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NEP 2020

MATHEMATICS

Teacher's Manual
(Class 7)

- Learning Tips
- Maths Lab Activity
- Model Test Paper
- MCQs

Chapter

1 Integers

Exercise 1.1

1. Write the value of :

(a) $|-27| = 27$

(b) $-|-200| = -(200) = -200$

(c) $|763 - 771| = |-8| = 8$

(d) $-|9997 - 10010| = -|-13| = -(13) = -13$

2. Arrange the following integers in ascending order :

(a) $-27 < -8 < -5 < 4 < 8 < 16.$

(b) $-16 < -9 < -3 < -1 < 0\ 3.$

(c) $-21 < -18 < -10 < 1 < 7 < 14.$

3. Arrange the following integers in descending order :

(a) $20 > 9 > 0 > -1 > -5 > -21,$

(b) $25 > 15 > 1 > -3 > -7 > -25,$

(c) $8 > 4 > 3 > -9 > -11 > -16.$

4. Use the sign < or > or = in the box :

(a) $-7 + (-11) + 5 < -5 + (-11) + 7$

(b) $-15 - (-8) > (-15) + (-8)$

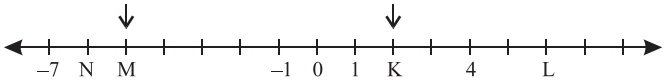
(c) $-64 + (-24) = (-64) - (-24) - 48$

5. Which temperature is higher?

(a) 2°C is higher than –8° C, (b) +10° C is higher than +7° C,

(c) –2° C is higher than –5° C, (d) +8° C is higher than –8° C.

6.



Letter K represent the integer +2.

Letter L represent the integer +6.

Letter M represent the integer –5.

Letter N represent the integer –6.

7. Describe the following statements by using positive or negative numbers :
   (a) 25°C below freezing point $= -25°$ C.
   (b) 5 minutes before blast off a missile $= -5$ minutes.
   (c) 4 hours after the train leaves the station $= +4$ hours.
   (d) Walking 10 yards backwards $= -10$ yards.
   (e) The height of a hill which is 5000 m above level $= +5000$ m.

Exercise 1.2

1. Which one is greater ?
   (a) $(-15) \times 0 \times (-4) \boxed{<} (-15) \times (-4)$
   (b) $(-9) \times (-20) \times (-1) \boxed{<} (9) \times (-20) \times (-1)$
   (c) $(-2) \times 5 \times (-36) \boxed{>} (-1) \times (-5) \times 37$
2. Find the value of :
   (a) $(-2) \times (-2) \times (-2)$
   $= (-1) \times (2 \times 2 \times 2)$
   $= -8$
   (b) $0 \times (-8) \times (-4) \times 3 \times (-4)$
   $= 0$
   (c) $(-6) \times 2 + 6 \times (-2)$
   $= -12 + (-12)$
   $= -24$
   (d) $(-2) \times (-2) \times (-2) \times (-2) \times (-2) \times (-2)$
   $= (+1) \times (2 \times 2 \times 2 \times 2 \times 2)$
   $= 64$
3. Using the distributive law simplify the following.
   (a) $199 \times 26743 - (-26743)$
   $= 199 \times 26743 + 26743$
   $= -26743\,(199 + 1)$
   $= 26743 + 200 = 5348600$
   (b) $(-546) \times (-22) + (-546) \times (-78)$
   $= (-546)\,[-22 + (-78)]$
   $= -546 \times (-100) = +54600$

(c) $7250 \times (-31) + (-7250) \times 69$

$$= 7250[-31 + (-1) \times 69]$$
$$= 7250[-31 - 69]$$
$$= 7250 \times (-100) = -72500$$

(d) $673 \times 272 - 673 \times 72$

$$= 673[272 - 72]$$
$$= 673 \times 200 = 134600$$

4. Fill in the blanks with the symbol >, < or =.

(a) $150 + 3 \times 72 < (150 + 3) \times 72$

(b) $99 - 3 \times 11 < (99 - 3) \times 11$

(c) $(-19) \times (-5) - 19 < (-19) \times (-5 - 19)$

(d) $7 \times (-3) = (-3) \times 7$

(e) $11 \times 2 + 13 > 13 \times 2 + 1$

(f) $17 \times [-3 + (-25)] = 17 \times (-3) + 17 \times (-25)$

5. First the room temp. was 50°C.

$\because$ Temp. falling 5°C every hour.

Then, the temp of room after 3 hours after process being

$$= 50°\,C - 5°\,C \times 8$$
$$= 50°\,C - 40°\,C = 10°\,C.$$

6. Total containing questions = 24

Marks awarded for every correct answer = 5

Marks awarded for every incorrect answer = -2

Marks awarded for not attempted questions = 0

(a) David attempt correct answer = 8

and he attempt incorrect answer = 16

Thus, score of david $= 8 \times 5 + 16 \times (-2)$

$= 40 - 32 = 8$ marks.

(b) Raveena attempts correct answer = 16

She attempts incorrect answer = 8

Thus, score of Raveena $= 16 \times 5 + 8 \times (-2)$

$= 80 - 16 = 64$ marks.

(c) Hamid attempts correct answer $= 4$
and, he attempts incorrect answer $= 12$
Thus, Score of Hamid $= 4 \times 5 + 12 \times (-2)$
$= 20 - 24 = -4$ marks.

7. Profit earn an electric company = ₹ 80 on every colour T.V.

Los of electric company = ₹ 60 on every refrigeration.

(a) Number of colour T.V. company sells = 5000 pieces
Number of refrigerator company sells = 4000 pieces.
Thus, Profit = ₹ 80×5000
= ₹ 400,000
and, Loss = ₹ 60×4000
= ₹ 240,000

$\because$ Profit > Loss

$\therefore$ Total profit of company = ₹ 400,000 – ₹ 240,000
= ₹ 160,000

(b) Let, the number of pieces of sells T.V. be x, if the company earns neither profit nor loss.
Thus, profit on T.V. = Loss on refrigerator

₹ $80 \times x =$ ₹ 60×4000

$$x = \frac{60 \times 4000}{80}$$

$$x = 3000$$

Hence, the company sells 300 pieces of colour T.V. and 4000 pieces of refrigerator to have neither profit nor loss.

8. Find the quotients.

(a) $16 \div (-4)$
$= \frac{16}{-4} = -4$

(b) $601 \div (-1)$
$= \frac{601}{(-1)} = -601$

(c) $(-16) \div (-4)$
$= \frac{(-16)}{(-4)} = +4$

(d) $0 \div (-8)$
$= \frac{0}{-8} = 0$

(e) $(-1000) \div (-10)$
$= \frac{-1000}{(-10)} = +100$

(f) $1000 \div (-10)$
$= \frac{1000}{(-10)} = -100$

9. State whether the following are true or false :

(a) True (b) False (c) True (d) True

(e) False (f) False (g) True (h) True

10. Rate of elevator = 5m/ min (ascend)

Total distance covered by elevator = 50 m + 25 m = 75 m

Thus, time taken $= \frac{75}{5}$ min

$= 15$ min

Hence, the elevator taken 15 min to reach 50 m above the ground from 25 m below the ground level.

11. Temperature of a room at midnight $= -4°$ C

Increasing rate of temperature = 2° C per hour

Thus, teperature of room at 4 a.m.

$= -4°\text{C} + 2°\text{C} \times 4$

$= -4°\text{C} + 8°\text{C} = +4°\text{C}$

and, the temperature of room at 12 noon

$= -4°\text{C} + 12° \times 2°\text{C}$

$= -4°\text{C} + 24°\text{C} = 20°\text{C}$

hence, the temperature of room + 4° C at 4 a.m. and +20° C at 12 noon.

12. Marks given for every correct answer = + 5

Marks given for every incorrect answer = (−1)

(a) Score of Brijesth is 30 marks, and he attempts 10 correct answers.

Thus, the number of incorrect answers attempt by Brijesh

$= 10 \times (+5) - 20$

$= 50 - 30 = 20$

Hence, Brijesh attempts 20 incorrect answers.

(b) Score of Sonia is −14 marks and she attempt 8 correct answers.

Thus, the number of incorrect answers attempt by Sonia

$= 8 \times (+5) - (-14)$

$= 40 + 14 = 54$

Hence, Sonia attempts 54 incorrect answers.

Exercise 1.3

1. Find the value of :

(a) $1^{102} = 1$

(b) $(-1)^{113} \times (-2)^3$

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

$= +8$

(c) $(-3) \times (-3) \times (-3) \times (-3)$

$= (+1) \times (3)^4$

$= 81$

2. Which is greater?

(a) $-875 \div 125 \boxed{<} -875 \div -125$

(b) $7 + 6 \times (-4) \boxed{>} -8 + (-2) \times (-8)(-1)$

(c) $(-4) \times (-22) \boxed{\times} 4 \times (-3) < (-2) \times (-1) \times (-1) \times 2$

3. Find the values of :

(a) $-5 - (-48) \div (12) + (-2) \times 6$

$= -5 + 48 \div 12 - 2 \times 6$

$= -5 + 4 - 2 \times 6$

$= -5 + 4 - 12$

$= -1 - 12 = -13$

(b) $10 + 4 - [3 - \{1 + 2 - (4 - 9)\}]$

$= 10 + 4 - [3 - \{1 + 2 - (-5)\}$

$= 14 - [3 - \{3 + 5\}]$

$= 14 - [3 - \{8\}]$

$= 14 - [3 - 8]$

$= 14 - [-5]$

$= 14 + 5 = 19$

(c) $[-15 + \{4 \div \overline{(-1) - (3)}\} \times 6]$

$= [-15 + \{4 \div (-1 - 3)\} \times 6]$

$= [-15 + \{4 \div (-4)\} \times 6]$

$= [-15 + \{-1\} \times 6]$

$= [-15 + (-6)]$

$= [-15 - 6] = -21$

(d) $140 - 12 \times [3 - 4\ \{2 \times 3 - \overline{2 \times (-8)}\}]$

$= 140 - 12 \times [3 - 4\ \{6 - (-16)\}]$

$$= 140 - 12 \times [3 - 4\{6 + 16\}]$$
$$= 140 - 12 \times [3 - 4 \times \{22\}]$$
$$= 140 - 12 \times [3 - 88]$$
$$= 140 - 12 \times (-85)$$
$$= 140 - (1020)$$
$$= 140 + 1020 = 1160$$

(e) $-80 + 6 \times [-3 \times 8 + 20] + 100$

$$= -80 + 6 \times (-24) + 100$$
$$= -80 + 6 \times (-4) + 100$$
$$= -80 + (-24) + 100$$
$$= -80 - 24 + 100$$
$$= -80 - 24 + 100$$
$$= -104 + 100 = -4$$

(f) $-40 + (-1) - (2) \times 6 \div 3 - 2$

$$= -40 + (-1 - 2) \times 6 \div 3 - 2$$
$$= -40 + (-3) \times 6 \div 1$$
$$= -40 - 3 \times 6$$
$$= -40 - 18 = -58$$

(g) $\{60 \times (-3)\} \div 45 \div (-2)$

$$= \{-180\} \div \left(-\frac{45}{2}\right)$$
$$= -180 \times \left(\frac{2}{-45}\right)$$
$$= +4 \times 2 = 8$$

(h) $120 - 12\,[3 - 4\,\{2 \times 3 - 2 \times (-8)\}]$

$$= 120 - 12[3 - 4\{6 - (-16)\}]$$
$$= 120 - 12[3 - 4\,\{6 + 16\}]$$
$$= 12 - 12[3 - 4 \times \{22\}]$$
$$= 120 - 12[3 - 88]$$
$$= 120 - 12 \times [-85]$$
$$= 120 - [1020]$$
$$= 120 + 1020 = 1140$$

(i) $-4 \times -1\ [2 \times (-6) + 3\ (\overline{2 \times 6} - 4 - 2)]$

$= +4\,[-12 + 3\,(12 - 6)]$

$= 4\,[-12 + 3 \times (6)]$

$= 4\,[-12 + 18]$

$= 4 \times [6] = 24$

(j) $-4 \times (-2)\ [2 \times (-6) + 3 \times (\overline{2 \times 6} - 4 - 4)]$

$= +8[-12 + 3 \times (12 - 8)]$

$= 8[-12 + 3 \times (4)]$

$= 8[-12 + 12]$

$= 8 \times [0] = 0$

4. Express the following in mathematical terms making use of brackets :

(a) $[(-24) + 4] + 6$ (b) $[8 \times (-1)] - [(-4) \times (-10)]$

(c) $[15 + (-20)] + 6$ (d) $(-10) - [(100 \div 10) \times 0]$

(e) $[12 + (-42)] \times (-15)$

Oral Assignment

Do it yourself.

Mental Ability

A. Multiple Choice Questions (MCQs):

1. (a) **2.** (c) **3.** (b) **4.** (b) **5.** (b) **6.** (c) **7.** (b) **8.** (a) **9.** (c) 10. (b)

B. Fill in the blanks :

1. The associative and commutative properties are not true for **subtraction of division** of integers.

2. The integer **0** is neither positive nor negative.

3. – [– (–87)] = **–87**.

4. When we add an integer to its additive inverse, we get **zero**.

5. (–2) × (–2) × **2** = 8

C. State True (T) ro False (F) :

1. False **2.** True **3.** False **4.** True **5.** True

Higher Order Thinking Skills

Marks given for every correct answer = + 4

Marks given for every incorrect answer $= -2$

(a) Score of renu $= 30$ marks, and she got 10 correct answers.

Thus, Number of incorrect answers attempt by Renu

$$= \frac{(+4) \times 10 - 30}{2}$$

$$= \frac{40 - 30}{2} = 5 \text{ answers.}$$

(b) Score of Rohit $= (-10)$ marks, and

He got 5 correct answers.

Thus, Number of incorrect answers attempt by Rohit

$$= \frac{(+4) \times 5 - (-10)}{2}$$

$$= \frac{20 + 10}{2} = 15 \text{ answers.}$$

Chapter

2 Fraction

Exercise 2.1

1. Write four equivalent fractions to each of the following :

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

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

$= \frac{10}{22} = \frac{15}{33} = \frac{20}{44} = \frac{25}{55}$

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

(b) $7\frac{3}{21}$

$7\frac{3}{21} = \frac{147 + 3}{21} = \frac{150}{21}$

$\because \quad \frac{150}{21} = \frac{150 \div 3}{21 \div 3} = \frac{50 \times 2}{7 \times 2} = \frac{50 \times 4}{7 \times 4} = \frac{50 \times 5}{7 \times 5}$

So, $\frac{50}{7}, \frac{100}{14}, \frac{200}{28}$ and $\frac{250}{350}$ are four equivalent fractions to $7\frac{3}{21}$.

(c) $1\frac{202}{303} = \frac{303+202}{303} = \frac{505}{303} = \frac{5}{3}$

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

$= \frac{10}{6} = \frac{15}{9} = \frac{20}{12} = \frac{25}{15}$

So, $\frac{10}{6}, \frac{15}{6}, \frac{20}{12}$ and $\frac{25}{15}$ are four equivalent fractions to $1\frac{202}{303}$.

2. Simplify :

(a) $\frac{5}{9} - \frac{7}{12} + \frac{1}{2}$

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

$\because$ LCM of 9, 12 and 2 = 36

$\therefore \quad \frac{5}{9} - \frac{7}{12} + \frac{1}{2}$

$= \frac{5\times 4 - 7\times 3 + 1\times 18}{36}$

$= \frac{20 - 21 + 18}{36} = \frac{17}{36}$

(b) $8 - 4\frac{1}{2} - 2\frac{1}{4}$

2	2, 4
2	1, 2
	1, 1

$= 8 - \frac{9}{2} - \frac{9}{4}$

$\because$ LCM of 2 and 4 = 4

$\therefore \quad 8 - \frac{9}{2} - \frac{9}{4} = \frac{8\times 4 - 9\times 2 - 9\times 1}{4}$

$= \frac{32 - 18 - 9}{4}$

$= \frac{32 - 27}{4} = \frac{5}{4}$

(c) $8\frac{5}{6}-3\frac{3}{8}+1\frac{7}{12}$

$$=\frac{53}{6}-\frac{27}{8}+\frac{19}{12}$$

2	6, 8, 12
2	3, 4, 6
2	3, 2, 3
3	3, 1, 3
	1, 1, 1

$\because$ LCM of 6, 8 and 12 = 24

$\therefore$ $\frac{53}{6}-\frac{27}{8}+\frac{19}{12}$

$$=\frac{53\times 4-27\times 3+19\times 2}{24}$$

$$=\frac{212-81+38}{24}=\frac{169}{24}$$

3. Let, we should added x.

Thus, $7\frac{4}{5}+x=8\frac{2}{5}$

$$x=8\frac{2}{5}-7\frac{4}{5}$$

$$=\frac{42}{5}-\frac{39}{5}$$

$$=\frac{42-39}{5}=\frac{3}{5}$$

Hence, we should added $\frac{3}{5}$ to $7\frac{4}{5}$ to get $8\frac{2}{5}$.

4. Daily studies of Suman $=5\frac{2}{3}$ hours

She devotese time for science and Mathematics $=2\frac{4}{5}$

Thus, time devotes for other subjects $=5\frac{2}{3}-2\frac{4}{5}$

$$=\frac{17}{3}-\frac{14}{5}$$

$$=\frac{17\times 5-14\times 3}{15}$$

$$=\frac{85-42}{15}=\frac{43}{15}=2\frac{13}{15}$$

Hence, she devotes $2\frac{13}{15}$ hours for other subjects.

5. Distance between Atul's school and his house $= 22\frac{1}{3}$ km

Distance between his school the museum $= 6\frac{1}{4}$ km

Thus, distance between museum and his house

$$= 22\frac{1}{3}\text{ km} + 6\frac{1}{4}\text{ km}$$

$$= \left(\frac{67}{3} + \frac{25}{4}\right)\text{km}$$

$$= \left(\frac{67 \times 4 - 25 \times 3}{12}\right)\text{km}$$

$$= \left(\frac{268 - 75}{12}\right)\text{km}$$

$$= \frac{193}{2}\text{ km} = 16\frac{1}{2}\text{ km}$$

Hence, the museum is $16\frac{1}{12}$ km far from Atul's house.

Exercise 2.2

1. Find the value of y :

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

$y = \frac{1 \times 22}{3} = \frac{22}{3}$

$y = 7\frac{1}{3}$

(b) $18 \times y = 1$

$y = \frac{1}{8}$

(c) $\frac{2}{13} \times y = 1$

$y = \frac{1 \times 13}{2} = \frac{13}{2}$

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

(d) $5\frac{2}{3} \times y = 1$

$\frac{17}{3}\, y = 1$

$y = \frac{1 \times 3}{17}$

(e) $\frac{9}{25} \times 2\frac{7}{9} = y$

$\frac{9}{25} \times \frac{25}{9} = y$

$1 = y$

$y = 1$

(f) $5\frac{1}{3} \times y = 1$

$\frac{16}{3} \times y = 1$

$y = \frac{1 \times 3}{16}$

$y = \frac{3}{16}$

$y = \frac{3}{17}$

2. Find the reciprocal of the following :

(a) Reciprocal of 95 is $\frac{1}{95}$.

(b) Reciprocal of $\frac{5}{12}$ is $\frac{12}{5}$.

(c) Reciprocal of $\frac{1}{44}$ is 44.

(d) Reciprocal of $\frac{18}{23}$ is $\frac{23}{18}$.

(e) Reciprocal of $5\frac{4}{7}$ is $\frac{7}{39}$.

(f) Reciprocal of $3\frac{9}{11}$ is $\frac{11}{42}$.

3. Find the value of :

(a) $\frac{3}{4}$ of 24 l

$= \frac{3}{4} \times 24l$

$= 18l$

(b) $\frac{4}{5}$ of ₹ 2

$= \frac{4}{5} \times$ ₹ 2

$=$ ₹ $\frac{8}{5} =$ ₹ $1\frac{3}{5}$

(c) $2\frac{1}{3}$ of 18 m

$= \frac{7}{3} \times 18$ m

$= 42$ m

(d) $\frac{1}{2}$ of $9\frac{1}{2}$

$= \frac{1}{2} \times \frac{19}{2}$

$= \frac{19}{4} = 4\frac{3}{2}$

(e) $3\frac{1}{5}$ of 250 min.

$= \frac{16}{5} \times 250$

$= 800$ min

(f) $1\frac{2}{3}$ of 3600 m

$= \frac{5}{3} \times 3600$ m

$= 6000$ m

(g) $\frac{1}{5}$ of $3\frac{3}{5}$

$\frac{1}{5}$ of $3\frac{3}{5}$

$= \frac{1}{5} \times \frac{18}{5}$

$= \frac{18}{25}$

(h) $\frac{2}{5}$ of $3\frac{3}{4}$ kg

$\frac{2}{5}$ of $3\frac{3}{4}$ kg

$= \frac{2}{5} \times \frac{15}{4}$ kg

$= \frac{3}{2} = 1\frac{1}{2}$ kg

4. Evaluate :

(a) $2\frac{2}{3} \times 3\frac{3}{4}$

$= \frac{8}{3} \times \frac{15}{4}$

$= 2 \times 5 = 10$

(b) $1\frac{1}{2} \times 1\frac{1}{3} \times 1\frac{1}{4}$

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

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

(c) $3\frac{1}{3} \times 2\frac{2}{5} \times 1\frac{1}{7}$

$= \frac{10}{3} \times \frac{12}{5} \times \frac{8}{7}$

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

(d) $22\frac{2}{3} \times 3\frac{1}{7}$

$= \frac{68}{3} \times \frac{22}{7}$

$= \frac{1496}{21} = 71\frac{5}{21}$

(e) $3\frac{1}{2} \times 2\frac{1}{5} \times \frac{25}{35}$

$= \frac{7}{2} \times \frac{11}{5} \times \frac{5}{7}$

$= \frac{11}{2} = 5\frac{1}{2}$

(f) $40\frac{5}{8} \times 2\frac{2}{5}$

$= \frac{325}{8} \times \frac{12}{5}$

$= \frac{65}{2} \times 3$

$= \frac{195}{2} = 97\frac{1}{2}$

(g) $5\frac{5}{6} \times 2\frac{1}{7}$

$= \frac{35}{6} \times \frac{15}{7}$

(h) $18\frac{2}{3} \times 3\frac{3}{8}$

$= \frac{56}{3} \times \frac{27}{8}$

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

$$= \frac{25}{2} = 12\frac{1}{2}$$

$$= 7 \times 9 = 63$$

5. Evaluate :

(a) $\frac{2}{3} \times \left[\frac{3}{4} + \frac{2}{3} + \frac{5}{2}\right]$

$$= \frac{2}{3} \times \left[\frac{9+8+30}{12}\right]$$

$$= \frac{2}{3} \times \frac{47}{12} = \frac{1 \times 47}{3 \times 6}$$

$$= \frac{47}{18} = 2\frac{11}{18}$$

(b) $\left[\frac{7}{9} - \frac{5}{27}\right] \times \left[\frac{1}{3} - \frac{5}{18}\right]$

$$= \left[\frac{21-5}{27}\right] \times \left[\frac{6-5}{18}\right]$$

$$= \frac{16}{27} \times \frac{1}{18}$$

$$= \frac{8}{27} \times \frac{1}{9} = \frac{8}{243}$$

(c) $\left(11\frac{1}{4} \times 3\frac{1}{5}\right) + \left(4\frac{2}{3} \times 5\frac{6}{7}\right)$

$$= \left(\frac{45}{4} \times \frac{16}{5}\right) + \left(\frac{14}{3} \times \frac{41}{7}\right)$$

$$= (9 \times 4) + \left(\frac{2 \times 41}{3}\right)$$

$$= 36 + \frac{82}{3} = 36 + 27 + \frac{1}{3}$$

$$= 63 + \frac{1}{3} = 36 + 27 + \frac{1}{3}$$

$$= 63 + \frac{1}{3} = 63\frac{1}{3}$$

(d) $\left(6\frac{2}{5} \times \frac{25}{8}\right) - \left(\frac{4}{3} \times 1\frac{1}{8}\right)$

$$= \left(\frac{32}{5} \times \frac{25}{8}\right) - \left(\frac{4}{3} \times \frac{9}{8}\right)$$

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

$$= 20 - \frac{3}{2} = \frac{40-3}{2}$$

$$= \frac{37}{3} = 12\frac{1}{3}$$

(e) $\left(3\frac{1}{4} \times \frac{12}{39}\right) - \left(\frac{2}{3} - \frac{3}{7}\right)$

$$= \left(\frac{13}{4} \times \frac{12}{39}\right) - \left(\frac{14-9}{21}\right)$$

$$= \frac{3}{3} - \frac{5}{21} = 1 - \frac{5}{21}$$

$$= \frac{21-5}{21} = \frac{16}{21}$$

(f) $\left(\frac{3}{11} + \frac{5}{22}\right) \times \left(\frac{14}{9} + \frac{5}{6}\right)$

$$= \left(\frac{6+5}{22}\right) \times \left(\frac{28+15}{18}\right)$$

$$= \frac{11}{22} \times \frac{43}{18} = \frac{1}{2} \times \frac{43}{18}$$

$$= \frac{43}{36} = 1\frac{7}{36}$$

Exercise 2.3

1. Evaluate the following :

(a) $\frac{6}{11} \div 15$

$= \frac{6}{11} \times \frac{1}{15}$

$= \frac{2 \times 1}{11 \times 5} = \frac{2}{55}$

(b) $6\frac{4}{5} \div \frac{7}{35}$

$= \frac{34}{5} \times \frac{35}{7}$

$= \frac{34}{5} \times 5 = 34$

(c) $\frac{16}{7} \div \frac{28}{42}$

$= \frac{16}{7} \quad \frac{42}{28}$

$= 4 \times \frac{6}{7}$

$= \frac{24}{7} = 3\frac{3}{7}$

(d) $\frac{8}{27} \div \frac{16}{9}$

$= \frac{8}{27} \times \frac{9}{16}$

$= \frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$

(e) $\frac{9}{35} \div \frac{1}{7}$

$= \frac{9}{35} \times 7$

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

(f) $36\frac{1}{4} \div 8\frac{3}{4}$

$= \frac{145}{4} \div \frac{35}{4}$

$= \frac{145}{4} \times \frac{4}{35}$

$= \frac{29}{7} = 4\frac{1}{7}.$

2. Simply is the following :

(a) $\left(5\frac{1}{4} \times \frac{16}{7}\right) \div \frac{2}{3}$

$= \left(\frac{21}{4} \times \frac{16}{7}\right) \times \frac{3}{2}$

$= 3 \times 4 \times \frac{3}{2} = 18.$

(b) $\left(18\frac{2}{9} \div 9\frac{1}{9}\right) \div 1\frac{1}{3}$

$= \left(\frac{164}{9} \div \frac{82}{9}\right) \div \frac{4}{3}$

$= \left(\frac{164}{9} \times \frac{9}{82}\right) \div \frac{4}{3}$

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

(c) $\left(2\frac{1}{7}\times 2\frac{4}{5}\right)\div\frac{1}{10}$

$=\left(\frac{15}{7}\times\frac{14}{5}\right)\div\frac{1}{10}$

$=(3\times 2)\times 10$

$=60$

(d) $\left[\frac{2}{7}\div\frac{40}{21}\right]\times\left[\frac{3}{10}\div\frac{9}{20}\right]$

$=\left[\frac{2}{7}\times\frac{21}{40}\right]\times\left[\frac{3}{10}\times\frac{20}{9}\right]$

$=\left[\frac{3}{20}\right]\times\left[\frac{3}{10}\times\frac{20}{9}\right]$

$=\frac{3}{20}\times\frac{2}{3}=\frac{1}{10}$

(e) $\left[\frac{4}{15}\times\frac{6}{28}\right]\times\frac{9}{2}$

$=\left[\frac{1\times 2}{5\times 7}\right]\times\frac{9}{2}$

$=\frac{2}{35}\times\frac{9}{2}=\frac{9}{35}$

(f) $\left(24\div 2\frac{2}{3}\right)\div 3\frac{1}{9}$

$=\left(24\div\frac{8}{3}\right)\div\frac{28}{9}$

$=\left(24\times\frac{3}{8}\right)\times\frac{9}{28}$

$=\frac{81}{28}=2\frac{25}{28}$

Exercise 2.4

1. Perimeter of a square $=9\frac{1}{11}$ m

Thus, each side of square $=\left(\frac{100}{11}\div 4\right)$ m

$=\left(\frac{100}{11}\times\frac{1}{4}\right)$ m

$=\frac{25}{11}$ m

So, Area of the square $=\frac{25}{11}\text{ m}\times\frac{25}{11}\text{ m}$

$=\frac{625}{121}\text{ m}^2$

$=5\frac{20}{121}\text{ m}^2$

2. Let, the other number be x.

Thus, $$\frac{7}{17} \times x = \frac{4}{9}$$

$$x = \frac{4}{9} \times \frac{17}{7}$$

$$= \frac{68}{63} = 1\frac{5}{63}.$$

3. Cost of $8\frac{1}{4}$ kg. of tomatoes = ₹ $194\frac{1}{4}$

Thus, cost of 1 kg of tomatoes = ₹ $194\frac{1}{4} \div 8\frac{1}{4}$

$$= \frac{₹\ 777}{4} \div \frac{33}{4}$$

$$= \frac{₹\ 777}{4} \times \frac{4}{33}$$

$$= ₹\ \frac{259}{11}$$

So, the cost of $3\frac{3}{4}$ kg of tomatoes = ₹ $\frac{259}{11} \times 3\frac{3}{4}$

$$= \frac{₹\ 259}{11} \times \frac{15}{4}$$

$$= \frac{₹\ 259 \times 15}{11 \times 4}$$

$$= \frac{₹\ 3885}{44} = ₹\ 88\frac{13}{44}$$

4. Total number of structure in class = 50

Number of girls = $\frac{3}{5}$ of all students

$$= \frac{3}{5} \times 50 = 30$$

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

Hence, there are 20 boys in the class.

5. Total number of pieces of iron-rod $= 8$

Length of each piece of iron rod $= 6\frac{3}{4}$ m

Thus, total length of iron-rod $= 8 \times 6\frac{3}{4}$ m

$$= 8 \times \frac{27}{4} \text{ m}$$

$$= 2 \times 27 = 54 \text{ m}$$

6. Let, the other number be x.

Thus,
$$6\frac{1}{3} \times x = 15\frac{5}{6}$$

$$\frac{19}{3} \times x = \frac{95}{6}$$

$$\frac{19}{3} \times x = \frac{95}{6}$$

$$x = \frac{95}{6} \times \frac{3}{19}$$

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

Hence, the other number is $2\frac{1}{2}$.

7. Let, the total number of students in the school be x.

Thus, number of boys $= \frac{4}{7}$ of x

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

$\because$ number of girls $= 210$

$\therefore$
$$\frac{4x}{7} + 210 = x$$

$$210 = x - \frac{4x}{7}$$

$$210 = \frac{7x - 4x}{7}$$

$$7 \times 210 = 3x$$

$$3x = 7 \times 210$$

$$x = \frac{7 \times 210}{3} = 7 \times 70$$

$$x = 490$$

So, number of students $= \frac{4}{7}$ of 490

$$= \frac{4}{7} \times 490$$

$$= 4 \times 70 = 280$$

Hence, there are 280 boys students in the school.

8. Total weight of toffees $= 30\frac{3}{8}$ kg

Weight of each packet of toffees $= 2\frac{1}{40}$ kg

Thus, Total number of packets $= \dfrac{30\frac{3}{8}}{2\frac{1}{40}}$

$$= \frac{\frac{243}{8}}{\frac{81}{40}}$$

$$= \frac{243}{8} \times \frac{40}{81} = 3 \times 5 = 15$$

Hence, Ravi can be made 15 packets.

9. Let, the required number be x.

Thus, $9\frac{4}{5} \times x = 42$

$$\frac{49}{5} \times x = 42$$

$$x = \frac{42 \times 5}{49} = \frac{6 \times 5}{7}$$

$$x = \frac{30}{7} = 4\frac{2}{7}$$

$$x = 4\frac{2}{7}$$

Hence, $9\frac{4}{5}$ Should be multiplied by $4\frac{2}{7}$ to get 42.

10. Cost of $18\frac{1}{2}$ m of cloths = ₹ $245\frac{1}{8}$

$\therefore$ Cost of m of cloths = ₹ $245\frac{1}{8} \div 18\frac{1}{2}$

$$= ₹\ \frac{1961}{8} \div \frac{37}{2}$$

$$= \frac{₹\ 1961}{8} \times \frac{2}{37}$$

$$= ₹\ \frac{53}{4} = ₹\ 13\frac{1}{4}$$

So, cost of $26\frac{1}{2}$ m ob cloths = ₹ $\frac{53}{4} \times 26\frac{1}{2}$

$$= ₹\ \frac{54}{4} \times \frac{53}{2}$$

$$= \frac{₹\ 2809}{8} = ₹\ 351\frac{1}{8}$$

Hence, Wasim pay ₹ $351\frac{1}{8}$ to the shopkeeper.

Mental Ability

A. Multiple Choice Questions (MCQs) :

1. (a) **2.** (b) **3.** (d) **4.** (c) **5.** (a) **6.** (b) **7.** (c) **8.** (d)

B. Fill in the blanks :

1. The multiplicative inverse of $9\frac{9}{10}$ is $\mathbf{\frac{10}{99}}$.

2. The lowest form of $\frac{148}{160}$ is $\mathbf{\frac{37}{40}}$.

3. $\frac{3}{4} \div \left(-\frac{4}{3}\right)$ is equal to $\mathbf{\frac{-9}{16}}$.

4. $\frac{1}{5}$ of 3 < $\frac{1}{3}$ of 5. Put < or > sign in the box.

5. The reciprocal of **0** does not exist.

C. State True (T) or False :

1. False **2.** True **3.** False **4.** True **5.** False

Higher Order Thinking Skills

1. Let, the fraction be $\frac{x}{y}$.

Thus,
$$\frac{x}{y+1} = \frac{1}{2} \qquad \ldots(1)$$
$$\frac{x+1}{y} = 1 \qquad \ldots(2)$$

By equation (1),
$$\frac{x}{y+1} = \frac{1}{2}$$
$$x = \frac{1}{2}(y+1)$$

Put the value of x in equation (2),
$$\frac{\frac{1}{2}(y+1)+1}{y} = 1$$
$$\frac{1}{2}(y+1)+1 = y$$
$$\frac{(y+1)+2}{2} = y$$
$$y+1+2 = 2y$$
$$3 = 2y - y$$
$$y = 3$$

Put, the value of y in equation (1),

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

$$x = \frac{1}{2} \times 4$$

$$x = 2$$

Hence, the required fraction is $\frac{2}{3}$.

2. $\because$ $\frac{9}{49}, \frac{3}{49}, \frac{7}{49}, \frac{5}{49}, \frac{10}{49}, \frac{6}{49}$

The are all the like fractions.

$\therefore$ $\frac{10}{49}$ is the largest and $\frac{3}{49}$ is the smallest fraction.

Thus, their product $= \frac{10}{49} \times \frac{3}{49} = \frac{30}{2401}$.

Chapter

3 Rational Numbers

Exercise 3.1

1. $\frac{15}{8}, \frac{-4}{-13}, \frac{-89}{-201}$ are positive rational numbers.

and, $\frac{-5}{7}, \frac{-16}{23}, \frac{25}{-37}$ are negative rational numbers.

2. Express the following in the standard form.

(a) $\frac{-108}{204}$

$\because$ HCF of 108 and 204 is 12.

$\therefore$ $\frac{-108}{204} = \frac{-108 \div 12}{204 \div 12} = \frac{-9}{17}$

(b) $\frac{-81}{-99}$

$\because$ HCF of 81 and 99 is 9.

$\therefore$ $\frac{-81}{-99} = \frac{-81 \div 9}{-99 \div 9} = \frac{-9}{-11} = \frac{9}{11}$.

(c) $\frac{-195}{275}$

(d) $\frac{132}{330}$

$\because$ HCF of 195 and 275 is 5.

$\therefore \quad \dfrac{-195}{275} = \dfrac{-195 \div 5}{275 \div 5} = \dfrac{-39}{55}$

$\because$ HCF of 132 and 330 is 66.

$\therefore \quad \dfrac{132}{330} = \dfrac{132 \div 66}{330 \div 66} = \dfrac{2}{5}.$

3. Express each of the following as a rational number with positive denominator.

(a) $\dfrac{45}{-51}$

$= \dfrac{45 \div (-3)}{-51 \div (-3)} = \dfrac{-15}{17}$

(b) $\dfrac{12}{-19}$

$= \dfrac{12 \div (-1)}{-19 \div (-1)} = \dfrac{-12}{19}$

(c) $\dfrac{-68}{-117}$

$= \dfrac{-68 \div (-1)}{-117 \div (1)} = \dfrac{68}{117}$

4. Express $\dfrac{5}{9}$ as a rational number with denominator.

(a) -27

$\because \quad -27 \div 9 = -3$

$\therefore \quad \dfrac{5}{9} = \dfrac{5 \times (-3)}{9 \times (-3)} = \dfrac{-15}{-27}$

(b) 54

$\because \quad 54 \div 9\ l = 6$

$\therefore \quad \dfrac{5}{9} = \dfrac{5 \times 6}{9 \times 6} = \dfrac{30}{54}$

(c) 108

$\because \quad 108 \div 9 = 12$

$\therefore \quad \dfrac{5}{9} = \dfrac{5 \times 12}{9 \times 2} = \dfrac{60}{108}$

(d) 9000

$\because \quad 9000 \div 9 = 1000$

$\therefore \quad \dfrac{5}{9} = \dfrac{5 \times 1000}{9 \times 1000}$

$= \dfrac{5000}{9000}$

5. Find five rational numbers equivalent to each of the following rational numbers.

(a) $\dfrac{-4}{9}$

$\because \quad \dfrac{-4}{9} = \dfrac{-4 \times 2}{9 \times 2} = \dfrac{-4 \times 3}{9 \times 3} = \dfrac{-4 \times 4}{9\ \ 4} = \dfrac{-4 \times 5}{9 \times 5} = \dfrac{-4 \times 6}{9 \times 6}$

$$= \frac{-8}{18} = \frac{-12}{27} = \frac{-16}{36} = \frac{20}{45} = \frac{-24}{54}$$

Hence, $\frac{-8}{18}, \frac{-12}{27}, \frac{-16}{36}, \frac{-20}{45}$ and $\frac{-24}{54}$ are five equivalent rational numbers of $\frac{-4}{9}$.

(b) $\frac{7}{-3}$

$$\because \quad \frac{7}{-3} = \frac{7\times 2}{-3\times 2} = \frac{7\times 3}{-3\times 3} = \frac{7\times 4}{-3\times 4} = \frac{7\times 5}{-3\times 5} = \frac{7\times 6}{-3\times 6}$$

$$= \frac{-14}{6} = \frac{-21}{9} = \frac{-28}{12} = \frac{-35}{15} = \frac{-42}{18}$$

Hence, $-\frac{14}{6}, \frac{-21}{9}, \frac{-28}{12}, \frac{35}{15}$ and $\frac{-42}{18}$ and $\frac{-42}{48}$ are five rational number equivalent to $\frac{7}{-3}$.

6. Express $\frac{-125}{625}$ as a rational number with denominator equal to :

(a) $\because \quad 625 \div 5 = 125$

$$\therefore \quad \frac{-125}{625} = \frac{-125 \div 125}{625 \div 125} = \frac{-1}{5}.$$

(b) $\because \quad 625 \div 25 = 25$

$$\therefore \quad \frac{-125}{625} = \frac{-125 \div 25}{625 \div 25} = \frac{-5}{25}.$$

(c) $\because \quad 625 \div (-625) = -1$

$$\therefore \quad \frac{-125}{625} = \frac{-125 \times (-1)}{625 \times (-1)} = \frac{125}{-625}$$

(d) $\because \quad 625 \div (125) = -5$

$$\therefore \quad \frac{-125}{625} = \frac{-125 \div (-5)}{625 \div (-5)} = \frac{25}{-125}$$

7. Express $\frac{126}{-196}$ as a rational number with numerator equal to :

(a) $\because \quad 126 \div (-9) = -14$

$\therefore \quad \dfrac{126}{-196} = \dfrac{126 \div (-14)}{-196 \div (-14)} = \dfrac{-9}{14}$

(b) $\because \quad 126 \div 63 = 2$

$\therefore \quad \dfrac{126}{-196} = \dfrac{126 \div 2}{-193 \div 2} = \dfrac{63}{-198}$

(c) $\because \quad 126 \div (-126) = -1$

$\therefore \quad \dfrac{126}{-196} = \dfrac{126 \div (-1)}{-196 \div (-1)} = \dfrac{-126}{196}$

(d) $\because \quad 12600 \div 126 = 100$

$\therefore \quad \dfrac{126}{-196} = \dfrac{126 \times 100}{-196 \times 100} = \dfrac{12600}{-19600}$

8. In each of the following, find an equivalent rational number having a common denominator.

(a) $\dfrac{7}{6}$ and $\dfrac{5}{18}$

$\because$ LCM of 6 and 18 = 18

$\therefore \quad \dfrac{7}{6} = \dfrac{7 \times 3}{6 \times 3} = \dfrac{21}{18}$ and $\dfrac{5}{18} = \dfrac{5 \times 1}{18 \times 1} = \dfrac{5}{18}$

Thus, $\dfrac{21}{18}$ and $\dfrac{5}{18}$ are like fractions of a common denominator.

(b) $\dfrac{3}{4}, \dfrac{5}{24}, \dfrac{1}{2}$

$\because$ LCM of 4, 24 and 2 = 24

$\therefore \quad \dfrac{3}{4} = \dfrac{3 \times 6}{4 \times 6} = \dfrac{18}{24}, \dfrac{5}{24} = \dfrac{5}{24}$ and $\dfrac{1}{2} = \dfrac{1 \times 12}{2 \times 12} = \dfrac{12}{24}$

Thus, $\dfrac{18}{24}, \dfrac{5}{24}$ and $\dfrac{12}{24}$ are like fractions of a common denominator.

(c) $\dfrac{3}{5}, \dfrac{17}{20}, \dfrac{21}{40}, \dfrac{11}{16}$

$\because$ LCM of 5, 20, 40 and 16 = 80

$\because \quad \frac{3}{5}=\frac{3\times 16}{5\times 16}=\frac{48}{80}, \frac{17}{20}=\frac{17\times 4}{20\times 4}=\frac{68}{80},$

$\frac{21}{40}=\frac{21\times 2}{40\times 2}=\frac{42}{80}$ and $\frac{11}{16}=\frac{11\times 5}{16\times 5}=\frac{55}{80}$

Thus, $\frac{48}{80}, \frac{68}{80}, \frac{42}{80}$ and $\frac{55}{80}$ are like fractions of a common denominator.

(d) $\frac{2}{7}, \frac{13}{8}, \frac{9}{14}, \frac{17}{21}$

$\because$ LCM of 7, 8, 14 and 21 $=168$

$\therefore \quad \frac{2}{7}=\frac{2\times 24}{7\times 24}=\frac{48}{168}, \frac{13}{8}=\frac{13\times 21}{8\times 21}=\frac{273}{168},$

$\frac{9}{14}=\frac{9\times 12}{14\times 12}=\frac{108}{168}$ and $\frac{17}{21}=\frac{17\times 8}{21\times 8}=\frac{136}{168}$

Thus, $\frac{48}{168}, \frac{273}{168}, \frac{108}{168}$ and $\frac{136}{168}$ are like fractions of a common denominator.

Exercise 3.2

1. Put the correct symbol (>, < and =) in the box.

(a) $\frac{-2}{30}, < \frac{-1}{30}$ (b) $0, < \frac{-4}{-9}$ (c) $-3, < \frac{-14}{5}$

(d) $\frac{8}{19}, > \frac{-4}{13}$ (e) $\frac{-7}{8}, > \frac{-8}{9}$ (f) $\frac{2}{-3}, > \frac{-4}{5}$

2. Find the value of :

(a) $\left|\frac{-6}{7}\right|=\frac{6}{7}$

(b) $\left|\frac{5}{-11}\right|=\frac{5}{11}$

(c) $\left|\frac{-16}{-23}\right|=\left|\frac{16}{23}\right|=\frac{16}{23}$

3. Arrange the following rational numbers in ascending order.

(a) $\frac{-8}{9}, \frac{-8}{11}, \frac{-8}{3}$

$\because$ All numerators of fractions are equal.

