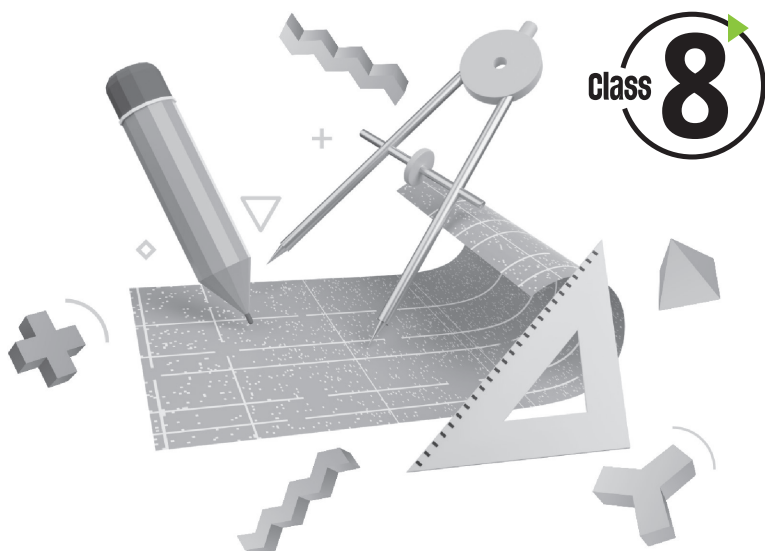




# FOCUS Maths

A Complete Course in Mathematics

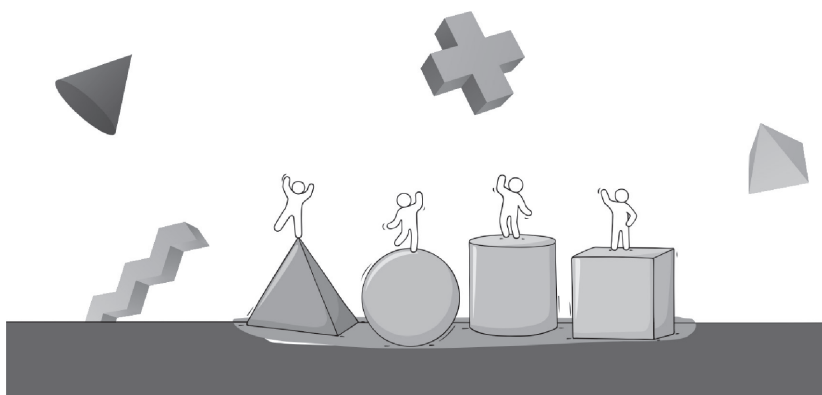
**Solution Manual**



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# Rational Number



## EXERCISE 1A

1. Which of the following statements are true/false?

(i) True

Because number and denominator of rational number both are same sign *i.e.*, -ve (negative)

(ii) False

Because rational number  $\frac{-18}{-6}$  is positive rational number which is lies on the right of 0 on the number line.

(iii) True

Because rational number  $\frac{1}{3}$  and  $-\frac{1}{3}$  both are opposite sign. Hence lies on the opposite side of 0 on the number line.

(iv) True

Because rational number  $-\frac{3}{5}$  is negative rational number which lies on the left side of the 0 on the number line.

(v) False (check)

Because rational number  $\frac{1}{-3}$  number and denominator are co-prime number.

Hence its common factor only 1.

(vi) False

Because all negative rational number is less than 0.

(vii) False

Because 0 is a rational number it can be written in the form  $\frac{p}{q}$  *i.e.*,

$\frac{0}{1}, \frac{0}{2}, \frac{0}{3}, \dots$  where  $q \neq 0$

(viii) True

Because in form of  $\frac{p}{q}$  where  $q \neq 0$

(ix) True

(x) True

2. Fill in the blanks:

$$(i) \frac{(-4)}{13} + \frac{(-3)}{26} = -\frac{4}{13} - \frac{3}{26} = \frac{-4 \times 2 - 3 \times 1}{26} = \frac{-8 - 3}{26} = \frac{-11}{26}$$

$$(ii) \frac{(-5)}{14} + x = 0 \Rightarrow x = \frac{5}{14} \Rightarrow \frac{(-5)}{14} + \frac{5}{14} = 0$$

$$(iii) \dots + \frac{15}{33} = 4 \Rightarrow x + \frac{15}{33} = 4 \Rightarrow x = \frac{4}{1} - \frac{15}{33} = \frac{4 \times 33 - 15}{33} \\ = \frac{132 - 15}{33} = \frac{117}{33} = \frac{39}{11}$$

Ans.

$$(iv) \frac{2}{5} + \frac{(-3)}{7} = \frac{(-3)}{7} + \dots$$

By commulative law of addition

$$\frac{p}{q} + \frac{r}{s} = \frac{r}{s} + \frac{p}{q}$$

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

3. Give the following rational numbers in their standard form :

$$(i) -\frac{14}{49}$$

Dividing the numerator or denominator of  $\frac{14}{49}$  by 7.

$$\text{We get } \frac{14 \div 7}{49 \div 7} = \frac{2}{7}$$

So the standard form of  $\frac{14}{49}$  is  $\frac{2}{7}$ .

$$(ii) -\frac{16}{256}$$

Dividing the numerator or denominator of  $\frac{-16}{256}$  by 16

$$\frac{-16 \div 16}{-256 \div 16} = \frac{-1}{-16} = \frac{1}{16}$$

So the standard form of  $\frac{-16}{-256}$  is  $\frac{1}{16}$ .

$$(iii) \frac{24}{60}$$

Dividing the numerator or denominator by 6

$$\text{We get } \frac{24}{60} = \frac{24 \div 6}{60 \div 6} = \frac{40 \div 2}{10 \div 2} = \frac{2}{5}$$

So the standard form of  $\frac{24}{60}$  is  $\frac{2}{5}$ .

$$(iv) \frac{-88}{-110}$$

Dividing numerator or denominator of  $\frac{-88}{-110}$  by 11

$$\text{We get } \frac{-88}{-110} = \frac{-88 \div 11}{-110 \div 11} = \frac{-8}{-10} = \frac{8 \div 2}{10 \div 2} = \frac{4}{5}$$

So the standard form of  $\frac{-88}{-110}$  is  $\frac{4}{5}$ .

4. Dividing numerator or denominator by  $\frac{-21}{35}$  by 7.

$$\text{We get } \frac{-21}{35} = \frac{-21 \div 7}{35 \div 7} = \frac{-3}{5} = \frac{3}{-5}$$

$$5. -\frac{48}{72}$$

Dividing numerator or denominator of  $\frac{48}{72}$  by 12

$$\text{We get } \frac{-48}{72} = \frac{-48 \div 12}{72 \div 12} = -\frac{4}{6} = \frac{4}{-6}$$

**Ans.**

6. Compare the following rational number

(i) Compare  $\frac{-4}{3}$  and  $\frac{-8}{7}$ .

$$\frac{-4}{3} = \frac{-4 \times 7}{3 \times 7} = \frac{-28}{21}$$

$$\frac{-8}{7} = \frac{-8 \times 3}{7 \times 3} = \frac{-24}{21}$$

$$\frac{-28}{21} < \frac{-24}{21}$$

$$\frac{-4}{3} < \frac{-8}{7}$$

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

$$\begin{aligned}\frac{5}{2} &= \frac{5 \times 4}{2 \times 4} = \frac{20}{8}; \quad \frac{1}{4} = \frac{1 \times 2}{4 \times 2} = \frac{2}{8} \\ \frac{20}{8} &> \frac{2}{8} \\ \frac{5}{2} &> \frac{1}{4}\end{aligned}$$

7. Fill up with the correct symbol  $>$ ,  $=$  and  $<$  :

(i) 
$$\begin{aligned}\frac{-3}{7} &= \frac{-3 \times 13}{7 \times 13} = \frac{-39}{91} \\ \frac{6}{-13} &= \frac{6 \times 7}{-13 \times 7} = \frac{42}{-91} \\ \frac{-39}{91} &> \frac{-42}{91} \Rightarrow \frac{-3}{7} > \frac{6}{-13}\end{aligned}$$

(ii) 
$$0 < \frac{-3}{5} \Rightarrow \frac{-3}{-5} = \frac{3}{5} \Rightarrow 0 < \frac{3}{5}$$

(iii) 
$$\begin{aligned}\frac{-8}{9} &> \frac{-9}{10} \\ \frac{-8}{9} &= \frac{-8 \times 10}{9 \times 10} = \frac{-80}{90} \\ \frac{-9}{10} &= \frac{-9 \times 9}{10 \times 9} = \frac{-81}{90} \Rightarrow \frac{-80}{90} > \frac{-81}{90} = \frac{-8}{9} > \frac{-9}{10}\end{aligned}$$

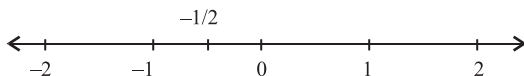
8. (i) Absolute value of  $\frac{-5}{7} = \left| \frac{-5}{7} \right| = \frac{5}{7}$

