u>	9	28
52	7	35
54	4	39
55	2	41

Here

$$n = 41$$

$$\begin{aligned} \text{So, Median weight} &= \left( \frac{40+1}{2} \right)^{\text{th}} \text{ term} \\ &= 21^{\text{st}} \text{ term} \\ &= 50 \text{ kg} \end{aligned}$$

- 13.

$(x_i)$	$(f_i)$	C.F.
15	5	5
20	4	9
25	9	18
<u>30</u>	7	25
36	8	33
42	4	37

$$n = 37$$

$$\begin{aligned} \text{So, Median weight} &= \left( \frac{37+1}{2} \right)^{\text{th}} \text{ term} \\ &= 19^{\text{th}} \text{ term} \\ &= 30 \text{ kg} \end{aligned}$$

14.

$(x_i)$	$(f_i)$	C.F.
125	9	9
128	7	16
130	5	21
132	10	31
135	8	39
142	4	43
145	3	46

$$n = 46$$

$$\begin{aligned} \text{So, Median} &= \frac{1}{2} \left\{ \text{value of } \left( \frac{46}{2} \right)^{\text{th}} + \left( \frac{46+1}{2} \right)^{\text{th}} \right\} \\ &= \frac{1}{2} (23^{\text{rd}} + 24^{\text{th}}) = \frac{1}{2} (132 + 132) \\ &= 132 \text{ cm} \end{aligned}$$

⇒ EXERCISE 3.3 .....

- (a) In given data, 4 is repeating maximum times.  
So 4 is mode.  
(b) In given data,  
10 is repeating maximum times so 10 is mode.
  - In given data, 10 is repeating maximum times so 10 is mode.
- 3-8. Similarly other questions.

⇒ HOTS .....

- Let the three numbers be  $x_1, x_2, x_3$ . Therefore,

$$\text{Mean} = \frac{x_1 + x_2 + x_3}{3}$$

$$10 = \frac{x_1 + x_2 + x_3}{3}$$

$$x_1 + x_2 + x_3 = 10 \times 3$$

$$x_1 + x_2 + x_3 = 30 \quad \dots(i)$$

Now, mean of other four numbers is 12. Let these four numbers be  $x_4, x_5, x_6, x_7$ . Therefore,

$$\text{Mean} = \frac{x_4 + x_5 + x_6 + x_7}{4}$$

$$12 = \frac{x_4 + x_5 + x_6 + x_7}{4}$$

$$x_4 + x_5 + x_6 + x_7 = 12 \times 4$$

$$x_4 + x_5 + x_6 + x_7 = 48 \quad \dots(ii)$$

So, combined mean of all numbers would be

$$\text{Mean} = \frac{x_1 + x_2 + x_3 + x_4 + x_5 + x_6 + x_7}{7}$$

$$\text{Mean} = \frac{x_1 + x_2 + x_3}{7} + \frac{x_4 + x_5 + x_6 + x_7}{7}$$

$$\text{Mean} = \frac{30}{7} + \frac{48}{7} = \frac{78}{7} = 11.14 \text{ [From (i) and (ii)]}$$

- We know that,

$$\text{Mean} = \frac{\text{Sum of observations}}{\text{Numbers of observations}}$$

$$4.5 = \frac{5 + 7 + 7 + 8 + x + 5 + 4 + 3 + 1 + 2}{10}$$

$$4.5 \times 10 = 42 + x$$

$$45 = 42 + x$$

$$45 - 42 = x$$

$$\text{Hence, } x = 3$$

Now arrange the data in ascending order.

We get 1, 2, 3, 3, 4, 5, 5, 7, 7, 8.

Since, the number of observations in the given case is even, the median will be mean of 5th and 6th observations.

$$\text{i.e., Median} = \frac{\text{5th observation} + \text{6th observation}}{2}$$

$$= \frac{4 + 5}{2} = \frac{9}{2} = 4.5$$

Hence, median of the given data is 4.5.

- (i) In the given data, we see that the observation 9 occurs maximum number of times, i.e., 3 times. Hence, mode is 9.  
(ii) Since, the value 120 occurs maximum number of times, i.e., 4. Hence, mode is 120.

⇒ NCERT CORNER .....

- First five whole numbers = 0, 1, 2, 3 and 4

$$\begin{aligned} \text{Sum of these whole numbers} &= 0 + 1 + 2 + 3 + 4 \\ &= 10 \end{aligned}$$

$$\begin{aligned} \therefore \text{Mean} &= \frac{\text{Sum of numbers}}{\text{Number of whole numbers}} \\ &= \frac{10}{5} = 2 \end{aligned}$$

- To Find the mode and median, we need to arrange the given data in ascending order :

5, 9, 10, 12, 15, 16, 19, 20, 20, 20, 20, 23, 24, 25, 25

- (i) Median is the middle observation.

$$\therefore \text{Median} = 20$$

- (ii) Mode is the observation that occurs most after.

$$\therefore \text{Mode} = 20$$

Yes, here the mode and median are the same.

- Arrange the given data in ascending order :

12, 12, 13, 13, 14, 14, 14, 16, 19

- (i) 14 is more frequent than other numbers.

$$\therefore \text{Mode} = 14$$

- (ii) 14 is also a middle value of the given observation.  
 $\therefore$  Median = 14

## 4 Bar Graphs and Probability

### EXERCISE 4.1

1–10. Do yourself.

### EXERCISE 4.2

- (a) May happen but not certain.  
 (b) impossible  
 (c) may happen but not certain  
 (d) may happen but not certain  
 (e) may happen but not certain.
- Possible outcomes = 2 (Head or tail)  
 Favourable outcomes = 1  
 So, required probability =  $\frac{1}{2}$
- Possible outcomes = 6  
 (1 or 2 or 3 or 4 or 5 or 6)  
 Favourable outcomes = 3 (2, 4, 6)  
 So, required probability =  $\frac{3}{6} = \frac{1}{2}$
- Possible outcomes = 6  
 Favourable outcomes = 2 (4, 6)  
 So, required probability =  $\frac{2}{6} = \frac{1}{3}$
- Possible outcomes = 70  
 Favourable outcomes = 20  
 Required probability =  $\frac{20}{70} = \frac{2}{7}$

6. Required =  $\frac{30}{120} = \frac{1}{4}$

- (a) Possible outcomes = 15  
 Favourable outcomes = 6  
 $\therefore$  Required probability =  $\frac{6}{15} = \frac{2}{5}$   
 (b) Favourable outcomes = 5 + 4 = 9  
 $\therefore$  Required probability =  $\frac{9}{15} = \frac{3}{5}$

- (a) Probability =  $\frac{1}{10}$   
 (b) Favourable outcomes = 5 (2, 3, 5, 7, 11)  
 $\therefore$  Required probability =  $\frac{5}{10} = \frac{1}{2}$

- Possible outcomes = 180  
 Favourable outcomes = 60  
 $\therefore$  Required probability =  $\frac{60}{180} = \frac{1}{3}$
- Possible outcomes = 100  
 Favourable outcomes = 35  
 $\therefore$  Required probability =  $\frac{35}{100} = \frac{7}{20}$

### HOTS

- Given in the answersheet.
- (a) We can clearly see that all the 5 given letters are vowels, *i.e.*, A, E, I, O, U. Hence, it is certain to draw a vowel, *i.e.*, probability of drawing a vowel is 1.

(b) Probability =  $\frac{\text{Number of cards marked } U}{\text{Total number of cards}}$   
 $= \frac{1}{5}$

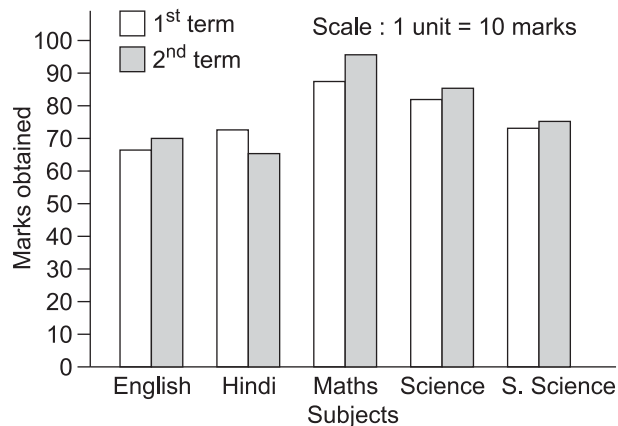
(c) Probability =  $\frac{\text{Number of cards marked } A \text{ or } I}{\text{Total number of cards}}$   
 $= \frac{2}{5}$

(d) Probability =  $\frac{\text{Number of cards marked with a consonant}}{\text{Total number of cards}}$   
 $= \frac{0}{5} = 0$

Hence, it is impossible to draw a consonant.

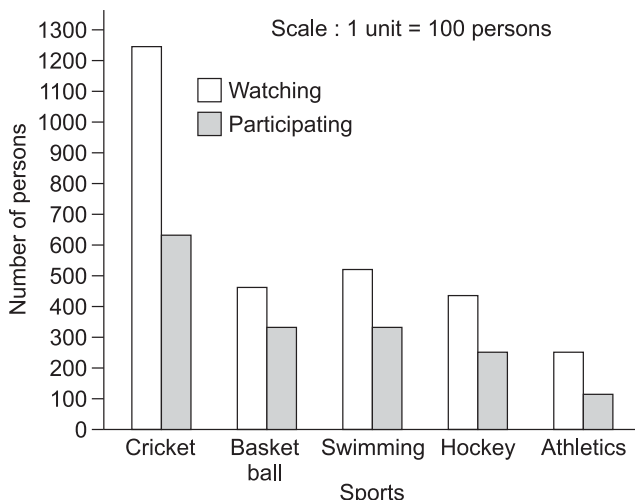
### NCERT CORNER

1.



- The child improved his performance the most in the subject of Maths.
- The improvement is the least in the subject of S. Science.
- Yes, the performance has gone down in the subject of Hindi.

2.



- (i) From the bar graph it is inferred that the people of the colony like the cricket the most and athletics the least.
- (ii) The most popular sport is cricket.
- (iii) Watching sports is more preferred than participating in sports.

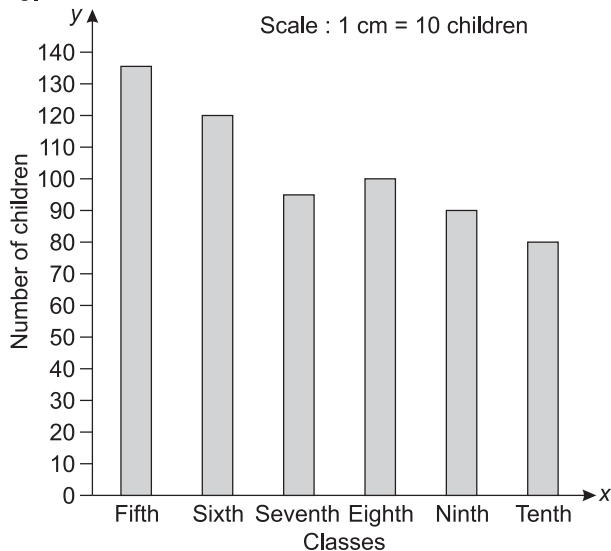
3. (i) Probability of drawing marble with number 2  

$$= \frac{1}{6}$$
 (ii) Probability of drawing marble with number 5  

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

4. When a coin is tossed, then either 'head' or a 'tail' comes.  
 $\therefore$  Successfully achieved outcome = 1  
 Total number of possible outcomes = 2  
 $[\because \text{Head} + \text{Tail} = 1 + 1 = 2]$   
 $\therefore$  Probability =  $\frac{1}{2}$

5.



(a) Here the greatest value in the data is 135 which is less than 140. Therefore we can choose the scale from 0 to 140 which is neither too long nor too small. By choosing a scale : 1 unit = 10 students and taking class along x-axis, we draw the bar graph as shown.

- (b) (i) Fifth class is having the maximum number of children, i.e., 135 children.  
 Tenth class is having the minimum number of children, i.e., 80 children.  
 (ii)  $\therefore$  Number of children in sixth class = 120  
 Number of children in eighth class = 100  
 $\therefore$  The required ratio =  $\frac{120}{100} = \frac{6}{5} = 6:5$

6. Given in answersheet.

## 5 Algebraic Expressions

### EXERCISE 5.1

1-6. Given in answersheet.

### EXERCISE 5.2

1. (a)  $4mn + 6mn - 5mn = (4 + 6 - 5)mn = 5mn$   
 (b)  $3np - 4np + 7np + 8pn = (3 - 4 + 7 + 8)np = 14np$   
 (c)  $10x^2 - 5x^2 + 7x^2 = (10 - 5 + 7)x^2 = 12x^2$   
 (d)  $8m^2n - 6nm^2 + 7mn + 4mn = (8 - 6)m^2n + (7 + 4)mn = 2m^2n + 11mn$   
 (e)  $4x^2y - 3xy^2 - 5xy^2 + 3x^2y = (4x^2y + 3x^2y) + (-3xy^2 - 5xy^2) = (4 + 3)x^2y - (3 + 5)xy^2 = 7x^2y - 8xy^2$   
 (f)  $5m^2 - 6m^2n^2 + 4m^2n^2 + 3m^2 = (5m^2 + 3m^2) + (-6m^2n^2 + 4m^2n^2) = 8m^2 - 2m^2n^2$
2. (a)  $3a^2b + 4b^2a - 6a^2b + 8ab^2 - 7ab^2 = (3a^2b - 6a^2b) + (4b^2a + 8ab^2 - 7ab^2) = -3a^2b + 5ab^2$   
 (b)  $5m - 7n + 3n - 4m + 2 + 2m - 3mn + 7mn + 4 = (5m - 4m + 2m) + (-7n + 3n) + (-3mn + 7mn) + (2 + 4) = 3m - 4n + 4mn + 6$   
 (c)  $4x^2y - 6x^2y - 8yx^2 + 15xy + 7xy - 14yx = (4 - 6 - 8)x^2y + (15 + 7 - 14)yx = -10x^2y + 8yx$

$$\begin{aligned}
 \text{(d)} \quad & 14x + 10y - 12xy - 13 + 15 - 7x - 12y + 8xy \\
 &= (14x - 7x) + (10y - 12y) \\
 &\quad + (-12xy + 8xy) - 13 + 15 \\
 &= 7x - 2y - 4xy + 2
 \end{aligned}$$

$$\begin{aligned}
 \text{(e)} \quad & 3y^2 + 5y - 4 - 8y + y^2 + 4 - 7y^2 \\
 &= (3y^2 + y^2 - 7y^2) + (5y - 8y) - 4 + 4 \\
 &= -3y^2 - 3y = 0 \\
 &= -3y^2 - 3y
 \end{aligned}$$

$$\begin{aligned}
 \text{(f)} \quad & 3a - 2b - ab + 2ab - 6b + 5a + 8ab \\
 &= (3a + 5a) + (-2b - 6b) + (-ab + 2ab + 8ab) \\
 &= 8a - 8b + 9ab
 \end{aligned}$$

$$\begin{array}{r}
 \text{3. (a)} \quad 5xyz + 3x^2y^2 - 15 \\
 + 4xyz + 4x^2y^2 + 18 \\
 \hline
 9xyz + 7x^2y^2 + 3
 \end{array}$$

$$\begin{array}{r}
 \text{(b)} \quad -2x^2 + 4xy - 16 \\
 + 3x^2 - 6xy + 18 + 13y^2 \\
 \hline
 x^2 - 2xy + 2 + 13y^2
 \end{array}$$

$$\begin{array}{r}
 \text{(c)} \quad 19mn^2 - 6mnp + 8n^2 \\
 + 16mn^2 + 8mnp - 6n^2 \\
 \hline
 35mn^2 + 2mnp + 2n^2
 \end{array}$$

$$\begin{array}{r}
 \text{(d)} \quad 5x^2y - 5x^2 + 3y^2 \\
 - 10x^2y + 6x^2 - 4y^2 \\
 \hline
 -5x^2y + x^2 - y^2
 \end{array}$$

$$\begin{array}{r}
 \text{(e)} \quad \frac{3}{7}m^2n - \frac{2}{5}mn + 10 \\
 \frac{4}{7}nm^2 + \frac{1}{5}mn - 5 \\
 \hline
 1m^2n - \frac{1}{5}mn + 5 = m^2n - \frac{1}{5}mn + 5
 \end{array}$$

$$\begin{array}{r}
 \text{(f)} \quad \frac{4}{11}xy^2 - \frac{6}{13}y^2 + 18x^2 \\
 \frac{5}{11}xy^2 + \frac{5}{13}y^2 - 19x^2 \\
 \hline
 \frac{9}{11}xy^2 - \frac{1}{13}y^2 - x^2
 \end{array}$$

$$\begin{array}{r}
 \text{4. (a)} \quad 18y - 8y^2 + 19 \\
 7y + 4y^2 - 16 \\
 \begin{array}{ccc}
 (-) & (-) & (+)
 \end{array} \\
 \hline
 11y - 12y^2 + 35
 \end{array}$$

$$\begin{array}{r}
 \text{(b)} \quad 7mn - 5n^2 + 2m^2 \\
 6mn + 10n^2 - m^2 \\
 \begin{array}{ccc}
 (-) & (-) & (+)
 \end{array} \\
 \hline
 mn - 15n^2 + 3m^2
 \end{array}$$

$$\begin{array}{r}
 \text{(c)} \quad 13 - 10x \\
 -5 + 10x - x^2 \\
 \begin{array}{ccc}
 (+) & (-) & (+)
 \end{array} \\
 \hline
 18 - 20x + x^2
 \end{array}$$

$$\begin{array}{r}
 \text{(d)} \quad 3p^2 - 2q^2 - 3pq \\
 -4p^2 + 3q^2 + 5pq \\
 \begin{array}{ccc}
 (+) & (-) & (-)
 \end{array} \\
 \hline
 7p^2 - 5q^2 - 8pq
 \end{array}$$

$$\begin{array}{r}
 \text{(e)} \quad 3ab - 2a^2 - 5b^2 \\
 -8ab + 5a^2 + 4b^2 \\
 \begin{array}{ccc}
 (+) & (-) & (-)
 \end{array} \\
 \hline
 11ab - 7a^2 - 9b^2
 \end{array}$$

$$\begin{array}{r}
 \text{(f)} \quad 3x^3 + 2y^3 + 6xyz \\
 x^3 - y^3 - 5xyz \\
 \begin{array}{ccc}
 (-) & (+) & (+)
 \end{array} \\
 \hline
 2x^3 + 3y^3 + 11xyz
 \end{array}$$

5. Required expression

$$\begin{aligned}
 &= (3m^2 - 5mn + 6n^2) - (m^2 + mn + n^2) \\
 &= 3m^2 - 5mn + 6n^2 - m^2 - mn - n^2 \\
 &= 2m^2 - 6mn + 5n^2
 \end{aligned}$$

6. Required expression

$$\begin{aligned}
 &= (-a^2 + 7ab - 3b^2) - (3a^2 - 6ab + 2b^2) \\
 &= -a^2 + 7ab - 3b^2 - 3a^2 + 6ab - 2b^2 \\
 &= -4a^2 + 13ab - 5b^2
 \end{aligned}$$

7. Required expression

$$\begin{aligned}
 &= (2a + 8b + 10) - (-4b + 8a - 6) \\
 &= 2a + 8b + 10 + 4b - 8a + 6 \\
 &= -6a + 12b + 16
 \end{aligned}$$

8. Required expression

$$\begin{aligned}
 &= (-x^2 + 3xy + 2y^2) - (4x^2 - 2xy - 3y^2) \\
 &= -x^2 + 3xy + 2y^2 - 4x^2 + 2xy + 3y^2 \\
 &= -5x^2 + 5xy + 5y^2
 \end{aligned}$$

9. First add  $a^2 + ab + 6b^2$  and  $-5a^2 + 3b^2$

$$\therefore a^2 + ab + 6b^2 - 5a^2 + 3b^2 = -4a^2 + 9b^2 + ab$$

Now find the sum of

$$-3a^2 - 6ab \text{ and } 4a^2 + 5b^2 - 2ab$$

$$\therefore -3a^2 - 6ab + 4a^2 + 5b^2 - 2ab = a^2 - 8ab + 5b^2$$

Now, subtract  $-4a^2 + 9b^2 + ab$

from  $a^2 - 8ab + 5b^2$ , we get

$$\begin{aligned}
 &(a^2 - 8ab + 5b^2) - (-4a^2 + 9b^2 + ab) \\
 &= a^2 - 8ab + 5b^2 + 4a^2 - 9b^2 - ab \\
 &= 5a^2 - 9ab - 4b^2
 \end{aligned}$$

10. Add  $m^2 - mn + 3n^2$

and  $2m^2 + 2mn - 7n^2$

We get  $3m^2 + mn - 4n^2$

Now, subtract it from  $8mn$ , we get

$$8mn - (3m^2 + mn - 4n^2) = 8mn - 3m^2 - mn + 4n^2$$

$$= 7mn - 3m^2 + 4n^2$$

➤ **EXERCISE 5.3** .....

1. (a)  $x^2 - 3x = (-2)^2 - 3 \times (-2) = 4 + 6 = 10$

(b)  $4x - 3x^3 = 4 \times (-2) - 3(-2)^3 = -8 - 3(-8)$   
 $= -8 + 24 = 16$

(c)  $x^3 + 4x^2 - 4 = (-2)^3 + 4(-2)^2 - 4$   
 $= -8 + 4(4) - 4$   
 $= -8 + 16 - 4 = 4$

(d)  $4x^3 + 6x^2 + 4 = 4(-2)^3 + 6(-2)^2 + 4$   
 $= 4(-8) + 6(4) + 4$   
 $= -32 + 24 + 4 = -4$

(e)  $9x - 7x^2 + 2 = 9(-2) - 7(-2)^2 + 2$   
 $= -18 - 7(4) + 2$   
 $= -18 - 28 + 2 = -44$

(f)  $x^4 - x^3 + 7x = (-2)^4 - (-2)^3 + 7(-2)$   
 $= 16 - (-8) - 14$   
 $= 16 + 8 - 14 = 10$

2. (a)  $3p^2 - 7p + 6 = 3(-3)^2 - 7(-3) + 6$   
 $= 3(9) + 21 + 6$   
 $= 27 + 21 + 6 = 54$

(b)  $2p^2 - 7p + 61 = 2(-3)^2 - 7(-3) + 61$   
 $= 2(9) + 21 + 61$   
 $= 18 + 21 + 61 = 100$

(c)  $4p - 17p^2 + 2 = 4(-3) - 17(-3)^2 + 2$   
 $= -12 - 17(9) + 2$   
 $= -12 - 153 + 2 = -163$

(d)  $p^2 + p + 16 = (-3)^2 + (-3) + 16$   
 $= 9 - 3 + 16 = 22$

(e)  $7p + 4p^3 + 17 = 7(-3) + 4(-3)^3 + 17$   
 $= -21 + 4(-27) + 17$   
 $= -21 - 108 + 17 = -112$

(f)  $2p^3 - 2p^2 + 4p = 2(-3)^3 - 2(-3)^2 + 4(-3)$   
 $= 2(-27) - 2(9) - 12$   
 $= -54 - 18 - 12 = -84$

3. (a)  $3x - 4x^2 + 3xyz = 3 \times 1 - 4 \times 1^2 + 3 \times 1 \times (-2) \times 3$   
 $= 3 - 4 - 18 = -19$

(b)  $x^3 + y^3 + z^3 - 3xyz$   
 $= 1^3 + (-2)^3 + 3^3 - 3 \times 1 \times (-2) \times 3$   
 $= 1 - 8 + 27 + 18 = 38$

(c)  $4x^3 - 3z^2 + y = 4 \times 1^3 - 3 \times 3^2 + (-2)$   
 $= 4 - 27 - 2 = -25$

(d)  $4x^2 + 5y^3 - 6z = 4 \times 1^2 + 5 \times (-2)^3 - 6 \times 3$   
 $= 4 + 5(-8) - 18$   
 $= 4 - 40 - 18 = -54$

(e)  $(x + y + z)^2 - 3xyz$   
 $= (1 - 2 + 3)^2 - 3 \times 1 \times (-2) \times 3$   
 $= 2^2 + 18$   
 $= 4 + 18 = 22$

(f)  $4y^3 + 3x^2 + 4 = 4(-2)^3 + 3 \times 1^2 + 4$   
 $= 4 \times (-8) + 3 + 4$   
 $= -32 + 7 = -25$

4. (a)  $2a^2b + 3b^2 - ab = 2 \times 2^2 \times 3 + 3 \times 3^2 - 2 \times 3$   
 $= 24 + 27 - 6 = 45$

(b)  $2a - 7b(b + 2) = 2 \times 2 - 7 \times 3(3 + 2)$   
 $= 4 - 21 \times 5$   
 $= 4 - 105 = -101$

(c)  $4a + 2(b - c) = 4 \times 2 + 2(3 - 0)$   
 $= 8 + 2 \times 3 = 8 + 6 = 14$

(d)  $3a^3 - b^2 + 6ab = 3 \times 2^3 - 3^2 + 6 \times 2 \times 3$   
 $= 24 - 9 + 36 = 51$

(e)  $2a^3b + 3c^2 - 2ab = 2 \times 2^3 \times 3 + 3 \times 0^2 - 2 \times 2 \times 3$   
 $= 48 + 0 - 12 = 36$

(f)  $6c^2 - 4a + 3b^3 = 6 \times 0^2 - 4 \times 2 + 3 \times 3^3$   
 $= 0 - 8 + 81 = 73$

5. (a)  $m^2 + 3mn + p = 2^2 + 3 \times 2 \times (-3) + 1$   
 $= 4 - 18 + 1 = -13$

(b)  $m^2 + mn - 7p = 2^2 + 2 \times (-3) - 7 \times 1$   
 $= 4 - 6 - 7 = -9$

(c)  $16m - 17n + 10 = 16 \times 2 - 17 \times (-3) + 10$   
 $= 32 + 51 + 10 = 93$

(d)  $6m - 7p^2 + 4n^2 = 6 \times 2 - 7 \times 1^2 + 4(-3)^2$   
 $= 12 - 7 + 4 \times 9$   
 $= 12 - 7 + 36 = 41$

(e)  $6m(m + n) + 10 = 6 \times 2(2 - 3) + 10$   
 $= 12 \times (-1) + 10 = -12 + 10 = -2$

(f)  $4(4m - 1) + 3n = 4(4 \times 2 - 1) + 3 \times (-3)$   
 $= 4(7) - 9$   
 $= 28 - 9 = 19$

6.  $x = 1, \quad y = -2, \quad z = 2 \times 1 = 2$   
 $m = 2, \quad n = 3 \times 2 = 6 \quad p = 2 \times 6 = 12$

(a)  $3x^2 - 2y^3 + xz + 2m$   
 $= 3 \times 1^2 - 2 \times (-2)^3 + 1 \times 2 + 2 \times 2$   
 $= 3 - 2 \times (-8) + 2 + 4$   
 $= 3 + 16 + 2 + 4 = 25$

(b)  $4x^3 + z^2 - 10mn + p$   
 $= 4 \times 1^3 + 2^2 - 10 \times 2 \times 6 + 12$   
 $= 4 + 4 - 120 + 12 = -100$

(c)  $6m^2 - 2mn + 3n^2 + p$   
 $= 6 \times 2^2 - 2 \times 2 \times 6 + 3 \times 6^2 + 12$   
 $= 6 \times 4 - 24 + 108 + 12$   
 $= 24 - 24 + 120 = 120$

(d)  $17x^2 - 14y^3 + 2mnp$   
 $= 17 \times 1^2 - 14 \times (-2)^3 + 2 \times 2 \times 6 \times 12$   
 $= 17 - 14 \times (-8) + 288$   
 $= 17 + 112 + 288 = 417$

(e)  $2(x^2 + xy) + 3 - 3n = 2(1^2 + 1 \times -2) + 3 - 3 \times 6$   
 $= -2 + 3 - 18 = -17$

(f)  $n^3 - 3(n - 10p) + 15 = 6^3 - 3(6 - 10 \times 12) + 15$   
 $= 216 - 3(6 - 120) + 15$   
 $= 216 - 3 \times -114 + 15$   
 $= 216 + 342 + 15 = 573$

⇒ **HOTS** .....

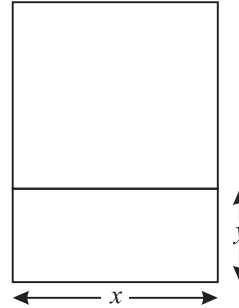
1. We have,  
 $93P^2 - 55P + 4$  exceeds  $13P^3 - 5P^2 + 17P - 90$   
 $\therefore 93P^2 - 55P + 4 - (13P^3 - 5P^2 + 17P - 90)$   
 $= 93P^2 - 55P + 4 - 13P^3 + 5P^2 - 17P + 90$   
 By combining the like terms, we get  
 $= 93P^2 + 5P^2 - 55P - 17P + 4 + 90 - 13P^3$   
 $= 98P^2 - 72P + 94 - 13P^3$   
 $= -13P^3 + 98P^2 - 72P + 94$   
 So,  $93P^2 - 55P + 4$  exceeds  $13P^3 - 5P^2 + 17P - 90$   
 by  $(-13P^3 + 98P^2 - 72P + 94)$

2.  $\therefore$  Rohan's mother gave money = ₹  $3xy^2$   
 His father gave money = ₹  $5(xy^2 + 2)$   
 $= ₹ 5xy^2 + 5 \times 2$   
 $= ₹ (5xy^2 + 10)$   
 Total money he have = ₹  $(3xy^2 + 5xy^2 + 10)$   
 $= ₹ (8xy^2 + 10)$   
 He spent from his total money = ₹  $(10 - 3xy^2)$

Left money = ₹  $(8xy^2 + 10) - ₹ (10 - 3xy^2)$   
 $= ₹ (8xy^2 + 10 - 10 + 3xy^2)$   
 $= ₹ 11xy^2$

3. Perimeter of rectangle is  $2(x + y)$   
 Perimeter of square is  $4x$ .

In the given figure walls of rectangle and square lawn are common.



$\therefore$  The perimeter of combined together  
 $= y + x + y + x + x + x = 4x + 2y$

4. It will be less than 11 as it is negative.

*i.e.*,  $11 \times -5 = -55$

5. Sum of square of first  $n$  natural numbers is

$$\frac{1}{6}n(n+1)(2n+1) \quad \text{or} \quad \frac{1}{6}(2n^3 + 3n^2 + n)$$

Putting the value of  $n = 10$

We get,  $= \frac{1}{6}[2(10)^3 + 3(10)^2 + 10]$   
 $= \frac{1}{6}[2000 + 300 + 10] = 385$

⇒ **NCERT CORNER** .....

1. (i)  $y - z$       (ii)  $x^2 + y^2$       (iii)  $ab - (a + b)$

2.

S.No.	Expression	Term containing x	Coefficient of x
(i)	$y^2x + y$	$y^2x$	$y^2$
(ii)	$x + y + 2$	$x$	1
(ii)	$1 + y \times xy$	$x$	1
(iv)	$7 + xy^2$	$xy^2$	$y^2$

3. (i) Sum =  $t - 8tz + 3tz - z + z - t$   
 $= t - t - 8tz + 3tz - z + z$   
 $= 0 - 5tz - 0 = -5tz$  (rearranging terms)  
 (ii) Sum =  $5m - 7n + 3n - 4m + 2 + 2m - 3mn - 5$   
 $= 5m + 2m - 4m + 3n - 7n + 2 - 5 - 3mn$   
 (rearranging terms)  
 $= 3m - 4n - 3 - 3mn$



4. The required expression  

$$= (3x^2 - 4y^2 + 5xy + 20)$$

$$- (-x^2 - y^2 + 6xy + 20)$$

$$= 3x^2 - 4y^2 + 5xy + 20 + x^2 + y^2$$

$$- 6xy - 20$$

$$= 3x^2 + x^2 + y^2 - 4y^2 + 5xy - 6xy + 20 - 20$$
(rearranging terms)  

$$= 4x^2 - 3y^2 - xy$$

5. (i)  $x + 7 + 4(x - 5) = x + 7 + 4x - 20$   

$$= x + 4x + 7 - 20$$
(rearranging terms)  

$$= 5x - 13 = 5(2) - 13 = 10 - 13 = -3$$

(ii)  $3(x + 2) + 5x - 7 = 3x + 6 + 5x - 7$   

$$= 3x + 5x + 6 - 7$$
(rearranging terms)  

$$= 8x - 1 = 8(2) - 1$$

$$= 16 - 1 = 15$$

(iii)  $6x + 5(x - 2) = 6x + 5x - 10 = 11x - 10$   

$$= 11(2) - 10 = 22 - 10 = 12$$

(iv)  $4(2x - 1) + 3x + 11 = 8x - 4 + 3x + 11$   

$$= 8x + 3x + 11 - 4$$
(rearranging terms)  

$$= 11x + 7 = 11(2) + 7$$

$$= 22 + 7 = 29$$

6.  $2(a^2 + ab) + 3 - ab = 2a^2 + 2ab + 3 - ab$   

$$= 2a^2 + 2ab - ab + 3$$

$$= 2a^2 + ab + 3$$
(rearranging terms)  

$$= 2(5)^2 + (5)(-3) + 3$$

$$= 50 - 15 + 3 = 50 + 3 - 15$$

$$= 53 - 15 = 38$$

## 6 Simple Equations

### EXERCISE 6.1

1. (a)  $x + 9 = 25$  ( $x = 16$ )  
L.H.S.  $x + 9 = 16 + 9 = 25$  Yes  
(b)  $7x + 5 = 19$  ( $x = 2$ )  
L.H.S.  $7 \times 2 + 5 = 14 + 5 = 19$  Yes  
(c)  $m - 7 = 8$  ( $m = 15$ )  
L.H.S.  $15 - 7 = 8$  Yes  
(d)  $2x - 3 = 4$  ( $x = 5$ )  
L.H.S.  $2 \times 5 - 3 = 10 - 3 = 7$  No

(e)  $\frac{n}{3} = 2$  ( $n = 9$ )

L.H.S.  $\frac{9}{3} = 3$  No

(f)  $3n - 4 = 14$  ( $n = 6$ )

L.H.S.  $3 \times 6 - 4 = 18 - 4 = 14$  Yes

(g)  $4p - 3 = 13$  ( $p = -2$ )

L.H.S.  $4 \times -2 - 3 = -8 - 3 = -11$  No

(h)  $7p + 7 = 8$  ( $p = 1$ )

L.H.S.  $7 \times 1 + 7 = 7 + 7 = 14$  No

2. (a)  $4m - 5 = 7$

Let  $m = 1$   $4 \times 1 - 5 = 4 - 5 = -1$

Let  $m = 2$   $4 \times 2 - 5 = 8 - 5 = 3$

Let  $m = 3$   $4 \times 3 - 5 = 12 - 5 = 7$

So,  $m = 3$

(b)  $5x + 2 = 17$

Let  $x = 1$   $5 \times 1 + 2 = 5 + 2 = 7$

Let  $x = 2$   $5 \times 2 + 2 = 10 + 2 = 12$

Let  $x = 3$   $5 \times 3 + 2 = 15 + 2 = 17$

So,  $x = 3$

(c)  $4l - 3 = 9$

Let  $l = 1$   $4 \times 1 - 3 = 4 - 3 = 1$

Let  $l = 2$   $4 \times 2 - 3 = 8 - 3 = 5$

Let  $l = 3$   $4 \times 3 - 3 = 12 - 3 = 9$

So,  $l = 3$

(d)  $3p - 14 = 4$

Let  $p = 3$   $3 \times 3 - 14 = 9 - 14 = -5$

Let  $p = 5$   $3 \times 5 - 14 = 15 - 14 = 1$

Let  $p = 6$   $3 \times 6 - 14 = 18 - 14 = 4$

So,  $p = 6$

(e)  $\frac{m}{3} = 2$

Let  $m = 3$   $\frac{3}{3} = 1$

Let  $m = 6$   $\frac{6}{3} = 2$

So,  $m = 6$

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

Let  $k = 15$   $\frac{15}{3} - 2 = 5 - 2 = 3$

Let  $k = 18$   $\frac{18}{3} - 2 = 6 - 2 = 4$

Let  $k = 21$   $\frac{21}{3} - 2 = 7 - 2 = 5$

So,  $k = 21$

3-4. Given in answersheet.