$\therefore$ Comparing with denominators

$\because$ $11 > 9 > 3$

$\therefore$ $\frac{-8}{11} < \frac{-8}{9} < \frac{-8}{3}$ are in ascending order.

(b) $\frac{-9}{10}, \frac{2}{-15}, \frac{-11}{30}, 0$

$\because$ LCM of 10, 15 and 30 = 30

$\therefore$ $\frac{-9}{10} = \frac{-9 \times 3}{10 \times 3} = \frac{-27}{30}, \frac{2}{-15} = \frac{2 \times (-2)}{-15 \times (-2)} = \frac{-4}{30},$

$\frac{-11}{30} = \frac{-11}{30}$ and $0 = \frac{0}{30}$

Comparing

$\because$ $\frac{-27}{30} < \frac{-11}{30} < \frac{-4}{30} < \frac{0}{30}$

Hence, $\frac{-9}{10} < \frac{-11}{30} < \frac{2}{-15} < 0$ are in ascending order.

4. Arrange the following rational numbers in descending order.

(a) $\frac{-1}{6}, -2, 0, \frac{7}{-3}$

$\because$ LCM of 6 and 3 = 6

$\therefore$ $\frac{-1}{6} = \frac{-1}{6}, \frac{-2}{1} = \frac{-2 \times 6}{1 \times 6} = \frac{-12}{6}, 0 = \frac{0}{6}$

and $\frac{7}{-3} = \frac{7 \times (-2)}{-3 \times (-2)} = \frac{-14}{6}$

$\because$ $\frac{0}{6} > \frac{-1}{6} > \frac{-12}{6} > \frac{-14}{6}$

Hence, $0 > \frac{-1}{6} > -2 > \frac{7}{-3}$ are in descending order.

(b) $\frac{17}{-20}, \frac{9}{-5}, -3, \frac{-1}{10}$

$\because$ LCM of 20, 5 and 10 = 20.

$\therefore$ $\frac{17}{-20} = \frac{17\times(-1)}{-20\times(-1)} = \frac{-17}{20}, \frac{9}{-5} = \frac{9\times(-4)}{-5\times(-4)} = \frac{-36}{20},$

$\frac{-3}{1} = \frac{-3\times 20}{1\times 20} = \frac{-60}{20}$ and $\frac{-1}{10} = \frac{-1\times 2}{10\times 2} = \frac{-2}{20}$

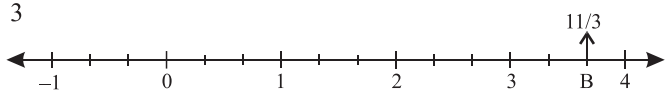
$\because$ $\frac{-2}{20} > \frac{-17}{20} > \frac{-36}{20} > \frac{-60}{20}$

Hence, $\frac{-1}{10} > \frac{17}{-20} > \frac{9}{-5} > -3$ are in descending order.

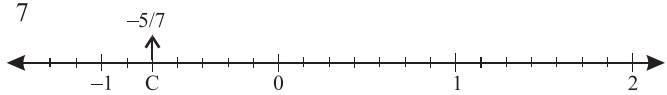
5. Represent the following rational numbers on a number line.

(a) $\frac{3}{4}$

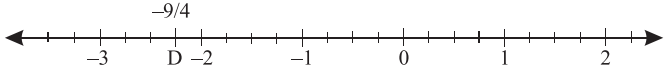
(b) $\frac{11}{3}$



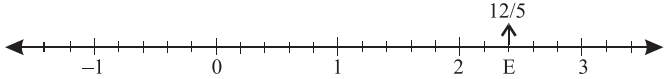
(c) $\frac{-5}{7}$



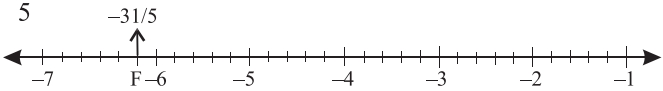
(d) $\frac{-9}{4}$



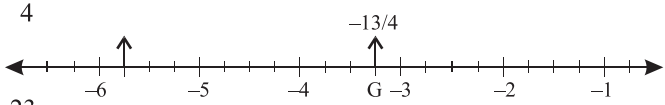
(e) $\frac{12}{5}$



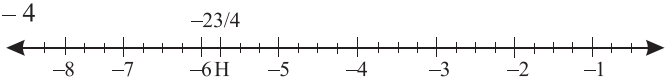
(f) $\frac{-31}{5}$



(h) $\frac{-13}{4}$



(g) $\frac{23}{-4}$



6. Find the value of y if

(a) $\frac{15}{y} = -5$

$15 = -5y$

$y = \frac{15}{-5}$

$y = -3$

(b) $\frac{4}{5} = \frac{y}{-25}$

$\frac{4}{5} \times (-25) = y$

$4 \times (-5) = y$

$-20 = y$

$y = -20$

(c) $\frac{-36}{y} = \frac{2}{3}$

$-36 \times 3 = 2y$

$y = \frac{-36 \times 3}{2}$

$y = -18 \times 3$

$y = -54$

(d) $\frac{13}{6} = \frac{-65}{y}$

$13 \times y = -65 \times 6$

$y = \frac{-65 \times 6}{13}$

$y = -5 \times 6$

$y = -30$

(e) $\frac{-1}{8} = \frac{8}{y}$

$-1 \times y = 8 \times 8$

$-y = 64$

$y = -64$

(f) $\frac{-4}{11} = \frac{y}{77}$

$-4 \times 77 = 11 \times y$

$\frac{-4 \times 77}{11} = y$

$-4 \times 7 = y$

$$-28 = y$$
$$y = -28$$

7. Which of the two rational numbers is greater in each of the following pairs?

(a) $\frac{3}{29}$ is greater than 0.

(b) 0 is greater than $\frac{-5}{11}$.

(c) $\frac{15}{7}$ is greater than $\frac{-93}{4}$.

(d) $4\frac{7}{5}$ is greater than $4\frac{3}{5}$.

(e) $\frac{-7}{12}$ is greater than $\frac{9}{-12}$.

(f) $\frac{-5}{6}$ is greater than $\frac{4}{-3}$.

8. Find two rational numbers between :

(a) $\because \quad \frac{1}{2} = \frac{1 \times 8}{2 \times 8} = \frac{8}{16}$ and $\frac{8}{4} = \frac{3 \times 4}{4 \times 4} = \frac{12}{16}$

Now, $\frac{8}{16} < \frac{9}{16} < \frac{10}{16} < \frac{11}{16} < \frac{12}{16}$

Hence, $\frac{9}{16}$ and $\frac{11}{16}$ are two rational numbers between $\frac{1}{2}$ and $\frac{3}{4}$.

(b) $\because \quad \frac{-1}{2} = \frac{-1 \times 2}{2 \times 2} = \frac{-2}{4}$ and $\frac{1}{2} = \frac{1 \times 2}{2 \times 2} = \frac{2}{4}$

Now, $\frac{-2}{4} < \frac{-1}{4} < 0 < \frac{1}{4} < \frac{2}{4}$

Hence, $\frac{-1}{4}$ and $\frac{1}{4}$ are two rational number between $\frac{-1}{2}$ and $\frac{1}{2}$.

9. Find four rational numbers between :

(a) $\because \quad \frac{1}{4} = \frac{1 \times 15}{4 \times 5} = \frac{15}{60}$ and $\frac{1}{6} = \frac{1 \times 10}{6 \times 10} = \frac{10}{60}$

Now, $\frac{15}{60} > \frac{14}{60} > \frac{13}{60} > \frac{12}{60} > \frac{11}{60} > \frac{10}{60}$

Hence, $\frac{11}{60}, \frac{12}{60}, \frac{13}{60}$ and $\frac{14}{60}$ are four rational numbers between $\frac{1}{4}$ and $\frac{1}{6}$.

(b) $\because \quad \frac{-4}{5} = \frac{-4 \times 3}{5 \times 3} = \frac{-12}{15}$ and $\frac{-1}{3} = \frac{-1 \times 5}{3 \times 5} = \frac{-5}{15}$

Now, $\frac{-12}{15} < \frac{-11}{15} < \frac{-10}{15} < \frac{-9}{15} < \frac{-8}{15} < \frac{-7}{15} < \frac{-6}{15} < \frac{-5}{15}$

Hence, $\frac{-7}{15}, \frac{-8}{15}, \frac{-10}{15}$ and $\frac{-11}{15}$ are four rational numbers between $\frac{-4}{5}$ and $\frac{-1}{3}$.

10. Write (T) for True and (F) for False statements :

(a) False (b) False (c) False

(d) True (e) False (f) True

Exercise 3.3

1. Fill in the blanks.

(a) $\frac{-7}{9} + \frac{\mathbf{25}}{\mathbf{9}} = 2$ (b) $\frac{-3}{17} - \left(\frac{-2}{51}\right) = \frac{-7}{51}$

(c) $\frac{\mathbf{-13}}{\mathbf{18}} + \left(\frac{-5}{18}\right) = -1$

2. Add the following rational numbers.

(a) $\frac{7}{-15}$ and $\frac{4}{15}$

$= \frac{7}{-15} + \frac{4}{15} = \frac{-7+4}{15}$

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

(b) $\frac{-3}{19}$ and $\frac{-9}{19}$

$= \frac{-3}{19} + \frac{(-9)}{19} = \frac{-3}{19} - \frac{9}{19}$

$= \frac{-3-9}{19} = \frac{-12}{19}$.

(c) $\frac{-23}{35}$ and $\frac{8}{-35}$

$= \frac{-23}{35} + \frac{8}{-35} = \frac{-23}{35} - \frac{8}{35}$

$= \frac{-23-8}{35} = \frac{-31}{35}$

3. Subtract the first rational number from the second in each of the following pairs.

(a) $\frac{6}{7} - \left(\frac{-2}{3}\right) = \frac{6}{7} + \frac{2}{3}$ (b) $\frac{-1}{11} - \left(\frac{3}{-11}\right) = \frac{-1}{11} + \frac{3}{11}$

$$= \frac{18+14}{21} = \frac{32}{21}$$

$$= \frac{-1+3}{11} = \frac{2}{11}$$

(c) $\frac{3}{-} - \left(\frac{-4}{-7}\right) = \frac{-3}{7} - \frac{4}{7}$

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

4. Simplify :

(a) $\frac{-2}{5} + \frac{3}{15} - \frac{7}{10}$

$$= \frac{-12+6-21}{30} = \frac{-27}{30} = \frac{-9}{10}$$

(b) $\frac{6}{11} - \left(\frac{-2}{33}\right) + \left(\frac{-5}{44}\right) + 0$

$$= \frac{6}{11} + \frac{2}{33} - \frac{5}{44} = \frac{72+8-15}{132} = \frac{65}{132}$$

(c) $\frac{8}{21} - \frac{15}{-19} - \frac{3}{21}$

$$\frac{8}{21} + \frac{15}{-19} - \frac{3}{21} = \frac{152+315-+63}{399} = \frac{404}{399}$$

5. Let the other number be x.

Thus, $-4 + x = \frac{-1}{6}$

$$x = \frac{-1}{6} + 4$$

$$= \frac{-1+24}{6} = \frac{23}{6} = 3\frac{5}{6}$$

Hence, the other number is $3\frac{5}{6}$.

6. Let, the other number be x.

Thus, $\frac{4}{3} + x = -35$

$$x = -35 - \frac{4}{3}$$

$$x = \frac{-105-4}{3} = \frac{-101}{3} = -33\frac{2}{3}$$

Hence, the other number is $-33\frac{2}{3}$.

7. Let, the required number be x.

Thus, $$\frac{-8}{9} + x = 1$$

$$x = 1 + \frac{8}{9}$$

$$= \frac{9+8}{9} = \frac{17}{9} = 1\frac{8}{9}$$

Hence, $1\frac{8}{9}$ should be added to $\frac{-8}{9}$ to get 1.

8. Let, the required number be x.

Thus, $$\frac{-119}{37} + x = 0$$

$$x = 0 + \frac{119}{37} = \frac{119}{37}$$

Hence, $\frac{119}{37}$ should ble added to $\frac{-119}{37}$ to get 0.

9. Let, the required number be x.

Thus, $$\frac{-3}{14} - x = \frac{-5}{6}$$

$$-x = \frac{-5}{6} + \frac{3}{14}$$

$$-x = \frac{-35+9}{42} = \frac{-26}{42}$$

$$x = \frac{26}{42} = \frac{13}{21}$$

Hence, $\frac{13}{21}$ should be subtracted from $\frac{-3}{14}$ to get $\frac{-5}{6}$.

10. $$\left[\frac{4}{5} - \left(-\frac{2}{5}\right)\right] - \left[2\frac{3}{7} + \left(-5\frac{4}{7}\right)\right]$$

$$=\left[\frac{4}{15}+\frac{2}{5}\right]-\left[2\frac{3}{7}-5\frac{4}{7}\right]$$

$$=\left[\frac{4+6}{15}\right]-\left[\frac{17}{7}-\frac{39}{7}\right]$$

$$=\frac{10}{15}-\left[\frac{17-39}{7}\right]$$

$$=\frac{2}{5}-\left(-\frac{22}{7}\right)$$

$$=\frac{2}{5}+\frac{22}{7}=\frac{14+110}{35}$$

$$=\frac{124}{35}=3\frac{19}{35}$$

Exercise 3.4

1. Multiply :

(a) $\frac{-15}{31}$ by $\frac{62}{18}$

$$=\frac{-15}{31}\times\frac{62}{18}=\frac{-5\times 2}{1\times 6}$$

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

(b) $\frac{-32}{15}$ by $\frac{5}{16}$

$$=\frac{-32}{15}\times\frac{5}{16}=\frac{-2\times 1}{3\times 1}$$

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

(c) $3\frac{2}{7}\times 1\frac{1}{6}$

$$=\frac{23}{7}\times\frac{7}{6}=\frac{23\times 1}{1\times 6}$$

$$=\frac{23}{6}=3\frac{5}{6}$$

(d) $2\frac{4}{9}\times 2\frac{3}{5}$

$$=2\frac{4}{9}\times 2\frac{3}{45}=\frac{286}{45}$$

$$=6\frac{16}{45}$$

2. Find the value of :

(a) $-6\div\frac{12}{5}$

$$=-6\times\frac{5}{12}=-1\times\frac{5}{2}$$

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

(b) $\frac{7}{-8}\div(-14)$

$$=\frac{7}{-8}\times\frac{1}{-14}=\frac{1\times 1}{-8\times(-2)}$$

$$=\frac{1}{16}$$

(c) $\frac{9}{13} \div \left(\frac{-27}{78}\right)$

$= \frac{9}{13} \times \frac{78}{(-27)} = \frac{1 \times 6}{1 \times (-3)}$

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

(d) $\frac{-19}{23} \div \frac{1}{3}$

$= \frac{-19}{23} \times 3 = \frac{-57}{23}$

$= -2\frac{11}{23}$

3. Simplify :

(a) $\left(\frac{36}{11} \times \frac{88}{18}\right) + \left(\frac{-26}{14} \times \frac{-28}{13}\right)$

$= (2 \times 8) + [-2 \times (-2)]$

$= 16 + 4 = 20$

(b) $\left(\frac{-16}{17} \times \frac{-65}{64}\right) - \left(\frac{-8}{45} \times \frac{9}{24}\right)$

$= \left(\frac{-1}{17} \times \frac{-65}{4}\right) - \left(\frac{-1}{5} \times \frac{1}{3}\right)$

$= \frac{65}{68} + \frac{1}{15} = \frac{975 + 68}{1020} = \frac{1043}{1020}$

(c) $\left(\frac{-9}{4} \times \frac{2}{3}\right) + \left(\frac{1}{2} \times 0\right) - \left(\frac{5}{-6} \times \frac{18}{15}\right)$

$= \left(\frac{-3}{2}\right) + 0 - \left(-\frac{90}{90}\right)$

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

(d) $\left(\frac{2}{13} \div \frac{1}{7}\right) \times \frac{26}{14}$

$= \left(\frac{2}{13} \times 7\right) \times \frac{26}{14}$

$= \frac{14}{13} \times \frac{26}{14} = \frac{1 \times 2}{1 \times 1} = 2$

4. The cost of dozen oranges = ₹ $85\frac{1}{3}$

$\therefore$ The cost of one orange $= ₹\ 85\frac{1}{3} \div (2 \times 12)$

$$= \frac{₹\ 256}{3} \times \frac{1}{24}$$

$$= \frac{₹\ 256}{72} = \frac{₹\ 32}{9} = ₹\ 3\frac{5}{9}.$$

5. $\because$ *Ox* any rational number $= 0$

Thus, $\frac{-7}{44}$ should be multiplied by 0, to obtain 0.

6. $\left[\frac{16}{5} + \left(\frac{-11}{3}\right)\right] \div \left[\frac{-2}{19} \times \frac{38}{-15}\right]$

$$= \left[\frac{16}{5} - \frac{11}{3}\right] \div \left[-2 \times \frac{2}{-15}\right]$$

$$= \left[\frac{48 - 55}{15}\right] \div \left[\frac{-4}{-15}\right]$$

$$= \frac{-7}{15} \times \frac{15}{4} = \frac{-7}{4} = -1\frac{3}{4}.$$

7. $\because$ Distance covered by bus in an hour $= 50\frac{2}{5}$ km

Thus, distance covered by bus in $3\frac{1}{2}$ hours

$$= 50\frac{2}{5} \times 3\frac{1}{2} \text{ km}$$

$$= \frac{252}{5} \times \frac{7}{2}$$

$$= \frac{126}{5} \times 7 = \frac{882}{5} \text{ km}$$

$$= \frac{882}{5} = 176\frac{2}{5} \text{ km}$$

Hence, the bus covered $176\frac{2}{5}$ km of distance in $3\frac{1}{2}$ hours.

8. Let, the required rational number be *x*.

Thus, $\frac{-65}{7} \div x = \frac{-12}{5}$

$$\frac{-65}{7} \times \frac{1}{x} = \frac{-12}{5}$$

$$\frac{-65}{7} \times \frac{5}{-12} = x$$

$$\frac{-325}{-84} = x$$

$$x = \frac{325}{84} = 3\frac{73}{84}$$

Hence, $\frac{-65}{7}$ should be devided by $3\frac{73}{84}$ so that the quotient is $\frac{-12}{5}$.

9. Let, the requried number be *x*.

Thus, $\frac{-98}{17} \div x = \frac{28}{119}$

$$\frac{-98}{17} \times \frac{1}{x} = \frac{28}{119}$$

$$\frac{-98}{17} \times \frac{119}{28} = x$$

$$\frac{-49}{1} \times \frac{7}{14} = x$$

$$-49 \times \frac{1}{2} = x$$

$$x = \frac{-49}{2} = -24\frac{1}{2}$$

Hence, $\frac{-98}{17}$ should ble devided by $-24\frac{1}{2}$. So that the quotient is $\frac{28}{119}$.

10. Let, the other number be *x*.

Thus, $\frac{13}{21} \times x = \frac{-65}{14}$

$$x = \frac{-65}{14} \times \frac{21}{13}$$

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

Mental Ability

A. Multiple Choice Questions (MCQs) :

1. (c) **2.** (b) **3.** (a) **4.** (b) **5.** (c) **6.** (a) **7.** (c) **8.** (d)

B. Fill in the blanks :

1. Which is greater $\frac{-2}{5}$ or $\frac{-1}{5}$? $\mathbf{\frac{-1}{5}}$.
2. The value of $\left(\frac{3}{-5} \times \frac{15}{27}\right)^{-1}$ is **–3**.
3. The absolute value of (99 – 199) is **100**.
4. The multiplicative inverse of $4\frac{3}{5}$ is $\mathbf{\frac{5}{23}}$.

C. State True (T) or False (F).

1. False **2.** False **3.** False **4.** True **5.** True

Chapter

4 Decimal

Exercise 4.1

1. Convert each of the following into a fraction in its simplest form :

(a) 0.6

$$= \frac{0.6 \times 10}{10} = \frac{6}{10} = \frac{3}{5}$$

(b) 0.08

$$= \frac{0.8 \times 100}{100}$$

$$= \frac{8}{100} = \frac{2}{25}$$

(c) 0.224

$$= \frac{0.224 \times 1000}{1000} = \frac{224}{1000} = \frac{28}{125}$$

2. Convert each of the following as a mixed fraction:

(a) 6.4

$$= \frac{6.4 \times 10}{10}$$

$$= \frac{64}{10} = \frac{32}{5} = 6\frac{2}{5}$$

(b) 16.5

$$= \frac{16.5 \times 10}{10} = \frac{165}{10}$$

$$= \frac{33}{2} = 16\frac{1}{2}$$

(c) 8.36

$$= \frac{8.36 \times 100}{100} = \frac{836}{100} = \frac{209}{25} = 8\frac{9}{25}$$

3. Convert each of the following into a decimal :

(a) $\frac{37}{10} = 3.7$

(b) $\frac{967}{100} = 9.67$

(c) $\frac{4589}{100} = 45.89$

4. Convert each of the following into like decimals :

(a) 7.5, 64.23, 0.074

$\because$ $7.5 = 7.500$, $64.23 = 64.230$

and, $0.074 = 0.074$

Thus, 7.500, 64.230 and 0.74 are like fractions.

(b) 0.6, 5.937, 2.36, 4.2

$\because$ $0.6 = 0.600$, $5.937 = 5.937$,

$2.36 = 2.360$ and $4.2 = 4.200$

Thus, 0.600, 5.937, 2.360 and 4.200 are like fractions.

5. Arrange the following decimals in an ascending order :

(a) 2.54, 2.45, 2.4, 2.5, 2.05

$2.05 < 2.4 < 2.45 < 2.5 < 2.54$

(b) 7.7, 7.707, 7.077, 0.77, 7.007

$0.77 < 7.007 < 7.077 < 7.7 < 7.707$

6. Arrange the following decimals in an descending order :

(a) 7.3, 8.73, 73.03, 7.33, 8.073

$73.03 > 0.73 > 8.073 > 7.33 > 7.3$

(b) 9.88, 9.088, 98.8, 98.08, 9.008

$98.8 > 98.08 > 9.88 > 9.088 > 9.008$

7. Simplify :

(a) $19.267 + 31.01 + 0.002$

$19.267 + 31.01 + 0.002$

$= 50.279$

(b) $(38.01 - 0.07) + (11.65 + 0.001)$

$= 37.94 + 11.651 \Rightarrow 49.591$

(c) $4.396 + (32.06 - 0.7)$

$= 4.396 + 31.36 \Rightarrow 35.756$

(d) $15.25 - 7.86 + 11.34 - 0.005$

$= 15.25 + 11.34 - 7.86 - 0.005$

$= 26.59 - 7.865 \Rightarrow 18.725$

8. Wheat bought by Sarita $= 5.50$ kg

Rice bought by Sarita $= 25.65$ kg

Sugar bought by Sarita $= + 4.25$ kg

Total quantity bought by Sarita $= 35.40$ kg

Wheat bought by Kavita $= 65.20$ kg

Rice bought by Kavita $= 19.65$ kg

Sugar bought by Kavita $= 6.15$ kg

Total quantity bought by Kavita $= 91.00$ kg

$\because$ $91.00 \text{ kg} > 35.40 \text{ kg}$

$$\begin{array}{r} 91.00 \text{ kg} \\ -35.40 \text{ kg} \\ \hline 55.60 \text{ kg} \end{array}$$

Hence, Kavita bought 55.60 kg more quantity than Sarita.

9. Milk give to first costumer $= 10.250$ L

Milk give to second costumer $= + 6.450$ L

Total, sold milk $= 16.700$ L

Milkman has milk $= 25.400$ L

Total sold milk $= - 16.700$ L

Thus, left milk with him $= 8.700$ L

Hence, 8 L 700 mL milk is left with the milk man.

Exercise 4.2

1. Find the product of the following :

(a) 5.179×10

$= \frac{5179}{1000} \times 10$

$= \frac{5179}{100} = 5179$

(b) 32.007×10

$= \frac{32007}{1000} \times 10$

$= \frac{32007}{100} = 320.07$

(c) 44.795×100

$= \frac{44795}{1000} \times 10$

$= \frac{44795}{100} = 447.95$

(d) 0.007×1000

$= \frac{7}{1000} \times 1000$

$= 7$

(e) 0.014×100

$= \frac{14}{1000} \times 100$

$= \frac{14}{10} = 1.14$

(f) 273.6×10000

$= \frac{2736}{10} \times 10000$

$= 2736 \times 1000 = 2736000$

(g) 3.968×10000

$= \frac{3968}{1000} \times 10000$

$= 3968 \times 10$

$= 39680$

(h) 17.45×100

$= \frac{1745}{100} \times 100$

$= 1745$

2. Find the product of the following :

(a) 53.2×1.96

$= \frac{532}{10} \times \frac{196}{100}$

$= \frac{104272}{1000}$

$= 104.272$

(b) 7.6×1.8

$= \frac{76}{10} \times \frac{18}{10}$

$= \frac{1368}{100} = 13.68$

(c) 19.75×0.002

$= \frac{1975}{100} \times \frac{2}{1000}$

$= \frac{3950}{100000} = 0.0395$

(d) 2.46×0.18

$= \frac{246}{100} = \frac{18}{100}$

$= \frac{4428}{10000} = 0.4428$

3. Find the product of the following :

(a) 94.6×75

$= \frac{946}{10} \times 75$

$= \frac{70950}{10} = 7095$

(b) 25.645×352

$= \frac{25645}{1000} \times 352$

$= \frac{9027040}{1000}$

(c) 13.459×200

$= \frac{13459}{1000} \times 200$

$= \frac{2691800}{1000}$

$= 2691.8$

(d) 0.835×27

$= \frac{835}{1000} \times 27$

$= \frac{22545}{1000}$

$= 22.545$

(e) 6.145×180

$= \frac{6145}{1000} \times 180$

$= \frac{1106100}{1000}$

$= 1106.1$

(f) 12.65×103

$= \frac{1265}{100} = 103$

$= \frac{130295}{100}$

$= 1302.95$

4. If $2.65 \times 39.7 = 105.205$, without actual multiplication evaluate :

$\because \quad 2.65 \times 39.7 = 105.205$

(a) 2.65×3.97

$= 2.65 \times \frac{39.7}{100}$

$= \frac{(2.65 \times 39.7)}{10}$

$= \frac{105.205}{10} = 10.5205$

(b) 26.5×0.0397

$= (2.65 \times 10) \times \frac{39.7}{1000}$

$= \frac{(2.65 \times 39.7)}{100}$

$= \frac{105.205}{100} = 1.05205$

(c) 2.65×0.00397

$= 2.65 \times \frac{39.7}{10000}$

$= \frac{105.205}{10000} = 0.105205$

(d) 2.65×39700

$= 2.65 \times (39.7 \times 1000)$

$= 105.205 \times 1000$

$= 105205$

5. Evaluate :

(a) $1.1 \times 2.2 \times 0.2$

$= \frac{11}{10} \times \frac{22}{10} \times \frac{2}{10}$

$= \frac{484}{1000} = 0.484$

(b) $1.5 \times 1.5 \times 1.5$

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

$= \frac{3375}{1000} = 0.375$

(c) $0.002 \times 0.2 \times 200$

$= \frac{2}{1000} \times \frac{2}{10} \times 200$

$= \frac{800}{10000}$

$= \frac{8}{100} = 0.08$

(d) $0.5 \times 5 \times 0.005 \times 500$

$= \frac{5}{10} \times 5 \times \frac{5}{1000} \times 500$

$= \frac{62500}{10000} = \frac{625}{100}$

$= \frac{62500}{10000} = \frac{625}{100}$

$= 6.25$

6. The cost of 1 m long of string = 150.50

Thus, the cost of 14.25 m long of string = ₹ 150.50 × 14.25

= ₹ 2144.625

7. Wages of per hour of a labour = ₹ 24.60

Thus, wages for 6.5 hours of the labour = ₹ 24.60 × 6.5

= ₹ 159.90

Exercise 4.3

1. Fill in the blanks :

(a) 14.23 ÷ 10 = **1.423**

(b) 23.64 ÷ 10 = **2.364**

(c) 0.456 ÷ 10 = **2.364**

(d) 0.05 ÷ 10 = **0.0456**

(e) 8.12 ÷ 100 = **0.0812**

(f) 217.4 ÷ 100 = **2.174**

(g) 476.35 ÷ 1000 = **0.47635**

(h) 38.9 ÷ 1000 = **0.0389**

2. Divide :

(a) $1.305 \div 0.9$

$= \frac{1305}{1000} \div \frac{9}{10}$

(b) $25.395 \div 1.$

$= \frac{25395}{1000} \div \frac{15}{10}$

$$= \frac{1305}{100} \times \frac{10}{9}$$

$$= \frac{145}{100} = 1.45$$

(c) 2.0484 ÷ 0.18

$$= \frac{20484}{10000} \div \frac{18}{100}$$

$$= \frac{20484}{10000} \times \frac{100}{18}$$

$$= \frac{1138}{100} = 11.38$$

(d) 56.192 ÷ 3.2

$$= \frac{56192}{1000} \div \frac{32}{10}$$

$$= \frac{56192}{1000} \times \frac{10}{32}$$

$$= \frac{1756}{100} = 17.56$$

(e) 236.6 ÷ 0.26

$$= \frac{2366}{10} \div \frac{26}{100}$$

$$= \frac{2366}{10} \times \frac{100}{26}$$

$$= 91 \times 10 = 910$$

(f) 0.625 ÷ 0.025

$$= \frac{625}{1000} \div \frac{25}{1000}$$

$$= \frac{625}{1000} \times \frac{1000}{25}$$

$$= \frac{625}{25} = 25$$

(g) 1.296 by 0.108

$$= \frac{1296}{1000} \div \frac{108}{1000}$$

$$= \frac{1296}{1000} \times \frac{1000}{108}$$

$$= \frac{1296}{108} = 12$$

(h) 7.45 by 0.32

$$= \frac{745}{100} \div \frac{32}{100}$$

$$= \frac{745}{100} \times \frac{100}{32}$$

$$= \frac{745}{32} = 23.28125$$

3. Divide :

(a) 58.944 by 8

$$= \frac{58944}{1000} \times \frac{1}{8}$$

$$= \frac{7368}{1000} = 7.368$$

(b) 85.956 by 12

$$= \frac{85956}{1000} \times \frac{1}{12}$$

$$= \frac{7163}{1000} = 7.163$$

(c) 82.04 by 14

$$= \frac{8204}{100} \times \frac{1}{14}$$

(d) 77.055 by 15

$$= \frac{77055}{1000} \times \frac{1}{15}$$

$= \frac{586}{100} = 5.86$

(e) 3.45 by 25

$= \frac{345}{100} \times \frac{1}{25}$

$= \frac{13.8}{100} = 0.138$

(f) 1.877 by 25

$= \frac{1877}{1000} \times \frac{1}{25}$

$= \frac{75.08}{1000} = 0.7508$

(g) 1302.4 by 16

$= \frac{13024}{10} \times \frac{1}{16}$

$= \frac{814}{10} = 8.14$

(h) 1125.3 by 11

$= \frac{11253}{10} \times \frac{1}{11}$

$= \frac{1023}{10} = 102.3$

4. $\because$ Area of a rectangle $= 915.9$ sq. m

$\therefore$ Length $\times$ Breadth $= 915.9\ m^2$

$35.5\ m \times$ Breadth $= 915.9\ m^2$

$$\text{Breadth} = \frac{915.9\ m^2}{35.5\ m}$$

$= 25.8$ m

Hence, the breadth of the rectangle is 25.8 m.

5. Total length of a ribbon $= 52.80$ m

Length of each cutting piece of ribbon $= 1.65$ m

Thus, Total number of cutting piece of ribbon $= \frac{52.80}{1.65} = 32$

Hence, There are 32 ribbons of length 1.65 m can be cut from a ribbon of 52.80 m.

6. Cost of 16.5 kg of onions = ₹ 255.75

Cost of one kg of onions = ₹ $\frac{255.75}{16.5}$

Thus, the cost of 2 kg of onions = $\frac{₹\ 255.75}{16.5} \times 2$

= ₹ 15.5×2

= ₹ 31.00

7. Total capacity of the tank = 53.75 L

Capacity of the jar = 2.15 L

Thus, total number of jars $= \frac{53.75}{2.15} = 25$

Hence, there are 25 jars of capacity 2.15 L are required to empty the tank of 53.75 L.

8. Jay travels by scooter in 17 minutes = 11.05 km

He travels in 1 minute $= \frac{11.05}{17}$ km

Thus, he travels in 19.5 minutes $= \frac{11.05}{17} \times 19.5$ km

$= 0.65 \times 19.5$ km

$= 12.675$ km

Hence, Jay travels 12.675 km in 19.5 minutes by scooter.

Mental Ability

A. Multiple Choice Questions (MCQs):

1. (c) **2.** (d) **3.** (b) **4.** (b) **5.** (a) **6.** (c) **7.** (b) **8.** (c) **9.** (b) **10.** (c)

B. Fill in the blanks :

1. If 756 ÷ 12 = 63, then 7.56 ÷ 12 = **0.63**.

2. 0.9 × (7.6 – 7.0) × 0 = **0**.

3. The $\frac{p}{q}$ form of 0.735 is $\frac{\mathbf{147}}{\mathbf{200}}$.

4. The value of $6.3 + (0.3)^2$ = **6.39**.

5. $0.39 + (-1.005) \times 2 = -1.62$.

Chapter

5 Ratio, Proportion and Percentage

Exercise 5.1

1. Express each of the following ratios in simplest form :

(a) 12 months : 3 years (b) 3 kg 400 g : 17 kg

$$= \frac{12 \text{ months}}{3 \text{ years}} = \frac{12 \text{ months}}{3 \times 12 \text{ months}}$$

$$= \frac{12}{36} = \frac{1}{3} = 1 : 3$$

$$= \frac{3.400 \text{ kg}}{17 \text{ kg}} = \frac{3.4}{17}$$

$$= \frac{34}{170} = \frac{1}{5} = 1 : 5$$

(c) 60 minutes : 35 seconds

$$= \frac{60 \text{ minutes}}{35 \text{ seconds}} = \frac{60 \times 60 \text{ seconds}}{35 \text{ seconds}}$$

$$= \frac{12 \times 60}{7} = \frac{720}{7} = 720 : 7$$

(d) 160 cm : 1 metre

$$= \frac{160 \text{ cm}}{1 \text{ metre}} = \frac{160 \text{ cm}}{100 \text{ cm}}$$

$$= \frac{16}{10} = \frac{8}{5} = 8 : 5.$$

(e) 7 kg : 140 g

$$= \frac{7 \text{ kg}}{140 \text{ g}} = \frac{7 \times 1000 \text{ g}}{140 \text{ g}}$$

$$= \frac{7000}{140} = \frac{50}{1} = 50 : 1$$

(f) 16 hrs : 2 days

$$= \frac{16 \text{ hrs}}{2 \text{ days}} = \frac{16 \text{ hours}}{2 \times 24 \text{ hours}}$$

$$= \frac{16}{48} = \frac{1}{3} = 1 : 3$$

(g) 1 crore : 1 million

$$= \frac{1 \text{ crore}}{1 \text{ million}} = \frac{1,00,00,000}{1,000,000}$$

$$= \frac{10}{1} = 10 : 1$$

(h) 7.35 : 10.95

$$= \frac{7.35}{10.95} = \frac{735}{1095}$$

$$= \frac{147}{219} = \frac{49}{73} = 49 : 73$$

(i) 2 l : 3 kl

$$= \frac{2l}{3\text{ kl}} = \frac{2l}{3 \times 100\,l} = \frac{2}{3000} = \frac{1}{1500} = 1 : 1500$$

2. Which ratio is greater?

(a) 2 : 5 or 3 : 7

$\because \quad 2 : = \frac{2}{5}$

$= \frac{2 \times 7}{5 \times 7} = \frac{14}{35}$

and, $3 : 7 = \frac{3}{7}$

$= \frac{3 \times 5}{7 \times 5} = \frac{15}{35}$

Now, $\frac{15}{35} > \frac{14}{35}$

Thus, 3 : 7 is greater.

(b) 4 : 5 or 5 : 6

$\because \quad 4 : 5 = \frac{4}{5} = \frac{4 \times 6}{5 \times 6} = \frac{24}{30}$

and, $5 : 6 = \frac{5}{6} = \frac{5 \times 5}{6 \times 5} = \frac{25}{30}$

Now, $\frac{25}{30} > \frac{24}{30}$

Thus, 5 : 6 is greater.

(c) 7 : 8 or 8 : 11

$\because \quad 7 : 8 = \frac{7}{8} = \frac{7 \times 11}{8 \times 11} = \frac{77}{88}$

and, $8 : 11 = \frac{8}{11} = \frac{8 \times 8}{11 \times 8} = \frac{64}{88}$

Now, $\frac{77}{88} > \frac{64}{88}$

Thus, 7 : 8 is greater.

3. Ratio $= \frac{1}{5} : \frac{1}{8} = \frac{8}{40} : \frac{5}{40} = 8 : 5$

Sum of ratio $= 8 + 5 = 13$

Thus, value of first part $= \frac{₹\ 650 \times 8}{13} = ₹\ 400$

and, value of second part $= \frac{₹\ 650 \times 5}{13} = ₹\ 250$

Hence, ₹ 650 is devided into ₹ 400 and ₹ 250.

4. Ratio $= 2 : 3 : 4$

Sum of Ratio $= 2 + 3 + 4 = 9$

Thus, value of first part $= \dfrac{₹\ 531 \times 2}{9} = ₹\ 118$

Value of second part $= \dfrac{₹\ 531 \times 3}{9} = ₹\ 177$

and, Value of third part $= \dfrac{₹\ 531 \times 4}{9} = ₹\ 236$

Hence, ₹ 531 is devided into ₹ 118, ₹ 177 and ₹ 236.

5. $A : B = 2 : 3$ and $B : C = 3 : 4$

$\therefore \qquad \dfrac{A}{B} = \dfrac{2}{3} \qquad \ldots(1)$

and, $\qquad \dfrac{B}{C} = \dfrac{3}{4} \qquad \ldots(2)$

Multiply Equation (1) and Equation (2),

$$\frac{A}{B} \times \frac{B}{C} = \frac{2}{3} \times \frac{3}{4}$$

$$\frac{A}{C} = \frac{2}{4} = \frac{1}{2}$$

Hence, $A : C = 1 : 2$

6. $\because \quad A : B = 3 : 4$ and $B : C = 5 : 6$

$\therefore \quad \dfrac{A}{B} = \dfrac{3}{4}$ and $\dfrac{B}{C} = \dfrac{5}{6}$

Now, $\dfrac{A}{B} = \dfrac{3}{4} = \dfrac{3 \times 5}{4 \times 5} = \dfrac{15}{20}$

Hence, $BC = \dfrac{5}{6} = \dfrac{5 \times 4}{6 \times 4} = \dfrac{20}{24}$

Thus, $\qquad A : B : C = 15 : 20 : 24$

7. Total sum of money $=$ ₹ 1200

Ratio $= 5 : 3$

Sum of Ratio $= 5 + 3 = 8$

Thus, first sun get money $= \dfrac{₹\ 1200 \times 5}{8}$

$= ₹\ 750$

and, second son get money $= ₹\ \dfrac{1200 \times 3}{8} = ₹\ 450$

Hence, Mr. Kashyap devide the money of ₹ 1200 for his two sons into ₹ 750 and ₹ 450.

8. Students get 'A' grade of Class VII A

$= 9$ out of $40 = \dfrac{9}{40}$

and, students got 'A' grade of class VII B

$= 6$ out of $40 = \dfrac{6}{40}$

$\because \quad \dfrac{9}{40} > \dfrac{6}{40}$

Hence, class VII A has better record of 'A' grades.

9. Total number of plants $= 1050$

Students of school 'A' planted plants $= 615$

Thus, students of school 'B' Planted plants $= 1050 - 615 = 435$

So, ratio of plants of school A to school $B = \dfrac{615}{435} = \dfrac{41}{29} = 41 : 29$

10. Let, total number of coins be x.

Ratio of coins $= 5 : 9 : 4$

Sum of Ratio $= 5 + 9 + 4 = 18$

Number of 50-paise coins $= \dfrac{5x}{18}$

Value of 50-paise coins $= \dfrac{5x}{18} \times \dfrac{1}{2} = \dfrac{5x}{36}$

Number of 25-paise coins $= \dfrac{9x}{18} = \dfrac{x}{2}$

Value of 25-paise coins $= \dfrac{x}{2} \times \dfrac{1}{4} = \dfrac{x}{8}$

Number of 10-paise coins $= \frac{4x}{18} = \frac{2x}{9}$

Value of 10-paise coins $= \frac{2x}{9} \times \frac{1}{10} = \frac{x}{45}$

$\because$ Total money = ₹ 412

$$\therefore \quad \frac{5x}{36} + \frac{x}{8} + \frac{x}{45} = 412$$

$$\frac{50x + 45x + 8x}{360} = 412$$

$$\frac{103}{360}x = 412$$

$$x = \frac{412 \times 360}{103}$$

$$x = 1440$$

So, Number of 50-paise coins $= \frac{5}{18} \times 1440$

$= 400$

Number of 25-paise coins $= \frac{9}{18} \times 1440$

$= 720$

and, Number of 10-paise coins $= \frac{4}{18} \times 1440$

$= 320$

11. Find the value of 'x' in the following :

(a) $4 : x :: 20 : 35$

$$\frac{4}{x} = \frac{20}{35}$$

$$4 \times 35 = 20 \times x$$

$$x = \frac{4 \times 35}{20}$$

So, $x = 7$

(b) $2.5 : 7.5 :: x : 10.5$

$$\frac{2.5}{7.5} = \frac{x}{10.5}$$

$$\frac{25}{75} \times 10.5 = x$$

$$\frac{10.5}{3} = x$$

$$x = 3.5$$

(c) $x : 19 :: 142 : 71$

$$\frac{x}{19} = \frac{142}{71}$$

$$x = \frac{142}{71} \times 19$$

$$x = 2 \times 19$$

So, $x = 38$

12. Check , whether the following numbers are in proportion or not–

(a) 15, 8, 25, 14

Product of Extremes $= 15 \times 14 = 210$

Productof means $= 8 \times 25 = 200$

$\because$ Product of Extremes $\neq$ Product of means

So, 15, 8, 25 and 14 are not in proportion.

(b) 20, 25, 8, 10

Product of extremes $= 20 \times 10 = 200$

Product of means $= 25 \times 8 = 200$

$\because$ Product of extremes = Product of means

So, 20, 25, 8 and 10 are in propertion.

13. Check, whether the following numbers are in continued proportion or not–

(a) 12, 18 and 16

If a, b and c are in continued proportion.

Then, $b^2 = a \times c$

Thus, $(18)^2 = 18 \times 18 = 324$

and, $12 \times 16 = 192$

$\because$ $324 \neq 192$

So, 12,18 and 16 are not in continued proportion.

(b) 25, 35 and 49

If a, b and c are in continued proportion.

Then, $b^2 = a \times c$

Now, $(35)^2 = 35 \times 35 = 1225$

and, $25 \times 49 = 1225$

$\because \qquad (35)^2 = 25 \times 49$

So, 25, 35 and 49 are in continued proportion.

14. Find the third proportional to the numbers :

(a) 9 and 12

Let, the third proportion be x.

Thus, 9 : 12 : x in continued proportion.

So, $(12)^2 = 9 \times x$

$$\frac{144}{9} = x$$

$$x = 16$$

Hence, the third proportion to the number 9 and 12 is 16.

(b) 8 and 32

Let, the thrid proportion be y.

Thus, $8 : 32 : y$ in continued proportion.

So, $(32)^2 = 8 \times y$

$$\frac{32 \times 32}{8} = y$$

$$y = 4 \times 32$$

$$y = 128$$

hence, the third proportion to the numbers 8 and 32 is 128.

15. Find the mean proportional between :

(a) 9 and 16

Let, the mean proportional be x.

Thus, $9 : x : 16$ are in continued proportion.

So, $x^2 = 9 \times 16$

$$x^2 = 144$$

$$x = \sqrt{144} = 12$$

Hence, the mean proportion between 9 and 16 is 12.

(b) 8 and 32

Let, the mean proportional be y.

So, $x^2 = 8 \times 32$

$$x^2 = \sqrt{256}$$

$$x = \sqrt{256} = 16$$

Hence, the mean proportional between 8 and 32 is 16.