(ii) Absolute value of  $\frac{2}{9} = \left| \frac{2}{9} \right| = \frac{2}{9}$

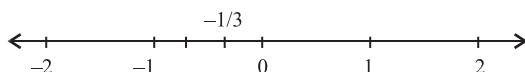
(iii) Absolute value of  $\frac{9}{-16} = \frac{9}{16}$

(iv) Absolute value of  $\frac{-8}{-7} = \left| \frac{-8}{-7} \right| = \frac{8}{7}$

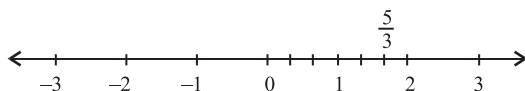
9. (i)  $-\frac{1}{2}$



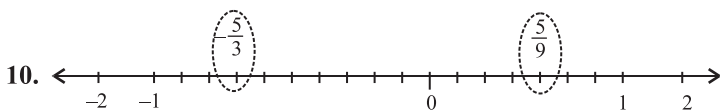
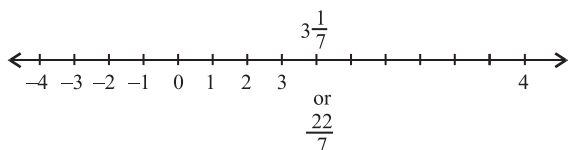
(ii)  $-\frac{1}{3}$



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



- (iv) To represent  $\frac{22}{7}$  on no. line firstly unit  $\frac{22}{7}$  in the form of mixed fraction.



11. Arrange the following rational numbers in ascending order:

(i)  $\frac{-3}{5}, \frac{7}{-10}, \frac{-5}{8}$

Write all the rational numbers with positive denominators

$$\frac{-3}{5}, \frac{-7}{10}, \frac{-5}{8}$$

LCM of 5, 10 and 8 is 40.

$$\frac{-3}{5} = \frac{-3 \times 8}{5 \times 8} = \frac{-24}{40}$$

$$\frac{-7}{10} = \frac{-7 \times 4}{10 \times 4} = \frac{-28}{40}$$

$$\frac{-5}{8} = \frac{-5 \times 5}{8 \times 5} = \frac{-25}{40}$$

Hence,

$$-\frac{28}{40} < -\frac{25}{40} < -\frac{24}{40}$$

i.e.,

$$\frac{7}{-10} < \frac{-5}{8} < \frac{-3}{5}$$

(ii) Arrange in ascending order

$$\frac{-4}{7}, \frac{-9}{14}, \frac{13}{-28}, \frac{-23}{42}$$

Write all the rational number with positive denominator

$$\frac{-4}{7}, \frac{-9}{14}, \frac{13}{-28}, \frac{-23}{42}$$

Now take the L.C.M. of 7, 14, 28 and 42 is 84.

$$\frac{-4}{7} = \frac{-4 \times 12}{7 \times 12} = \frac{-48}{84}$$

$$\frac{-9}{14} = \frac{-9 \times 6}{14 \times 6} = \frac{-54}{84}$$

$$\frac{-13}{28} = \frac{-13 \times 3}{28 \times 3} = \frac{-39}{84}$$

$$\frac{-23}{42} = \frac{-23 \times 2}{42 \times 2} = \frac{-46}{84}$$

Hence,

$$\frac{-54}{84} < \frac{-48}{84} < \frac{-46}{84} < \frac{-39}{84}$$

$$\frac{-9}{14} < \frac{-4}{7} < \frac{-23}{42} < \frac{-13}{28}$$

**12.** Arrange the following rational numbers in descending order :

(i)  $\frac{3}{-5}, \frac{-7}{10}, \frac{-11}{15}, \frac{-13}{20}$

Write all the rational number with positive denominator.

$$\frac{-3}{5}, \frac{-7}{10}, \frac{-11}{15}, \frac{-13}{20}$$

L.C.M. of 5, 10, 15 and 20 is 60

$$\frac{-3}{5} = \frac{-3 \times 12}{5 \times 12} = \frac{-36}{60}$$

$$\frac{-7}{10} = \frac{-7 \times 6}{10 \times 6} = \frac{-42}{60}$$

$$\frac{-11}{15} = \frac{-11 \times 4}{15 \times 4} = \frac{-44}{60}$$

$$\frac{-13}{20} = \frac{-13 \times 3}{20 \times 3} = \frac{-39}{60}$$

Hence arrange the descending order :

$$-\frac{36}{60} > -\frac{39}{60} > -\frac{42}{60} > -\frac{44}{60}$$

$$\frac{-3}{5} > \frac{-13}{20} > \frac{-7}{10} > \frac{-11}{15} \quad \text{Ans.}$$

13. Add the following :

$$(i) \frac{3}{5} + \frac{2}{5} = \frac{3+2}{5} = \frac{3+2}{5} = \frac{5}{5} = 1 \quad \text{Ans.}$$

$$(ii) \frac{4}{-11} + \frac{(-6)}{11} = \frac{-4}{11} - \frac{6}{11} = \frac{-4-6}{11} = \frac{-10}{11} \quad \text{Ans.}$$

$$(iii) \frac{-7}{3} + \frac{4}{3} = \frac{-7+4}{3} = \frac{-3}{3} = -1 \quad \text{Ans.}$$

$$(iv) \frac{-3}{7} \text{ and } \frac{-8}{-5}$$

$$\frac{-3}{7} + \frac{-8}{-5} = \frac{-3}{7} + \frac{8}{5} = \frac{(-3) \times 5 + 8 \times 7}{7 \times 5} = \frac{-15 + 56}{35} = \frac{41}{35} \quad \text{Ans.}$$

$$(v) \frac{7}{3} \text{ and } 4$$

$$\frac{7}{3} + \frac{4}{1} = \frac{7+4 \times 3}{3 \times 1} = \frac{7+12}{3} = \frac{19}{3} \quad \text{Ans.}$$

$$(vi) \frac{-3}{11} \text{ and } \frac{5}{9}$$

$$\frac{-3}{11} + \frac{5}{9} = \frac{(-3) \times 9 + 5 \times 11}{11 \times 9} = \frac{-27 + 55}{99} = \frac{28}{99} \quad \text{Ans.}$$

14. Find the sum by making suitable rearrangements:

$$(i) \frac{4}{3} + \frac{3}{5} + \frac{-2}{3} + \frac{-11}{5}$$

$$= -\frac{3}{5} + \frac{(-11)}{5} + \frac{4}{3} + \frac{(-2)}{3}$$

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

$$= \frac{-8}{5} + \frac{2}{3} = \frac{(-8) \times 3 + 2 \times 5}{5 \times 3} = \frac{-24 + 10}{15} = \frac{-14}{15} \quad \text{Ans.}$$

$$(ii) \frac{-2}{7} + \frac{5}{-6} + \frac{-4}{3} + \frac{-15}{-7}$$

$$= \frac{2}{7} - \frac{5}{6} - \frac{4}{3} + \frac{15}{7} = -\frac{2}{3} + \frac{15}{7} - \frac{5}{6} - \frac{4}{3}$$

$$= \left( -\frac{2}{7} + \frac{15}{7} \right) - \left( \frac{5}{6} + \frac{4}{3} \right) = \left( \frac{-2+15}{7} \right) - \left( \frac{5 \times 1 + 4 \times 2}{6} \right)$$

$$\begin{aligned}
 &= \frac{13}{7} - \left( \frac{5+8}{6} \right) = \frac{13}{7} - \frac{13}{6} \\
 &= \frac{13 \times 6 - 13 \times 7}{7 \times 6} = \frac{78 - 91}{42} = \frac{13}{42}
 \end{aligned}$$

**Ans.**

**15.** Verify and name the properties of addition for the following:

(i)  $\frac{5}{12} + \frac{3}{4} = \frac{3}{4} + \frac{5}{12}$

L.H.S.  $\frac{5}{12} + \frac{3}{4} = \frac{5 \times 4 + 3 \times 12}{12 \times 4} = \frac{20 + 36}{48} = \frac{56}{48} = \frac{7}{6}$

R.H.S.  $\frac{3}{4} + \frac{5}{12} = \frac{3 \times 12 + 5 \times 4}{4 \times 12} = \frac{36 + 20}{48} = \frac{56}{48} = \frac{7}{6}$

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

Commutative property

So, the commutative law of addition of rational number is verified.