5. Let Ranjan's age be  $y$  years, then his father's age  
 $= (4y + 2)$  years

Now,  $4y + 2 = 34$

6. Let Anshu has  $x$  toffees

So Amit has  $3x + 5$

Now,  $3x + 5 = 17$

7. Let oranges in small box be  $m$

So large box has  $6m + 8$

Now,  $6m + 8 = 104$

8. Let lowest marks be  $y$

So, highest marks  $2y + 5$

Now,  $2y + 5 = 85$

9. Let base angle be  $m^\circ$

So vertex angle will be  $(2m)^\circ$

Now,  $2m + m + m = 180^\circ$

**EXERCISE 6.2** .....

1. (a)  $y + 2 = 3 \Rightarrow y + 2 - 2 = 3 - 2 \Rightarrow y = 1$
- (b)  $n - 3 = 8 \Rightarrow n - 3 + 3 = 8 + 3 \Rightarrow n = 11$
- (c)  $l - 2 = -4 \Rightarrow l - 2 + 2 = -4 + 2 \Rightarrow l = -2$
- (d)  $x - 1 = 2 \Rightarrow x - 1 + 1 = 2 + 1 \Rightarrow x = 3$
- (e)  $y + 4 = -4 \Rightarrow y + 4 - 4 = -4 - 4 \Rightarrow y = -8$
- (f)  $n + 3 = -6 \Rightarrow n + 3 - 3 = -6 - 3 \Rightarrow n = -9$
- (g)  $m + 4 = 6 \Rightarrow m + 4 - 4 = 6 - 4 \Rightarrow m = 2$
- (h)  $x + 6 = -6 \Rightarrow x + 6 - 6 = -6 - 6 \Rightarrow x = -12$

2. (a)  $4m = 12 \Rightarrow \frac{4m}{4} = \frac{12}{4} \Rightarrow m = 3$
- (b)  $10p = 80 \Rightarrow \frac{10p}{10} = \frac{80}{10} \Rightarrow p = 8$
- (c)  $9m = 26 \Rightarrow \frac{9m}{9} = \frac{26}{9} \Rightarrow m = \frac{26}{9}$
- (d)  $8y = 36 \Rightarrow \frac{8y}{8} = \frac{36}{8} \Rightarrow y = \frac{9}{2}$
- (e)  $3n = 27 \Rightarrow \frac{3n}{3} = \frac{27}{3} \Rightarrow n = 9$
- (f)  $-3x = 7 \Rightarrow \frac{-3x}{-3} = \frac{7}{-3} \Rightarrow x = \frac{-7}{3}$
- (g)  $4x = 40 \Rightarrow \frac{4x}{4} = \frac{40}{4} \Rightarrow x = 10$
- (h)  $16k = -32 \Rightarrow \frac{16k}{16} = \frac{-32}{16} \Rightarrow k = -2$

3. (a)  $\frac{b}{2} = 3 \Rightarrow \frac{b}{2} \times 2 = 3 \times 2 \Rightarrow b = 6$
- (b)  $\frac{3p}{10} = 6 \Rightarrow \frac{3p}{10} \times 10 = 6 \times 10 \Rightarrow 3p = 60$   
 $\Rightarrow \frac{3p}{3} = \frac{60}{3} \Rightarrow p = 20$

$$(c) \frac{3m}{5} = \frac{4}{9} \Rightarrow \frac{3m}{5} \times 5 = \frac{4}{9} \times 5 \Rightarrow 3m = \frac{20}{9}$$

$$\Rightarrow \frac{3m}{3} = \frac{20}{9} \times \frac{1}{3} \Rightarrow m = \frac{20}{27}$$

$$(d) \frac{p}{4} = 7 \Rightarrow \frac{p}{4} \times 4 = 7 \times 4 \Rightarrow p = 28$$

$$(e) \frac{-p}{3} = 7 \Rightarrow \frac{-p}{3} \times -3 = 7 \times -3 \Rightarrow p = -21$$

$$(f) -6x = \frac{14}{23} \Rightarrow \frac{-6x}{-6} = \frac{14}{23} \times \frac{-1}{6} \Rightarrow x = \frac{-7}{69}$$

$$(g) \frac{z}{3} = \frac{5}{4} \Rightarrow \frac{z}{3} \times 3 = \frac{5}{4} \times 3 \Rightarrow z = \frac{15}{4}$$

$$(h) 2m = \frac{8}{3} \Rightarrow \frac{2m}{2} = \frac{8}{3} \times \frac{1}{2} \Rightarrow m = \frac{4}{3}$$

$$4. (a) \quad 3s + 18 = 0$$

$$3s + 18 - 18 = 0 - 18$$

$$3s = -18$$

$$\frac{3s}{3} = \frac{-18}{3}$$

$$s = -6$$

$$(b) \quad -3p + 8 = -4$$

$$-3p + 8 - 8 = -4 - 8$$

$$-3p = -12$$

$$\frac{-3p}{-3} = \frac{-12}{-3}$$

$$p = 4$$

$$(c) \quad 4s = 0$$

$$\frac{4s}{4} = \frac{0}{4}$$

$$s = 0$$

$$(d) \quad 2q - 6 = 0$$

$$2q - 6 + 6 = 0 + 6$$

$$2q = 6$$

$$\frac{2q}{2} = \frac{6}{2}$$

$$q = 3$$

$$(e) \quad 5m + 6 = 21$$

$$5m + 6 - 6 = 21 - 6$$

$$5m = 15$$

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

$$m = 3$$

$$(f) \quad 9t + 6 = -4$$

$$9t + 6 - 6 = -4 - 6$$

$$9t = -10$$

$$\frac{9t}{9} = \frac{-10}{9}$$

$$t = \frac{-10}{9}$$

(g)  $4m + 8 = 0$   
 $4m + 8 - 8 = 0 - 8$   
 $4m = -8$   
 $\frac{4m}{4} = \frac{-8}{4}$   
 $m = -2$

(h)  $7t + 5 = 0$   
 $7t + 5 - 5 = 0 - 5$   
 $7t = -5$   
 $\frac{7t}{7} = \frac{-5}{7}$   
 $t = \frac{-5}{7}$

### EXERCISE 6.3

1. (a)  $3x - 5 = 4$   
 $3x = 4 + 5 = 9$   
 $x = \frac{9}{3} = 3$

(b)  $5t + 28 = 10$   
 $5t = 10 - 28$   
 $5t = -18$   
 $t = \frac{-18}{5}$

(c)  $5x - 3 = 17$   
 $5x = 17 + 3 = 20$   
 $x = \frac{20}{5} = 4$

(d)  $3(n - 5) = -21$   
 $n - 5 = \frac{-21}{3} = -7$   
 $n = -7 + 5$   
 $n = -2$

(e)  $6m + 10 = -2$   
 $6m = -2 - 10$   
 $6m = -12$   
 $m = \frac{-12}{6} = -2$

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

(g)  $2 + x = -2$   
 $x = -2 - 2 = -4$   
 $4 = 5(p - 2)$   
 $4 = 5p - 10$

$4 + 10 = 5p$   
 $p = \frac{14}{5}$

(h)  $2(x - 3) = 13$   
 $2x - 6 = 13$   
 $2x = 13 + 6 = 19$   
 $x = \frac{19}{2}$

(i)  $16 + 4(m - 6) = 0$   
 $4(m - 6) = -16$   
 $m - 6 = \frac{-16}{4}$   
 $m - 6 = -4$   
 $m = -4 + 6 = 2$

(j)  $4(2 - x) = 8$   
 $2 - x = \frac{8}{4}$   
 $2 - x = 2$   
 $-x = 2 - 2 = 0$   
 $x = 0$

(k)  $\frac{2m + 5}{3} = 3m - 10$   
 $2m + 5 = 9m - 30$   
 $2m - 9m = -30 - 5$   
 $-7m = -35$   
 $m = \frac{-35}{-7} = 5$

(l)  $\frac{n + 2}{n - 2} = \frac{7}{3}$   
 $3(n + 2) = 7(n - 2)$   
 $3n + 6 = 7n - 14$   
 $3n - 7n = -14 - 6$   
 $-4n = -20$   
 $n = \frac{-20}{-4} = 5$

(m)  $\frac{3p - 1}{5} - \frac{p}{7} = 3$   
 $\frac{7(3p - 1) - 5p}{35} = 3$   
 $21p - 7 - 5p = 105$

$$16p = 105 + 7$$

$$16p = 112$$

$$p = \frac{112}{16} = 7$$

(n)  $2(m-2) + 3(4m-1) = 0$

$$2m - 4 + 12m - 3 = 0$$

$$14m - 7 = 0$$

$$14m = 7$$

$$m = \frac{7}{14} = \frac{1}{2}$$

(o)  $\frac{2n-1}{3} - \frac{6n-2}{5} = \frac{1}{3}$

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

$$10n - 5 - 18n + 6 = \frac{15}{3}$$

$$-8n + 1 = 5$$

$$-8n = 5 - 1$$

$$-8n = 4$$

$$n = \frac{4}{-8} = -\frac{1}{2}$$

(p)  $\frac{2}{7}(l-9) + \frac{l}{3} = 3$

$$\frac{6(l-9) + 7l}{21} = 3$$

$$6l - 54 + 7l = 63$$

$$13l = 63 + 54$$

$$13l = 117$$

$$l = \frac{117}{13} = 9$$

(q)  $15m + 3m - 3 = 21 + 5m - 2m$

$$18m - 3 = 21 + 3m$$

$$18m - 3m = 21 + 3$$

$$15m = 24$$

$$m = \frac{24}{15} = \frac{8}{5}$$

(r)  $\frac{y-1}{3} = 1 + \frac{y-2}{4}$

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

$$4(y-1) = 3(y+2)$$

$$4y - 4 = 3y + 6$$

$$y = 10$$

(s)  $0.5x + \frac{x}{3} = 5$

$$\frac{1.5x + x}{3} = 5$$

$$2.5x = 15$$

$$x = \frac{15}{2.5} \times 10 = 6$$

(t)  $0.5(x-3) = 0.6(x+3)$

$$0.5x - 1.5 = 0.6x + 1.8$$

$$0.5x - 0.6x = 1.8 + 1.5$$

$$-0.1x = 3.3$$

$$x = \frac{3.3}{-0.1} = -33$$

### EXERCISE 6.4

1. Let the number be  $x$ ,

Then  $2x + 5 = 13$

$$2x = 13 - 5$$

$$2x = 8$$

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

2. Let the number be  $x$

$$3x - 18 = 6$$

$$3x = 6 + 18$$

$$3x = 24$$

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

3. Let the number be  $x$

$$2x - 9 = 15$$

$$2x = 15 + 9$$

$$2x = 24$$

$$x = \frac{24}{2} = 12$$

4. Let the number be  $x$

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

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

$$x = 3 \times 3$$

$$x = 9$$

5. Let the numbers be  $x$  and  $x + 5$

Then  $x + (x + 5) = 55$

$$2x = 55 - 5$$

$$2x = 50$$

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

So numbers are 25 and 30.

6. Let consecutive natural numbers be  $x, x + 1$

So,  $x + x + 1 = 87$

$$2x = 87 - 1$$

$$2x = 86$$

$$x = \frac{86}{2} = 43$$

So, numbers are 43 and 44.

7. Let cost of a note-book be ₹  $x$

So cost of pen is ₹  $(x + 4)$

$$\begin{aligned} \text{Then, } 4(x + 4) + 6x &= 106 \\ 4x + 16 + 6x &= 106 \end{aligned}$$

$$10x = 106 - 16$$

$$x = \frac{90}{10} = 9$$

So cost of note book is ₹ 9 and that of pen is ₹ 13.

8. Let cost of chair be ₹  $x$

So cost of table is ₹  $(x + 60)$

$$\begin{aligned} \text{Then } 5(x + 60) + 4x &= 1560 \\ 5x + 300 + 4x &= 1560 \end{aligned}$$

$$9x = 1560 - 300$$

$$9x = 1260$$

$$x = \frac{1260}{9} = 140$$

So cost of chair is ₹ 140 and that of table is ₹ 200.

9. Let age of her brother be  $x$

So age of Rama is  $(x + 10)$  years

$$\text{Then, } (x + 10) + x = 40$$

$$2x = 40 - 10$$

$$2x = 30$$

$$x = \frac{30}{2} = 15$$

So age of Rama is 25 years and age of her brother is 15 years.

10. Let Pooja's age be  $x$  years

Then her father's age will be  $(3x + 4)$  years

$$\text{Now, } 3x + 4 = 49$$

$$3x = 49 - 4$$

$$x = \frac{45}{3}$$

$$x = 15$$

So Pooja's age is 15 years.

11. Let Tanu has marbles be  $x$

Then Manu has  $6x + 9$

$$\text{Now, } 6x + 9 = 45$$

$$6x = 45 - 9$$

$$6x = 36$$

$$x = \frac{36}{6}$$

$$x = 6$$

So, Tanu has 6 marbles.

12. Let Anshu has toffees be  $x$

Then Amit has =  $3x + 5$

$$\text{Now, } 3x + 5 = 17$$

$$3x = 17 - 5$$

$$3x = 12$$

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

So, Tanu has 4 toffees.

13. Let lowest marks be  $x$

then highest marks will be  $(2x + 5)$

$$\text{Now, } 2x + 5 = 85$$

$$2x = 85 - 5$$

$$2x = 80$$

$$x = \frac{80}{2} = 40$$

So, lowest marks are 40.

14. Let breadth be  $x$  m

then length will be  $(2x)$  m

$$\text{Perimeter} = 300$$

$$2(l + b) = 300$$

$$2(2x + x) = 300$$

$$2 \times 3x = 300$$

$$6x = 300$$

$$x = \frac{300}{6} = 50$$

So length is 100 m and breadth is 50 m

15. Let denominator be  $x$

then numerator is  $x - 9$

Fraction becomes  $\frac{x - 9}{x}$

$$\text{Now, } \frac{(x - 9) - 2}{x - 2} = \frac{2}{5}$$

$$5(x - 11) = 2(x - 2)$$

$$5x - 55 = 2x - 4$$

$$5x - 2x = -4 + 55$$

$$3x = 51$$

$$x = \frac{51}{3} = 17$$

So denominator is 17 and numerator is

$$17 - 9 = 8$$

So fraction is  $\frac{8}{17}$

16. Let numerator be  $x$

then denominator is  $(x + 4)$

So, fraction is  $\frac{x}{x + 4}$

Now,

$$\frac{x+1}{x+4-2} = \frac{24}{25}$$

$$\frac{x+1}{x+2} = \frac{24}{25}$$

$$25x + 25 = 24x + 48$$

$$25x - 24x = 48 - 25$$

$$x = 23$$

So fraction is  $\frac{23}{27}$ .

### ⇒ HOTS .....

1. Given in answersheet.

2. Let the number be  $x$ .

So, as per given condition

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

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

$$\Rightarrow x = 9$$

∴ The required number is 9.

3. Let the consumption of rice =  $x$  kg

Then, the consumption of wheat =  $4 \times x$  kg

Total consumption = 80 kg

$$x \text{ kg} + 4x \text{ kg} = 80 \text{ kg}$$

$$5x = 80$$

On dividing both sides by 5, we get

$$\frac{5x}{5} = \frac{80}{5}$$

$$x = 16$$

∴ Consumption of rice =  $x$  kg = 16 kg  
and consumption of wheat =  $4x$  kg =  $4 \times 16$  kg  
= 64 kg

4. Given, number of prizes = 30

Total prize money = ₹ 52,000

and 1st and 2nd prizes are worth ₹ 2000 and ₹ 1000 respectively.

(a) If 1st prizes are  $x$  in number, the number of 2nd prizes are  $30 - x$ , because total number of prizes are 30.

(b) The total value of prizes in terms of  $x$  are

$$2000x + 1000(30 - x)$$

(c) The equation formed is  $1000x + 30000 = 52000$

From (b)

$$2000x + 1000(30 - x) = 52000$$

$$2000x + 30000 - 1000x = 52000$$

$$1000x + 30000 = 52000$$

(d) The solution of the equation is 22.

From (c)

$$1000x + 30000 = 52000$$

$$1000x = 52000 - 30000$$

$$1000x = 22000$$

$$x = \frac{22000}{1000} = 22$$

(e) The number of 1st prizes are 22 and the number of 2nd prizes are 8.

From (b)

$$2000x + 1000(30 - x) = 52000$$

$$2x + 30 - x = 52$$

[1000 divide both sides]

$$x + 30 = 52$$

$$x = 52 - 30 = 22$$

Number of 2nd prizes =  $30 - 22 = 8$ .

5. Since, one side is represented by  $18x - 20$  and the adjacent side is represented by  $42 - 13x$  because in square all sides are equal.

$$\therefore 18x - 20 = 42 - 13x$$

On transposing  $(-13x)$  from RHS to LHS, we get

$$18x - 20 + 13x = 42$$

$$31x - 20 = 42$$

On adding 20 to both sides, we get

$$31x - 20 + 20 = 42 + 20$$

$$31x = 62$$

On dividing both sides by 31, we get

$$\frac{31x}{31} = \frac{62}{31} \Rightarrow x = 2$$

$$\text{Side} = 18x - 20 = 18 \times 2 - 20 = 36 - 20 = 16$$

Hence, the side of the square is 16.

### ⇒ NCERT CORNER .....

- (i) If you add 4 to  $p$ , you get 15.  
(ii) If you take away 7 from  $m$ , you get 3.  
(iii) Two times  $m$  is 7.  
(iv) The number  $m$  divided by 5 gives 3.

2. (i)  $3l = 42$

Dividing both sides of the given equation by 3.

$$\text{We obtain } \frac{3l}{3} = \frac{42}{3}$$

∴  $l = 14$ . It is the required solution.

(ii)  $\frac{b}{2} = 6$

Multiplying both sides of the given equation by 2.

We obtain  $\frac{b}{2} \times 2 = 6 \times 2$

$\therefore b = 12$ . It is the required solution.

(iii)  $\frac{a}{5} = \frac{7}{15}$

Multiplying both sides of the given equation by 5.

We obtain  $\frac{a}{5} \times 5 = \frac{7}{15} \times 5$

$\therefore a = \frac{7}{3}$ . It is the required solution.

(iv)  $20t = -10$

Dividing both sides of the given equation by 20.

We obtain  $\frac{20t}{20} = \frac{-10}{20}$

$\therefore t = \frac{-1}{2}$ . It is the required solution.

3. (i)  $10p = 100$

Dividing both sides of the given equation by 10.

We obtain  $\frac{10p}{10} = \frac{100}{10} \Rightarrow p = 10$

Thus, it is the required solution.

(ii)  $10p + 10 = 100$

Subtracting 10 from both sides of the given equation.

We obtain  $10p + 10 - 10 = 100 - 10$   
 $10p = 90 \quad \dots(i)$

Now, dividing both sides of the eq. (i) by 10.

We obtain  $\frac{10p}{10} = \frac{90}{10} \Rightarrow p = 9$

Thus, it is the required solution.

(iii)  $\frac{p}{4} = 5$

Multiplying both sides of the given equation by 4.

We obtain  $\frac{p}{4} \times 4 = 5 \times 4 \Rightarrow p = 20$

Thus, it is the required solution.

(iv)  $\frac{-p}{3} = 5$

Multiplying both sides of the given equation by  $(-3)$ .

We obtain  $\frac{-p}{3} \times (-3) = 5 \times (-3)$

$\Rightarrow p = -15$

Thus, it is the required solution.

4. (a) (i)  $x = 2$

Multiplying both sides by 5,  $5x = 10$

Subtracting 3 from both sides,

$5x - 3 = 10 - 3 \Rightarrow 5x - 3 = 7$

(ii)  $x = 2$

Multiplying both sides by 7,  $7x = 14$

Adding 6 to both sides,

$7x + 6 = 14 + 6 \Rightarrow 7x + 6 = 20$

(iii)  $x = 2$

Dividing both sides by 4,  $\frac{x}{4} = \frac{1}{2}$

Subtracting 5 from both sides,

$\frac{x}{4} - 5 = \frac{1}{2} - 5 \Rightarrow \frac{x}{4} - 5 = \frac{1-10}{2}$

$\Rightarrow \frac{x}{4} - 5 = \frac{-9}{2}$

(b) (i)  $x = -2$

Subtracting 2 from both sides,

$x - 2 = -2 - 2 \Rightarrow x - 2 = -4$

(ii)  $x = -2$

Multiplying both sides by 8,  $8x = -16$

Adding 10 to both sides,

$8x + 10 = -16 + 10 \Rightarrow 8x + 10 = -6$

(iii)  $x = -2$

Dividing both sides by 2,  $\frac{x}{2} = -1$

Adding 5 to both sides,

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

## 7

## Lines and Angles

### EXERCISE 7.1

1. Given in answersheet.

2. Given in answersheet.

3.  $\angle AOC + \angle BOC = 180^\circ$  (L.P.)  
 $115^\circ + \angle BOC = 180^\circ$   
 $\angle BOC = 180^\circ - 115^\circ$   
 $\angle BOC = 65^\circ$

4.  $\angle POR + \angle ROS + \angle SOQ = 180^\circ$  (L.P.)  
 $\Rightarrow 45^\circ + \angle ROS + 52^\circ = 180^\circ$   
 $\angle ROS = 180^\circ - 97^\circ$   
 $\angle ROS = 83^\circ$

5.  $\angle y = 105^\circ$  (V.O.A)

$x + 105^\circ = 180^\circ$  (L.P.)  
 $x = 180^\circ - 105^\circ = 75^\circ$   
 $\angle z = \angle x = 75^\circ$

6.  $\angle z = 110^\circ$  (V.O.A.)

$$110^\circ + y = 180^\circ \text{ (L.P.)}$$

$$y = 180^\circ - 110^\circ = 70^\circ$$

$$x + 40^\circ = y \quad \text{(V.O.A.)}$$

$$x + 40^\circ = 70^\circ$$

$$x = 70^\circ - 40^\circ = 30^\circ$$

7.  $\angle POS + \angle ROS = 180^\circ$  (L.P.)

$$5x + 28 + 4x - 10 = 180$$

$$9x + 18 = 180$$

$$9x = 180 - 18$$

$$9x = 162$$

$$x = \frac{162}{9} = 18^\circ$$

$$\therefore \angle POS = 5 \times 18 + 28 = 90 + 28 = 118^\circ$$

$$\angle ROS = 4 \times 18 - 10 = 72 - 10 = 62^\circ$$

8.  $\angle POS + \angle SOQ = 180^\circ$  (L.P.)

$$(2x - 5) + (3x + 15) = 180^\circ$$

$$5x + 10 = 180$$

$$5x = 180 - 10$$

$$5x = 170$$

$$x = \frac{170}{5} = 34$$

$$\angle POS = 2 \times 34 - 5 = 68 - 5 = 63^\circ$$

$$\angle SOQ = 3 \times 34 + 15$$

$$= 102 + 15 = 117^\circ$$

9.  $\angle AOE + \angle DOE + \angle DOC + \angle COB + \angle AOB = 360^\circ$

$$\angle AOE + 120^\circ + 90^\circ + 50^\circ + 40^\circ = 360^\circ$$

$$\angle AOE + 300^\circ = 360^\circ$$

$$\angle AOE = 360^\circ - 300^\circ$$

$$\angle AOE = 60^\circ$$

10. Given in answersheet.

**EXERCISE 7.2** .....

1. Given in answersheet.

2. Since the sum of complementary angles is  $90^\circ$ . So,

- (a) Complement of  $70^\circ = 90^\circ - 70^\circ = 20^\circ$
- (b) Complement of  $80^\circ = 90^\circ - 80^\circ = 10^\circ$
- (c) Complement of  $55^\circ = 90^\circ - 55^\circ = 35^\circ$
- (d) Complement of  $25^\circ = 90^\circ - 25^\circ = 65^\circ$
- (e) Complement of  $85^\circ = 90^\circ - 85^\circ = 5^\circ$
- (f) Complement of  $18^\circ = 90^\circ - 18^\circ = 72^\circ$
- (g) Complement of  $43^\circ = 90^\circ - 43^\circ = 47^\circ$
- (h) Complement of  $64^\circ = 90^\circ - 64^\circ = 26^\circ$
- (i) Complement of  $59^\circ = 90^\circ - 59^\circ = 31^\circ$
- (j) Complement of  $x^\circ = 90^\circ - x^\circ = 90^\circ - x^\circ$

3. Since the sum of supplementary angles is  $180^\circ$ . So,

- (a) Supplement of  $135^\circ = 180^\circ - 135^\circ = 45^\circ$
- (b) Supplement of  $90^\circ = 180^\circ - 90^\circ = 90^\circ$
- (c) Supplement of  $145^\circ = 180^\circ - 145^\circ = 35^\circ$
- (d) Supplement of  $108^\circ = 180^\circ - 108^\circ = 72^\circ$
- (e) Supplement of  $168^\circ = 180^\circ - 168^\circ = 12^\circ$
- (f) Supplement of  $175^\circ = 180^\circ - 175^\circ = 5^\circ$
- (g) Supplement of  $69^\circ = 180^\circ - 69^\circ = 111^\circ$
- (h) Supplement of  $75^\circ = 180^\circ - 75^\circ = 105^\circ$
- (i) Supplement of  $153^\circ = 180^\circ - 153^\circ = 27^\circ$
- (j) Supplement of  $y^\circ = 180^\circ - y^\circ = 180^\circ - y^\circ$

4. Let angle be  $x^\circ$

Then its supplement will be  $x^\circ$

So,  $x^\circ + x^\circ = 180^\circ$

$$2x^\circ = 180^\circ$$

$$x^\circ = \frac{180^\circ}{2} = 90^\circ$$

So angle is  $90^\circ$ .

5. Let complement of an angle be  $x^\circ$

Then angle will be  $\left(\frac{x}{3}\right)^\circ$

So,  $\frac{x}{3} + x = 90$

$$\frac{x + 3x}{3} = 90$$

$$4x = 90 \times 3$$

$$x = \frac{270}{4} = 67.5^\circ$$

So angle is  $\frac{67.5}{3} = 22.5^\circ$

6. Let supplement of an angle be  $x^\circ$

Then angle will be  $\left(\frac{x}{4}\right)^\circ$

So,  $\frac{x}{4} + x = 180$

$$\frac{5x}{4} = 180$$

$$x = \frac{180 \times 4}{5} = 144^\circ$$

So supplement is  $144^\circ$ .

7. Let one angle be  $x^\circ$

Then other will be  $(x + 36)^\circ$

So,  $x + x + 36 = 180$

$$2x = 180 - 36$$

$$2x = 144$$



$$x = \frac{144}{2}$$

$$x = 72^\circ$$

So one angle is  $72^\circ$  and other is  $108^\circ$ .

8. Given in answersheet.  
 9. Given in answersheet  
 10. Given in answersheet.

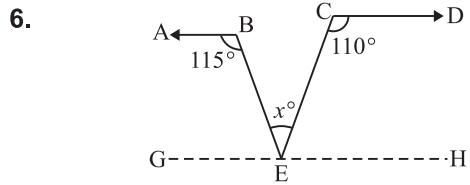
**EXERCISE 7.3**

1. (a)  $(\angle 4, \angle 8), (\angle 3, \angle 7)$   
 $(\angle 1, \angle 5)$  and  $(\angle 2, \angle 6)$   
 (b)  $(\angle 3, \angle 5)$  and  $(\angle 2, \angle 8)$   
 (c)  $(\angle 1, \angle 3)$  and  $(\angle 2, \angle 4)$   
 $(\angle 5, \angle 7)$  and  $(\angle 6, \angle 8)$
2.  $\angle 1 + \angle 2 = 180^\circ$  L.P.  
 $70^\circ + \angle 2 = 180^\circ$   
 $\angle 2 = 180^\circ - 70^\circ$   
 $\angle 2 = 180^\circ - 70^\circ = 110^\circ$   
 $\angle 4 = \angle 2 = 110^\circ$  (V.O.A.)  
 $\angle 3 = \angle 1 = 70^\circ$  (V.O.A.)  
 $\angle 5 = \angle 1 = 70^\circ$  (C.P.A.)  
 $\angle 7 = \angle 5 = 70^\circ$  (V.O.A.)  
 $\angle 6 = \angle 2 = 110^\circ$  (C.P.A.)  
 $\angle 8 = \angle 6 = 110^\circ$  (V.O.A.)

3.  $\angle z + 120^\circ = 180^\circ$  (co-interior angles)  
 $\Rightarrow \angle z = 180^\circ - 120^\circ = 60^\circ$   
 $\angle y = \angle z = 60^\circ$  (V.O.A.)  
 $\angle x = 100^\circ$  (C.P.A.)

4.  $x = 80^\circ$  (C.P.A.)  
 $z + 80^\circ = 180^\circ$   
 $z = 180^\circ - 80^\circ = 100^\circ$   
 $\angle y = 100^\circ$

5.  $x^\circ + 60^\circ = 180^\circ$   
 $x^\circ = 180^\circ - 60^\circ = 120^\circ$   
 $y^\circ = 60^\circ$  (C.P.A.)



$$\angle ABE + \angle BEG = 180^\circ \text{ (co-int.)}$$

$$115^\circ + \angle BEG = 180^\circ$$

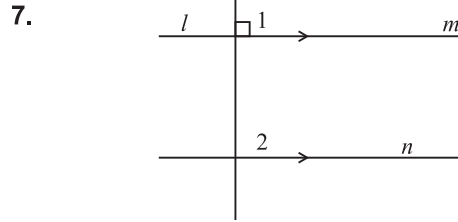
$$\angle BEG = 180^\circ - 115^\circ = 65^\circ$$

$$\angle DCE + \angle CEH = 180^\circ$$

$$110^\circ + \angle CEH = 180^\circ$$

$$\angle CEH = 180^\circ - 110^\circ = 70^\circ$$

Now,  $\angle BEG + x^\circ + \angle CEH = 180^\circ$  (L.P.)  
 $65^\circ + x^\circ + 70^\circ = 180^\circ$   
 $x^\circ + 135^\circ = 180^\circ$   
 $x^\circ = 180^\circ - 135^\circ = 45^\circ$



Let  $m \parallel n$   
 and  $l \perp m$   
 Now  $\angle 1 = \angle 2$  (C.P.A.)  
 So  $\angle 2 = 90^\circ$   
 Hence,  $l$  also perpendicular to  $n$ .

8.  $\angle BAC + \angle ACD = 180^\circ$   
 $110^\circ + \angle ACE = 180^\circ$   
 $\angle ACE = 180^\circ - 110^\circ = 70^\circ$   
 $\angle FEC + \angle ECD = 180^\circ$   
 $120^\circ + \angle ECD = 180^\circ$   
 $\angle ECD = 180^\circ - 120^\circ = 60^\circ$   
 Now,  $\angle ACE = \angle ACD + \angle FEC$   
 $\angle ACE = 70^\circ + 60^\circ = 130^\circ$

9. (a)  $110^\circ + 70^\circ = 180^\circ$   
 So,  $m \parallel n$   
 (b)  $100^\circ + 90^\circ = 200^\circ \neq 180^\circ$   
 So,  $m$  is not parallel to  $n$ .  
 (c)  $90^\circ + 80^\circ = 170^\circ \neq 180^\circ$   
 So,  $m$  is not parallel to  $n$   
 (d)  $78^\circ + 102^\circ = 180^\circ$   
 So,  $m \parallel n$

10.  $\angle FEC + \angle ECD = 180^\circ$   
 $140^\circ + \angle ECD = 180^\circ$   
 $\angle ECD = 180^\circ - 140^\circ = 40^\circ$   
 So,  $\angle BCD = \angle BCE + \angle ECD$   
 $= 10^\circ + 40^\circ = 50^\circ$   
 But  $\angle ABC = 50^\circ$   
 So,  $\angle ABC = \angle BCD = 50^\circ$   
 Hence,  $EF \parallel CD$

**HOTS**

1. Given in answersheet.  
 2. Given in answersheet.  
 3. Given,  $\angle 1 = 34^\circ$  [alternate angles]  
 $\angle AEF = 34^\circ$   
 $\therefore \angle FGD = 135^\circ$

$$\therefore \angle 2 + 135^\circ = 180^\circ$$

[Sum of pair of cointerior angles is  $180^\circ$ ]

$$\Rightarrow \angle 2 = 180^\circ - 135^\circ$$

$$\Rightarrow \angle 2 = 45^\circ$$

$$\Rightarrow \angle 1 + \angle 2 = 34^\circ + 45^\circ = 79^\circ$$

$$\text{Reflex of } \angle EFG = 360^\circ - 79^\circ = 281^\circ$$

[Since, reflex angle is less than  $360^\circ$  and more than  $180^\circ$ ]

4. Given  $PQ \parallel RT$ ,  $\angle P = 45^\circ$  and  $\angle Q = 55^\circ$

$PQ \parallel RT$  and  $RQ$  is transversal then

or  $\angle b = 55^\circ$  [Alternate interior angle]

And if  $PQ \parallel RT$  and  $PS$  as transversal

Then,  $\angle P = \angle a$  [Corresponding angle]

or  $\angle a = 45^\circ$

Now,  $\angle a + \angle b = 45^\circ + 55^\circ = 100^\circ$

### NCERT CORNER

1. Given in answersheet.

2. (i)  $\angle 1$  and  $\angle 4$ ;  $\angle 5$  and  $\angle 2 + \angle 3$  are vertically opposite angles.

(ii)  $\angle 4$  and  $\angle 5$ ;  $\angle 5$  and  $\angle 1$  are linear pairs.

3. Given in answersheet.

4. Given in answersheet.

5. (i)  $\angle x = 180^\circ - 110^\circ = 70^\circ$

[Supplementary angles]

(ii)  $\angle x = 60^\circ$

[Interior opposite angles]

(iii)  $\angle x = 100^\circ$

[Corresponding angles]

## 8 The Triangle and its Properties

### EXERCISE 8.1

1. (a)  $\angle A + \angle B + \angle C = 180^\circ$

$$x + 120^\circ + 30 = 180$$

$$x = 180 - 150 = 30^\circ$$

(b)  $\angle P + \angle Q + \angle R = 180^\circ$

$$40^\circ + 2x + 2x = 180^\circ$$

$$4x = 180^\circ - 40^\circ$$

$$4x = 140^\circ$$

$$x = \frac{140}{4} = 35^\circ$$

So,  $\angle Q$  and  $\angle R = 2x = 2 \times 35 = 70^\circ$  each.

(c)  $\angle A + \angle B + \angle C = 180^\circ$

$$x + 90^\circ + x = 180^\circ$$

$$2x = 90^\circ$$

$$x = \frac{90}{2} = 45^\circ$$

(d)  $\angle M + \angle N + \angle S = 180^\circ$

$$2x + 90 + x = 180$$

$$3x = 180 - 90$$

$$3x = 90$$

$$x = \frac{90}{3} = 30^\circ$$

(e)  $\angle A + \angle B + \angle C = 180^\circ$

$$x + 50 + 50 = 180^\circ$$

$$x = 180 - 100$$

$$x = 80^\circ$$

(f)  $\angle P + \angle Q + \angle R = 180^\circ$

$$x + x + x = 180^\circ$$

$$3x = 180^\circ$$

$$x = \frac{180^\circ}{3} = 60^\circ$$

2. Let measure of equal angle be  $x^\circ$

$$\therefore x^\circ + x^\circ + 80^\circ = 180^\circ$$

$$2x^\circ = 180^\circ - 80^\circ$$

$$2x = 100$$

$$x = 50^\circ$$

3. Let measure of acute angle be  $x^\circ$

$$\text{So } x^\circ + 90^\circ + 62^\circ = 180^\circ$$

$$x + 152^\circ = 180^\circ$$

$$x = 180 - 152 = 28^\circ$$

4. Let base angle be  $x^\circ$

Then vertical angle will be  $(2x)^\circ$

$$x^\circ + x^\circ + 2x = 180^\circ$$

$$4x = 180^\circ$$

$$x = \frac{180}{4} = 45^\circ$$

So angles are  $45^\circ$ ,  $45^\circ$  and  $90^\circ$

5. Ratio of angles =  $3 : 2 : 4$

Sum of ratio =  $3 + 2 + 4 = 9$

$$\text{So Ist angle} = \frac{3}{9} \times 180 = 60^\circ$$

$$\text{2nd angle} = \frac{2}{9} \times 180^\circ = 40^\circ$$

$$\text{3rd angle} = \frac{4}{9} \times 180 = 80^\circ$$

6. Ratio of angles =  $2 : 4 : 4$

Sum of ratio =  $2 + 4 + 4 = 10$

$$\text{So 1st angle} = \frac{2}{10} \times 180 = 36^\circ$$

$$\text{2nd angle} = \frac{4}{10} \times 180^\circ = 72^\circ$$

$$\text{and 3rd angle} = \frac{4}{10} \times 180^\circ = 72^\circ$$

Two angles are equal so it is an isosceles triangle.