16. Swee served to 200 people $= 50$ kg.

$\therefore$ Sweet served to each people $= \frac{50}{200}$ kg

Thus, sweet served to 700 people $= \frac{50}{200} \times 700$ kg

$$= \frac{700}{4} = 175 \text{ kg}$$

So, 175 kg of sweets is required for 700 people.

17. Let, the jet plane requires x kg of fuel for a two hour flight.

Thus, $600 : 45 :: x : (2 \times 60)$

$$\frac{600}{45} = \frac{x}{120}$$

$$\frac{600 \times 120}{45} = x$$

$$40 \times 40 = x$$

$$x = 1600$$

Hence, the jet plane requires 1600 kg of fuel for a flight of two hours.

18. Let, the distance between city A and C is x.

Thus, $700 : 5 :: x : 11$

$$\frac{700}{5} = \frac{x}{11}$$

$$\frac{700}{5} = \frac{x}{11}$$

$$700 \times 11 = x \times 5$$

$$5x = 7700$$

$$x = \frac{7700}{5}$$

$$x = 1540$$

Hence, the distance between the two cities A and C is 1540 km.

Exercise 5.2

1. Let, 15 men can dig the wall in x days.

Number of men	Time (days)
10	9 ↑
15	x

Thus, $10 : 15 :: x : 9$

$$\frac{10}{15} = \frac{x}{9}$$

$$\frac{10}{15} = \frac{x}{9}$$

$$x = \frac{10 \times 9}{15} = 2 \times 3$$

$$x = 6$$

So, 15 men can dig the same wall in 6 days.

2. Let, x pckets of lays are needed for 12 children.

Thus,

Number of children	Number of packets
5	30
12	x

Now, $5 : 12 :: 30 : x$

$$\frac{5}{12} = \frac{30}{x}$$

$$5x = 30 \times 12$$

$$x = \frac{30 \times 12}{5}$$

$$x = 72$$

So, 72 packets of lays are needed for 12 children.

3. Let, the weight of 1080 apples dare x kg.

Number of apples	Weight (kg)
30	6
1080	x

Now, $30 : 1080 :: 6 : x$

$$\frac{30}{1080} = \frac{6}{x}$$

$$30x = 6 \times 1080$$

$$x = \frac{6 \times 1080}{30}$$

$$x = 216$$

Hence, the weight of 1080 such apples are 216 kg.

4. Let, x number of erasers can be bought for ₹ 300.

Number of erasers	Cost (₹)
15	37.50
x	300

Thus, $15 : x :: 37.50 : 300$

$$\frac{15}{x} = \frac{37.50}{300}$$

$$\frac{15 \times 300}{37.5} = x$$

$$x = \frac{45000}{375} = 120$$

$\because$ Cost of 15 erasers = ₹ 37.50

$\therefore$ Cost of 1 eraser $= \dfrac{₹\ 37.50}{15}$

Thus, the cost of 20 erasers $= \dfrac{₹\ 37.50}{15} \times 20$

$= ₹\ 50$

Hence, 120 erasers can be bought for ₹ 300 and the cost of 20 erasers will ₹ 50.

5. Let, the train will travel x km in 4 hrs 30 minutes.

Distance (km)	Time (hrs)
90	$1\frac{1}{2}$
x	$4\frac{1}{2}$

Now, $$90 : x :: 1\frac{1}{2} : 4\frac{1}{2}$$

$$\frac{90}{x} = \frac{3/2}{9/2}$$

$$\frac{90}{x} = \frac{3}{2} \times \frac{2}{9}$$

$$\frac{90 \times 9}{3} = x$$

$$x = 270$$

Hence, the train will travell 270 km in 4 hrs 30 minutes at the same speed.

6. Let, the tap can fill 2.5 litre container in x seconds.

Capacity (litre)	Time (seconds)
1	10
2.5	x

Now, $$1 : 2.5 :: 10 : x$$

$$\frac{1}{2.5} = \frac{10}{x}$$

$$x = 10 \times 2.5 = 25$$

Hence, the tap can fill 2.5 litre container in 25 seconds.

7. Using petrol for 500 km of journey $= 20$ litre

Using petrol for 1 km of journey $= \frac{20}{500}$ litre

thus, using petrol for 750 km of journey $= \frac{20}{500} \times 750 = 30$ litre

$\because$ Distance covered by car in 20 litre of petrol $= 500$ km

$\therefore$ Distance covered by car in 1 litre of petrol $= \frac{500}{20}$ km

So, distance covered by car in 27 litre of petrol $= \frac{500}{20} \times 27$

$= 675$ km

Hence, 30 litre of petrol will be used for a journey of 750 km and the car can travel 675 km with 27 litre of petrol.

8. Let, the height of the glass building is x m.

Height	Length of shadow (m)
5	7.5
x	97.5

Thus, $5 : x :: 7.5 : 97.5$

$$\frac{5}{x} = \frac{7.5}{97.5}$$

$$\frac{5}{x} = \frac{75}{975}$$

$$5 \times 975 = 75 \times x$$

$$x = \frac{5 \times 975}{75}$$

$$x = 5 \times 13 = 65 \text{ m}$$

Hence, the height of glass building is 65 m.

9. Parking charge for first hour = ₹ 10

Parking charge for second hour = ₹ $(5 + 5)$ = ₹ 10

Parking charge for next half hour = ₹ 5

So, parking charge for $2\frac{3}{4}$ hours = ₹ $(10 + 10 + 5 + 5)$

= ₹ 30

10. A printing machine can print 150 sheets for every 3 minutes. Find :

(a) Time taken by machine print 150 sheets = 3 min.

$\therefore$ Time taken fo print each sheet $= \frac{3}{150}$ min

So, the taken of print 3000 sheets $= \frac{3}{150} \times 3000$

$= 60 \text{ min} = 1 \text{ hour}$

(b) Print sheet by machine in 3 min. $= 150$ sheets

Print sheet by machien in 1 min. $= \frac{150}{3} = 50$ sheets

So, print sheets by machine in $1\frac{1}{2}$ hour

or $(90 \text{ min}) = 50 \times 90 = 4500$ sheets.

Exercise 5.3

1. Express each of the following as a ratio in the simplest form :

(a) 32%

$= 32 \times \frac{1}{100} = \frac{8}{25}$

$= 8 : 25$

(b) $6\frac{1}{4}\%$

$= \frac{25}{4}\% = \frac{25}{4} \times \frac{1}{100}$

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

(c) 0.35%

$= 0.35 \times \frac{1}{100}$

$= \frac{35}{100} \times \frac{1}{100} = \frac{7}{20} \times \frac{1}{100}$

$= \frac{7}{2000} = 7 : 2000$

(d) 200%

$= 200 \times \frac{1}{100} = \frac{200}{100}$

$= \frac{2}{1} = 2:1$

(e) $15\frac{2}{3}\%$

$= \frac{47}{3}\% = \frac{47}{3} \times \frac{1}{100}$

$= \frac{47}{300} = 47 : 300$

(f) 0.05%

$= 0.05 \times \frac{1}{100}$

$= \frac{5}{100} \times \frac{1}{100} = \frac{1}{20} \times \frac{1}{100}$

$= \frac{1}{2000} = 1 : 2000$

2. Express each of the following ratios as a per cent :

(a) 1 : 5

$$= \frac{1}{5} = \frac{1}{5} \times 100\%$$

$$\frac{100}{5}\% = 20\%$$

(b) 2 : 3

$$= \frac{2}{3} = \frac{2}{3} \times 100\%$$

$$= \frac{200}{3}\% = 66\frac{2}{3}\%$$

(c) 25 : 75

$$= \frac{25}{75} = \frac{25}{75} \times 100\%$$

$$= \frac{100}{3}\% = 33\frac{1}{3}\%$$

(d) 20 : 25

$$= \frac{20}{25} \times 100\%$$

$$= (20 \times 4)\% = 80\%$$

(e) 11 : 125

$$= \frac{11}{25} = \frac{11}{125} \times 100\%$$

$$= \frac{11}{5} \times 4 = \frac{44}{5}\%$$

$$= 8\frac{4}{5}\%$$

(f) 7 : 5

$$= \frac{7}{5} = \frac{7}{5} \times 10\%$$

$$= (7 \times 20)\% = 140\%$$

3. Express each of the following fractions or mixed numbers into a per cent :

(a) $\frac{51}{100}$

$$= \frac{51}{100} \times 100\% = 51\%$$

(b) $2\frac{3}{5}$

$$= \frac{13}{5} = \frac{13}{5} \times 100\%$$

(c) $\frac{75}{40}$

$$= \frac{75}{40} \times 100\% = \frac{75 \times 5}{2}\%$$

(d) $6\frac{1}{4}$

$$= \frac{25}{4} = \frac{25}{4} \times 100\%$$

(e) $\frac{1}{7}$

$$= \frac{1}{7} \times 100\% = 14\frac{2}{7}\%$$

(f) $\frac{7}{15}$

$$= \frac{7}{15} = \frac{7}{15} \times 100\%$$

$$= \frac{7 \times 20}{3} = \frac{140}{3} = 46\frac{2}{3}\%$$

4. Express each of the following as a fraction :

(a) 30%

$= 30 \times \frac{1}{100}$

$= \frac{3}{10}$

(b) $12\frac{1}{2}\%$

$= \frac{25}{2}\% = \frac{25}{2} \times \frac{1}{100}$

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

(c) 1.45%

$= 1.45 \times \frac{1}{100}$

$= \frac{1.45}{100} \times \frac{100}{100}$

$= \frac{145}{10000} = \frac{29}{2000}$

(d) 0.5%

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

$= \frac{5}{10} \times \frac{1}{100}$

$= \frac{1}{2} \times \frac{1}{100} = \frac{1}{200}$

5. Express each of the following as a decimal :

(a) 25%

$= 25 \times \frac{1}{100} = 0.25$

(b) 0.3%

$= 0.3 \times \frac{1}{100} = 0.003$

(c) $\frac{5}{4}\%$

$= \frac{5}{4} \times \frac{1}{100} = \frac{1}{80}$

$= 0.0125$

(d) $2\frac{1}{3}\%$

$= \frac{7}{3}\% = \frac{7}{3} \times \frac{1}{100}$

$= \frac{7}{300} = 0.023333$

(e) 145%

$= 145 \times \frac{1}{100} = \frac{29}{20}$

$= 1.45$

(f) $1\frac{1}{4}\%$

$= \frac{5}{4}\% = \frac{5}{4} \times \frac{1}{100}$

$= \frac{1}{80} = 0.0125$

6. Express each of the following decimals as a per cent :

(a) 0.04

$0.04 \times 100\%$

$= 4\%$

(b) 2.35

$= 2.35 \times 100\%$

$= 235\%$

(c) 7.50

$= 7.50 \times 100\%$

$= 750\%$

7. Find the value of :

(a) $4\frac{1}{2}\%$ of ₹ 180

$= \frac{9}{2} \times \frac{1}{100} \times$ ₹ 180

$= \frac{₹\ 9 \times 90}{100} =$ ₹ 8.1

(b) 2.25% of 1000 m

$= 2.25 \times \frac{1}{100} \times 1000$ m

$= 22.5$ m

(c) 140% of 5 kg

$= 140 \times \frac{1}{100} \times 5$ kg

$= \frac{14 \times 5}{10} = 7$ kg

(d) 0.5% of 250 km

$= 0.5 \times \frac{1}{100} \times 250$ km

$= \frac{5}{10} \times \frac{1}{10} \times 25$ km

$= \frac{125}{100} = 1.25$ km

(e) $3\frac{1}{3}\%$ of 60 litres

$= \frac{10}{3} \times \frac{1}{100} \times 60$ litres

$= \frac{6}{3} = 2$ 2 litres

(f) 21.5% of 1650 kg

$= \frac{215}{10} \times \frac{1}{100} \times 1650$ kg

$= \frac{215 \times 165}{100}$ kg

$= 354.75$ kg

8. What per cent is each of the following :

(a) Let, x% of ₹ 500 is ₹ 100

Thus, $x \times \frac{1}{100} \times 500 = 100$

$$x = \frac{100}{5} = 20$$

Hence, 20% of ₹ 500 is ₹ 100.

(b) Let, x% of 5 km is 160 metres.

Thus, $x \times \frac{1}{100} \times 5000\text{ m} = 160$ m

$$x \times 50 = 160$$
$$x = \frac{160}{50} = 3.2$$

Hence, 3.2% of 5 km is 160 metres.

(c) Let, x% of ₹ 8 is 75 paise.

Thus, $x \times \frac{1}{100} \times ₹\ 8 = ₹\ 0.75$

$$x \times \frac{8}{100} = 0.75$$
$$x = \frac{0.75 \times 100}{8}$$
$$x = \frac{75}{8} = 9\frac{3}{8}$$

Hence, $9\frac{3}{8}$% of ₹ 8 is 75 paise.

(d) Let, x% of 5 is 0.5

Thus, $x \times \frac{1}{100} \times 5 = 0.5$

$$x = \frac{0.5 \times 100}{5} = 10$$

Hence, 10% of 5 is 0.5.

(e) Let, x% of 2.75 kg is 450 grams.

Thus, $x \times \frac{1}{100} \times 2.75 \text{ kg} = 450 \text{ grams}$

$$x \times \frac{1}{100} \times 2.75 \times 1000 \text{ grams} = 450 \text{ grams}$$
$$x \times 2.75 \times 10 = 450$$
$$x = \frac{450}{27.5} = \frac{4500}{275}$$
$$= \frac{180}{11} = 16\frac{4}{11}\%$$

Hence, $16\frac{4}{11}$% of 2.75 kg is 450 grams.

(f) Let, x% of 3 hours is 12 minutes.

Thus, $x \times \frac{1}{100} \times 3 \text{ hours} = 12 \text{ minutes}$

$$x \times \frac{1}{100} \times 3 \times 60 = 12$$

$$x \times \frac{18}{10} = 12$$

$$x = \frac{12 \times 10}{18} = \frac{20}{3} = 6\frac{2}{3}$$

Hence, $6\frac{2}{3}$% of 13 hours is 12 minutes.

9. Let, the required number be x.

Thus, $10\% \text{ of } x = 5$

$$10 \times \frac{1}{100} \times x = 5$$

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

Hence, 10% of 50 is 5.

10. Let, the required number be x.

Thus $3\frac{1}{4}\% \text{ of } x = 13$

$$\frac{13}{4} \times \frac{1}{100} \times x = 13$$

$$x = \frac{13 \times 100 \times 4}{13} = 400$$

Hence, $3\frac{1}{4}$% of 400 is 13.

12. $\because$ $y\% \text{ of } 250 = 21$

Then, $y \times \frac{1}{100} \times 250 = 21$

$$y = \frac{21 \times 100}{250} = \frac{21 \times 4}{10}$$

$$y = \frac{84}{10} = 8.4$$

Hence, the value of y is 8.4.

13. Marks obtained by Prachi = 40 out of 80

Percent of marks $= \frac{40}{80} \times 100\%$

$$= \frac{1}{2} \times 100\% = 50\%$$

Hence, Prachi get 50% of total marks.

14. Income of Sita = ₹ 1500

Spent money by her = ₹ 575

Thus, her saving = ₹ 1500 – ₹ 575

$= 925$

So, percent of saving $= \frac{925}{1500} \times 100\%$

$$= \frac{925}{15} = 61\frac{2}{3}\%$$

Hence, $61\frac{2}{3}\%$ percent of income sita is spent by her.

15. Total number of oranges in the basket = 120

Distributed oranges among the students = 25

Thus, left oranges in the basket = 120 – 25

$= 95$

So, percent of left oranges $= \frac{95}{120} = 100\%$

$$= \frac{95 \times 5}{6} = 79\frac{1}{6}\%$$

Hence, $79\frac{1}{6}\%$ oranges are left in the basket.

Exercise 5.4

1. Marked Price of a shirt = 225

Thus, reduction = 8% of market prie

$$= 8 \times \frac{1}{100} \times ₹\ 225$$

$$= ₹\ 18$$

So, net price of shirt $= ₹\ 225 - ₹\ 18$

$$= ₹\ 207$$

2. Percent marks of $A = \frac{565}{650} \times 100\%$

$$= \frac{1130}{13} = 86\frac{12}{13}\%$$

Percent marks of $B = \frac{420}{500} \times 100\%$

$$= 84\%$$

Hence, performance of A is better.

3. Income of Rawat $= ₹\ 16000$

Spend money by Rawat $= ₹\ 10400$

$$= ₹\ 5600$$

So, percent of his saving $= \frac{5600}{16000} \times 100\%$

$$= \frac{560}{16} = 35\%$$

Hence, Rawat save 35% of his income.

4. The monthly tuition fee $= ₹\ 350$

Increase in tution fee $= 15\%$ of $₹\ 350$

$$= \frac{₹\ 350 \times 15}{100}$$

$$= ₹\ 52.50$$

So, increased tution fee $= ₹\ 350 + ₹\ 52.50$

$$= 402.50$$

5. Increases price of a car $= ₹\ 195000$ to $₹\ 210600$

$$= ₹\ 210600 - ₹\ 195000$$

$$= ₹\ 15600$$

Thus, percentage of increase price $= \frac{15600}{195000} \times 100$

$= 8\%$

Hence, the price of the car is increased by 8%.

6. Eligible voters in an election $= 105000$

Voters casting their votes $= 65000$

Thus, percentage of voters casting their

$$\text{Voter} = \frac{65000}{105000} \times 100\%$$

$$= \frac{1300}{21} = 61\frac{19}{21}\%$$

7. The population of India $= 100$ crore

Increasing in population $= 2.5\%$ of 100 crore

$$= \frac{2.5 \times 100}{100} \text{ crore}$$

$= 2.5$ crore

So, population of india after 1 year $= (100 + 2.5)$ crore

$= 102.5$ crore

$= 102$ crore 50 lakh

Hence, the population of India will be 102 crore 50 lakh after 1 year.

8. Speed of train $= 120$ km/h

Increase speed of train $= 10\%$ of 120% km/h

$$= \frac{10}{100} \times 120 = 12 \text{ km/h}$$

Thus, New speed of the train $= 120$ km/h + 12 km/h

$= 132$ km/h

9. Monthly salary of Vinod = ₹ 9000

Increased in salary = 5% of ₹ 9000

$$= ₹\ 9000 \times \frac{5}{100}$$

$= ₹\ 450$

Thus,

New, salary of Vinod = ₹ 9000 + ₹ 450

= ₹ 9,450

Hence, Vinod get ₹ 9,450 in next month.

10. Marks obtaind by Sahid = 420 out of 500

Percent of marks of Sahid $= \frac{420}{500} \times 100\%$

$= 84\%$

Marks obtained by Noorjahan = 536 out of 600

Percent of marks of Noorjahan $= \frac{536}{600} \times 100\%$

$= 89\frac{1}{3}\%$

Hence, Noorjahan's performance is better than Sahid.

11. Let, total number of employees in the facotry be x.

Number of men employees = 264

Thus, number of female employees $= x - 264$

$\because$ 12% of employees are women

$\therefore$ 12% of $x = x - 264$

$$x \times \frac{12}{100} = x - 264$$

$$x - \frac{12x}{100} = 264$$

$$\frac{88x}{100} = \frac{264}{}$$

$$x = \frac{264 \times 100}{88} = 3 \times 100$$

$$x = 300$$

and, females $= \frac{112x}{100} = \frac{12 \times 300}{100} = 36$

Hence, the total number of employees is 300 and the number of females is 36 in the factory.

12. Income of a state = ₹ 2120

(a) Spent money on education = 25% of ₹ 2120 crore

$$= ₹\ 2120 \times \frac{25}{100} \text{ crore}$$

$$= \frac{₹\ 2120}{4} = ₹\ 530 \text{ crore}$$

(b) Spent money on other items = ₹ 2120 crore – 530 crore

= ₹ 1590 crore

13. Distance travelled by Razia = 15 km

She travel distance by bus = 75% of 15 km

$$= \frac{75}{100} \times 15 \text{ km}$$

$$= \frac{45}{4} = 11.25 \text{ km}$$

And, she travel distance by foot = 15 km – 11.25 km = 3.75 km

14. Original price of DVD player = ₹ 5488

And, reduced price = ₹ 4802

Thus, reduction = ₹ 5488 – ₹ 4802

= ₹ 686

$$\text{Percentage of reduction} = \frac{686}{5488} \times 100\%$$

$$= \frac{100}{8} = 12.5\%$$

Hence, the percent decrease in the marked price of the DVD player is $12\frac{1}{2}\%$.

Exercise 5.5

1. Complete the table given below :

S.No.	C.P.	S.P	Profit	Loss	Profit %	Loss %
a.	₹ 1200	₹ 1325	₹ 125	**₹ 1325**	$10\frac{5}{12}\%$	$\mathbf{10\frac{5}{12}\%}$

b.	₹ 1600	₹ 1800	₹ 200	**₹ 1600**	12.5%	12.5
c.	₹ 25000	₹ 21000	**₹ 4000**	₹ 4000	**16%**	16 %
d.	₹ 99000	₹ 85000	**₹ 99000**	₹ 14000	**14.14%**	14.14%
e	₹ 212500	₹ 133450	**₹ 133450**	₹ 79050	**37.2%**	37.2 %

2. Cost price of 5 dozen of bananas = ₹ 120

loss = 10%

Loss = 10% of ₹ 120

$= ₹\ 120 \times \frac{10}{100} = ₹\ 12$

Thus, selling price of 5 dozen bananas = ₹ 120 − ₹ 12

= ₹ 108

$\because$ Selling price of a banana $= \frac{₹\ 108}{5 \times 12}$

$= ₹\ \frac{9}{5} = ₹\ 1.80$

3. Let, the cost of price of a grocery item be *x*.

Sellint price of grocery item = ₹ 249.75

Profit% $= 12\frac{1}{2}\% = \frac{25}{2}\%$

Profit $= \frac{25}{2}\%$ of x

$= \frac{25}{2} \times \frac{1}{100} \times x = \frac{x}{8}$

$\because$ Cost price + Profit = Selling Price

$x + \frac{1}{8}x = ₹\ 249.75$

$\left(1 + \frac{1}{8}\right)x = ₹\ 249.75$

$$\frac{9}{8}x = ₹\ 249.75$$

$$x = \frac{₹\ 249.75 \times 8}{9}$$

$$x = ₹\ 222$$

Hence, the cot price of the grocery item is ₹ 222.

4. Cost price of Fen $= 670$

Spent money on its repair $=$ ₹ 45

Thus, actual cost price of Fen $=$ ₹ $670 +$ ₹ 45

$=$ ₹ 715

And, Selling price of Fen $=$ ₹ 880

Thus, gain $=$ ₹ $888 -$ ₹ 715

$=$ ₹ 165

So, gain% $= \frac{165}{715} \times 100\% = 23\frac{1}{13}\%$

5. Cost price of a house $=$ ₹ 300000

Money spent on its repair $=$ ₹ 65000

Thus, actual cost of house $=$ ₹ $300000 +$ ₹ 65000

$=$ ₹ 365000

Selling price of house $=$ ₹ 325000

$\because$ $365000 > 32500$

$\therefore$ Loss $=$ ₹ $365000 -$ ₹ 325000

$=$ ₹ 40,000

So, Loss % $= \frac{40000}{365000} \times 100\%$

$= \frac{800}{73} = 10\frac{70}{73}\%$

6. Let, cost price of each book $= x$

Cost price of 12 books $= 12x$

and, cost price of 15 books $= 15x$

$\because$ Cost price of 15 books $=$ Selling price of 12 books

$\therefore$ Selling price of 12 books $= 15x$

$\because$ Selling price > Cost price

$\therefore$ Gain $= 15x - 12x = 3x$

Thus, Gain% $= \frac{3x}{12x} \times 100\%$

$= \frac{1}{4} \times 100\% = 25\%$

7. If cost price of 3 apples = ₹ 1

Thus, cost price of 120 apples = ₹ $\frac{120}{3}$ = ₹ 40

If cost price of 2 apples = ₹ 1

Thus, cost price of 120 apples = ₹ $\frac{1}{2} \times 120$ = ₹ 60

So, total number of apples $= 120 + 120 = 240$

And, total cost price of apples = ₹ 40 + ₹ 60 = ₹ 100

$\because$ Selling price of 5 apples = ₹ 2

Thus, selling price of 240 apples = $\frac{₹\ 2}{5} \times 240$ = ₹ 96

$\because$ Selling price < cost price

$\therefore$ loss = ₹ 100 – ₹ 96

= ₹ 4

So, loss % $= \frac{4}{100} \times 100\%$

$= 4\%$

Hence, total loss percent of rekha is 4%.

8. Let, the cost price of each table $= x$

Thus, cost price of 20 tables $= 20x$

and, cost price of 25 tables $= 25x$

$\because$ C.P. of 20 tables = S.P. of 25 tables

$\therefore$ Selling price of 25 tables $= 20x$

$\because$ Cost price > Selling price

$\therefore$ Loss $= 25x - 20x = 5x$

So, loss% $= \frac{5x}{25x} \times 100\%$

$= \frac{1}{5} \times 100 = 20\%$

9. Let, the cost price of a book $= x$

Profit $= 15\%$ of x

$= x \times \frac{15}{100} = \frac{15x}{100}$

$\because$ Selling price of book $=$ ₹ 230

$\therefore$ $x + \frac{15x}{100} =$ ₹ 230

$\frac{115}{100}x =$ ₹ 230

$x = \frac{₹\ 230}{115} \times 100$

$=$ ₹ 200

Profit $= 15\%$ of ₹ 200

$=$ ₹ $200 \times \frac{15}{100} =$ ₹ 30

Hence, the cost price of book is ₹ 200 and the actual profit is ₹ 30.

10. Cost price of a dozen of bananas $=$ ₹ 15

Selling price of a dozen of bananas $=$ ₹ 10

$\because$ Selling price $<$ Cost price

$\therefore$ Loss $=$ ₹ 15 $-$ ₹ 10 $=$ ₹ 5

Thus, loss% $= \frac{5}{15} \times 100\% = 33\frac{1}{3}\%$.

11. Let, the cost price of T.V. set $= x$

loss $= 5\%$

Thus, selling price of T.V. set $= x - 5\%$ of x

$= x - \frac{x \times 5}{100}$

$= \frac{95}{100}x$

If he sold T.V. set for ₹ 2880 more, then he earned 10% profit.

Thus, $x + 10\% \text{ of } x = \frac{95}{100}x = ₹\ 2880$

$$x + \frac{x \times 10}{100} = \frac{95}{100}x + ₹\ 2880$$

$$\frac{110}{100}x - \frac{95}{100}x = ₹\ 2880$$

$$\frac{(110-95)x}{100} = ₹\ 2880$$

$$15x = ₹\ 2880 \times 100$$

$$x = \frac{₹\ 2880}{15} \times 100$$

$$x = ₹\ 19200$$

Hence, the cost price of T.V. set is ₹ 19,200.

12. Cost price of 25 kg apples $= ₹\ 8 \times 25$

$= ₹\ 200$

Cost price of 30 kg apples $= ₹\ 10 \times 30$

$= ₹\ 300$

Thus, total cost price of apples to gain 21%

$= ₹\ 500 + 21\% \text{ of } ₹\ 500$

$= ₹\ 500 + ₹\ 500 \times \frac{21}{100}$

$= ₹\ 500 + ₹\ 105 = ₹\ 605$

$\because$ Selling price of 55 kg of apples $= ₹\ 605$

$\therefore$ Selling price of 1 kg of apples $= \frac{₹\ 605}{55} = ₹\ 11$

Hence, the fruit seller will sell apples at the rate of ₹ 11 per kg to gain 21%.

Exercise 5.6

1. Fill in the blanks in the given table :

	Principal	Period	Rate per annum	Interest	Amount
(a)	₹ 810	3 years	5%	**₹ 121.50**	**₹ 931.50**
(b)	₹ 500	2 years	$5\frac{1}{2}\%$	**₹ 55**	**₹ 555**
(c)	**₹ 375**	4 years	6%	₹ 90	**₹ 465**
(d)	₹ 800	**$1\frac{1}{2}$ years**	$7\frac{1}{2}\%$	₹ 90	**₹ 890**
(e)	₹ 3000	6 years	**$8\frac{1}{2}\%$**	**₹ 1530**	₹ 4530

2. Principal = ₹ 1600, $R = 4\%$ per annum

and, Time = 36 months $= \frac{36}{12} = 3$ years

So, S.I. $= \frac{P \times R \times T}{100}$

$= \frac{₹\ 1600 \times 4 \times 3}{100}$

$=$ ₹ 192

3. Principle = ₹ 750, Amount = ₹ 900

Rate = 4% per annum

So, S.I. $= \frac{P \times R \quad T}{100}$

$= \frac{₹\ 750 \times 4 \times T}{100}$

$= 30T$

$\because$ Amount = Interest + Principle

$900 = 30T + 750$

$30T = 900 - 750$

$$T = \frac{150}{30} = 5 \text{ years}$$

4. Principle = ₹ 3000, Amount = ₹ 3360

Time = 3 yeaers

$\because$ S.I. $= \dfrac{P \times R \times T}{100}$

and, Amount = Principle + Interest

$$\therefore \quad A - P = \frac{P \times R \times T}{100}$$

$$₹\ 3360 - ₹\ 3000 = \frac{₹\ 300 \times R \times 3}{100}$$

$$300 = 90R$$

$$R = \frac{360}{90} = 4\%$$

Hence, the Rate percent is 4% per annum.

5. Principle = ₹ 1250, Rate = 18% per annum

and, Time = 2 = 2 years 4 months

$$= \left(2 + \frac{4}{12}\right) \text{years}$$

$$= 2 + \frac{1}{3} = \frac{7}{3} \text{ years}$$

So, S.I. $= \dfrac{P \times R \times T}{100}$

$$= \frac{₹\ 1250 \times 18 \times 7}{100 \times 3}$$

$$= ₹\ \frac{125 \times 6 \times 7}{10} = ₹\ 5250$$

6. Principle = 1820, Rate $= 7\frac{1}{2} = \frac{15}{2}$ % per annum

Time period = 9 october − 21 Dec

$= 22 + 30 + 21$ days

$= 73$ days

So, $$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$= \frac{₹\ 1820 \times \frac{15}{2} \times \frac{73}{365}}{100}$$

$$= \frac{₹\ 182 \times 15 \times 1}{10 \times 2 \times 5} = ₹\ 27.30$$

7. Amount = ₹ 364.80, Rate $= 3\frac{1}{2} = \frac{7}{2}$% per annum

Time = 8 years

$\because$ $$\text{S.I.} = \frac{P \times R \times T}{100} \text{ and S.I.} = A - P$$

$\therefore$ $$A - P = \frac{P \times R \times T}{100}$$

$$₹\ 364.80 - P = \frac{P \times \frac{7}{2} \times 8}{100}$$

$$364.80 = \frac{28P}{100} + P$$

$$\frac{128}{100} P = 364.80$$

$$P = \frac{36480}{128} = 285$$

Hence, the sum of money is ₹ 285.

8. Amount ₹ 1472, Rate = 5% p.a., Time = 3 years

$\because$ $$\text{S.I.} = \frac{P \times R \times T}{100} \text{ and S.I.} = A - P$$

$\therefore$ $$A - P = \frac{P \times R \times T}{100}$$

$$A = \frac{P \times R \times T}{100} + P$$

$$₹\ 1472 = \frac{P \times 5 \times 3}{100} + P$$

$$₹\ 1472 = \frac{15P}{100} + P$$

$$₹\ 1472 = \frac{115P}{100}$$

$$P = \frac{₹\ 1472 \times 100}{15}$$

$$P = ₹\ 1280$$

Hence, the sum of money is ₹ 1280.

9. Let, the sum of money is ₹ 1280.

Rate = 5% per annum, Time = 6 years

$$\because \quad A_1 - P = \frac{P \times R \times T_1}{100}$$

$$₹\ 1326 - P = \frac{P \times 5 \times 6}{100}$$

$$₹\ 1326 = \frac{30P}{100} + P$$

$$\frac{130}{100} P = 1326$$

$$P = \frac{₹\ 1326 \times 10}{13}$$

$$P = ₹\ 1020$$

Now, $$A_2 - P = \frac{P \times R \times T_2}{100}$$

$$2P - P = \frac{P \times R \times T_2}{100}$$

$$₹\ 1020 = \frac{₹\ 1020 \times 5 \times T_2}{100}$$

$$\frac{₹\ 1020}{₹\ 1020} \times 100 = 5T_2$$

$$T_2 = \frac{100}{5} = 20 \text{ years}$$

Hence, the sum of money is double itself in 20 years.

10. Let, the principle be P.

$$\because \quad A - P = \frac{P \times R \times T}{100}$$

$$\therefore \quad ₹\ 2600 - P = \frac{P \times 10 \times 3}{100}$$

$$₹\ 2600 = \frac{130}{100} P$$

$$P = \frac{₹\ 2600 \times 100}{130}$$

$$P = ₹\ 2000$$

Hence, the principle is ₹ 2000.

11. $\because$

$$A_1 - P_1 = \frac{P_1 \times R \times T_1}{100}$$

$$₹\ 504 - ₹\ 450 = \frac{₹\ 450 \times R \times 3}{100}$$

$$\frac{54}{450 \times 3} \times 100 = R$$

$$R = \frac{2}{50} \times 100$$

$$R = 4\%$$

Now, $$A_2 - P_2 = \frac{P_2 \times R \times T_2}{100}$$

$$A_2 - ₹\ 615 = \frac{₹\ 615 \times 4 \times \frac{5}{2}}{100}$$

$$A_2 = \frac{₹\ 615 \times 10}{100} + ₹\ 615$$

$$= ₹\ 61.50 + ₹\ 615$$

$$= ₹\ 676.50$$

Hence, ₹ 615 amount to ₹ 676.50 in $2\frac{1}{2}$ years at the same rate of interest.

12. Deposit money in bank account = ₹ 2600

Rate of interest = 6% per annum

Time = 23, April − 4 July

$= (8 + 31 + 30 + 4)$ days

$= 73$ days

Thus, $\text{Interest} = \dfrac{P \times R \times T}{100}$

$$= \frac{₹\ 2600 \times 6 \times \frac{73}{365}}{100}$$

$$= ₹\ 26 \times 6 \times \frac{1}{5} = ₹\ 31.20$$

$\therefore$ Amount $= ₹\ 2600 + ₹\ 31.20$

$= ₹\ 2631.20$

Hence, Neeraj received ₹ 2631.20 from the bank.

13. Let, the first part of money be x.

Thus, the second part of money = ₹ $2500 - x$

Now, $\text{S.I}_1 = \dfrac{P_1 \times R_1 \times T_1}{100}$

$\therefore \quad \text{I}_1 = \dfrac{x \times 4 \times 5}{100}$

$\text{I}_1 = \dfrac{20x}{100} = \dfrac{x}{5}$

$\because \quad \text{I}_1 = 2\text{I}_2$

$\therefore \quad \text{I}_2 = \dfrac{1}{2} \times \text{I}_1$

$= \dfrac{1}{2} \times \dfrac{x}{5} = \dfrac{x}{10}$

Now, $\text{S.I}_2 = \dfrac{P_2 \times R_2 \times T_2}{100}$

$\dfrac{x}{100} = \dfrac{₹\ (2500 - 5) \times 5 \times 3}{100}$

$$\frac{x}{10} \times 100 = ₹\ (2500 - x) \times 15$$

$$\frac{10x}{15} = ₹\ 2500 - x$$

$$\frac{2x}{3} + x = ₹\ 2500$$

$$\frac{5x}{3} = ₹\ 2500$$

$$x = \frac{₹\ 2500 \times 3}{5}$$

$$x = ₹\ 1500$$

Hence, the first part of money is ₹ 1500 and the second part of money is ₹ $(2500 - 1500) =$ ₹ 1000.

14. Let, the sum of money be P.

Thus, Amount $= 2P$

$$\because \quad A - P = \frac{P \times R \times T}{100}$$

$$2P - P = \frac{P \times 100 \times T}{100}$$

$$P = \frac{PT}{10}$$

$$T = \frac{10P}{P} = 10 \text{ years}$$

So, the sum of money is double inself at 10% interest in 10 years.

Mental Ability

A. Multiple Choice Questions (MCQs) :

1. (b) **2.** (c) **3.** (b) **4.** (b) **5.** (d) **6.** (b) **7.** (c) **8.** (c) **9.** (a) **10.** (b)

B. Fill in the blanks :

1. **Ratio** has no unit.

2. If a : 20 :: 3 : 5, then a is **12**.

3. 1 : 250 can be written as per cent **0.4%**.

4. ₹ **90** is 50% more than ₹ 60.

5. $12\frac{1}{2}$% of 25g is **3.125 g or $3\frac{1}{8}$ g**.

6. The price for which an article is sold is called **selling price**.

7. The simplest form of $3\frac{1}{2} : 10\frac{1}{2} =$ **1 : 3**.

8. Gain or loss per cent is always calculated on **cost price**.

C. State True (T) or False (F) :

1. True **2.** True **3.** True **4.** True **5.** False

Higher Order Thinking Skills

1. Do it yourself.

2. $\because$ Discount of sweater = 25%

$\therefore$ 25 of M.P. = 20

$$\text{M.P.} \times \frac{25}{100} = 20$$

$$\text{M.P.} = ₹\ \frac{20 \times 100}{25}$$

$$\text{M.P.} = ₹\ 80$$

Hence, the marked price of sweater before the discount is ₹ 80.

Chapter

6 Algebraic Expressions and Identities

Exercise 6.1

1. Fill in the following table :

S.No.	Expressions	Constant	No. of terms	Highest degree of variable
(a)	$17x^2 - 6x + 4$	x	3	2
(b)	$8y^3 - 4$	y	2	3
(c)	$-6a^2 + 18ab + 9$	a and b	3	2
(d)	$-4x^2 + 9y^2 + 3$	x and y	3	2

2. Add :

(a) $(2x^2 - 2y^2) + (3y^2 - 7x^2) + (5x^2 - y^2)$

$= 2x^2 - 2y^2 + 3y^2 - 7x^2 + 5x^2 - y^2$

$= 2x^2 - 7x^2 + 5x^2 - 2y^2 + 3y^2 - y^2$

$= 0 + 0 = 0.$

(b) $(-2x^2 y^2) + \left(\frac{4}{3}x^2 y^2\right) + \left(-\frac{1}{6}x^2 y^2\right) + \left(\frac{1}{3}x^2 y^3\right)$

$= \left[-2 + \frac{4}{3} - \frac{1}{6} + \frac{1}{3}\right]x^2 y^2$

$= \left[\frac{-12 + 8 - 1 + 2}{3}\right]x^2 y^2$

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

(c) $\left(\frac{3}{2}x^2 y - \frac{1}{2}xy\right) + (3x^2 y + 2xy) + \left(-\frac{1}{2}x^2 y + \frac{3}{2}xy\right)$

$= \frac{3}{2}x^2 y + 3x^2 y - \frac{1}{2}x^2 y - \frac{1}{2}xy + 2xy + \frac{3}{2}xy$

$= \left(\frac{3}{2} + 3 - \frac{1}{2}\right)x^2 y + \left(-\frac{1}{2} + 2 + \frac{3}{2}\right)xy$

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

$= 4x^2 y + 3xy$

(d) $\left(3x^2 + \frac{2}{3}x + 1\right) + \left(-5x^2 - \frac{1}{4}x + \frac{2}{5}\right) + \left(2x^2 - \frac{5}{12}x - \frac{7}{5}\right)$

$= 3x^2 - 5x^2 + 2x^2 + \frac{2}{3}x - \frac{1}{4}x - \frac{5}{12}x + 1 + \frac{2}{5} - \frac{7}{5}$

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

$= 0x^2 + \left(\frac{8 - 3 - 5}{12}\right)x + \left(\frac{5 + 2 - 7}{2}\right)$

$= 0 + 0x + 0 = 0$

3. Subtract :

(a) $-a-b$ from $a+b$

$=(a+b)-(-a-b)$

$=a+b+a+b$

$=2a+2b=2(a+b)$

(b) $\frac{1}{6}x^2y^2$ from $-2x^2y^2$

$=-2x^2y^2-\frac{1}{6}x^2y^2$

$=\left(-2-\frac{1}{6}\right)x^2y^2$

$=\frac{-13}{6}x^2y^2$

(c) $2x^2+3y^2-4z^2$ from $2z^2-3x^2+4y^2$

$=(2z^2-3x^2+4y^2)-(2x^2+3y^2-4z^2)$

$=2z^2-3x^2+4y^2-2x^2-3y^2+4z^2$

$=(2z^2+4z^2)+(-3x^2-2x^2)+(4y^2-3y^2)$

$=-6z^2-5x^2+y^2$

(d) $a^2-2a+\frac{1}{2}$ from $-a^2+2a-\frac{1}{2}$

$=\left(-a^2+2a-\frac{1}{2}\right)-\left(a^2-2a+\frac{1}{2}\right)$

$=-a^2+2a-\frac{1}{2}-a^2+2a-\frac{1}{2}$

$=-2a^2+4a-\frac{1}{2}-\frac{1}{2}$

$=-2a^2+4a-1$

4. Simplify :

(a) $(2m^2-2n^2)-(m^2-n^2)$

$=2m^2-2n^2-m^2+n^2$

$=2m^2-m^2-2n^2+n^2=m^2-n^2$

(b) $(x+y)-\frac{1}{2}(2+x-2y)$

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

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

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

(c) $[5z-(x+2y)]-[3x-(y-2z)]$

$=[5z-x-2y]-[3x-y+2z]$

$=5z-x-2y-3x+y-2z$

$=3z-4x-y$

(d) $\left(\frac{1}{2}x^2+\frac{1}{2}y^2+\frac{1}{2}z^2\right)-\left(\frac{1}{2}+\frac{3}{2}x^2+\frac{5}{2}y^2+\frac{7}{2}z^2\right)$

$=\frac{1}{2}x^2+\frac{1}{2}y^2+\frac{1}{3}z^2-\frac{1}{2}-\frac{3}{2}x^2-\frac{5}{2}y^2-\frac{7}{2}z^2$

$=\frac{1}{2}x^2-\frac{3}{2}x^2+\frac{1}{2}y^2-\frac{5}{2}y^2+\frac{1}{2}z^2-\frac{7}{2}z^2-\frac{1}{2}$

$=\frac{-2}{2}x^2-\frac{4}{2}y^2-\frac{6}{2}z^2-\frac{1}{2}$

$=-x^2-2y^2-3z^2-\frac{1}{2}$

$=-\left(x^2+2y^2+3z^2+\frac{1}{2}\right)$

5. $\because$ $(x^3-2x^2+x+4)-(2x^3+7x^2-5x+6)$

$=x^2-2x^2+x+4-2x^3-7x^2+5x-6$

$=-x^3-9x^2+6x-2$

Hence, (x^2-2x^2+x+4) is $(-x^3-9x^2+6x-2)$ greater than $(2x^2+7x^2-5x+6)$.

6. Let, the requried number be X.

Thus, $5x^3-11x^2-4+X=10x^3-4x^2+6$

$X=10x^3-4x^2+6-5x^3+11x^2+4$

$$= 5x^3 + 7x^2 + 10$$

Hence, $5x^3 + 7x^2 + 10$ should be added to $5x^3 - 11x^2 - 4$ to get $10x^3 - 4x^2 + 6$.

7. $[(11xy - x^2 - 4) + (-14xy + 5x^2)] + (15xy + x^2 + 2)$

$= [11xy - x^2 - 4 - 14xy + 5x^2] + 15xy + x^2 + 2$

$= -4xy + 4x^2 - 4 + 15xy + x^2 + 2$

$= 5x^2 + 11xy - 2$

8. Let, the other eexpression is P.

Thus, $(2y^2 + 2x - y - 10) + P = x^2 - y^2 + 3y - 5$

$P = (x^2 - y^2 + 3y - 5) - (2y^2 + 2x - y - 10)$

$P = x^2 - y^2 + 3y - 5 - 2y^2 - 2x + y + 10$

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

Hence, the other expression is $x^2 - 3y^2 + 4y + 5$.

9. (a) $25 + z^2$

The degree of 25 is 0.

The degree of x^2 is 2.

And the degree of expression $(25 + z^2)$ is 2.

(b) $125 - y^3$

The degree of 125 is 0.

The degree of y^3 is 3.

And the degree of expression $(125 - y^2)$ is 3.

(c) $1 - 2p + p^2 - 3p^3$

The degree of 1 is 0.

The degree of $-2p$ is 1.

The degree of $ph2$ is 2.

The degree of $-3p^3$ is 3.