(ii)  $\frac{3}{8} + \left[ \frac{(-3)}{4} + \frac{7}{2} \right] = \left[ \frac{3}{8} + \frac{(-3)}{4} \right] + \frac{7}{2}$

L.H.S.  $\frac{3}{8} + \left[ \frac{(-3)}{4} + \frac{7}{2} \right] = \frac{3}{8} + \left[ -\frac{3}{4} + \frac{7}{2} \right] = \frac{3}{8} + \left[ \frac{-3 \times 1 + 7 \times 2}{4} \right]$   
 $= \frac{3}{8} + \left[ \frac{-3 + 14}{4} \right] = \frac{3}{8} + \left[ \frac{11}{4} \right] = \frac{3}{8} + \frac{11}{4}$   
 $= \frac{3 \times 4 + 11 \times 8}{32} = \frac{12 + 88}{32} = \frac{100}{32} = \frac{25}{8}$

R.H.S.  $\left[ \frac{3}{8} + \frac{(-3)}{4} \right] + \frac{7}{2} = \left[ \frac{3}{8} - \frac{3}{4} \right] + \frac{7}{2} = \left[ \frac{3-6}{8} \right] + \frac{7}{2} = -\frac{3}{8} + \frac{7}{2}$   
 $= \frac{-3 + 28}{8} = \frac{25}{8}$

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

So, the associative law of addition rational number is verified.

**16.** (i)  $\frac{2}{5} + \frac{(-3)}{5} + \frac{1}{6} + \frac{-8}{15}$   
 $= \frac{2}{5} + \frac{3}{5} + \frac{1}{6} - \frac{8}{15}$

2	5, 5, 6, 15
3	5, 5, 3, 15
5	5, 5, 1, 5
	1, 1, 1, 1

L.C.M. of 5, 6 and 15 is 30.

$$\begin{aligned}
 &= \frac{2 \times 6 - 3 \times 6 + 1 \times 5 - 8 \times 2}{30}
 \end{aligned}$$



$$= \frac{12-18+5-16}{30} = \frac{17-34}{30} = \frac{-17}{30}$$

**Ans.**

$$(ii) \frac{2}{9} + \frac{3}{8} + \frac{4}{3} + \frac{(-3)}{4}$$

$$= \frac{2}{9} + \frac{3}{8} + \frac{4}{3} - \frac{3}{4}$$

L.C.M. of 9, 8, 3 and 4 is 72

$$= \frac{2 \times 8 + 3 \times 9 + 4 \times 24 - 3 \times 18}{72}$$

$$= \frac{16 + 27 + 96 - 54}{72} = \frac{139 - 54}{72} = \frac{85}{72}$$

L.C.M. =  $2 \times 2 \times 2 \times 3 \times 3 = 72$

$$(iii) \frac{(-2)}{3} + \frac{8}{3} + \frac{2}{5} + \frac{4}{5}$$

$$= \frac{-2}{3} + \frac{8}{3} + \frac{2}{5} + \frac{4}{5}$$

L.C.M 3, 3, 5 and 5 is 15.

$$= \frac{-2 \times 5 + 8 \times 5 + 2 \times 3 + 4 \times 3}{15}$$

$$= \frac{-10 + 40 + 6 + 12}{15} = \frac{48}{15} = \frac{16}{5}$$

**Ans.**

17. Verify that  $\left(\frac{a}{b} + \frac{c}{d}\right) + \frac{e}{f} = \frac{a}{b} + \left(\frac{c}{d} + \frac{e}{f}\right)$  for the following:

$$(i) \frac{a}{b} = \frac{4}{5}, \frac{c}{d} = \frac{-2}{3}, \frac{e}{f} = \frac{8}{9}$$

$$\text{L.H.S. } \left(\frac{a}{b} + \frac{c}{d}\right) + \frac{e}{f} = \left[\frac{4}{5} + \frac{(-2)}{3}\right] + \frac{8}{9} = \left[\frac{4}{5} - \frac{2}{3}\right] + \frac{8}{9}$$

$$= \left(\frac{4 \times 3 - 2 \times 5}{15}\right) + \frac{8}{9} = \left(\frac{12 - 10}{15}\right) + \frac{8}{9} = \frac{2}{15} + \frac{8}{9}$$

$$= \frac{2 \times 3 + 8 \times 5}{45} = \frac{6 + 40}{45} = \frac{46}{45}$$

$$\text{R.H.S. } \frac{a}{b} + \left(\frac{c}{d} + \frac{e}{f}\right) = \frac{4}{5} + \left(\frac{-2}{3} + \frac{8}{9}\right) = \frac{4}{5} + \left(\frac{-2 \times 3 + 8}{9}\right)$$

$$= \frac{4}{5} + \left(\frac{-6 + 8}{9}\right) = \frac{4}{5} + \frac{2}{9}$$

2	9, 8, 3, 4
2	9, 4, 3, 2
2	9, 2, 3, 1
3	9, 1, 3, 1
3	3, 1, 1, 1
	1, 1, 1, 1

3	3, 3, 5, 5
5	1, 1, 5, 5
	1, 1, 1, 1

L.C.M =  $3 \times 5 = 15$

$$= \frac{4 \times 9 + 2 \times 5}{45} = \frac{36 + 10}{45} = \frac{46}{45}$$

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

Hence verified.

$$(ii) \frac{a}{b} = \frac{3}{4}, \frac{c}{d} = \frac{2}{5}, \frac{e}{f} = \frac{-4}{7}$$

$$\begin{aligned} \text{L.H.S. } \left( \frac{a}{b} + \frac{c}{d} \right) + \frac{e}{f} &= \left( \frac{3}{4} + \frac{2}{5} \right) + \frac{(-4)}{7} = \left( \frac{3 \times 5 + 2 \times 4}{20} \right) - \frac{4}{7} \\ &= \left( \frac{15 + 8}{20} \right) - \frac{4}{7} = \frac{23}{20} - \frac{4}{7} = \frac{23 \times 7 - 4 \times 20}{140} \\ &= \frac{161 - 80}{140} = \frac{81}{140} \end{aligned}$$

**Ans.**

$$\begin{aligned} \text{R.H.S. } \frac{a}{b} + \left( \frac{c}{d} + \frac{e}{f} \right) &= \frac{3}{4} + \left( \frac{2}{5} - \frac{4}{7} \right) = \frac{3}{4} + \left( \frac{2 \times 7 - 4 \times 5}{35} \right) \\ &= \frac{3}{4} + \left( \frac{14 - 20}{35} \right) = \frac{3}{4} + \frac{(-6)}{35} = \frac{3}{4} - \frac{6}{35} \\ &= \frac{3 \times 35 - 6 \times 4}{140} = \frac{105 - 24}{140} = \frac{81}{140} \end{aligned}$$

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

Hence verified.

**18.** Find the additive inverse of the following:

$$(i) \frac{(-2)}{5}$$

Additive inverse of  $\frac{(-2)}{5}$  is  $\frac{2}{5}$ .

$$(ii) \frac{7}{15}$$

Additive inverse of  $\frac{7}{15}$  is  $\frac{-7}{15}$ .

$$(iii) \frac{-2}{-7}$$

Additive inverse of  $\frac{-2}{-7}$  is  $\left( \frac{-2}{-7} \right) = -\frac{2}{7}$ .

## EXERCISE-1B

**1.** Which of the following statements are true/false?

(i) Rational numbers are always closed under division.

**True**

- (ii) The multiplicative identity is 0 for rational numbers. **False**  
 Because multiplicative identity is always 1.
- (iii)  $x \div (y + z) = x \div y + x \div z$  is true for  $y = z$ . **False**
- (iv) Rational numbers are commutative under division. **False**
- (v) Zero has no reciprocal. **False**
- (vi) If  $x$  is a negative rational number, then the multiplicative inverse of  $x$  is positive. **False**
- (vii) For every non-zero rational number  $\frac{p}{q}$ ,  $\left(\frac{p}{q} \div \frac{-p}{q}\right) = \left(\frac{-p}{q} \div \frac{p}{q}\right)$ . **True**
- (viii) The reciprocal of  $-1$  is 1. **False**  
 Because reciprocal of  $-1$  is always  $-1$
- (ix) The product of a rational number and its reciprocal is always 1. **True**
- (x) Division of rational numbers satisfies associative law. **False**

## 2. Fill in the blanks

(i)  $\frac{-1}{7} \times \text{---} = 1$

Let the missing number be  $x$ .

$$\frac{-1}{7} \times x = 1 \Rightarrow -x = 1 \times 7 \Rightarrow x = -7$$

(ii)  $0 \times \frac{5}{16} = 1$

Let the missing number be  $x$ .

$$x \times \frac{5}{16} = 0 \Rightarrow x = 0 \times \frac{16}{5} \Rightarrow x = 0$$

(iii)  $\frac{-6}{17} \times \frac{5}{9} = \frac{5}{9} \times \frac{-6}{17}$

Under the commutative law of multiplication of rational number.

$$\frac{a}{b} \times \frac{c}{d} = \frac{c}{d} \times \frac{a}{b}$$

(iv)  $\frac{-5}{7} \times \left[\frac{6}{9} + \frac{3}{9}\right] = \frac{-5}{7} \times \frac{6}{9} + \frac{-5}{7} \times \frac{2}{9}$

Using distributive law of multiplication over of rational number

$$\frac{a}{b} \times \left(\frac{c}{d} + \frac{e}{f}\right) = \frac{a}{b} \times \frac{c}{d} + \frac{a}{b} \times \frac{e}{f}$$

$$(v) \left[ \frac{3}{7} \right]^{-1} = \dots$$

$$\left[ \frac{3}{7} \right]^{-1} = \left( \frac{7}{3} \right)^1 = \frac{7}{3} \quad \text{Ans.} \quad \because \left( \frac{p}{q} \right)^{-n} = \left( \frac{q}{p} \right)^n$$

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

(vii) The product of two negative rational numbers is always **positive**.