7. Let  $3\angle A = 6$   $\angle B = 2$   $\angle C = k$

$$\angle A = \frac{k}{3}$$

$$\angle B = \frac{k}{6}$$

$$\angle C = \frac{k}{2}$$

$$\angle A + \angle B + \angle C = 180^\circ$$

$$\frac{k}{3} + \frac{k}{6} + \frac{k}{2} = 180^\circ$$

$$\frac{2k + k + 3k}{6} = 180^\circ$$

$$\frac{6k}{6} = 180^\circ$$

$$k = 180^\circ$$

So,

$$\angle A = \frac{180}{3} = 60^\circ$$

$$\angle B = \frac{180}{6} = 30^\circ$$

$$\angle C = \frac{180^\circ}{2} = 90^\circ$$

8. Let  $2\angle P = 3\angle Q = 6\angle R = k$

$$\angle P = \frac{k}{2}$$

$$\angle Q = \frac{k}{3}$$

$$\angle R = \frac{k}{6}$$

$$\angle P + \angle Q + \angle R = 180^\circ$$

$$\frac{k}{2} + \frac{k}{3} + \frac{k}{6} = 180^\circ$$

$$\frac{3k + 2k + k}{6} = 180^\circ$$

$$\frac{6k}{6} = 180^\circ$$

$$k = 180^\circ$$

$$\angle P = \frac{180}{2} = 90^\circ$$

$$\angle Q = \frac{180}{3} = 60^\circ$$

$$\angle R = \frac{180}{6} = 30^\circ$$

9.  $PQ = PR$

So,

$$\angle R = \angle Q = 60^\circ$$

$$\angle x = \angle R = 60^\circ \quad (\text{C.P.A.})$$

$$\angle m = \angle Q = 60^\circ \quad (\text{C.P.A.})$$

In  $\triangle PMN$

$$\angle P + \angle M + \angle N = 180^\circ$$

$$y + 60^\circ + 60^\circ = 180^\circ$$

$$y + 120^\circ = 180^\circ$$

$$y = 180^\circ - 120^\circ = 60^\circ$$

10. In  $\triangle ADC$

$$x + 90 + 2x = 180^\circ$$

$$3x = 180^\circ - 90^\circ$$

$$3x = 90^\circ$$

$$x = \frac{90^\circ}{3} = 30^\circ$$

11–12. Given in answersheet.

➔ EXERCISE 8.2

1. (a)  $x + 70^\circ = 120^\circ$  (ext. angle property)

$$x = 120^\circ - 70^\circ = 50^\circ$$

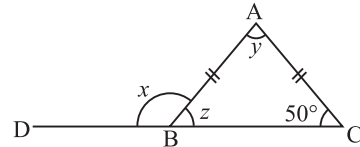
(b)  $\angle y = 65^\circ + 70^\circ$  (ext. angle property)

$$y = 135^\circ$$

$$x + y = 180^\circ$$

$$x = 180^\circ - 135^\circ = 45^\circ$$

(c)



$$AB = AC$$

$$z = 50^\circ$$

So,

$$x + z = 180^\circ$$

$$x + 50^\circ = 180^\circ$$

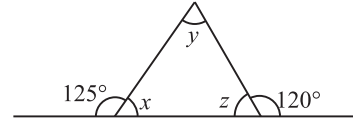
$$x = 180^\circ - 50^\circ = 130^\circ$$

$$y + 50^\circ = x$$
 (ext. angle)

$$y + 50^\circ = 130^\circ$$

$$y = 130^\circ - 50^\circ = 80^\circ$$

(d)



$$x + 125^\circ = 180^\circ$$

$$x = 180^\circ - 125^\circ$$

$$= 55^\circ$$

$$x + y = 120^\circ \quad (\text{ext. angle property})$$

$$55^\circ + y = 120^\circ$$

$$y = 120^\circ - 55^\circ = 65^\circ$$

(e)

$$x = 90^\circ$$

(V.O.A.)

$$x + y + 40^\circ = 180^\circ$$

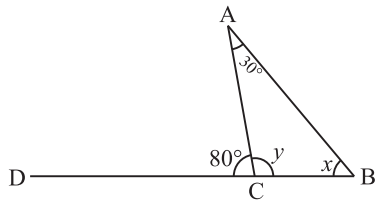
$$90 + y + 40^\circ = 180^\circ$$

$$y + 130^\circ = 180^\circ$$

$$y = 180^\circ - 130^\circ = 50^\circ$$

(f)  $y = 50^\circ$  (side opp. to equal angles)  
 $50 + y = x$  (ext. angle property)  
 $50 + 50 = x$  or  $x = 100^\circ$

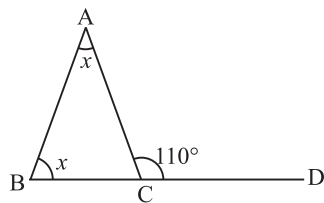
2.



$y + 80^\circ = 180^\circ$   
 $y = 180^\circ - 80^\circ = 100^\circ$   
 $x + 30^\circ = 80^\circ$  (ext. angle property)  
 $x = 80^\circ - 30^\circ = 50^\circ$

One of its angles is obtuse so it is obtuse angled triangle.

3.



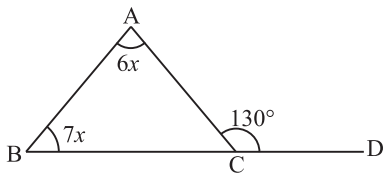
$\angle A + \angle B = \angle ACD$   
 $x + x = 110$   
 $2x = 110$   
 $x = \frac{110}{2} = 55^\circ$

So equal interior opposite angles are of measure  $55^\circ$  each.

$\angle ACB = 180^\circ - 110^\circ = 70^\circ$

It is an acute angled triangle.

4.

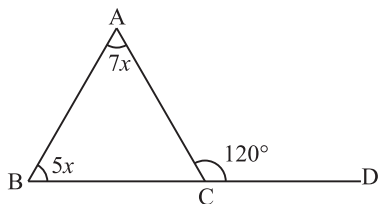


$\angle A + \angle B = \angle ACD$   
 $6x + 7x = 130^\circ$   
 $13x = 130$   
 $x = 10^\circ$

So,

$\angle A = (6 \times 10)^\circ = 60^\circ$   
 $\angle B = (7 \times 10)^\circ = 70^\circ$   
 $\angle C = 180^\circ - 130^\circ = 50^\circ$

5.



$\angle A + \angle B = \angle ACD$

$7x + 5x = 120^\circ$

$12x = 120^\circ$

$x = 10$

So,

$\angle A = (7 \times 10)^\circ = 70^\circ$

$\angle B = (5 \times 10)^\circ = 50^\circ$

$\angle C = 180^\circ - 120^\circ = 60^\circ$

6.  $\angle B + \angle D = 115^\circ$  (ext. angle)

$x + 55^\circ = 115^\circ$

$x = 115^\circ - 55^\circ$

$= 60^\circ$

$\angle ACB = \angle B = 60^\circ$

So,

$y + 60^\circ = 180^\circ$

$y = 180^\circ - 60^\circ = 120^\circ$

7.  $\angle PRS = \angle P + \angle Q$  (ext. angle prop)

$x = 40^\circ + 58^\circ$

$= 98^\circ$

$35^\circ + x + y = 180^\circ$

$35^\circ + 98^\circ + y = 180^\circ$

$y = 180 - 133 = 47^\circ$

8.  $AB = AD$

So

$\angle ADB = \angle ABC = 50^\circ$

$\angle ADC + x^\circ = 180^\circ$  (L.P.)

$50^\circ + x^\circ = 180^\circ$

$x^\circ = 180^\circ - 50^\circ$

$x = 130^\circ$

$y = 25^\circ + 50^\circ$  (ext. angle prop)

$= 75^\circ$

### EXERCISE 8.3

1. (a)  $3 \text{ cm} + 4 \text{ cm} > 5 \text{ cm}$

$7 \text{ cm} > 5 \text{ cm}$

(Yes)

(b)  $6 \text{ cm} + 7 \text{ cm} > 10 \text{ cm}$

$13 \text{ cm} > 10 \text{ cm}$

(Yes)

(c)  $11 \text{ cm} + 15 \text{ cm} > 14$

$26 \text{ cm} > 14$

(Yes)

(d)  $9 \text{ cm} + 10 \text{ cm} > 20 \text{ cm}$

$19 \text{ cm} > 20 \text{ cm}$

(No)

(e)  $5 \text{ cm} + 8 \text{ cm} > 13 \text{ cm}$

$13 \text{ cm} > 13 \text{ cm}$

(No)

(f)  $7 \text{ cm} + 6 \text{ cm} > 12 \text{ cm}$

$13 \text{ cm} > 12 \text{ cm}$

(Yes)

(g)  $10.5 \text{ cm} + 4 \text{ cm} > 15 \text{ cm}$

$14.5 \text{ cm} > 15 \text{ cm}$

(No)

(h)  $8.5 \text{ cm} + 6.2 \text{ cm} > 3.8 \text{ cm}$

$14.7 \text{ cm} > 3.8 \text{ cm}$

(Yes)

2-4. Given in answersheet.

5. The sum of two sides of a triangle is always greater than the third side. So, third side has to be less than the sum of the two sides. The third side is thus less than  $5\text{ cm} + 8\text{ cm} = 13\text{ cm}$ .

The side cannot be less than the difference of two sides. Thus, the third side has to be more than  $8\text{ cm} - 5\text{ cm} = 3\text{ cm}$ .

Hence, the length of the third side will lie between 3 cm and 13 cm.

6. The length of the third side will lie between  $(5.3 - 3.5) = 1.8\text{ cm}$  and  $(5.3 + 3.5) = 8.8\text{ cm}$

**EXERCISE 8.4**

1. (a) By Pythagoras theorem

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

$$y^2 = 100$$

$$y = 10^2 \text{ or } y = 10$$

(b) By Pythagoras theorem

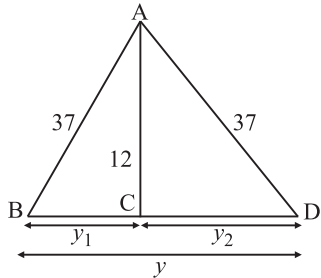
$$13^2 = y^2 + 5^2$$

$$169 = y^2 + 25$$

or  $y^2 = 169 - 25 = 144 = 12^2$

or  $y = 12$

(c)



In  $\triangle ABC$   $AB^2 = AC^2 + y_1^2$

$$37^2 = 12^2 + y_1^2$$

$$1369 = 144 + y_1^2$$

or  $y_1^2 = 1369 - 144$

$$= 1225 = (35)^2$$

$$y_1 = 35$$

So,  $y_2 = y_1 = 35$

So,  $y = y_1 + y_2 = 35 + 35 = 70$

2. (a)  $8^2 = 8 \times 8 = 64$

$$15^2 = 15 \times 15 = 225$$

$$17^2 = 17 \times 17 = 289$$

Now,  $64 + 225 = 289$  (Yes)

(b)  $12^2 = 12 \times 12 = 144$

$$15^2 = 15 \times 15 = 225$$

$$17^2 = 17 \times 17 = 289$$

Now,  $144 + 225 = 369 \neq 289$  (No)

(c)  $6^2 = 6 \times 6 = 36$

$$11^2 = 11 \times 11 = 121$$

$$15^2 = 15 \times 15 = 225$$

Now,  $36 + 121 = 157 \neq 225$  (No)

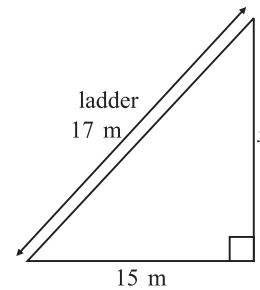
(d)  $5^2 = 5 \times 5 = 25$

$$24^2 = 24 \times 24 = 576$$

$$25^2 = 25 \times 25 = 625$$

Now,  $25 + 576 = 601 \neq 625$  (No)

3.



By Pythagoras theorem

$$17^2 = x^2 + 15^2$$

$$289 = x^2 + 225$$

$$x^2 = 289 - 225$$

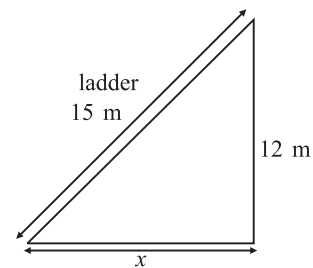
$$x^2 = 64$$

$$x = 8^2$$

or  $x = 8$

So ladder will reach upto 8 m on the wall.

4.



By Pythagoras theorem

$$15^2 = 12^2 + x^2$$

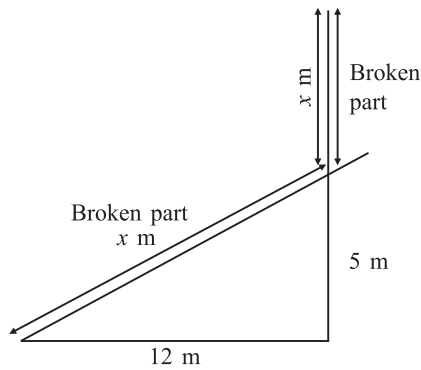
$$225 = 144 + x^2$$

$$x^2 = 225 - 144$$

$$= 81 = 9^2$$

or  $x = 9\text{ m}$

5.



By Pythagoras theorem

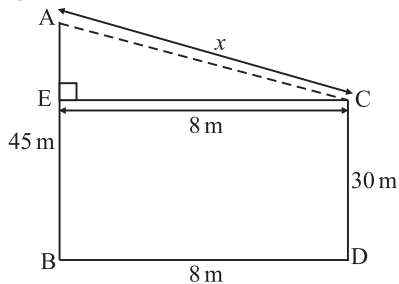
$$x^2 = 5^2 + 12^2 = 25 + 144 = 169$$

$$x^2 = 13^2$$

or  $x = 13$  m

So, height of the tree before broken =  $5 + 13 = 18$  m

6.



$$AE = 45 - 30 = 15 \text{ m}$$

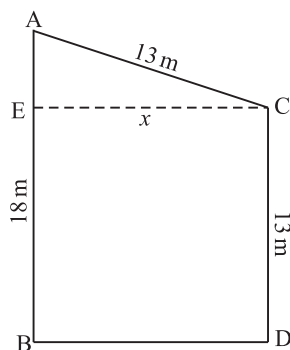
$$AC^2 = AE^2 + EC^2$$

$$= 15^2 + 8^2 = 225 + 64 = 289 = 17^2$$

or

$$AC = 17 \text{ m}$$

7.



$$AE = AB - BE = 18 - 13 = 5 \text{ m}$$

By Pythagoras theorem

$$AC^2 = AE^2 + EC^2$$

$$13^2 = 5^2 + x^2$$

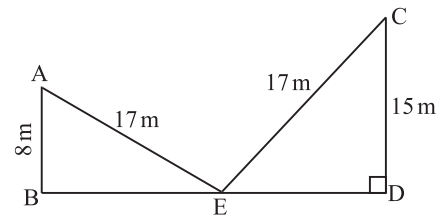
$$169 = 25 + x^2$$

$$169 - 25 = x^2$$

$$x^2 = 144$$

$$x^2 = 12^2 \quad \text{or} \quad x = 12 \text{ m}$$

8.



In  $\triangle ABE$ , by Pythagoras theorem

$$AE^2 = AB^2 + BE^2$$

$$17^2 = 8^2 + BE^2$$

$$BE^2 = 289 - 64$$

$$BE^2 = 225$$

$$BE = 15 \text{ m}$$

or

$$\text{In } \triangle CED \quad CE^2 = CD^2 + DE^2$$

$$17^2 = 15^2 + DE^2$$

$$289 = 225 + DE^2$$

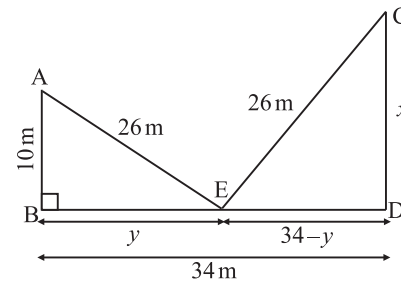
$$DE^2 = 289 - 225 = 64 = 8^2$$

or

$$DE = 8 \text{ m}$$

Width of the street =  $BE + DE = 15 + 8 = 23$  m

9.



In  $\triangle ABE$ , by Pythagoras theorem

$$AE^2 = AB^2 + BE^2$$

$$26^2 = 10^2 + y^2$$

$$676 = 100 + y^2$$

or

$$y^2 = 676 - 100 = 576$$

$$y^2 = 24^2$$

or

$$y = 24 \text{ m}$$

So,  $DE = 34 - 24 = 10$  m

In  $\triangle CDE$ , by Pythagoras theorem

$$CE^2 = CD^2 + DE^2$$

$$26^2 = x^2 + 10^2$$

$$676 = x^2 + 100$$

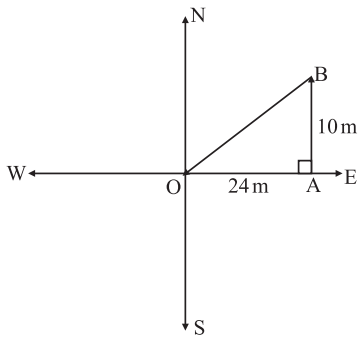
$$676 - 100 = x^2$$

$$x^2 = 576 = (24)^2$$

or

$$x = 24 \text{ m}$$

10.



By Pythagoras theorem

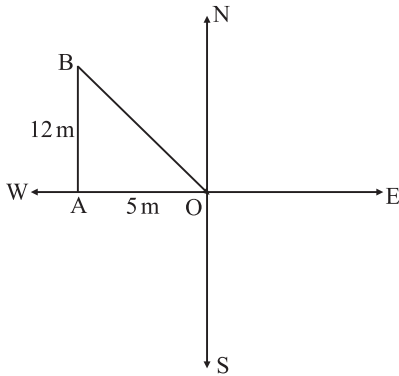
$$OB^2 = OA^2 + AB^2 = 24^2 + 10^2$$

$$= 576 + 100 = 676 = (26)^2$$

or  $OB = 26$  m

So, he is 26 m away from starting point.

11.



By Pythagoras theorem

$$OB^2 = OA^2 + AB^2 = 5^2 + 12^2$$

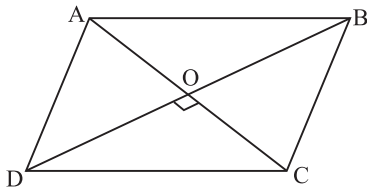
$$= 25 + 144 = 169$$

$$OB^2 = 13^2$$

or  $OB = 13$  m

So, Aman is 13 m away from the starting point.

12.



Let

$$AC = 16 \text{ cm}$$

$$BD = 30 \text{ cm}$$

then

$$OD = \frac{1}{2} BD$$

$$= \frac{1}{2} \times 30 = 15 \text{ cm}$$

and

$$OC = \frac{1}{2} AC = \frac{1}{2} \times 16 = 8 \text{ cm}$$

Diagonals of rhombus bisect each other at right-angle.

So, by Pythagoras theorem

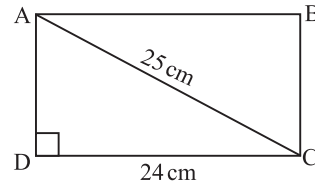
$$DC^2 = OD^2 + OC^2 = 15^2 + 8^2 = 225 + 64 = 289$$

$$DC^2 = 17^2 \text{ or } DC = 17 \text{ cm}$$

So, Perimeter =  $4 \times$  side

$$= 4 \times 17 = 68 \text{ cm}$$

13.



By Pythagoras theorem

$$AC^2 = AD^2 + DC^2$$

$$25^2 = AD^2 + 24^2$$

$$625 = AD^2 + 576$$

$$AD^2 = 625 - 576 = 49 = 7^2$$

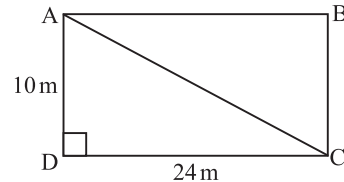
$$AD = 7 \text{ cm}$$

So, perimeter of rectangle

$$ABCD = 2 (DC + AD)$$

$$= 2 (24 + 7) = 2 \times 31 = 62 \text{ cm}$$

14.



By Pythagoras theorem

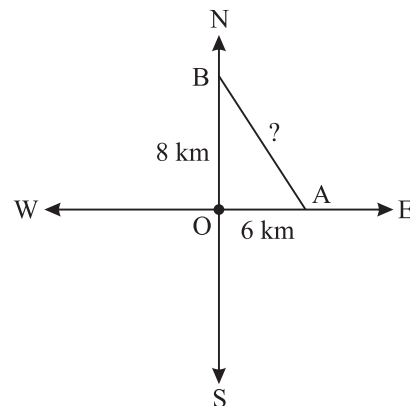
$$AC^2 = AD^2 + DC^2$$

$$= 10^2 + 24^2 = 100 + 576 = 676 = (26)^2$$

or  $AC = 26$  m

### ➤ HOTS .....

- Given in answersheet.
- Here,  $A$  is the starting place and  $B$  is the final destination.



In  $\triangle OAB$ , by using Pythagoras theorem,  
 $(AB)^2 = (OA)^2 + (OB)^2 = (6)^2 + (8)^2 = 100$

By taking square root of both sides,  
 Distance  $(AB) = 10$  km

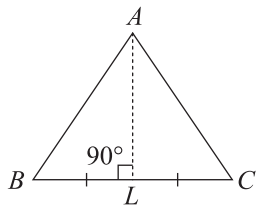
3. In  $\triangle ABC$ ,
- $$\angle A + \angle B + \angle C = 180^\circ$$
- [Since, sum of all the angles of a triangle is  $180^\circ$ ]
- $$z + 30^\circ + 40^\circ = 180^\circ$$
- $$\Rightarrow z + 70^\circ = 180^\circ$$
- $$\Rightarrow \angle z = 180^\circ - 70^\circ = 110^\circ$$
- $$DE \parallel BC$$
- $\therefore \angle ADE = \angle ADB$
- [Since, corresponding angles are equal]
- $$\Rightarrow \angle x = 30^\circ$$
- and  $\angle AED = \angle ACB$
- [Since, corresponding angles are equal]
- $$\Rightarrow \angle y = 40^\circ$$

4. Since,  $\triangle ACD$  is a right angle triangle.  
 Here,  $AC$  is hypotenuse,  $CD$  is perpendicular and  $AD$  is base.  
 According to the Pythagoras theorem,  
 $(AC)^2 = (AD)^2 + (CD)^2$
- $$\Rightarrow (AC)^2 = (30)^2 + (40)^2$$
- $$\Rightarrow (AC)^2 = 900 + 1600$$
- $$\Rightarrow (AC)^2 = 2500$$

By taking square root on both sides,  $AC = 50$  m  
 Now,  $AB = AC - BC = 50 - 12 = 38$  m  
 Hence, the distance between  $AB$  is 38 m.

**NCERT CORNER** .....

1. Isosceles triangle means any two sides are equal.  
 Take  $\triangle ABC$  having  $AB = AC$ . Draw its median  $AL$ .  
 Now, with the help of a protractor, measure the  $\angle ALB$ .  
 We find that  $\angle ALB = 90^\circ$ .  
 $\therefore AL$  is perpendicular to  $BC$ .  
 Thus,  $AL$  is the median and altitude of the given  $\triangle ABC$ .



2. Since, Exterior angle = sum of its two interior opposite angles (By exterior angle property of a triangle).
- (i)  $115^\circ = x + 50^\circ$   
 $\Rightarrow 115^\circ - 50^\circ = x$  or  $\angle x = 65^\circ$

(ii)  $125^\circ = x + 90^\circ$   
 $\Rightarrow 125^\circ - 90^\circ = x$  or  $\angle x = 35^\circ$

(iii)  $75^\circ = x + 35^\circ$   
 $\Rightarrow 75^\circ - 35^\circ = x$  or  $\angle x = 40^\circ$

3. (i) In  $\triangle PQR$ ,  
 $\angle QPR + \angle PRQ + \angle RQP = 180^\circ$   
 (By angle sum property of a triangle)  
 $\Rightarrow 90^\circ + x + 30^\circ = 180^\circ$   
 $\Rightarrow x + 120^\circ = 180^\circ$   
 $\Rightarrow \angle x = 180^\circ - 120^\circ = 60^\circ$
- (ii) In  $\triangle XYZ$ ,  
 $\angle YXZ + \angle XZY + \angle ZYX = 180^\circ$   
 (By angle sum property of a triangle)  
 $\Rightarrow 30^\circ + x + 110^\circ = 180^\circ$   
 $\Rightarrow x + 140^\circ = 180^\circ$   
 $\Rightarrow \angle x = 180^\circ - 140^\circ = 40^\circ$
- (iii) In the given triangle,  $x + x + 50^\circ = 180^\circ$  (By angle sum property of a triangle)  
 $\Rightarrow 2x + 50^\circ = 180^\circ$   
 $\Rightarrow 2x = 180^\circ - 50^\circ = 130^\circ$   
 $\Rightarrow \angle x = \frac{130^\circ}{2} = 65^\circ$

**9 Congruence of Triangles**

**EXERCISE 9.1** .....

1. Given in answersheet.  
 2. Do it yourself  
 3-5. Given in answersheet.

**EXERCISE 9.2** .....

1. (a) Corresponding sides :  
 $AB, QR; BC, RS; AC, QS$   
 Corresponding angles :  
 $\angle A, \angle Q; \angle B, \angle R; \angle C, \angle S$
- (b) Corresponding sides :  
 $MN, XY; NS, YZ; MS, XZ$   
 Corresponding angles :  
 $\angle M, \angle X; \angle N, \angle Y; \angle S, \angle Z$
- (c) Corresponding sides :  
 $BC, EF; CD, FG; BD, EG$   
 Corresponding angles :  
 $\angle B, \angle E; \angle C, \angle F; \angle D, \angle G$
- (d) Corresponding sides :  
 $KP, AB; PM, BC; KM, AC$   
 Corresponding angles :  
 $\angle K, \angle A; \angle P, \angle B; \angle M, \angle C$



2. (a) By SSS congruence rule
- (b) By SAS congruence rule
- (c) By SAS congruence rule
- (d) By ASA congruence rule
- (e) By RHS congruence rule
- (f) By SAS congruence rule

3. In  $\Delta PQR$  and  $\Delta PSR$

$$\begin{aligned} PQ &= PS && \text{(given)} \\ QR &= SR && \text{(given)} \\ PR &= PR && \text{(common)} \end{aligned}$$

$$\begin{aligned} \therefore \Delta PQR &\cong \Delta PSR && \text{(by SSS)} \\ \angle QPR &= \angle SPR && \text{(CP.CTC)} \end{aligned}$$

So,  $PR$  bisects  $\angle P$

$$\text{So, } \angle QRP = \angle SRP \quad \text{(CPCTC)}$$

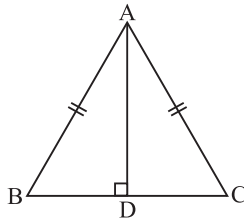
So,  $RP$  bisects  $\angle R$

4. In  $\Delta BAC$  and  $\Delta DCA$

$$\begin{aligned} BA &= DC && \text{(given)} \\ BC &= DA && \text{(given)} \\ AC &= CA && \text{(common)} \end{aligned}$$

$$\begin{aligned} \therefore \Delta BAC &\cong \Delta DCA && \text{(by SSS)} \\ \angle ABC &= \angle CDA && \text{(by CPCTC)} \end{aligned}$$

5.



Draw  $AD \perp BC$

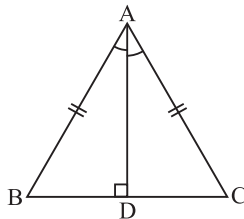
In  $\Delta ADB$  and  $\Delta ADC$

$$\begin{aligned} AB &= AC && \text{(given)} \\ AD &= AD && \text{(common)} \\ \angle ADB &= \angle ADC && \text{(each } 90^\circ) \end{aligned}$$

$$\therefore \Delta ADB \cong \Delta ADC \quad \text{(by RHS)}$$

$$\text{So } \angle B = \angle C \quad \text{(CPCTC)}$$

6.



$$\text{Given } \angle BAD = \angle CAD$$

since  $AD$  bisects  $\angle A$

Now, In  $\Delta BAD$  and  $\Delta CAD$

$$\begin{aligned} AB &= AC && \text{(given)} \\ \angle BAD &= \angle CAD && \text{(given)} \\ AD &= AD && \text{(common)} \end{aligned}$$

$$\begin{aligned} \therefore \Delta BAD &\cong \Delta CAD && \text{(SAS)} \\ BD &= DC && \text{(CPCTC)} \\ \angle ADB &= \angle ADC && \text{(CPCTC)} \end{aligned}$$

$$\text{But } \angle ADB + \angle ADC = 180^\circ$$

$$\therefore \angle ADB = \angle ADC = \frac{180^\circ}{2} = 90^\circ$$

Hence  $AD$  bisects  $BC$  at right angle.

7. In  $\Delta OPQ$  and  $\Delta OSR$

$$\begin{aligned} \angle P &= \angle S \\ \angle POQ &= \angle SOR && \text{(V.O.A.)} \\ OQ &= OR && \text{(given)} \\ \Delta OPQ &\cong \Delta OSR && \text{(by AAS)} \\ \angle OQP &= \angle ORS && \text{(CPCTC)} \end{aligned}$$

8. In  $\Delta ADB$  and  $\Delta ADC$

$$\begin{aligned} BD &= DC && \text{(given)} \\ \angle ADB &= \angle ADC && \text{(given)} \\ AD &= AD && \text{(common)} \\ \therefore \Delta ADB &\cong \Delta ADC && \text{(SAS)} \\ \angle BAD &= \angle CAD && \text{(CPCTC)} \end{aligned}$$

[Note : Instead of  $\angle B = \angle C$  in the book

$\angle ADB = \angle ADC$  are given. It is misprint.]

$$\begin{aligned} 9. \quad PQ &= PR && \text{(given)} \\ \text{and } PN &= PM && \text{(given)} \\ \therefore PQ - PN &= PR - PM \\ QN &= RM \end{aligned}$$

10. In  $\Delta ABC$  and  $\Delta DCB$

$$\begin{aligned} AB &= DC && \text{(given)} \\ \angle A &= \angle D && \text{(each } 90^\circ) \\ BC &= CB && \text{(common)} \\ \therefore \Delta ABC &\cong \Delta DCB && \text{(RHS)} \end{aligned}$$

11. In  $\Delta CBD$  and  $\Delta BCE$

$$\begin{aligned} BD &= CE && \text{(given)} \\ \angle CDB &= \angle BEC && \text{(each } 90^\circ) \\ CB &= BC && \text{(common)} \\ \therefore \Delta CBD &\cong \Delta BCE && \text{(RHS)} \\ \text{So, } \angle DCB &= \angle ECB && \text{(CPCTC)} \end{aligned}$$

### ⇒ HOTS .....

1. Do it yourself.

2. In  $\Delta ABC$

$$\angle A = 80^\circ \quad \text{[By angle sum property of triangle]}$$

Similarly in  $\Delta DCB$

$$\angle D = 80^\circ \quad \text{[By angle sum property of triangle]}$$

Now in  $\triangle ABC$  and  $\triangle DCB$

$$\angle A = \angle D \quad [\text{Proved above}]$$

$$\angle B = \angle C = 70^\circ \quad [\text{Given}]$$

and  $BC = BC \quad [\text{Common}]$

Hence,

(i) Yes,  $\triangle ABC \cong \triangle DCB$  [By AAS congruency]

(ii) Yes,  $AB = DC$  [By CPCT]

(iii) Yes,  $AC = DB$  [By CPCT]

3. (i) In  $\triangle NOM$  and  $\triangle MLN$

(a)  $ON = LM$

(b)  $OM = LN$

(c)  $\angle M = \angle N$  [Both of  $90^\circ$ ]

(ii) Yes,  $\triangle NOM \cong \triangle MLN$  [By SSS congruency]

$$ON = LM \quad [\text{Given}]$$

$$OM = LN \quad [\text{Given}]$$

and  $MN = MN \quad [\text{Common}]$

**NCERT CORNER** .....

1. (i)  $\angle E \leftrightarrow \angle C$ ,

(ii)  $\overline{EF} \leftrightarrow \overline{CA}$

(iii)  $\angle F \leftrightarrow \angle A$

(iv)  $\overline{DF} \leftrightarrow \overline{BA}$

2. Given :  $AC = DF$ ,

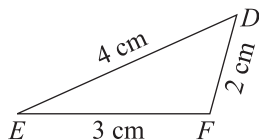
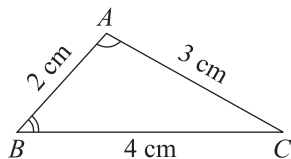
$$AB = DE,$$

$$BC = EF$$

So,  $\triangle ABC \cong \triangle DEF$  [By SSS congruency]

3. No, he is not justified, because  $AAA$  is not a congruence criterion.

4.



In  $\triangle ABC$  and  $\triangle DEF$ ,

$$AB = DF \quad (\text{each } 2 \text{ cm})$$

$$BC = ED \quad (\text{each } 4 \text{ cm})$$

$$CA = EF \quad (\text{each } 3 \text{ cm})$$

$$\angle BAC = \angle EDF$$

$$\angle ABC = \angle DEF$$

But,  $\triangle ABC$  is not congruent to  $\triangle DEF$ .

5. We use,  $BC = RQ$  by ASA congruence criterion.

**10**

**Comparing Quantities**  
(Ratio, Proportion and Unitary Method)

**EXERCISE 10.1** .....

1. (a) 45 paise to ₹ 3 =  $\frac{45}{3 \times 100} = \frac{45}{300} = 3 : 20$

(b) 25 m to 2 km =  $\frac{25}{2 \times 1000} = \frac{25}{2000} = 1 : 80$

(c) 3 litres to 2 kl =  $\frac{3}{2 \times 1000} = \frac{3}{2000} = 3 : 2000$

(d) 3 kg 400 gm to 5 kg =  $\frac{(3 \times 1000 + 400) \text{ gm}}{5 \times 1000 \text{ gm}}$   
 $= \frac{3400}{5000} = \frac{17}{25} = 17 : 25$

(e) 4 months to 1 year =  $\frac{4}{1 \times 12} = \frac{4}{12} = \frac{1}{3} = 1 : 3$

(f) 2 hours 30 minutes to 5 hours  
 $= \frac{(2 \times 60 + 30) \text{ minutes}}{(5 \times 60) \text{ minutes}}$   
 $= \frac{150}{300} = \frac{1}{2} = 1 : 2$

(g) 18 minutes to one hour =  $\frac{18}{1 \times 60} = \frac{18}{60} = 3 : 10$

(h) 75 cm to 4 m =  $\frac{75 \text{ cm}}{(4 \times 100) \text{ cm}} = \frac{75}{400} = 3 : 16$

(i) 1 m 30 cm to 3 m =  $\frac{(1 \times 100 + 30) \text{ cm}}{(3 \times 100) \text{ cm}}$   
 $= \frac{130}{300} = \frac{13}{30} = 13 : 30$

(j) 36 seconds to 2 minutes =  $\frac{36}{2 \times 60} = \frac{36}{120} = 3 : 10$

2. (a) 4 : 7 or 6 : 7

$$\frac{4}{7} < \frac{6}{7}, \text{ so } 4 < 6$$

So, 6 : 7 is greater.

(b) 7 : 9 or 13 : 15

$$\frac{7}{9} \times \frac{13}{15}$$

$$7 \times 15 = 105 \text{ and } 13 \times 9 = 117$$

So, 13 : 15 is greater.

(c) 6 : 11 or 11 : 17

$$\frac{6}{11} \times \frac{11}{17}$$

$$6 \times 17 = 102 \text{ and } 11 \times 11 = 121$$

So, 11 : 17 is greater.

(d) 6 : 5 or 8 : 5

$$\frac{6}{5} < \frac{8}{5} \quad \text{so, } 6 < 8$$

So, 8 : 5 is greater.

(e) 8 : 9 or 9 : 11

$$\frac{8}{9} \times \frac{9}{11}$$

$$8 \times 11 = 88 \quad \text{and} \quad 9 \times 9 = 81$$

So, 8 : 9 is greater.

(f) 9 : 10 or 10 : 11

$$\frac{9}{10} \times \frac{10}{11}$$

$$9 \times 11 = 99 \quad \text{and} \quad 10 \times 10 = 100$$

So, 10 : 11 is greater.