And, the degree of expression $(1 - 2p + p^2 - 3p^3)$ is 3.

Exercise 6.2

1. Find the following products.

(a) $3a^2\ (2a^2 - 4)$

$= 3a^2 \times 2a^2 - 3a^2 \times 4$

$= 6a^4 - 12a^2$

(b) $\frac{3}{4}a\,(a^3 + b^3)$

$= \frac{3}{4}a \times a^3 + \frac{3}{4}a \times b^3$

$= \frac{3}{4}a^4 + \frac{3}{4}ab^3$

(c) $10y\,(0.02x^2 - 0.02y)$

$= 10y \times 0.02x^2 - 10y \times 0.02y$

$= 0.2\,x^2 y - 0.2\ y^2$

(d) $2x^3\ (2x^2 - 4y^2\ )$

$= 2x^3 \times 2x^2 - 2x^3 \times 4y^2$

$= 4x^5 - 8x^3 y^3$

(e) $0.2s(0.02s + 0.002r)$

$= 0.25 \times 0.025 + 0.25 \times 0.002r$

$= 0.004s^2 + 0.0004\ rs$

(f) $\frac{-2}{3}x\left(\frac{3}{4}x + \frac{3}{8}y\right)$

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

$= \frac{-6}{12}x^2 - \frac{6}{24}xy$

$= -\frac{1}{2}x^2 - \frac{1}{2}xy$

2. Find the following products.

(a) $\frac{6}{5}ab \times 2b^2 \times 0$

$= \frac{12}{5}ab^3 \times 0 = 0$

(b) $2a^2 \times (-3ab)$

$= -6a^3 b$

(c) $-3xy \times (-4xy)$

$= +12x^2 y^2$

(d) $\left(-\frac{1}{3}x^2\right)\left(\frac{-3}{10}y\right)\left(\frac{-4}{5}\times yz\right)$

$=\left(\frac{-1}{3}\times\frac{-3}{10}\times\frac{-4}{5}\right)\times x^2y\times xyz$

$=\frac{-2}{25}x^3y^2z$

(e) $(-2x^6y)\left(\frac{6}{22}xy^4\right)\left(\frac{11}{12}x^3y^3\right)$

$=\left(-2\times\frac{6}{12}\times\frac{11}{12}\right)\times x^6y\cdot xy^4\cdot x^3y^3$

$=\frac{-11}{12}x^{10}\cdot y^8$

(f) $\left(\frac{5}{6}x^5\right)\left(\frac{-3}{10}y^4\right)\left(\frac{9}{5}xy\right)$

$=\left(\frac{5}{6}\times\frac{-3}{10}\times\frac{9}{5}\right)\times x^5\cdot y^4\cdot xy$

$=\frac{-9}{20}x^6y^5$

3. Simplify, and verify the result for $p=1$.

(a) $4p^3\times 3p^4\times(-p^5)$

$=-12p^{3+4+5}=-12p^{12}$

Put, $p=1$

L.H.S. $=4(-1)^3\times 3(-1)^4\times(-1)^5$

$=4\times 3\times(-1)=-1$

R.H.S $=-12$

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

(b) $p^2\times 3p^3\times(-8p^5)$

$=3\times(-8)\times p^2\cdot p^3\cdot p^5$

$=-24p^{10}$

Put, $(p=1)$

$\text{L.H.S.} = 1^2 \times 3 \cdot 1^3 \times (-8 \cdot 1^5)$

$= 1 \times 3 \times (-8) = -24$

$\text{R.H.S.} = -24 \times 1^{10} = -24$

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

4. If $x = -12$, $y = -5$, find the value of each of the following expressions :

(a) $x^2 - y^2$

Put $x = -12$ and $y + -5$

$x^2 - y^2 = (-12)^2 - (-5)^2$

$= 144 - 25$

$= 119$

(b) $x^3 - y^3$

Put, $x = -12$ and $y = -5$

$x^3 - y^3 = (-12)^3 - (-5)^3$

$= -1728 - (-125)$

$= -1728 + 125$

$= -1603$

(c) $x^2 + y^2 - xy$

Put, $x = -12$ and $y = -5$

$x^2 + y^2 - xy = (-12)^2 + (-5)^2 - (-12) \times (-5)$

$= 144 + 25 - 60$

$= 109$

5. Find the value of each product for $a = 2$, $b = 0.5$

(a) $32a^2 (1 - 2a)$

$= 3a^2 - 64a^3$

Put, $a = 2$

$= 3 \times (2)^2 - 64 \times (2)^3$

$= 3 \times 4 - 64 \times 8$

$= 12 - 512 = -500$

(b) $ab(a^3 - b^3)$

$= a^4 b - ab^4$

Put, $a = 2$ and $b = 0.5$

$= (2)^2 \cdot (0.5) - (2) \cdot (0.5)^4$

$= 16 \times 0.5 - 2 \times 0.0625$

$= 8 - 0.125 = 7.875$

6. Find the value of each product for $x = -1$, $y = -2$, $z = 1$

(a) $x^2 (1 + y^2 - 2xy)$

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

Put, $x = -1$, and $y = -2$

$= (-1)^2 + (-2)^2 \quad (-1)^2 - 2 \times (-1)^3 \times (-2)$

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

$= 1 + 4 - 4 = 1$

(b) $3xy(x^2 + y^2 + 4)$

$= 3x^3 y + 3xy^3 + 12xy$

Put, $x = -1$ and $y = -2$

$= 3(-1)^3 \times (-2) + 3(-1) \times (-2)^3 + 12(-1) \times (-2)$

$= 3 \times (-1) \times (-2) + 3(-1) \times (-8) + 12 \times 2$

$= 6 + 24 + 24 = 54$

(c) $-12yz^3 \left(4yz^2 + \frac{3}{4} y^2 z^2\right)$

$= -48y^2 z^5 - \frac{36}{4} y^3 z^5$

$= -48y^2 z^5 - 9y^3 z^5$

Put, $y = -2$ and $z = 1$

$= -48 \times (-2)^2 \times (1)^5 - 9 \times (-2)^3 \times (1)^5$

$= -48 \times 4 \times 1 - 9 \times (-8) \times 1$

$= -192 + 72 = -120$

7. Simplify :

(a) $2a(a^2 + b^2) - 2b^2(b + a) + 2$

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

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

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

(b) $x^2(x+1) - x(x^2 + 1) - x^3$

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

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

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

(c) $x^2(3x^3 - 2x^2 + 1) - x(x^4 - 2x^3 + x)$

$= 3x^5 - 2x^4 + x^2 - x^5 + 2x^4 - x^2$

$= 2x^5 + 0 + 0 = 2x^5$

(d) $a^3(b^3 - c^3) + b^3(c^3 - a^3) + c^3(a^3 - b^3)$

$= a^3 b^3 - a^3 c^3 + b^3 c^3 - a^3 b^3 + a^3 c^3 - b^3 c^3$

$= 0 + 0 + 0 = 0$

(e) $a^2b(b^2-2a)+a(b-a^2b)-b(a+2a^3)$

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

$=a^2b^3-3a^2b$

$=a^2b(b^2-3a)$

(f) $\frac{5}{9}x(x^2-x^3)-\frac{1}{3}x^2(x^3-x)+\frac{1}{3}x^3(1-x^2)$

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

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

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

$=\frac{-2}{3}x^5-\frac{5}{9}x^4+\left(\frac{5+6}{9}\right)x^3$

$=-\frac{2}{3}x^5-\frac{5}{9}x^4+\frac{11}{9}x^3$

$=-\frac{1}{9}x^3[-2x^2+5x-11]$

8. Find the products of the following binomials.

(a) $(2a^2+3b)(2a^2+3b)$

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

$=4a^4+6a^2b+6a^2b+9b^2$

$=4a^4+12a^2b+9b^2$

(b) $(-4p+7q)(-4p+7q)$

$=-4p(4p+7q)+7q(-4p+7q)$

$=+16p^2-28pq-28pq+49q^2$

$=16p^2-56pq+49q^2$

(c) $\left[\frac{2}{3}x+\frac{5}{7}y\right]\left[\frac{2}{3}x+\frac{5}{7}y\right]$

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

$$= \frac{4}{9}x^2 + \frac{10}{21}xy + \frac{10}{21}xy + \frac{25}{49}y^2$$

$$= \frac{4}{9}x^2 + \frac{20}{21}xy + \frac{25}{49}y^2$$

9. Simplify :

(a) $(2y+3)(y-2)-(5y+3)(y-2)$

$= (y-2)[(2y+3)-(5y+3)]$

$= (y-2)[2y+3-5y-3]$

$= (y-2)[-3y]$

$= -3y^2 + 6y^2 + 6y = 3y(2-y)$

(b) $(3x-4y)(x+y)+(5x+7y)(x-y)$

$= 3x(x+y) - 4y(x+y) + 5x(x-y) + 7y(x-y)$

$= 3x^2 + 3xy - 4xy - 4y^2 + 5x^2 - 5xy + 7xy - 7y^2$

$= 8x^2 - xy + 2xy - 11y^2$

$= 8x^2 + xy - 11y^2$

(c) $(3x+4y)(3x-4y)-(3x+4y)^2$

$= (3x+4y)^2\,[(3x-4y)-(3x+4y)]$

$= (3x+4y)[3x-4y\ \ 3x-4y]$

$= (3x+4y)(-8y)$

$= -8y(3x+4y)$

(d) $(5a-3)(a+4)-(2a+5)(3a-4)$

$= [5a(a+4)-3(a+4)]-[2a(3a-4)+5(3a-4)]$

$= [5a^2 + 20a - 3a - 12]-[6a^2 - 8a + 15a - 20]$

$= (5a^2 + 17a - 12)-(6a^2 + 7a - 20)$

$= 5a^2 + 17a - 12 - 6a^2 - 7a + 20$

$= -a^2 + 10a + 8$

Exercise 6.3

1. Evaluate the following using identities :

(a) 92×88

$= (90+2)\times(90-2)$

$= (90)^2 - (2)^2$

(b) 7.4×8.6

$= (8-0.6)\times(8+0.6)$

$= (8)-(0.6)^2$

$= 8100 - 4 = 8096$

(c) $104^2 - 4^2$

$= (104 + 4) \times (104 - 4)$

$= 108 \times 100$

$= 10800$

(d) 98^2

$= (100 - 2)^2$

$= (100)^2 - 2 \times 100 \times 2 + (2)^2$

$= 10000 - 400 + 4$

$= 9604$

$= (8)^2 - (0.6)^2$

$= 64 - 0.36 = 63.64$

(e) 99.2×100.8

$= (100 - 0.8) \times (100 + 0.8)$

$= (100)^2 - (0.8)^2$

$= 10000 - 0.64$

$= 9999.36$

(f) 1002^2

$= (1000 + 2)^2$

$= (1000)^2 + 2 \times 1000 \times 2 + (2)^2$

$= 1000000 + 4000 + 4$

(g) $225 \times 225 - 175^2$

$= (225)^2 - (175)^2$

$= (225 + 175) \times (225 - 175)$

$= 400 \times 50$

$= 20000$

(h) $(14^2 - 4^2)(20^2 - 2^2)$

$= [(14 + 4)(14 - 4)][(20 + 2)(20 - 2)]$

$= [18 \times 10][22 \times 18]$

$= 180 \times 396$

$= 180 \times (400 - 4)$

$= 72000 - 720$

$= 71280$

(i) $155 \times 155 - 145 \times 145$

$= (155)^2 - (145)^2$

$= (155 + 145)(155 - 145)$

$= 300 \times 10 = 3000$

2. Find the products :

(a) $(x+9)(x-9)$

$=x^2-9^2$

$=x^2-81$

(b) $(2x+3y)(2x-3y)$

$=(2x)^2-(3y)^2$

$=4x^2-9y^2$

(c) $(x^2+y^2)(x^2-y^2)$

$=(x^2)^2-(y^2)^2$

$=x^4-y^4$

(d) $\left(\frac{2}{3}x^2+\frac{1}{2}y^2\right)\left(-\frac{2}{3}x^2+\frac{1}{2}y^2\right)$

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

$=\left(\frac{1}{2}y^2\right)^2-\left(\frac{2}{3}x^2\right)^2$

$=\frac{1}{4}y^2-\frac{4}{9}x^4$

(e) $\left(\frac{x}{2}-\frac{y}{3}\right)\left(\frac{x}{2}+\frac{y}{3}\right)$

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

$=\frac{x}{4}-\frac{y^2}{3}$

(f) $\left(x+\frac{a}{y}\right)\left(x-\frac{a}{y}\right)$

$=x^2-\left(\frac{a}{y}\right)^2=x^2-\frac{a^2}{y^2}$

3. Expand using identities :

(a) $[2f^2+\frac{1}{3}g^2]^2$

$=(2f^2)^2+\left(\frac{1}{3}g^2\right)^2+2\times 2f^2\times\frac{1}{3}g^2$

$=4f^4+\frac{1}{9}g^4+\frac{4}{3}f^2y^2$

(b) $[\frac{1}{4}b+\frac{1}{3}c]^2$

$$=\left(\frac{1}{4}b\right)^2+\left(\frac{1}{3}c\right)^2+2\times\frac{1}{4}b\times\frac{1}{3}c$$

$$=\frac{1}{16}b^2+\frac{1}{9}c^2+\frac{1}{6}bc$$

(c) $(2q+3r)^2$

$$=(2q)^2+(3r)^2+2\times 2q\times 3r$$

$$=4q^2+9r^2+12qr$$

(d) $(5x+6y)^2$

$$=(5x)^2+(6y)^2+2\times 5x\times 6y$$

$$=25x^2+36y^2+60xy$$

(e) $(25b+3)^2$

$$=(25b)^2+(3)^2+2\times 25b\times 3$$

$$=625b^2+9+150b$$

(f) $(2a-3b)^2$

$$=(29)^2+(3b)^2-2\times 2a\times 3b$$

$$=4a^2+9b^2-12ab$$

4. Using the identity for difference of squares, expand the following :

(a) $25p^2r^4-36r^2$

$$=(5pr^2)^2-(6r)^2$$

$$=(5pr^2-6r)(5pr^2+6r)$$

$$=r^2(5pr-6r)(5pr+6r)$$

(b) $4a^2-9b^2c^2$

$$=(2a)^2-(3bc)^2$$

$$=(2a+3bc)(2a-3bc)$$

(c) $\frac{x^2}{9}-\frac{y^2}{16}$

$$=\left(\frac{x}{3}\right)^2-\left(\frac{y}{4}\right)^2$$

$$=\left(\frac{x}{3}+\frac{y}{4}\right)\left(\frac{x}{3}-\frac{y}{4}\right)$$

(d) $\frac{4}{9}x^2-\frac{25}{36}y^2$

$$=\left(\frac{2}{3}x\right)^2-\left(\frac{5}{6}y\right)^2$$

$$=\left(\frac{2}{3}x+\frac{5}{6}y\right)\left(\frac{2}{3}x-\frac{5}{6}y\right)$$

5. Simplify the following :

(a) $(x+a)(x-a)(x^2+a^2)$

$=[(x+a)(x-a)](x^2+a^2)$

$=(x^2-a^2)(x^2+a^2)$

$=[(x^2)^2-(a^2)^2][(x^2)^2+(a^2)^2]$

$=[x^4-a^4][x^4+a^4]$

(b) $(a^2-1)(a^2+1)(a^4+1)$

$=[(a^2-1)(a^2+1)](a^4+1)$

$=[(a^2)^2-1^2](a^4+1)$

$=[a^4-1](a^4+1)$

$=[(a^4)^2-1^2]$

$=(a^8-1)(a^8+1)$

6. If $x+\frac{1}{x}=4$, find the value of $x^2+\frac{1}{x^2}$.

Squaring both the sides—

$$\left(x+\frac{1}{x}\right)^2=4^2$$

$$x^2+\left(\frac{1}{x}\right)^2 \quad 2\times x\times\frac{1}{x}=16$$

$$x^2+\frac{1}{x^2}+2=16$$

$$x^2+\frac{1}{x^2}=16-2$$

7. If $x-\frac{1}{x}=5$, find the value of :

(a) $x-\frac{1}{x}=5$ (given)

Squaring both the sides—

$$\left(x-\frac{1}{x}\right)^2=5^2$$

$$x^2+\left(\frac{1}{x}\right)^2-2\times x\times\frac{1}{x}=25$$

$$x^2+\left(\frac{1}{x}\right)^2-2\times x\times\frac{1}{x}=25$$

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

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

So, $$x^2+\frac{1}{x^2}=27$$

(b) $x^2+\frac{1}{x^2}=27$

Squaring both the side—

$$\left(x^2+\frac{1}{x^2}\right)^2=(27)^2$$

$$(x^2)^2+\left(\frac{1}{x^2}\right)^2+2\times x^2\times\frac{1}{x^2}=729$$

$$x^4+\frac{1}{x^4}+2=729$$

$$x^4+\frac{1}{x^4}=729-2$$

So, $$x^4+\frac{1}{x^4}=727$$

8. Find the value of the variable.

(a) $8a=34^2-26^2$

$8a=(34+26)(34-26)$

$a=\frac{60\times 8}{8}$

(b) $16x=536^2-136^2$

$8a=60\times 8$

$16x=(536+136)(536-136)$

So, $a = 60$

$16x = 672 \times 400$

$16x = 268800$

$x = \frac{268800}{16}$

So, $x = 16800$

(c) $0.03^2 - 0.01^2 = 0.4p$

$(0.03 + 0.01)(0.03 - 0.01) = 0.4\ p$

$0.04 \times 0.02 = 0.4\ p$

$P = \frac{0.04 \times 0.02}{0.4}$

$= 0.1 \times 0.02$

So, $P = 0.002$

9. Find the products using identities.

(a) $(2a^2 + 3b)(2a^2 + 3b)$

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

$= (2a^2)^2 + (3b)^2 + 2 \times 2a \times 3b$

$= 4a^2 + 9b^2 + 12ab$

(b) $(4p + 7q)(4p + 7q)$

$= (4p + 7q)^2$

$= (4p)^2 + (7q)^2 + 2 \times 4p \times 7q$

$= 16p + 49q + 56pq$

(c) $\left(\frac{2}{3}x + \frac{5}{7}y\right)\left(\frac{2}{3}x + \frac{5}{7}y\right)$

$= \left(\frac{2}{3}x + \frac{5}{7}y\right)^2$

$= \left(\frac{2}{3}x\right)^2 + \left(\frac{5}{7}y\right)^2 + 2 \times \frac{2}{3}x \times \frac{5}{7}$

$= \frac{4}{9}x^2 + \frac{25}{49}y^2 + \frac{20}{21}xy$

(d) $(3x-2y)(3x-2y)$

$=(3x-2y)^2$

$=(3x)^2+(2y)^2+2\times 3x\times 2y$

$=9x^2+4y^2+12xy$

(e) $\left(a+\frac{1}{a}\right)\left(a+\frac{1}{a}\right)$

$=\left(a+\frac{1}{a}\right)^2$

$=a^2+\left(\frac{1}{a}\right)^2+2\times a\times\frac{1}{a}$

$=a^2+\frac{1}{a^2}+2$

(f) $\left(x-\frac{1}{x}\right)\left(x-\frac{1}{x}\right)$

$=\left(x-\frac{1}{x}\right)^2$

$=x^2+\left(\frac{1}{x}\right)^2-2\times x+\frac{1}{x}$

$=x^2+\frac{1}{x^2}-2$

Mental Ability

A. Multiple Choice Questions (MCQs) :

1. (c) **2.** (a) **3.** (a) **4.** (d) **5.** (c) **6.** (d) **7.** (b) **8.** (c) **9.** (a) **10.** (a)

B. Fill in the blanks :

1. In $-3xy$, the coefficient of x is $\mathbf{-3y}$.

2. A letter used to represent a number is called **variable**.

3. Expression $3p+3q-3r$ is a **trinomial**.

4. The degree of the expression $x+x^2+x^3+4$ is **3**.

5. If $x=2$, the value of $-11-5x$ is **−21**.

C. State True (T) or False (F) :

1. True **2.** False **3.** False **4.** True **5.** False

Higher Order Thinking Skills

Addition of $3x^2y$, $6xy^2$ and $9x^2y^2$

$= 3x^2y + 6xy^2 + 9x^2y^2$

$\because$ Answer of $A = 18x^2y^2$

And, Answer of $B = 3x^2y + 6xy^2 + 9x^2y^2$

Hence, A is wrong. Because, we can add only like terms.

Chapter

7 Simple Equation

1. Write equations for the following statements.

(a) $7m = 84$ (b) $\frac{1}{2}y = 33$ (c) $5b - 3 = 12$

(d) $5x + 3 = 18$ (e) $d - 11 = 40$ (f) $\frac{1}{6}c + 2 = 8$

(g) $\frac{1}{4}p + 4 + 40$ (h) $\frac{t}{7} + 13 = 20$

2. Write the following equations in statement forms :

(a) Sum of x and 8 is 21.

(b) Difference between 5 and P is -3

(c) Negtive quotient of P and 7 is 7.

(d) Quotient of K and 9 is 9.

(e) Three-fourth of y is 15.

(f) 6 times x is added to 11 gives 35.

(g) 3 subtracted from the quotient of $\frac{b}{7}$ is 8.

(h) 5 subtracted from y is -12.

3. Form an equation for the following cases.

(a) $x + (x + 1) = 67$
$2x + 1 = 67$

(b) $(x + 6) + x = 24$
$2x + 6 = 24$

(c) $\frac{x}{2} + x = 117$

$x + 2x = 117 \times 2$

$3x = 234$

(d) $(2b - 6) + b = 240$

$3b - 6 = 240$

(e) $3x + 4 = 43$

(f) $x + \frac{2}{5}x = 35$

$5x + 2x = 35 \times 5$

$7x = 175$

Exercise 7.2

1. $x - 5 = 0$

By Trial and Error Method :

x	L.H.S.	R.H.S.	
1	$1 - 5 = -4$	0	L.H.S. $\neq$ R.H.S.
2	$2 - 5 = -3$	0	L.H.S. $\neq$ R.H.S.
3	$3 - 5 = -2$	0	L.H.S. $\neq$ R.H.S.
4	$4 - 5 = -1$	0	L.H.S. $\neq$ R.H.S.
5	$5 - 5 = 0$	0	L.H.S. $\neq$ R.H.S.

$\therefore$ $x = 5$ is the solution of the given equation.

By Systematic method :

$x - 5 = 0$

$x - 5 + 5 = 0 + 5$ {Adding 5 on both sides}

So, $x = 5$

2. $x + 4 = 0$

x	L.H.S.	R.H.S.	
0	$0 + 4 = 4$	0	L.H.S. $\neq$ R.H.S.
-1	$-1 + 4 = 3$	0	L.H.S. $\neq$ R.H.S.
-2	$-2 + 4 = 2$	0	L.H.S. $\neq$ R.H.S.
-3	$-3 + 4 = 1$	0	L.H.S. $\neq$ R.H.S.
-4	$-4 + 4 = 0$	0	L.H.S. $\neq$ R.H.S.

$\therefore$ $x = -4$ is the solution of the given equation.

By systematic method :

$$x + 4 = 0$$

$$x + 4 - 4 = 0 - 4 \quad \text{(Subtracting 4 from both sides)}$$

So, $x = -4$

3. $b - 7 = 9$

b	L.H.S.	R.H.S.	
10	$10 - 7 = 3$	9	L.H.S. $\neq$ R.H.S.
11	$11 - 7 = 4$	9	L.H.S. $\neq$ R.H.S.
12	$12 - 7 = 5$	9	L.H.S. $\neq$ R.H.S.
13	$13 - 7 = 6$	9	L.H.S. $\neq$ R.H.S.
14	$14 - 7 = 7$	9	L.H.S. $\neq$ R.H.S.
15	$15 - 7 = 8$	9	L.H.S. $\neq$ R.H.S.
16	$19 - 7 = 9$	9	L.H.S. $=$ R.H.S.

$\therefore$ $b = 16$ is the solution of the given equation.

By systematic method :

$$b - 7 = 9$$

$$b - 7 + 7 = 9 + 7 \quad \text{[Adding 7 on both sides]}$$

So, $b = 16$

4. $y + 8 = 20$

By Trial and Error Method :

y	L.H.S.	R.H.S.	
1	$1 + 8 = 9$	20	L.H.S. $\neq$ R.H.S.
2	$2 + 8 = 10$	20	L.H.S. $\neq$ R.H.S.
3	$3 + 8 = 11$	20	L.H.S. $\neq$ R.H.S.
4	$4 + 8 = 12$	20	L.H.S. $\neq$ R.H.S.
5	$5 + 8 = 13$	20	L.H.S. $\neq$ R.H.S.
6	$6 + 8 = 14$	20	L.H.S. $\neq$ R.H.S.
7	$7 + 8 = 15$	20	L.H.S. $\neq$ R.H.S.

8	$8+8=16$	20	L.H.S. $\neq$ R.H.S.
9	$9+8=17$	20	L.H.S. $\neq$ R.H.S.
10	$10+8=18$	20	L.H.S. $\neq$ R.H.S.
11	$11+8=19$	20	L.H.S. $\neq$ R.H.S.
12	$12+8=20$	20	L.H.S. $\neq$ R.H.S.

By systematic method :

$$y+8=20$$

$$y+8-8=20-8 \quad \text{[Subtracting 8 from both sides]}$$

So, $y=12$

5. $p+6=-6$

p	L.H.S.	R.H.S.	
1	$1+6=7$	-6	L.H.S. $\neq$ R.H.S.
-1	$-1+6=5$	-6	L.H.S. $\neq$ R.H.S.
-4	$-4+6=2$	-6	L.H.S. $\neq$ R.H.S.
-6	$-6+6=0$	-6	L.H.S. $\neq$ R.H.S.
-8	$-8+6=-2$	-6	L.H.S. $\neq$ R.H.S.
-10	$-10+6=-4$	-6	L.H.S. $\neq$ R.H.S.
-12	$-12+6=-6$	-6	L.H.S. $\neq$ R.H.S.

$\therefore$ $p=-12$ is the solutionof the given equation.

6. $q+9=9$

q	L.H.S.	R.H.S.	
1	$1+9=10$	9	L.H.S. $\neq$ R.H.S.
2	$2+9=11$	9	L.H.S. $\neq$ R.H.S.
-2	$-2+9=7$	9	L.H.S. $\neq$ R.H.S.
-1	$-1+9=8$	9	L.H.S. $\neq$ R.H.S.
0	$0+9=9$	9	L.H.S. $=$ R.H.S.

$\therefore$ $q=0$ is the solution fo the given equation.

7. $5d = 45$

d	L.H.S.	R.H.S.	
1	$5 \times 1 = 5$	45	L.H.S. $\neq$ R.H.S.
2	$5 \times 2 = 10$	45	L.H.S. $\neq$ R.H.S.
3	$5 \times 3 = 15$	45	L.H.S. $\neq$ R.H.S.
4	$5 \times 4 = 20$	45	L.H.S. $\neq$ R.H.S.
5	$5 \times 5 = 25$	45	L.H.S. $\neq$ R.H.S.
6	$6 \times 5 = 30$	45	L.H.S. $\neq$ R.H.S.
7	$7 \times 5 = 35$	45	L.H.S. $\neq$ R.H.S.
8	$8 \times 5 = 40$	45	L.H.S. $\neq$ R.H.S.
9	$9 \times 5 = 45$	45	L.H.S. $=$ R.H.S.

$\therefore$ $d = 9$ is the solution of the given equation.

8. $30t = -60$

t	L.H.S.	R.H.S.	
1	$30 \times 1 = 30$	-60	L.H.S. $\neq$ R.H.S.
2	$30 \times 2 = 60$	-60	L.H.S. $\neq$ R.H.S.
3	$30 \times 3 = 90$	-60	L.H.S. $\neq$ R.H.S.
-1	$30 \times (-1) = -30$	-60	L.H.S. $\neq$ R.H.S.
-2	$30 \times (-2) = -60$	-60	L.H.S. $=$ R.H.S.

$\therefore$ $t = -2$ is the solution of the given equation.

9. $\frac{-r}{8} = 6$

r	L.H.S.	R.H.S.	
1	$\frac{-1}{8}$	6	L.H.S. $\neq$ R.H.S.
8	$\frac{-8}{8} = -1$	6	L.H.S. $\neq$ R.H.S.

-8	$\frac{-(-8)}{8}=1$	6	L.H.S. $\neq$ R.H.S.
-16	$\frac{-(-16)}{8}=2$	6	L.H.S. $\neq$ R.H.S.
-24	$\frac{-(-24)}{8}=3$	6	L.H.S. $\neq$ R.H.S.
-32	$\frac{-(-32)}{8}=4$	6	L.H.S. $\neq$ R.H.S.
-40	$\frac{-(-40)}{8}=5$	6	L.H.S. $\neq$ R.H.S.
-48	$\frac{-(-48)}{8}=6$	6	L.H.S. $=$ R.H.S.

$\therefore \quad r=-48$, is the solution of the given equation.

10. $\frac{-a}{11}=\frac{18}{55}$

By systematic method :

$\frac{-a}{11}\times(-11)=\frac{18}{55}\times(-11)$ [Multiplying both the sides by (-11)]

$+a=\frac{18}{-5}=-3\frac{3}{5}$

So, $a=-3\frac{3}{5}$

11. $\frac{y}{16}=\frac{7}{48}$

By systematic method :

$\frac{y}{16}\times 16=\frac{7}{48}\times 16$ [Multiplying both the sides by 16]

So, $y=\frac{7}{3}$

12. $3n-2=22$

By systematic method :

$$3n - 2 + 2 = 22 + 2 \quad \text{[Adding 2 on both the sides]}$$

$$3n = 24$$

$$\frac{3n}{3} = \frac{24}{3} \quad \text{[Dividing both the sides by 3]}$$

So, $n = 8$

13. $4x + 9 = 45$

x	L.H.S.	R.H.S.	
1	$4 \times 1 + 9 = 13$	45	L.H.S. $\neq$ R.H.S.
2	$4 \times 2 + 9 = 17$	45	L.H.S. $\neq$ R.H.S.
3	$4 \times 3 + 9 = 21$	45	L.H.S. $\neq$ R.H.S.
4	$4 \times 4 + 9 = 25$	45	L.H.S. $\neq$ R.H.S.
5	$4 \times 5 + 9 = 29$	45	L.H.S. $\neq$ R.H.S.
6	$4 \times 6 + 9 = 33$	45	L.H.S. $\neq$ R.H.S.
7	$4 \times 7 + 9 = 37$	45	L.H.S. $\neq$ R.H.S.
8	$4 \times 8 + 9 = 41$	45	L.H.S. $\neq$ R.H.S.
9	$4 \times 9 + 9 = 45$	45	L.H.S. $=$ R.H.S.

$\therefore$ $x = 9$ is the solution of given equation.

14. $14l = 56$

l	L.H.S.	R.H.S.	
1	$14 \times 1 = 14$	56	L.H.S. $\neq$ R.H.S.
2	$14 \times 2 = 28$	56	L.H.S. $\neq$ R.H.S.
3	$14 \times 3 = 42$	56	L.H.S. $\neq$ R.H.S.
4	$14 \times 4 = 56$	56	L.H.S. $=$ R.H.S.

15. $15p + 15 = 90$

p	L.H.S.	R.H.S.	
1	$15 \times 1 + 15 = 30$	90	L.H.S. $\neq$ R.H.S.
2	$15 \times 2 + 15 = 45$	90	L.H.S. $\neq$ R.H.S.
3	$15 \times 3 + 15 = 60$	90	L.H.S. $\neq$ R.H.S.

4	$15\times 4+15=75$	90	L.H.S. $\neq$ R.H.S.
5	$15\times 5+15=90$	90	L.H.S. $=$ R.H.S.

$\therefore$ $p=5$ is the solution of the given equation.

16. $-5x-8=107$

x	L.H.S.	R.H.S.	
1	$-5\times 1-8=-13$	107	L.H.S. $\neq$ R.H.S.
-1	$-5\times(-1)-8=-3$	107	L.H.S. $\neq$ R.H.S.
-3	$-5\times(-3)-8=7$	107	L.H.S. $\neq$ R.H.S.
-5	$-5\times(-5)\times 8=17$	107	L.H.S. $\neq$ R.H.S.
-10	$-5\times(-10)-8=42$	107	L.H.S. $\neq$ R.H.S.
-13	$-15\times(-13)-8=57$	107	L.H.S. $\neq$ R.H.S.
-15	$-5\times(-15)-8=92$	107	L.H.S. $\neq$ R.H.S.
-20	$-5\times(-20)-8=92$	107	L.H.S. $\neq$ R.H.S.
-23	$-5\times(-23)-8=107$	107	L.H.S. $=$ R.H.S.

17. $4y+3y=84$

y	L.H.S.	R.H.S.	
1	$4\times 1+3\times 1=7$	84	L.H.S. $\neq$ R.H.S.
4	$4\times 4+3\times 4=28$	84	L.H.S. $\neq$ R.H.S.
8	$4\times 8+3\times 8=56$	84	L.H.S. $\neq$ R.H.S.
10	$4\times 10+3\times 10=70$	84	L.H.S. $\neq$ R.H.S.
11	$4\times 11+3\times 11=77$	84	L.H.S. $\neq$ R.H.S.
12	$4\times 12+3\times 12=84$	84	L.H.S. $=$ R.H.S.

$\therefore$ $y=12$ is the solution of the given equation.

18. $5+9x-7=9x-2-x$

x	L.H.S.	R.H.S.	
1	$5+9\times 1-7=7$	$9\times 1-2-1=6$	L.H.S. $\neq$ R.H.S.
2	$5+9\times 2-7=16$	$9\times 2-2-2=14$	L.H.S. $\neq$ R.H.S.

3	$5+9\times 3-7=25$	$9\times 3-2-3=22$	L.H.S. $\neq$ R.H.S.
-1	$5+9\times(-1)-7=-11$	$9\times(-1)-2-(-1)$	L.H.S. $\neq$ R.H.S.
-2	$5+9\times(-2)-7=-20$	$9\times(-2)-2-(-2)$ $=-18$	L.H.S. $\neq$ R.H.S.
0	$5+9\times 0-2$	$9\times 0-2-0=-2$	L.H.S. $=$ R.H.S.

$\therefore$ $x=0$ is the solution of given equation.

19. $x+\frac{1}{2}=19$

$$x+\frac{1}{2}-\frac{1}{2}=19-\frac{1}{2} \quad \text{[Subtracting } (-2) \text{ both the sides]}$$

$$x=\frac{38-1}{2}$$

So, $$x=\frac{37}{2}=18\frac{1}{2}$$

20. $2S-\frac{1}{2}=-\frac{1}{3}$

$2S=-\frac{1}{3}+\frac{1}{2}$

$2S=\frac{-2+3}{6}=\frac{1}{6}$

$S=\frac{1}{6}\times 2=\frac{2}{6}=\frac{1}{3}$

So, $S=\frac{1}{3}$

Exercise 7.3

1. $-2(y+3)=7$

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

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

$y=\frac{-7-6}{2}=\frac{-13}{2}$

2. $2m+\frac{5}{2}=\frac{37}{2}$

$2m=\frac{37}{2}-\frac{5}{2}$

$2m=\frac{37-2}{5}$

$m=\frac{32}{2\times 2}=8$

Check :

$$\text{L.H.S.} = -\left[\frac{-13}{2} + 3\right]$$

$$= -2\left[\frac{-13+6}{2}\right]$$

$$= -2 \times \left(\frac{-7}{2}\right) = 7 = \text{R.H.S.}$$

Hence, $y = \frac{-13}{2}$ is the solution of the given equation.

Check :

$$\text{L.H.S.} = 2m + \frac{5}{2}$$

$$= 2 \times 8 + \frac{5}{2}$$

$$= 16 + \frac{5}{2} = \frac{32+5}{2}$$

$$= \frac{37}{2} = \text{R.H.S.}$$

Hence, $m = 8$, is the solution of given equation.

3. $34 - 5(n-1) = 4$

$-5(n-1) = 4 - 34$

$-5(n-1) = -30$

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

$n = 6 + 1 = 7$

Check : L.H.S. $= 34 - 5(n-1)$

$= 34 - 5(7-1)$

$= 34 - 5 \times 6$

$= 34 - 30$

$= 4 = \text{R.H.S.}$

Hence, $n = 7$ is the solution of given equation.

4. $-4(4-x) = 2x + 5$

$-12 + 3x = 2x + 5$

$3x - 2x = 5 + 12$

$x = 17$

Check : L.H.S. $= -3(4-x)$

$= -3(4-17)$

$= -3 \times (-13) = 39$

R.H.S. $= 2x + 5$

$= 2 \times 17 + 5$

$= 34 + 5 = 39$

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

Hence, $x = 17$ is the solution of given equation.

5. $0 = 18 + 9(m-2)$

$0 = 18 + 9m - 18$

$0 = 9m$

$m = \frac{0}{9} = 0$

Check : L.H.S. $= 18 + 9(0-2)$

6. $4(5x-4) + 3(2x-1) = 7$

$20(x) - 16 + 6x - 3 = 7$

$26x - 7 = 7$

$26x = 7 + 19$

$26x = 26$

$= 18 + 9 \times (-2)$

$= 18 - 18$

$= 0 = \text{R.H.S.}$

Hence, $m = 0$ is the solution of given equation.

7. $4x - \frac{1}{3} = \frac{1}{5} + 3x$

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

$x = \frac{3+5}{15} = \frac{8}{15}$

Hence, $x = \frac{8}{15}$ is the solution of given equation.

Check : L.H.S. $= 4 \times \frac{8}{15} - \frac{1}{3}$

$= \frac{32}{15} - \frac{1}{3}$

$= \frac{32-5}{15} = \frac{27}{15} = \frac{9}{5}$

R.H.S. $= \frac{1}{5} + 3 \times \frac{8}{15}$

$= \frac{1}{5} + \frac{8}{5} = \frac{1+8}{5} = \frac{9}{5}$

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

$x = \frac{26}{26} = 1$

Hence, $x = 1$ is the solution of given equation.

Check :

L.H.S. $= 4(5x - 4) + 3(2x - 1)$

$= 4(5 \times 1 - 4) + 3(2 \times 1 - 1)$

$= 4(5 - 4) + 3(2 \times 1 - 1)$

$= 4(5 - 4) + 3(2 - 1)$

$= 4 \times 1 + 3 \times 1$

$= 4 + 3 = 7 = \text{R.H.S.}$

8. $\frac{y}{5} - \frac{y}{6} = \frac{1}{30}$

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

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

Hence, $y = 1$ is the solution of given equation.

Check : L.H.S. $= \frac{y}{5} - \frac{y}{6}$

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

$= \frac{1}{30} = \text{R.H.S.}$

Hence, $y = 1$ is the solution of given equation.

9. $\frac{2x}{3} - \frac{x}{2} = 30$

$\frac{4x - 3x}{6} = 30$

$x = 30 \times 6$

$x = 180$

Check : L.H.S. $= \frac{2x}{3} - \frac{x}{2}$

$= \frac{2 \times 180}{3} - \frac{180}{2}$

$= 120 - 90 = 30 =$ R.H.S.

Hence, $x = 180$ is the solution of given equation.

10. $\frac{7b}{8} - 15 = -1$

$\frac{7b}{8} = -1 + 15$

$\frac{7b}{8} = 14$

$b = \frac{14 \times 8}{7} = 16$

Check : L.H.S. $= \frac{7b}{8} - 5$

$= \frac{7 \times 16}{8} - 15$

$= 14 - 15$

$= -1 =$ R.H.S.

Hence, $b = 16$ is the solution of the given equation.

11. $\frac{x}{4} = \frac{x}{5} + 1$

$\frac{x}{4} - \frac{x}{5} = 1$

$\frac{5x - 4x}{20} = 1$

$x = 1 \times 20 = 20$

Check : L.H.S. $= \frac{x}{4}$

$= \frac{20}{4} = 5$

R.H.S. $= \frac{x}{5} + 1$

$= \frac{20}{5} + 1$

$= \frac{20}{5} + 1$

12. $3p - 2(2p - 5) = 2(p + 3) - 8$

$3p - 4p + 10 = 2p + 6 - 8$

$-p + 10 = 2p - 2$

$-p - 2p = -2 - 10$

$-p = -12$

$p = \frac{-12}{-3} = +4$

Check : L.H.S. $= 3p - 2(2p - 5)$

$= 3 \times 4 - 2[2 \times 4 - 5]$

$= 12 - 2[8 - 5]$

$= 4 + 1 = 5$

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

Hence, $x = 20$ is the solution of the given equation.

$= 12 - 2 \times 3$

$= 12 - 6 = 6$

R.H.S. $= 2(p + 3) - 8$

$= 2(4 + 3) - 8$

$= 2 \times 7 - 8$

$= 14 - 8 = 6$

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

Hence, $p = 4$ is the solution of given equation.

Exercise 7.4

1. Let, two consecutive numbers are x and $(x + 2)$.

Thus, $x + (x + 2) = 136$

$2x = 136 - 2$

$x = \frac{134}{2} = 67$

Hence, the required consecutive numbers are 67 and 69.

2. Let, the required number be x.

Thus, $2x + 7 = 59$

$2x = 59 - 7$

$x = \frac{52}{2} = 26$

Hence, the required number is 26.

3. Let, the required number be x.

Thus, $\frac{3}{4}x + x = 91$

$\frac{3x + 4x}{4} = 91$

$7x = 91 \times 4$

$x = \frac{91 \times 4}{7}$

$x = 52$

Hence, the required number is 26.

4. Let, the two consecutive even numbers are x and $x + 2$.

Thus, $$x + (x + 2) = 502$$
$$x + x + 2 = 502$$
$$2x = 502 - 2$$
$$x = \frac{500}{2} = 250$$

Hence, the required number is 250.

5. Let the required number be x.

Thus, $$\frac{2}{3}x = \frac{1}{3}x + 3$$
$$\frac{2}{3}x - \frac{1}{3}x = 3$$
$$\frac{2x - x}{3} = 3$$
$$x = 3 \times 3$$
$$x = 9$$

Hence, the required number is 9.

6. Let, the required number be x.

Thus, $$5x - 3 = 42$$
$$5x = 42 + 3$$
$$x = \frac{45}{5} = 9$$

Hence, the required number is 9.

7. Let, the number of boys in class be x.

Thus, number of girls in class $= \frac{3}{5}x$.

$\therefore$ $$x + \frac{3}{5}x = 40$$
$$\frac{5x + 3x}{5} = 40$$
$$8x = 40 \times 5$$
$$x = \frac{40 \times 5}{8} = 25$$

Hence, the number of girls in the class is $\frac{3}{5} \times 25 = 15$.

8. The ratio of all the angles of a triangle $= 1:2:3$

Let, the angles of the triangle $= x$, $2x$ and $3x$.

$\because$ Sum of all the angles of triangle $= 180°$

$$\therefore \quad x + 2x + 3x = 180°$$
$$6x = 180°$$
$$x = \frac{180°}{6} = 30°$$
$$2x = 2 \times 30° = 60°$$

and, $3x = 3 \times 30° = 90°$

Hence, 30°, 60° and 90° are the angles of the triangle.

9. Let, the age of Varun be x.

Thus, age of Varun's mother $= 5x$.

$\because$ Sum of their ages $= 48$ years

$$\therefore \quad x + 5x = 48$$
$$6x = 48$$
$$x = \frac{48}{6} = 8 \text{ years}$$

Hence, the age of Varun is 8 years, and the age of his mother is 40 years.

10. Let, three consecutive integers are x, $2x$ and $3x$.

Thus, $x + 2x + 3x = 72$

$$6x = 72$$
$$x = \frac{72}{6} = 12$$
$$2x = 2 \times 12 = 24$$
$$3x = 3 \times 12 = 36$$

Hence, the required three consecutive integers are 12, 24 and 36.

11. Let the age of Nisha be x.

Thus, the age of her mother $= 3x$.

$\because$ Sum of their ages $= 72$ years

$\therefore \quad x + 3x = 72$

$4x = 72$

$x = \frac{72}{4} = 18$

Hence, the age of Nisha is 18 years, and the age of her mother is $3 \times 18 = 54$ years.

12. Let, the score of Siddhu $= x$ runs

Thus, the score of Raina $= 2x$ runs

$\because$ Their together runs $= 2 \times 100 - 5$

$\therefore \quad x + 2x = 200 - 5$

$3x = 195$

$x = \frac{195}{3} = 65$

Hence, the score of Sidhu is 65 runs, and the score of Raina is $2 \times 65 = 130$ runs.