3. Multiply the following:

$$(i) \frac{3}{11} \text{ by } \frac{22}{7} = \frac{3}{11} \times \frac{22}{7} = \frac{3 \times 2}{7} = \frac{6}{7} \quad \text{Ans.}$$

$$(ii) \frac{5}{9} \text{ by } \frac{6}{15} = \frac{5}{9} \times \frac{6}{15} = \frac{1 \times 6}{3 \times 3} = \frac{11 \times 2}{9} = \frac{2}{9} \quad \text{Ans.}$$

$$(iii) \frac{15}{8} \text{ by } \frac{4}{3} = \frac{15}{8} \times \frac{4}{3} = \frac{5 \times 1}{2 \times 1} = \frac{5}{2} \quad \text{Ans.}$$

$$(iv) \frac{14}{11} \text{ by } \frac{11}{28} = \frac{14}{11} \times \frac{11}{28} = \frac{1}{2} \Rightarrow \frac{1 \times 1}{1 \times 2} = \frac{1}{2} \quad \text{Ans.}$$

4. Subtract the sum of  $\frac{-3}{10}$  and  $\frac{5}{8}$  from the sum of  $\frac{4}{15}$  and  $\frac{2}{-5}$

$$\text{Sum of } \frac{-3}{10} \text{ and } \frac{5}{8} = \frac{-3}{10} + \frac{5}{8} = \frac{-3 \times 4 + 5 \times 5}{40} = \frac{-12 + 25}{40} = \frac{13}{40} \quad \text{Ans.}$$

$$\text{Sum of } \frac{4}{15} \text{ and } \frac{2}{-5}$$

$$\frac{4}{15} + \frac{2}{(-5)} = \frac{4}{15} - \frac{2}{5} = \frac{4 \times 1 - 2 \times 3}{15} = \frac{4 - 6}{15} = \frac{-2}{15}$$

Subtract

$$-\frac{2}{15} - \frac{13}{40} = \frac{-2 \times 8 - 13 \times 3}{120} = \frac{-16 - 39}{120} = \frac{-55}{120} = \frac{-11}{24}$$

5.  $x = \frac{3}{7}$  and  $y = -\frac{1}{2}$ ,

$$\text{L.H.S.} = |x + y| = \left| \frac{3}{7} + \left( -\frac{1}{2} \right) \right|$$

$$= \left| \frac{3}{7} - \frac{1}{2} \right| = \left| \frac{3 \times 2 - 1 \times 7}{14} \right| = \left| \frac{6 - 7}{14} \right| = \left| -\frac{1}{14} \right| = \frac{1}{14}$$

$$\text{R.H.S. } |x| + |y| = \left| \frac{3}{7} \right| + \left| -\frac{1}{2} \right| = \frac{3}{7} + \frac{1}{2} = \frac{3 \times 2 + 1 \times 7}{14} = \frac{6 + 7}{14} = \frac{13}{14}$$

Hence,  $\frac{1}{14} < \frac{13}{14}$

$$|x + y| < |x| + |y|$$

**Hence proved.**

6.  $x = \frac{-4}{5}, y = \frac{3}{-7}$

L.H.S.  $|x \times y|$   
 $= \left| \frac{-4}{5} \times \frac{3}{-7} \right|$   
 $= \left| \frac{-12}{-35} \right| = \frac{12}{35}$

R.H.S.  $|x| \times |y|$   
 $= \left| \frac{-4}{5} \right| \times \left| \frac{3}{-7} \right|$   
 $= \frac{4}{5} \times \frac{3}{7} = \frac{12}{35}$

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

$|x \times y| = |x| \times |y|$  **Hence proved.**

7. Given : Product of two no. = -1, one rational no. =  $\frac{-17}{8}$

Ist othe no. be  $x$

Then  $A$  to  $Q$

One number  $\times$  Other number = Product of two number

$$-\frac{17}{8} \times x = -1$$

$$x = -1 \times \frac{8}{-17} \Rightarrow x = \frac{8}{17}$$

Hence, other no. be  $\frac{8}{17}$ .

**Ans.**

8. Given, sum of two rational number =  $\frac{3}{2}$

One of the number =  $-\frac{3}{10}$

Let the other no. be  $x$ .

$A$  to  $Q$ ,  $\frac{-3}{10} + x = \frac{3}{2} \Rightarrow x = \frac{3}{2} + \frac{3}{10} = \frac{3 \times 5 + 3}{10} = \frac{15 + 3}{10} = \frac{18}{10} = \frac{9}{5}$  **Ans.**

9. Let  $x$  be added to  $\frac{8}{14}$ , we get  $\frac{-2}{7}$

$$x + \frac{8}{14} = \frac{-2}{7}$$

$$x = -\frac{2}{7} - \frac{8}{14} = \frac{-2 \times 2 - 8}{14} = \frac{-4 - 8}{14} = \frac{-12}{14} = \frac{-6}{7}$$

**Ans.**

10. Let  $x$  be subtracted from  $-\frac{5}{4}$  to get 0

Then 
$$-\frac{5}{4} - x = 0 \Rightarrow x = -\frac{5}{4}$$

11. Verify  $x \times (y + z) = x \times y + x \times z$ , for the values of  $x, y$  and  $z$  given below :

(i)  $x = \frac{3}{5}, y = -\frac{2}{5}, z = -\frac{7}{5}$

$$x \times (y + z) = x \times y + x \times z$$

Now put the value of  $x, y, z$  on both sides

$$\begin{aligned} \text{L.H.S.} &= \text{R.H.S.} \\ \frac{3}{5} \times \left[ \frac{-2}{5} + \left( -\frac{7}{5} \right) \right] &= \frac{3}{5} \times \frac{(-2)}{5} + \frac{3}{5} \times \frac{(-7)}{5} \\ \frac{3}{5} \times \left[ \frac{-2}{5} - \frac{7}{5} \right] &= \frac{-6}{25} + \frac{(-21)}{25} \\ \frac{3}{5} \times \left[ \frac{-2-7}{5} \right] &= \frac{-6-21}{25} \\ \frac{3}{5} \times \frac{(-9)}{5} = -\frac{27}{25} &= -\frac{27}{25} \end{aligned}$$

(ii) 
$$\text{L.H.S.} = \text{R.H.S.}$$
  

$$x = \frac{-5}{12}, y = \frac{7}{8}, z = \frac{12}{3}$$

Verify  $x \times (y + z) = x \times y + x \times z$

Put the value of  $x, y, z$  on both side

$$\begin{aligned} x \times (y + z) &= x \times y + x \times z \\ -\frac{5}{12} \times \left( \frac{7}{8} + \frac{12}{3} \right) &= -\frac{5}{12} \times \frac{7}{8} + \left( -\frac{5}{12} \right) \times \frac{12}{3} \\ -\frac{5}{12} \times \left( \frac{7}{8} + 4 \right) &= -\frac{5}{12} \times \frac{7}{8} - \frac{5}{12} \times 4 \\ -\frac{5}{12} \times \left( \frac{7+4 \times 8}{8} \right) &= \frac{-35}{96} - \frac{20}{12} \\ -\frac{5}{12} \times \left( \frac{7+32}{8} \right) &= \frac{-35-20 \times 8}{96} \\ \frac{-5}{12} \times \frac{39}{8} &= \frac{-35-160}{96} \end{aligned}$$

$$\frac{-5}{4} \times \frac{13}{8} = -\frac{195}{96}$$

$$\frac{-65}{32} = -\frac{65}{32}$$

$$\text{L.H.S.} = \text{R.H.S.} \quad \text{Hence verified.}$$

12. Verify the following

$$(i) \frac{5}{7} \times \frac{-12}{5} = \frac{-12}{5} \times \frac{5}{7}$$

L.H.S.

R.H.S.

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

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

$$\text{L.H.S.} =$$

$$\text{R.H.S.} \quad \text{Hence verified.}$$

$$(ii) \frac{-3}{4} \times \frac{17}{8} \times \frac{-1}{2} = \frac{-1}{2} \times \frac{-3}{4} \times \frac{17}{8}$$

L.H.S.