(g) 13 : 19 or 21 : 25

$$\frac{13}{19} \times \frac{21}{25}$$

$$13 \times 25 = 325 \quad \text{and} \quad 21 \times 19 = 399$$

So, 21 : 25 is greater.

(h) 7 : 19 or 11 : 18

$$\frac{7}{19} \times \frac{11}{18}$$

$$7 \times 18 = 126 \quad \text{and} \quad 19 \times 11 = 209$$

So, 11 : 18 is greater.

3. Sum of ratio = 7 + 12 = 19

So, first part = ₹  $\left(\frac{7}{19} \times 380\right)$  = ₹ 140

and second part = ₹  $\left(\frac{12}{19} \times 380\right)$  = ₹ 240

4. Sum of ratio = 5 + 8 = 13

So, first part = ₹  $\left(\frac{5}{13} \times 650\right)$  = ₹ 250

and second part = ₹  $\left(\frac{8}{13} \times 650\right)$  = ₹ 400

5. Sum of ratio = 2 + 3 + 4 = 9

So, first part = ₹  $\left(\frac{2}{9} \times 1062\right)$  = ₹ 236

second part = ₹  $\left(\frac{3}{9} \times 1062\right)$  = ₹ 354

and third part = ₹  $\left(\frac{4}{9} \times 1062\right)$  = ₹ 472

6. (a) Product of extremes = 30 × 60 = 1800

Product of means = 45 × 40 = 1800

Here, product of extremes = Product of means

Hence, 30, 45, 40 and 60 are in proportion.

(b) Product of extremes = 40 × 20 = 800

Product of means = 10 × 80 = 800

Here, product of extremes = Product of means

Hence, 40, 10, 80 and 20 are in proportion.

(c) Product of extremes = 20 × 10 = 200

Product of means = 25 × 8 = 200

Here, product of extremes = Product of means

Hence, 20, 8, 25 and 10 are in proportion.

(d) Product of extremes = 18 × 14 = 252

Product of means = 12 × 16 = 192

Here, product of extremes ≠ Product of means

Hence, 18, 12, 16 and 14 are not in proportion.

(e) Product of extremes = 25 × 12 = 300

Product of means = 16 × 20 = 320

Here, product of extremes ≠ Product of means

Hence, 25, 16, 20 and 12 are not in proportion.

(f) Product of extremes = 27 × 18 = 486

Product of means = 9 × 54 = 486

Here, product of extremes = Product of means

Hence, 27, 9, 54 and 18 are in proportion.

7. (a) 22 : 33 = 42 : x

So  $22 \times x = 33 \times 42$

or  $x = \frac{33 \times 42}{22} = 63$

(b) 8 : x = 16 : 35

So,  $8 \times 35 = x \times 16$

or  $x = \frac{8 \times 35}{16} = 17.5$

(c) x : 5 = 21 : 15

So,  $x \times 15 = 5 \times 21$

or  $x = \frac{5 \times 21}{15} = 7$

(d) 16 : 20 = x : 25

So,  $16 \times 25 = 20 \times x$

or  $x = \frac{16 \times 25}{20} = 20$

8. Let actual distance be x km

So,  $2 : 1200 = 5 : x$

or  $2 \times x = 5 \times 1200$

$$x = \frac{5 \times 1200}{2} = 3000 \text{ km}$$

So, distance is 3000 km.

9. Let distance on map be x cm

So,  $2.5 : 1000 = x : 2500$

$$2.5 \times 2500 = x \times 100$$

$$\text{or } x = \frac{2.5 \times 2500}{1000} = 6.25 \text{ cm}$$

10. Let number of girls be  $y$

$$\text{So, } 4 : 7 = 360 : y$$

$$\text{or } 4 \times y = 360 \times 7$$

$$y = \frac{360 \times 7}{4} = 630$$

11. Let number be  $5x$  and  $6x$

$$\text{Then } \frac{5x+5}{6x+5} = \frac{6}{7}$$

$$\text{So, } 7(5x+5) = 6(6x+5)$$

$$35x+35 = 36x+30$$

$$\text{or } 36x-35x = 35-30$$

$$x = 5$$

$$\text{So numbers are } 5 \times 5 = 25$$

$$\text{and } 6 \times 5 = 30$$

12. Let  $x$  must be subtracted

$$\text{So, } 13-x : 9-x = 8-x : 6-x$$

$$\text{or } (13-x)(6-x) = (9-x)(8-x)$$

$$78-13x-6x+x^2 = 72-8x-9x+x^2$$

$$78-19x = 72-17x$$

$$-19x+17x = 72-78$$

$$-2x = -6$$

$$x = 3$$

### EXERCISE 10.2

1. Cost of 8 note-books = ₹ 128

$$\therefore \text{ Cost of 1 note-book} = ₹ \left( \frac{128}{8} \right)$$

$$\text{and cost of 19 note-books} = ₹ \left( \frac{128}{8} \times 19 \right) = ₹ 304$$

2. Cost of 22 pens = ₹ 308

$$\therefore \text{ Cost of 1 pen} = ₹ \left( \frac{308}{22} \right)$$

$$\text{and cost of 8 pens} = ₹ \left( \frac{308}{22} \times 8 \right) = ₹ 112$$

3. Cost of 7 m cloth = ₹ 161

$$\therefore \text{ Cost of 1 m cloth} = ₹ \left( \frac{161}{7} \right)$$

$$\text{and cost of 12 m cloth} = ₹ \left( \frac{161}{7} \times 12 \right) = ₹ 276$$

4. Number of boxes in ₹ 658 = 28

$$\therefore \text{ Number of boxes in ₹ 1} = \frac{28}{658}$$

$$\text{and number of boxes in ₹ 1057.50} = \frac{28 \times 1057.50}{658}$$

$$= 45$$

5. Number of oranges in ₹ 30 = 12

$$\therefore \text{ Number of oranges in ₹ 1} = \frac{12}{30}$$

$$\text{and number of oranges in ₹ 157.50} = \frac{12}{30} \times 157.50$$

$$= 63$$

6. Time taken to cover 56 km = 45 min

$$\therefore \text{ Time taken to cover 1 km} = \frac{45}{56}$$

$$\text{and time taken to cover 224} = \frac{45}{56} \times 224$$

$$= 180 \text{ min} = 3 \text{ hours}$$

7. A bus goes in 25 l = 150 km

$$\therefore \text{ A bus goes in 1 l} = \frac{150}{25}$$

$$\text{and a bus will go in 30 l} = \frac{150}{25} \times 30 = 180 \text{ km}$$

8. Thickness of 500 sheets = 4.5 cm

$$\therefore \text{ Thickness of 1 sheet} = \frac{4.5}{500}$$

$$\text{and thickness of 360 sheets} = \frac{4.5}{500} \times 360 = 3.24 \text{ cm}$$

9. 18 m long shadow casted by 30 m tower

$$\therefore \text{ 1 m long shadow casted by} = \frac{30}{18} \text{ m}$$

$$\text{and 12 m long shadow casted by} = \frac{30}{18} \times 12 = 20 \text{ m}$$

10. 6 students needed 4 computers

$$\therefore \text{ 1 student needed} = \frac{4}{6} \text{ computers}$$

$$\text{and 36 students needed} = \frac{4}{6} \times 36 \text{ computers}$$

$$= 24 \text{ computers}$$

### HOTS

1. Number of men = 28

$$\text{Total number of persons} = 72$$

$$\therefore \text{ Number of women} = 72 - 28 = 44$$

$$\text{(i) Number of men to that of women}$$

$$= 28 : 44 = 7 : 11$$

$$\text{(ii) Number of men to total number of persons}$$

$$= 28 : 72 = 7 : 18$$

$$\text{(iii) Number of persons to that of the women}$$

$$= 72 : 44 = 18 : 11$$

2. Ratio of Akhil's share to Deepa's share = 4 : 7

Sum of ratio terms = 4 + 7 = 11

$$\text{Akhil's share} = \frac{4}{11} \times ₹ 495 = ₹ \frac{4 \times 495}{11} = ₹ 180$$

$$\text{Deepa's share} = \frac{7}{11} \times ₹ 495 = ₹ \frac{7 \times 495}{11} = ₹ 315$$

3. Here, 5 : 8 means  $\frac{5}{8}$  and 10 : 12 means  $\frac{10}{12} = \frac{5}{6}$ .

The LCM of 8 and 6 is 24.

We write the two fractions in such a way that the denominator in each case is 24.

$$\text{We know that } \frac{5}{8} = \frac{15}{24} \text{ and } \frac{10}{12} = \frac{5}{6} = \frac{20}{24}$$

Since,  $\frac{15}{24} < \frac{20}{24}$ , 5 : 8 is less than 10 : 12 or 10 : 12 is greater than 5 : 8.

4. Let the number of women be  $x$ . Then the ratio of the number of men to that of women is 40 :  $x$ .

But, the ratio given is 5 : 4.

Therefore, 40 :  $x = 5 : 4$

This gives  $40 \times 4 = 5 \times x$

$$\Rightarrow 5x = 160$$

$$\Rightarrow x = \frac{160}{5} = 32$$

Thus, the number of women in the party is 32.

5. (i) In 5 hours car travels = 275 km

$$\therefore \text{In 1 hour car travels} = \frac{275}{5} \text{ km}$$

Now, the distance travelled by a car in  $8\frac{1}{2}$  hours or  $\frac{17}{2}$  hours

$$= \left( \frac{275}{5} \times \frac{17}{2} \right) \text{ km} = 467.50 \text{ km}$$

(ii) To travel 275 km, time taken by the car

$$= 5 \text{ hours}$$

$$\therefore \text{To travel 1 km, time taken} = \frac{5}{275} \text{ hours}$$

Hence, to travel 495 km, time taken

$$= \left( \frac{5}{275} \times 495 \right) \text{ hours} = 9 \text{ hours}$$

### ⇒ NCERT CORNER .....

1. (a) First, convert both to the same unit

$$\text{So, } ₹ 5 = 5 \times 100 \text{ paise} = 500 \text{ paise}$$

Thus, the required ratio

$$₹ 5 : 50 \text{ paise} = 500 \text{ paise} : 50 \text{ Paise} = 10 : 1$$

(b) First, convert both the weights to the same unit

$$\text{So, } 15 \text{ kg} = 15 \times 1000 \text{ g} = 15000 \text{ g}$$

Thus, the required ratio

$$15 \text{ kg} : 210 \text{ g} = 15000 \text{ g} : 210 \text{ g}$$

$$\therefore \frac{15000}{30} : \frac{210}{30} = 500 : 7$$

[∵ HCF of 15000 and 210 is 30]

(c) First, convert both to the same unit

$$\text{So, } 9 \text{ m} = 9 \times 100 \text{ cm} = 900 \text{ cm}$$

Thus, the required ratio

$$9 \text{ m} : 27 \text{ cm} = 900 \text{ cm} : 27 \text{ cm}$$

$$\therefore \frac{900}{9} : \frac{27}{9} = 100 : 3$$

[∵ HCF of 900 and 27 is 9]

(d) First, convert both to the same unit

$$\text{So, } 1 \text{ day} = 24$$

$$30 \text{ day} = 24 \times 30 = 720 \text{ hours}$$

Thus, the required ratio

$$30 \text{ days} : 36 \text{ hours} = 720 \text{ hours} : 36 \text{ hours}$$

$$\therefore \frac{720}{36} : \frac{36}{36} = 20 : 1$$

[∵ HCF of 720 and 36 is 36]

2. Let  $x$  computers required for 24 students,

Then, the ratio is 3 :  $x = 6 : 24$

$$\Rightarrow \frac{3}{x} = \frac{6}{24}$$

$$\Rightarrow 6x = 24 \times 3$$

$$\Rightarrow 6x = 72$$

$$\Rightarrow x = \frac{72}{6}$$

$$\Rightarrow x = 12$$

Thus, 12 computers will be needed for 24 students.

3. (i) Population of Rajasthan = 570 lakhs

$$\text{Area of Rajasthan} = 3 \text{ lakhs km}^2$$

$$\therefore \text{Population per km}^2 = \frac{570}{3} = 190 \text{ lakh/km}^2$$

Thus, 190 lakh per  $\text{km}^2$  people are there in Rajasthan state.

$$\text{Population of UP} = 1660 \text{ lakhs}$$

$$\text{Area of UP} = 2 \text{ lakh km}^2$$

$$\therefore \text{Population per km}^2 = \frac{1660}{2}$$

$$= 830 \text{ lakh/km}^2$$

Thus, 830 lakh per  $\text{km}^2$  people are there in UP state.

(ii) Rajasthan is less populated state.

⇒ EXERCISE 11.1.....

1. (a)  $\frac{1}{8} \times 100 = 12.5\%$       (b)  $\frac{3}{40} \times 100 = 7.5\%$   
 (c)  $\frac{7}{8} \times 100 = 87.5\%$       (d)  $\frac{16}{45} \times 100 = 35.55\%$   
 (e)  $\frac{58}{125} \times 100 = 46.4\%$       (f)  $\frac{5}{4} \times 100 = 125\%$   
 (g)  $\frac{2}{7} \times 100 = 28.57\%$       (h)  $\frac{7}{12} \times 100 = 58.33\%$   
 (i)  $0.004 \times 100 = 0.4\%$       (j)  $0.16 \times 100 = 16\%$

2. (a)  $165\% = \frac{165}{100} = \frac{33}{20}$   
 (b)  $35\% = \frac{35}{100} = \frac{7}{20}$   
 (c)  $20\% = \frac{20}{100} = \frac{1}{5}$   
 (d)  $150\% = \frac{150}{100} = \frac{3}{2}$   
 (e)  $25\frac{1}{4}\% = \frac{101}{4}\% = \frac{101}{4} \times \frac{1}{100} = \frac{101}{400}$   
 (f)  $2.3\% = \frac{2.3}{100} = \frac{23}{1000}$   
 (g)  $3.51\% = \frac{3.51}{100} = \frac{351}{10000}$   
 (h)  $5\% = \frac{5}{100} = \frac{1}{20}$   
 (i)  $125\% = \frac{125}{100} = \frac{5}{4}$   
 (j)  $33\frac{1}{4}\% = \frac{100}{3}\% = \frac{100}{3} \times \frac{1}{100} = \frac{1}{3}$

3. (a)  $3\% \text{ of } 180 = \frac{3}{100} \times 180 = 5.4$   
 (b)  $3\% \text{ of } 2 \text{ hr} = \frac{3}{100} \times 2 = \frac{6}{100} \text{ hr}$   
 $= \frac{6}{100} \times 60 = 3.6 \text{ minutes}$   
 (c)  $75\% \text{ of } 2 \text{ km} = \left(\frac{75}{100} \times 2\right) \text{ km} = 1.5 \text{ km}$   
 (d)  $15\% \text{ of } ₹ 300 = ₹ \left(\frac{15}{100} \times 300\right) = ₹ 45$   
 (e)  $80\% \text{ of } 4 \text{ l} = \left(\frac{80}{100} \times 4\right) \text{ l} = 3.2 \text{ l}$   
 (f)  $45\% \text{ of } 8 \text{ kg} = \left(\frac{45}{100} \times 8\right) \text{ kg} = 3.6 \text{ kg}$

4. (a)  $5\% \text{ of } x \text{ is } ₹ 600$   
 $\Rightarrow \frac{5}{100} x = 600$   
 $\Rightarrow x = \frac{600 \times 100}{5} = ₹ 12000$   
 (b)  $150\% \text{ of } x = 75$   
 $\Rightarrow \frac{150}{100} \times x = 75$   
 $\Rightarrow x = \frac{75 \times 100}{150} = 50$   
 (c)  $12\% \text{ of } x = 1080 \text{ l}$   
 $\Rightarrow \frac{12}{100} \times x = 1080$   
 $\Rightarrow x = \frac{1080 \times 100}{12} = 9000 \text{ l}$   
 (d)  $18\% \text{ of } x = 1 \text{ m}$   
 $\Rightarrow \frac{18}{100} \times x = 1$   
 $\Rightarrow x = \frac{100}{18} = \frac{50}{9} \text{ m}$   
 (e)  $70\% \text{ of } x = 84 \text{ minutes}$   
 $\Rightarrow \frac{70}{100} \times x = 84$   
 $\Rightarrow x = \frac{84 \times 100}{70} = 120 \text{ minutes}$   
 (f)  $\frac{15}{2}\% \text{ of } x = 75 \text{ l}$   
 $\Rightarrow \frac{15}{2} \times \frac{1}{100} \times x = 75$   
 $\Rightarrow x = \frac{75 \times 200}{15} = 1000 \text{ l}$
5. (a)  $25\% \text{ of } x = 9$   
 $\Rightarrow \frac{25}{100} \times x = 9$   
 $\Rightarrow x = \frac{9 \times 100}{25} = 36$   
 (b)  $75\% \text{ of } x = 15$   
 $\Rightarrow \frac{75}{100} \times x = 15$   
 $\Rightarrow x = \frac{15 \times 100}{75} = 20$   
 (c)  $30\% \text{ of } x = 24$   
 $\Rightarrow \frac{30}{100} \times x = 24$   
 $x = \frac{24 \times 100}{30} = 80$

(d) 45% of  $x = 90$

$$\Rightarrow \frac{45}{100} \times x = 90$$

$$\Rightarrow x = \frac{90 \times 100}{45} = 200$$

6. Let monthly income be ₹  $x$

$$\therefore 32\% \text{ of } x = ₹ 960$$

$$\Rightarrow \frac{32}{100} \times x = 960$$

$$\Rightarrow x = \frac{960 \times 100}{32} = ₹ 3000$$

So, monthly income is ₹ 3000

7. Let salary be ₹  $x$ . 10% of  $x = ₹ 4000$

$$\Rightarrow \frac{10}{100} \times x = ₹ 4000$$

$$\Rightarrow x = \frac{4000 \times 100}{10} = ₹ 40000$$

8. Number of votes = 60% of 20000

$$= \frac{60}{100} \times 20000 = 12000$$

Percentage who did not cast their votes

$$= 100 - 60 = 40\%$$

9. Percentage of boys = 40%

$$\therefore \text{Percentage of girls} = (100 - 40) = 60\%$$

Let total strength be  $x$

$$\therefore 60\% \text{ of } x = 540$$

$$\Rightarrow \frac{60}{100} \times x = 540$$

$$\Rightarrow x = \frac{540 \times 100}{60} = 900$$

10. Percentage of carbon =  $100 - (60 + 15)$

$$= 100 - 75 = 25\%$$

$$\therefore \text{Quantity of carbon} = 25\% \text{ of } 12 \text{ kg}$$

$$= \left( \frac{25}{100} \times 12 \right) \text{ kg} = 3 \text{ kg}$$

11. Minimum passing marks =  $168 + 32 = 200$

Let maximum marks be  $x$

$$\therefore 40\% \text{ of } x = 200$$

$$\Rightarrow \frac{40}{100} \times x = 200$$

$$\Rightarrow x = \frac{200 \times 100}{40}$$

$$x = 500$$

12. Rajni spends on food and education =  $30 + 9 = 39\%$

Let monthly salary be ₹  $x$

$$\text{So, } 39\% \text{ of } x = ₹ 7800$$

$$\Rightarrow \frac{39}{100} \times x = 7800$$

$$\Rightarrow x = \frac{7800 \times 100}{39} = ₹ 20000$$

### EXERCISE 11.2

1. Sum of the angles =  $2 + 4 + 4 = 10$

$$\text{So, first angle} = \frac{2}{10} \times 180 = 36^\circ$$

$$\text{Second angle} = \frac{4}{10} \times 180 = 72^\circ$$

$$\text{and third angle} = \frac{4}{10} \times 180 = 72^\circ$$

$$\text{Percentage of first angle} = \frac{2}{10} \times 100 = 20\%$$

$$\text{Percentage of second angle} = \frac{4}{10} \times 100 = 40\%$$

$$\text{Percentage of third angle} = \frac{4}{10} \times 100 = 40\%$$

2. Sum of the angle =  $6 + 5 + 5 + 4 = 20$

$$\text{So, first angle} = \frac{6}{20} \times 360 = 108^\circ$$

$$\text{Second angle} = \frac{5}{20} \times 360 = 90^\circ$$

$$\text{Third angle} = \frac{5}{20} \times 360 = 90^\circ$$

$$\text{and fourth angle} = \frac{4}{20} \times 360 = 72^\circ$$

$$\text{Percentage of first angle} = \frac{6}{20} \times 100 = 30\%$$

$$\text{Percentage of second angle} = \frac{5}{20} \times 100 = 25\%$$

$$\text{Percentage of third angle} = \frac{5}{20} \times 100 = 25\%$$

$$\text{Percentage of fourth angle} = \frac{4}{20} \times 100 = 20\%$$

3. Ratio of material =  $1 : 1 : 2 : 4$

$$\therefore \text{Sum of ratio} = 1 + 1 + 2 + 4 = 8$$

$$\text{Percentage of ghee} = \frac{1}{8} \times 100 = 12.5\%$$

$$\text{Percentage of besan} = \frac{1}{8} \times 100 = 12.5\%$$

$$\text{Percentage of sugar} = \frac{2}{8} \times 100 = 25\%$$

$$\text{Percentage of water} = \frac{4}{8} \times 100 = 50\%$$

4. Ratio of money divided among Ritu,  
Manu and Pinku = 2 : 3 : 5  
Sum of ratio = 2 + 3 + 5 = 10
- So Ritu gets =  $\frac{2}{10} \times 400 = ₹ 80$   
Manu gets =  $\frac{3}{10} \times 400 = ₹ 120$   
Pinku gets =  $\frac{5}{10} \times 400 = ₹ 200$
- So, percentage of Ritu =  $\frac{2}{10} \times 100 = 20\%$   
Percentage of Manu =  $\frac{3}{10} \times 100 = 30\%$   
Percentage of Pinku =  $\frac{5}{10} \times 100 = 50\%$

5. Vibhor gets = 40% of 25 =  $\frac{40}{100} \times 25 = 10$   
Meeku gets = 60% of 25 =  $\frac{60}{100} \times 25 = 15$

6. Increase % =  $\frac{2}{8} \times 100 = 25\%$

7. Decrease % =  $\frac{7}{25} \times 100 = 28\%$

8. Increase % =  $\frac{100}{200} \times 100 = 50\%$

9. Population before one year = 60,000  
Present population = 60000 + 12% of 60000  
=  $60000 + \frac{12}{100} \times 60000$   
=  $60000 + 7200 = 67200$

10. Increase % =  $\frac{46}{2} \times 100 = 2300\%$

11. Decrease % =  $\frac{2000}{10000} \times 100 = 20\%$

12. Increase % =  $\frac{40}{500} \times 100 = 8\%$

**➤ HOTS** .....

1. Total mortar = 800 kg  
Sand = 55%  
Cement = 33%  
Lime =  $[100 - (55 + 33)]\% = (100 - 88)\% = 12\%$   
∴ Mass of lime in mortar = 12% of 800 kg  
=  $\frac{12}{100} \times 800 = 96$  kg  
Hence, 96 kg lime is present in mortar.

2. There are three papers each of 100 marks. A candidate obtained 53 marks in first, 75 marks in second paper.

Total obtained marks in two papers =  $53 + 75 = 128$

Let the marks in third paper =  $x$

Total marks in three papers =  $128 + x$

According to the question, total marks are 70%.

∴  $70\% \text{ of } 300 = 128 + x$

⇒  $\frac{70}{100} \times 300 = 128 + x$

⇒  $210 = 128 + x$

⇒  $x = 210 - 128 = 82$

3. Given, Ambika got marks in Maths = 99%, Hindi = 76%, English = 61%, science = 84%, Social Science = 95%.

Each subject carries 100 marks.

So, marks of all five subjects are 99, 76, 61, 84 and 95.

Total obtained marks =  $99 + 76 + 61 + 84 + 95 = 415$

Total marks =  $100 + 100 + 100 + 100 + 100 = 500$

Percentage of aggregate marks =  $\frac{415}{500} \times 100 = 83\%$

Hence, Ambika got 83% marks in the aggregate of all subjects.

4. Given, man travelled 60 km by car and 240 km by train.

Total distance covered by him =  $(60 + 240)$  km  
= 300 km

Per cent of journey travelled by car

=  $\left(\frac{60}{300} \times 100\right)\% = 20\%$

Per cent of journey travelled by train

=  $\left(\frac{240}{300} \times 100\right)\% = 80\%$

Hence, man travelled 20% by car and 80% by train.

5. A is increased by 20% and equals to B

i.e.,  $A + 20\% \text{ of } A = B$

⇒  $A + \frac{20}{100} \times A = B$

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

$\frac{6}{5} A = B$

B is decreased by 50% equal to C.

i.e.,  $B - 50\% \text{ of } B = C$

⇒  $B - \frac{50}{100} \times B = C$



$$\Rightarrow \frac{6}{5}A - \frac{1}{2} \times \frac{6}{5}A = C \quad \left[ \because B = \frac{6}{5}A \right]$$

$$\frac{6}{5}A - \frac{3}{5}A = C$$

$$\frac{3}{5}A = C$$

In percentage of  $A$ , i.e.,  $\frac{3}{5} = \left( \frac{3}{5} \times 100 \right) \%$

$$= (20 \times 3) \% = 60\%$$

Hence, 60% of  $A$  is equal to  $C$ .

### ⇒ NCERT CORNER .....

1. (a)  $0.65 = \frac{65}{100} = \frac{65}{100} \times 100\% = 65\%$

(b)  $2.1 = \frac{21}{10} = \frac{21}{10} \times 100\% = 210\%$

(c)  $0.02 = \frac{2}{100} = \frac{2}{100} \times 100\% = 2\%$

(d)  $12.35 = \frac{1235}{100} = \frac{1235}{100} \times 100\% = 1235\%$

2.  $100\% - 60\% = 40\%$  who did not vote

Number of voters who did not vote = 40% of

$$15,000 = \frac{40}{100} \times 15,000 = 6,000$$

Thus, 6,000 voters did not vote.

3. Total number of matches played = 20

Matches won by a local cricket team = 25%

So, 25% of 20 =  $\frac{25}{100} \times 20 = 5$

Thus, 5 match did they win.

4. (a) 3 : 1

Total of parts = 3 + 1 = 4

First part of ratio =  $\frac{3}{4} \times 100\% = 75\%$

Second part of ratio =  $\frac{1}{4} \times 100\% = 25\%$

(b) 2 : 3 : 5

Total of parts = 2 + 3 + 5 = 10

First part of ratio =  $\frac{2}{10} \times 100\% = 20\%$

Second part of ratio =  $\frac{3}{10} \times 100\% = 30\%$

Third part of ratio =  $\frac{5}{10} \times 100\% = 50\%$

(c) 1 : 4

Total of parts = 1 + 4 = 5

First part of ratio =  $\frac{1}{5} \times 100\% = 20\%$

Second part of ratio =  $\frac{4}{5} \times 100\% = 80\%$

(d) 1 : 2 : 5

Total of parts = 1 + 2 + 5 = 8

First part of ratio =  $\frac{1}{8} \times 100\% = 12.5\%$

Second part of ratio =  $\frac{2}{8} \times 100\% = 25\%$

Third part of ratio =  $\frac{5}{8} \times 100\% = 62.5\%$

5. (i)  $\frac{1}{4}$  part is Coloured

$$\Rightarrow \frac{1}{4} = \frac{1}{4} \times 100\% = \frac{100}{4} \% = 25\%.$$

Thus, 25% part is coloured.

(ii)  $\frac{3}{5}$  Part is coloured

$$\Rightarrow \frac{3}{5} = \frac{3}{5} \times 100\% = \frac{300}{5} \% = 60\%.$$

Thus, 60% part is coloured.

(iii)  $\frac{3}{8}$  Part is coloured

$$\Rightarrow \frac{3}{8} = \frac{3}{8} \times 100\% = \frac{300}{8} \% = 37.5\%.$$

Thus, 37.5% part is coloured.

## 12

## Profit, Loss and Discount

### ⇒ EXERCISE 12.1 .....

1. Gain = S.P. - C.P. = ₹ (700 - 550) = ₹ 150

$$\text{Gain \%} = \frac{150}{550} \times 100 = 27.27\%$$

2. Total C.P. = 500 + 60 = ₹ 560

S.P. = ₹ 700

Profit = 700 - 560 = 140

$$\text{Profit \%} = \frac{140}{560} \times 100 = 25\%$$

3. C.P. of 1 orange = ₹  $\frac{1}{2}$

S.P. of 1 orange = ₹  $\frac{3}{5}$

$$\text{Gain} = ₹ \left( \frac{3}{5} - \frac{1}{2} \right) = ₹ \frac{1}{10}$$

$$\text{Gain \%} = \frac{\frac{1}{2}}{\frac{1}{10}} \times 100 = \frac{2}{10} \times 100 = 20\%$$

4. Total C.P. = ₹ (225 + 25) = ₹ 250

S.P. = ₹ 380

Gain = S.P. - C.P. = ₹ (380 - 250) = ₹ 130

Gain % =  $\frac{130}{250} \times 100 = 52\%$

5. C.P. =  $\left(\frac{100}{100 - L\%}\right) \times \text{S.P.} = \left(\frac{100}{100 - 25}\right) \times 900$   
 $= ₹ \left(\frac{100}{75} \times 900\right) = ₹ 1200$

6. C.P. =  $\frac{100}{100 + P\%} \times \text{S.P.} = \frac{100}{100 + 10} \times 550$   
 $= ₹ \left(\frac{100}{110} \times 550\right) = ₹ 500$

7. C.P. =  $\frac{100}{100 + P\%} \times \text{S.P.} = \frac{100}{100 + 15} \times 43470$   
 $= ₹ \frac{100}{115} \times 43470 = ₹ 37800$

8. S.P. =  $\frac{100 + P\%}{100} \times \text{C.P.} = ₹ \left(\frac{100 + 18}{100} \times 12500\right)$   
 $= ₹ \left(\frac{118}{100} \times 12500\right) = ₹ 14750$

9. C.P. =  $\left(\frac{100}{100 - L\%}\right) \times \text{S.P.} = ₹ \left(\frac{100}{100 - 12} \times 2200\right)$   
 $= ₹ \left(\frac{100}{88} \times 2200\right) = ₹ 2500$

10. First find cost price

So, C.P. =  $\left(\frac{100}{100 + P\%}\right) \times \text{S.P.}$   
 $= ₹ \left(\frac{100}{100 + 15} \times 57960\right)$   
 $= ₹ \left(\frac{100}{115} \times 57960\right) = ₹ 50400$

So new S.P. at 21% =  $\left(\frac{100 + 21}{100} \times 50400\right) = ₹ 60984$

11. First find cost price

So C.P. =  $₹ \left(\frac{100}{100 - 15} \times 6375\right) = ₹ \left(\frac{100}{85} \times 6375\right)$   
 $= ₹ 7500$

So, new S.P. at 12% gain =  $\left(\frac{100 + 12}{100} \times 7500\right)$   
 $= ₹ 8400$

12. C.P. of first bicycle =  $\left(\frac{100}{100 + P\%}\right) \times \text{S.P.}$   
 $= \left(\frac{100}{100 + 120}\right) \times 960$   
 $= ₹ \left(\frac{100}{120} \times 960\right)$   
 $= ₹ 800$

C.P. of second bicycle =  $\left(\frac{100}{100 - L\%}\right) \times \text{S.P.}$   
 $= \left(\frac{100}{100 - 20}\right) \times 960$   
 $= \frac{100}{80} \times 960$   
 $= ₹ 1200$

Total C.P. = ₹ (800 + 1200) = ₹ 2000

Total S.P. = ₹ (960 × 2) = ₹ 1920

∴ Loss = ₹ (2000 - 1920) = ₹ 80

Loss % =  $\frac{80}{2000} \times 100 = 4\%$

13. C.P. of first goat =  $\left(\frac{100}{100 + 12}\right) \times 4928$   
 $= ₹ \left(\frac{100}{112} \times 4928\right)$   
 $= ₹ 4400$

C.P. of second goat =  $₹ \left(\frac{100}{100 - 12}\right) \times 4928$   
 $= ₹ \left(\frac{100}{88} \times 4928\right)$   
 $= ₹ 5600$

Total C.P. of both = 4400 + 5600 = ₹ 10000

Total S.P. of both = 2 × 4928 = ₹ 9856

∴ Loss = ₹ (10000 - 9856)

= ₹ 144

Loss % =  $\frac{144}{10000} \times 100 = 1.44\%$

14. Let C.P. of 1 bat = ₹ 1

So, C.P. of 25 bats = ₹ 25

S.P. of 21 bats = C.P. of 25 bats = ₹ 25

∴ S.P. of 1 bat = ₹  $\left(\frac{25}{21}\right)$

$$\text{Profit} = ₹ \left( \frac{25}{21} - 1 \right) = ₹ \left( \frac{4}{21} \right)$$

$$\text{Profit \%} = \frac{\frac{4}{21}}{1} \times 100 = 19.05\%$$

15. Let C.P. of 1 pen = ₹ 1

∴ Let C.P. of 12 pens = ₹ 12

S.P. of 15 pens = ₹ 12

$$\therefore \text{S.P. of 1 pen} = ₹ \left( \frac{12}{15} \right)$$

$$\text{Loss} = ₹ \left( 1 - \frac{12}{15} \right) = ₹ \left( \frac{3}{15} \right) = ₹ \frac{1}{5}$$

$$\text{Loss \%} = \frac{\frac{1}{5}}{1} \times 100 = 20\%$$

16. S.P. of the article = ₹ 300

Loss = ₹ 60

∴ C.P. of the article = ₹ (300 + 60) = ₹ 360

$$\text{Gain} = 15\% \text{ of } ₹ 360 = ₹ \left( \frac{15}{100} \times 360 \right) = ₹ 54$$

∴ New S.P. of the article = C.P. + Gain

$$= ₹ (360 + 54)$$

$$= ₹ 414$$

Hence, he should sell the article at ₹ 414 to gain 15%.

### ⇒ EXERCISE 12.2

1. (a) Discount = M.P. - S.P. = ₹ (400 - 350) = ₹ 50

$$\text{Discount \%} = \frac{50}{400} \times 100 = 12.5\%$$

(b) Discount = 800 - 750 = 50

$$\text{Discount \%} = \left( \frac{50}{800} \right) \times 100 = 6.25\%$$

(c) Discount = 1200 - 1000 = ₹ 200

$$\text{Discount \%} = \frac{200}{1200} \times 100 = 16.66\%$$

(d) Discount = 3120 - 2350 = ₹ 770

$$\text{Discount \%} = \frac{770}{3125} \times 100 = 24.64\%$$

2. (a) S.P. =  $\left( \frac{100 - D}{100} \right) \times \text{M.P.}$

$$= \frac{100 - 15}{100} \times 600 = ₹ \left( \frac{85}{100} \times 600 \right) = ₹ 510$$

(b) S.P. =  $\left( \frac{100 - D}{100} \right) \times \text{M.P.}$

$$= \frac{100 - 8}{100} \times 1000 = ₹ 920$$

$$\begin{aligned} \text{(c) S.P.} &= \frac{100 - 7.5}{100} \times 1780 \\ &= \left( \frac{92.5}{100} \times 1780 \right) = ₹ 1646.50 \end{aligned}$$

$$\begin{aligned} \text{(d) S.P.} &= \left( \frac{100 - 12}{100} \right) \times 9850 \\ &= ₹ \frac{88}{100} \times 9850 = ₹ 8668 \end{aligned}$$

$$\begin{aligned} \text{3. (a) M.P.} &= \left( \frac{100}{100 - D\%} \right) \times \text{S.P.} = \left( \frac{100}{100 - 8} \right) \times 552 \\ &= ₹ \left( \frac{100}{92} \times 552 \right) = ₹ 600 \end{aligned}$$

$$\begin{aligned} \text{(b) M.P.} &= \left( \frac{100}{100 - 6} \right) \times 2115 \\ &= ₹ \left( \frac{100}{94} \times 2115 \right) = ₹ 2250 \end{aligned}$$

$$\begin{aligned} \text{(c) M.P.} &= \frac{100}{100 - 12} \times 2464 \\ &= ₹ \left( \frac{100}{88} \times 2464 \right) = ₹ 2800 \end{aligned}$$

$$\begin{aligned} \text{(d) M.P.} &= \left( \frac{100}{100 - 15} \right) \times 2975 \\ &= ₹ \left( \frac{100}{85} \times 2975 \right) = ₹ 3500 \end{aligned}$$

4. M.P. = ₹ 2500

S.P. = ₹ 2300

∴ Discount = ₹ (2500 - 2300) = ₹ 200

$$\text{Discount \%} = \frac{200}{2500} \times 100 = 8\%$$

5. Discount = M.P. - S.P. = 1850 - 1600 = 250

$$\therefore \text{Discount \%} = \frac{250}{1850} \times 100 = 13.51\%$$

6. S.P. of computer table =  $\left( \frac{100 - 10}{100} \right) \times 800$

$$= ₹ \left( \frac{90}{100} \times 800 \right) = ₹ 720$$

7. S.P. of microwave =  $\left( \frac{100 - 18}{100} \right) \times 4500$

$$= ₹ \left( \frac{82}{100} \times 4500 \right) = ₹ 3690$$

8. M.P. of briefcase =  $\left( \frac{100}{100 - 5} \right) \times 1292$

$$= ₹ \left( \frac{100}{95} \times 1292 \right) = ₹ 1360$$

$$9. \text{ M.P. of fan} = \frac{100}{100-12} \times 2040$$

$$= ₹ \left( \frac{100}{88} \times 2040 \right) = ₹ 2318.18$$

10. Let C.P. of refrigerator = ₹ 100

$$\therefore \text{ M.P.} = 100 + 30\% \text{ of } 100 = 100 + 30 = ₹ 130$$

$$\text{S.P.} = \left( \frac{100-15}{100} \times 130 \right)$$

$$= ₹ \left( \frac{85}{100} \times 130 \right) = ₹ 110.50$$

$$\text{So, Profit} = ₹ (110.50 - 100) = ₹ 10.50$$

$$\text{Profit \%} = \frac{10.50}{100} \times 100 = 10.50\%$$

### ⇒ HOTS .....

1. C.P. of buffalo = ₹ 44,000

C.P. of cow = ₹ 18,000

$$\text{Total C.P. of buffalo and cow} = ₹ 44000 + ₹ 18000$$

$$= ₹ 62000$$

Loss on buffalo = 5%

$$\text{S.P. of buffalo} = \frac{(100 - \text{Loss \%})}{100} \times \text{CP}$$

$$= \frac{(100 - 5)}{100} \times 44000$$

$$= \frac{95}{100} \times 44000 = ₹ 41800$$

Profit on cow = 10%

$$\text{S.P. of cow} = \frac{(100 + \text{Gain \%})}{100} \times \text{CP}$$

$$= \frac{(100 + 10)}{100} \times 18000$$

$$= \frac{110}{100} \times 18000 = ₹ 19800$$

$$\text{Total S.P. of buffalo and cow} = ₹ 41800 + ₹ 19800$$

$$= ₹ 61600$$

∴ Total C.P. > Total S.P.