13. Let, each base angle of isoscele triangle be x.

Thus, vertex angle of isoscele triangle $= 3x$.

$\because$ Sum of all the angles of a triangle $= 180°$

$\therefore \quad x + x + 3x = 180°$

$5x = 180°$

$x = \frac{180°}{5} = 36°$

And, $\quad 3x = 3 \times 36° = 108°$

Hence, the angle of triangle are 36°, 36° and 108°.

14. Let, the breadth of the rectangle be x.

Thus, the length of the rectangle $= 4x - 3$

$\because$ Perimeter of rectangle $= 2(l + b)$

$2[(4x - 3) + x] = 94$ m

$8x - 6 + 2x = 94$

$10x = 94 + 6$

$x = \frac{100}{10} = 10$ metre

So, the length of rectangle is $4 \times 10 - 3 = 37$ m

and the breadth of rectangle is 10 m.

15. Let, the age of Rekha's mother be x.

Thus, the age of Rekha $= x - 5$

After 4 years, the age of her brother $= x + 4$

After 4 years, the age of Rekha $= x - 5 + 4 = x - 1$

$\because$ Ratio of their ages $= 2 : 3$

$\therefore$ $(x-1):(x+4) = 2:3$

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

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

$$3x - 3 = 2x + 8$$

$$3x - 2x = 8 + 3$$

$$x = 11 \text{ years}$$

Hence, the age of Rekha is $(15-5) = 6$ years and the age of her brother is 11 years.

16. Let the number of 2-rupee coins $= x$

Thus, the number of 1-rupee coins $= 3x$

So, ₹ $2 \times x +$ ₹ $1 \times 3x =$ ₹ 50

$$2x + 3x = 50$$

$$5x = 50$$

$$x = \frac{50}{5} = 10$$

Hence, the number of 2-rupee coins is 10 and the number of 1 rupee coins is $2 \times 10 = 20$.

17. Let, the present age of Gulshan be x.

After 15 years, the age of Gulshan $= x + 15$

So, $$4x = x + 15$$

$$4x - x = 15$$

$$3x = 15$$

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

$$x = 5$$

Hence, the present age of Gulshan is 5 years.

18. Let, the number of 100-rupee notes $= x$

and, the number of 500-rupee notes $= y$

Thus, $x + y = 30$ ...(1)

and, ₹ $100x +$ ₹ $500y =$ ₹ 5000

$$100x + 500y = 5000$$

$$100(x + 5y) = \frac{5000}{100}$$

$$x + 5y = 50$$

$$x = 50 - 5y$$

Put, the value of x in Equation (1),

$$50 - 5y + y = 30$$

$$-4y = 30 - 50$$

$$y = \frac{-20}{-4} = 5$$

Put, the value of y in equation (1),

$$x + 5 = 30$$

$$x = 30 - 5 = 25$$

Hence, the number of ₹ 100 - notes are 25,

and the number of ₹ 500 - notes are 5.

Mental Ability

A. Multiple Choice Questions (MCQs):

1. (a) **2.** (b) **3.** (d) **4.** (c) **5.** (c) **6.** (b) **7.** (b) **8.** (c)

B. Fill in the blanks :

1. $6x + 19 = 25x$ is an equation in **one** variable.
2. In an equation, the two expressions on either side of equality sign have **equal** value.
3. The value of the variable of an equation is called the solution of the **expression or equation**.
4. If $10x + 8 = 38$, then $x =$ **degree**.

5. The highest power of a variable in a linear equation is called its _____.

C. Sate True (T) or False (F) :

1. True **2.** True **3.** False **4.** True **5.** False

Higher Order Thinking Skills

1. $3x * 2 = 7$

Put $x = 3$

$$3 \times 3 * 2 = 7$$
$$9 * 2 = 7$$
$$\because \quad 9 - 2 = 7$$

Hence, $(-)$ sign to be put in place of * in the equation.

2. $\because$ The speed of second car more than the first car.

$\therefore$ The second car will be closer to Delhi when they meet.

Chapter

8 Exponents

Exercise 8.1

1. Fill in the blanks :

(a) $(-9)^3 = \mathbf{-729}$

(b) $\left(-\frac{1}{6}\right)^4 = \mathbf{\frac{1}{1296}}$

(c) $0^4 = \mathbf{0}$

(d) $(-5)^2 \times (-5)^3 = \mathbf{-3125}$

2. Express in power notation :

(a) $\frac{1}{256} = \frac{1}{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2} = \frac{1}{(2)^8} = \left(\frac{1}{2}\right)^8$

(b) $\frac{-1}{27} = \frac{1}{-27} = \frac{1}{(-3) \times (-3) \times (-3)} = \frac{1}{(-3)^3} = \left(\frac{-1}{3}\right)^3$

(c) $\frac{-64}{125} = \frac{-(2\times 2\times 2\times 2\times 2\times 2)}{5\times 5\times 5} = \frac{(-4)\times(-4)\times(-4)}{5\times 5\times 5} = \left(-\frac{4}{5}\right)^3$

(d) $\frac{729}{15625} = \frac{3\times 3\times 3\times 3\times 3\times 3}{5\times 5\times 5\times 5\times 5\times 5} = \left(\frac{3}{5}\right)^6$

3. Find the value of :

(a) $\left(\frac{12}{17}\right)^2 = \frac{12\times 12}{17\times 17} = \frac{144}{289}$

(b) $\left(\frac{-33}{51}\right)^3 = \frac{(-33)\times(-33)\times(-33)}{51\times 51\times 51} = \frac{35937}{132651}$

(c) $\left(\frac{-1}{23}\right)^4 = \frac{(-1)\times(-1)\times(-1)\times(-1)}{23\times 23\times 23\times 23} = \frac{1}{279841}$

(d) $\left(\frac{11}{10}\right)^5 = \frac{11\times 11\times 11\times 11\times 11}{10\times 10\times 10\times 10\times 10} = \frac{161051}{100000}$

4. Express the following in the exponential notation :

(a) $\frac{3}{17}\times\frac{3}{17}\times\frac{3}{17}\times\frac{3}{17}\times\frac{3}{17}\times\frac{3}{17} = \left(\frac{3}{17}\right)^6$

(b) $\left(\frac{-2}{21}\right)\times\left(\frac{-2}{21}\right)\times\left(\frac{-2}{21}\right)\times\left(\frac{-2}{21}\right)\times\left(\frac{-2}{21}\right) = \left(\frac{-2}{21}\right)^5$

(c) $10000000 = 10^7$

5. Which is greater?

(a) 2^9 or $9^2 = 2\times 2\times 2\times 2\times 2\times 2\times 2\times 2\times 2 = 512$

$9^2 = 9\times 9 = 81$

$\because$ $81 < 512$

$\therefore$ 2^9 is greater than 9^2.

(b) $4^5 = 4\times 4\times 4\times 4\times 4 = 1024$

$5^4 = 5\times 5\times 5\times 5 = 625$

$\because$ $1024 > 625$

$\therefore$ 4^5 is greater than 5^4.

(c) 6×10^{12} or 5×10^{13}

$\because \quad 6\times 10^{12} < 50\times 10^{12}$

$\therefore \quad 5\times 10^{13}$ is greater than 6×10^{12}.

6. Write the reciprocal of each in the exponential form :

(a) $\dfrac{256}{2401} = \dfrac{2\times 2\times 2\times 2\times 2\times 2\times 2\times 2}{7\times 7\times 7\times 7} = \dfrac{4\times 4\times 4\times 4}{7\times 7\times 7\times 7}$

$= \left(\dfrac{4}{7}\right)^4$

So, reciprocal of $\dfrac{256}{2401}$ is $\left(\dfrac{7}{4}\right)^4$.

(b) $\dfrac{-12167}{68921} = \dfrac{-(23\times 23\times 23)}{41\times 41\times 41} = \dfrac{(-23)\times(-23)\times(-23)}{41\times 41\times 41} = \left(\dfrac{-23}{41}\right)^3$

So, reciprocal of $\dfrac{-12167}{98921}$ is $\left(-\dfrac{41}{23}\right)^3$

(c) $\left(\dfrac{-4}{9}\right)^2 = \left(\dfrac{4}{9}\right)^2 = \left(\dfrac{2^2}{3^2}\right)^2 = \left(\dfrac{2}{3}\right)^4$

So, reciprocal of $\left(\dfrac{-4}{9}\right)^2$ is $\left(\dfrac{3}{2}\right)^4$.

(d) $\left(\dfrac{-5}{11}\right)^5$

So, reciprocal of $\left(\dfrac{-5}{11}\right)^5$ is $\left(\dfrac{-11}{5}\right)^3$

7. Find the value of :

(a) $\left(\dfrac{-3}{5}\right)^3 \div \left(\dfrac{-2}{5}\right)^5$

$= \left(\dfrac{-3}{5}\right)^3 \times \left(\dfrac{5}{-2}\right)^5 = \dfrac{(-3)\times(-3)\times(-3)}{5\times 5\times 5}$

$\times \dfrac{5\times 5\times 5\times 5\times 5}{(-2)\times(-2)\times(-2)\times(-2)\times(-2)}$

$$= \frac{-27 \times 25}{-32} = \frac{675}{32}$$

(b) $\left(\frac{2}{3}\right)^4 \div \left(\frac{4}{5}\right)^2$

$$= \left(\frac{2}{3}\right)^4 \times \left(\frac{5}{4}\right)^2 = \frac{2 \times 2 \times 2 \times 2}{3 \times 3 \times 3 \times 3} \times \frac{5 \times 5}{4 \times 4}$$

$$= \frac{16}{81} \times \frac{25}{16} = \frac{25}{81}.$$

(c) $\left(\frac{1}{2}\right)^4 \times \left(\frac{4}{9}\right)^2$

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

$$= \frac{1}{16} \times \frac{16}{81} = \frac{1}{81}$$

(d) $\left(\frac{-4}{3}\right)^3 \times \left(\frac{9}{8}\right)^2$

$$= \frac{(-4) \times (-4) \times (-4)}{3 \times 3 \times 3} = \frac{9 \times 9}{8 \times 8}$$

$$= \frac{-64}{27} \times \frac{81}{64} = \frac{-81}{27} = -3$$

(e) $\left(\frac{-5}{8}\right)^3 \times \left(\frac{-24}{5}\right)^2$

$$= \frac{(-5) \times (-5) \times (-5)}{8 \times 8 \times 8} \times \frac{(-24) \times (-24)}{5 \times 5}$$

$$= \frac{-125}{512} \times \frac{576}{25} = \frac{-5 \times 9}{8} = \frac{-45}{8}$$

(f) $\left(\frac{-3}{7}\right)^4 \times \left(\frac{14}{3}\right)^4$

$$= \frac{(-3) \times (-3) \times (-3) \times (-3)}{7 \times 7 \times 7 \times 7} \times \frac{14 \times 14 \times 14 \times 14}{3 \times 3 \times 3 \times 3}$$

$$= \frac{81}{2401} \times \frac{38416}{81} = 16$$

8. Simplify :

(a) $\left[\left(\frac{-3}{4}\right)^2 - \left(\frac{1}{2}\right)^3\right] \times 4^3$

$= \left[\frac{9}{16} - \frac{1}{8}\right] \times 64$

$= \left[\frac{9-2}{16}\right] \times 64$

$= \frac{7}{16} \times 64 = 7 \times 4 = 28$

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

$= \frac{1}{16} \times 16 \times \frac{(-1)}{125} = \frac{-1}{125}$

(c) $(13^2 - 12^2) \div \frac{25}{36}$

$= (169 - 144) \times \frac{36}{25}$

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

$= 25 \times \frac{36}{25} = 36$

(d) $(4^3 - 3^4) \times \left(\frac{1}{17}\right)^2$

$= (64 - 81) \times \frac{1}{289} = \frac{-17}{289}$

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

$= \frac{-64}{125} \times 25 \times \frac{1}{25} = \frac{-64}{125}$

(f) $2^5 - (5) \times 5 - 7$

$= 32 - 25 - 7 = 0$

9. Simplify and write as a rational number :

(a) $4^{10} \div 4^7 = 4^{10} \times \frac{1}{4^7} = 4^{10^{-7}} = 4^3 = 64$

(b) $\left(\frac{-1}{5}\right)^{17} \div \left(\frac{-1}{5}\right)^{14} = \left(-\frac{1}{5}\right)^{17} \times \left(-\frac{1}{5}\right)^{-14}$

$= \left(\frac{-1}{5}\right)^{17-14} = \left(\frac{-1}{5}\right)^3 = \frac{-1}{125}$

(c) $\left[\left(-\frac{3}{4}\right)^3\right]^2 = \left(\frac{-3}{4}\right)^{3 \times 2} = \left(\frac{-3}{4}\right)^6 = \frac{729}{4096}$

(d) $(-2)^3 \times (-2)^2 = (-2)^{3+2} = (-2)^5 = -32$

(e) $3^2 \times 3^2 = (3)^{2+2} = 3^4 = 18$

(f) $\left(\frac{1}{2}\right)^3 \times \left(\frac{1}{2}\right)^3 = \left(\frac{1}{2}\right)^{3+3} = \left(\frac{1}{2}\right)^6$

$= \frac{1}{64}$

10. Compute the following :

(a) $2^5 \times -3^4$

$= (2 \times 2 \times 2 \times 2 \times 2) \times [(-3) \times (-2) \times (-3) \times (-3)]$

$= 32 \times 81 = 2592$

(b) $\left(\frac{1}{2}\right)^3 \times \left(\frac{3}{4}\right)^2$

$= \frac{1}{8} \times \frac{9}{16} = \frac{9}{128}$

(c) $2^3 \times (-3)^2$

$= 8 \times 9 = 72$

(d) $\left(\frac{-2}{7}\right)^2 \div \left(\frac{5}{14}\right)^2$

$= \frac{4}{49} \div \frac{25}{196}$

$= \frac{4}{49} \times \frac{196}{25}$

$= \frac{4 \times 4}{25} = \frac{16}{25}$

(e) $\left(\frac{1}{3}\right)^4 \div \left(\frac{1}{6}\right)^3$

$= \frac{1}{81} \div \frac{1}{216} = \frac{1}{81} \times 216$

$= \frac{8}{3}$

(f) $\left(\frac{-6}{7}\right)^2 \div \left(\frac{1}{3}\right)^3$

$= \frac{36}{49} \div \frac{1}{27} = \frac{36}{49} \times 27 = \frac{972}{49}$

11. Compare the following expressions :

(a) $\left(\frac{-2}{3}\right)^2 = \frac{(-2) \times (-2)}{3 \times 3} = \frac{4}{9}$

and, $\left(\frac{-3}{2}\right)^2 = \frac{(-3) \times (-3)}{2 \times 2} = \frac{9}{4}$

$\because \quad \frac{9}{74} < \frac{9}{4}$

$\therefore \quad \left(\frac{-2}{3}\right)^2 < \left(\frac{-3}{2}\right)^2$

(b) 2^5 and 5^2

$$2^5 = 2 \times 2 \times 2 \times 2 \times 2 = 32$$

and, $\quad 5^2 = 5 \times 5 = 25$

$\because \quad 32 > 25$

$\therefore \quad 2^5 > 5^2$

(c) $(-3)^4$ and $(-4)^3$

$$(-3)^4 = (-3) \times (-3) \times (-3) \times (-3) = 81$$

and, $(-4)^3 = (-4) \times (-4) \times (-4) = -64$

$\because \quad 81 > (-64)$

$\therefore \quad (-3)^4 > (-4)^3$

12. $16 \times 16 \times 16 \times 16 = (4 \times 4) \times (4 \times 4) \times (4 \times 4) \times (4 \times 4)$

$$= 4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4$$

$$= 4^8$$

13. Express each of the following as a product of prime factors only in exponential form :

(a) $54 \times 36 = (2 \times 3 \times 3 \times 3) \times (2 \times 2 \times 3 \times 3)$

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

$$= 2^3 \times 3^4$$

(b) $64 \times 243 = (2 \times 2 \times 2\,2 \times 2 \times 2) \times (7 \times 7 \times 7)$

$$= 2^6 \times 7^3$$

Exercise 8.2

1. Simplify and write in the exponential form :

(a) $\left(\frac{4}{5}\right)^8 \times \left(\frac{4}{5}\right)^7$ (b) $\left(\frac{-3}{11}\right)^3 \times \left(\frac{-3}{11}\right)^8$

$$=\left(\frac{4}{5}\right)^{8+7}=\left(\frac{4}{5}\right)^{15}$$

(c) $\left(\frac{-2}{13}\right)^{17}\div\left(\frac{-2}{13}\right)^{5}$

$$=\left(\frac{-2}{13}\right)^{17-5}=\left(\frac{-2}{13}\right)^{12}$$

(d) $\left(\frac{-1}{4}\right)^{3}\div\left(\frac{-1}{4}\right)^{7}$

$$=\left(\frac{-3}{11}\right)^{3+8}=\left(\frac{-3}{11}\right)^{11}$$

$$=\left(\frac{-1}{4}\right)^{3+7}=\left(\frac{-1}{4}\right)^{10}$$

(e) $(-6)^{3}\div(-6)^{9}$

$$=(-6)^{3-9}=(-6)^{-6}$$

$$=\left(\frac{1}{-6}\right)^{6}=\left(\frac{-1}{6}\right)^{6}$$

(f) $\left[\left(\frac{-3}{13}\right)^{6}\right]^{3}$

$$=\left(\frac{-3}{13}\right)^{6\times 3}$$

$$=\left(\frac{-3}{13}\right)^{18}$$

2. Use the laws of exponent and give your answer in exponential form :

(a) $\left(\frac{10}{13}\right)^{3}\times\left(\frac{10}{13}\right)^{7}$

$$=\left(\frac{10}{13}\right)^{3+7} \qquad \{\because a^{m}\times a^{n}=a^{m+n}\}$$

(b) $\left\{\left(\frac{25}{26}\right)^{1}\right\}^{3}$

$$=\left(\frac{25}{26}\right)^{1\times 3} \qquad \{\because (a^{m})^{n}=a^{m\times n}\}$$

$$=\left(\frac{25}{26}\right)^{3}$$

(c) $\left(\frac{-11}{25}\right)^{14}\div\left(\frac{-11}{25}\right)^{8}$

$$= \left(\frac{-11}{25}\right)^{14-8} \qquad \{\because a^m \div a^n = a^{m-n}\}$$

$$= \left(\frac{-11}{25}\right)^{6}$$

(d) $\left(-\frac{2}{5}\right)^{3} \times \left(\frac{-2}{5}\right)^{-2} \times \left(\frac{-2}{5}\right)^{-4}$

$$= \left(\frac{-2}{5}\right)^{3-2-4} \qquad \{\because a^m \times a^n = a^{m+n}\}$$

$$= \left(\frac{-2}{5}\right)^{-3} = \left(\frac{-5}{2}\right)^{3} \qquad \left\{\because a^m - \frac{1}{a^{-m}}\right\}$$

3. Express as a rational number :

(a) $(13)^{-1} = \frac{1}{13}$

(b) $\left(\frac{5}{7}\right)^{-1} = \frac{7}{5}$

(c) $\left(\frac{-4}{11}\right)^{-1} = \frac{11}{-4}$

(d) $\left(\frac{-7}{13}\right)^{-1} = \frac{-13}{7}$

(e) $(-2)^{-1} \times \left(\frac{2}{3}\right)^{-1}$

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

(f) $\left(\frac{4}{9}\right)^{-1} \times \left(\frac{3}{8}\right)^{-1}$

$= \frac{9}{4} \times \frac{8}{3} = 3 \times 2 = 6$

(g) $(90)^{\circ} \times \left(\frac{-3}{2}\right)^{-1}$

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

(h) $\left(\frac{-7}{5}\right)^{-1} \div 7^{0}$

$= \frac{5}{-7} \times \frac{1}{7^{\circ}} = \frac{-5}{7} \times 1 = \frac{-5}{7}$

4. Find the value of :

(a) 17^{0}

$= 1$

(b) $\left(\frac{6}{31}\right)^{0} + \left(\frac{13}{6}\right)^{0}$

$= 1 + 1 = 2$

(c) $\left(\frac{-7}{27}\right)^0$

$=1$

(d) $100^0 + 200^0 + 300^0$

$=1+1+1=3$

(e) $(80^0 - 20^0) - 40^0$

$=(1-1)-1$

$=0-1=-1$

(f) $(11^0 + 13^0)(12^0 - 11^0)$

$=(1+1)(1-1)$

$=2\times 0=0$

(g) $5^0 \times 6^0 \times 7^0$

$=1\times 1\times 1=1$

(h) $10^0 \div 5^0$

$=1\div 1=1$

5. Simplify :

(a) $(4^5 \times 4^6) \div 4^{11}$

$=4^{5+6} \times \frac{1}{4^{11}}$

$=4^{11-11} = 4^0 = 1$

(b) $(-5)^3 \div 5^3$

$=\frac{(-5)^3 \times (-5)^3 \times (-5)^3}{5\times 5\times 5}$

$=\frac{-125}{125}=-1$

(c) $\left[\left(\frac{2}{19}\right)^{15} \div \left(\frac{2}{19}\right)^{13}\right] \div \left(\frac{2}{19}\right)^2$

$\left[\frac{2}{19}\right]^{15-13} \div \left(\frac{2}{19}\right)^2 = \left(\frac{2}{19}\right)^{2-2}$

$=\left(\frac{2}{19}\right)^0 = 1$

(d) $\left[\left(\frac{-2}{7}\right)^2 \times \left(\frac{-2}{7}\right)^4\right] \div \left(\frac{4}{49}\right)^3$

$=\left[\left(\frac{-2}{7}\right)^{2+4}\right] \div \left[\frac{2\times 2}{7\times 7}\right]^3$

$=\left(\frac{-2}{7}\right)^6 \div \left[\left(\frac{2}{7}\right)^2\right]^3$

$$= \left(\frac{-2}{7}\right)^6 \div \left(\frac{2}{7}\right)^6$$

$$= (-1)^6 \times \left(\frac{2}{7}\right)^6 \div \left(\frac{2}{7}\right)^6$$

$$= (-1)^6 \times \left(\frac{2}{7}\right)^{6-6} = (-1)^6 \times \left(\frac{2}{7}\right)^0$$

$$= (+1) \times 1 = 1.$$

(e) $\left[\left(\frac{-8}{5}\right)^{12}\right]^0 = \left(\frac{-8}{5}\right)^{12 \times 0}$

$= \left(\frac{-8}{5}\right)^0 = 1$

(f) $\left[\left(\frac{5}{21}\right)^0\right]^3 = \left(\frac{5}{21}\right)^{0 \times 3}$

$= \left(\frac{5}{21}\right)^0 = 1$

6. Simplify :

(a) $(6^{-1} \div 12^{-1}) \times \frac{1}{2}$

$= \left(\frac{1}{6} \div \frac{1}{12}\right) \times \frac{1}{2}$

$= \left(\frac{1}{6} \times 12\right) \times \frac{1}{2}$

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

(b) $(4^{-1} - 5^{-1}) + (5^{-1} - 6^{-1})$

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

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

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

(c) $(5^{-1} \times 8^{-1}) \div 16^{-1}$

$= \left(\frac{1}{5} \times \frac{1}{8}\right) \div \frac{1}{16}$

$= \frac{1}{40} \times 16 = \frac{2}{5}$

(d) $(9^{-1} - 10^{-1}) \div 45^{-1}$

$= \left(\frac{1}{9} - \frac{1}{10}\right) \div \frac{1}{45}$

$= \left(\frac{10-9}{90}\right) \times 45$

$= \frac{1}{90} \times 45 = \frac{1}{2}$

(d) $(9^{-1} - 10^{-1}) \div 45^{-1}$

$= \left(\frac{1}{9} - \frac{1}{10}\right) \div \frac{1}{45}$

$$=\left(\frac{10-9}{90}\right)\times 45$$

$$=\frac{1}{90}\times 45=\frac{1}{2}$$

7. Find the value :

(a) $\left[\left(\frac{-2}{11}\right)^4\times\left(\frac{-2}{11}\right)^7\right]\div\left(\frac{-2}{11}\right)^9$

$$=\left[\left(\frac{-2}{11}\right)^{4+7}\right]\div\left(\frac{-2}{11}\right)^9$$

$$=\left(\frac{-2}{11}\right)^{11}\div\left(\frac{-2}{11}\right)^9=\left(\frac{-2}{11}\right)^{11-9}=\left(\frac{-2}{11}\right)^2=\frac{4}{121}$$

(b) $[(-3)^{10}\div(-3)^9]\times(-3)^2$

$$=[(-3)^{10-9}]\times(-3)^2$$

$$=(-3)^1\times(-3)^2$$

$$=(-3)^{1+2}=(-3)^3$$

(c) $\left[\left(\frac{-4}{5}\right)^5\div\left(\frac{-4}{5}\right)^9\right]\times\left(\frac{-4}{5}\right)^6$

$$=\left[\left(\frac{-4}{5}\right)^{5-9}\right]\times\left(\frac{-4}{5}\right)^6$$

$$=\left(\frac{-4}{5}\right)^{-4}\times\left(\frac{-4}{5}\right)^6=\left(\frac{-4}{5}\right)^{-4+6}=\left(\frac{-4}{5}\right)^2=\frac{16}{25}$$

(d) $\left[\left(\frac{-1}{2}\right)^{11}\div\left(\frac{-1}{2}\right)^{10}\right]^3$

$$=\left[\left(\frac{-1}{2}\right)^{11-10}\right]^3$$

$$=\left[\left(\frac{-1}{2}\right)^1\right]^3=\left(\frac{-1}{2}\right)^{1\times 3}=\left(\frac{-1}{2}\right)^3=\frac{-1}{8}$$

8. Let, the other number be *x*.

Thus, $(-3)^{-1}\times x=(-5)^{-1}$

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

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

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

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

9. Let, the required number be *x*.

Thus, $$\left(\frac{-2}{3}\right)^{-1}\times x=\left(\frac{-3}{2}\right)^{-1}$$

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

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

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

Hence, the required number is 1.

10. Which of the following statements are true?

(a) $a^m\times a^n=a^{m+n}$ (True)

(b) $a^m\div a^n=a^{m\div n}$ (False)

(c) $(a^m)^n=a^{mn}$ (True)

(d) $a^m\div a^m=1$ (True)

Exercise 8.3

1. Write the following as a power of 10.

(a) 0.0001

$= \frac{1}{10000} = 10^{-4}$

(b) $\frac{1}{1000}$

$= \frac{1}{(10)^3} = 10^{-3}$

(c) 900000

$= 9 \times 100000$

$= 9 \times 10^5$

(d) 100000000

$= 10^8$

(e) $\frac{1}{1200000}$

$= \frac{1}{12} \times \frac{1}{100000}$

$= 0.08333 \times 10^{-5}$

$= 0.8333 \times 10^{-6}$

(f) 0.000001

$= \frac{1}{1000000} = 10^{-6}$

2. Write the following in the usual form :

(d) 12×10^{12}

$= 12 \times 1000000000000$

$= 12000000000000$

(b) 6.09×10^7

$= 6.09 \times 10000000$

$= 60900000$

(c) 5.3×10^{-1}

5.3×10^{-1}

$= \frac{53}{100} = 0.53$

(d) 9.8×10^6

$= 9.8 \times 1000000$

$= 9800000$

(e) 0.032×10^2

$= 0.032 \times 100$

$= 3.2$

(f) 6.7931×10^6

$= 6.7931 \times 1000000$

$= 6793100$

3. Express the following in the standard form :

(a) 481000

$= 481 \times 1000$

(b) 19 billion

$= 19,000,000,000$

$= \frac{481}{100} \times 100 \times 1000$

$= 4.81 \times 10^5$

(c) 693.257

$= \frac{693257}{1000}$

$= 693257 \times \frac{1}{1000}$

$= \frac{693257}{100000} = \frac{100000}{1000}$

$= 6.93257 \times 100$

$= 6.93257 \times 10^2$

$= 19 \times 1{,}000{,}000{,}000$

$= \frac{19}{10} \times 10 \times 10^9$

(d) 10 crore

$= 10{,}00{,}00{,}000$

$= 10^8$

4. Express the following statements in the standard form :

(a) 1 nanometre $= \frac{1}{1000000000}$ metre angle

$= \frac{1}{10^9} = 10^{-9}$ metre

(b) Mass of Earth = 59,800,000,000,000,000,000,000,000 kg

$= \frac{598}{100} \times 100 \times 10^{23}$ kg

$= 5.98 \times 10^{25}$ kg

(c) The distance between Sun and Earth

= 149,600,000,000 metre

$= \frac{1496}{1000} \times 1000 \times 10^8$ metre

$= 1.496 \times 10^{11}$ metre

(d) Change of a electron $= \frac{48}{10{,}000{,}000{,}000}$ electrostatic units

$= \frac{48}{10} \times 10 \times 10^{10}$ electrostatic units

$= 4.8 \times 10^{11}$ electrostatic units

(e) A light year = 9500000000000000 metre

$$= \frac{95}{10} \times 10 \times 10^{14} \text{ metre}$$

$$= 9.5 \times 10^{15} \text{ metre}$$

Mental Ability

A. Multiple Choice Questions (MCQs) :

1. (b) **2.** (c) **3.** (b) **4.** (a) **5.** (b) **6.** (d) **7.** (a) **8.** (c) **9.** (d) **10.** (c) **11.** (b) **12.** (c) $\frac{6}{5}$

B. Fill in the blanks :

1. $x^m \div x^n = \boldsymbol{x^{m-n}}$.
2. $\left(\frac{19}{29}\right)^5 \div \left(\frac{19}{29}\right)^7 = \left(\frac{19}{29}\right)^{-2}$
3. 1,658,000,000 in standard form $= \mathbf{1.658 \times 10^9}$.
4. $\{(10)^{10}\}^{10} = \mathbf{10^{100}}$.
5. the reciprocol of $\left(\frac{p}{q}\right)^m = \left(\frac{\boldsymbol{p}}{\boldsymbol{q}}\right)^{-\boldsymbol{m}}$ **or** $\left(\frac{\boldsymbol{q}}{\boldsymbol{p}}\right)^{\boldsymbol{m}}$.

C. State True (T) or False (F) :

1. True **2.** False **3.** True **4.** False **5.** True

Higher Order Thinking Skills

$\because \quad 8 + 8 \times 3 - 3$

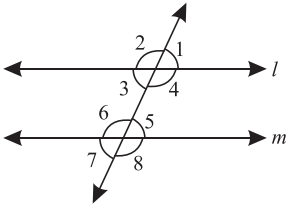
$= 8 + 24 - 3 = 32 - 3 = 29$

So, $8 + 8 \times 3 - 3$ is required expression.

Chapter

9 Understanding Shapes

1.



$\because$ l and m are parallel lines.

$\angle 1 = 65°$ (given)

$\angle 3 = \angle 1$ {Vertically opposite angles}

$\therefore$ $\angle 3 = 65°$

$\angle 5 = \angle 1$ {corresponding angles}

$\therefore$ $\angle 5 = 65°$

$\angle 7 = \angle 3$ {corresponding angles}

$\angle 7 = 65°$

Also, $\angle 2 + \angle 1 = 180°$ {Linear pair}

$\angle 2 + 65° = 180°$

$= 2 = 180° - 65°$

$\therefore$ $\angle 2 = \angle 115°$

$\angle 4 = \angle 2$ {Vertically opposite angles}

$\angle 4 = 115°$

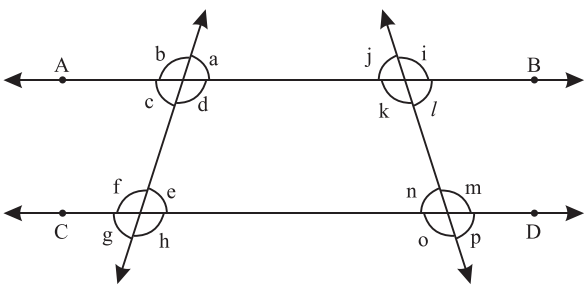
$\angle 6 = \angle 4$ {Alternate angle}

$\therefore$ $\angle 6 = 115°$

$\angle 8 = \angle 4$ {Corresponding angles}

Hence, $\angle 1 = \angle 3 = \angle 5 = \angle 7 = 65°$ and $\angle 2 = \angle 4 = \angle 6 = \angle 8 = 115°$.

2.



$\because$ AB and CD are parallel lines.

$\angle C = 50°$

$\angle a = \angle c$ {Vertically opposite angles}

$\therefore$ $\angle a = 50°$

$\angle e = \angle a$ {Corresponding angles}

$\therefore \quad \angle e = 50°$

$\angle g = \angle e$ {Vertically opposite angles}

$\therefore \quad \angle g = 50°$

Also, $\angle a + \angle b = 180°$ {Linear pair}

$50° + \angle b = 180°$

$\angle b = 180° - 50°$

$\therefore \quad \angle b = 130°$

$\angle d = \angle b$ {Vertically opposite angles}

$\therefore \quad \angle d = 130°$

$\angle f = \angle d$ {Alternate angles}

$\therefore \quad \angle f = 130°$

$\angle h = \angle d$ {Corresponding angles}

$\therefore \quad \angle h = 130°$

and, $\angle m = 115°$ (given)

$\angle o = \angle m$ {Vertically opposite angles}

$\therefore \quad \angle o = 115°$

$\angle i = \angle m$ {Corresponding angles}

$\therefore \quad \angle i = 115°$

$\angle k = \angle m$ {Alternate angles}

$\therefore \quad \angle k = 115°$

Also, $\angle m + \angle n = 180°$ {linear pair}

$115° + \angle n = 180°$

$\angle n = 180° - 115°$

$\therefore \quad \angle n = 64°$

$\angle p = \angle n$ {Vertically opposite angles}

$\therefore \quad \angle p = 65°$

$\angle l = \angle n$ {Alternate angles}

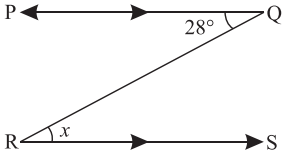
$\therefore \quad \angle l = 65°$

$\angle j = \angle n$ {Corresponding angles}

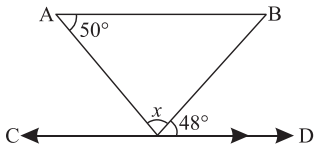
$\therefore \quad \angle j = 65°$

Hence, $\angle a = \angle c = \angle e = \angle g = 50°$, $\angle b = \angle d = \angle f = \angle h = 130°$, $\angle i = \angle k = \angle m = \angle o = 115°$ and $\angle j = \angle l = \angle n = \angle p = 65°$

3.



(i)



(ii)

(i) $\because \quad PQ \parallel RS$

$\therefore \quad \angle PQR = \angle QRS$ {Alternate angles}

$28° = x$

So, $x = 28°$

(ii) $\because \quad AB \parallel CD$

$\therefore \quad \angle ABO = \angle BOD$ {Alternate angles}

$\angle ABO = 48°$

In ΔABO: $\angle A + \angle B + \angle O = 180°$

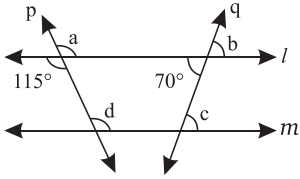
$50° + 48° + x = 180°$

$98° + x = 180°$

$x = 180° - 98°$

So, $x = 82°$

4.



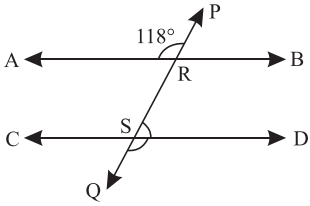
$\therefore \quad \angle a = 115°$ {Vertically opposite angles}

$\angle b = 70°$ {Vertically opposite angles}

$\angle d = 115°$ {Alternate angles}

and, $\angle c = 70°$ {Alternate angles}

5.



$\because$ $AB \parallel CD$ and PQ is a transversal.

$\angle ARP = 118°$ (given)

$\angle ARP + \angle PRB = 180°$ {linear pair}

$118° + \angle PRB = 180°$

$\angle PRB = 180° - 118°$

$\therefore$ $\angle PRB = 62°$

Now, $\angle RSD = PRB$ {Corresponding angles}

$\therefore$ $\angle RSD = 62°$

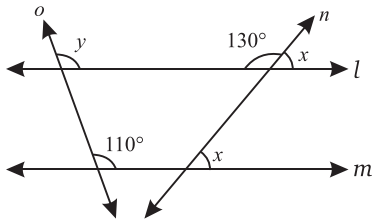
$\angle RSD + \angle QSD = 180°$ {Linear pair}

$62° + \angle QSD = 180°$

$\angle QSD = 180° - 62°$

$\therefore$ $\angle QSD = 118°$.

6.



$\because$ $l \parallel m$

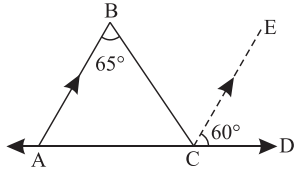
$x + 130° = 180°$ (linear pair)

$x = 180° - 130°$

$\therefore$ $x = 50°$

and, $y = 100°$ {Corresponding angles}

7.



$\because$ $CE \parallel AB$

$\angle BAC = \angle EAD$ {Corresponding angles}

$\therefore$ $\angle BAC = 60°$

Now, In ΔABC,

$$\angle BAC + \angle ABC + \angle BCA = 180^\circ$$

$$60^\circ + 65^\circ + \angle BCA = 180^\circ$$

$$\angle BCA = 180^\circ - 125^\circ$$

$\therefore$ $$\angle BCA = 55^\circ$$

$\because$ $$\angle ACB + \angle BCE + \angle ECD = 180^\circ \quad \text{\{Linear pair\}}$$

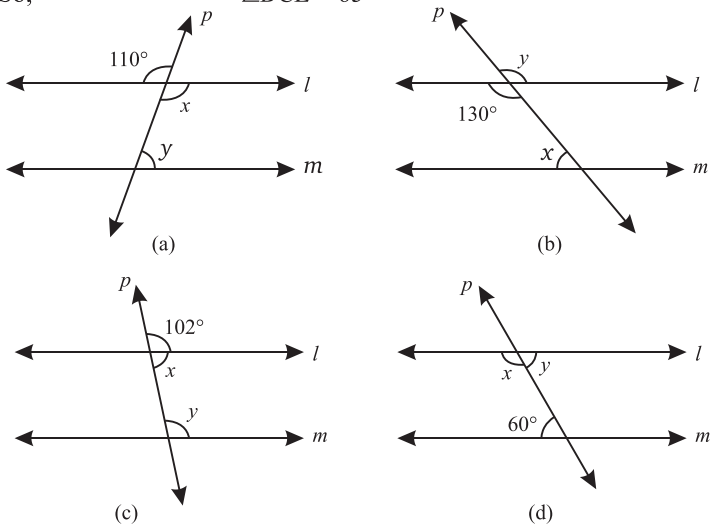
$$55^\circ + \angle BCE + 60^\circ = 180^\circ$$

$$\angle BCA + 115^\circ = 180^\circ$$

$$\angle BCE = 180^\circ - 115^\circ$$

So, $$\angle BCE = 65^\circ$$

8.



(a) $\because$ $l \parallel m$

$\therefore$ $\angle x = 110^\circ$ {Vertically opposite angles}

and, $\angle x + \angle y = 180^\circ$

{Interior angles on the same side of the transversal}

$$110^\circ + \angle y = 180^\circ$$

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

$\therefore$ $$\angle y = 70^\circ$$

(b) $\because \quad l \parallel m$

$\therefore \quad y = 130°$ {Vertically opposite angles}

and, $\angle x + \angle y = 180°$

{Interior angles on the same side of the transversal}

$\angle x + 130° = 180°$

$\angle x = 180° - 130°$

$\therefore \quad \angle x = 50°$

(c) $\because \quad l \parallel m$

$\angle x + 102° = 180°$ {Linear pair}

$\angle x = 180° - 102°$

$\therefore \quad \angle x = 78°$

and, $\angle y = 102°$ {Corresponding angles}

(d) $\because \quad l \parallel m$

$\therefore \quad y = 60°$ {Alternate angles}

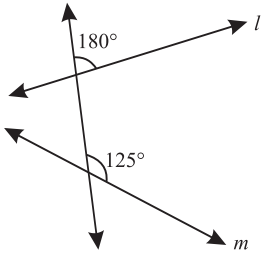
and, $\angle x + \angle y = 180°$ {Linear pair}

$\angle x + 60° = 180°$

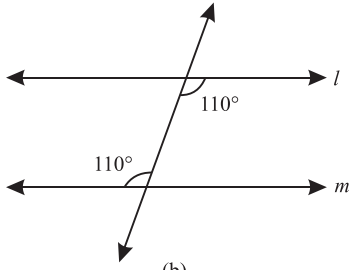
$\angle x = 180° - 60°$

$\therefore \quad \angle x = 120°$.

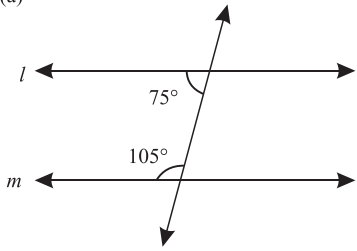
9.



(a)



(b)



(c)

(a) $\because$ $\angle 180° \neq \angle 125°$

$\therefore$ Lines m and l are not parallel.

(b) $\because$ $110° = 110°$ {Alternate angles}

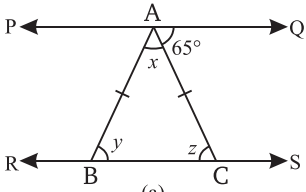
$\therefore$ Lines l and m are parallel.

(c) $\because$ $\angle 75° + 105° = 180°$

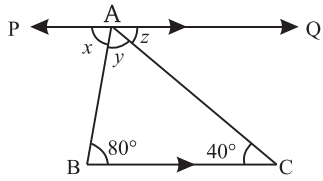
{Interior angles on the same side of the transversal}

$\therefore$ Lines l and m are parallel.

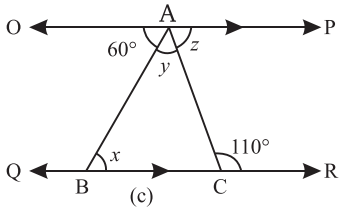
10.



(a)



(b)



(c)

(a) $\because$ $PQ \parallel RS$

$\therefore$ $\angle BCA = \angle QAC$ {Alternate angles}

$\angle BCA = 65°$

$\because$ $AB = AC$

$\therefore$ $\angle ABC = ACB$

$y = z = 65°$

In ΔABC,

$\angle A + \angle B + \angle C = 180°$

$x + y + z = 180°$

$x + 65° + 65° = 180°$

$x = 180° - 130°$

$x = 50°$

Hence, $x = 50°$, $y = 65°$ and $z = 65°$.

(b) $\because \quad PQ \parallel BC$

$\therefore \quad \angle PAQ = \angle ABC$ {Alternate angles}

$x = 80°$

and, $\angle QAC = \angle ACB$ {Alternate angles}

$z = 40°$

$\because \quad x + y + z = 180°$ {Linear pair}

$80° + y + 40° = 180°$

$y + 120° = 180°$

$y = 180° - 120°$

$y = 60°$

Hence, $x = 80°$, $y = 60°$ and $z = 40°$

(c) $\because \quad PO \parallel QR$

$\therefore \quad \angle OAB = \angle ABC$ {Alternate angles}

$60° = x$

and, $\angle PAC + \angle ACR = 180°$

{Interior angles on the same side of the transversal}

$z + 110° = 180°$

$z = 180° - 110°$

$z = 70°$

$\because \quad \angle OAB + \angle BAC + \angle PAC = 180°$ {Linear pair}

$60° + y + z = 180°$

$60° + y + 70° = 180°$

$y = 180° - 130°$

$y = 50°$

Hence, $x = 60°$, $y = 50°$ and $z = 70°$

11. State which of the following statements are true and which are false :

(a) True (b) False (c) True (d) True (e) False

Exercise 9.2

1. Find the complement angles of the following angles :

(a) Complement angle of $80°$ is $90° - 80° = 10°$.

(b) Complement angle of $(10° + y°)$ is $(90° - 10 - y)° = 80° - y°$.

(c) Complement angle of $\left(\frac{1}{2} \text{ of } 60^\circ\right)$ is $90^\circ - \left(\frac{1}{2} \times 60^\circ\right) = 60^\circ$.

(d) Complement angle of $\left(\frac{2}{5} \text{ of } 60^\circ\right)$ is $90^\circ - \left(\frac{2}{5} \times 60^\circ\right) = 66^\circ$.