R.H.S.

$$\begin{aligned} \frac{-3}{4} \times \frac{17}{8} \times \frac{-1}{2} \\ = \frac{51}{64} \end{aligned}$$

$$\begin{aligned} \frac{-1}{2} \times \frac{-3}{4} \times \frac{17}{8} \\ = \frac{51}{64} \end{aligned}$$

$$\text{L.H.S.} =$$

$$\text{R.H.S.} \quad \text{Hence verified.}$$

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

$$\begin{aligned} \text{L.H.S.} \quad \frac{5}{-7} + \frac{7}{5} + \frac{(-3)}{2} &= \frac{-5}{7} + \frac{7}{5} - \frac{3}{2} = \frac{-5 \times 10 + 7 \times 14 - 3 \times 35}{70} \\ &= \frac{-50 + 98 - 105}{70} = \frac{-155 + 98}{70} = \frac{-57}{70} \end{aligned}$$

$$\begin{aligned} \text{R.H.S.} \quad \frac{7}{5} + \frac{(-3)}{2} + \frac{(-5)}{7} &= \frac{7}{5} - \frac{3}{2} - \frac{5}{7} = \frac{7 \times 14 - 3 \times 35 - 5 \times 10}{70} \\ &= \frac{98 - 105 - 50}{70} = \frac{98 - 155}{70} = \frac{57}{70} \end{aligned}$$

$$\text{L.H.S.} = \text{R.H.S.}$$

$$\text{Hence verified.}$$

13. Simplify

$$\begin{aligned} (i) \quad \frac{-2}{5} - \frac{(-3)}{10} - \frac{(-4)}{7} &= \frac{-2}{5} + \frac{3}{10} + \frac{4}{7} = \frac{-2 \times 14 + 3 \times 7 + 4 \times 10}{70} \\ &= \frac{-28 + 21 + 40}{70} = \frac{-28 + 61}{70} = \frac{33}{70} \end{aligned}$$

Ans.

$$\begin{aligned}
 \text{(ii)} & -\left(\frac{3}{11} \times \frac{(-5)}{6}\right) - \left(\frac{9}{12} \div \frac{3}{4}\right) - \left(\frac{5}{13} \times \frac{(-6)}{15}\right) \\
 & = -\left(\frac{1}{11} \times \frac{(-5)}{2}\right) - \left(\frac{9}{12} \times \frac{4}{3}\right) - \left(\frac{1}{13} \times \frac{(-6)}{3}\right) \\
 & = -\left(\frac{-5}{22}\right) - \left(\frac{3 \times 1}{3 \times 1}\right) - \left(\frac{1}{13} \times (-2)\right) = \frac{5}{22} - 1 + \frac{2}{13} \\
 & = \frac{5 \times 13 - 22 \times 13 + 2 \times 22}{22 \times 13} \\
 & = \frac{65 - 286 + 44}{286} = \frac{-286 + 109}{286} = \frac{177}{286}
 \end{aligned}$$

**Ans.**

$$\begin{aligned}
 \text{(iii)} & \left(\frac{1}{2} \times \frac{1}{4}\right) - \left(1 \times \frac{1}{4}\right) + \left[\left(\frac{-7}{18}\right) + \left(\frac{7}{-15}\right)\right] \\
 & = \left(\frac{1}{8}\right) - \left(\frac{1}{4}\right) + \left[\frac{-7}{18} - \frac{7}{15}\right] = \frac{1}{8} - \frac{1}{4} + \left[\frac{-7 \times 5 - 7 \times 6}{90}\right] \\
 & = \frac{1}{8} - \frac{1}{4} + \left[\frac{-35 - 42}{90}\right] = \frac{1}{8} - \frac{1}{4} - \left[\frac{77}{90}\right] = \frac{1}{8} - \frac{1}{4} - \frac{77}{90} \\
 & = \frac{1 \times 90 - 1 \times 180 - 77 \times 8}{720} = \frac{90 - 180 - 616}{720} \\
 & = \frac{90 - 796}{720} = \frac{-706}{720} = \frac{-353}{360}
 \end{aligned}$$

**Ans.**

**14.** Sum of  $\frac{-13}{5}$  and  $\frac{12}{7}$

$$\frac{-13}{5} + \frac{12}{7} = \frac{-13 \times 7 + 12 \times 5}{35} = \frac{-91 + 60}{35} = \frac{-31}{35}$$

$$\text{Product of } \frac{-31}{7} \text{ and } -\frac{1}{2} = \frac{-31}{7} \times \left(\frac{-1}{2}\right) = \frac{31}{14}$$

$$\text{Divide } \frac{-31}{35} \div \frac{31}{14} = \frac{-31}{35} \times \frac{14}{31} = \frac{-14}{35} = \frac{-2}{5}$$

**Ans.**

## MULTIPLE CHOICE QUESTIONS

Choose the correct answer

**1.** The absolute value of  $\frac{-5}{-3}$  is  $\frac{5}{3}$ .

Hence the correct option is (c).



2. Multiplicative identity for rational number is 1.

Hence the correct option is (b).

3. Subtract 0 from  $\frac{9}{7}$  is  $\frac{9}{7} - 0 = \frac{9}{7}$

Hence the correct option is (a).

4. The reciprocal of  $\frac{-p}{q}$  is  $\frac{-q}{p}$ .

Hence the correct option is (b).

5. The multiplicative inverse of 0 does not exist.

This is because  $0 \times N = 0$  and  $\frac{1}{0}$  is undefined.

Hence the correct option is (d).



## Exponents



### EXERCISE-2A

1. Evaluate the following:

$$\text{Use } \left(\frac{p}{q}\right)^{-n} = \left(\frac{q}{p}\right)^n$$

(i)  $7^{-2} = \frac{1}{7^2} = \frac{1}{7 \times 7} = \frac{1}{49}$  **Ans.**

(ii)  $\left(\frac{-5}{3}\right)^{-3} = \left(-\frac{3}{5}\right)^3 = \frac{(-3) \times (-3) \times (-3)}{5 \times 5 \times 5} = \frac{-27}{125}$  **Ans.**

(iii)  $\left(\frac{-3}{17}\right)^{-2} = \left(\frac{-17}{3}\right)^2 = \frac{(-17) \times (-17)}{3 \times 3} = \frac{289}{9}$  **Ans.**

(iv)  $\left(\frac{2}{-7}\right)^{-3} = \left(\frac{-7}{2}\right)^3 = \frac{(-7) \times (-7) \times (-7)}{2 \times 2 \times 2} = \frac{49 \times (-7)}{8} = \frac{-343}{8}$  **Ans.**

2. Simplify the following:

$$\begin{aligned} \text{(i)} \quad \left(\frac{-1}{2}\right)^2 \times \left(\frac{-1}{2}\right)^3 &= \left(\frac{-1}{2}\right)^{2+3} = \left(\frac{-1}{2}\right)^5 \left[ \because \left(\frac{p}{q}\right)^m + \left(\frac{p}{q}\right)^n = \left(\frac{p}{q}\right)^{m+n} \right] \\ &= \left(\frac{-1}{2}\right) \times \left(\frac{-1}{2}\right) \times \left(\frac{-1}{2}\right) \times \left(\frac{-1}{2}\right) \times \left(\frac{-1}{2}\right) = \frac{-1}{32} \quad \text{Ans.} \end{aligned}$$

$$(ii) \left(\frac{1}{3}\right)^2 \times \left(\frac{1}{3}\right)^5 \times \left(\frac{1}{3}\right)^{-6} = \left(\frac{1}{3}\right)^{2+5-6} = \left(\frac{1}{3}\right)^{7-6} = \left(\frac{1}{3}\right)^1 = \frac{1}{3} \quad \text{Ans.}$$

$$(iii) \left(\frac{7}{3}\right)^{-3} \times \left(\frac{9}{7}\right)^{-2} \times \left(\frac{3}{7}\right)^3 = \left(\frac{3}{7}\right)^3 \times \left(\frac{7}{9}\right)^2 \times \left(\frac{3}{9}\right) = \left(\frac{3}{7}\right)^{3+1} \times \left(\frac{7}{9}\right)^2$$

$$= \left(\frac{3}{7}\right)^4 \times \left(\frac{7}{9}\right)^2 = \frac{3^4 \times 7^2}{7^4 \times 9^2} = \frac{3^4}{7^{(4-2)} \times (3 \times 3)^2}$$

$$= \frac{3^4}{7^2 \times 3^4} = \frac{1}{-2} = \frac{1}{7 \times 7} = \frac{1}{49} \quad \text{Ans.}$$

3. Evaluate the following:

$$(i) \left(\frac{-1}{5}\right)^{-3} \div \left(\frac{-1}{5}\right)^{-5} = (-5)^3 \div (-5)^5$$

$$= (-5)^{3-5} = (-5)^{-2} = \left(-\frac{1}{5}\right)^2 = \frac{1}{25} \quad \text{Ans.}$$

$$(ii) \left[\left(\frac{3}{2}\right)^2\right]^{-2} = \left[\frac{9}{4}\right]^{-2} = \left(\frac{4}{9}\right)^2 = \frac{16}{81} \quad \text{Ans.}$$

$$(iii) \left\{\left[\left(\frac{-1}{7}\right)^2\right]\right\}^{-1} = \left[\left(\frac{1}{49}\right)^2\right]^{-1} = \left[\frac{1}{49 \times 49}\right]^{-1} = \left[\frac{1}{2401}\right]^{-1} = 2401 \quad \text{Ans.}$$