So, there is loss.

$$\therefore \text{ Net loss} = \text{C.P.} - \text{S.P.} = ₹ 62000 - ₹ 61600$$

$$= ₹ 400$$

2. Given, C.P. of 100 lemons = ₹ 120

$$\text{Then, C.P. of 1 lemon} = ₹ \frac{120}{100}$$

$$\therefore \text{ C.P. of 720 lemons} = ₹ \frac{120}{100} \times 720 = ₹ 864$$

∴ 10% of the lemons were rotten.

$$\therefore \text{ Rotten lemons} = 10\% \text{ of } 720 = \frac{10}{100} \times 720 = 72$$

Now, S.P. of 100 rotten lemons = ₹ 50

$$\text{S.P. of 1 rotten lemon} = ₹ \frac{50}{100}$$

$$\text{S.P. of 72 rotten lemons} = ₹ \frac{50}{100} \times 72 = ₹ 36$$

∴ Remaining lemons = 720 - 72 = 648

∴ S.P. of remaining 100 lemons = ₹ 125

$$\therefore \text{ S.P. of remaining 1 lemon} = ₹ \frac{125}{100}$$

$$\therefore \text{ S.P. of remaining 648 lemons} = ₹ \frac{125}{100} \times 648$$

$$= ₹ 810$$

Total S.P. = S.P. of rotten lemons

$$+ \text{ S.P. of remaining lemons}$$

$$= ₹ (36 + 810) = ₹ 846$$

∴ Total C.P. > Total S.P.

So, there is loss

$$\text{Loss} = \text{C.P.} - \text{S.P.} = ₹ (864 - 846) = ₹ 18$$

$$\text{Loss \%} = \frac{\text{Loss}}{\text{C.P.}} \times 100 = \frac{18}{864} \times 100 = 2.08\%$$

Hence, vender has 2.08% loss.

3. Given, ratio of blended two varieties of tea = 5 : 4

Cost of first variety = ₹ 200 per kg

Cost of second variety = ₹ 300 per kg

S.P. of blended tea = ₹ 275 per kg

According to the ratio,

Let first variety be 5x kg and second variety be 4x kg.

So, Cost of first variety = 5x × 200 = ₹ 1000x

Cost of second variety = 4x × 300 = ₹ 1200x

Total C.P. = ₹ (1000x + 1200x) = ₹ 2200x

Total quantity = (4x + 5x) kg = 9x kg

So, for 9x kg

$$\therefore \text{ S.P. of blended tea} = ₹ 275 \times 9x$$

$$\text{S.P.} = ₹ 2475x$$

∴ C.P. < S.P.

So, there is profit on, blended tea.

$$\text{Profit} = ₹ (2475x - 2200x) = ₹ 275x$$

$$\text{Profit \%} = \frac{\text{Profit}}{\text{C.P.}} \times 100$$

$$= \frac{275x}{2200x} \times 100$$

$$= \frac{275}{22} = 12.5\%$$

Hence, there is 12.5% profit on blended tea.

## NCERT CORNER

1. (a) CP = ₹ 12,000, S.P. = ₹ 13,500  
 $\therefore$  S.P. > C.P. So, there is a profit.  
 Profit = S.P. - C.P. = ₹ 13,500 - ₹ 12,000  
 = ₹ 1,500  
 Profit % =  $\frac{\text{Profit}}{\text{C.P.}} \times 100\%$   
 =  $\frac{1,500}{12,000} \times 100\% = 12.5\%$
- (b) C.P. = ₹ 250, S.P. = ₹ 150  
 $\therefore$  S.P. > C.P. So, there is a loss.  
 Loss = S.P. - C.P. = ₹ 250 - ₹ 150 = ₹ 100  
 Loss % =  $\frac{\text{Loss}}{\text{C.P.}} \times 100\% = \frac{100}{250} \times 100\% = 40\%$
2. C.P. = ₹ 10,000, Profit = 20%  
 $\therefore$  Profit = 20% of ₹ 10,000 =  $\frac{20}{100} \times 10,000 = ₹ 2,000$   
 S.P. = C.P. + Profit = ₹ 10,000 + ₹ 2,000 = ₹ 12,000  
 Thus, I get ₹ 12,000 for it.
3. C.P. = ₹ 275, Loss = 15%  
 So, Loss = 15% of C.P. =  $\frac{15}{100} \times 275$   
 =  $\frac{15 \times 11}{4} = \frac{165}{4} = ₹ 41.25$   
 Now, S.P. = C.P. - Loss = ₹ 275 - ₹ 41.25  
 = ₹ 233.75  
 Thus, she sells it for ₹ 233.75.

## 13

## Simple Interest

### EXERCISE 13.1

1. (a) S.I. =  $\frac{P \times R \times T}{100} = \frac{1200 \times 5 \times 3}{100} = ₹ 180$
- (b) S.I. =  $\frac{4500 \times \frac{25}{4} \times \frac{9}{12}}{100} = \frac{4500 \times 25 \times 9}{4 \times 12 \times 100}$   
 = ₹ 210.94
- (c) S.I. =  $\frac{6050 \times 6.5 \times 4}{100} = ₹ 1573$
- (d) S.I. =  $\frac{8250 \times 9 \times \frac{18}{12}}{100} = \frac{8250 \times 9 \times 18}{100 \times 12} = ₹ 1113.75$
2. S.I. =  $\frac{4200 \times 3 \times 6.25}{100} = 787.50$   
 $\therefore$  Amount = P + S.I.  
 = 4200 + 787.50 = ₹ 4987.50

3. S.I. =  $\frac{48000 \times 12 \times 4}{100} = ₹ 23040$   
 $\therefore$  Amount = P + S.I.  
 = ₹ (48000 + 23040) = ₹ 71040  
 He will return ₹ 71040.

4. S.I. = ₹ 594, R = 9% p.a., T =  $2\frac{1}{2}$  years  
 $P = \frac{\text{S.I.} \times 100}{R \times T} = \frac{594 \times 100}{9 \times \frac{5}{2}} = ₹ 2640$

So, Sushil borrowed ₹ 2640

5. P = ₹ 56000, S.I. = ₹ 2800, T = 2 years  
 $R = \frac{\text{S.I.} \times 100}{P \times T} = \frac{2800 \times 100}{56000 \times 2} = 2.5\%$
6. P = ₹ 5000, A = ₹ 6200, T = 3 years  
 S.I. = A - P = ₹ (6200 - 5000) = ₹ 1200  
 $R = \frac{\text{S.I.} \times 100}{P \times T} = \frac{1200 \times 100}{5000 \times 3} = 8\%$
7. P = ₹ 1500, A = ₹ 2040, R = 8% p.a.  
 S.I. = A - P = ₹ (2040 - 1500) = ₹ 540  
 $T = \frac{\text{S.I.} \times 100}{P \times R} = \frac{540 \times 100}{1500 \times 8} = 4\frac{1}{2}$  years
8. P = ₹ 4800, A = ₹ 7176, R = 9%  
 S.I. = A - P = ₹ (7176 - 4800) = ₹ 2376  
 $T = \frac{\text{S.I.} \times 100}{P \times R} = \frac{2376 \times 100}{4800 \times 9} = 5\frac{1}{2}$  years

9. Let principle be ₹ x

Then amount would be ₹ (2x)

So, S.I. = 2x - x = x, R =  $12\frac{1}{2}\% = \frac{25}{2}\%$

$$T = \frac{\text{S.I.} \times 100}{P \times R} = \frac{x \times 100}{x \times \frac{25}{2}} = 8 \text{ years}$$

10. Let principle be ₹ x

Then amount would be ₹  $\frac{8}{5}x$

$$\text{S.I.} = \frac{8}{5}x - x = \frac{8x - 5x}{5} = \frac{3x}{5}$$

$$\therefore R = \frac{\text{S.I.} \times 100}{P \times T} = \frac{\frac{3x}{5} \times 100}{x \times 5} = \frac{3 \times 100}{5 \times 5} = 12\%$$

11. Let principle be ₹ x

Then amount would be ₹  $\frac{7}{4}x$ .

$$\text{S.I.} = \frac{7}{4}x - x = ₹ \frac{7x - 4x}{4} = ₹ \frac{3x}{4}$$

$$R = \frac{\text{S.I.} \times 100}{P \times T} = \frac{\frac{3x}{4} \times 100}{x + 6} = \frac{3 \times 100}{4 \times 6} = 12.5\%$$

12. Let principle be ₹  $x$

Then amount would be  $3x$

$$\text{S.I.} = 3x - x = ₹ 2x$$

$$\therefore T = \frac{\text{S.I.} \times 100}{P \times R} = \frac{2x \times 100}{x \times 15} = 13\frac{1}{3} \text{ years}$$

### ⇒ HOTS .....

1. Given, money = ₹ 10000

Divide ₹ 10000 in two parts such that S.I. on first part for 4 years at 12% per annum may be equal to the S.I. on second part for 4.5 years at 16%.

Let First part = ₹  $x$

$$\text{Second part} = ₹ (10000 - x)$$

For first part ( $x$ ),

$$P_1 = ₹ x, T_1 = 4 \text{ years}, R_1 = 12\%$$

$$\text{S.I.}_1 = \frac{P_1 \times R_1 \times T_1}{100} = \frac{x \times 12 \times 4}{100}$$

For second part ( $10000 - x$ )

$$P_2 = (10000 - x), T_2 = 4.5 \text{ years}, R_2 = 16\%$$

$$\text{S.I.}_2 = \frac{P_2 \times R_2 \times T_2}{100} = \frac{(10000 - x) \times 16 \times 4.5}{100}$$

According to the question,

∴ S.I.<sub>1</sub> is equal to S.I.<sub>2</sub>

$$\text{Then, } \frac{x \times 12 \times 4}{100} = \frac{(10000 - x) \times 16 \times 4.5}{100}$$

$$48x = (10000 - x) \times 16 \times 4.5$$

$$\frac{48x}{4.5 \times 16} = (10000 - x)$$

$$\frac{48x \times 10}{45 \times 16} = 10000 - x$$

$$\frac{2}{3}x = 10000 - x$$

$$\frac{2}{3}x + x = 10000$$

$$\frac{5x}{3} = 10000$$

$$x = 10000 \times \frac{3}{5} = 6000$$

First part =  $x = ₹ 6000$

Second part =  $10000 - x$

$$= ₹ 10000 - ₹ 6000 = ₹ 4000$$

Hence, two parts of the sum are ₹ 6000 and ₹ 4000.

2. Here,  $P = ₹ 5,00,000, R = 12\%$

So,  $T = 1 \text{ year}$

$$\begin{aligned} \text{Now, S.I.} &= \frac{P \times R \times T}{100} \\ &= \frac{500000 \times 12 \times 1}{100} = ₹ 60000 \end{aligned}$$

∴ Total amount of scholarship is ₹ 60,000.

Total money of second and third scholarships are

$$= ₹ (20000 + 15000) = ₹ 35000$$

∴ Scholarship for first position

$$= ₹ (60000 - 35000) = ₹ 25000$$

Hence, the scholarship for first position is ₹ 25,000.

### ⇒ NCERT CORNER .....

1. (a) Principal ( $P$ ) = ₹ 1,200; Rate ( $R$ ) = 12% p.a.;

Time ( $T$ ) = 3 years

$$\text{Interest} = \frac{P \times R \times T}{100} = \frac{1200 \times 12 \times 3}{100} = ₹ 432$$

Amount to be paid at the end of 3 years

$$\text{Principal} + \text{Interest} = ₹ 1,200 + ₹ 432 = ₹ 1,632$$

(b) Principal = ₹ 7,500; Rate ( $R$ ) = 5% p.a.;

Time ( $T$ ) = 3 years

$$\begin{aligned} \text{Interest} &= \frac{P \times R \times T}{100} \\ &= \frac{7,500 \times 5 \times 3}{100} = ₹ 1,125 \end{aligned}$$

Amount to be paid at the end of 3 years

$$= \text{Principal} + \text{Interest} = ₹ 7,500 + ₹ 1,125$$

$$= ₹ 8,625$$

2. Principal ( $P$ ) = ₹ 56,000; Time ( $T$ ) = 2 years;

Interest ( $I$ ) = ₹ 0280; Rate ( $R$ ) = ?

$$\text{Interest} = \frac{P \times R \times T}{100}$$

$$\Rightarrow 280 = \frac{56,000 \times R \times 2}{100}$$

$$\Rightarrow R = \frac{280 \times 100}{56,000 \times 2} = \frac{1}{4} = 0.25\%$$

3. Principal ( $P$ ) = ?, Time ( $T$ ) = 1 year,

Rate ( $R$ ) = 9% p.a., Interest ( $I$ ) = ₹ 45

$$\text{Interest} = \frac{P \times R \times T}{100}$$

$$\Rightarrow 45 = \frac{P \times 9 \times 1}{100}$$

$$\Rightarrow P = \frac{45 \times 100}{9}$$

$$= ₹ 500$$

Thus, the sum she has borrowed is ₹ 500.

### EXERCISE 14.1

1. Given in answersheet.

2. Given in answersheet.

3. Given in answersheet.

4. (a)  $\frac{-4}{15} \times \frac{-2}{-2} = \frac{8}{-30}$

(b)  $\frac{-4}{15} \times \frac{-4}{-4} = \frac{16}{-60}$

(c)  $\frac{-4}{15} \times \frac{10}{10} = \frac{-40}{150}$

(d)  $\frac{-4}{15} \times \frac{-12}{-12} = \frac{48}{-180}$

(e)  $\frac{-4}{15} \times \frac{+15}{+15} = \frac{-60}{225}$

5. (a)  $\frac{7}{-11} \times \frac{3}{3} = \frac{21}{-33}$

(b)  $\frac{7}{-11} \times \frac{-4}{-4} = \frac{-28}{44}$

(c)  $\frac{7}{-11} \times \frac{6}{6} = \frac{42}{-66}$

(d)  $\frac{7}{-11} \times \frac{-9}{-9} = \frac{-63}{99}$

(e)  $\frac{7}{-11} \times \frac{12}{12} = \frac{84}{-132}$

6. Given in answersheet.

7. (a)  $\frac{-27 \div 27}{108 \div 27} = \frac{-1}{4}$

(b)  $\frac{44 \div (-4)}{-428 \div (-4)} = \frac{-11}{107}$

(c)  $\frac{185 \div 5}{200 \div 5} = \frac{37}{40}$

(d)  $\frac{-78 \div 26}{208 \div 26} = \frac{-3}{8}$

(e)  $\frac{76 \div (-1)}{-245 \div (-1)} = \frac{-76}{243}$

(f)  $\frac{129 \div (-3)}{-729 \div (3)} = \frac{-43}{243}$

(g)  $\frac{252 \div 63}{1827 \div 63} = \frac{4}{29}$

(h)  $\frac{-240 \div 120}{840 \div 120} = \frac{-2}{7}$

(i)  $\frac{-85 \div 17}{119 \div 17} = \frac{-5}{7}$

(j)  $\frac{56 \div (56)}{-1288 \div (-56)} = \frac{-1}{23}$

8. (a)  $\frac{14}{-25} \times \frac{42}{-75}$

$14 \times -75 = -1050$  and  $42 \times -25 = -1050$

So,  $\frac{14}{-25} = \frac{42}{-75}$

Yes, equivalent

(b)  $\frac{-6}{15}$  and  $\frac{5}{-18}$  or  $\frac{-6}{15} \times \frac{-5}{18}$

$-6 \times 18 = -108$  and  $-5 \times 15 = -75$

Not equivalent

(c)  $\frac{16}{-25} \times \frac{64}{-100}$

$16 \times -100 = -1600$  and  $64 \times -25 = -1600$

Yes, equivalent.

(d)  $\frac{-18}{49} \times \frac{15}{-46}$  or  $\frac{-18}{49} \times \frac{15}{-46}$

$-18 \times 46 = -828$  and  $-15 \times 49 = -735$

Not equivalent

(e)  $\frac{4}{18} \times \frac{20}{90}$

$4 \times 90 = 360$  and  $20 \times 18 = 360$

Yes, equivalent.

(f)  $\frac{17}{-25} \times \frac{68}{-100}$  or  $\frac{17}{-25} \times \frac{-68}{100}$

$-17 \times 100 = -1700$  and  $-68 \times 25 = -1700$

Yes, equivalent.

9. Given in answersheet.

10. Given in answersheet.

### EXERCISE 14.2

1. Do it yourself.

2. (a)  $\frac{2}{3}$  or  $\frac{5}{2}$

$\frac{2}{3} \times \frac{5}{2}$

$2 \times 2 = 4$  and  $5 \times 3 = 15$

$\frac{2}{3}$  is smaller.

(b)  $\frac{-5}{6}$  and  $\frac{-4}{3}$

$\frac{-5}{6} \times \frac{-4}{3}$

$-5 \times 3 = -15$  and  $-4 \times 6 = -24$

$-15 > -24$  so  $\frac{-4}{3}$  is smaller.

(c)  $\frac{-1}{4}$  or  $\frac{1}{4}$

$\frac{-1}{4}$  is smaller because negative rational numbers are smaller than positive rational numbers.

(d) 0 or  $\frac{-3}{5}$

$\frac{-3}{5}$  is smaller because negative rational numbers are smaller than 0.

(e)  $\frac{-4}{9}$  or  $\frac{-5}{6}$

$\frac{-4}{9}$   $\times$   $\frac{-5}{6}$

$-4 \times 6 = -24$  and  $-5 \times 9 = -45$   
 $-24 > -45$  so  $\frac{-5}{6}$  is smaller.

(f)  $\frac{-5}{8}$  or  $\frac{-3}{12}$

$\frac{-5}{8}$   $\times$   $\frac{-3}{12}$

$-5 \times 12 = -60$  and  $-3 \times 8 = -24$   
 $-60 < -24$  so  $\frac{-5}{8}$  is smaller.

(g)  $\frac{4}{8}$  or  $\frac{-3}{6}$

$\frac{-3}{6}$  is smaller because negative rational numbers are smaller than positive rational numbers.

(h)  $\frac{6}{7}$  or  $\frac{2}{1}$

$\frac{6}{7}$   $\times$   $\frac{2}{1}$

$6 \times 1 = 6$  and  $2 \times 7 = 14$   
 $6 < 14$  so  $\frac{6}{7}$  is smaller.

3. (a)  $\frac{-6}{13}$  or  $\frac{-7}{13}$

$-6 > -7$  so  $\frac{-6}{13}$  is greater.

(b)  $\frac{7}{15}$  or  $\frac{-5}{12}$

$\frac{7}{15}$  is greater because positive rational numbers are greater than negative rational numbers.

(c)  $\frac{4}{8}$  or  $\frac{1}{4}$

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

$4 \times 8 = 32$  and  $1 \times 8 = 8$   
So,  $\frac{4}{8}$  is greater.

(d)  $\frac{-17}{8}$  or  $-3$

$\frac{-17}{8}$   $\times$   $\frac{-3}{1}$

$-17 \times 1 = -17$  and  $-3 \times 8 = -24$   
 $-17 > -24$  so,  $\frac{-17}{8}$  is greater.

(e)  $\frac{5}{12}$  or  $\frac{-6}{17}$

$\frac{5}{12}$  is greater.

(f)  $\frac{6}{7}$  or  $-6$

$\frac{6}{7}$  is greater.

(g)  $-4$  or  $\frac{-16}{5}$

$\frac{-4}{1}$   $\times$   $\frac{-16}{5}$

$-4 \times 5 = -20$  and  $-16 \times 1 = -16$   
 $-20 < -16$  so  $\frac{-16}{5}$  is greater.

(h)  $\frac{-5}{6}$  or 1

1 is greater.

4. Given in answersheet.

5. (a)  $\frac{2}{21}$ ,  $\frac{-5}{14}$ , 0,  $\frac{-3}{7}$

$\frac{-5}{14}$  and  $\frac{-3}{7}$

$\frac{-3}{7} = -\frac{3 \times 2}{7 \times 2} = \frac{-6}{14}$

So, ascending order is  $\frac{-6}{14}$ ,  $\frac{-5}{14}$ , 0,  $\frac{2}{21}$

or,  $\frac{-3}{7}$ ,  $\frac{-5}{14}$ , 0,  $\frac{2}{21}$

(b)  $\frac{-5}{11}$ , 2,  $\frac{-6}{22}$ ,  $\frac{-7}{11}$

$\frac{-5}{11} = \frac{-5 \times 2}{11 \times 2} = \frac{-10}{22}$



$$\frac{-7}{11} = \frac{-7 \times 2}{11 \times 2} = \frac{-14}{22}$$

So, ascending order is

$$\frac{-14}{22}, \frac{-10}{22}, \frac{-6}{22}, 2$$

or  $\frac{-7}{11}, \frac{-5}{11}, \frac{-6}{22}, 2$

(c)  $\frac{-6}{25}, \frac{-5}{20}, \frac{7}{15}, \frac{-3}{10}$

LCM of 25, 20 and 10

5	25, 20, 10
5	5, 4, 2
2	1, 4, 2
2	1, 2, 1
	1, 1, 1

$$\text{LCM} = 5 \times 5 \times 2 \times 2 = 100$$

Now,  $\frac{-6}{25} = \frac{-6 \times 4}{25 \times 4} = \frac{-24}{100}$

$$\frac{-5}{20} = \frac{-5 \times 5}{20 \times 5} = \frac{-25}{100}$$

$$\frac{-3}{10} = \frac{-3 \times 10}{10 \times 10} = \frac{-30}{100}$$

So, ascending order is

$$\frac{-30}{100}, \frac{-25}{100}, \frac{-24}{100}, \frac{7}{15}$$

or  $\frac{-3}{10}, \frac{-5}{20}, \frac{-6}{25}, \frac{7}{15}$

(d)  $\frac{5}{16}, \frac{-3}{4}, \frac{-8}{12}, \frac{9}{24}$

LCM of 16, 4, 12, 24 =  $4 \times 3 \times 2 \times 2 = 48$

4	16, 4, 12, 24
3	4, 1, 3, 6
2	4, 1, 1, 2
2	2, 1, 1, 1
	1, 1, 1, 1

Now,  $\frac{5}{16} = \frac{5 \times 3}{16 \times 3} = \frac{15}{48}$

$$-\frac{3}{4} = \frac{-3 \times 12}{4 \times 12} = \frac{-36}{48}$$

$$-\frac{8}{12} = \frac{-8 \times 4}{12 \times 4} = \frac{-32}{48}$$

$$-\frac{9}{24} = \frac{9 \times 2}{24 \times 2} = \frac{18}{48}$$

So, ascending order is

$$\frac{-36}{48}, \frac{-32}{48}, \frac{15}{48}, \frac{18}{48}$$

or  $\frac{-3}{4}, \frac{-8}{12}, \frac{5}{16}, \frac{9}{24}$

6. (a)  $\frac{7}{-18}, \frac{-4}{27}, \frac{-2}{3}, \frac{-4}{9}$

LCM of 18, 27, 3, 9 =  $3 \times 3 \times 2 \times 3 = 54$

3	18, 27, 3, 9
3	6, 9, 1, 3
2	2, 3, 1, 1
3	1, 3, 1, 1
	1, 1, 1, 1

Now,  $\frac{-7}{18} = \frac{-7 \times 3}{18 \times 3} = \frac{-21}{54}$

$$\frac{-4}{27} = \frac{-4 \times 2}{27 \times 2} = \frac{-8}{54}$$

$$-\frac{2}{3} = \frac{-2 \times 18}{3 \times 18} = \frac{-36}{54}$$

$$-\frac{4}{9} = \frac{-4 \times 6}{9 \times 6} = \frac{-24}{54}$$

So, descending order is

$$\frac{-8}{54}, \frac{-21}{54}, \frac{-24}{54}, \frac{-36}{54}$$

or  $\frac{-4}{27}, \frac{7}{-18}, \frac{-4}{9}, \frac{-2}{3}$

(b)  $\frac{-6}{21}, -1, \frac{-3}{14}, \frac{-5}{7}$

LCM of 21, 14, 7 =  $7 \times 3 \times 2 = 42$

7	21, 14, 7
3	3, 2, 1
2	1, 2, 1
	1, 1, 1

Now,  $\frac{-6}{21} = \frac{-6 \times 2}{21 \times 2} = \frac{-12}{42}$

$$-1 = \frac{-1 \times 42}{42} = \frac{-42}{42}$$

$$\frac{-3}{14} = \frac{-3 \times 3}{14 \times 3} = \frac{-9}{42}$$

$$\frac{-5}{7} = \frac{-5 \times 6}{7 \times 6} = \frac{-30}{42}$$

So, descending order is

$$\frac{-9}{42}, \frac{-12}{42}, \frac{-30}{42}, \frac{-42}{42}$$

or  $\frac{-3}{14}, \frac{-6}{21}, \frac{-5}{7}, -1$

(c)  $\frac{-1}{5}, \frac{2}{3}, \frac{-5}{6}, \frac{-7}{12}$

LCM of 5, 6, 12 =  $6 \times 5 \times 2 = 60$

6	5, 6, 12
5	5, 1, 2
2	1, 1, 2
	1, 1, 1

Now,  $\frac{-1}{5} = \frac{-1 \times 12}{5 \times 12} = \frac{-12}{60}$

$\frac{-5}{6} = \frac{-5 \times 10}{6 \times 10} = \frac{-50}{60}$

$\frac{-7}{12} = \frac{-7 \times 5}{12 \times 5} = \frac{-35}{60}$

So, descending order is

$\frac{2}{3}, \frac{-12}{60}, \frac{-35}{60}, \frac{-50}{60}$

or  $\frac{2}{3}, \frac{-1}{5}, \frac{-7}{12}, \frac{-5}{6}$

(d)  $-3, \frac{-6}{5}, \frac{-8}{3}, \frac{-1}{3}$

LCM of 5, 3, 3 =  $5 \times 3 = 15$

Now,  $\frac{-3}{1} = \frac{-3 \times 15}{1 \times 15} = \frac{-45}{15}$

$\frac{-6}{5} = \frac{-6 \times 3}{5 \times 3} = \frac{-18}{15}$

$\frac{-8}{3} = \frac{-8 \times 5}{3 \times 5} = \frac{-40}{15}$

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

So, descending order is

$\frac{-5}{15}, \frac{-18}{15}, \frac{-40}{15}, \frac{-45}{15}$

or  $\frac{-1}{3}, \frac{-6}{5}, \frac{-8}{3}, -3$

7. Given in answersheet.

8. Given in answersheet.

9. Given in answersheet.

10. Given in answersheet.

➤ **EXERCISE 14.3** .....

1. (a)  $\frac{-5}{11} + \frac{3}{11} = \frac{-5+3}{11} = \frac{-2}{11}$

(b)  $\frac{3}{17} + \frac{6}{17} + \frac{-4}{17} = \frac{3+6-4}{17} = \frac{5}{17}$

(c)  $\frac{-6}{25} + \frac{4}{25} + \frac{3}{25} = \frac{-6+4+3}{25} = \frac{1}{25}$

(d)  $\frac{18}{19} + \frac{-3}{19} + \frac{-4}{19} = \frac{18-3-4}{19} = \frac{11}{19}$

(e)  $\frac{-6}{29} + \frac{6}{29} + \frac{3}{29} = \frac{-6+6+3}{29} = \frac{3}{29}$

(f)  $\frac{6}{23} + \frac{4}{23} - \frac{10}{23} = \frac{6+4-10}{23} = \frac{0}{23} = 0$

(g)  $\frac{-9}{23} + \frac{2}{23} + \frac{-11}{23} = \frac{-9+2-11}{23} = \frac{-18}{23}$

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

2. (a)  $\frac{-6}{9} + \frac{2}{15}$

3	9, 15
3	3, 5
5	1, 5
	1, 1

LCM of 9, 15 =  $3 \times 3 \times 5 = 45$

$\frac{-6}{9} + \frac{2}{15} = \frac{-6 \times 5 + 2 \times 3}{45} = \frac{-30+6}{45} = \frac{-24}{45} = \frac{-8}{15}$

(b)  $\frac{-12}{7} + \frac{5}{14} = \frac{-12 \times 2 + 5 \times 1}{14} = \frac{-24+5}{14} = \frac{-19}{14}$

(c)  $\frac{-5}{36} + \frac{2}{12} = \frac{-5 \times 1 + 2 \times 3}{36} = \frac{-5+6}{36} = \frac{1}{36}$

(d)  $\frac{5}{18} + \frac{-7}{12} = \frac{5 \times 2 + (-7) \times 3}{36} = \frac{10-21}{36} = \frac{-11}{36}$

(e)  $\frac{7}{9} + \frac{-5}{18} = \frac{7 \times 2 + (-5) \times 1}{18} = \frac{14-5}{18} = \frac{9}{18} = \frac{1}{2}$

(f)  $\frac{-3}{22} + \frac{6}{11} = \frac{-3 \times 1 + 6 \times 2}{22} = \frac{-3+12}{22} = \frac{9}{22}$

(g)  $\frac{2}{51} + \frac{3}{34} + \frac{-6}{17} = \frac{2 \times 2 + 3 \times 3 - 6 \times 6}{102}$

$= \frac{4+9-36}{102} = \frac{-23}{102}$

(h)  $\frac{6}{-7} + \frac{-2}{21} + \frac{5}{-14} = \frac{-6 \times 6 - 2 \times 2 - 5 \times 3}{42}$

$= \frac{-36-4-15}{42} = \frac{-55}{42}$

3. (a)  $\frac{-3}{7} + \frac{(-2)}{1} + \frac{5}{14} + \frac{-9}{42}$

$= \frac{-3 \times 6 + (-2) \times 42 + 5 \times 3 + (-9) \times 1}{42}$

$= \frac{-18-84+15-9}{42} = \frac{-96}{42} = \frac{-16}{7}$

$$\begin{aligned} \text{(b)} \quad \frac{4}{7} + \frac{-8}{9} + \frac{-12}{7} + 0 + \frac{16}{21} \\ = \frac{4 \times 9 + (-8) \times 7 + (-12) \times 9 + 0 + 16 \times 3}{63} \\ = \frac{36 - 56 - 108 + 48}{63} = \frac{-80}{63} \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad \frac{-6}{13} + \frac{5}{26} + \frac{-7}{39} + 0 = \frac{-6 \times 6 + 5 \times 3 + (-7) \times 2 + 0}{78} \\ = \frac{-36 + 15 - 14}{78} = \frac{-35}{78} \end{aligned}$$

$$\begin{aligned} \text{(d)} \quad \frac{-7}{10} + \frac{5}{18} + \frac{-2}{5} + \frac{6}{15} \\ = \frac{-7 \times 9 + 5 \times 5 + (-2) \times 18 + 6 \times 6}{90} \\ = \frac{-63 + 25 - 36 + 36}{90} = \frac{-38}{90} = \frac{-19}{45} \end{aligned}$$

$$\begin{aligned} \text{4. (a)} \quad \frac{6}{7} + \frac{-3}{5} + \frac{-2}{21} + \frac{2}{15} \\ = \left( \frac{6}{7} + \frac{-2}{21} \right) + \left( \frac{-3}{5} + \frac{2}{15} \right) \\ = \left( \frac{6 \times 3 - 2 \times 1}{21} \right) + \left( \frac{-3 \times 3 + 2 \times 1}{15} \right) \\ = \left( \frac{18 - 2}{21} \right) + \left( \frac{-9 + 2}{15} \right) \\ = \frac{16}{21} + \frac{-7}{15} = \frac{16 \times 5 + (-7) \times 7}{105} \\ = \frac{80 - 49}{105} = \frac{31}{105} \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad \frac{3}{10} + \frac{4}{11} + \frac{-7}{20} + \frac{5}{33} \\ = \left( \frac{3}{10} + \frac{-7}{20} \right) + \left( \frac{4}{11} + \frac{5}{33} \right) \\ = \left( \frac{3 \times 2 - 7 \times 1}{20} \right) + \left( \frac{4 \times 3 + 5 \times 1}{33} \right) \\ = \left( \frac{6 - 7}{20} \right) + \left( \frac{12 + 5}{33} \right) \\ = \frac{-1}{20} + \frac{17}{33} = \frac{-1 \times 33 + 17 \times 20}{660} \\ = \frac{-33 + 340}{660} = \frac{307}{660} \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad \frac{-6}{15} + \frac{-7}{9} + \frac{3}{10} + \frac{-5}{6} \\ = \left( \frac{-6}{15} + \frac{3}{10} \right) + \left( \frac{-7}{9} + \frac{-5}{6} \right) \end{aligned}$$

$$\begin{aligned} &= \left( \frac{-6 \times 2 + 3 \times 3}{30} \right) + \left( \frac{-7 \times 2 - 5 \times 3}{18} \right) \\ &= \frac{-12 + 9}{30} + \frac{-14 - 15}{18} \\ &= \frac{-3}{30} + \frac{-29}{18} = \frac{-3 \times 3 - 29 \times 5}{90} \\ &= \frac{-9 - 145}{90} = \frac{-154}{90} = \frac{-77}{45} \end{aligned}$$

$$\begin{aligned} \text{(d)} \quad \frac{-3}{5} + \frac{5}{8} + \frac{-4}{15} + \frac{-1}{3} + \frac{1}{4} \\ = \left( \frac{-3}{5} + \frac{-4}{15} + \frac{-1}{3} \right) + \left( \frac{5}{8} + \frac{1}{4} \right) \\ = \left( \frac{-3 \times 3 - 4 \times 1 - 1 \times 5}{15} \right) + \left( \frac{5 \times 1 + 1 \times 2}{8} \right) \\ = \frac{-9 - 4 - 5}{15} + \frac{5 + 2}{8} = \frac{-18}{15} + \frac{7}{8} \\ = \frac{-6}{5} + \frac{7}{8} = \frac{-6 \times 8 + 7 \times 5}{40} \\ = \frac{-48 + 35}{40} = \frac{-13}{40} \end{aligned}$$