2. Find the supplement any angle of the following :

(a) Supplement angle of $137^\circ = 180^\circ - 137^\circ = 43^\circ$.

(b) Supplement angle of $(y + 20^\circ) = 180^\circ - y - 20^\circ = 160^\circ - y^\circ$.

(c) Supplement angle of $\left(\frac{2}{5} \text{ of } 100^\circ\right)$ is $180^\circ - \left(\frac{2}{5} \times 100^\circ\right) = 140^\circ$.

(d) Supplement angle of $\left(\frac{1}{3} \text{ of } 150^\circ\right)$ is $180^\circ - \left(\frac{1}{3} \times 150^\circ\right) = 130^\circ$.

3. State which of the following pairs are : complementary, supplementary and neither complementary nor supplementary :

(a) $26^\circ + 54^\circ = 80^\circ$ (Neither complementary nor Supplementary)

(b) $30^\circ + 72^\circ = 102^\circ$
(Neither Complementary nor Supplementary)

(c) $50^\circ + 40^\circ = 90^\circ$ (Complementary angles

(d) $120^\circ + 60^\circ = 180^\circ$ (Supplementary angles)

(e) $100^\circ + 80^\circ = 180^\circ$ (Supplementary angles)

(f) $110^\circ + 90^\circ = 180^\circ$ (Complementary angles)

(g) $40^\circ + 140^\circ = 180^\circ$ (Supplementary angles)

(h) $89^\circ + 1^\circ = 90^\circ$ (Complementary angles)

4. Let the one supplementary angle be x.

Thus, another supplementary angle $= x$

$\therefore$ $x + x = 180^\circ$ (Supplementary angles)

$$2x = 180^\circ$$

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

Hence, 90° is equal to its supplement.

5. Let the required angle be x.

Thus, supplement of $x = 2x$.

$\therefore$ $x + 2x = 180^\circ$ (Supplementary angles)

$3x = 180^\circ$ (Supplementary angles)

$$3x = 180°$$
$$x = \frac{180°}{3} = 60°$$

Hence, 120° is twice to its supplement.

6. Let, one complement angle be x.

Thus, another complement angle $= x$.

$\therefore$ $x + x = 90°$ (Complementary angles)

$$2x = 90°$$
$$x = \frac{90°}{2} - 45°$$

Hence, 45° is equal to its complement.

7. Let, the measure of other angle be x.

Thus, $90° + x = 180°$ {Linear pair}

$$x = 180° - 90°$$
$$x = 90°$$

Hence, the other angle is 90°.

8. No, two angles are not equal, if both of them are obtuse or acute.

9. Let, the measure of each angle be x.

Thus, $x + x = 90°$ (Complementary angles)

$$2x = 90°$$
$$x = \frac{90°}{2} = 45°$$

Hence, the measure of each angle is 45°.

10. Let, the measure of each angle be x.

Thus, $x + x = 180°$ (Supplementary angles)

$$2x = 180°$$
$$x = \frac{180°}{2} = 90°$$

Hence, the measure of each angle is 90°.

11. $\angle ABC = 90°$ (given)

$\because$ $\angle ABD + \angle CBD = \angle ABC$

$\therefore$ $(2x + 5)° + (x - 5)° = 90°$

$$2x + 5° + x - 5° = 90°$$
$$3x = 90°$$
$$x = \frac{90°}{3} = 30°$$

(a) $\angle CBD = x - 5° = 30° - 5° = 25°$

(b) $\angle ABD = 2x + 5° = 30° \times 2 + 5° = 65°$

12. $\angle AOC + \angle COB = 180°$ {Linear pair}

$$(6x + 4)° + (x + 8)° = 180°$$
$$6x + 4° + x + 8° = 180°$$
$$7x = 180° - 12°$$

So, $x = \frac{168}{7} = 24°$

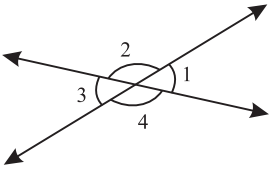
$\therefore$ $\angle BOC = x + 8° = 24° + 8 = 32°$

and, $\angle AOC = 6x + 4° = 6 \times 24° + 4° = 148°$

13. (a) $\angle 4$ equal to $\angle 2$.

(b) $\angle 3$ equal to $\angle 1$.

(c) $(\angle 1, \angle 2)$, $(\angle 2, \angle 3)$, $(\angle 3, \angle 4)$ and $(\angle 4, \angle 1)$ are the pairs of adjacent angles.



14.

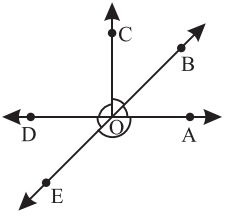
(a) $\angle AOB$ and $\angle BOD$,

(b) $\angle AOB$, $\angle BOC$ and $\angle DOC$,

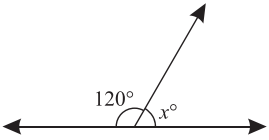
(c) $\angle DOE$ and $\angle AOB$,

(d) $\angle AOE$ and $\angle DOE$,

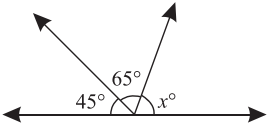
(e) $\angle AOB$ and $\angle BOC$.



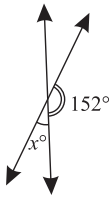
15.



(i)



(ii)



(iii)

(i) $120° + x = 180°$ {Linear pair}
$x = 180° - 120°$
So, $x = 60°$

(ii) $45° + 65° + x = 180°$ {Linear pair}
$110° + x = 180°$
$x = 180° - 110°$
So, $x = 70°$

(iii) $x + 152° = 180°$ {Linear pair}
$x = 180° - 152°$
So, $x = 28°$

16. State whether the following statements are true or false :
(a) False (b) True (c) True (d) False (e) False

Mental Ability

A. Multiple Choice Questions (MCQs) :
1. (a) **2.** (c) **3.** (a) **4.** (b) **5.** (b) **6.** (c) **7.** (a) **8.** (a)

B. Fill in the blanks :

1. Angles 30° and 60° are **complement** to each other.
2. The angle formed between north direction and east direction is **90°**.
3. Two lines perpendicular to the same line in a plane are **Parallel**.
4. Which direction will you face if your turn to right forming an angle of 270° while facing the rising sun **South**.
5. A line which intersects two or more lines at different points is called a **transversal**.

C. True and False :
1. True 2. False 3. True 4. False 5. False

Higher Order Thinking Skills

$\because$ $PQ \parallel AB$ and $QR \parallel BC$

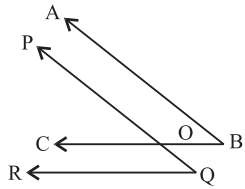
and $\angle PQR = 50°$

$\angle POC = \angle PQR$ {Alternate angles}

$\therefore$ $\angle POC = 50°$

and, $\angle ABC = \angle POC$

$\therefore$ $\angle ABC = 50°$



Chapter

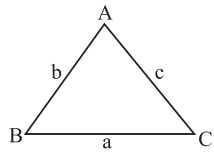
10 The Triangle and Its Properties

1. (i) (a) Elements of triangles :

Angles $= \angle A, \angle B$ and $\angle C$

Sides $= a, b$ and c

(b) Side $AB = b$, Side $BC = a$ and $AC = C$.

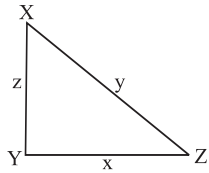


(ii) (a) Elements of triangles :

Angles $= \angle X, \angle Y$ and $\angle Z$.

Sides $= x, y$ and z.

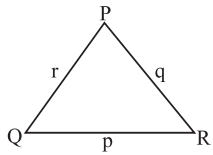
(b) Side $XY = z$, Side $YZ = x$ and Side $XZ = y$.



(iii) (a) Elements of triangles :

Angles $= \angle P, \angle Q$ and $\angle R$.

(b) Side $PQ = r$, Side $QR = p$ and Side $PR = q$.

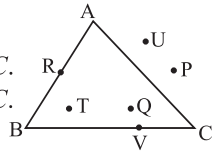


2. Name the points in figure 10.9 :

(a) Points-T and Q are in the interior of ΔABC.

(b) Points-U and P are in the exterior of ΔABC.

(c) Points-R and V are on the ΔABC.



3. Classify the following triangles as equilateral, isosceles or scalene from the measures of their angles.

(a) 45°, 90°, 45°

$\because$ Two angles are equal.

$\therefore$ 45°, 90° and 45° are the angles of isosceles triangle.

(b) 60°, 30°, 90°

$\because$ All angles are different.

$\therefore$ 60°, 30°, 90° are the angles of scalene triangle.

(c) 60°, 60°, 60°

$\because$ All angles are equal.

$\therefore$ 60°, 60° and 60° are the angles of equilateral triangle.

(d) 30°, 30°, 120°

$\because$ Two angles are equal

$\therefore$ 30°, 30° and 120° are the angles of isoscele triangle.

(e) 55°, 25°, 100°

$\because$ All angles are different.

$\therefore$ 55°, 25° and 100° are the angles of scalene triangle.

(f) 10°, 10°, 160°

$\because$ Two angles are equal.

$\therefore$ 10°, 10° and 160° are the angles of isoscele triangle.

4. Measures of the three angles of triangles are given below. Classify the triangles as acute, obtuse or right.

(a) $\because$ All angles are acute angles.

$\therefore$ 45°, 76° and 59° are the angles of a acute-angled triangle.

(b) $\because$ One angle is obtuse angle.

$\therefore$ 92°, 38° and 50° are the angles of obtuse-angled triangle.

(c) $\because$ One angle is right angle.

$\therefore$ 60°, 30° and 90° are the angles of right-angled tirangle.

(d) $\because$ All angles alre acute angles.

$\therefore$ 89°, 40° and 51° are the angles of acute-angled triangle.

(e) $\because$ All angles are acute angles.

$\therefore$ 33°, 66° and 81° are the angles of acute-angled triangle.

(f) $\because$ One angle is obtuse angle.

$\therefore$ 12°, 20° and 148° are the angles of obtuse-angled triangle.

5. Measures of the three sides of triangles are given below. Classify them as equilateral, isosceles or scalene.

(a) $\because$ All sides are unequal.

$\therefore$ 3 cm, 4 cm and 5 cm are the sides of scalene triangle.

(b) $\because$ Two sides are equal.

$\therefore$ 8 cm, 6 cm and 8 cm are the sides of isoscele triangle.

(c) $\because$ Two dies are equal.

$\therefore$ 3 cm, 3cm and 5 cm are the sides of isoscele triangle.

(d) $\because$ All sides are equal.

$\therefore$ 5.5 cm, 5.5 cm and 5.5 cm are the sides of equilateral triangle.

(e) $\because$ All sides are unequal.

$\therefore$ 3.5 cm, 4.5 cm and 5.5 cm are the sides of scalene triangle.

(f) $\because$ Two sides are equal.

$\therefore$ 8.1 cm, 8.1 cm and 9.1 cm are the sides of isoscele triangle.

6. Say which of these groups can form a triangle.

(a) $45° + 45° + 45° = 135°$

$\because$ Sum of angles are not equal to 180°.

$\therefore$ 45°, 45° and 45° is nto a form of angles of a triangle.

(b) $120° + 13° + 57° = 190°$

$\because$ Sum of angles are not equal to 180°.

$\therefore$ 120°, 13, and 57° is not a form of angles of a triangle.

(c) $65° + 35° + 80° = 180°$

$\because$ Sum of angles are equal to 180°.

$\therefore$ 65°, 35° and 80° is a form of angles of a triangle.

(d) $60° + 70° + 50°\ \ 180°$

$\because$ Sum of angles are equal to 180°,

$\therefore$ 60°, 70° and 50° is a form of angles of a triangle.

(e) $87° + 33° + 50° = 170°$

$\because$ Sum of angles are not equal to 180°,

$\therefore$ 87°, 33° and 50° is not a form of angles of a triangle.

(f) $90° + 25° + 65° = 180°$

$\because$ Sum of angles are equal to 180°.

$\therefore$ 90°, 25° and 65° is a form of angles of a triangle.

7. Find the third angle and say if the triangle is acute, obtuse or right-angled.

(a) Let, the third angle of triangle be x.

Thus, $45° + 45° + x = 180°$

$$x = 180° - 90° = 90°$$

Hence, the third angle of triangle is 90°, and, it is a right-angled tirangle.

(b) Let, the third angle of triangle be x.

Thus, $67° + 13° + x = 180°$

$$80° + x = 180°$$

$$x = 180° - 80° = 100°$$

Hence, the third angle of triangle is 100° and it is a obtuse-angled triangle.

(c) Let, the third angle of triangle be x.

Thus, $30° + 95° + x = 180°$

$$125° + x = 180°$$

$$x = 180° - 125° = 55°$$

Hence, the third angle of triangle is 55° and it is a obtuse-angled triangle.

(d) Let, the third angle of triangle be x.

Thus, $15° + 28° + x = 180°$

$$43° + x = 180°$$

$$x = 180° - 43° = 137°$$

Hence, the angle of triangle is 137° and it is a obtuse-angled triangle.

(e) Let, the third angle of triangle be x.

Thus, $45° + 65° + x = 180°$

$$110° + x = 180°$$

$$x = 180° - 110° = 70°$$

Hence, the third angle of triangle is 70° and it is a acute-angled triangle.

(f) Let, the third angle of triangle be x.

Thus, $60° + 30° + x = 180°$

$$90° + x = 180°$$

$$x = 180° - 110° = 70°$$

Hence, the third angle of triangle is 70°
and it is a acute-angled triangle.

8. Ratio of angle of a triangle $= 2:3:4$

Let, the angles of tirangle $= 2x$, $3x$ and $4x$.

Thus, $2x + 3x + 4x = 180°$

$$9x = 180°$$

$$x = \frac{180°}{9} = 20°$$

$\therefore$ $2x = 2 \times 20° = 40°$, $3x = 3 \times 20° = 60°$

and $4 = 4 \times 20° = 80°$

Hence, 40°, 60° and 80° are angles of a triangle.

9. Let, each equal angle be x.

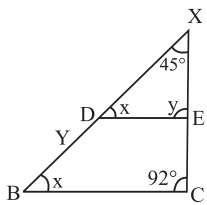
Thus, $x + x + 50° = 180°$

$$2x = 180° - 50°$$

$$x = \frac{130°}{2} = 65°$$

Hence, 65°, 65° and 50° are the angles of a triangle.

10. (a) In ΔABC :



$$\angle A + \angle B + \angle C = 180°$$

$$45° + x + 92° = 180°$$

$$x = 180° - 137°$$

$$x = 43°$$

In ΔADE,

$$\angle A + \angle D + \angle E = 180°$$

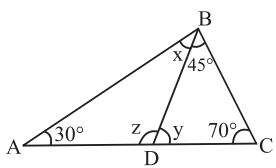
$$45° + x + y = 180°$$

$$45 + 43° + y = 180°$$

$$y = 180° - 88°$$

$$y = 92°$$

(b) In ΔBDC,



$$\angle B + \angle D + \angle C = 180°$$

$$45° + y + 70° = 180°$$

$$y + 115° = 180°$$

$$y = 180° - 115°$$
$$y = 65°$$

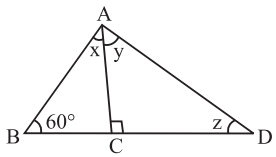
$\because$ $\angle ADB + \angle BDC = 180°$ {Linear pair}

$$z + y = 180°$$
$$z + 65° = 180°$$
$$z = 180° - 65°$$
$$z = 115°$$

In ΔABD,

$$\angle A + \angle B + \angle D = 180°$$
$$30° + x + z = 180°$$
$$30° + x + 115° = 180°$$
$$x = 180° - 145°$$
$$x = 35°$$

(c) In ΔABC,



$$\angle A + \angle B + \angle C = 180°$$
$$x + 60° + 90° = 180°$$
$$x + 150° = 180°$$
$$x = 180° - 150°$$
$$x = 30°$$

$\because$ $x + y = 90°$ (given)

$$30° + y = 90°$$
$$y = 90° - 30°$$
$$y = 60°$$

In ΔACD,

$$\angle A + \angle C + \angle D = 180°$$
$$y + 90° + z = 180°$$
$$60° + 90° \; z = 180°$$
$$z = 180° - 150°$$
$$z = 30°$$

11. In ΔEAB,

$$\angle EAB + \angle ABE + \angle AEB = 180° \qquad \ldots(1)$$

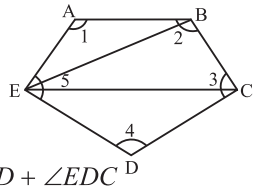
In ΔBEC,

$\angle BEC + \angle BCE + \angle EBC = 180°$ ...(2)

In ΔEDC,

$\angle CEB + \angle ECD + \angle EDC = 180°$ ...(3)

Adding equation (1), (2) and (3),



$$\angle EAB + \angle ABE + \angle AEB + \angle CEB + \angle ECD + \angle EDC$$
$$+ \angle BEC + \angle BCE + \angle EBC = 180° + 180° + 180°$$
$$\angle EAB + (\angle ABE + \angle EBC) + (\angle ECB + \angle ECD)$$
$$+ \angle EDC + (\angle AEB + \angle DEC) = 540°$$
$$\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5 = 54°$$

Hence, the sum of the five marked angles is 540°.

12. Ratio of sides of the triangle $= 2:3:4$

Let, the sides of triangle are $2x$, $3x$ and $4x$.

$\because$ The shortest side of triangle $= 4$ cm

$\therefore$ $2x = 4$ cm

$$x = \frac{4}{2} = 2 \text{ cm}$$

Thus, $3x = 3 \times 2 = 6$ cm

and, $4x = 4 \times 2 = 8$ cm

Hence, the other two sides of triangle are 6 cm and 8 cm.

13. Ratio of sides of triangle $= 3:4:4$

Let, the sides of triangle are $3x$, $4x$ and $4x$

$\because$ Unequal side of triangle $= 6$ cm

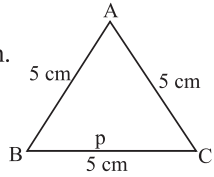
$\therefore$ $3x = 6$ cm

$$x = \frac{6}{3} = 2 \text{ cm}$$

Thus, $4x = 4 \times 2 \text{ cm} = 8$ cm

Hence, the length of each equal side is 8 cm.

14. Let, ABC is an equilateral triangle of side 5 cm.



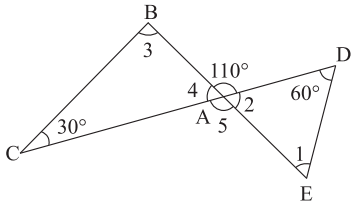
Thus, $\angle A = \angle B = \angle C = 60°$

Let, AP is an median.

Thus, $BP = PC = 2.5$ cm

Thus, it is not possible to construct an isosceles triangle.

15.



$\because \quad \angle BAD = \angle CAE$ {Vertically opposite angles}

$110° = \angle 5$

$\therefore \quad \angle 5 = 110°$

$\because \quad \angle BAD + \angle CAB = 180°$ {Linear pair}

$110° + \angle 4 = 180°$

$\angle 4 = 180° - 110°$

$\therefore \quad \angle 4 = 70°$

$\angle CAB = \angle DAE$ {Vertically opposite angles}

$\angle 4 = \angle 2$

$\therefore \quad \angle 2 = 70°$

In ΔABC,

$\angle A + \angle B + \angle C = 180°$

$\angle 4 + \angle 3 + 30° = 180°$

$70° + \angle 3 + 30° = 180°$

$\angle 3 = 180° - 100°$

$\therefore \quad \angle 3 = 80°$

In ΔAED,

$\angle A + \angle E + \angle D = 180°$

$\angle 2 + \angle 1 + 60° = 180°$

$70° + \angle 1 + 60° = 180°$

$\angle 1 = 180° - 130°$

$\angle 1 = 50°$

Hence, $\angle 1 = 50°$, $\angle 2 = \angle 4 = 70°$, $\angle 3 = 80°$ and $\angle 5 = 110°$.

16. Answer the following questions.

(a) No, an obtuse-angled triangle can not be the right-angled triangle.

(b) Yes, an acute-angled triangle can be the right-angled triangle.
(c) Now, a right-angle and an obtuse angle could not have in the same triangle.
(d) No, it is not possible to have two obtuse angles in a triangle.
(e) No, it is not possible to have two right angles in a triangle.
(f) Yes, it is possible to have two acute angles in a triangle.

Exercise 10.2

1.

S.N.	Exterior angle	$\angle YXZ$	$\angle XYZ$	$\angle XZY$
a.	$\angle XZA = \mathbf{125°}$	40°	**85°**	55°
b.	$\angle ZYC = \mathbf{135°}$	36°	45°	**99°**
c.	$\angle YXB = \mathbf{144°}$	**36°**	34°	110°
d.	$\angle AZX = 120°$	30°	**90°**	**60°**
e.	$\angle ZYC = 98°$	45°	**82°**	**53°**
f.	$\angle BXY = 90°$	**90°**	30°	**60°**

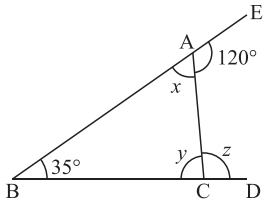
2. (a) 7 m, 8 m, 14 m
$\because$ $(7\text{ m} + 8\text{ m}) > 14\text{ m}$
$\therefore$ 7 m, 8 m and 14 m can be the sides of a triangle.
(b) 2 cm, 3 cm, 4 cm
$\because$ $(2\text{ cm} + 3\text{ cm}) > 4\text{ cm}$
$\therefore$ 2 cm, 3 cm and 4 cm can be the sides of a tirangle.
(c) 1.3 cm + 2.3 cm, 3.5 cm
$\because$ $(1.3\text{ cm} + 2.3\text{ cm}) > 3.5\text{ cm}$
$\therefore$ 1.3 cm, 2.3 cm and 3.5 cm can be the sides of a triangle.
(d) 1.8 cm, 3.9 cm, 5.2 cm
$\because$ $(1.8\text{ cm} + 3.9\text{ cm}) > 5.2\text{ cm}$
$\therefore$ 1.8 cm, 3.9 cm and 5.2 cm can be the sides of a triangle.
(e) 8.4 cm, 16.5 cm, 5.8 cm
$\because$ $(8.4\text{ cm} + 5.8\text{ cm}) < 16.5\text{ cm}$
$\therefore$ 8.4 cm, 16.5 cm and 5.8 cm can not be the sides of a triangle.

(f) 15.5 m, 8 m, 7 m

$\because$ $(8\text{ m} + 7\text{ m}) > 15.5\text{ m}$

$\therefore$ 15.5 m, 8 m and 7 m can be the sides of a triangle.

3.



$$\angle BAC + \angle EAC = 180^\circ \qquad \{\text{Linear pair}\}$$

$$x + 120^\circ = 180^\circ$$

$$x = 180^\circ - 120^\circ$$

$\therefore$ $$x = 60^\circ$$

In ΔABC,

$$\angle A + \angle B + \angle C = 180^\circ$$

$$x + 35^\circ + y = 180^\circ$$

$$60^\circ + 35^\circ + y = 180^\circ$$

$$y = 180^\circ - 95^\circ$$

$\therefore$ $$y = 85^\circ$$

Now, $$\angle y + \angle z = 180^\circ \qquad \{\text{Linear pair}\}$$

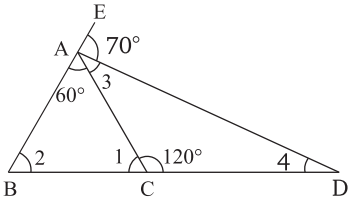
$$85^\circ + z = 180^\circ$$

$$z = 180^\circ - 85^\circ$$

$\therefore$ $$z = 95^\circ$$

Hence, $x = 60^\circ$, $y = 85^\circ$ and $z = 95^\circ$

4.



$$\angle BAC + \angle CAD + \angle DAE = 180^\circ \quad \{\text{Linear pair}\}$$

$$60° + \angle 3 + 70° = 180°$$
$$\angle 3 + 130° = 180°$$
$$\angle 3 = 180° - 130°$$
$$\therefore \quad \angle 3 = 50°$$

In ΔACD,

$$\angle A + \angle C + \angle D = 180°$$
$$\angle 3 + 120° + \angle 4 = 180°$$
$$50° + 120° + \angle 4 = 180°$$
$$\angle 4 = 180° - 170°$$
$$\therefore \quad \angle 4 = 10°$$

Now, $\angle BCA + \angle ACD = 180°$ {Linear pair}

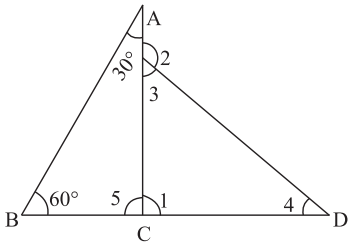
$$\angle 1 + 120° = 180°$$
$$\angle 1 = 180° - 120°$$
$$\therefore \quad \angle 1 = 60°$$

In ΔABC,

$$\angle A + \angle B + \angle C = 180°$$
$$60° + \angle 2 + \angle 1 = 180°$$
$$60° + \angle 2 + 60° = 180°$$
$$\angle 2 = 180° - 120°$$
$$\therefore \quad \angle 2 = 60°$$

Hence, $\angle 1 = 60°$, $\angle 2 = 60°$, $\angle 3 = 50°$ and $\angle 4 = 10°$

5.



In ΔABC,

$$\angle A + \angle B + \angle C = 180°$$
$$30° + 60° + \angle 5 = 180°$$
$$\angle 5 = 180° - 90°$$

$\therefore \quad \angle 5 = 90°$

$\angle ACB + \angle ACD = 180°$

{Linear pair}

$\angle 5 + \angle 1 = 180°$

$90° + \angle 1 = 180°$

$\angle 1 = 180° - 90°$

$\therefore \quad \angle 1 = 90°$

In ΔECD,

$\angle E + \angle C + \angle D = 180°$

$\angle 3 + \angle 1 + \angle 4 = 180°$

$\angle 3 + 90° + \angle 3 = 180°$ $\{\because \angle 3 = \angle 4\}$

$2 \cdot \angle 3 = 180° - 90°$

$\angle 3 = \frac{90°}{2} = 45°$

$\therefore \quad \angle 3 = \angle 4 = 45°$

Now, $\angle AED + \angle CED = 180°$ {Linear pair}

$\angle 2 + \angle 3 = 180°$

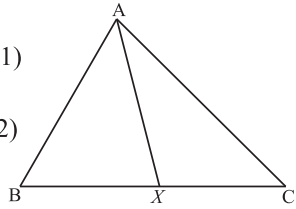
$\angle 2 + 45° = 180°$

$\angle 2 = 180° - 45°$

$\therefore \quad \angle 2 = 135°$

Hence, $\angle 1 = 90°$, $\angle 2 = 135°$, $\angle 3 = 45°$ and $\angle 4 = 45°$.

6. In ΔABX,



$AB + BX > AX$ …(1)

In ΔAXC,

$AC + XC > AX$ …(2)

Adding equation (1) and (2),

$(AB + BX) + (AC + XC) > AX + AX$

$AB + (BX + XC) + AC > 2AX$

$\because \quad BX + XC = BC$

So, $[AB + BC + AC > 2AX]$ Proved.

7. In ΔAOB,

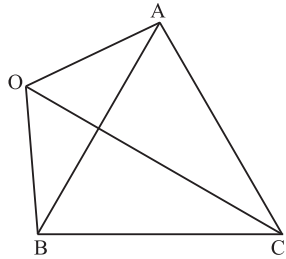
$$OA + OB > AB \qquad \ldots(1)$$

In ΔAOC,

$$OA + OC > AC \qquad \ldots(2)$$

In ΔBOC,

$$OB + OC > BC \qquad \ldots(3)$$



Adding equation (1), (2) and (3),

$$(OA + OB) + (OA + OC) + (OB + OC) > AB + BC + CA$$

$$(OA + OB + OA + OC + OB + OC) > AB + BC + CA$$

2. $OA + 2 \cdot OB + 2 \times OC > AB + BC + CA$

$$2(OA + OB + OC) > AB + BC + CA$$

So, $OA + OB + OC > \frac{1}{2}(AB + BC + CA)$ Proved.

Exercise 10.3

1. (a) By Pythagoras theorem,

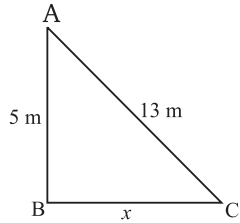
$$AC^2 = AB^2 + BC^2$$

$$(13\text{ m})^2 = (5\text{ m})^2 + x^2$$

$$169\text{ m}^2 = 25\text{ m}^2 + x^2$$

$$x^2 = 169\text{ m}^2 - 25\text{ m}^2 = 144\text{ m}^2$$

$$x = \sqrt{144}\text{ m}$$



So, $x = 12\text{ m}$

(b) By Pythagoras theorem,

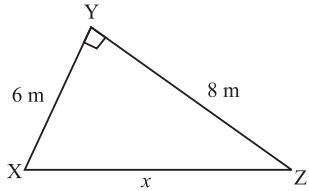
$$XZ^2 = YX^2 + YZ^2$$

$$x^2 = (6\text{ m})^2 + (8\text{ m})^2$$

$$x^2 = 36\text{ m}^2 + 64\text{ m}^2$$

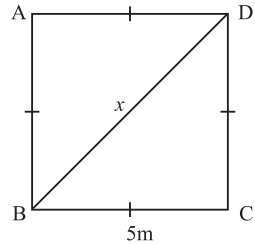
$$x^2 = 100\text{ m}^2$$

$$x = \sqrt{100}\text{ m}$$



So, $x = 10\text{ m}$

(c) By Pythagoras thorem,



$$BD^2 = BC^2 + DC^2$$

$$x^2 = (5\text{ m})^2 + (5\text{ m})^2$$

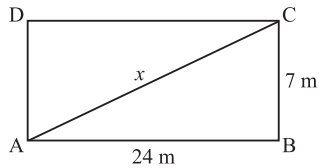
$$x^2 = 25\text{ m}^2 + 25\text{ m}^2$$

$$x^2 = 50\text{ m}^2$$

$$x = \sqrt{50}\text{ m}$$

So, $x = 5\sqrt{2}\text{ m}$

(d) By Pythagoras theorem,



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

$$x^2 = (24\text{ m})^2 + (7\text{ m})^2$$

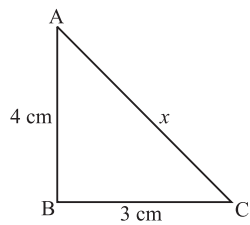
$$x^2 = 576\text{ m}^2 + 49\text{ m}^2$$

$$x^2 = 625\text{ m}^2$$

$$x = \sqrt{625}\text{ m}$$

So, $x = 25\text{ m}$

(e) By Pythagoras theorem :



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

$$x^2 = (4\text{ cm})^2 + (3\text{ cm})^2$$

$$x^2 = 16\text{ cm}^2 + 9\text{ cm}^2$$

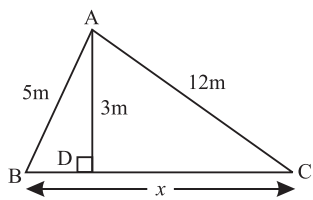
$$x^2 = 25\text{ cm}^2$$

$$x = \sqrt{25}\text{ cm}$$

So, $x = 5\text{ cm}$

(f) In ΔABD,

By Pythagoras theorem,



$$AB^2 = BD^2 + AD^2$$

$$(5\text{ m})^2 = BD^2 + (3\text{ m})^2$$

$$25\text{ m}^2 = BD^2 + 9\text{ m}^2$$

$$BD^2 = 25\text{ m}^2 - 9\text{ m}^2$$

$$BD^2 = 16\text{ m}^2$$

$$BD = \sqrt{16}\text{ m} = 4\text{ m}$$

In ΔADC,

By Pythagoras theorem,

$$AC^2 = AD^2 + DC^2$$

$$(12\text{ m})^2 = (3\text{ m})^2 + DC^2$$

$$144\text{ m}^2 = 9\text{ m}^2 + DC^2$$

$$DC^2 = 144\text{ m}^2 - 9\text{ m}^2$$

$$DC^2 = 135\text{ m}^2$$

$$DC = \sqrt{135}\text{ m} = 11.6\text{ m}$$

$\because$ $$BC = BD + DC$$

$$x = 4\text{ m} + 11.6\text{ m}$$

So, $x = 15.6$ m

2. (a) $a = 6$ cm, $b = 8$ cm and $c = 10$ cm

$$a^2 + b^2 = (6\text{cm})^2 + (8\text{cm})^2$$

$$= 36\text{cm}^2 + 64\text{ cm}^2$$

$$= 100\text{cm}^2$$

and, $c^2 = (100\text{cm})^2 = 100\text{cm}^2$

$\because$ $a^2 + b^2 = c^2$

Hence, a, b and c are the sides of a right-angled-triangle.

(b) $a = 2.5$ cm, $b = 3.5$ cm, $c = 4.5$ cm

$$a^2 + b^2 = (2.5\text{ cm})^2 + (3.5\text{ cm})^2$$

$$= 6.25\text{ cm}^2 + 12.25\text{ cm}^2$$

$$= 18.5\text{ cm}^2$$

and, $c^2 = (4.5\text{ cm})^2 = 20.25\text{ cm}^2$

$\because$ $a^2 + b^2 \neq c^2$

Hence, a, b and c are not the sides of a right-angled triangle.

(c) $a = 8\,\text{cm}, b = 15\,\text{cm}, c = 17\,\text{cm}$

$$a^2 + b^2 = (8\,\text{cm})^2 + (15\,\text{cm})^2$$
$$= 64\,\text{cm}^2 + 225\,\text{cm}^2$$
$$= 289\,\text{cm}^2$$

and, $c^2 = (17\,\text{cm})^2 = 289\,\text{cm}^2$

$\because \quad a^2 + b^2 = c^2$

Hence, a, b and c are the sides fo a right angled triangle.

(d) $a = 0.3$ m, $b = 0.4$ m, $c = 0.5$ m

$$a^2 + b^2 = (0.3\text{ m})^2 + (0.4\text{ m})^2$$
$$= 0.09\text{ m}^2 + 0.16\text{ m}^2$$
$$= 0.25\text{ m}^2$$

and, $c^2 = (0.5\text{ m})^2 = 0.25\text{ m}^2$

$\because \quad c^2 = (0.5\text{ m})^2 = 0.25\text{ m}^2$

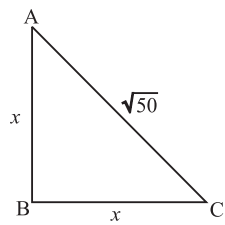
$\because \quad a^2 + b^2 = c^2$

Hence, a, b and c are the sides of a right angled triangle.

3. Let, the length of each side of right-angled isoscele triangle be x.

By Pythagoras theorem :

$$AC^2 = AB^2 + BC^2$$
$$50 = x^2 + x^2$$
$$50 = 2x^2$$
$$\frac{50}{2} = x^2$$
$$x^2 = 25$$
$$x = \sqrt{25} = 5$$



Hence, the length of each side of right-angled isoscele triangle is 5 sq. unit.

4. (a) 8, 15, 7

$$8^2 + 7^2 = 64 + 49 = 113$$

and, $15^2 = 225$

$\because \quad 8^2 + 7^2 \neq 15^2$

$\therefore$ 8, 15 and 7 are not Pythagorean triplets.

(b) 7, 23, 25

$7^2 + 23^2 = 49 + 529 = 578$

and, $25^2 = 625$

$\because \quad 7^2 + 23^2 \neq 25^2$

$\therefore$ 7, 23 and 25 are not Pythagorean triplets.

(c) 12, 35, 37

$12^2 + 35^2 = 144 + 1225 = 1369$

and, $37^2 = 1369$

$\because \quad 12^2 + 35^2 = 37^2$

$\therefore$ 12, 35 and 37 are the Pythagorean triplets.

(d) 55, 132, 143

$55^2 + 132^2 = 3025 \;\; 17424 = 20449$

and, $143^2 = 20449$

$\because \quad 55^2 + 132^2 = 143^2$

$\therefore$ 55, 132 and 143 are the Pythagorean triplets.

(e) 3, 4, 5

$3^2 + 4^2 = 9 + 16 = 25$

and, $5^2 = 25$

$\because \quad 3^2 + 4^2 = 5^2$

$\therefore$ 3, 4 and 5 are the Pythagorean triplets.

(f) 0.7, 2.4, 2.5

$(0.7)^2 + (2.4)^2 = 0.49 + 5.76 = 6.25$

and, $(2.5)^2 = 6.25$

$\because \quad (0.7)^2 + (2.4)^2 = (2.5)^2$

$\therefore$ 0.7, 2.4 and 2.5 are the Pythagorean triplets.

5. Distance covered to North from starting point = 15 m.

Distance, covered to last point to west = 8 m.

Thus, distance between from starting point to the last point

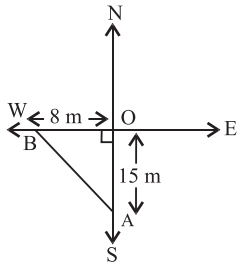
$$AB = \sqrt{(OA)^2 + (OB)^2}$$

$$= \sqrt{(15\text{ m})^2 + (8\text{ m})^2}$$

$$= \sqrt{225\text{ m}^2 + 64\text{ m}^2}$$

$$= \sqrt{289\text{ m}^2}$$

$$= 17\text{ m}.$$



Hence, 17 metre for away from the starting point, I am now.

6. Total height of pole = 81 m

Let, the height above break point of pole be *x*.

By pythagorian theorem,

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

$$(81 - x)^2 = (27)^2 + x^2$$

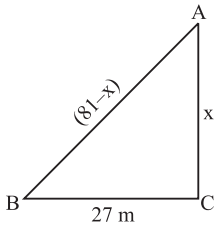
$$(81)^2 + x^2 - 2 \times x \times 81 = 729 + x^2$$

$$6581 + x^2 - 162x = 729 + x^2$$

$$6581 - 729 = x^2 - x^2 + 162x$$

$$5832 = 162x$$

$$x = \frac{5832}{162} = 36\text{ m}$$



Hence, the pole broke at 36 metre high from the ground.

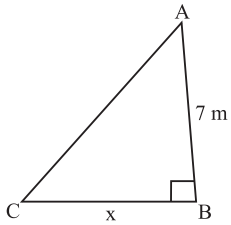
7. Total height of the tree = 32 m

Let, the distance betwen the bottom of tree and the touches point of top of tree be *x*.

$\because$ Broke point of tree = 7 m

$\therefore$ Broke part of tree = (32 – 7) m

= 25 m



By Pythagoras theorem,

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

$$(25\text{ m})^2 = (7\text{ m})^2 + x^2$$

$$625\text{ m}^2 = 49\text{ m}^2 + x^2$$

$$x^2 = 625\text{ m}^2 - 49\text{ m}^2$$

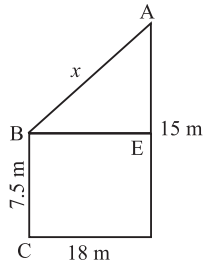
$$x^2 = 576\text{ m}^2$$

$$x = \sqrt{576}\text{ m} = 24\text{ m}$$

Hence, the distance between the top of tree and, the botom of tree is 24 metre.

8. Let, the length of wire stretched from the top of oen to the top of second pole be *x*.

By Pythagoras theorem,



$$AB^2 = BE^2 + AE^2$$

$$x^2 = (18\text{ m})^2 + (15\text{ m} - 7.5\text{ m})^2$$

$$= (18\text{ m})^2 + (7.5)\text{ m}^2$$

$$= 324\text{ m}^2 + 56.25\text{ m}^2$$

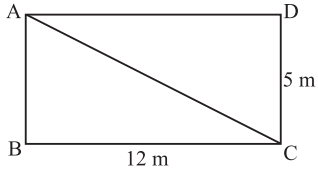
$$x^2 = 380.25\text{ m}^2$$

$$x = \sqrt{380.25}\text{ m}$$

$$= 19.5\text{ m}$$

Hence, the length of wire stretched from the top of one pole to the top of second pole is 19.50 metre.

9. Length of rectangular park $= 2\text{ m}$



Width of rectangular park $= 5\text{ m}$

In ΔABC, By Pythagoras theorem,

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

$$= (5\text{ m})^2 + (12\text{ m})^2$$

$$= 25\text{ m}^2 + 144\text{ m}^2$$

$$AC^2 = 169\text{ m}^2$$

$$AC = \sqrt{169} \text{ m}$$
$$= 13 \text{ m}$$

and, $AB + BC = 5 + 12 \text{ m}$
$$= 17 \text{ m}$$

$\because \quad (AB + BC) > AC$

Hence, AC is the shorter route then $(AB + BC)$ route by 4 metre.

Mental Ability

A. Multiple Choice Questions (MCQ) :

1. (b) **2.** (b) (d) **3.** (b) **4.** (c) **5.** (b) **6.** (b)

B. Fill in the blanks :

1. Any triangle can have only **one** obtuse angle.
2. Natural numbers a, b and c form Pythagorean triplets, if $\boldsymbol{a^2 + b^2 = c^2}$.
3. Any triangle can have a maximum of **one** right angle.
4. Difference of any two sides of a triangle is **less** than the third side.
5. The sum of two sides of a triangle is **greater** than the third side.
6. An isosceles triangle is a triangle that has **two** equal sides.

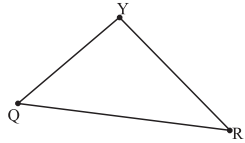
C. State True (T) or False (F) :

1. False **2.** False **3.** False **4.** True **5.** False

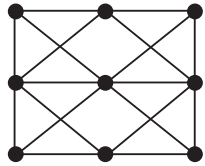
Higher Order Thinking

1. We could not draw any triangle by joining three collinear poinits.

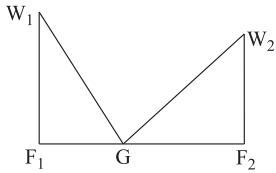
2. Yes, we can draw a triangle by joining these non-collinear points—P, Q and R.



3. Hence, we can draw only 44 trianglesby joining these dots.



4. In ΔW_1F_1G, By Pythagoras theorem,



$$(W_1G)^2 = (W_1F_1)^2 + (F_1G)^2$$
$$(8.5\text{ m})^2 = (7.5\text{ m})^2 + (F_1G)^2$$
$$72.25\text{ m}^2 = 56.25\text{ m}^2 + (F_1G)^2$$
$$(F_1G)^2 = 72.25\text{ m}^2 - 56.25\text{ m}^2$$
$$(F_1G)^2 = 16\text{ m}^2$$
$$F_1G = \sqrt{16}\text{ m} = 4\text{ m}$$

In ΔW_2GF_2,

By Pythagoras theorem,

$$(W_2G)^2 = (W_2F_2)^2 + (GF_2)^2$$
$$(8.5\text{ m})^2 = (4\text{ m})^2 + (F_2G)^2$$
$$72.25\text{ m}^2 = 16\text{ m}^2 + (F_2G)^2$$
$$(F_2G)^2 = 72.25\text{ m}^2 - 16\text{ m}^2$$
$$(F_2G)^2 = 56.25\text{ m}^2$$
$$F_2G = \sqrt{56.25}\text{ m} = 7.5\text{ m}$$

Now, $F_1F_2 = F_1G + F_2G$

$= 4\text{ m} + 7.5\text{ m} = 11.5\text{ m}$

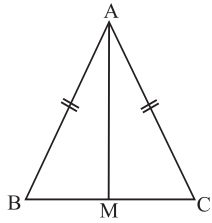
Hence, the distance between the walls is 11.5 metre.

Chapter

11 Exponents

1. Let, ABC is an isosceles triangle.

and, AM is a median of its.



Now, $AC = AB$

$MC = BM$

and, $AM = AM$

$\therefore$ By SSS, congruence condition,

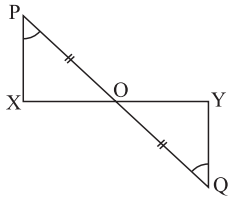
$$\Delta ABM \cong \Delta ACM$$

$\because \quad \Delta ABM \cong \Delta ACM$

So, $\angle ABM = \angle ACM$.

2. Now, $PO = OQ$ (given)

$\angle P = \angle Q$ (given)



and, $\angle POX = QOY$

$\{\because PQ$ and XY are straight lines$\}$

By ASA, congruence condition,

So, $\Delta POX \cong \Delta QOY$

3. (a) If, $\Delta ABC \cong \Delta PQR$

Thus, $\angle A = \angle P, \angle B = \angle Q$ and $\angle C = \angle R$.