4. Simplify the following:

$$(i) \left(\frac{9r^5h^6}{3rh^3}\right)^2 = \left[\frac{9}{3}r^{(5-1)}h^{(6-2)}\right]^2 = 1(3r^4h^4)^2 = 9r^8h^8 \quad \text{Ans.}$$

$$(ii) \left(\frac{1}{3C^4}\right) \div \left(\frac{1}{5C^8}\right)$$

$$= \frac{1}{3C^4} \times 5C^8 = \frac{5}{3}C^{8-4} = \frac{5}{3}C^4 \quad \text{Ans.}$$

$$(iii) \frac{12 \times 4^{-3} \times a^{-5}}{27 \times a^{-4}} = \frac{12 \times a^4}{27 \times 4^3 \times a^5} = \frac{3 \times 4 \times a^4}{3 \times 3^2 \times 4 \times 4^2 \times a^5}$$

$$= \frac{a^{4-5}}{3 \times 3 \times 4 \times 4} = \frac{a^{-1}}{144} = \frac{1}{144a} \quad \text{Ans.}$$

5.  $3^{-1} - 2^{-1}$

$$(i) \frac{1}{3} - \frac{1}{2} = \frac{2-3}{6} = \frac{-1}{6} \quad \text{Ans.}$$

$$(ii) (4^{-1} + 5^0) \times 2^3 = \left(\frac{1}{4+1}\right) \times 2^3 = \frac{(1+4)}{4} \times 8 = \frac{5}{8} \times 8 = 5 \times 2 = 10 \quad \text{Ans.}$$

$$(iii) \left[ \left(\frac{1}{2}\right)^{-1} - \left(\frac{1}{3}\right)^{-1} \right]^{-2} = [2-3]^{-2} = [-1]^2 = \left(\frac{1}{-1}\right)^2 = 1 \quad \text{Ans.}$$

$$(iv) (5^{-1} \div 6^{-1}) \times \left(\frac{1}{5}\right)^{-1} = \left(\frac{1}{5} \div \frac{1}{6}\right) \times 5 = \left(\frac{1}{5} \times 6\right) 5 = \frac{6}{5} \times 5 = 6 \quad \text{Ans.}$$

6. Find the value of:

$$(i) (3^0 + 2^{-1}) \div 2^{-2} = \left(1 + \frac{1}{2}\right) \div \left(\frac{1}{2}\right)^2 \\ = \left(\frac{2+1}{2}\right) \div \frac{1}{4} = \frac{3}{2} \times 4 = 3 \times 2 = 6 \quad \text{Ans.}$$

$$(ii) \left[ 9^{-1} + \left(\frac{3}{2}\right)^{-1} \right]^{-2} = \left[ \frac{1}{9} + \frac{2}{3} \right]^{-2} = \left[ \frac{1 \times 1 + 2 \times 3}{9} \right]^{-2} \\ = \left[ \frac{1+6}{9} \right]^{-2} = \left(\frac{7}{9}\right)^{-2} = \left(\frac{9}{7}\right)^2 = \frac{81}{49} \quad \text{Ans.}$$

$$(iii) \left[ \left(\frac{1}{3}\right)^{-2} - \left(\frac{1}{4}\right)^{-2} \right] \div \left(\frac{1}{2}\right)^{-3} = [3^2 - 4^2] \div 2^3 \\ = [9-16] \div 8 = -7 \div 8 = \frac{-7}{8} \quad \text{Ans.}$$

7. Find the value of  $\frac{p}{q}$  for which  $\left(\frac{3}{5}\right)^{-5} \times \left(\frac{15}{7}\right)^{-5} = \left(\frac{p}{q}\right)^{-5}$

$$\Rightarrow \left(\frac{3}{5} \times \frac{15}{7}\right)^{-5} = \left(\frac{p}{q}\right)^{-5}$$

Here power is same on both side, then

$$\frac{3}{5} \times \frac{15}{7} = \frac{p}{q}$$

$$\frac{3 \times 3}{7} = \frac{p}{q}$$

$$\frac{9}{7} = \frac{p}{q} \Rightarrow \frac{p}{q} = \frac{9}{7}$$

8. Find the value of  $x$

$$\begin{aligned}\left(\frac{-2}{7}\right)^4 \div \left(\frac{-2}{7}\right)^3 &= \left(\frac{-7}{2}\right)^x \\ \Rightarrow \left(\frac{7}{2}\right)^{-4} \div \left(\frac{-7}{2}\right)^3 &= \left(\frac{-7}{2}\right)^x \\ \Rightarrow \left(\frac{-7}{2}\right)^{-4-(-3)} &= \left(\frac{-7}{2}\right)^x \\ \Rightarrow \left(\frac{-7}{2}\right)^{-4+3} &= \left(\frac{-7}{2}\right)^x \\ \Rightarrow \left(\frac{-7}{2}\right)^{-1} &= \left(\frac{-7}{2}\right)^x\end{aligned}$$

Here base is same than power are equal.

$$x = -1$$

**Ans.**

9. Find the value of  $x$  for which  $13^{10} \div 13^8 = \left(\frac{1}{13}\right)^x$

$$\begin{aligned}13^{10-8} &= \left(\frac{1}{13}\right)^x \\ (13)^2 &= \left(\frac{1}{13}\right)^x \\ \left(\frac{1}{13}\right)^{-2} &= \left(\frac{1}{13}\right)^x\end{aligned}$$

Compare power on both sides

$$x = -2$$

**Ans.**

10.  $3^{2x+1} \div 9 = 27$

$$\begin{aligned}3^{2x+1} \div 3^2 &= 3^3 \\ 3^{2x+1} &= 3^3 \times 3^2 \\ 3^{2x+1} &= 3^5\end{aligned}$$

On comparing power both sides

$$\begin{aligned}2x+1 &= 5 \\ 2x &= 5-1=4 \\ x &= \frac{4}{2}=2\end{aligned}$$

**Ans.**

11. Let required no. be  $x$ .

then  $A$  to  $q$

$$\begin{aligned}\left[-\frac{11}{7}\right]^{-1} \div x &= \left(\frac{-22}{7}\right) \\ x &= \left(-\frac{11}{7}\right)^{-1} \div \left(\frac{-22}{7}\right)^{-1} \\ x &= \left(-\frac{7}{11}\right) \times \left(-\frac{22}{7}\right) = \frac{7 \times 22}{11 \times 7} \\ x &= 2\end{aligned}$$

**Ans.**

12. Let the required no. be  $x$ .

$A$  to  $q$

$$\begin{aligned}(-5)^{-1} \times x &= (-20)^{-1} \\ \Rightarrow x &= (-20)^{-1} \div (-5)^{-1} \\ &= -\frac{1}{20} \div \frac{1}{(-5)} \\ &= -\frac{1}{20} \times (-5) = \frac{5}{20} = \frac{1}{4}\end{aligned}$$

**Ans.**

## EXERCISE- 2B

1. Express the following numbers in standard form:

(i)  $36.75 = 3.675 \times 10^1$

**Ans.**

(ii)  $3750000 = 3.75 \times 10^6$

**Ans.**

(iii)  $917000000000 = 9.11 \times 10^{11}$

**Ans.**

(iv)  $47589 \times 10^4 = 4.7589 \times 10^8$

**Ans.**

2. Express the following in usual form:

(i)  $2.4 \times 10^4 = 24 \times 10^3 = 24000$

**Ans.**

(ii)  $6.51 \times 10^6 = 651 \times 10^4 = 6510000$

**Ans.**

(iii)  $1.3 \times 10^{-5} = 13 \times 10^{-6} = \frac{13}{1000000} = 0.00013$

**Ans.**

(iv)  $20.3 \times 10^{-4} = 203 \times 10^5 = \frac{203}{100000} = 0.00203$

**Ans.**

3. Simplify the following and express in standard form ;

(i)  $(4.325 \times 10^{14}) + 2.3 \times 10^{12}$   
 $= (4.325 \times 10^{14}) + .023 \times 10^{14}$

$$= (4.325 + 0.023) \times 10^{14} = 4.348 \times 10^{14} \quad \text{Ans.}$$

$$\begin{aligned} \text{(ii)} \quad & (7.89 \times 10^5) - (5.5 \times 10^4) \\ &= (7.89 \times 10^5) - (0.55 \times 10^5) \\ &= (7.89 - 0.55) \times 10^5 = 7.34 \times 10^5 \end{aligned} \quad \text{Ans.}$$

$$\text{(iii)} \quad (4 \times 10^{-3})^2 = 4^2 \times 10^{-3 \times 2} = 16 \times 10^{-6} = 1.6 \times 10^{-5} \quad \text{Ans.}$$

4. Find the value of  $x$  that satisfies the given equations.

$$\begin{aligned} \text{(i)} \quad & 0.000000063 = 6.3 \times 10^x \\ \Rightarrow & 0.000000063 = 6.3 \times 10^x \\ \Rightarrow & 6.3 \times 10^{-8} = 6.3 \times 10^x \\ \Rightarrow & 10^{-8} = 10^x \end{aligned}$$