5. Do it yourself.

6. Do it yourself.

7. Given in answersheet.

8. Given in answersheet.

#### EXERCISE 14.4

$$\text{1. (a)} \quad -2 - \frac{7}{18} = \frac{-36 - 7}{18} = \frac{-43}{18}$$

$$\begin{aligned} \text{(b)} \quad \frac{-6}{11} - \left( \frac{-5}{13} \right) = \frac{-6}{11} + \frac{5}{13} = \frac{-6 \times 13 + 5 \times 11}{143} \\ = \frac{-78 + 55}{143} = \frac{-23}{143} \end{aligned}$$

$$\text{(c)} \quad \frac{-9}{25} - \frac{18}{35} = \frac{-9 \times 7 - 18 \times 5}{175} = \frac{-63 - 90}{175} = \frac{-153}{175}$$

$$\text{(d)} \quad \frac{-5}{18} - \frac{13}{12} = \frac{-5 \times 2 - 13 \times 3}{36} = \frac{-10 - 39}{36} = \frac{-49}{36}$$

$$\text{(e)} \quad \frac{-4}{39} - \frac{5}{13} = \frac{-4 \times 1 - 5 \times 3}{39} = \frac{-4 - 15}{39} = \frac{-19}{39}$$

$$\text{(f)} \quad \frac{-6}{17} - 1 = \frac{-6 - 17}{17} = \frac{-23}{17}$$

$$\text{(g)} \quad \frac{-9}{22} - \frac{5}{11} = \frac{-9 \times 1 - 5 \times 2}{22} = \frac{-9 - 10}{22} = \frac{-19}{22}$$

$$\begin{aligned} \text{(h)} \quad \frac{4}{39} - \left( \frac{-3}{13} \right) = \frac{4}{39} + \frac{3}{13} = \frac{4 \times 1 + 3 \times 3}{39} \\ = \frac{4 + 9}{39} = \frac{13}{39} = \frac{1}{3} \end{aligned}$$

$$2. (a) \frac{3}{20} - \frac{5}{8} = \frac{3 \times 2 - 5 \times 5}{40} = \frac{6 - 25}{40} = \frac{-19}{40}$$

$$(b) \frac{5}{8} - \left(\frac{-3}{7}\right) = \frac{5}{8} + \frac{3}{7} = \frac{5 \times 7 + 3 \times 8}{56} = \frac{35 + 24}{56} = \frac{59}{56}$$

$$(c) \frac{-1}{4} - \frac{5}{8} = \frac{-1 \times 2 - 5 \times 1}{8} = \frac{-7}{8}$$

$$(d) 1 - \left(\frac{-16}{23}\right) = 1 + \frac{16}{23} = \frac{23 + 16}{23} = \frac{39}{23}$$

$$(e) \frac{-3}{14} - \left(\frac{-6}{7}\right) = \frac{-3}{14} + \frac{6}{7} = \frac{-3 \times 1 + 6 \times 2}{14} = \frac{9}{14}$$

$$(f) \frac{5}{42} - \left(\frac{-8}{21}\right) = \frac{5}{42} + \frac{8}{21} = \frac{5 \times 1 + 8 \times 2}{42} \\ = \frac{5 + 16}{42} = \frac{21}{42} = \frac{1}{2}$$

$$(g) \frac{-4}{11} - \frac{-16}{33} = \frac{-4}{11} + \frac{16}{33} = \frac{-4 \times 3 + 16 \times 1}{33} \\ = \frac{-12 + 16}{33} = \frac{4}{33}$$

$$(h) \frac{-3}{8} - (-7) = \frac{-3}{8} + \frac{7}{1} = \frac{-3 \times 7 + 8 \times 8}{8} \\ = \frac{-3 + 56}{8} = \frac{53}{8}$$

$$3. (a) \frac{8}{15} - \frac{2}{3} - \frac{7}{30} + \frac{1}{10} + 2 \\ = \frac{8 \times 2 - 2 \times 10 - 7 \times 1 + 1 \times 3 + 2 \times 30}{30}$$

$$= \frac{16 - 20 - 7 + 3 + 60}{30} = \frac{52}{30} = \frac{26}{15}$$

$$(b) \frac{1}{12} - \frac{5}{18} - \frac{7}{24} + \frac{4}{27} + 1 \\ = \frac{1 \times 18 - 5 \times 12 - 7 \times 9 + 4 \times 8 + 1 \times 216}{216}$$

$$= \frac{18 - 60 - 63 + 32 + 216}{216} = \frac{143}{216}$$

$$(c) \frac{-6}{25} - \frac{4}{15} + \frac{-7}{30} - 4 + 0 \\ = \frac{-6 \times 6 - 4 \times 10 - 7 \times 5 - 4 \times 150 + 0}{150}$$

$$= \frac{-36 - 40 - 35 - 600}{150} = \frac{-711}{150}$$

$$(d) \frac{-3}{11} + \frac{5}{22} + \frac{1}{5} + \frac{-2}{10} + 1 \\ = \frac{-3 \times 10 + 5 \times 5 + 1 \times 22 - 2 \times 11 + 1 \times 110}{110}$$

$$= \frac{-30 + 25 + 22 - 22 + 110}{110} = \frac{105}{110} = \frac{21}{22}$$

$$(e) \frac{5}{14} - \frac{2}{7} - \frac{6}{10} + \frac{15}{28} - 2 \\ = \frac{5 \times 10 - 2 \times 20 - 6 \times 14 + 15 \times 5 - 2 \times 140}{140}$$

$$= \frac{50 - 40 - 84 + 75 - 280}{140} = \frac{-279}{140}$$

$$(f) \frac{-5}{16} + \frac{7}{32} - \frac{11}{48} + 3 \\ = \frac{-5 \times 6 + 7 \times 3 - 11 \times 2 + 3 \times 96}{96}$$

$$= \frac{-30 + 21 - 22 + 288}{96} = \frac{257}{96}$$

$$4. \text{ Required number} = \frac{-3}{5} - \frac{5}{17} \\ = \frac{-3 \times 17 - 5 \times 5}{85}$$

$$= \frac{-51 - 25}{85} = \frac{-76}{85}$$

$$5. \text{ Required number} = -3 - \left(\frac{-4}{5}\right) \\ = -3 + \frac{4}{5} = \frac{-3 \times 5 + 4 \times 1}{5}$$

$$= \frac{-15 + 4}{5} = \frac{-11}{5}$$

$$6. \text{ Required number} = \frac{3}{17} - \left(\frac{-5}{34}\right) \\ = \frac{3}{17} + \frac{5}{34}$$

$$= \frac{3 \times 2 + 5 \times 1}{34} = \frac{11}{34}$$

$$7. \text{ Required number} = \frac{-7}{10} - \frac{11}{30} \\ = \frac{-7 \times 3 - 11 \times 1}{30}$$

$$= \frac{-21 - 11}{30} = \frac{-32}{30} = \frac{-16}{15}$$

$$8. \left(-3 + \frac{7}{10}\right) - \left(\frac{-3}{7} + \frac{5}{14}\right) \\ = \left(\frac{-3 \times 10 + 7 \times 1}{10}\right) - \left(\frac{-3 \times 2 + 5 \times 1}{14}\right)$$

$$= \left(\frac{-30 + 7}{10}\right) - \left(\frac{-6 + 5}{14}\right)$$

$$= \frac{-23}{10} + \frac{1}{14} = \frac{-23 \times 7 + 1 \times 5}{70}$$

$$= \frac{-161 + 5}{70} = \frac{-156}{70} = \frac{-78}{35}$$

$$\begin{aligned}
 9. \left(\frac{-9}{10} + \frac{8}{15}\right) - \left(-5 + \frac{-4}{13}\right) \\
 &= \left(\frac{-9 \times 3 + 8 \times 2}{30}\right) - \left(\frac{-5 \times 13 - 4 \times 1}{13}\right) \\
 &= \left(\frac{-27 + 16}{30}\right) - \left(\frac{-65 - 4}{13}\right) \\
 &= \frac{-11}{30} + \frac{69}{13} = \frac{-11 \times 13 + 69 \times 30}{390} \\
 &= \frac{-143 + 2070}{390} = \frac{1927}{390}
 \end{aligned}$$

### EXERCISE 14.5

1. (a)  $\frac{9}{8} \times \frac{16}{27} = \frac{2}{3}$
- (b)  $\frac{6}{7} \times \frac{28}{-41} = \frac{-24}{41}$
- (c)  $\frac{-15}{31} \times \frac{62}{18} = \frac{-5}{3}$
- (d)  $-32 \times \frac{5}{16} = -10$
- (e)  $\frac{-5}{13} \times \frac{-52}{25} = \frac{4}{5}$
- (f)  $\frac{13}{25} \times \frac{-40}{39} = \frac{-8}{15}$
- (g)  $\frac{-9}{16} \times \frac{48}{27} = -1$
- (h)  $\frac{-9}{11} \times \frac{22}{27} = \frac{-2}{3}$
2. (a)  $\frac{-15}{29} \times 58 = -30$
- (b)  $-17 \times \frac{5}{34} = \frac{-5}{2}$
- (c)  $\frac{17}{25} \times \frac{-30}{68} = \frac{-3}{10}$
- (d)  $\frac{-6}{7} \times 28 = -24$
- (e)  $\frac{-13}{10} \times -15 = \frac{39}{2}$
- (f)  $\frac{-6}{13} \times \frac{52}{-75} = \frac{8}{25}$
- (g)  $\frac{-9}{64} \times \frac{16}{25} = \frac{-9}{100}$
- (h)  $2\frac{4}{9} \times 2\frac{3}{5} = \frac{22}{9} \times \frac{13}{5} = \frac{286}{45}$

3. Do it yourself.
4. Do it yourself.
5. Do it yourself.

6. Given in answersheet.

7. (a)  $\frac{-1}{9} \times \frac{4}{-9} \times \frac{81}{-64} \times 2 = -\frac{1}{8}$
- (b)  $-8 \times \frac{-6}{11} \times \frac{33}{-24} \times \frac{6}{7} = -\frac{36}{7}$
- (c)  $\frac{-8}{17} \times \frac{34}{25} \times \frac{-35}{16} \times -4 = -\frac{28}{5}$
- (d)  $\frac{10}{16} \times \frac{-8}{25} \times \frac{11}{18} \times \frac{9}{-22} = \frac{1}{20}$
- (e)  $\frac{-4}{5} \times \frac{10}{-13} \times \frac{-5}{6} \times \frac{26}{-35} = \frac{8}{21}$
- (f)  $\frac{13}{25} \times \frac{-5}{39} \times \frac{2}{11} \times \frac{22}{10} = \frac{-2}{75}$
8. (a)  $\left(\frac{-2}{5}\right)^{-1} = \frac{-5}{2}$
- (b)  $\left(\frac{-5}{6}\right)^{-1} = -\frac{6}{5}$
- (c)  $\left(\frac{-8}{9} \times \frac{18}{25}\right)^{-1} = \left(\frac{-16}{25}\right)^{-1} = \frac{-25}{16}$
- (d)  $\left(\frac{-3}{4}\right)^{-1} \times \frac{4}{9} \times \left(\frac{6}{7}\right)^{-1} = \frac{-4}{3} \times \frac{4}{9} \times \frac{7}{6} = \frac{-56}{81}$
- (e)  $\left(\frac{4}{-9}\right)^{-1} \times \left(\frac{16}{18}\right)^{-1} \times -9 = \frac{-9}{4} \times \frac{18}{16} \times -9 = \frac{729}{32}$
- (f)  $\left(\frac{-5}{6} \times \frac{18}{25}\right)^{-1} = \left(\frac{-3}{5}\right)^{-1} = \frac{-5}{3}$

9. Given in answersheet.

10. Given in answersheet.

### EXERCISE 14.6

1. (a)  $\frac{-4}{11} \div \frac{12}{33} = \frac{-4}{11} \times \frac{33}{12} = -1$
- (b)  $(-16) \div \frac{4}{19} = -16 \times \frac{19}{4} = -76$
- (c)  $\frac{-4}{11} \div \frac{16}{55} = \frac{-4}{11} \times \frac{55}{16} = \frac{-5}{4}$
- (d)  $\left(-\frac{1}{10}\right) \div \frac{-7}{15} = -\frac{1}{10} \times \frac{-15}{7} = \frac{3}{14}$
- (e)  $\frac{-8}{13} \div \frac{5}{52} = \frac{-8}{13} \times \frac{52}{5} = \frac{-32}{5}$
- (f)  $\frac{4}{13} \div \left(\frac{16}{-39}\right) = \frac{4}{13} \times \frac{-39}{16} = \frac{-3}{4}$
- (g)  $(-5) \div \frac{45}{38} = -5 \times \frac{38}{45} = \frac{-38}{9}$
- (h)  $\frac{6}{31} \div \frac{-12}{62} = \frac{6}{31} \times \frac{62}{-12} = -1$

$$(i) \frac{27}{40} \div (-18) = \frac{27}{40} \times \frac{-1}{18} = \frac{-3}{80}$$

2. Given in answersheet.

3. Do it yourself.

4. Do it yourself.

5. Product of two rational numbers =  $\frac{-5}{16}$

One number =  $\frac{4}{11}$

Other number =  $\frac{-5}{16} \div \frac{4}{11} = \frac{-5}{16} \times \frac{11}{4} = \frac{-55}{64}$

6. Product of two rational numbers =  $\frac{11}{169}$

One number =  $\frac{-21}{13}$

Other number =  $\frac{11}{169} \div \frac{-21}{13} = \frac{11}{169} \times \frac{13}{-21} = \frac{-13}{273}$

7. Required number =  $\frac{27}{-55} \div \frac{-9}{11} = \frac{27}{-55} \times \frac{11}{-9} = \frac{3}{5}$

8. Required number =  $\frac{-16}{39} \div \frac{4}{13} = \frac{-16}{39} \times \frac{13}{4} = \frac{-4}{3}$

9. Required number =  $\frac{3}{16} \div \frac{-9}{28} = \frac{3}{16} \times \frac{-28}{9} = -\frac{7}{12}$

10. Required number =  $\frac{5}{11} \div \frac{-10}{33} = \frac{5}{11} \times \frac{33}{-10} = \frac{-3}{2}$

**⇒ HOTS** .....

1. Given in answersheet.

2. She simplified rational number  $\frac{-25}{-30} = \frac{-5}{6}$  which is wrong as she divided numerator by 5 and denominator by -5. As the correct answer should be

$$= \frac{5}{6} \left[ \frac{-25 \div -5}{-30 \div -5} \right]$$

3. Let the total volume = 1

Body floats volume =  $\frac{2}{9}$

Body submerged volume =  $\frac{1}{1} - \frac{2}{9}$

∴ LCM of 1 and 9 = 9

On multiplying numerator and denominator by their HCF, we get

$$\frac{1 \times 9}{1 \times 9} = \frac{9}{9}$$

∴ Body submerged volume =  $\frac{9}{9} - \frac{2}{9} = \frac{7}{9}$

**Ratio :**

Body submerged volume	Body floats volume
$\frac{7}{9}$	$\frac{2}{9}$

On multiplying both sides by 9, we get

$$\frac{7}{9} \times 9 : \frac{2}{9} \times 9 = 7 : 2$$

In rational number form =  $\frac{7}{2}$ .

4.  $7\frac{1}{6} = \frac{43}{6}$  and  $3\frac{2}{6} = \frac{20}{6}$

$$7\frac{1}{6} \div 3\frac{2}{6} = \frac{43}{6} \div \frac{20}{6}$$

$$\Rightarrow \frac{43}{6} \times \frac{6}{20} = \frac{43}{20} = 2.15$$

2.15 which is greater than 1.

**⇒ NCERT CORNER** .....

1. (i) Here,  $\frac{-7}{21}$  is a negative rational number and  $\frac{3}{9}$  is a positive rational number. Hence, the given pair does not represent the same rational number.

(ii)  $\frac{-16}{20} = \frac{-16 \div 4}{20 \div 4} = \frac{-4}{5}$  or  $-\frac{4}{5}$

and  $\frac{20}{-25} = \frac{20 \div 5}{-25 \div 5} = \frac{4}{-5}$  or  $-\frac{4}{5}$

Hence,  $\frac{-16}{20} = \frac{20}{-25}$ . Thus, the given pair represent the same rational number.

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

Hence,  $\frac{-2}{-3} = \frac{2}{3}$ . Thus, the given pair represent the same rational number.

2. (i) Since, a negative rational number is always less than a positive rational number

$$\therefore \frac{-5}{7} \square \frac{2}{3}$$

(ii)  $\frac{-8}{5} = \frac{-8 \times 4}{5 \times 4} = \frac{-32}{20}$ ;  $\frac{-7}{4} = \frac{7 \times 5}{4 \times 5} = \frac{-35}{20}$

Since  $\frac{-32}{20} > \frac{-35}{20}$  ∴  $\frac{-8}{5} \square \frac{-7}{4}$

(iii)  $\frac{1}{-3} = \frac{1 \times (-4)}{-3 \times (-4)} = \frac{-4}{12}$ ;  $\frac{-1}{4} = \frac{-1 \times 3}{4 \times 3} = \frac{-3}{12}$

Since  $\frac{-4}{12} < \frac{-3}{12}$  ∴  $\frac{1}{-3} \square \frac{-1}{4}$

3. (i)  $\frac{5}{4} + \frac{(-11)}{4} = \frac{5+(-11)}{4} = \frac{5-11}{4} = \frac{-6}{4} = \frac{-3}{2}$   
(ii)  $\frac{-9}{10} = \frac{(-9) \times 3}{10 \times 3} = \frac{-27}{30}$ ;  $\frac{22}{15} = \frac{22 \times 2}{15 \times 2} = \frac{44}{30}$   
[∴ LCM of 10 and 15 is 30]  
 $\Rightarrow \frac{-9}{10} + \frac{22}{15} = \frac{-27}{30} + \frac{44}{30} = \frac{-27+44}{30} = \frac{17}{30}$   
(iii)  $\frac{-2}{3} + 0 = \frac{-2}{3} + \frac{0}{3} = \frac{-2+0}{3} = \frac{-2}{3}$   
4. (i)  $\frac{7}{24} = \frac{7 \times 3}{24 \times 3} = \frac{21}{72}$ ;  $\frac{17}{36} = \frac{17 \times 2}{36 \times 2} = \frac{34}{72}$

[∴ LCM of 24 and 36 is 72]  
Now,  $\frac{7}{24} - \frac{17}{36} = \frac{7}{24} + \frac{(-17)}{36}$   
 $= \frac{21}{72} + \frac{(-34)}{72} = \frac{21+(-34)}{72}$   
 $= \frac{21-34}{72} = \frac{-13}{72}$

(ii)  $\frac{-6}{13} - \left(\frac{-7}{15}\right) = \frac{-6}{13} + \text{additive inverse of}$

$\frac{-7}{15} = \frac{-6}{13} + \frac{7}{15}$   
 $\Rightarrow \frac{-6}{13} = \frac{(-6) \times 15}{13 \times 15} = \frac{-90}{195}$ ;  
 $\frac{7}{15} = \frac{7 \times 13}{15 \times 13} = \frac{91}{195}$

[∴ LCM of 13 and 15 is 195]  
 $\Rightarrow \frac{-6}{13} + \frac{7}{15} = \frac{-90}{195} + \frac{91}{195} = \frac{1}{195}$

(iii)  $-2\frac{1}{9} - 6 = \frac{-19}{9} - \frac{6}{1} = \frac{-19}{9} + \text{additive inverse}$

of  $\frac{6}{1} = \frac{-19}{9} + \frac{(-6)}{1}$   
 $\Rightarrow \frac{-19}{9} = \frac{-19 \times 1}{9 \times 1} = \frac{-19}{9}$ ;

$\frac{-6}{1} = \frac{-6 \times 9}{1 \times 9} = \frac{-54}{9}$   
 $\Rightarrow \frac{-19}{9} + \frac{(-6)}{1} = \frac{-19}{9} + \frac{(-54)}{9}$   
 $= \frac{-19-54}{9} = \frac{-73}{9}$ .

5. (i)  $\frac{9}{2} \times \left(\frac{-7}{4}\right) = \frac{9 \times (-7)}{2 \times 4} = \frac{-63}{8}$

(ii)  $\frac{-6}{5} \times \frac{9}{11} = \frac{-6 \times 9}{5 \times 11} = \frac{-54}{55}$

(iii)  $\frac{3}{-5} \times \frac{-5}{3} = \frac{3 \times (-5)}{-5 \times 3} = \frac{-15}{-15} = 1$

6. (i)  $\frac{-3}{5} \div 2 = \frac{-3}{5} \div \frac{2}{1} = \frac{-3}{5} \times \text{reciprocal of } \frac{2}{1}$   
 $= \frac{-3}{5} \times \frac{1}{2} = \frac{-3}{10}$

(ii)  $\frac{-2}{13} \div \frac{1}{7} = \frac{-2}{13} \times \frac{7}{1} = \frac{-14}{13}$

(iii)  $\frac{3}{13} \div \left(\frac{-4}{65}\right) = \frac{3}{13} \times \frac{-65}{4} = \frac{-195}{52} = \frac{-15}{4}$

## 15 Practical Geometry (Construction)

### EXERCISE 15.1

1-4. Do yourself.

### EXERCISE 15.2

1-7. Do yourself.

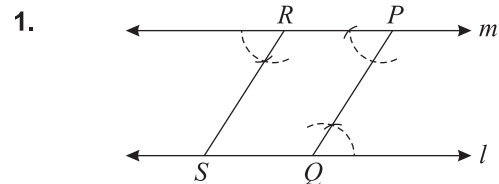
### EXERCISE 15.3

1-8. Do yourself.

### HOTS

1-3. Do yourself.

### NCERT CORNER



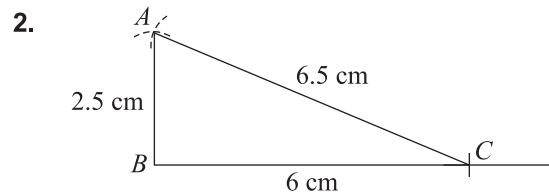
#### Steps for construction :

1. Draw a line  $l$  and mark a point  $P$  outside it.
2. Take a point  $Q$  on line  $l$  and join  $PQ$ .
3. Draw a line  $m$  parallel to line  $l$  through  $P$ .
4. Mark a point  $R$  on line  $m$ .
5. Through  $R$ , draw  $RS \parallel PQ$ , such that it meets  $l$  and  $S$ .

Since,  $l \parallel m$ , so  $RP \parallel SQ$

Also  $PQ \parallel RS$

∴  $PQRS$  is a parallelogram.

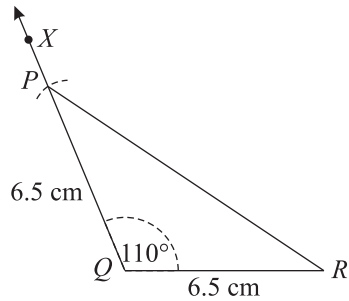


#### Steps for construction :

1. Draw a line segment  $BC$  of length 6 cm.
2. With  $B$  as centre, draw an arc of radius 2.5 cm.
3. With  $C$  as centre, draw another arc of radius 6.5 cm to cut the previous arc at  $A$ .

4. Join  $AB$  and  $AC$ .  
Thus,  $\triangle ABC$  is the required triangle.  
On measurement,  $\angle B = 90^\circ$ .

3.

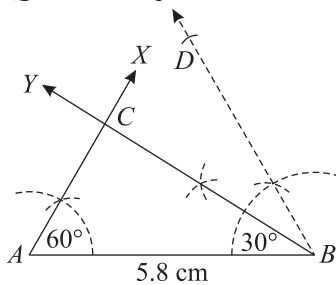


**Steps for construction :**

1. Draw a line segment  $QR$  of length 6.5 cm.
2. At  $Q$ , draw  $QX$  making  $110^\circ$ , using a protector with  $QR$ .
3. With  $Q$  as centre, draw an arc of radius 6.5 cm to cut  $QX$  at  $P$ .
4. Join  $PR$ .

Thus,  $\triangle PQR$  is the required isosceles triangle.

4.

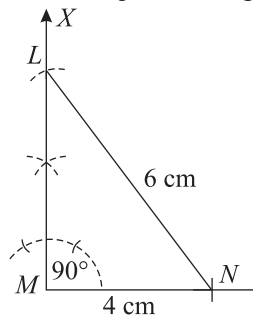


**Steps for construction :**

1. Draw a line segment  $AB$  of length 5.8 cm.
2. At  $A$ , draw  $\angle BAX = 60^\circ$
3. At  $B$ , draw  $\angle ABY = 30^\circ$ .
4. Let the rays  $AX$  and  $BY$  intersect at  $C$ .

Thus,  $\triangle ABC$  is the required triangle.

5.



**Steps for construction :**

1. Draw a line segment  $MN$  of length 4 cm.
2. At  $M$ , construct  $\angle NMN = 90^\circ$ .
3. With  $N$  as centre, draw an arc of radius 6 cm.
4. Draw an arc to cut  $\overrightarrow{MX}$  at  $L$ .
5. Join  $LN$

Thus, the  $\triangle LMN$  is the required right-angled triangle.

**16**

**Perimeter and Area of Rectilinear Figures**

**EXERCISE 16.1**

1. Breadth =  $\frac{\text{Area}}{\text{Length}} = \frac{440}{22} = 20$  m

Perimeter of rectangular field =  $2(l + b)$   
 $= 2 \times (22 + 20)$   
 $= 2 \times 42 = 84$  m

Cost of wire = ₹  $(84 \times 2.20) = ₹ 184.80$

2. Perimeter of square = 500 m

$4 \times \text{side} = 500$

$\therefore \text{side} = \frac{500}{4} = 125$  m

Area of park =  $125 \times 125 = 15625$  m<sup>2</sup>

$\therefore$  Cost of levelling the park = ₹  $(15625 \times 1.85)$   
 $= ₹ 28906.25$

3. Ratio of length and breadth is = 4 : 3

So, length is  $(4x)$  m and breadth is  $(3x)$  m

Area of field = 8112

$4x \times 3x = 8112$

$12x^2 = 8112$

$x^2 = \frac{8112}{12}$

$x^2 = 676$

$x^2 = (26)^2$  or  $x = 26$

So, length is  $4 \times 26 = 104$  m

breadth is  $3 \times 26 = 78$  m

Perimeter of the field =  $2(l + b)$

$= 2(104 + 78)$

$= 2 \times 182 = 364$  m

Length of wire =  $(5 \times 364)$  m = 1820 m

Cost of wire = ₹  $(1820 \times 2.85) = ₹ 5187$

4. Ratio of sides is 7 : 6

So length is  $(7x)$  m and breadth is  $(6x)$  m

Area = 2688

$7x \times 6x = 2688$

$42x^2 = 2688$

$x^2 = \frac{2688}{42}$

$x^2 = 64$

$x^2 = 8^2$  or  $x = 8$



So, length =  $7 \times 8 = 56$  m

breadth =  $6 \times 8 = 48$  m

Perimeter of the field =  $2(l + b)$   
 $= 2 \times (56 + 48) = 208$  m

So, cost of planting the trees = ₹  $(208 \times 4.45)$   
 $= ₹ 925.60$

5. Perimeter of rectangle =  $2(l + b) = 2 \times (40 + 32)$   
 $= 2 \times 72 = 144$  cm

So, length of wire = 144 cm

Perimeter of square = 144

$4 \times \text{side} = 144$

side =  $\frac{144}{4} = 36$  cm

Area of square =  $(36)^2 = 1296$  cm<sup>2</sup>

Area of rectangle =  $40 \times 32 = 1280$  cm<sup>2</sup>

So, square encloses 16 cm<sup>2</sup> more area.

6. Length of wire = Perimeter of square  
 $= 4 \times 22 = 88$  cm

Perimeter of rectangle = length of wire

$2(l + b) = 88$  cm

$2(24 + b) = 88$

$24 + b = \frac{88}{2} = 44$

∴  $b = 44 - 24 = 20$  cm

Area of rectangle =  $l \times b = 24 \times 20 = 480$  cm<sup>2</sup>

Area of square =  $(22)^2 = 484$  cm<sup>2</sup>

So, square encloses more area by 4 cm<sup>2</sup>.

7. Area of square park = Area of rectangular park

⇒  $(80)^2 = l \times 50$

⇒  $l = \frac{80 \times 80}{50}$

⇒  $l = 128$  m

Perimeter of rectangular park =  $2(l + b)$   
 $= 2(128 + 50)$   
 $= 2 \times 178 = 356$  m

8. Area of carpet = Area of room

$= (15 \times 12) \text{ m}^2 = 180 \text{ m}^2$

Length of carpet =  $\frac{\text{Area}}{\text{breadth}} = \frac{180}{0.80} = 225$  m

Cost of carpet = ₹  $(225 \times 90) = ₹ 20250$

9. Perimeter of square park =  $\frac{3600}{1.20}$

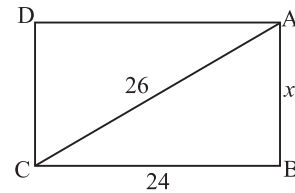
$4 \times \text{side} = 3000$

side =  $\frac{3000}{4} = 750$  m

Area of park =  $(750)^2 = 562500 \text{ m}^2$

So, cost of grassing the park = ₹  $\left(562500 \times \frac{60}{100}\right)$   
 $= ₹ 337500$

10.



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

$$(26)^2 = x^2 + (24)^2$$

$$676 = x^2 + 576$$

$$676 - 576 = x^2$$

$$\Rightarrow x^2 = 100 = 10^2$$

$$x = 10 \text{ m}$$

Perimeter of rectangular park =  $2(24 + 10)$   
 $= 2 \times 34 = 68$  m

Area =  $24 \times 10 = 240 \text{ m}^2$

11. Area of square park = 2304 m<sup>2</sup>

side<sup>2</sup> = 2304

side<sup>2</sup> =  $(48)^2$

or

side = 48 m

Diagonal =  $48\sqrt{2}$  m

Perimeter of square =  $4 \times \text{side} = 4 \times 48 = 192$  m

12. Area of square field = 2 hectare

side<sup>2</sup> =  $(2 \times 10000) \text{ m}^2$

So diagonal = side  $\sqrt{2}$   
 $= 100\sqrt{2} \times \sqrt{2} = 200$  m

13. Area of floor =  $(8 \times 5) \text{ m}^2 = 40 \text{ m}^2$

Area of tile =  $(10 \times 8) \text{ cm}^2 = 80 \text{ cm}^2$

So, number of tiles =  $\frac{40 \times 100 \times 100}{80} = 5000$  tiles

14. Area of verandah =  $(12 \times 9) \text{ m}^2 = 108 \text{ m}^2$

Area of one tile =  $(25 \times 18) \text{ cm}^2 = 450 \text{ cm}^2$

Number of tiles =  $\frac{108 \times 100 \times 100}{450} = 2400$  tiles

Cost of tiles = ₹  $(2400 \times 15) = ₹ 36000$

15. Area of four walls = 336

$2(l + b) \times h = 336$

$2(l + 18) \times 4 = 336$

$8(l + 18) = 336$

$$l + 18 = \frac{336}{8}$$

$$l + 18 = 42$$

$$l = 42 - 18$$

$$l = 24 \text{ m}$$

16. Area of four walls = 280

$$2(l + b) \times h = 280$$

$$2 \times (22 + b) \times 3.5 = 280$$

$$7 \times (22 + b) = 280$$

$$22 + b = \frac{280}{7}$$

$$22 + b = 40$$

$$\therefore b = 40 - 22 = 18 \text{ m}$$

17. Area of four walls =  $2h(l + b)$

$$= 2 \times 2.5(5 + 4.4)$$

$$= 5 \times 9.4 = 47 \text{ m}^2$$

$$\begin{aligned} \text{Cost of whitewashing the four walls} &= ₹(47 \times 3.80) \\ &= ₹178.60 \end{aligned}$$

18. Area of four walls =  $2h(l + b)$

$$= 2 \times 4.5 \times (10 + 8)$$

$$= 9 \times 18 = 162 \text{ m}^2$$

Area of two doors =  $2 \times (2 \times 1.2)$

$$= 2 \times 2.4 = 4.8 \text{ m}^2$$

Area of three windows =  $3(2.5 \times 1.8)$

$$= 3 \times 4.5 = 13.5 \text{ m}^2$$

So remaining area of four walls

$$= 162 - (4.8 + 13.5)$$

$$= 143.7 \text{ m}^2$$

Cost of whitewashing =  $₹(143.7 \times 4.40)$

$$= ₹632.28$$

19. Area of four walls =  $2h(l + b)$

$$= 2 \times 5 \times (15 + 12)$$

$$= 10 \times 27 = 270 \text{ m}^2$$

Area of ceiling =  $15 \times 12 = 180 \text{ m}^2$

$$\text{Total area} = 270 + 180 = 450 \text{ m}^2$$

Area of three doors =  $3 \times (2 \times 1.5) = 3 \times 3 = 9 \text{ m}^2$

Area of four windows =  $4 \times (2.2 \times 1.8) = 15.84 \text{ m}^2$

So, remaining area =  $450 - (9 + 15.84) = 425.16 \text{ m}^2$

So, cost of whitewashing =  $₹(425.16 \times 5.30)$

$$= ₹2253.35$$

20. Area of four walls =  $\frac{990}{7.50} = 132 \text{ m}^2$

Area of 2 doors =  $2 \times 2 \times 1.5 = 6 \text{ m}^2$

Area of 1 window =  $1.5 \times 1.2 = 1.8 \text{ m}^2$

So, total area of four walls =  $132 + 6 + 1.8$   
 $= 139.8 \text{ m}^2$

$$2 \times h \times (l + b) = 139.8$$

$$2h \times (14 + 10) = 139.8$$

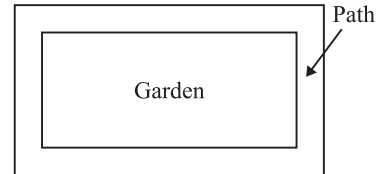
$$2h \times 24 = 139.8$$

$$h = \frac{139.8}{48}$$

$$h = 2.91 \text{ m approx.}$$

### EXERCISE 16.2

1.



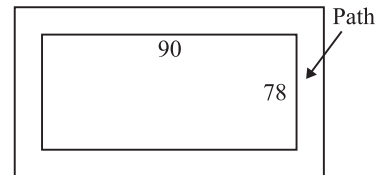
$$\begin{aligned} \text{Area of the path} &= (118 \times 93) - (110 \times 85) \\ &= (10974 - 9350) \text{ m}^2 = 1624 \text{ m}^2 \end{aligned}$$

Area of garden =  $110 \times 85 = 9350 \text{ m}^2$

$$10000 \text{ m}^2 = 1 \text{ hectare}$$

$$\therefore 9350 \text{ m}^2 = \frac{9350}{10000} = 0.9350 \text{ hectare}$$

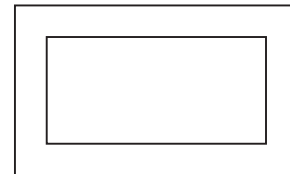
2.



$$\begin{aligned} \text{Area of path} &= (97 \times 85) - 90 \times 78 \\ &= (8245 - 7020) \text{ m}^2 = 1225 \text{ m}^2 \end{aligned}$$

Cost of gravelling =  $₹(1225 \times 1.40) = ₹1715$

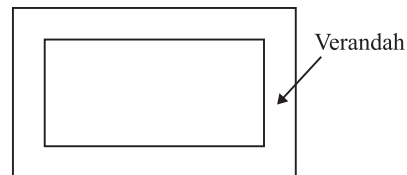
3.



$$\text{Area of path} = (98)^2 - (92.4)^2 = 9604 - 8537.76$$

Cost of levelling =  $₹(1066.24 \times 2.25) = ₹2399.04$

4.