Sides, $AB = PQ, BC = QR$ and $AC = PR$

Vertices, $A \leftrightarrow P, B \leftrightarrow Q$ and $C \leftrightarrow R$.

(b) If, $\Delta PQR \cong \Delta EDF$

Thus, Angles, $\angle P = \angle E, \angle Q = \angle D$ and $\angle R = \angle F$.

Sides, $PQ = ED, QR = DF$ and $PR = EF$

Vertices, $P \leftrightarrow E, Q \leftrightarrow D$ and $R \leftrightarrow F$

(c) $\Delta XYZ \cong \Delta RPQ$

Thus, Angles, $\angle X = \angle R, \angle Y = \angle P$ and $\angle Z = \angle Q$

Sides, $XY = RP, YZ = PQ$ and $XZ = RQ$

Vertices, $X \leftrightarrow R, Y \leftrightarrow P$ and $Z \leftrightarrow Q$.

(d) $\Delta MNO \cong \Delta CBA$

Thus, Angles, $\angle M = \angle C, \angle N = \angle B$ and $\angle O = \angle A$

Sides, $MN = CB$, $NO = BA$ and $MO = CA$

Vertices, $M \leftrightarrow C, N \leftrightarrow B$ and $O \leftrightarrow A$.

4. (a) $\Delta ABC \cong \Delta PRQ$

Sides : $AB = PR, BC = RQ$ and $AC = RQ$

Angles : $\angle A = \angle P, \angle B = \angle R$ and $\angle C = \angle Q$

(b) $\Delta DEF \cong \Delta QPR$

Sides : $DE = QP, EF = PR$ and $DF = QR$

Angles : $\angle D = \angle Q, \angle E = \angle P$ and $\angle F = \angle R$.

5. Let, ABC is an isoscele triangle

and AM is a median of its.

Now, $AB = AC$

$\angle ABM = \angle ACM$

and, $AM = AM$ (command)

$\therefore$ By SAS congruence condition

$\Delta ABM \cong ACM$

$\because$ $\Delta ABM \cong ACM$

Thus, $BM = MC$

and, $\angle AMB = \angle AMC$

Now, $\angle AMB + \angle AMC = 180°$ {Linear pair}

$\angle AMB + \angle AMB = 180°$ $\{\because \angle AMB = \angle AMC\}$

$2 \cdot AMB = 180°$

$\therefore$ $\angle AMB = 90° = \angle AMC$

Hence, the bisector of the vertical angle of an isoscele triangle bisects the base at right angle.

6. $\because$ $AB = AC$

$PB = \dfrac{AB}{2}$

and, $QC = \dfrac{AC}{2}$

Thus, $PB = QC$

and, $\angle BPC = \angle CQB$

$BC = BC$

$\therefore$ By SAS congruence condtion :

$\Delta PBC \cong \Delta QCB$

Then, $BQ = CP$

7. $\because$ $\angle APQ = \angle AQP$

$\therefore$ $AP = AQ$

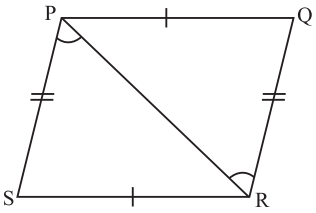
and, $\angle APB = \angle AQC$ {By linear pair}

$BP = QC$ (given)

By SAS congruence condition :

So, $\Delta ABP \cong \Delta ACQ.$

8. $\because$ PQ and SR are parallel lines and PR is a transversal.



$\therefore$ $\angle QPR = \angle PRS$

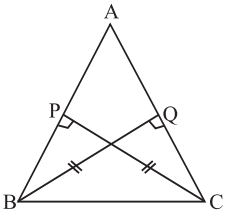
$PQ = SR$ (given)

and, $PS = QR$ (given)

By SAS congruence condition,

So, $\Delta PQR \cong \Delta RSP$

9. $\because$ BQ and CP are altitudes.



$\therefore$ $\angle BPC = \angle CQB = 90°$

Now, $BQ = PC$ (given)

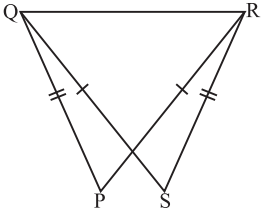
$\angle BPC = \angle CQB$ (each 90°)

$BC = BC$ (common)

By SAS congruence condition,

So, $\Delta BCQ \cong \Delta CBP$

10. $\because$ $PQ = SR$ (given)

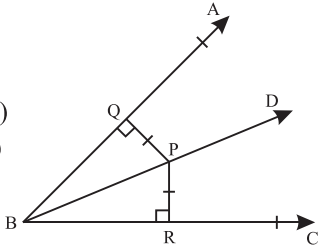


$PR = SQ$ (given)

and, $QR = QR$ (common)

$\therefore$ $\Delta PQR \cong \Delta SRQ$ (By SSS)

11. $\because$ $PQ \perp BA$ and $PR \perp B$



$\therefore$ $\angle BQP = \angle BRP = 90°$.

Now, $PQ = PR$ (given)

$\angle BQP = \angle BRP$ (each 90°)

and, $BP = BP$ (common)

$\therefore$ $\Delta BPR \cong \Delta BPQ$ (By SAS)

$\because$ $\Delta BPR \cong \Delta BPQ$

$\therefore$ $\angle RBP = \angle QBP$

So, it is clear that BP bisects $\angle ABC$.

12. $\because$ $AB = AC$,

and, D and F are the mid point of AB and AC.

Thus, $AD = DB = AF = FC$

$\because$ E is a mid point of BC.

Thus, $BE = EC$

$\because$ $AB = AC$

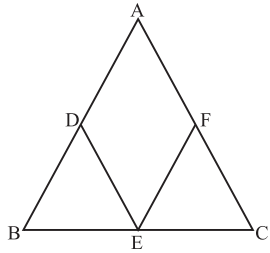
$\therefore$ $\angle ABC = \angle ACB$

Now, $BD = FC$

$BE = EC$

and, $\angle DBE = \angle FCE$

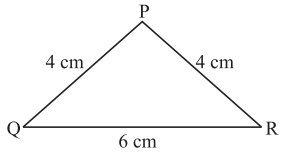
So, $\Delta DBE \cong \Delta FCE$



Exercise 11.2

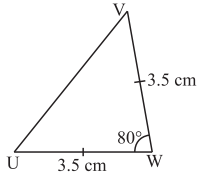
1. (a) $\because$ $PQ = PR = 4$ cm

$\therefore$ $\angle PQR = \angle PQR$



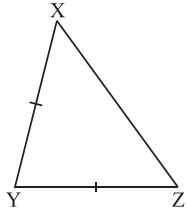
(b) $\because$ $VW = UW = 3.5$ cm

$\therefore$ $\angle UVW = \angle VUW$



(c) $\because$ $XY = YZ$

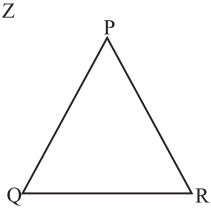
$\therefore$ $\angle Y \times Z = \angle YZX$



2. In ΔPQR,

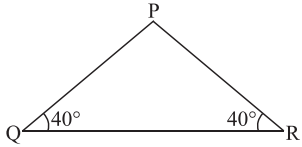
$\because$ $PQ = PR$

$\therefore$ $\angle PQR = \angle PRQ$



3. (a) $\because$ $\angle Q = \angle R = 40°$

$\therefore$ Sides, $PQ = PR$



(b) In ΔOVW,

$\angle U + \angle V + \angle W = 180°$

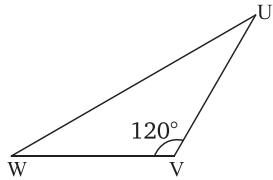
$\angle U + 120° + 30° = 180°$

$\angle U = 180° - 150°$

$\therefore \quad \angle U = 30°$

$\because \quad \angle U = \angle W = 30°$

$\therefore \quad$ Sides, $UV = WV$.



(c) In ΔXYZ,

$\angle X + \angle Y + \angle Z = 180°$

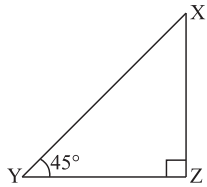
$\angle X + 45° + 90° = 180°$

$\angle X = 180° - 135°$

$\therefore \quad \angle X = 45°$

$\because \quad \angle X = \angle Y = 45°$

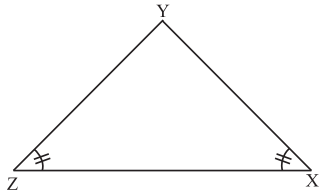
$\therefore \quad$ Sdies, $XZ = YZ$



4. In ΔXYZ,

$\because \quad \angle Z = \angle X$

Thus, $\quad YZ = YX$.



5. In ΔPQR,

(i) $\because \quad PR = QR$

$\therefore \quad \angle QPR = \angle PQR$

Thus, $\angle PQR = 80°$

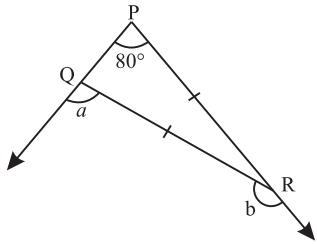
$\because \quad \angle P + \angle Q + \angle R = 180°$

$80° + 80° + \angle R = 180°$

$\angle R = 180° - 160°$

$\therefore \quad \angle R = 20°$

Thus, $\angle PRQ = 20°$



(ii) $\angle PRQ + \angle b = 180°$ {Linear pair}

$20° + \angle b = 180°$

$\angle b = 180° - 20°$

$\therefore \quad \angle b = 160°$

$\angle PQR + \angle a = 180° \qquad$ {Linear pair}

$80° + \angle a = 180°$

$\angle a = 180° - 80°$

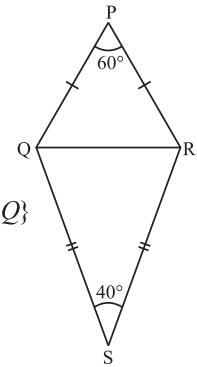
$\therefore \quad \angle a = 100°$

6. $\because \quad PQ = PR$

$\therefore \quad \angle PQR = \angle PRQ$

and, $\quad QS = RS$

$\therefore \quad \angle SQR = \angle SRQ$



(a) In ΔPQR,

$\angle PQR + \angle PRQ + \angle QPR = 180°$

$\angle PQR + PQR + 60° = 180° \quad \{\angle PQR = \angle PRQ\}$

$2.\ \angle PQR = 180° - 60°$

$\angle PQR = \dfrac{120°}{2} = 60°$

So, $\angle PQR = \angle PRQ = 60°$

(b) In ΔQRS,

$\angle SQR + \angle QSR + \angle QRS = 180°$

$\angle SQR + 40° + \angle SQR = 180° \quad \{\because \angle SQR = \angle QRS\}$

$2 \cdot \angle SQR = 180° - 40°$

$\angle SQR = \dfrac{140°}{2} = 70°$

So, $\quad \angle SQR = \angle QRS = 70°$

(c) $\because \quad \angle PQS = \angle PQR + RQS$

$\therefore \quad \angle PQS = 60° + 70° = 130°$

and, $\angle PRS = \angle PRQ + \angle QRS$

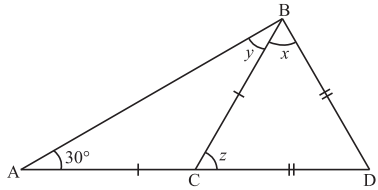
$\therefore \quad \angle PRS = 60° + 70° = 130°$

So, $\angle PQS = \angle PRS = 130°$

Hence, ($\angle PQR$ and $\angle PRQ$), ($\angle SQR$ and $\angle SRQ$)

and, ($\angle PQS$ and $\angle PRS$) are equal.

7. $\because \quad AC = BC$



$\therefore \quad \angle BAC = \angle ABC$

$30° = y$

So, $\quad y = 30°$

In ΔABC,

$$\angle A + \angle B + \angle C = 180°$$
$$30° + y + \angle C = 180°$$
$$30° + 30° + \angle C = 180°$$
$$\angle C = 180° - 60°$$
$$\therefore \quad \angle C = 120°$$

Now, $\angle ACB + \angle BCD = 180°$ {Linear pair}

$$120° + z = 180°$$
$$z = 180° - 120°$$

So, $\quad z = 60°$

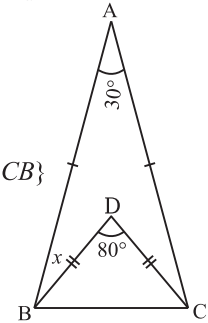
$\because \quad BD = CD$

$\therefore \quad \angle BCD = \angle CBD$

$$z = x$$
$$60° = x$$

So, $\quad x = 60°$

8. In Fig. 11.33, ΔABC and ΔDBC are isosceles. Find



(a) $\because \quad AB = AC$

$\therefore \quad \angle ABC = \angle ACB$

In ΔABC,

$\angle ABC + \angle BAC + \angle ACB = 180°$

$\angle ABC + 30° + \angle ABC = 180° \quad \{\because \ \angle ABC = \angle ACB\}$

$$2 \cdot \angle ABC = 180° - 30°$$
$$\angle ABC = \frac{150°}{2} = 75°$$

So, $\quad \angle ABC = \angle ACB = 75°$

(b) $\because \quad BD = CD$

$\therefore \quad \angle DBC = \angle DCB$

In ΔDBC,

$$\angle DBC + \angle BDC + \angle DCB = 180^\circ$$
$$\angle DBC + 80^\circ + \angle DBC = 180^\circ \qquad \{\angle DBC = \angle DCB\}$$
$$2 \cdot \angle DBC = 180^\circ - 80^\circ$$
$$\angle DBC = \frac{100^\circ}{2} = 50^\circ$$

So, $\angle DBC = \angle DCB = 50^\circ$

(c) $\because \quad \angle ABC = \angle ABD + \angle DBC$

$$70^\circ = x + 50^\circ$$
$$x = 75^\circ - 50^\circ$$

So, $x = 25^\circ$

Mental Ability

A. Multiple Choice Questions (MCQs) :

1. (a) **2.** (c) **3.** (c) **4.** (b) **5.** (b) **6.** (d) **7.** (b) **8.** (b)

B. Fill in the blanks :

1. $\Delta PQR \cong \Delta ABC, \angle Q = \angle B = 90^\circ, PQ = 4\,\text{cm}, QR = 3\,\text{cm}$. Find AC. **5 cm**.
2. Two circles are said to be congruent if they have the same **radii**.
3. If two figures have same shape and size, they are said to be **congruent**.
4. Two line segments are **congruent**, if they have equal length and thickness.
5. $\Delta PQR \cong \Delta LMN, PQ = 8\text{cm}, QR = 10\text{cm}$ *and* $\angle N = 70^\circ$. Find $\angle R$ and MN $\boldsymbol{R = 70^\circ}$ **adn** $\boldsymbol{MN = 10}$ **cm**.

C. T for 'True' or F for 'False' :

1. False **2.** False **3.** False **4.** False

Chapter

12 Constructions

1. Steps of Construction :

(i) Draw a line segment $AB = 7\,\text{cm}$.

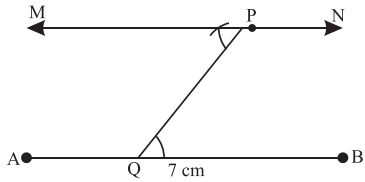
(ii) Take any point P above AB.

(iii) Take any point Q on AB and join PQ.

(iv) Draw MPQ, such that $MPQ = PQB$.

(v) extend MP to N.

Thus, $MN \parallel AB$.

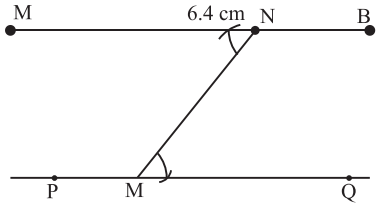


2. Steps of Construction :

(i) Draw a line segment $AB = 6.4$ cm.

(ii) Take any point M below AB.

(iii) Take any point N, on line AB and join MN.



(iv) Draw, NMQ, such that $\angle NMQ = ANM$

(v) Extent MQ to P.

Thus, $AB \parallel PQ$.

3. Steps fo Construction :

(i) Draw an angle

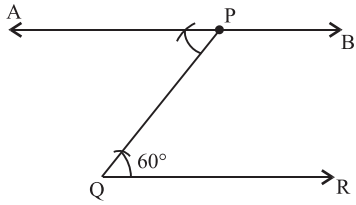
$$\angle PQR = 60°.$$

(ii) At point P, draw an another angle $\angle PRQ$ such that

$$\angle APQ = \angle PQR = 60°$$

(iii) Extend AP to B.

So, AB is parallel to QR.



4. Steps of Construction :

(i) Draw aline segment $MN = 4$ cm.

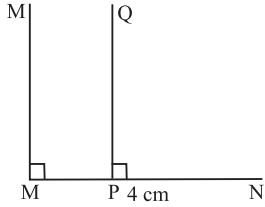
(ii) At M, draw a line MM' perpendicular to MN.

(iii) At midpoint of MN, draw line PQ.

Perpndicular ot MN.

$\because$ $\angle M'MN = \angle QPN$. {each 90°}

Thus, $MM' \parallel PQ$.



5. Step of Construction :

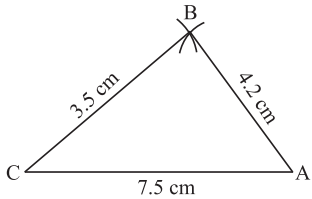
(i) Draw a line segment $AC = 7.5$ cm.

(ii) With C as centre and radius 4.3 cm, draw an arc.

(iii) With A as centre and radius 3.8 cm, draw another arc, cutting the previous arc at point B.

(iv) Join BC and AB.

Thus, ΔABC is the required triangle.



6. Steps of Construction :

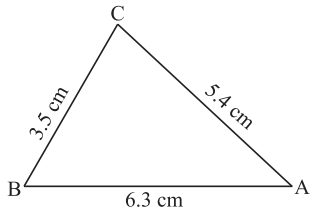
(i) Draw a line segment $AB = 6.3$ cm.

(ii) With B as centre and radius 4.6 cm, draw an arc.

(iii) With A as centre and radius 5.4 cm, draw another arc, cutting the previous arc at Point C.

(iv) Join BC and AC.

Thus, ΔABC is the required triangle.



7. Steps of Construction :

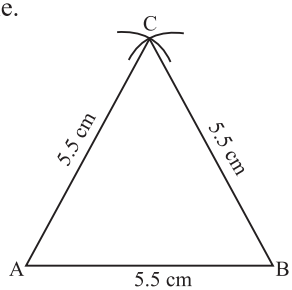
(i) Draw a line segment $AB = 5.5$ cm.

(ii) With A as centre, and radius 5.5 cm, draw an arc.

(iii) With B as centre, and radius 5.5 cm, draw an another arc, cutting the previous arc at point C.

(iv) Join AC and AB.

Thus, ΔABC is the requried triangle.

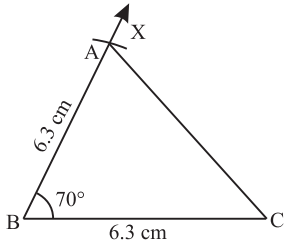


8. Steps of Construction :

(i) Draw a line segment $BC = 6.3$ cm.

(ii) At point B, draw an angle $\angle CBX = 70°$.

(iii) With B as centre and radius 6.3 cm, draw an arc, cutting the Ray $\overrightarrow{BX}$ at A.



(iv) Join AC.

Thus, ΔABC is the required triangle.

9. Steps of Construction :

(i) Draw a line segment $AC = 5.6$ cm.

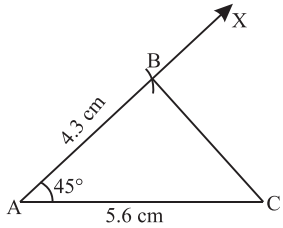
(ii) At point A, draw an angle

$$\angle CAX = 45°.$$

(iii) With A as centre and radius 4.3 cm, draw an arc, cutting the ray $\overrightarrow{AX}$ at point B.

(iv) Join BC.

Thus, ΔABC is the required triangle.



10. Steps of Construction :

(i) Draw a line segment $BC = 6$ cm.

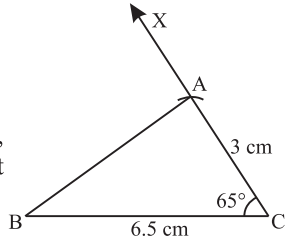
(ii) At point C, draw an angle

$$\angle BCX = 65°.$$

(iii) With C as centre and radius 3 cm, draw an arc, cutting the ray CX at point A.

(iv) Join BA.

Thus, ΔABC is the required triangle.



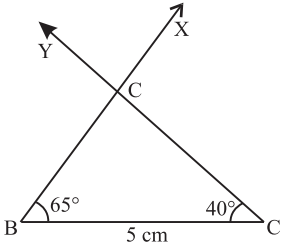
11. Steps of Construction :

(i) Draw a line segment $AB = 5$ cm.

(ii) At point A, draw an angle $\angle BAX = 65°$.

(iii) At point B, draw an another angle $\angle ABY = 40°$, Ray $\overrightarrow{AB}$ and BY cutting each other at point C.

Thus, ΔABC is the required triangle.



12. In ΔABC,

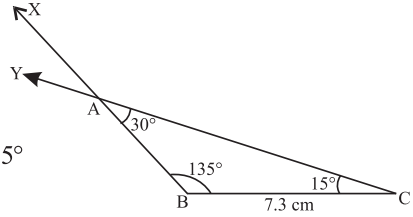
$$\angle A + \angle B + \angle C = 180°$$

$$30° + 135° + \angle C = 180°$$

$$165° + \angle C = 180°$$

$$\angle C = 180° - 165°$$

$$\therefore \quad \angle C = 15°$$



Steps of Construction :

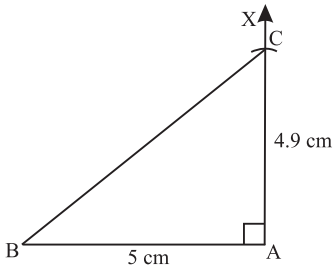
(i) Draw a line segment $BC = 7.3$ cm.

(ii) At point B, draw an angle $\angle CBX = 135°$.

(iii) At point C, draw a angle $\angle BCY = 15°$, Ray $\overrightarrow{BX}$ and $\overrightarrow{CY}$ cutting each other at point A.

Thus, ΔABC is the required triangle.

13. Steps of Construction :



(i) Draw a line segment $AB = 5$ cm.

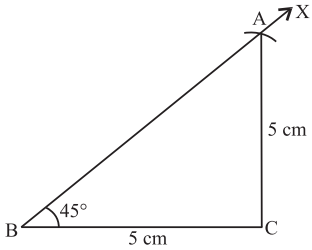
(ii) At point A, draw an angle $\angle BAX = 90°$.

(iii) With A as centre and radius 4.8 cm, draw and arc cutting the Ray AX at C.

(iv) Join BC.

Thus, ΔABC is the required triangle.

14. Steps of Construction :



(i) Draw a line segment $BC = 5$ cm.

(ii) At point B, draw an angle $\angle CBX = 45°$.

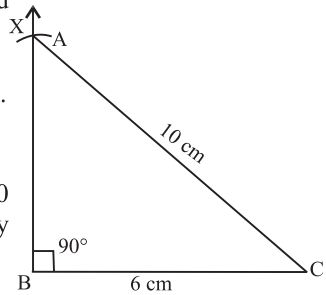
(iii) With C as centre and radius 5 cm draw an arc cutting the ray $\overrightarrow{BX}$ at point A.

(iv) Join AC.

Thus, ΔABC is the required triangle.

Yes, this is a right-angled triangle.

15. Steps of Cosntruction :



(i) Draw a line segment $BC = 6$ cm.

(ii) At point B, draw an angle $\angle CBX = 90°$.

(iii) With C as centre and radius 10 cm draw an arc cutting the Ray $\overrightarrow{BX}$ at point A.

(iv) Join AC.

Thus, ΔABC is the required tirangle and the measure of AB is 8 cm.

16. Steps of Construction :

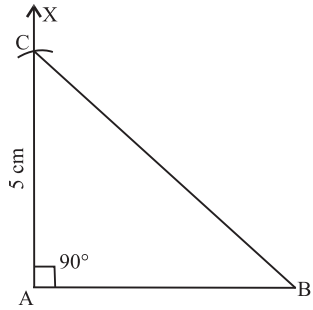
(i) Draw a line segment $AB = 5$ cm.

(ii) At point A, draw an angle, $\angle BAX = 90°$.

(iii) With A as centre and radius 5 cm draw an arc cutting the ray $\overrightarrow{AX}$ at point C.

(iv) Join BC.

Thus, ΔABC is the required triangle.



17. Steps of Construction :

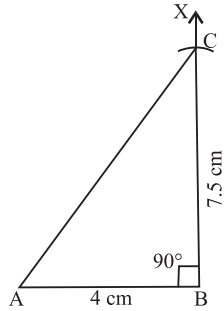
(i) Draw a line segment $AB = 4$ cm.

(ii) At point B, draw a angle $\angle ABX = 90°$.

(iii) With B as centre and radius 7.5 cm draw an arc cutting the ray $\overrightarrow{BX}$ at point C.

(iv) Join AC.

Thus, ΔABC is the required triangle, and the measure of AC is 8.5 cm.



Mental Ability

A. Multiple Choice Questions (MCQs) :

B. Fill in the blanks :

1. A triangle can be constructed, when its **three** sides are given.
2. We can construct a triangle when its two sides and **an angle** are given.
3. If two angles and **a side** are given, a triangle can be constructed.
4. For constructing a right-angled triangle, its hypotenuse and one **side** should be given.
5. Can a triangle be constructed with the sides 6 cm, 5 cm and 12 cm? **No**.

6. ΔLMN can be constructed, when $LM = 4$ cm, $MN = 5.5$ cm and $\angle M = 50°$ using **SAS** criterion.

C. State True (T) or False (F) :

1. True **2.** False **3.** True **4.** False **5.** True

Chapter

13 Visualising Solid Shapes

Exercise 13

1. Give the specific name to the following :

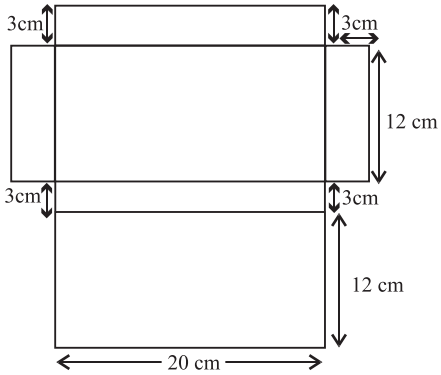
(a) Door—Cuboid,
(b) Orange—Sphere
(c) Circular pipeCylinder
(d) Book—Cuboid
(e) Tennis ball—Sphere
(f) Almirah—Cuboid
(g) Birthday cap—Cone
(h) Tube light—Cylinder

2. Complete the following table :

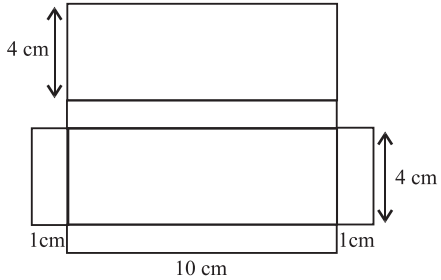
3D object	Number of vertices	Number of edges	Number of faces
(a) Sphere	**0**	**0**	**1**
(b) Cylinder	**0**	**2**	**3**
(c) Cone	**1**	**1**	**2**
(d) Triangular prism	**6**	**9**	**5**
(e) Tetrahedron	**4**	**6**	**4**
(f) Triangular pyramid	**4**	**6**	**4**

3. Draw nets for the following objects.

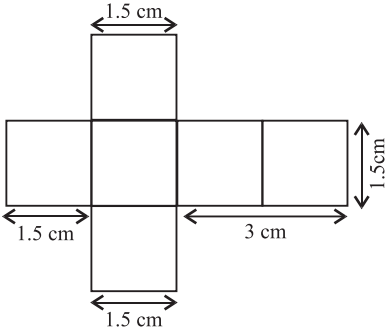
(a)


3cm
3cm
12 cm
3cm
3cm
12 cm
20 cm

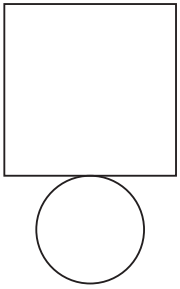
(b)


4 cm
4 cm
1cm
1cm
10 cm

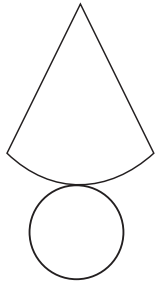
(c)


1.5 cm
1.5cm
1.5 cm
3 cm
1.5 cm

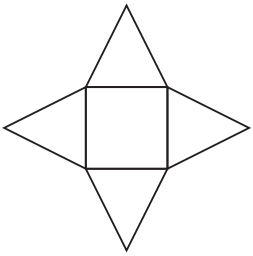
(d)



(e)



(f)



4. (a), (b), and (f) can be the nets fo a cube.

5. Dimensions of the cartoon $= 100\text{ cm} \times 50\text{ cm} \times 60\text{ cm}$.

And, dimensions of small cube $= 10\text{ cm} \times 10\text{ cm} \times 10\text{ cm}$

So, total number of small cube $= \dfrac{100 \times 50 \times 60}{10 \times 10 \times 10}$

$= 300$

So, there are 300 cubes can be fitted in the above cartoon.

6. Match the figures (Column A) with their respective names (Column B) :

	'A'	**'B'**
(a)		(i) Sphere
(b)		(ii) Cuboid

(c)  (iii) Cone

(d)  (iv) Prism

(e)  (v) Cube

Mental Ability

A. Multiple Choice Questions (MCQs) :

1. (d) **2.** (a) **3.** (c) **4.** (b) **5.** (c) **6.** (d) **7.** (d)

B. Fill in the blanks :

1. Clown's cap is an example of **cone**.
2. The flat surfaces of a solid are called its **Faces**.
3. A cube has **12** edges and **8** vertices.
4. A rectangular prism is also called a **Cuboid**.
5. A triangular pyramid has **4** triangular faces.
6. The corner where three faces of a solid meet is called its **vertex**.
7. A tetrahedron is also called a **triangular pyramid**.

C. State True (T) or False (F) :

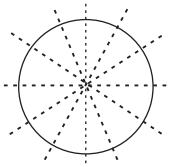
1. True **2.** True **3.** True **4.** False **5.** True **6.** False

Chapter 14 Symmetry

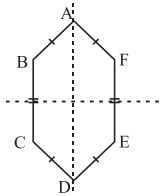
Exercise 14.1

1. Figure (b) and (f) have line of symmetry.

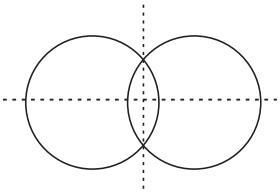
2.



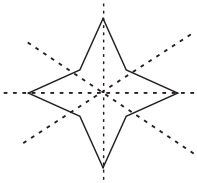
(a)



(b)

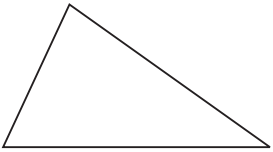


(c)



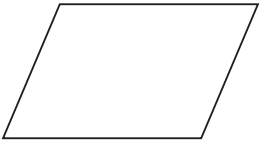
(d)

3. (i)



Scelene triangle

(ii)

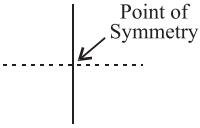


Parallel triangle

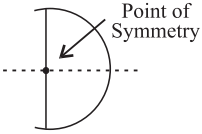
(iii)

letter G

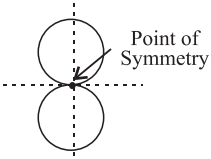
4.



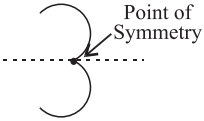
(a)



(b)

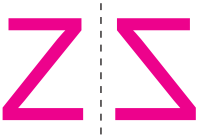


(c)

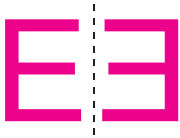


(d)

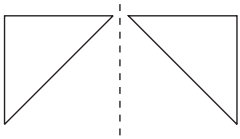
5.



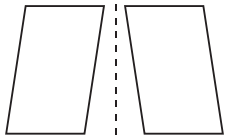
(a)



(b)

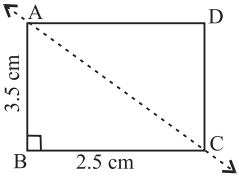


(c)

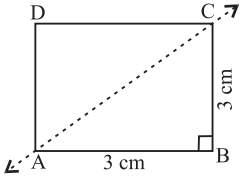


(d)

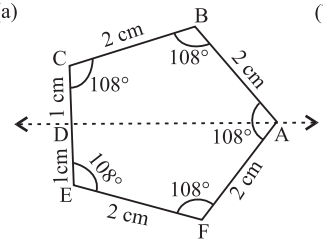
6.



(a)

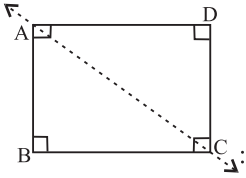


(b)

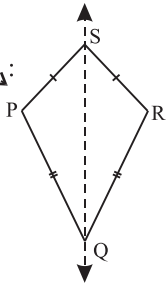


(b)

7. (a) Corresponding Sides : $(AB = CD)$ and $(AD = BC)$.
Corresponding Angles $(\angle ABC = \angle ADC)$, $(\angle BAC = \angle ACD)$ and $(\angle BCA = \angle CAD)$

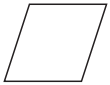
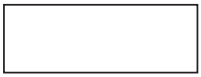


(b) Corresponding Sides : $(SP = SR)$ and $(PQ = RQ)$



Corresponding Angles :
$(\angle PSQ = \angle RSQ), (\angle PQS = \angle RQ)$
and $(\angle SPR = \angle SRQ)$.

8. Match the following :

Shapes	No. of line (s) of symmetry
(a) 	(i) 0
(b) 	(ii) 4
(c) 	(iii) 2
(d) 	(iv) many

Exercise 14.2

1. Letters—S, X, Z, H and O have rotational symmetry.

2. Figures—*a*, *b* and *c* have rotational symmetry.

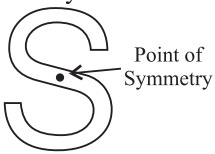
3. (a) Order of rotational symmetry = 3
(b) Order of rotational symmetry = 5
(c) Order of rotational symmetry = 8
(d) Order of rotational Symmetry = 4
(e) Order of rotational symmetry = 4
(f) Order of rotational symmetry = 3
(g) Order of rotational symmetry = 2
(h) Order of rotational symmetry = 2
(i) Order of rotational symmetry = 2
(j) Order of rotational symmetry = 2
(k) Order of rotational symmetry = 2
(l) Order of rotational symmetry = 2

4. Letters—A, B and C have line of symmetry but have no rotationl symmetry.

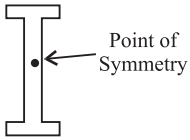
5. Letter—I, H and O have both line of symmetry.

6. A parallelogram is an example of geometric figure which has no line of symmetry but has rotational symmetry of order 2.

7.

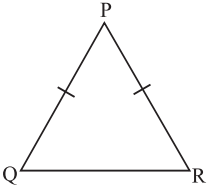


Order of rotational symmetry = 2

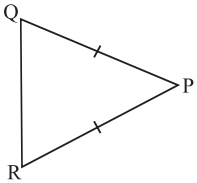


Order of rotational symmetry = 2

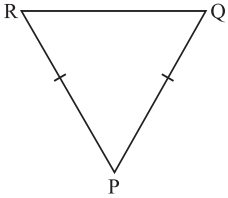
8.



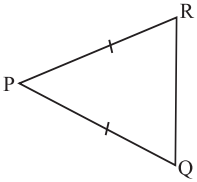
Rotate through = 90°



Rotate through = 180°



Rotate through = 180°



Rotate through = 270°

9. State whether the following statements are true or false :

(a) False (b) True (c) True (d) False (e) True (f) False (g) False

Mental Ability

A. Multiple Choice Questions (MCQs) :

1. (c) **2.** (a) **3.** (b) **4.** (b) **5.** (a) **5.** (c) **6.** (c) **7.** (c) **8.** (c) **9.** (a) **10.** (d) **11.** (c)

B. Fill in the blanks :

1. Letter 'T' has got **no** rotational symmetry.
2. A figure is said to have rotational symmetry only if it looks the same after a rotation of **180°** .

3. Rotational order of a parallelogram is **2** .
4. A circle has **inifinite** order of rotational symmetry.
5. The line which divides a given figure into two equal halves is called **line of symmetry**.

C. State True (T) or False (F) :

1. True **2.** False **3.** True **4.** True **5.** True

Chapter

15 Perimeter and Area

Exercise 15

1. Find the value of *x* when :

(a) $\because$ Perimeter of rectangle $= 48$ unit

$\therefore$ $2(l + b) = 48$ unit

$2(3x + x) = 48$ unit

$2 \times 4x = 48$ unit

$8x = 48$ unit

$x = \frac{48}{8}$ unit

So, $x = 6$ unit

(b) $\because$ Perimeter of equailateral triangle $= 15$ unit

$\therefore$ $3 \times$ each side $= 15$ unit

$3 \times (x - 2) = 15$ unit

$3x - 6 = 15$ unit

$3x = (15 + 6)$ unit

$x = \frac{21}{3} = 7$ unit

(c) $\because$ Perimeter of quadrilateral $= 8$ unit

$\therefore$ Sum of all the sides $= 8$ unit

$(x - 2) + (2x - 3) + (x - 2) + (2x - 3) = 8$ un it

$x - 2 + 2x - 3 + x - 2 + 2x - 3 = 8$ unit

$6x - 10 = 8$ unit

$6x = (8 + 10)$ unit

$$x = \frac{18}{6} = 3 \text{ unit}$$

2. Breadth a rectangular sheet $= 20$ cm

$\because$ Perimeter of rectangular sheet $= 108$ cm

$\therefore$ $2[l + b] = 108$ cm

$2[l + 20] = 108$

$l + 20 = \frac{108}{2}$

$l = 34 - 20$

Hence, the length of rectangular sheet is 34 cm.

3. Radius of a tyre of a car $= 28$ cm

Thus, circumference of tyre of car $= 2\pi r$

$$= 2 \times \frac{22}{7} \times 28 \text{ cm}$$

$$= 176 \text{ cm}$$

$\because$ distance covered by car in 1 revolution $= 176$ cm

$\therefore$ distance covered by car in 1000 revolution $= 1000 \times 176$ cm

$$= \frac{176000}{1000} \text{ m} = 1760 \text{ m}$$

4. Radius of a circular garden $= 28$ m

Thus, perimeter of circular garden $= 2\pi r$

$$= 2 \times \frac{22}{7} \times 28 \text{ m}$$

$$= 176 \text{ m}$$

So, the required fence is 176 m long.

5. $\because$ Circle and square formed with the same wire.

$\therefore$ Periemter of circle $=$ Perimeter of square

$$2\pi r = 4 \times \text{side}$$

$$2 \times \frac{22}{7} \times 10 \text{ cm} = 4 \times \text{side}$$

$$\frac{2 \times 22 \times 10}{7 \times 4} = \text{side}$$

$$\frac{110}{7} = \text{side}$$

$$\text{side} = 15\frac{5}{7}\text{ cm}$$

Hence, each side of formed square is $15\frac{5}{7}$ cm.

6. Total length of wire $= 157$ cm

Thus, circumference of circular bent wire $= 157$ cm

$$\therefore \quad 2\pi r = 157\text{ cm}$$

$$r = \frac{157}{2\pi}\text{ cm}$$

$$= \frac{157}{2 \times 3.14}\text{ cm}$$

$$= \frac{50}{2} = 25\text{ cm}$$

$$d = 2r = 2 \times 25 = 50\text{ cm}$$

Hence, the perimeter is 157 cm, radius is 25 cm and diameter is 50 cm.

7. Dimentions of rectangle $= 10$ cm and 14 cm.

$\because$ Perimeter of rectangle = Perimeter of square

$$2[l + b] = 4 \times \text{side}$$

$$2[10 + 14] = 4 \times \text{side}$$

$$\frac{2 \times 24}{4} = \text{each side}$$

each side $= 12$ cm

Hence, the length of each side of square is 12 cm.

8. Diameter of a wheel of a truck $= 1$ m

Thus, circumference of wheel $= \pi \cdot d$

$$= \frac{22}{7} \times 1\text{ m}$$

$$= 3.14\text{ m}$$

$\because$ Total distance covered by truck $= 78.5$ km

$\therefore$ Total number of revolution $= \dfrac{78.5 \times 1000 \text{ m}}{3.14 \text{ m}}$

$$= \frac{78.5 \times 100}{3.14} = 25000$$

9. Total length of hour hand of a clock $= 4.9$ cm

Thus, distance covered by the tip of hour hand in a revodlution $= 2\pi r$

$$= 2 \times \frac{22}{7} \times 4.9 \text{ cm}$$

$$= 30.8 \text{ cm}$$

$\because$ one revolution of hour hand $= 12$ hours

and one week $= 7 \times 24$ hours

$\therefore$ Total number of revolution $= \dfrac{7 \times 24}{12} = 14$

$\because$ Distance covered by hour hand in a revolution $= 30.8$ cm

$\therefore$ Distance covered by hour hand is 14 revolutions $= 14 \times 30.8$ cm

$= 431.2$ cm

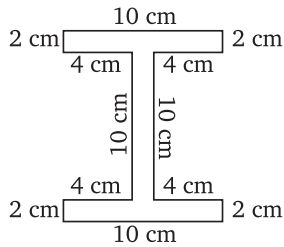
Hence, distance covered by the tip of hour hand in a week is 431.2 cm.

10. (a) Perimeter of figure

$= (10 + 2 + 4 + 10 + 4 \;\; 2 + 10 +$

$2 + 4 + 10 + 4 + 2)$ cm

$= 64$ cm.

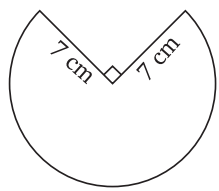


(b) Perimeter of figure

$$= \left[\frac{3}{4} \times 2\pi r + 2r\right]$$

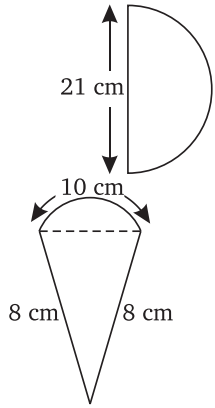
$$= \left[\frac{3}{4} \times 2 \times \frac{22}{7} \times 7 + 2 \times 7\right] \text{cm}$$

$$= 33 + 14 = 47 \text{cm}.$$



(c) Perimeter of figure $= \dfrac{\pi d}{2} + d$

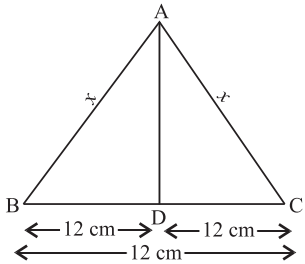
$$= \left[\frac{22 \times 21}{7 \times 2} + 21\right] \text{cm}$$
$$= 11 \times 3 + 21$$
$$= 33 + 21 = 54 \text{ cm.}$$



(d) Perimeter of figure $= 10\,\text{cm} + 8\,\text{cm} + 8\,\text{cm}$
$= (10 + 8 + 8)\,\text{cm}$
$= 26\,\text{cm}$

Exercise 15.2

1. Let, ABC an isosceleme triangle
and, $AB = AC = x$



$\because$ Perimeter of triangle $= 50\,\text{cm}$

$\therefore$ $AB + BC + AC = 50\,\text{cm}$

$$x + 24\text{ cm} + x = 50\text{ cm}$$
$$2x = (50 - 24)\text{ cm}$$
$$x = \frac{26}{2} = 13\text{ cm}$$

Thus, $AB = AC = 13\,\text{cm}$.