Here base is same on both side

$$\Rightarrow x = -8$$

$$\text{(ii)} \quad \frac{1}{5000000000} = 0.2 \times 10^x$$

$$\Rightarrow \frac{1}{5 \times 10^9} = 0.2 \times 10^x$$

$$\Rightarrow 0.2 \times 10^{-9} = 0.2 \times 10^x \Rightarrow 10^{-9} = 10^x$$

Here base is same on both side

$$\text{Then, } x = -9$$

5. Express the numbers appearing in the following statements in standard form:

(i) The average radius of a red blood cell is 0.0000035 mm.

$$3.5 \times 10^{-6}$$

(ii) One billion =  $1 \times 10^9$

(iii) 1 tetrabyte =  $1 \times 10^{12}$  byte

(iv) Size of a virus is 0.000000000002 m

$$0.000000000002 \text{ m} = 2 \times 10^{-12}$$

(v) Charge on an electron is

$$0.000,000,000,000,000,000,16 \text{ coulomb} = 1.6 \times 10^{-19} \text{ Coulomb.}$$

6. Given, radius of a portion = 1.2 fermis

$$1 \text{ fermi} = 10^{-15} \text{ m} = 10^{-15} \times 100 \text{ cm} = 10^{-13} \text{ cm}$$

$$\text{Radius of the portion } 1.2 \text{ fermis} = 1.2 \times 10^{-13} \text{ cm} \quad \text{Ans.}$$

7. Given, speed of light in space =  $3 \times 10^5$  km/s

Distance between earth from the sun =  $1.5 \times 10^8$  km

Time taken (light from the sun to reach earth)

$$\begin{aligned} &= \frac{\text{Distance}}{\text{speed}} = \frac{1.5 \times 10^8 \text{ km}}{3 \times 10^5 \text{ km/s}} \\ &= \frac{15 \times 10^{7=500}}{3 \times 10^5} = 5 \times 10^2 = 500 \text{ second} \end{aligned}$$

8. Given, speed of dust in width of electron microscope =  $1.2 \times 10^2$  mm

Image size larger than actual size =  $-5 \times 10^2$  time

Width of actual speech of dust in mm = ?

A to Q

Actual size of dust =  $\frac{\text{Size of dust in electron microscope}}{\text{Image of size}}$

$$= \frac{1.2 \times 10^2}{5 \times 10^2} = \frac{1.2}{5} = 0.24 \text{ mm} \quad \text{Ans.}$$

9. Half life of Uranium-238 =  $4.5 \times 10^9$  year

Half life of Uranium-234 =  $2.5 \times 10^5$  year

$$\begin{aligned} &= \frac{4.5 \times 10^9}{2.5 \times 10^5} = \frac{45 \times 10^5 \times 10^4}{25 \times 10^5} \\ &= 1.8 \times 10^4 \text{ times} \quad \text{Ans.} \end{aligned}$$

## MULTIPLE CHOICE QUESTIONS

1. (b)

$$\text{Because } (x^{-1} + y^{-1})^{-1} = \left( \frac{1}{x} + \frac{1}{y} \right)^{-1} = \left( \frac{x+y}{xy} \right)^{-1} = \frac{xy}{x+y} \quad \text{Ans.}$$

2. (b)  $x = 4$

$$\begin{aligned} 5^x \div 5^{-1} &= 5^5 \\ 5^{x-1} &= 5^5 \Rightarrow x-1 = 5 \Rightarrow x = 5+1 \Rightarrow x = 6 \quad \text{Ans.} \end{aligned}$$

3. (d)  $1/3 \text{ m}^2$

$$\begin{aligned} \text{Area of rectangle} &= l \times b \\ &= 9^{-2} \times 3^3 \\ &= 3^{-4} \times 3^3 = 3^{-1} = \frac{1}{3} \text{ m}^2 \end{aligned}$$

4. (b)  $5.43 \times 10^{-4}$

5. (b)  $x = 3$

$$\left(\frac{2}{9}\right)^{x-1} = \left(\frac{9}{2}\right)^{x-5} \Rightarrow \left(\frac{2}{9}\right)^{x-1} = \left(\frac{2}{9}\right)^{-(x-5)}$$

Base same than and compare both powers

$$x-1 = -(x-5)$$

$$\Rightarrow x-1 = -x+5 \Rightarrow 2x = 5+1$$

$$\Rightarrow 2x = 6 \Rightarrow x = 3$$



## Square and Square Roots



### EXERCISE-3A

1. Which of the following statements are true/false?

(i) The number ending in 2, 3, 7 or 8 is a perfect square.

**False**

A perfect square

(ii) The sum of two perfect squares is a perfect square.

**False**

(iii) The product of two perfect square is a perfect square.

**True**

(iv) If  $n$  and  $(n+1)$  are any two consecutive natural numbers then  $(n+1)^2 - n^2 = \{(n+1) + n\}$ .

**True**

(v) If  $(p, q, r)$  is a Pythagorean triplet then  $p^2 + q^2 = r^2$ .

**True**

2. Which of the following are perfect squares:

(i) 365

The given number is 365.

$$365 = 5 \times 73$$

Clearly prime factor ccan not be grouped into pair of equal factors.

Hence, 365 is not a perfect square.

**No.**

(ii) 441

$$441 = \underbrace{3 \times 3} \times \underbrace{7 \times 7} = (3 \times 7)^2 = (21)^2$$

Clearly prime factor can be grouped in to prime fo equal factors

Hence, 441 is a perfect square.

Yes (21)

5	365
73	73
	1

3	441
3	147
7	49
7	7



(iii) 10434

$$10434 = 2 \times 3 \times 37 \times 47$$

Clearly prime factor can not be grouped in to pair of equal factors.

Hence 10434 is not a perfect square.

2	10434
3	5217
37	1739
47	47
	1

(iv) 4489

$$4489 = \underbrace{67 \times 67}$$

Clearly prime factor can be grouped in to pair of equal factor.

Hence, 4489 is a perfect square.

Yes (67)

3. Which of the following numbers are not perfect square.

(i) 640000

$$640000 = \overline{2 \times 2} \times \overline{2 \times 2} \times \overline{2 \times 2} \times \overline{2 \times 2} \times \overline{2 \times 2} \times \overline{5 \times 5} \times \overline{5 \times 5}$$

$$\begin{aligned} \sqrt{640000} &= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 5 \times 5 \\ &= 800 \end{aligned}$$

Clearly prime factor can be grouped in to pair of equal factor.

Hence, 640000 is a perfect square.

(800) **Ans.**

Yes

2	640000
2	320000
2	160000
2	80000
2	40000
2	20000
2	10000
2	5000
2	2500
5	1250
5	625
5	125
5	25
5	5
	1

(ii) 3300

$$3300 = 2 \times 2 \times 5 \times 5 \times 3 \times 11$$

Clearly prime factor can not be grouped in to pair of equal factor.

Hence, 3300 is not a perfect square.

No.

2	3300
2	1650
5	825
5	165
3	33
11	11
	1

(iii) 8100

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

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

Clearly prime factor can be grouped in to pair of equal factor.

Hence, 8100 is a perfect square. Yes (90)

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

(iv) 1600000

$$1600000 = \overline{2 \times 2} \times \overline{2 \times 2} \times \overline{2 \times 2} \times \overline{2 \times 2} \times \overline{5 \times 5} \times \overline{5 \times 5} \times 5$$

Clearly prime factor can not be grouped in to pair of equal factor.

Hence, 1600000 is not a perfect square. Yes (90)

2	1600000
2	800000
2	400000
2	200000
2	100000
2	50000
2	25000
2	12500
2	6250
5	3125
5	625
5	125
5	25
5	5
	1

4. Which of the following are squares of even numbers:

(i) 484

$$484 = 2 \times 2 \times 11 \times 11$$

$$\sqrt{484} = 2 \times 2 \times 11 \times 11$$

$$\sqrt{484} = 2 \times 11$$

$$= 22 \text{ (even)}$$

Hence 484 is a perfect square of even number.

2	484
2	242
11	121
11	11
	1

(ii) 1156

$$1156 = 2 \times 2 \times 17 \times 17$$

$$\sqrt{1156} = 2 \times 17 = 34 \text{ (even)}$$

Hence, 1156 is a perfect square of even number.

2	1156
2	578
17	289
17	17
	1

(iii) 1369

$$1369 = 37 \times 37$$

$$\sqrt{1369} = 37 \text{ (odd)}$$

1369 is a square of odd number.

(iv) 529

$$529 = 23 \times 23$$

$$\sqrt{529} = 23 \text{ (odd)}$$

Hence 529 is a square of odd number.

5. Which of the following are squares of odd numbers:

(i) 49

$$49 = 7 \times 7$$

$$\sqrt{49} = 7 \text{ (odd)}$$

Hence 49 is square of odd number.

(ii) 2401

$$2401 = 7 \times 7 \times 7 \times 7$$

$$\sqrt{2401} = 7 \times 7 = 49 \text{ (odd)}$$

Hence, 2401 is a square of odd number. (Yes)

(iii) 256

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

$$\sqrt{256} = 4 \times 4$$

$$= 16 \text{ (even)}$$

Hence, 256 is a square of even number.