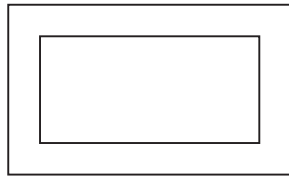


$$\text{Area of verandah} = (11 \times 9.5) - (8 \times 6.5)$$

$$= (104.5 - 52) \text{ m}^2 = 52.5 \text{ m}^2$$

Cost of flooring =  $₹(52.5 \times 25) = ₹1312.50$

5.



$$\begin{aligned} \text{Area of the verandah} &= (18.4 \times 16.8) - (14 \times 12.4) \\ &= (309.12 - 173.6) \text{ m}^2 \\ &= 135.52 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Cost of cementing the floor} &= ₹ (135.52 \times 32) \\ &= ₹ 4336.64 \end{aligned}$$

6. Area of enlarged flower bed =  $(2.90)^2 = 8.41 \text{ m}^2$

$$\begin{aligned} \text{Increase in area} &= (2.90)^2 - (2.5)^2 \\ &= 8.41 - 6.25 = 2.16 \text{ m}^2 \end{aligned}$$

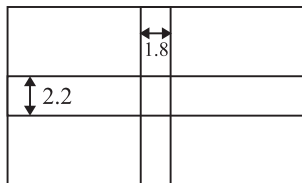
7. Area of increased bed sheet =  $(3.20)^2 \text{ m}^2$   
 $= 10.24 \text{ m}^2$

8. Area of the margin =  $(24.8 \times 22.8) - (20 \times 18)$   
 $= 565.44 - 360$   
 $= 205.44 \text{ cm}^2$

$$\begin{aligned} \text{Cost of used cardboard} &= ₹ (205.44 \times 4.50) \\ &= ₹ 2544.48 \end{aligned}$$

9. Similarly (do it yourself).

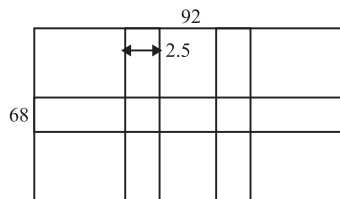
10.



$$\begin{aligned} \text{Area of the paths} &= 30 \times 2.2 + 24.6 \times 1.8 - 2.2 \times 1.8 \\ &= 66 + 44.28 - 3.96 \\ &= 106.32 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Area of the remaining portion} &= (30 \times 24.6) - 106.32 \\ &= 738 - 106.32 \\ &= 631.68 \text{ m}^2 \end{aligned}$$

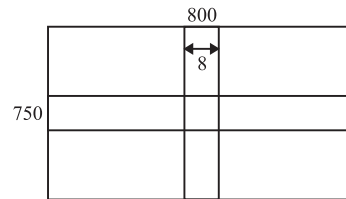
11.



$$\begin{aligned} \text{Area of roads} &= (92 \times 2.5) + 2 \times (68 \times 2.5) \\ &\quad - 2 \times (2.5 \times 2.5) \\ &= 230 + 340 - 12.5 = 557.50 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Area of the remaining field} &= (92 \times 68 - 557.50) \text{ m}^2 \\ &= 6256 - 557.50 \\ &= 5698.50 \text{ m}^2 \end{aligned}$$

12.



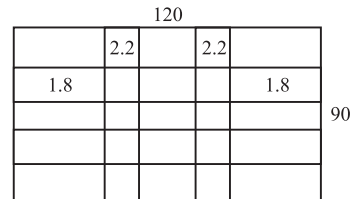
$$\begin{aligned} \text{Area of the roads} &= (800 \times 8) + (750 \times 8) - (8 \times 8) \\ &= 6400 + 6000 - 64 = 12336 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Area of remaining field} &= (800 \times 750) - 12336 \\ &= 600000 - 12336 \\ &= 587664 \text{ m}^2 \end{aligned}$$

$$10000 \text{ m}^2 = 1 \text{ hectare}$$

$$\therefore 587664 \text{ m}^2 = 58.7664 \text{ hectare}$$

13.



$$\begin{aligned} \text{Area of the paths} &= 2 \times (120 \times 1.8) + 2 \times (90 \times 2.2) \\ &\quad - 4 \times (2.2 \times 1.8) \\ &= 432 + 396 - 15.84 = 812.16 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Area of the remaining field} &= (120 \times 90) - 812.16 \\ &= 10800 - 812.16 \\ &= 9987.84 \text{ m}^2 \end{aligned}$$

### EXERCISE 16.3

1. (a) Area of  $\triangle ABC = \frac{1}{2} \times BC \times AD = \frac{1}{2} \times 5 \times 4$

$$= 10 \text{ cm}^2$$

(b) Area of  $\triangle QPR = \frac{1}{2} \times PR \times QS = \frac{1}{2} \times 7 \times 5.4$

$$= 18.9 \text{ cm}^2$$

(c) Area of  $\triangle MNP = \frac{1}{2} \times NP \times MN = \frac{1}{2} \times 3.4 \times 4.8$

$$= 8.16 \text{ cm}^2$$

(d) Area of  $\triangle XYZ = \frac{1}{2} \times YZ \times XT = \frac{1}{2} \times 5.4 \times 3.4$

$$= 9.18 \text{ cm}^2$$

(e) Area of  $\triangle ABC = \frac{1}{2} \times BC \times AD = \frac{1}{2} \times 8 \times 4$

$$= 16 \text{ cm}^2$$

(f) Area of  $\triangle PNM = \frac{1}{2} \times MN \times PS = \frac{1}{2} \times 4 \times 3.5$

$$= 7 \text{ cm}^2$$

$$2. \text{ Length of altitude} = \frac{2 \times \text{Area}}{\text{Base}} = \frac{2 \times 180}{15} = 24 \text{ cm}$$

$$3. \text{ Length of altitude} = \frac{2 \times 36}{6} = 12 \text{ dm}$$

$$4. \text{ Base} = 1.6 \text{ dm} = 1.6 \times 10 = 16 \text{ cm}$$

$$\text{Length of altitude} = \frac{2 \times 148}{16} = 18.5 \text{ cm}$$

5. Area of  $\triangle ABC$  on base  $AB$

$$= \text{Area of } \triangle ABC \text{ on base } AC$$

$$\Rightarrow \frac{1}{2} \times AB \times CE = \frac{1}{2} \times AC \times BD$$

$$\Rightarrow \frac{1}{2} \times 5 \times 6 = \frac{1}{2} \times 4.8 \times BD$$

$$\Rightarrow BD = \frac{30}{4.8} = 6.25 \text{ cm}$$

$$\begin{aligned} \text{Area of } \triangle ABC &= \frac{1}{2} \times AB \times CE \\ &= \frac{1}{2} \times 5 \times 6 = 15 \text{ cm}^2 \end{aligned}$$

6. Area of  $\triangle ABC$  on base  $BC$

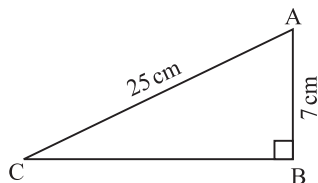
$$= \text{Area of } \triangle ABC \text{ on base } AB$$

$$\Rightarrow \frac{1}{2} \times BC \times AD = \frac{1}{2} \times AB \times AC$$

$$\Rightarrow \frac{1}{2} \times 13 \times AD = \frac{1}{2} \times 5 \times 12$$

$$\Rightarrow AD = \frac{60}{13} = 4.61 \text{ cm}$$

7.



By Pythagoras theorem,

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

$$(25)^2 = 7^2 + BC^2$$

$$625 = 49 + BC^2$$

or  $BC^2 = 625 - 49$

$$BC^2 = 576 = (24)^2$$

or  $BC = 24 \text{ cm}$

$$\text{Area of } \triangle ABC = \frac{1}{2} \times BC \times AB$$

$$= \frac{1}{2} \times 24 \times 7 = 84 \text{ cm}^2$$

$$8. \text{ Area of } \triangle = \frac{1}{2} \times 12 \times 12 = 72 \text{ cm}^2$$

9. Ratio of base and height is 3 : 5

So length of base is  $(3x)$  dm and length of height is  $5x$  dm

$$\text{Area of } \triangle = 750 \text{ dm}^2$$

$$\frac{1}{2} \times 3x \times 5x = 750$$

$$\frac{1}{2} \times 15x^2 = 750$$

$$x^2 = \frac{750 \times 2}{15}$$

$$x^2 = 100 = 10^2 \quad \text{or } x = 10 \text{ dm}$$

So, base is 30 dm and height is 50 dm

10. Area of shaded part

$$= \text{Area of rectangle } ABCD - \text{Area of } \triangle$$

$$= BC \times DC - \frac{1}{2} \times DC \times BC$$

$$= 14 \times 12 - \frac{1}{2} \times 14 \times 12$$

$$= 168 - 84 = 84 \text{ cm}^2$$

$$11. \text{ Area of } \triangle ABC = \frac{1}{2} \times BC \times AE = \frac{1}{2} \times 4 \times 3 = 6 \text{ cm}^2$$

Now, Area of  $\triangle ABC$  on base  $AC = \frac{1}{2} \times AC \times BD$

$$6 = \frac{1}{2} \times 8 \times BD$$

$$\frac{6}{4} = BD \quad \text{or } BD = 1.5 \text{ cm}$$

$$12. \text{ Area of triangular field} = \frac{33750}{25} = 13.5 \text{ hectare}$$

$$\therefore 13.5 \text{ hectare} = (13.5 \times 10000) \text{ m}^2 = 135000 \text{ m}^2$$

Let altitude be  $x$  m then base will be  $(3x)$  m

$$\text{Area of triangular field} = 135000$$

$$\Rightarrow \frac{1}{2} \times 3x \times x = 135000$$

$$\Rightarrow 3x^2 = 135000 \times 2$$

$$x^2 = \frac{135000 \times 2}{3} = 90000$$

$$x^2 = (300)^2 \quad \text{or } x = 300 \text{ m}$$

So, base is 900 m and altitude is 300 m.

### EXERCISE 16.4

1. (a) Area of parallelogram = base  $\times$  altitude

$$= 4 \times 4.4 = 17.6 \text{ cm}^2$$

(b) Area of parallelogram =  $6 \times 3.6 = 21.6 \text{ cm}^2$

(c) Area of parallelogram =  $2.5 \times 3 = 7.5 \text{ cm}^2$

(d) Area of parallelogram =  $8 \times 6 = 48 \text{ cm}^2$

(e) Area of parallelogram =  $7 \times 4.8 = 33.6 \text{ cm}^2$

(f) Area of parallelogram =  $4 \times 5 = 20 \text{ cm}^2$

2. Length of altitude =  $\frac{\text{Area}}{\text{Base}} = \frac{350}{12} = 29.16 \text{ cm}$

3. Length of altitude =  $\frac{300}{18} = 16.67 \text{ cm}$

4. Let height be  $x \text{ cm}$

Then base will be  $2x \text{ cm}$

Area of parallelogram = 288

$\Rightarrow$  base  $\times$  height = 288

$\Rightarrow 2x \times x = 288$

$\Rightarrow 2x^2 = 288$

$x^2 = \frac{288}{2}$

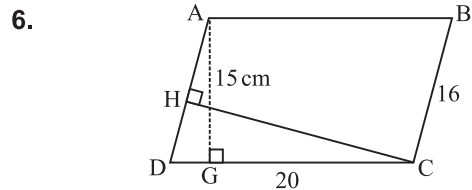
$x^2 = 144$

$x^2 = 12^2$  or  $x = 12$

So height is 12 cm and base is 24 cm.

5. Area of parallelogram  $ABCD = DC \times AK$   
 $= 12 \times 6 = 72 \text{ cm}^2$

Now,  $AD \times CL = 72$   
 $8 \times CL = 72$   
 $CL = \frac{72}{8} = 9 \text{ cm}$



Area of parallelogram

$\Rightarrow DC \times AG = AD \times CH$

$\Rightarrow 20 \times 15 = 16 \times CH$

$\Rightarrow CH = \frac{300}{16} = 18.75 \text{ cm}$

7. Area of rhombus =  $\frac{1}{2} \times d_1 \times d_2 = \frac{1}{2} \times 24 \times 20$   
 $= 240 \text{ cm}^2$

8. Area of rhombus =  $\frac{1}{2} \times 18.4 \times 16.8 = 154.56 \text{ cm}^2$

9. Perimeter of rhombus = 60

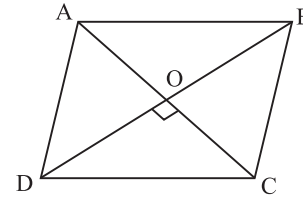
$4 \times \text{side} = 60$

side =  $\frac{60}{4}$

side = 15 cm

Altitude =  $\frac{\text{Area}}{\text{Side}} = \frac{207}{15} = 13.8 \text{ cm}$

10.



Area of rhombus =  $\frac{1}{2} \times d_1 \times d_2 = \frac{1}{2} \times AC \times BD$

$96 = \frac{1}{2} \times 12 \times BD$

$BD = \frac{96}{6} = 16 \text{ cm}$

$\therefore$  Diagonals of rhombus bisect at right angle.

So, in  $\triangle ODC$ , by Pythagoras theorem

$DC^2 = OD^2 + OC^2$

$= \left(\frac{1}{2} \times BD\right)^2 + \left(\frac{1}{2} \times AC\right)^2$

$= \left(\frac{1}{2} \times 16\right)^2 + \left(\frac{1}{2} \times 12\right)^2$

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

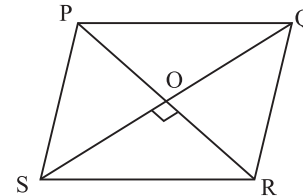
$DC^2 = 100$

$DC^2 = 10^2$  or  $DC = 10 \text{ cm}$

So, perimeter of rhombus =  $4 \times \text{side}$

$= 4 \times 10 = 40 \text{ cm}$

11.



Area of rhombus  $PQRS = \frac{1}{2} \times PR \times QS$

$216 = \frac{1}{2} \times 18 \times QS$

$QS = \frac{219}{9} = 24 \text{ cm}$

$\therefore$  Diagonals of rhombus bisect each other at right angle.

So, in  $\triangle OSR$ ,

$SR^2 = OS^2 + OR^2$

$= \left(\frac{1}{2} QS\right)^2 + \left(\frac{1}{2} PR\right)^2$

$= \left(\frac{1}{2} \times 24\right)^2 + \left(\frac{1}{2} \times 18\right)^2$

$$= 12^2 + 9^2 = 144 + 81$$

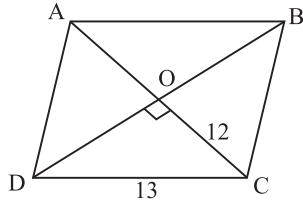
$$= 225 = (15)^2$$

$$SR = 15$$

Perimeter of rhombus

$$PQRS = 4 \times \text{side} = 4 \times 15 = 60 \text{ cm}$$

12.



Let  $DC = 13 \text{ cm}$

$AC = 24 \text{ cm}$

So  $OC = \frac{1}{2} \times AC = \frac{1}{2} \times 24 = 12 \text{ cm}$

In  $\triangle ODC$

$$DC^2 = OD^2 + OC^2$$

$$13^2 = OD^2 + 12^2$$

$$169 = OD^2 + 144$$

$$169 - 144 = OD^2$$

$$25 = OD^2$$

$$OD^2 = 5^2$$

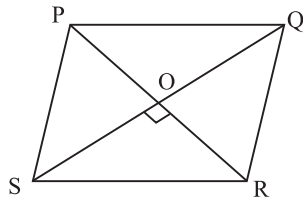
$$OD = 5$$

So,  $BD = 2 \times OD = 10 \text{ cm}$

$$\text{Area of rhombus} = \frac{1}{2} \times AC \times BD = \frac{1}{2} \times 24 \times 10$$

$$= 120 \text{ cm}^2$$

13.



Let  $SR = 20 \text{ cm}$

$PR = 24 \text{ cm}$

So  $OR = \frac{1}{2} \times 24 = 12 \text{ cm}$

In  $\triangle OSR$ ,

$$SR^2 = OS^2 + OR^2$$

$$(20)^2 = OS^2 + 12^2$$

$$400 = OS^2 + 144$$

$$OS^2 = 400 - 144 = 256 = (16)^2$$

or  $OS = 16 \text{ cm}$

or  $OS = 2 \times (OS) = 32 \text{ cm}$

$$\text{Area of rhombus} = \frac{1}{2} \times PR \times QS = \frac{1}{2} \times 24 \times 32$$

$$= 384 \text{ cm}^2$$

14. Area of parallelogram = Area of rhombus

$$= \frac{1}{2} \times d_1 \times d_2$$

$$= \frac{1}{2} \times 18 \times 15$$

$$= 135 \text{ cm}^2$$

### ⇒ HOTS.....

1. Area covered by swimming pool =  $30 \text{ m} \times 20 \text{ m}$   
 $= 600 \text{ m}^2$

∴ Length of the outer rectangle =  $(30 + 8 + 8) \text{ m}$   
 $= 46 \text{ m}$

and its breadth =  $(20 + 5 + 5) \text{ m} = 30 \text{ m}$

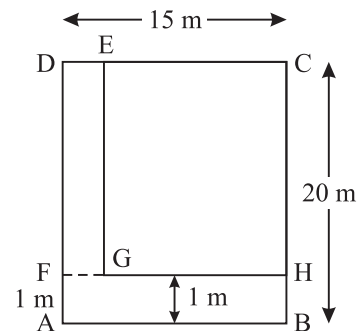
So, the area of outer rectangle =  $46 \text{ m} \times 30 \text{ m}$   
 $= 1380 \text{ m}^2$

Area of cemented path = Area of outer rectangle  
 $-$  Area of swimming pool  
 $= (1380 - 600) = 780 \text{ m}^2$

∴ Cost of cementing  $1 \text{ m}^2$  path = ₹ 200

∴ Total cost of cementing the path = ₹  $780 \times 200$   
 $= ₹ 1,56,000$

2. Area of flower bed  $ABHF = l \times b = 1 \times 15 = 15 \text{ m}^2$



Area of flower bed  $DEFG = 19 \times 1 = 19 \text{ m}^2$

[∵  $DF = (20 - 1) = 19 \text{ cm}$ ]

Total area of flower bed =  $(15 + 19) \text{ m}^2 = 34 \text{ m}^2$

∴ Cost of manuring for  $1 \text{ m}^2$  flower bed = ₹ 45

∴ Cost of manuring for  $34 \text{ m}^2$  flower bed  
 $= 45 \times 34 = ₹ 1530$

3. The given shape is a rectangle and shaded portion is a parallelogram

Here,  $ABCD$  is a rectangle and  $BEDF$  is a parallelogram.

Since,  $\triangle DAF$  is a right angled triangle.

$$\begin{aligned}\therefore \text{Area of } \triangle DAF &= \frac{1}{2} \times \text{Base} \times \text{Height} \\ &= \frac{1}{2} \times AF \times AD \\ &= \frac{1}{2} \times 4 \text{ cm} \times 6 \text{ cm} \\ &= 12 \text{ cm}^2\end{aligned}$$

$$\begin{aligned}\therefore \quad \triangle BCE &\cong \triangle DAF \\ \therefore \text{Area of } \triangle BCE &= \text{Area of } \triangle DAF = 12 \text{ cm}^2 \\ \text{Area of parallelogram } BEDF &= \text{Area of rectangle} \\ &\quad - \text{Area of two triangles} \\ \therefore \text{Area of rectangle} &= 10 \text{ cm} \times 6 \text{ cm} = 60 \text{ cm}^2 \\ \text{Area of parallelogram} &= (60 - 2 \times 12) = (60 - 24) \\ &= 36 \text{ cm}^2 \\ \therefore \text{Required ratio} &= \text{Ratio of area of shaded portion} : \\ &\quad \text{Area of remaining rectangle} \\ &= 36 \text{ cm}^2 : 24 \text{ cm}^2 = 3 : 2\end{aligned}$$

### NCERT CORNER .....

1. Perimeter of a square park = 320 m

$$\text{Side of a square park} = \frac{320}{4} \text{ m} = 80 \text{ m}$$

$$\begin{aligned}\text{Now, area of a square park} &= \text{Side} \times \text{Side} \\ &= 80 \times 80 \\ &= 6,400 \text{ m}^2\end{aligned}$$

2. Length of the door = 2 m

Breadth of the door = 1 m

$$\text{Area of the door} = (l \times b) = 2 \times 1 = 2 \text{ m}^2$$

Length of the wall = 4.5 m

Breadth of the wall = 3.6 m

$$\text{Area of the wall} = l \times b = 4.5 \times 3.6 = 16.20 \text{ m}^2$$

$$\begin{aligned}\text{Required area of white washing of the wall} \\ &= \text{Area of the Wall} - \text{Area of the door} \\ &= 16.20 - 2 = 14.20\end{aligned}$$

$$\text{Rate of white washing} = ₹ 20 \text{ per m}^2$$

$$\therefore \text{Cost of white washing} = 14.20 \times 20 = ₹ 284$$

3. (a) Area of a parallelogram = Base  $\times$  Height

$$= 7 \times 4 = 28 \text{ cm}^2$$

(b) Area of a parallelogram = Base  $\times$  Height

$$= 5 \times 3 = 15 \text{ cm}^2$$

(c) Area of a parallelogram = Base  $\times$  Height

$$= 2.5 \times 3.5 = 8.75 \text{ cm}^2$$

(d) Area of a parallelogram = Base  $\times$  Height

$$= 5 \times 4.8 = 24 \text{ cm}^2$$

$$\begin{aligned}4. \text{Area of } \triangle ABC &= \frac{1}{2} (\text{Base} \times \text{Height}) \\ &= \frac{1}{2} (BC \times AD) \\ &= \frac{1}{2} (9 \times 6) = 27 \text{ cm}^2\end{aligned}$$

Thus, the area of  $\triangle ABC$  is  $27 \text{ cm}^2$ .

$$\begin{aligned}\text{Again, area of } \triangle ABC &= \frac{1}{2} (\text{Base} \times \text{Height}) \\ &= \frac{1}{2} (AB \times CE)\end{aligned}$$

$$27 = \frac{1}{2} (7.5 \times CE)$$

$$\Rightarrow CE = \frac{27 \times 2}{7.5} = 7.2 \text{ cm}$$

Thus, the height from  $C$  to  $AB$ , i.e., the length of  $CE$  is 7.2 cm.

## 17 Circumference and Area of a Circle

### EXERCISE 17.1 .....

$$1. (a) c = 2\pi r = 2 \times \frac{22}{7} \times 14 = 88 \text{ cm}$$

$$(b) c = 2\pi r = 2 \times \frac{22}{7} \times 21 = 132 \text{ dm}$$

$$(c) c = 2\pi r = 2 \times \frac{22}{7} \times 10.5 = 66 \text{ cm}$$

$$(d) c = 2\pi r = 2 \times \frac{22}{7} \times 49 = 308 \text{ mm}$$

$$2. (a) c = \pi d = \frac{22}{7} \times 56 = 22 \times 8 = 176 \text{ cm}$$

$$(b) c = \pi d = \frac{22}{7} \times 42 = 132 \text{ mm}$$

$$(c) c = \pi d = \frac{22}{7} \times 3.64 = 11.44 \text{ cm}$$

$$(d) c = \pi d = \frac{22}{7} \times 28 = 88 \text{ cm}$$

$$3. (a) r = \frac{c}{2\pi} = \frac{2.64}{2 \times 3.14} = 0.42 \text{ m}$$

$$(b) r = \frac{c}{2\pi} = \frac{63.8}{2 \times 3.14} = 10.15 \text{ m}$$

$$(c) r = \frac{c}{2\pi} = \frac{46.2}{2 \times 3.14} = 7.35 \text{ cm}$$

$$(d) r = \frac{c}{2\pi} = \frac{123.2}{2 \times 3.14} = 19.61 \text{ cm}$$

$$4. c = 2\pi r = 2 \times \frac{22}{7} \times 84 = 528 \text{ m}$$

$$\text{So length of wire needed to fence twice} = 2 \times 528 = 1056 \text{ m}$$

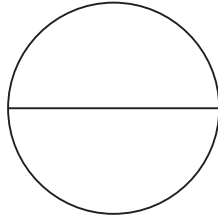
$$5. \text{Circumference of park} = \pi d = \frac{22}{7} \times 63$$

$$= 22 \times 9 = 198$$

$$\text{Length of wire required to fence twice} = 2 \times 198 = 396$$

$$\text{Cost of wire} = ₹ (396 \times 4) = ₹ 1584$$

6.



$$\begin{aligned} \text{So, perimeter of each semicircle} &= \pi r + 2r \\ &= \frac{22}{7} \times 14 + 2 \times 14 \\ &= 22 \times 2 + 28 \\ &= 44 + 28 = 72 \text{ cm} \end{aligned}$$

7. Let radii of two circles be  $(5x)$  unit and  $(9x)$  unit

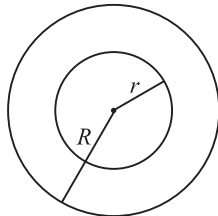
$$\begin{aligned} \text{Ratio of circumference} &= \frac{2\pi r_1}{2\pi r_2} = \frac{5x}{9x} = \frac{5}{9} \\ r_1 : r_2 &= 5 : 9 \end{aligned}$$

$$8. \frac{C_1}{C_2} = \frac{2\pi r_1}{2\pi r_2}$$

$$\frac{9}{11} = \frac{2\pi r_1}{2\pi r_2} \quad \text{or} \quad \frac{r_1}{r_2} = \frac{9}{11}$$

$$\text{So, } r_1 : r_2 = 9 : 11$$

9.



$$\text{Outer circumference} = 660$$

$$2\pi R = 660$$

$$R = \frac{660}{2 \times \frac{22}{7}} = \frac{660 \times 7}{44} = 105 \text{ m}$$

$$\text{Inner circumference} = 616$$

$$2\pi r = 616$$

$$r = \frac{616}{2 \times \frac{22}{7}} = \frac{616 \times 7}{44} = 98 \text{ m}$$

$$\text{So width of race track} = R - r = 105 - 98 = 7 \text{ m}$$

10. Radius of wheel = 49 cm

$$\begin{aligned} \text{So circumference of the wheel} &= 2\pi r \\ &= 2 \times \frac{22}{7} \times 49 \\ &= 308 \text{ cm} \end{aligned}$$

$$\text{Distance covered in one revolution} = 308 \text{ cm}$$

$$\begin{aligned} \text{So distance covered in 500 revolutions} &= (308 \times 500) \text{ cm} = 154000 \text{ cm} \\ 100000 \text{ cm} &= 1 \text{ km} \end{aligned}$$

$$\therefore 154000 \text{ cm} = \frac{154000}{100000} = 1.54 \text{ km}$$

11. Diameter of the wheel = 1.05 m

$$\text{So circumference} = \pi d = \frac{22}{7} \times 1.05 = 3.3 \text{ m}$$

$$\begin{aligned} \text{So, distance covered in 800 revolutions} &= (3.3 \times 800) \text{ m} = 2640 \text{ m} \\ 1000 \text{ m} &= 1 \text{ km} \end{aligned}$$

$$\therefore 2640 \text{ m} = 2.640 \text{ km}$$

12. Diameter of the wheel = 70 cm

$$\text{Circumference} = \pi d = \frac{22}{7} \times 70 = 220 \text{ cm}$$

$$\text{Distance} = 66 \text{ km} = 66 \times 100000 \text{ cm}$$

$$\therefore \text{Number of revolutions} = \frac{6600000}{220} = 30000$$

13. Covered distance = 11 km

$$\text{In 5000 revolutions} = 1100000 \text{ cm}$$

$$\therefore \text{In 1 revolution} = \frac{1100000}{5000} = 220 \text{ cm}$$

$$\pi d = 220$$

$$d = \frac{220 \times 7}{22}$$

$$d = 70 \text{ cm}$$

14. Distance in 2500 revolutions = 5.5 km

$$= 5.5 \times 100000 \text{ cm}$$

$$= 550000 \text{ cm}$$

$$\text{So distance in 1 revolution} = \frac{550000}{2500}$$

$$\therefore \text{Circumference} = 220 \text{ cm}$$

$$\pi d = 220$$

$$d = \frac{220}{\frac{22}{7}}$$

$$d = 70 \text{ cm}$$

15. Perimeter of the figure =  $4 \times \left( \frac{1}{2} \times 2\pi r \right) = 4 \times \pi r$

$$= 4 \times \frac{22}{7} \times \frac{21}{2} = 132 \text{ cm}$$



➔ EXERCISE 17.2.....

1. (a)  $A = \pi r^2 = \frac{22}{7} \times 7^2 = 154 \text{ cm}^2$   
 (b)  $A = \pi r^2 = \frac{22}{7} \times (10.5)^2 = 346.5 \text{ cm}^2$   
 (c)  $A = \pi r^2 = \frac{22}{7} \times (56)^2 = 9856 \text{ mm}^2$   
 (d)  $A = \pi r^2 = \frac{22}{7} \times (49)^2 = 75.46 \text{ cm}^2$

2. (a) Area =  $12.56 \text{ cm}^2$   
 $\pi r^2 = 12.56$   
 $r^2 = \frac{12.56}{3.14}$   
 $r^2 = 4 = 2^2$   
 $r = 2 \text{ cm}$

(b) Area =  $28.26 \text{ mm}^2$   
 $\pi r^2 = 28.26$   
 $r^2 = \frac{28.26}{3.14}$   
 $r^2 = 9 = 3^2$   
 $r = 3 \text{ mm}$

(c) Area =  $78.50 \text{ cm}^2$   
 $\pi r^2 = 78.50$   
 $r^2 = \frac{78.50}{3.14}$   
 $r^2 = 25 = 5^2$   
 $r = 5 \text{ cm}$

(d) Area =  $153.86 \text{ dm}^2$   
 $\pi r^2 = 153.86$   
 $r^2 = \frac{153.86}{3.14}$   
 $r^2 = 49 = 7^2$   
 $r = 7 \text{ dm}$

3.  $\frac{A_1}{A_2} = \frac{\pi r_1^2}{\pi r_2^2} = \frac{(4x)^2}{(5x)^2} = \frac{16x^2}{25x^2} = \frac{16}{25}$   
 $A_1 : A_2 = 16 : 25$

4.  $\frac{A_1}{A_2} = \frac{\pi r_1^2}{\pi r_2^2}$   
 $\frac{49x}{36x} = \frac{r_1^2}{r_2^2}$   
 $\frac{49}{36} = \frac{r_1^2}{r_2^2}$

$$\frac{7^2}{6^2} = \frac{r_1^2}{r_2^2}$$

or  $\frac{r_1}{r_2} = \frac{7}{6}$

$$r_1 : r_2 = 7 : 6$$

5.  $c = 88$

$$2\pi r = 88$$

$$r = \frac{88}{2\pi} = \frac{88}{2 \times \frac{22}{7}} = \frac{88 \times 7}{44} = 14 \text{ cm}$$

$$\text{Area} = \pi r^2 = \frac{22}{7} \times (14)^2 = 616 \text{ cm}^2$$

6.  $C = 264 \text{ mm}$

$$2\pi r = 264$$

$$r = \frac{264}{2 \times \frac{22}{7}}$$

$$r = \frac{264 \times 7}{44}$$

$$r = 42 \text{ mm}$$

$$A = \pi r^2 = \frac{22}{7} \times (42)^2 = 5544 \text{ mm}^2$$

7. Area =  $3850 \text{ cm}^2$

$$\pi r^2 = 3850$$

$$r^2 = \frac{3850}{\frac{22}{7}} = \frac{3850 \times 7}{22}$$

$$r^2 = 1225 = (35)^2$$

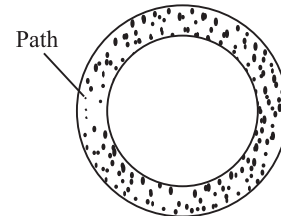
$$r = 35$$

$$c = 2\pi r = 2 \times \frac{22}{7} \times 35$$

$$= 220 \text{ cm}$$

Cost of wire = ₹  $(220 \times 2.40) = ₹ 528$

8.



$$c = 616 \text{ m}$$

$$2\pi R = 616$$

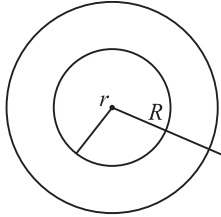
$$R = \frac{616}{2\pi} = \frac{616}{2 \times \frac{22}{7}} = \frac{616 \times 7}{44} = 98 \text{ m}$$

$$r = 98 - 14 = 84 \text{ m}$$

$$\begin{aligned} \text{Area of park excluding the path} &= \pi r^2 \\ &= \frac{22}{7} \times (84)^2 \\ &= 22176 \text{ m}^2 \end{aligned}$$

$$\text{Cost of grassing} = ₹ (22176 \times 1.40) = ₹ 31046.40$$

9.



$$\begin{aligned} 2\pi R &= 308 \\ 2 \times \frac{22}{7} \times R &= 308 \\ R &= \frac{308 \times 7}{44} = 49 \\ 2\pi r &= 264 \\ 2 \times \frac{22}{7} \times r &= 264 \\ r &= \frac{264 \times 7}{44} = 42 \end{aligned}$$

$$\begin{aligned} \text{Area of race-track} &= \pi (R^2 - r^2) \\ &= \frac{22}{7} (49^2 - 42^2) \\ &= \frac{22}{7} (2401 - 1764) \\ &= \frac{22}{7} \times 637 = 2002 \end{aligned}$$

$$\text{Cost of travelling} = ₹ (2002 \times 2.80) = ₹ 5605.60$$

10. Area of square = 484 cm<sup>2</sup>

$$\text{side}^2 = (22)^2 \quad \text{or} \quad \text{side} = 22 \text{ cm}$$

$$\text{Perimeter of the square} = 4 \times \text{side} = 4 \times 22 = 88 \text{ cm}$$

$$\text{Length of the wire} = 88 \text{ cm}$$

$$\text{Circumference of the circle} = 88 \text{ cm}$$

$$\begin{aligned} 2\pi r &= 88 \\ r &= \frac{88}{2\pi} = \frac{88}{2 \times \frac{22}{7}} = \frac{88 \times 7}{44} = 14 \text{ cm} \end{aligned}$$

$$\text{Area of circle} = \pi r^2 = \frac{22}{7} \times (14)^2 = 616 \text{ cm}^2$$

11. Length of wire = circumference of circle

$$\begin{aligned} &= \pi d \\ &= \frac{22}{7} \times 56 \\ &= 176 \text{ cm} \end{aligned}$$

$$\text{Perimeter of square} = 176$$

$$4 \times \text{side} = 176$$

$$\text{side} = \frac{176}{4}$$

$$\text{side} = 44 \text{ cm}$$

$$\text{Area of square} = (44)^2 = 1936 \text{ cm}^2$$

$$\text{Area of circle} = \pi r^2 = \frac{22}{7} \times (28)^2 = 2464 \text{ cm}^2$$

So, circle encloses

$$\text{Area of circle} - \text{Area of square,}$$

$$\text{i.e., } 2464 \text{ cm}^2 - 1936 \text{ cm}^2 = 528 \text{ cm}^2 \text{ more area.}$$

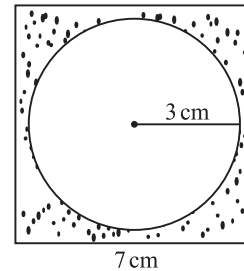
12. Area of the remaining portion

$$= \text{Area of } ABCD - \text{Area of semicircle}$$

$$= AB \times BC - \frac{1}{2} \times \pi r^2$$

$$= 20 \times 14 - \frac{1}{2} \times \frac{22}{7} \times 7^2 = 280 - 77 = 203 \text{ cm}^2$$

13.



$$\text{Area of the circle} = \pi r^2 = \frac{22}{7} \times 3^2 = 28.29 \text{ cm}^2$$

$$\text{Area of the square} = 7^2 = 49 \text{ cm}^2$$

$$\text{So area of remaining sheet} = 49 - 28.29 = 20.71 \text{ cm}^2$$

$$\begin{aligned} 14. \quad PR &= \sqrt{PS^2 + SR^2} = \sqrt{7^2 + 24^2} \\ &= \sqrt{49 + 576} = \sqrt{625} \end{aligned}$$

$$PR^2 = (25)^2 \quad \text{or} \quad PR = 25$$

$$\therefore \text{Radius of circle} = \frac{1}{2} \times 25 = \frac{25}{2} \text{ cm}$$

$$\text{Area of circle} = \pi r^2 = \frac{22}{7} \times \left(\frac{25}{2}\right)^2 = 491.07$$

$$\begin{aligned} \text{Area of rectangle } PQRS &= PQ \times QR \\ &= 24 \times 7 = 168 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{So, area of the shaded part} &= 491.07 - 168 \\ &= 323.07 \text{ cm}^2 \end{aligned}$$

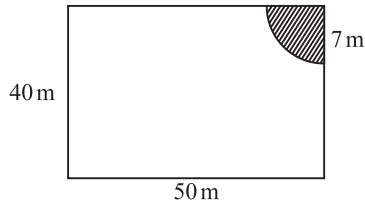
$$15. \text{ Area of two circle} = 2 \times \frac{22}{7} \times (3.5)^2 = 77 \text{ cm}^2$$

$$\text{Area of square} = (3)^2 = 9 \text{ cm}^2$$

$$\text{Area of big circle} = \frac{22}{7} \times (14)^2 = 616 \text{ cm}^2$$

$$\begin{aligned} \text{So, area of the shaded region} &= 616 - (77 + 9) \\ &= 616 - 86 = 530 \text{ cm}^2 \end{aligned}$$

16.



$$\begin{aligned} \text{Area grazed by cow} &= \frac{1}{4} \times \pi r^2 = \frac{1}{4} \times \frac{22}{7} \times 7^2 \\ &= 38.5 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Remaining area} &= (50 \times 40) - 38.5 = 2000 - 38.5 \\ &= 1961.5 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{17. Area of four quadrants} &= 4 \times \frac{1}{4} \times \pi r^2 \\ &= \frac{22}{7} \times 1^2 = 3.14 \end{aligned}$$

$$\text{Area of circle} = \frac{22}{7} \times 1^2 = 3.14$$

$$\begin{aligned} \text{So, area of the shaded region} &= (4 \times 4) - (3.14 + 3.14) \\ &= 16 - 6.28 = 9.72 \text{ cm}^2 \end{aligned}$$

18. Minute hand covers a complete circle in 60 minutes or in 1 hr.

$$\begin{aligned} \text{So in 10 hours} &= 10 \times \pi r^2 = 10 \times 3.14 \times 3^2 \\ &= 282.6 \text{ cm}^2 \end{aligned}$$

[Note : Read 10 hours instead of 10 minutes]

### ⇒ HOTS

1. ∴ Area of rectangle =  $l \times b$   
and area of circle =  $\pi r^2$

$$\therefore \text{Area of total land} = 15 \text{ m} \times 10 \text{ m} = 150 \text{ m}^2$$

$$\begin{aligned} \text{Area of land covered by plants} &= 9 \text{ m} \times 1 \text{ m} \\ &= 9 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Area of land covered by camel} &= 5 \text{ m} \times 3 \text{ m} \\ &= 15 \text{ m}^2 \end{aligned}$$

Area of land covered by ox in circular area.