In ΔABC,

$$AB^2 = AD^2 + BD^2$$
$$x^2 = AD^2 + (12\,\text{cm})^2$$
$$(13\,\text{cm})^2 = AD^2 + (12\,\text{cm})^2$$
$$169\,\text{cm}^2 = AD^2 + 144\,\text{cm}^2$$
$$AD^2 = 169\,\text{cm}^2 - 144\,\text{cm}^2$$
$$AD^2 = 25\,\text{cm}^2$$
$$AD = \sqrt{25}\text{ cm}$$
$$AD = 5\,\text{cm}$$

$\because$ Area of a triangle $= \frac{1}{2} \times BC \times AD$

$= \frac{1}{2} \times 24 \text{ cm} \times 5 \text{ cm}$

$= 60 \text{ cm}^2$

2. $\because$ Area of an equilateral triangle $= 100\sqrt{3} \text{ dm}^2$

$\therefore$ $\frac{\sqrt{3}}{4} \times (\text{side})^2 = 100\sqrt{3} \text{ dm}^2$

$(\text{side})^2 = \frac{100\sqrt{3}}{\sqrt{3}} \times 4 \text{ dm}^2$

$(\text{side})^2 = 400 \text{ dm}^2$

$\text{side} = \sqrt{400} \text{ dm}$

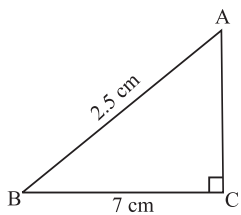
$= 20 \text{ dm}$

Hence, each side of equilateral triangle is 20 dm.

3. One side of a right angled triangle $= 7$ cm

and hypotenuse of a right-angled triangle $= 25$ cm

By Pythagoras theorem,



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

$(25 \text{ cm})^2 = AC^2 + (7 \text{ cm})^2$

$625 \text{ cm}^2 = AC^2 + 49 \text{ cm}^2$

$AC^2 = 625 \text{ cm}^2 - 49 \text{ cm}^2$

$AC^2 = 576 \text{ cm}^2$

$AC = \sqrt{576} \text{ cm}$

$AC = 24 \text{ cm}$

$\because$ Area of a triangle $= \frac{1}{2} \times \text{base} \times \text{height}$

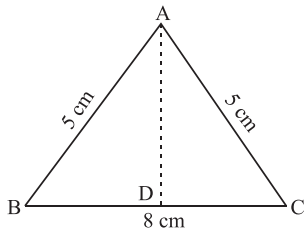
$\therefore$ Area of $\Delta ABC = \frac{1}{2} \times BC \times AC$

$$= \frac{1}{2} \times 7 \text{ cm} \times 24 \text{ cm}$$

$$= 84 \text{ cm}^2.$$

4. Base of a isoscele triangle $= 8$ cm

each of equal side of isoscele triangle $= 5$ cm



$\because \quad BC = BD + DC$

$\therefore \quad BD = DC = \frac{8}{2} = 4$ cm

By Pythagoras theorem,

$$AB^2 = AD^2 + BD^2$$

$$(5 \text{ cm})^2 = AB^2 + (4 \text{ cm})^2$$

$$25 \text{ cm}^2 = AB^2 + 16 \text{ cm}^2$$

$$AB^2 = 25 \text{ cm}^2 - 16 \text{ cm}^2$$

$$AB^2 = 9 \text{ cm}^2$$

$$AB = \sqrt{9} \text{ cm}$$

$$AB = 3 \text{ cm}$$

$\because$ Area of a triangle $= \frac{1}{2} \times$ base $\times$ height

$\therefore$ Area of $\Delta ABC = \frac{1}{2} \times BC \times AD$

$$= \frac{1}{2} \times 8 \text{ cm} \times 3 \text{ cm}$$

$$= 12 \text{ cm}^2.$$

5. Length of table top $= 2.5$ m

Width of table top $= 1.6$ m

So, Area of table top $= l \times b$

$$= 2.5 \text{ km} \times 1.6 \text{ m}$$

$$= 4 \text{ m}^2$$

$\because$ Cost of polishing per $\text{m}^2 =$ ₹ 5

$\therefore$ Cost of polishing 4 m^2 = ₹ 5×4

= ₹ 20

Hence, the cost of polishing the top of table is ₹ 20.

6. Let, the altitude of triangular garden be x.

Thus, the base of triangular garden = $3x$

$\therefore$ Area of tirangular garden $= \frac{1}{2} \times$ base $\times$ altitude

$= \frac{1}{2} \times$ base $\times$ altitude

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

$\because$ Cost of grassing the garden at ₹ 685 per hectare = ₹ 9247.50

$\therefore$ Area of garden $= \frac{9247.50}{685}$ hectare

= 13.5 hectare

$= 13.5 \times 10{,}000$ meter^2

$= 135{,}000$ m^2

Thus, $\frac{3}{2}x^2 = 135{,}000\,m^2$

$x^2 = \frac{135000 \times 2}{3}\,m^2$

$x^2 = 90{,}000\,m^2$

$x = \sqrt{90{,}000}$ m

$x = 300$ m.

So, base of triangular garden = 300 metre

and altitude of tirangular garden = $3x$

$= 3 \times 300 = 900$ metre.

7. $\because$ Ratio of sides of a triangle = 13 : 14 : 15

Let, the sides of triangle = $13x$, $14x$ and $15x$.

$\because$ Perimeter of triangle = 294 cm

$\therefore$ $13x + 14x + 15x = 294$ cm

$$42x = 294 \text{ cm}$$
$$x = \frac{294}{42} \text{ cm}$$
$$x = 7 \text{ cm}$$

Thus, all the sides of triangle $= 13 \times 7$ cm

$= 91$ cm, $14 \times 7 = 98$ cm and $15 \times 7 = 105$ cm

Now, $S = \frac{\text{Perimeter}}{2} = \frac{294}{2} = 147$ cm

Area of triangle $= \sqrt{S(S-a)(S-b)(S-c)}$

$= \sqrt{147(147-91)(147-98)(147-105)}$

$= \sqrt{147 \times 56 \times 49 \times 42}$

$= \sqrt{(3 \times 7 \times 7) \times (\underline{2 \times 2} \times 2 \times 7) \times (\underline{7 \times 7}) \times (3 \times 2 \times 7)}$

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

$= 98 \times 42 = 4116 \text{ cm}^2$

So, Altitude of triangle on longest side of triangle $= \frac{2 \times 4116}{105}$

$= 78.4$ cm

8. Dimension of a tile $= 25 \text{ cm} \times 20 \text{ cm}$

and dimension of the wall $= 4 \text{ m} \times 3 \text{ m}$

So, total number of tiles $= \frac{4 \text{ m} \times 3 \text{ m}}{25 \text{ cm} \times 20 \text{ cm}}$

$= \frac{4 \times 100 \text{ cm} \times 3 \times 100 \text{ cm}}{25 \text{ cm} \times 20 \text{ cm}}$

$= 4 \times 4 \times 3 \times 5$

$= 240$

Hence, there are 240 tiles is required to cover the wall.

9. Let the length of rectangle $= l$

and the breadth of rectangle $= b$

Thus, the area of rectangle $= l \times b = lp$

Now,

New length of rectangle $= 2l$

and new breadth of rectangle $= \frac{b}{2}$

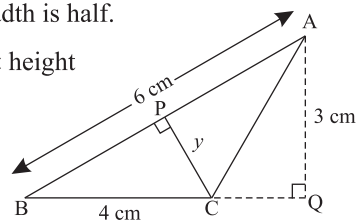
Thus, the area of new rectangle $= 2l \times \frac{b}{2}$

$= lb$

Hence, the area of rectangle is same.

If, the length is doubled and breadth is half.

10. (a) Area of triangle $= \frac{1}{2} \times$ base $\times$ height



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

$= 6 \text{cm}^2$

Now, area of triangle $= \frac{1}{2} \times$ base $\times$ height

$$6 \text{cm}^2 = \frac{1}{2} \times 6 \text{cm} \times y$$

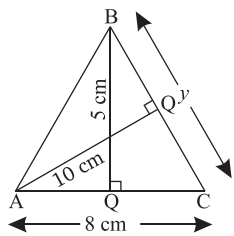
$$\frac{6 \times 2}{6} = y$$

Hence, $y = 2 \text{ cm}$

(b) $\because$ area of triangle $= \frac{1}{2} \times$ base $\times$ height

$$= \frac{1}{2} \times 8 \text{ cm} \times 5 \text{ cm}$$

$$= 20 \text{cm}^2$$



Now, Area of triangle

$$= \frac{1}{2} \times \text{bases} \times \text{height}$$

$$20 \text{cm}^2 = \frac{1}{2} \times y \times 10 \text{ cm}$$

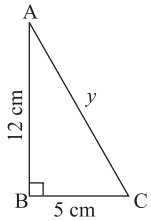
$$\frac{20 \times 2}{10} = y$$

Hence, $y = 4 \text{ cm}$

(c) Area of triangle $= \frac{1}{2} \times \text{base} \times \text{height}$

$= \frac{1}{2} \times 5\text{ cm} \times 12\text{ cm}$

$= 30\text{ cm}^2$



In ΔABC, By Pythagoras theorem

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

$$y^2 = (12\text{ cm})^2 + (5\text{ cm})^2$$

$$= 144\text{ cm}^2 + 25\text{ cm}^2$$

$$y^2 = 169\text{ cm}^2$$

$$y = \sqrt{169}\text{ cm}$$

Hence, $y = 13\text{ cm}$

11. Base of garden $= 18.5$ m

Altitude of garden $= 5.2$ m

Ahence, the area of garden $=$ base $\times$ height

$= 18.5\text{ m} \times 5.2\text{ m}$

$= 96.2\text{ m}^2$

$\because$ Cost of gardening per $\text{m}^2 =$ ₹ 5

$\therefore$ Cost of gardening $96.2\text{ m}^2 =$ ₹ 5×96.2

$=$ ₹ 481

12. Area of parallelogram $= 18\text{ cm}^2$

$$\frac{1}{2} \times \text{base} \times \text{height} = 18\text{ cm}^2$$

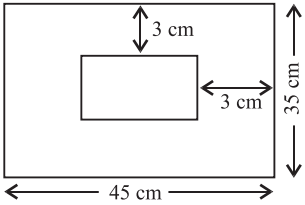
$$\frac{1}{2} \times \text{base} \times 6\text{ cm} = 18\text{ cm}^2$$

$$\text{base} = \frac{18 \times 2}{6}\text{ cm}$$

$$= 6\text{ cm}$$

hence, the base of parallelogram is 6 cm^2.

13. Dimentions of rectangular lawn $= 35$ m and 45 m.



Thus, Area of rectangular lawn $= 35\text{ m} \times 45\text{ m}$

$= 1575\text{ m}^2$

$\because$ width of path $= 3$ m

$\therefore$ Area of lawn with path $= (45 + 3 + 3)\text{ m} \times (35 + 3 + 3)\text{ m}$

$= 51\text{ m} \times 41\text{ m}$

$= 2091\text{ m}^2$

Thus, Area of path

$=$ Area of lawn with path $-$ Area of lawn without path

$= 2091\text{ m}^2 - 1575\text{ m}^2$

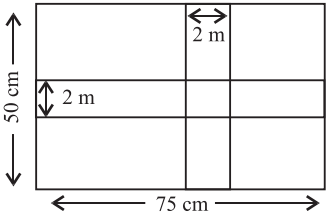
$= 516\text{ m}^2$

$\because$ Cost of constructing per m^2 path $=$ ₹ 100

Cost of constructing total path $=$ ₹ 100×516

$=$ ₹ 51,600

14. Dimensions of rectangular area $= 75\text{ m} \times 50\text{ m}$.



Area of path parallel to the length of rectangle $= 75\text{ m} \times 2\text{ m}$

$= 150\text{ m}^2$

Area of path parallel to the breadth of rectangle

$= 50\text{ m} \times 2\text{ m} = 100\text{ m}^2$

And,

Area of middle square path $= 2\text{ m} \times 2\text{ m} = 4\text{ m}^2$

So, Total Area of Path $= 150\text{ m}^2 + 100\text{ m}^2 - 4\text{ m}^2$

$= 246\text{ m}^2$.

15. Measure of sheet of paper $= 40\text{ cm} \times 20\text{ cm}$

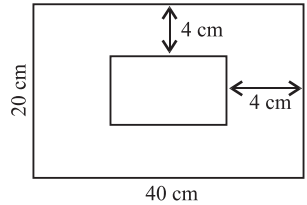
Thus, Area of sheet of paper $= 800\text{ cm}^2$

Area of remaining sheet of paper

$= (40 - 4 - 4)\,\text{cm} \times (20 - 4 - 4)\,\text{cm}$

$= 32\,\text{cm} \times 12\,\text{cm}$

$= 384\,\text{cm}^2$



Thus, Area of remaining area of

$= 800\,\text{cm}^2 - 384\,\text{cm}^2$

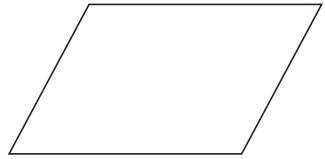
$= 416\,\text{cm}^2$.

16. (a) Area of parallelogram

$= \frac{1}{2} \times \text{base} \times \text{height}$

$= \frac{1}{2} \times 10\,\text{cm} \times 3\,\text{cm}$

$= 15\,\text{cm}^2$.

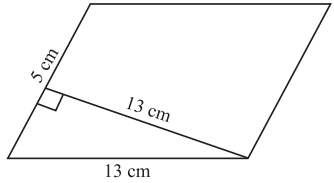


(b) Area of parallelogram

$= \frac{1}{2} \times \text{base} \times \text{height}$

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

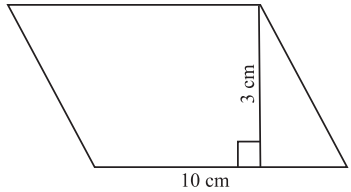
$= 32.5\text{ cm}^2$



(c) Area of parallelogram

$= \frac{1}{2} \times \text{base} \times \text{height}$

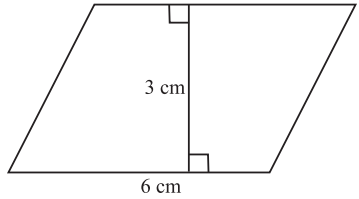
$= \frac{1}{2} \times 10\,\text{cm} \times 3\text{ cm} = 15\,\text{cm}^2$



(d) Area of parallelogram $= \frac{1}{2} \times \text{base} \times \text{height}$

$= \frac{1}{2} \times 6\,\text{cm} \times 3\text{ cm}$

$= 9\,\text{cm}^2$

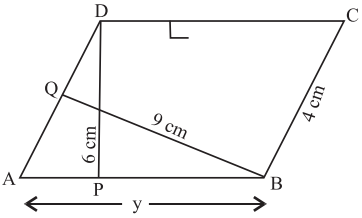


(e) Area of parallelogram

$= \frac{1}{2} \times \text{base} \times \text{height}$

$= \frac{1}{2} \times 4\text{ cm} \times 9\text{ cm}$

$= 18\text{ cm}^2$

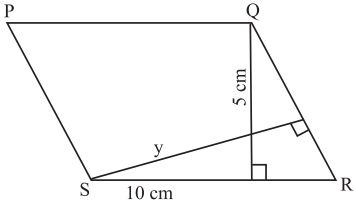


(f) Area of parallelogram

$= \frac{1}{2} \times \text{base} \times \text{height}$

$= \frac{1}{2} \times 10\text{ cm} \times 5\text{ cm}$

$= 25\text{ cm}^2$



17. $\because$ Area of circle $= 628\text{ cm}^2$

$\therefore$ $\pi r^2 = 628\text{ cm}^2$

$\frac{22}{7} \times r^2 = 628\text{ cm}^2$

$r^2 = \frac{628 \times 7}{22}\text{ cm}^2$

$r^2 = 200\text{ cm}^2$

$r = 10\sqrt{2}\text{ cm}$

Hence, diameter of circle $= 2 \times 10\sqrt{2}$ cm

$= 20\sqrt{2}$ cm.

18. Find the area of a circle whose radius is :

(a) Radius of circle $= 7\text{ cm}$

$\therefore$ Area of circle $= \pi r^2$

$= \frac{22}{7} \times (7\text{ cm})^2$

$= \frac{22}{7} \times 7\text{ cm} \times 7\text{ cm}$

$= 154\text{ cm}^3$

(b) Radius of circle $= 3.5$ cm

$\therefore$ Area of circle $= \pi r^2$

$$= \frac{22}{7} \times (3.5 \text{ m})^2$$

$$= \frac{22 \times 3.5 \times 3.5}{7} \text{ cm}^2$$

$$= 38.5 \text{ cm}^2$$

(c) Radius of circle $= 49$ cm

$\therefore$ Area of circle $= \pi r^2$

$$= \frac{22}{7} \times (49 \text{ cm})^2$$

$$= \frac{22}{7} \times 49 \times 49 \text{ cm}^2$$

$$= 22 \times 49 \times 7 \text{ cm}^2$$

$$= 7546 \text{ cm}^2$$

19. $\because$ Area of circle $= 38.5 \text{ cm}^2$

$$\pi r^2 = 38.5 \text{ cm}^2$$

$$\frac{22}{7} r^2 = 38.5 \text{ cm}^2$$

$$r^2 = \frac{38.5 \times 7}{22} \text{ cm}^2$$

$$r^2 = 12.25 \text{ cm}^2$$

$$r^2 = 12.25 \text{ cm}^2$$

$$r = \sqrt{12.25} \text{ cm}$$

$$r = 3.5 \text{ cm}$$

$\because$ Circle and square make by a wire.

$\therefore$ Perimeter of square $=$ Circumference of circle

$$4 \times \text{side} = 2\pi r$$

$$4 \times \text{side} = 2 \times \frac{22}{7} \times 3.5 \text{ cm}$$

each side $= 5.5$ cm

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

$= 5.5 \text{ cm} \times 5.5 \text{ cm}$

$= 30.25 \text{ cm}^2$

20. Radius of external circle $(R) = 8 \text{ cm}$

Radius of internal circle $(r) = 6 \text{ cm}$

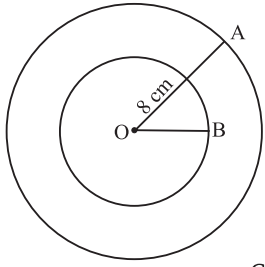
Thus, Area enclosed between these two circles $= \pi r_1^2 - \pi r_2^2$

$= \pi (R_1^2 - r_2^2)$

$= \frac{22}{7}[(8 \text{ cm})^2 - (6 \text{ cm})^2]$

$= \frac{22}{7}[64 \text{ cm}^2 - 36 \text{ cm}^2]$

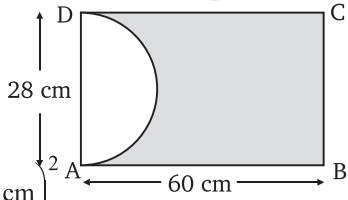
$= \frac{22}{7} \times 28 \text{ cm}^2 = 88 \text{ cm}^2$



21. (a) Area of rectangle

$ABCD = 60 \text{ cm} \times 28 \text{ cm}$

$= 1680 \text{ cm}^2$



Area of semi circle $= \frac{1}{2} \pi r^2$

$= \frac{1}{2} \times \frac{22}{7} \times \left(\frac{28}{2} \text{ cm}\right)^2$

$= \frac{11}{7} \times 14 \text{ cm} \times 14 \text{ cm}$

$= 308 \text{ cm}^2$

Thus, Area of shaded portion $= 1680 \text{ cm}^2 - 308 \text{ cm}^2$

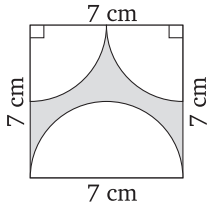
$= 1372 \text{ cm}^2$.

(b) Area of square $=$ side $\times$ side

$= 7 \text{ cm} \times 7 \text{ cm}$

$= 49 \text{ cm}^2$

Area of a circle $= \pi r^2$



$$= \frac{22}{7} \times \left(\frac{7}{2}\text{ cm}\right)^2$$

$$= \frac{22}{7} \times \frac{7}{2}\text{ cm} \times \frac{7}{2}\text{ cm}$$

$$= 38.5\text{ cm}^2$$

Thus, Area of shaded portion

$$= 49\text{ cm}^2 - \left[\frac{1}{2} \times 38.5\text{ cm}^2 + 2 \times \frac{1}{4} \times 38.5\text{ cm}^2\right]$$

$$= 49\text{ cm}^2 - 38.5\text{ cm}^2\left(\frac{1}{2} + \frac{1}{2}\right)$$

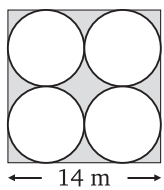
$$= 49\text{ cm}^2 - 38.5\text{ cm}^2$$

$$= 10.5\text{ cm}^2$$

(c) Area of square $= \text{side} \times \text{side}$

$$= 14\text{ cm} \times 14\text{ cm}$$

$$= 196\text{ cm}^2$$



Area of a circle $= \pi r^2$

$$= \frac{22}{7} \times \left(\frac{7}{2}\text{ cm}\right)^2$$

$$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}\text{ cm}^2$$

$$= 38.5\text{ cm}^2$$

Thus, Area of shaded portion $= 196\text{ cm}^2 - 4 \times 38.5\text{ cm}^2$

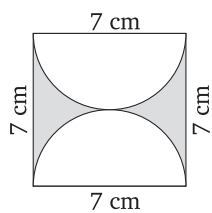
$$= 196\text{ cm}^2 - 154\text{ cm}^2$$

$$= 42\text{ cm}^2$$

(d) Area of square $= \text{side} \times \text{side}$

$$= 7\text{ cm} \times 7\text{ cm}$$

$$= 49\text{ cm}^2$$



Area of semi circle $= \frac{1}{2} \times \pi r^2$

$$= \frac{1}{2} \times \frac{22}{7} \times \left(\frac{7}{2}\text{ cm}\right)^2$$

$$= \frac{11}{7} \times \frac{7}{2} \times \frac{7}{2}\text{ cm}^2$$

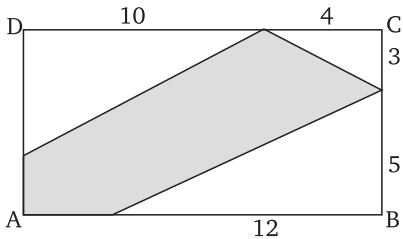
$$= 19.25\text{ cm}^2$$

Thus, Area of shaded portion $= 49\text{ cm}^2 - 2 \times 19.25\text{ cm}^2$

$= 49\text{ cm}^2 - 38.50\text{ cm}^2$

$= 10.50\text{ cm}^2$

(e)



Area of rectangle $ABCD = l \times b$

$= 14 \times 8$

$= 112$ sq. unit

Area of $\Delta DEH = \frac{1}{2} \times \text{base} \times \text{height}$

$\frac{1}{2} \times 10 \times 6 = 30$ sq. unit

Area of $\Delta HCG = \frac{1}{2} \times \text{base} \times \text{height}$

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

Area of $\Delta FBG = \frac{1}{2} \times \text{base} \times \text{height}$

$= \frac{1}{2} \times 12 \times 5$

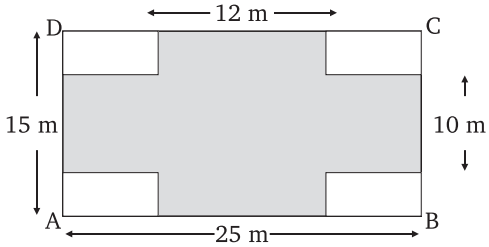
$= 30$ sq. unit

Thus, Area of shaded portion $= 112 - (30 + 6 + 30)$ sq. unit

$= 112 - 66$ sq. unit

$= 46$ sq. unit

(f)



Area of rectangle $ABCD = l \times b$

$= 25\text{ m} \times 12\text{ m}$

$= 300\text{ m}^2$

Area of shaded portion parallel to length $= l \times b$

$= 25\text{ m} \times 10\text{ m}$

$= 250\text{ m}^2$

Area of shaded portion parallel to breadth $= l \times b$

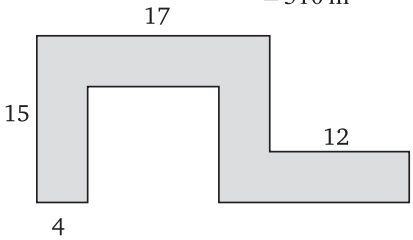
$= 12\text{ m} \times 15\text{ m} = 180\text{ m}^2$

Area of shaded middle rectangle $= l \times b$

$= 12\text{ m} \times 10\text{ m} = 120\text{ m}^2$

$= 310\text{ m}^2$

22.



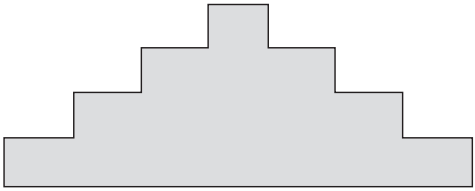
(a) Area of this figure

$= [(15 \times 4) + (9 \times 4) + (15 \times 4) + (12 \times 4)]$ sq. unit

$= (60 + 36 + 60 + 48)$ sq. unit

$= 204$ sq. unit

(b)



Area of this figure

$$= [(2 \times 1) + (6 \times 1) + (10 \times 1) + (14 \times 1)] \text{ sq. unit}$$
$$= (2 + 6 + 10 + 14) \text{ sq. unit}$$
$$= 32 \text{ sq. unit}$$

Mental Ability

A. Multiple Choice Questions (MCQs) :

1. (d) **2.** (c) **3.** (a) **4.** (b) **5.** (b) **6.** (d) **7.** (b) **8.** (d)

B. Fill in the blanks :

1. Value of π is $\mathbf{\frac{22}{7}}$ **or 3.14**.
2. 1 hectare = **10,000** m^2.
3. Height of equilateral triangle is $\mathbf{\frac{\sqrt{3}}{2}} \times$ **side**.
4. The distance around a circular region is called its **circumference**.
5. Circumference of the circle $\mathbf{2\pi r}$.

C. State True (T) or False (F) :

1. True **2.** False **3.** False **4.** True **5.** True

Higher Order Thinking Skills

Area of big semi-circle $= \frac{1}{2}\pi R^2$

$$= \frac{1}{2} \times \frac{22}{7} \times (28 \text{ cm}^2)$$
$$= \frac{1}{2} \times \frac{22}{7} \times 28 \times 28 \text{ cm}^2$$
$$= \frac{1}{2} \times 2464$$
$$= 1232 \text{ cm}^2$$

Area of small semi-circle $= \frac{1}{2}\pi r^2$

$$= \frac{1}{2} \times \frac{22}{7} \times (14\,\text{cm}^2)$$

$$= \frac{1}{2} \times 14 \times 14\,\text{cm}^2$$

$$= 308\,\text{cm}^2$$

Thus, Area of shaded portion $= 1232\,\text{cm}^2 - 2 \times 308\,\text{cm}^2$

$$= 1232\,\text{cm}^2 - 616\,\text{cm}^2$$

$$= 616\,\text{cm}^2$$

Chapter 16 Data Handling

Exercise 16.1

1. 12, 33, 37, 18, 19, 37, x, 33, 12, 33, 18, 37

$\because$ 33 and 37 occurs maximum number of times and 33 is the mode of followign data.

Thus, value of x is 33.

2. 19, x, 16, 18, 22, 17, 24, 23, 21

Ascending order : 16, 17, 18, 19, 21, 22, 23, 24 and x.

$\because$ number of observation $(n) = 9$ (odd)

$\therefore$ Median $= \left(\frac{n+1}{2}\right)$th value

$$20 = \left(\frac{9+1}{2}\right)\text{th value}$$

5th value $= 20$

Hence, the value of x is 20.

3. Find the arithmetic mean of :

(a) First ten natural numbers $= 1, 2, 3, 4, 5, 6, 7, 8, 9$ and 10

$$\text{Arithetic mean} = \frac{\text{Sum of the observation}}{\text{Number of observation}}$$

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

$$= \frac{55}{10} = 5.5$$

(b) First eight odd numbers = 1, 3, 5, 7, 9, 11, 13 and 15.

$$\text{Arithmetic mean} = \frac{\text{Sum of the observation}}{\text{Number observation}}$$

$$= \frac{1+3+5+7+9+11+13+15}{8}$$

$$= \frac{64}{8} = 8$$

(c) First six prime numbers = 2, 3, 5, 7, 11 and 13.

$$\text{Arithmetic mean} = \frac{\text{Sum of the observation}}{\text{Number of observation}}$$

$$= \frac{2+3+5+7+11+13}{6}$$

$$= \frac{41}{6} = 6.833$$

4. Find the median and the mode of the following sets of data :

(a) 1, 4, 6, 7, 9, 8, 2, 3, 6, 5, 6

Arrange the data in ascending order :

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

$\because$ Number of observation $(n) = 11$ (odd)

$\therefore$ Median $= \left(\frac{n+1}{2}\right)$ th value

$= \left(\frac{11+1}{2}\right)$ th value

$= 6$ th value $= 6$

Thus, the median of the sets of data is 6.

$\because$ 6 occurs maximum number of times.

Thus, the mode of the sets of data is 6.

(b) 14, 15, 19, 23, 19

Arrange the data in ascending order :

14, 15, 19, 19, 23

$\because$ Number of observation $(n) = 5$ (odd)

$\therefore$ Median $= \left(\frac{n+1}{2}\right)$th value

$= \left(\frac{5+1}{2}\right)$th value

$=$ 3rd value $= 19$

Thus, the median of the sets of data is 19.

$\because$ 19 occurs maximum number of times.

Thus, the mode of the sets of data is 19.

5. Mark scored by 6 students $= 66 \times 6$

$= 396$

Mark scored by 5 students $= 69 \times 5$

$= 345$

and, mark scored by 4 students $= 81 \times 4$

$= 324$

Thus, mean marks $= \frac{\text{Sum of marks}}{\text{Number of students}}$

$= \frac{396 + 345 + 324}{6 + 5 + 4}$

$= \frac{1065}{15} = 71$

Hence, the mean marks of class is 71 marks.

6. $\because$ Total number of students $= 44$

Mean marks of class $= 56$

$\therefore$ Total number of marks $= 56 \times 44$

$= 2464$ marks

$\because$ Teacher gave 5 marks to each students for assignment work.

More marks $= 44 \times 5$

$= 220$ marks

Thus, Total marks of all students $= 2464 + 220$

$= 2684$

Thus, new mean marks $= \frac{2684}{44}$

$= 61$ marks

So, mean is increase by 5 marks.

7.

Number	10	11	12	13	14	15	16	17
Frequency	6	7	8	15	18	9	10	12

$\because$ Frequency of 14 is highest.

Thus, the mode of this data is 14.

8. Score of Preet = 62, 75, 70, 75, 54, 73

Arrange these marks in ascending order

$\Rightarrow$ 54, 62, 70, 73, 75, 75

Thus, mean marks $= \dfrac{\text{Sum of marks}}{\text{Number of subjects}}$

$$= \frac{54 + 62 + 70 + 73 + 75 + 75}{6}$$

$$= \frac{409}{6} = 68.166$$

$\because$ Number of operations $(n) = 6$ (evenA)

$\therefore$ Median $= \dfrac{1}{2}\left[\left(\dfrac{n}{2}\right)\text{th} + \left(\dfrac{n}{2} + 1\right)\text{th value}\right]$

$$= \frac{1}{2}\left[\left(\frac{6}{2}\right)\text{th value} + \left(\frac{6}{2} + 1\right)\text{th value}\right]$$

$$= \frac{1}{2}[\text{3rd value} + \text{4th value}]$$

$$= \frac{1}{2}[70 + 73] = \frac{143}{2} = 71.5$$

$\because$ 75 occure maximum number of times

$\therefore$ Mode = 75

Hence, The mean, median and mode of the sets of data are 68.166, 71.5 and 75 respectively.

9. Given data = 12, 5, 3, 18, 10, x, 6, 6, 17

$\because$ Mean $= \dfrac{\text{Sum of the observatins}}{\text{Number of observations}}$

$$\therefore\ 9 = \frac{12+5+3+18+10+x+6+6+17}{9}$$

$$9 \times 9 = 77 \times x$$

$$81 - 77 = x$$

$$x = 4$$

Hence, the value of x is 4.

Range of data = max. observation − min. observation

$= 18 - 3 = 15.$

10. The calories (in ₹) of 15 employees

= 7000, 6500, 3300, 5600, 2350, 2500, 8500, 1900, 10000, 7500, 3500, 4500, 5500, 3000, 9000

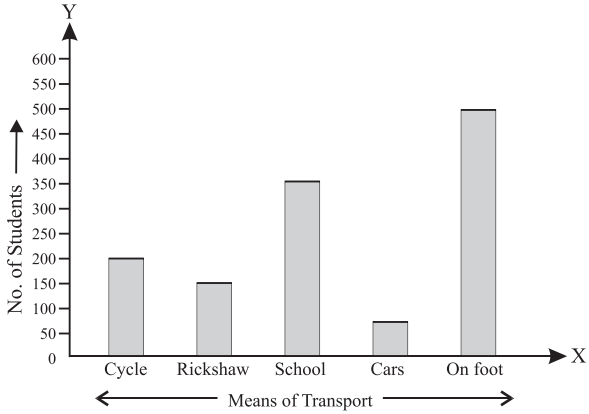
$$\therefore\ \text{Mean salary} = \frac{\text{Sum of all the salary}}{\text{Number of employees}}$$

$$= \frac{7000+6500+3300+5600+2350+2500+8500+1900+10000+7500+3500+4500+5500+3000+900}{15}$$

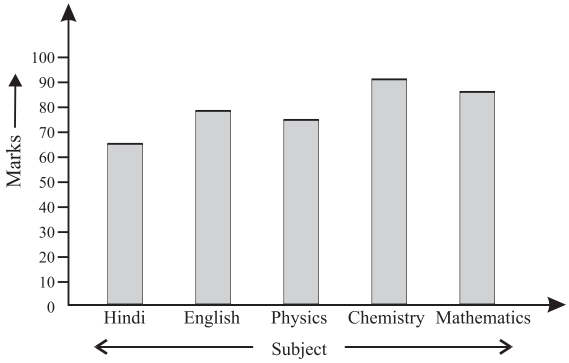
$$= \frac{80650}{15} = ₹\ 5376.66$$

Exercise 16.2

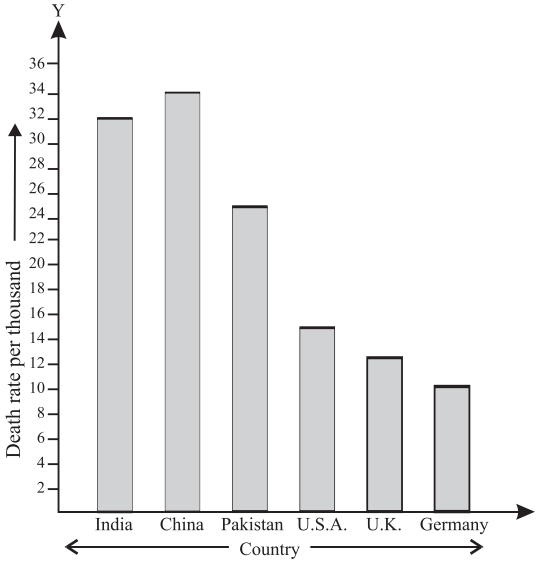
1.



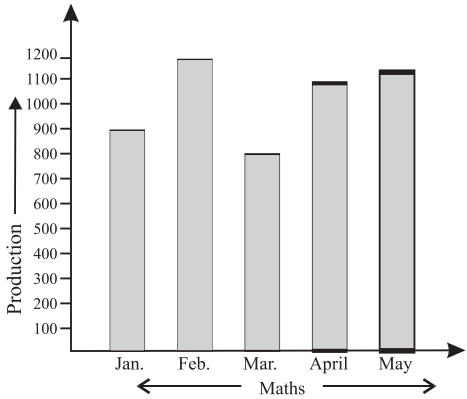
2.


Marks
100
90
80
70
60
50
40
30
20
10
0
Hindi
English
Physics
Chemistry
Mathematics
Subject

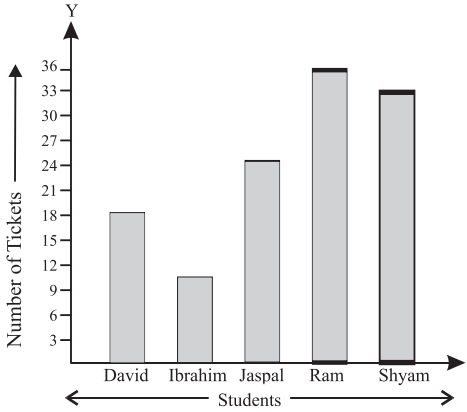
3.


Y
Death rate per thousand
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
India
China
Pakistan
U.S.A.
U.K.
Germany
Country

4.



5.



6. Read the bar graph carefully and answer the following questions :

(a) The given bar graph shows the production of coconuts in million tones during six years.

(b) In year-2014, was the production minimum.

(c) In year-2017, was the production maximum.

(d) Ratio between the maximum production and the minimum production $= \frac{275}{125} = \frac{11}{5} = 11 : 5.$

7. Study the bar graph in Fig. 16.7 and answer the following questions :

(a) The given bar graph shows the production of steel of a company during six years.
(b) There are 6 years covered in the survey.
(c) In year-2016, was the production maximum.
(d) In year-2013, was the production minimum.
(e) Ratio of maximum production to minimum

$$\text{production} = \frac{55}{20} = \frac{11}{4} = 11 : 4.$$

8. (a) On Saturday was the sale maximum.
(b) On Saturday was the sale minimum.
(c) Total sale $= 200 + 250 + 450 + 150 + 100 + 500$
$= 1650$ CFL's
(d) Ratio of sale between Saturday and Sunday $= \frac{500}{100} = \frac{5}{1} = 5 : 1.$

Exercise 16.3

1. Total number of balls $= 3 + 2 = 5$

(i) $\because$ Number of red balls $= 3$

$\therefore$ Probability $= \frac{\text{Successful outcomes}}{\text{Total outcomes}} = \frac{3}{5}$

(ii) $\because$ Number of black balls $= 2$

$\therefore$ Probability $= \frac{\text{Successful outcomes}}{\text{Total outcomes}} = \frac{2}{5}.$

2. Total number of faces of a dice $= (1, 2, 3, 4, 5, 6) = 6$

(a) $\because$ 3 is a number of dice.

$\therefore$ Probability of $3 = \frac{1}{6}.$

(b) Number less than $3 = 2$ and 1

$\therefore$ Successful outcomes $= 2$

So, Probability $= \frac{\text{Successful outcomes}}{\text{Total outcomes}}$

$$= \frac{2}{6} = \frac{1}{3}.$$

(c) Number more than $3 = 4, 5$ and 6.

$\therefore$ Successful outcomes $= 3$

So, Probability $= \dfrac{\text{Successful outcomes}}{\text{Total outcomes}}$

$$= \frac{3}{6} = \frac{1}{2}.$$

(d) $\because$ Number 8 is nto contain in a dice.

$\therefore$ Probability $= \dfrac{0}{8} = 0$

3. Total number of faces of a dice $= (1, 2, 3, 4, 5, 6)$

$= 6$ (total outcomes)

(a) Composite numbers $= 4$ and 6

$\therefore$ Successful outcomes $= 2$

So, Probability $= \dfrac{\text{Successful outcomes}}{\text{Total outcomes}}$

$$= \frac{2}{6} = \frac{1}{3}.$$

(b) Numbers less than $4 = 3, 2$ and 1

$\therefore$ Successful outcomes $= 3$

So, Probability $= \dfrac{\text{Successful outcomes}}{\text{Total outcomes}}$

$$= \frac{3}{6} = \frac{1}{2}.$$

(c) Numbers divisible by $3 = 3$ and 6

$\therefore$ Successful outcomes 2

So, Probability $= \dfrac{\text{Successful outcomes}}{\text{Total outcomes}}$

$$= \frac{2}{6} = \frac{1}{3}.$$

(d) Number between 2 and $6 = 3, 4$ and 5.

$\therefore$ Successful outcomes $= 3$

So, Probability $= \dfrac{\text{Successful outcomes}}{\text{Total outcomes}}$

$$= \frac{3}{6} = \frac{1}{2}.$$

4. Total number of faces of a dice = 1, 2, 3, 4, 5 and 6.

$\therefore$ Total outcomes = 6

(a) $\because$ 2 is a number of dice.

$\therefore$ Probability of a 2 $= \dfrac{\text{Successful outcomes}}{\text{Total outcomes}}$

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

(b) $\because$ Even Number on a dice = 2, 4 and 6.

$\therefore$ Successful outcomes = 3

So, Probability $= \dfrac{\text{Successful outcomes}}{\text{Total outcomes}}$

$$= \frac{3}{6} = \frac{1}{2}.$$

(c) $\because$ Prime number on a dice = 2, 3 and 5

$\therefore$ Successful outcomes = 3

So, Probability $= \dfrac{\text{Successful outcomes}}{\text{Total outcomes}}$

$$= \frac{3}{6} = \frac{1}{2}.$$

(d) Multiple of 3 on a dice = 3 and 6

$\therefore$ Successful outcomes = 2

So, Probability$= \dfrac{\text{Successful outcomes}}{\text{Total outcomes}}$

$$= \frac{2}{6} = \frac{1}{3}$$

(e) Factor of 6 = 1, 2, 3 and 6

$\therefore$ Successful outcomes = 4

So, Probability $= \dfrac{\text{Successful outcomes}}{\text{Total outcomes}}$

$$= \frac{4}{6} = \frac{2}{3}.$$

5. $\because$ Total outcomes = 48

and, Successful outcomes = 12

Hence, the probability of getting a 5

$$= \frac{\text{Successful outcomes}}{\text{Total outcomes}} = \frac{12}{48} = \frac{1}{4}.$$

6. $\because$ Total outcomes of a coin $= \{H, T\}$

$\therefore$ Total outal outcoms $= 2$

(a) Possible outcomes of a coin tossed two times $= 2^2 = 4.$

(b) Possible outcomes of a coin tossed three times $= 2^3 = 8.$

(c) Possible outcomes of a coin tossed five times $= 2^5 = 32.$

(d) Possible outcomes of a coin tossed ten times $= 2^{10} = 1024$

7. If two dice are thrown once.

Then, all possible outcomes $= 6 \times 6 = 36$

(a) $\because$ Successful outcomes $= 1$

$\therefore$ Successful outcomes $= 1$

So, Probability of a total of 12 $= \dfrac{\text{Successful outcomes}}{\text{Total outcomes}}$

$$= \frac{1}{36}.$$

(b) $\because$ A total of $3 = (1, 2), ()2, 1d$

$\therefore$ Successful outcomes $= 2$

So, Probability of a total of 3 $= \dfrac{\text{Successful outcomes}}{\text{Total outcomes}}$

$$= \frac{2}{36} = \frac{1}{18}$$

(c) $\because$ A total of $8 = (2, 6), (3, 5), (4, 4), (5, 3), (6, 3)$

$\therefore$ Successful outcomes $= 5$

So, Probability of a total of 8 $= \dfrac{\text{Successful outcomes}}{\text{Total outcomes}} = \dfrac{5}{36}.$

8. Total number of marbels $= 2 + 3 + 4 + 5 = 14$

$\therefore$ Total possible outcomes $= 14$

(a) Number white balls $= 2$

$\therefore$ Probability $= \dfrac{\text{Successful outcomes}}{\text{Total outcomes}}$

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

(b) Number of blue balls = 3

$\therefore$ Proabibliy $= \dfrac{\text{Successful outcomes}}{\text{Total outcomes}}$

$$= \frac{3}{14}.$$

(c) Number of green balls = 4

$\therefore$ Probability $= \dfrac{\text{Successful outcomes}}{\text{Total outcomes}}$

$$= \frac{4}{14} = \frac{2}{7}.$$

(d) Number of red balls = 5

$\therefore$ Probability $= \dfrac{\text{Successful outcomes}}{\text{Total outcomes}}$

$$= \frac{5}{14}.$$

Mental Ability

A. Multiple Choice Questions (MCQs) :

1. (a) **2.** (d) **3.** (d) **4.** (a) **5.** (d) **6.** (d) **7.** (c) **8.** (b) **9.** (b)

B. Fill in the blanks :

1. The probability of an impossible happening is **0 (zero)**.
2. The difference between the maximum and minimum observation of the raw data is called the **range**of the data.
3. Median of a data if n is odd $= \left(\dfrac{n+1}{2}\right)$**th value**.
4. Bar graph is also called **Column graph**.
5. The original form of a data is called **raw or ungrouped data**.

C. State True (T) or False (F).

1. True **2.** False **3.** True **4.** False **5.** True