So, the diameter is given  $d = 2.8 \text{ m}$

$$\text{Radius} = \frac{d}{2} = \frac{2.8}{2} \text{ m} = 1.4 \text{ m}$$

$$\begin{aligned} \text{Area of land covered by ox} &= \pi r^2 \\ &= \frac{22}{7} \times 1.4 \times 1.4 \text{ m}^2 \\ &= 6.16 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Total area covered by plants, camel and ox} &= 9 \text{ m}^2 + 15 \text{ m}^2 + 6.16 \text{ m}^2 = 30.16 \text{ m}^2 \end{aligned}$$

Remaining land for living

$$\begin{aligned} &= \text{Total area} - \text{Area covered by plants and animals} \\ &= (150 - 30.16) \text{ m}^2 = 119.84 \text{ m}^2 \end{aligned}$$

∴ Ratio of areas kept for animals and plants :

$$\begin{aligned} &\text{Ratio of living area} \\ &= 30.16 : 119.84 = 3016 : 11984 = 377 : 1498 \end{aligned}$$

2. ∴ Diameter of complete circle = 14 cm

$$\text{Radius} = \frac{14}{2} = 7 \text{ cm} \quad \left[ \because \text{Radius} = \frac{\text{Diameter}}{2} \right]$$

$$\begin{aligned} \text{Area of complete circle} &= \pi r^2 = \frac{22}{7} \times 7 \times 7 \\ &= 154 \text{ cm}^2 \end{aligned}$$

$$\text{Diameter of small circle} = \frac{7}{4} \text{ cm}$$

$$\therefore \text{Radius} = \frac{7}{4 \times 2} = \frac{7}{8} \text{ cm}$$

∴ Area of shaded region = Area of complete circle - Area of two small circles

$$\begin{aligned} &= \left( 154 - \frac{77}{16} \right) = \frac{154 \times 16 - 77}{16} \\ &= \frac{2464 - 77}{16} = \frac{2387}{16} \\ &= 149 \frac{3}{16} \text{ cm}^2 \end{aligned}$$

### ⇒ NCERT CORNER

1. Diameter of the circular garden = 21 m

$$\therefore \text{Its radius} = \frac{21}{2} \text{ m}$$

Circumference of a circular garden

$$= 2\pi r = 2 \times \frac{22}{7} \times \frac{21}{2} = 66 \text{ m}$$

Length of the rope to make 2 rounds of fence

$$= 66 \times 2 = 132 \text{ m}$$

Cost of 1 m of the rope = ₹ 4

$$\therefore \text{Cost of 132 m of the rope} = 132 \times 4 = ₹ 528$$

2. Diameter of semicircle = 10 cm

$$\therefore \text{Its radius} = \frac{10}{2} = 5 \text{ cm}$$

$$\begin{aligned} \text{Circumference of a semicircle} &= \frac{2\pi r}{2} \\ &= \frac{2 \times 3.14 \times 5}{2} \\ &= 15.7 \text{ cm} \end{aligned}$$

$$\begin{aligned} \therefore \text{Perimeter of the semicircle} \\ = 15.7 + 10 = 25.7 \text{ cm} \end{aligned}$$

3. Radius of a circular card = 14 cm

$$\begin{aligned} \therefore \text{Area of a circular card} &= \pi r^2 \\ &= \frac{22}{7} (14)^2 \\ &= \frac{22}{7} \times 14 \times 14 = 616 \text{ cm}^2 \end{aligned}$$

Radius of an inner circle = 3.5 cm

$$\begin{aligned} \therefore \text{Area of an inner circle} &= \pi r^2 \\ &= \frac{22}{7} (3.5)^2 \\ &= \frac{22}{7} \times 3.5 \times 3.5 = 38.5 \text{ cm}^2 \end{aligned}$$

Area of two inner circles =  $38.5 \times 2 = 77 \text{ cm}^2$

Length of a rectangle is 3 cm and breadth is 1 cm

Area of a rectangle =  $l \times b = 3 \times 1 = 3 \text{ cm}^2$

$$\begin{aligned} \therefore \text{Area of remaining sheet} \\ = 616 - (77 + 3) = 616 - 80 = 536 \text{ cm}^2 \end{aligned}$$

4. Radius of inner circle =  $19 - 10 = 9 \text{ cm}$

$$\begin{aligned} \therefore \text{Circumference of inner circle} &= 2\pi r \\ &= 2 \times 3.14 \times 9 \\ &= 56.52 \text{ m} \end{aligned}$$

Radius of outer circle = 19 m

$$\begin{aligned} \therefore \text{Circumference of outer circle} &= 2\pi r \\ &= 2 \times 3.14 \times 19 \\ &= 119.32 \text{ m} \end{aligned}$$

5. (i) Area of the whole land =  $l \times b = 10 \times 5 = 50 \text{ m}^2$

$$\begin{aligned} \text{(ii) Area of the flower bed} &= \pi r^2 = 3.14 \times (2)^2 \\ &= 12.56 \text{ m}^2 \end{aligned}$$

(iii) Area of the lawn excluding the area of the flower bed =  $50 - 12.56 = 37.44 \text{ m}^2$

$$\begin{aligned} \text{(iv) Circumference of the flower bed} \\ = 2\pi r = 2 \times 3.14 \times 2 = 12.56 \text{ m} \end{aligned}$$

$$\text{(e) } (8)^5 = 8 \times 8 \times 8 \times 8 \times 8 = 32768$$

$$\text{(f) } \left(\frac{4}{7}\right)^3 = \frac{4 \times 4 \times 4}{7 \times 7 \times 7} = \frac{64}{343}$$

$$\text{(g) } \left(-\frac{1}{4}\right)^4 = \left(-\frac{1}{4}\right) \times \left(-\frac{1}{4}\right) \times \left(-\frac{1}{4}\right) \times \left(-\frac{1}{4}\right) = \frac{1}{256}$$

$$\begin{aligned} \text{(h) } \left(\frac{-3}{4}\right)^5 &= \frac{(-3) \times (-3) \times (-3) \times (-3) \times (-3)}{4 \times 4 \times 4 \times 4 \times 4} \\ &= \frac{-243}{1024} \end{aligned}$$

$$\text{(i) } \left(\frac{-13}{17}\right)^3 = \frac{(-13) \times (-13) \times (-13)}{17 \times 17 \times 17} = \frac{-2197}{4913}$$

$$\text{(j) } \left(\frac{3}{5}\right)^4 = \frac{3 \times 3 \times 3 \times 3}{5 \times 5 \times 5 \times 5} = \frac{81}{625}$$

3. (a)  $\frac{225}{289}$

3	225
3	75
5	25
5	5
	1

17	289
17	17
	1

$$\text{So, } \frac{225}{289} = \frac{3 \times 3 \times 5 \times 5}{17 \times 17} = \frac{(3 \times 5)^2}{17^2} = \left(\frac{15}{17}\right)^2$$

(b)  $\frac{-243}{3125}$

3	243
3	81
3	27
3	9
3	3
	1

5	3125
5	625
5	125
5	25
5	5
	1

$$\text{So, } \frac{-243}{3125} = \frac{-3 \times 3 \times 3 \times 3 \times 3}{5 \times 5 \times 5 \times 5 \times 5} = \left(\frac{-3}{5}\right)^5$$

(c)  $\frac{1331}{4096}$

11	1331
11	121
11	11
	1

2	4096
2	2048
2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

## 18 Exponents and Powers

### EXERCISE 18.1

1. Given in answersheet.

2. (a)  $2^5 = 2 \times 2 \times 2 \times 2 \times 2 = 32$

(b)  $(-3)^6 = (-3) \times (-3) \times (-3) \times (-3) \times (-3) \times (-3)$   
 $= 729$

(c)  $(-11)^3 = (-11) \times (-11) \times (-11) = -1331$

(d)  $(17)^3 = 17 \times 17 \times 17 = 4913$

$$\begin{aligned} \text{So, } \frac{1331}{4096} &= \frac{11 \times 11 \times 11}{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2} \\ &= \frac{11^3}{(2 \times 2 \times 2 \times 2)^3} = \left(\frac{11}{16}\right)^3 \end{aligned}$$

$$(d) \frac{-3125}{7776}$$

5	3125
5	625
5	125
5	25
5	5
	1

6	7776
6	1296
6	216
6	36
6	6
	1

$$\text{So, } \frac{-3125}{7776} = \left(\frac{-5}{6}\right)^5$$

$$(e) \frac{256}{2401}$$

4	256
4	64
4	16
4	4
	1

7	2401
7	343
7	49
7	7
	1

$$\text{So, } \frac{256}{2401} = \frac{4 \times 4 \times 4 \times 4}{7 \times 7 \times 7 \times 7} = \left(\frac{4}{7}\right)^4$$

$$(f) \frac{-27}{512}$$

3	27
3	9
3	3
	1

8	512
8	64
8	8
	1

$$\text{So, } \frac{-27}{512} = -\frac{3 \times 3 \times 3}{8 \times 8 \times 8} = \left(\frac{-3}{8}\right)^3$$

$$(g) \frac{625}{14641}$$

5	625
5	125
5	25
5	5
	1

11	14641
11	1331
11	121
11	11
	1

$$\text{So, } \frac{625}{14641} = \frac{5 \times 5 \times 5 \times 5}{11 \times 11 \times 11 \times 11} = \left(\frac{5}{11}\right)^4$$

$$(h) \frac{343}{2197}$$

7	343
7	49
7	7
	1

13	2197
13	169
13	13
	1

$$\text{So, } \frac{343}{2197} = \frac{7 \times 7 \times 7}{13 \times 13 \times 13} = \left(\frac{7}{13}\right)^3$$

$$(i) \frac{27}{2744}$$

3	27
3	9
3	3
	1

2	2744
2	1372
2	686
7	343
7	49
7	7
	1

$$\text{So, } \frac{27}{2744} = \frac{3 \times 3 \times 3}{2 \times 2 \times 2 \times 7 \times 7 \times 7} = \left(\frac{3}{14}\right)^3$$

$$(j) \frac{625}{83521}$$

5	625
5	125
5	25
5	5
	1

17	83521
17	4913
17	289
17	17
	1

$$\text{So, } \frac{625}{83521} = \frac{5 \times 5 \times 5 \times 5}{17 \times 17 \times 17 \times 17} = \left(\frac{5}{17}\right)^4$$

4. (a)  $4^2 = 4 \times 4 = 16$

$$2^4 = 2 \times 2 \times 2 \times 2 = 16$$

Both are equal.

(b)  $3^4 = 3 \times 3 \times 3 \times 3 = 81$

$$4^4 = 4 \times 4 \times 4 \times 4 = 64$$

$3^4$  is greater.

(c)  $10^3 = 10 \times 10 \times 10 = 1000$

$$3^{10} = 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 = 59049$$

$3^{10}$  is the greatest.

(d)  $5^3 = 5 \times 5 \times 5 = 125$

$$3^5 = 3 \times 3 \times 3 \times 3 \times 3 = 243$$

$3^5$  is the greatest.

(e)  $7^2 = 7 \times 7 = 49$

$$2^7 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 128$$

$2^7$  is the greatest.



2. (a)  $3^4 \times 3^6 \times 3^{-2} = 3^{4+6-2} = 3^8$   
 (b)  $(4^{18} \div 4^{12}) \times 4^3 = (4^{18-12}) \times 4^3$   
 $= 4^6 \times 4^3 = 4^{6+3} = 4^9$   
 (c)  $\left(\frac{5}{9}\right)^6 \div \left(\frac{5}{9}\right)^8 = \left(\frac{5}{9}\right)^{6-8} = \left(\frac{5}{9}\right)^{-2} = \left(\frac{9}{5}\right)^2$   
 (d)  $\frac{a^7}{a^4} \times a^4 = (a^{7-4}) \times a^4$   
 $= a^3 \times a^4 = a^{3+4} = a^7$   
 (e)  $(2^{10} \div 2^{15}) \times 2^6 = (2^{10-15}) \times 2^6$   
 $= 2^{-5} \times 2^6 = 2^{-5+6} = 2^1 = 2$   
 (f)  $\left(\frac{11}{9}\right)^{11} \div \left(\frac{11}{9}\right)^8 = \left(\frac{11}{9}\right)^{11-8} = \left(\frac{11}{9}\right)^3$   
 (g)  $\left(\frac{13}{17}\right)^{14} \div \left(\frac{13}{17}\right)^2 \times \left(\frac{13}{17}\right)^{-16} = \left(\frac{13}{17}\right)^{14+2-16}$   
 $= \left(\frac{13}{17}\right)^0 = 1$   
 (h)  $\left(\frac{4}{7}\right)^{13} \div \left(\frac{4}{7}\right)^{16} = \left(\frac{4}{7}\right)^{13-16} = \left(\frac{4}{7}\right)^{-3} = \left(\frac{7}{4}\right)^3$

3. (a)  $3^0 - 2^0 = 1 - 1 = 0$   
 (b)  $5^0 + 7^0 = 1 + 1 = 2$   
 (c)  $2^0 + 3^0 + 4^0 = 1 + 1 + 1 = 3$   
 (d)  $(4^0 - 6^0)(4^0 + 6^0) = (1 - 1)(1 + 1) = 0 \times 2 = 0$   
 (e)  $(3^0 + 8^0)(3^0 + 6^0) = (1 + 1)(1 + 1) = 2 \times 2 = 4$   
 (f)  $(9^0 + 7^0)(4^0 - 3^0) = (1 + 1)(1 - 1) = 2 \times 0 = 0$

4. (a)  $\left(\frac{7}{10}\right)^{-1} = \left(\frac{10}{7}\right)^1 = \frac{10}{7}$   
 (b)  $\left(\frac{3}{11}\right)^{-5} = \left(\frac{11}{3}\right)^5$   
 (c)  $\left(\frac{-9}{13}\right)^{-1} = \left(\frac{13}{-9}\right)^1 = \frac{-13}{9}$   
 (d)  $\left(\frac{5}{7}\right)^{-1} \times \left(\frac{7}{6}\right)^{-1} = \frac{7}{5} \times \frac{6}{7} = \frac{6}{5}$   
 (e)  $(-5)^{-1} \times \left(\frac{1}{5}\right)^{-1} = \left(\frac{-1}{5}\right) \times 5 = -1$   
 (f)  $(3 + 7)^{-1} - (6 + 4)^{-1} = 10^{-1} - 10^{-1} = \frac{1}{10} - \frac{1}{10} = 0$

(g)  $(6^{-1} - 10^{-1})^{-1} = \left(\frac{1}{6} - \frac{1}{10}\right)^{-1} = \left(\frac{5-3}{30}\right)$   
 $= \left(\frac{2}{30}\right)^{-1} = \left(\frac{1}{15}\right)^{-1} = 15$

(h)  $(4^{-1} - 6^{-1})^{-1} = \left(\frac{1}{4} - \frac{1}{6}\right)^{-1}$   
 $= \left(\frac{3-2}{12}\right)^{-1} = \left(\frac{1}{12}\right)^{-1} = 12$

(i)  $(5^{-1} + 8^{-1})^{-1} = \left(\frac{1}{5} + \frac{1}{8}\right)^{-1}$   
 $= \left(\frac{8+5}{40}\right)^{-1} = \left(\frac{13}{40}\right)^{-1} = \frac{40}{13}$

5. (a)  $\frac{2^3 \times 3^4 \times 4^2}{32 \times 6} = \frac{2^3 \times 3^4 \times (2^2)^2}{25 \times 2 \times 3}$   
 $= \frac{2^{3+4} \times 3^4}{2^{5+1} \times 3} = \frac{2^7 \times 3^4}{2^6 \times 3}$   
 $= 2^{7-6} \times 3^{4-1} = 2^1 \times 3^3 = 54$

(b)  $\frac{12^4 \times 9^3 \times 4}{6^3 \times 8^2 \times 27} = \frac{(3 \times 2 \times 2)^4 \times (3^2)^3 \times 2^2}{(2 \times 3)^3 \times (2^3)^2 \times 3^3}$   
 $= \frac{3^4 \times 2^8 \times 3^6 \times 2^2}{2^3 \times 3^3 \times 2^6 \times 3^3}$   
 $= \frac{3^{4+6} \times 2^{8+2}}{2^{3+6} \times 3^{3+3}} = \frac{3^{10} \times 2^{10}}{2^9 \times 3^6}$   
 $= 3^{10-6} \times 2^{10-9} = 3^4 \times 2^1 = 162$

(c)  $\frac{3 \times 7^2 \times 11^8}{21 \times 11^3} = \frac{3 \times 7^2 \times 11^8}{3 \times 7 \times 11^3}$   
 $= 3^{1-1} \times 7^{2-1} \times 11^{8-3}$   
 $= 3^0 \times 7^1 \times 11^5 = 7 \times 11^5$

(d)  $\frac{2^8 \times a^5 \times b^2}{2^3 \times a^4 \times b^6} = 2^{8-3} \times a^{5-4} \times b^{2-6}$   
 $= 2^5 \times a^1 \times b^{-4} = 2^5 \cdot \frac{a}{b^4}$

(e)  $\frac{2 \times 3^4 \times 2^5}{9 \times 4^2} = \frac{2 \times 3^4 \times 2^5}{3^2 \times (2^2)^2}$   
 $= \frac{2^{1+5} \times 3^4}{3^2 \times 2^4} = \frac{2^6 \times 3^4}{3^2 \times 2^4}$   
 $= 2^{6-4} \times 3^{4-2}$   
 $= 2^2 \times 3^2 = 36$

$$(f) \frac{5^4 \times 3^8 \times c^3}{5^2 \times 3^6 \times c^4} = \frac{5^{4-2} \times 3^{8-6}}{c^{4-3}} = \frac{5^2 \times 3^2}{c}$$

$$(g) \frac{4^5 \times x^5 y^3}{4^6 \times x^3 y^3} = \frac{x^{5-3} \times y^{3-3}}{4^{6-5}} = \frac{x^2 \times y^0}{4^1} = \frac{x^2}{4}$$

$$(h) \frac{9 \times 16 \times a^5}{2^4 \times 3^2 \times a^5} = \frac{3^2 \times 2^4 \times a^5}{2^4 \times 3^2 \times a^5}$$

$$= 3^{2-2} \times 2^{4-4} \times a^{5-5}$$

$$= 3^0 \times 2^0 \times a^0 = 1 \times 1 \times 1 = 1$$

$$(i) \frac{9^2 \times 5^6 \times a^4}{3^4 \times 25^2 \times a^3} = \frac{(3^2)^2 \times 5^6 \times a^4}{3^4 \times (5^2)^2 \times a^3}$$

$$= \frac{3^4 \times 5^6 \times a^4}{3^4 \times 5^4 \times a^3}$$

$$= 3^{4-4} \times 5^{6-4} \times a^{4-3}$$

$$= 3^0 \times 5^2 \times a = 25a$$

$$6. (a) \left(\frac{5}{9}\right)^{-3} \times \left(\frac{3}{4}\right)^0 \times 9^{-2} \times \left(\frac{25}{16}\right)^{-1}$$

$$= \frac{9^3}{5^3} \times 1 \times \frac{1}{9^2} \times \frac{16}{25}$$

$$= \frac{9^3}{5^3} \times \frac{1}{9^2} \times \frac{16}{5^2} = \frac{9^{3-2} \times 16}{5^{3+2}}$$

$$= \frac{9 \times 16}{5^5} = \frac{144}{5^5}$$

$$(b) \left[ \left\{ \left(\frac{3}{4}\right)^3 \right\}^4 \div \left(\frac{3}{4}\right)^3 \right] \times \left(\frac{1}{3}\right)^{-3} \times 3^{-1} \times \left(\frac{5}{256}\right)^{-1}$$

$$= \left[ \left(\frac{3}{4}\right)^{12} \div \left(\frac{3}{4}\right)^3 \right] \times 3^3 \times \frac{1}{3} \times \frac{256}{5}$$

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

$$= \frac{3^9}{4} \times 3^{3-1} \times \frac{4^4}{5} = \frac{3^9}{4^9} \times 3^2 \times \frac{4^4}{5}$$

$$= \frac{3^{9+2}}{4^{9-4} \times 5} = \frac{3^{11}}{4^5 \times 5}$$

$$7. \left(\frac{7}{13}\right)^{-6} \times \left(\frac{7}{13}\right)^{-8} = \left(\frac{7}{13}\right)^{-2y}$$

$$\left(\frac{7}{13}\right)^{-6-8} = \left(\frac{7}{13}\right)^{-2y}$$

On comparing, we get  
 $-14 = -2y$  or  $y = 7$

$$8. \left(\frac{3}{11}\right)^4 \times \left(\frac{3}{11}\right)^{-10} = \left(\frac{3}{11}\right)^{5m-1}$$

$$\left(\frac{3}{11}\right)^{4-10} = \left(\frac{3}{11}\right)^{5m-1}$$

$$\left(\frac{3}{11}\right)^{-6} = \left(\frac{3}{11}\right)^{5m-1}$$

$$\therefore -6 = 5m - 1$$

$$-6 + 1 = 5m$$

$$-5 = 5m$$

$$m = \frac{-5}{5}$$

or  $m = -1$

$$9. \frac{x}{y} = \left(\frac{3}{5}\right)^{-2} \div \left(\frac{4}{7}\right)^0 = \left(\frac{5}{3}\right)^2 \div 1$$

$$\frac{x}{y} = \left(\frac{5}{3}\right)^2$$

$$\left(\frac{x}{y}\right)^{-2} = \left[\left(\frac{5}{3}\right)^2\right]^{-2} = \left(\frac{5}{3}\right)^{-4} = \left(\frac{3}{5}\right)^4$$

$$10. \text{ Required number} = \left(\frac{-3}{4}\right)^{-2} \div \left(\frac{-3}{4}\right)^{-8}$$

$$= \left(\frac{-3}{4}\right)^{-2+8} = \left(\frac{-3}{4}\right)^6$$

$$11. \text{ Required number} = (-5)^6 \div (-5)^{-2}$$

$$= (-5)^{6-(-2)} = (-5)^8$$

### EXERCISE 18.3

1-10. Given in answersheet.

### HOTS

1. Given in answersheet

$$2. \text{ Given, } 2^{n-5} \times 6^{2n-4} = \frac{1}{12^4 \times 2}$$

$$\Rightarrow 2^{n-5} \times (3 \times 2)^{2n-4} = \frac{1}{(2 \times 2 \times 3)^4 \times 2}$$

$$\Rightarrow 2^{n-5} \times 3^{2n-4} \times 2^{2n-4} = \frac{1}{2^4 \times 2^4 \times 3^4 \times 2}$$

$$[\because (a \times b)^m = a^m \times b^m]$$

$$\Rightarrow 2^{(n-5)+(2n-4)} \times 3^{2n-4} = \frac{1}{2^{4+4+1} \times 3^4}$$

$$[\because a^m \times a^n = a^{m+n}]$$

$$\Rightarrow 2^{3n-9} \times 3^{2n-4} = \frac{1}{2^9 \times 3^4}$$

$$\Rightarrow 2^{3n-9} \times 3^{2n-4} = 2^{-9} \times 3^{-4} \quad \left[ \because \frac{1}{a^m} = a^{-m} \right]$$



If bases are equal, then we can equate their powers.

$$2^{3n-9} = 2^{-9}$$

$$\Rightarrow 3n - 9 = -9$$

$$\Rightarrow 3n = -9 + 9$$

$$\Rightarrow 3n = 0 \text{ or } n = 0$$

3.  $\therefore$  Number of diagonals of  $n$ -sided figure

$$= \frac{1}{2}(n^2 - 3n)$$

For hexagon,  $n = 6$

$$\therefore \text{Number of diagonals} = \frac{1}{2}(6^2 - 3 \times 6)$$

$$= \frac{1}{2}(36 - 18) = \frac{1}{2} \times 18 = 9$$

**NCERT CORNER** .....

1. (i) 512

$$\begin{array}{r|l} 2 & 512 \\ \hline 2 & 256 \\ \hline 2 & 128 \\ \hline 2 & 64 \\ \hline 2 & 32 \\ \hline 2 & 16 \\ \hline 2 & 8 \\ \hline 2 & 4 \\ \hline 2 & 2 \\ \hline & 1 \end{array}$$

$$\therefore 512 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 2^9$$

(ii) 343

$$\begin{array}{r|l} 7 & 343 \\ \hline 7 & 49 \\ \hline 7 & 7 \\ \hline & 1 \end{array}$$

$$\therefore 343 = 7 \times 7 \times 7 = 7^3$$

(iii) 729

$$\begin{array}{r|l} 3 & 729 \\ \hline 3 & 243 \\ \hline 3 & 81 \\ \hline 3 & 27 \\ \hline 3 & 9 \\ \hline 3 & 3 \\ \hline & 1 \end{array}$$

$$\therefore 729 = 3 \times 3 \times 3 \times 3 \times 3 \times 3 = 3^6$$

(iv) 3125

$$\begin{array}{r|l} 5 & 3125 \\ \hline 5 & 625 \\ \hline 5 & 125 \\ \hline 5 & 25 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

$$\therefore 3125 = 5 \times 5 \times 5 \times 5 \times 5 = 5^5$$

2. (i) 648

$$\begin{array}{r|l} 2 & 648 \\ \hline 2 & 324 \\ \hline 2 & 162 \\ \hline 3 & 81 \\ \hline 3 & 27 \\ \hline 3 & 9 \\ \hline 3 & 3 \\ \hline & 1 \end{array}$$

$$\therefore 648 = 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 = 2^3 \times 3^4$$

(ii) 405

$$\begin{array}{r|l} 3 & 405 \\ \hline 3 & 135 \\ \hline 3 & 45 \\ \hline 3 & 15 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

$$\therefore 405 = 3 \times 3 \times 3 \times 3 \times 5 = 3^4 \times 5$$

(iii) 540

$$\begin{array}{r|l} 2 & 540 \\ \hline 2 & 270 \\ \hline 3 & 135 \\ \hline 3 & 45 \\ \hline 3 & 15 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

$$\therefore 540 = 2 \times 2 \times 3 \times 3 \times 3 \times 5 = 2^2 \times 3^3 \times 5$$

(iv) 3600

$$\begin{array}{r|l} 2 & 3600 \\ \hline 2 & 1800 \\ \hline 2 & 900 \\ \hline 2 & 450 \\ \hline 3 & 225 \\ \hline 3 & 75 \\ \hline 5 & 25 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

$$\therefore 3600 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5 = 2^4 \times 3^2 \times 5^2$$

3. (i)  $2.7 \times 10^{12} = \frac{27}{10} \times 10^{12} = 27 \times 10^{11}$

$$= 27 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10$$

$$= 27,00,00,00,00,000$$

$$1.5 \times 10^8 = \frac{15}{10} \times 10^8 = 15 \times 10^7$$

$$= 15 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10$$

$$= 15,00,00,000$$

$\therefore 27,00,00,00,00,000 > 15,00,00,000$

$\therefore 2.7 \times 10^{12} > 1.5 \times 10^8$

(ii)  $4 \times 10^{14}$  (contain 15 digits)

$3 \times 10^{17}$  (contain 18 digits)

$\therefore 3 \times 10^{17} > 4 \times 10^{14}$

4. (i) 
$$\frac{2^3 \times 3^4 \times 4}{3 \times 32} = \frac{2^3 \times 3^4 \times 2^2}{3 \times 2^5}$$

$$= \frac{2^{3+2} \times 3^4}{2^5 \times 3} = \frac{2^5 \times 3^4}{2^5 \times 3}$$

$$= \frac{3^4}{3^1} = 3^{4-1} = 3^3$$

(ii) 
$$\frac{3^7}{3^4 \times 3^3} = \frac{3^7}{3^{4+3}} = \frac{3^7}{3^7} = 3^{7-7} = 3^0 = 1$$

(iii) 
$$\left(\frac{a^5}{a^3}\right) \times a^8 = a^{5-3} \times a^8$$

$$= a^2 \times a^8 = a^{2+8} = a^{10}$$

(iv) 
$$(2^3 \times 2)^2 = (2^3 \times 2^1)^2$$

$$= (2^{3+1})^2 = (2^4)^2 = 2^{4 \times 2} = 2^8$$

5. (a)  $8 \times 10^4 + 6 \times 10^3 + 0 \times 10^2 + 4 \times 10^1 + 5 \times 10^0$   
 $= 86045$

(b)  $3 \times 10^4 + 7 \times 10^2 + 5 \times 10^0 = 30705$

6. (a) The distance between Earth and Moon is  $3.84 \times 10^8$  m.

(b) The earth has  $1.353 \times 10^9$  km<sup>3</sup> cubic km of sea water.

## 19

## Symmetry

### EXERCISE 19.1

1-4. Do yourself.

### EXERCISE 19.2

1-10. Given in answersheet

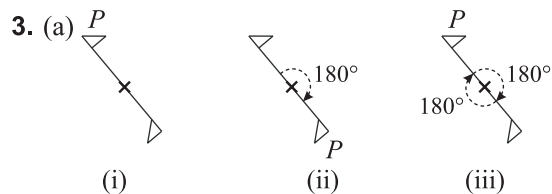
### HOTS

1-4. Given in answersheet.

### NCERT CORNER

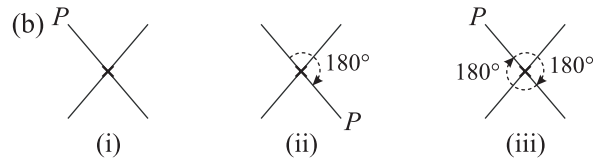
1. Given in answersheet.

2. Given in answersheet.

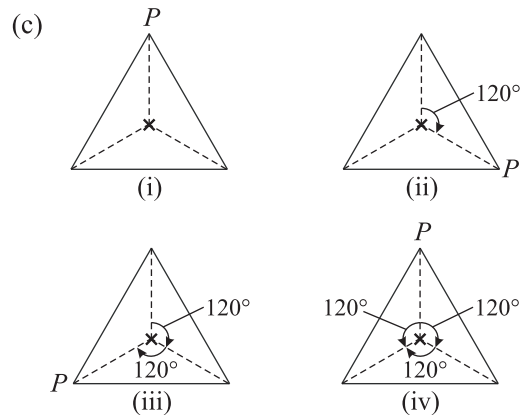


Let us mark a point  $P$  as shown in the figure (i). It

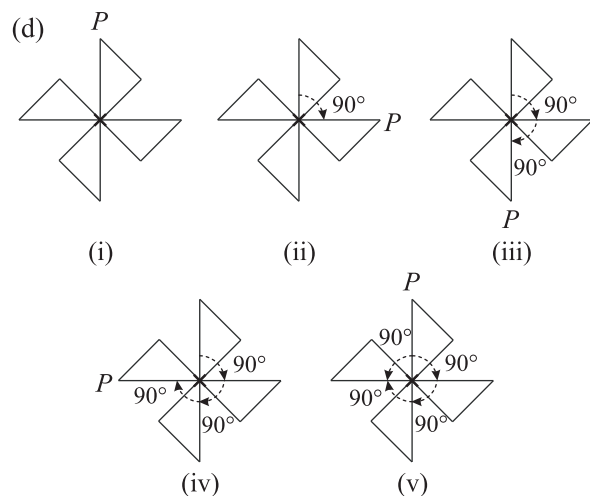
requires two rotations, each through  $180^\circ$  about the point ( $\times$ ) to come back to its original positions. So, it has a rotational symmetry of order 2.



Mark a point  $P$  as shown in figure (i). It requires two rotations, each through an angle of  $180^\circ$  about the marked point ( $\times$ ) to come back to its original position. So, it has a rotational symmetry of order 2.



Mark a point  $P$  as shown in figure (i). It requires three rotations, each through an angle of  $120^\circ$ , about the marked point ( $\times$ ) to come back to its original position. So, it has a rotational symmetry of order 3.



Mark a point  $P$  as shown in figure (i). It requires four rotations, each through an angle of  $90^\circ$ , about the marked point ( $\times$ ) to come back to its original position.

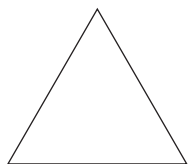
So, it has a rotational symmetry of order 4.

Similarly,

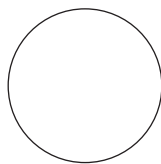
- (e) The figure requires four rotations each of  $90^\circ$ , about the marked point ( $\times$ ) to come back to its original position. So, it has a rotational symmetry of order 4.
- (f) The figure is a regular pentagon. It requires five rotations, each through an angle of  $72^\circ$ , about the marked point to come back to its original position. So, it has rotational symmetry of order 5.
- (g) The given figure requires six rotations, each through an angle of  $60^\circ$ , about the marked point ( $\times$ ) to come back to its original position. So, it has a rotational symmetry of order 6.
- (h) The given figure requires three rotations, each through an angle of  $120^\circ$ , about the marked point ( $\times$ ), to come back to its original position. So, it has a rotational symmetry of order 3.

4. Yes

5.



An equilateral triangle  
(i)



Circle  
(ii)

An equilateral triangle and circle have both line symmetry and rotational symmetry.

**20**

**Visualising Solid Shapes**  
(Three Dimensional Shapes)

⇒ **EXERCISE 20.1** .....

1–2. Given in answersheet

⇒ **EXERCISE 20.2** .....

1–3. Do yourself.

⇒ **EXERCISE 20.3** .....

1–4. Do yourself.

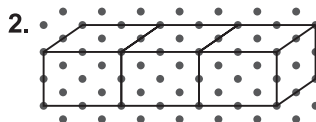
5. (a) 8, (b) 21, (c) 5, (d) 9.

⇒ **HOTS** .....

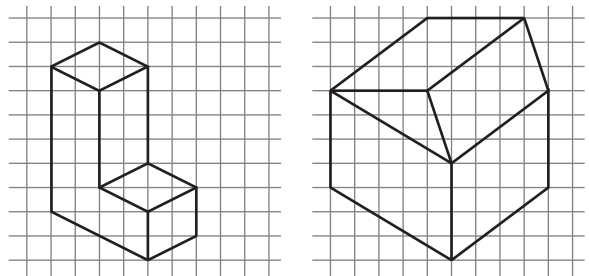
- 1. There are six pairs of 2 cubes.  
So, total cubes =  $6 \times 2 = 12$  cubes.
- 2. Do it yourself.
- 3. Given in answersheet.
- 4. Given in answersheet.
- 5. Given in answersheet.

⇒ **NCERT CORNER** .....

1. (a), (b) and (c) nets can be used to make cubes.



3.



4.

Solid	Shape of cross-section for vertical cut	Shape of cross-section for horizontal cut
(a) A brick	Rectangle	Rectangle
(b) A round apple	Circle	Circle
(c) A die	Square	Square
(d) A circular pipe	Circle	Rectangle
(e) An ice cream cone	Triangle	Circle

5. (i) True (ii) False



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