No.

(iv) 900

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

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

$$= 30 \text{ even}$$

Hence 900 is a square of 30 which is even.

No

37	1369
37	37
	1

No.

23	529
23	23
	1

No.

7	49
7	7
	1

Yes

7	2401
7	343
7	49
7	7
	1

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

2	900
2	450
3	225
3	75
5	25
5	5
	1

6. Without actual multiplication, evaluate the following:

(i)  $14^2 - 13^2$

$$14^2 - 13^2 = (14 + 13)(14 - 13) = (27) \cdot 1 = 27$$

**Ans.**

(ii)  $100^2 - 99^2$

$$100^2 - 99^2 = (100 + 99)(100 - 99) = 199$$

**Ans.**

(iii)  $504^2 - 503^2$

$$504^2 - 503^2 = (504 + 503)(504 - 503)$$

$$= (1007) \times (1) = 1007$$

**Ans.**

(iv)  $729^2 - 728^2$

$$729^2 - 728^2 = (729 + 728)(729 - 728)$$

$$= 1457 \times (1) = 1457$$

**Ans.**

7. From the Pythagorean triplet whose smallest number is

(i) 3

We know that the Pythagorean triplet is

$$2m, (m^2 - 1), (m^2 + 1)$$

$$\text{Now, } m^2 - 1 = 3 \Rightarrow m^2 = 3 + 1 = 4 \Rightarrow m = 2$$

put  $m = 2$  in p-triplets

$$2m = 2 \times 2 = 4$$

$$m^2 - 1 = 2^2 - 1 = 4 - 1 = 3$$

$$m^2 + 1 = 2^2 + 1 = 4 + 1 = 5$$

Hence, the Pythagorean triplet are 4, 3, 5.

**Ans.**

(ii) 6

$$2m = 6 \Rightarrow m = 3$$

Put  $m = 3$  in Pythagorean triplet

$$2m = 2 \times 3 = 6$$

$$m^2 - 1 = 3^2 - 1 = 9 - 1 = 8$$

$$m^2 + 1 = 3^2 + 1 = 9 + 1 = 10$$

Hence, the Pythagorean triplet are 6, 8, 10.

**Ans.**

(iii) 16

We know that the Pythagorean triplet are

$$2m, m^2 - 1, m^2 + 1$$

$$\text{Now, } 2m = 16 \Rightarrow m = \frac{16}{2} = 8$$

$$2m = 2 \times 8 = 16$$

$$m^2 - 1 = 8^2 - 1 = 64 - 1 = 63$$

$$m^2 + 1 = 8^2 + 1 = 64 + 1 = 65$$

Hence the Pythagorean triplet are 16, 63, 65.

**Ans.**

(iv) 20

We know that the Pythagorean triplet are

$$2m, m^2 - 1, m^2 + 1$$

Now,  $2m = 20 \Rightarrow m = \frac{20}{2} = 10$

put  $m = 10$  in triplet

$$2m = 2 \times 10 = 20$$

$$m^2 - 1 = (10)^2 - 1 = 99$$

$$m^2 + 1 = (10)^2 + 1 = 101$$

Hence the Pythagorean triplet are 20, 99, 101.

**8.** Find the sum without adding

(i)  $1 + 3 + 5 + 7 = \text{sum of 4 odd digit} = (4)^2 = 16$

**Ans.**

(ii)  $1 + 3 + 5 + 7 + 9 + 11 = 6\text{-digit} = (6)^2 = 36$

**Ans.**

(iii)  $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 = 9\text{-digit} = (9)^2 = 81$

**Ans.**

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

$$= 12\text{-digit} = (12)^2 = 144$$

**Ans.**

**9.** Express each of the following perfect square are the sum of odd numbers:

Sum of 7-odd digit :  $49 = (7)^2 = 1 + 3 + 5 + 7 + 9 + 11 + 13$

Sum of 7-odd digit :  $64 = (8)^2 = 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15$

**Ans.**

**10.** Column method

(i) 25

Given number = 25,  $a = 2$  and  $b = 5$

$a^2$	$2 \times a \times b$	$b^2$
$2^2$	$2 \times 2 \times 5$	$5^2$
4	20	25
+2	+2	
6	22	

$$(25)^2 = 625$$

$$25 = (25)^2 = 25 \times 25 = 625$$

**Verify**

(ii) 54

$$a = 5, b = 4$$

$a^2$	$2 \times a \times b$	$b^2$
$5^2$	$2 \times 5 \times 4$	$4^2$
25	40	16
+4	+1	
+2	4	

$$(54)^2 = 2916$$

$$(54)^2 = 54 \times 54 = 2916$$

**Verify**

(iii) Given number = 71

$$a = 7 \text{ and } b = 1$$

$a^2$	$2 \times a \times b$	$b^2$
49	14	1
+1	+0	
50	14	

$$71^2 = 5041$$

**Ans.**

(iv) 94

$$a = 9 \text{ and } b = 4$$

$a^2$	$2 \times a \times b$	$b^2$
81	72	16
+7	+1	
88	73	

$$94^2 = 8836$$

$$94^2 = 94 \times 94 = 8836$$

**11. Find the square of:**

(i) 105

Here the no. 105 ending in 5,

Then  $10 \times (10+1)$  hundred +  $5^2$

$$= 10 \times 11 \text{ hundred} + 25$$

$$= 110 \times 100 + 25 = 11000 + 25 = 11025$$

**Ans.**

(ii) 145 (Here the No. 145 ending in 5)

$$14 \times (14+1) \text{ hundred} + 5^2$$

$$= 14 \times 15 \text{ hundred} + 25 = 210 \times 100 + 25 = 21000 + 25 = 21025 \quad \text{Ans.}$$

(iii) 215 (Here the No. 215 ending in 5)

$$\text{Then } 21 \times (21+1) \text{ hundred} + 5^2$$

$$21 \times 22 \text{ hundred} + 25$$

$$= 46200 + 25 = 46225 \quad \text{Ans.}$$

(iv)  $404 = (404)^2$

$$= (400+4)^2 = (400)^2 + (4)^2 + 2 \times 400 \times 4$$

$$= 160000 + 16 + 3200 = 163200 + 16 = 163216 \quad \text{Ans.}$$

13. Find the value of each of the following using the diagonal method:

(i)  $(56)^2$

$$= 3136$$

Ans.

$$\begin{array}{r} 2 \\ +1 \\ \hline 3 \end{array}$$

		5	6
5	2	5	3
6	3	0	3
11	0	6	6
	3	6	

$$(56)^2 = 3136$$

(ii)  $(137)^2$

		1	3	7
1	0	1	0	3
3	0	3	0	9
7	0	7	2	1
	27	6	9	

$$(137)^2 = 18769$$

(iii)  $(67)^2$

$$= 4489 \quad \text{Ans.}$$

$$\begin{array}{r} 3 \\ +1 \\ \hline 4 \end{array}$$

		6	7
6	3	6	4
7	4	2	4
	8	9	

$$(67)^2 = 4489$$

$$\begin{aligned} \text{(iv) } (256)^2 \\ = 65536 \text{ Ans.} \end{aligned}$$

	2	5	6
0	4	0	2
1	0	5	0
1	2	0	6

$$(256)^2 = 65536$$

### 13. Square by Column Method

$$\text{(i) } (23)^2$$

$$a = 2, b = 3$$

$$(23)^2 = 529$$

$a^2$	$2ab$	$b^2$
$2^2$	$2 \times 2 \times 3$	$3^2$
4	12	9
+1		
5		

$$(23)^2 = 529$$

$$\text{(ii) } (52)^2$$

$$a = 5, b = 2$$

$$(52)^2 = 2704$$

**Ans**

$a^2$	$2ab$	$b^2$
$5^2$	$2 \times 5 \times 2$	$2^2$
25	20	4
+2		
27		

$$(52)^2 = 2704$$

$$\text{(iii) } (96)^2$$

$$a = 9 \text{ and } b = 6$$

$$(96)^2 = 9216$$

$a^2$	$2ab$	$b^2$
$9^2$	$2 \times 9 \times 6$	$6^2$
81	108	36
+11	+3	
92	111	

$$(96)^2 = 9216$$

$$\text{(iv) } (35)^2$$

$$a = 3 \text{ and } b = 5$$

$a^2$	$2ab$	$b^2$
$3^2$	$2 \times 3 \times 5$	$5^2$
9	30	25
+3	+2	
12	32	

$$(35)^2 = 1225$$



**14. Prime factorization of 252.**

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

Clearly the Prime factor 7 is unpaired. Therefore we multiply 252 by 7 to get perfect square.

$$252 \times 7 = 1764$$

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

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

**Ans.**

Least No. = 7

Perfect square = 42

**Ans.**

**15. Prime factorization of 2925**

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

Clearly the prime factor 13 is unpaired.

Therefore, we divide 2925 by 13 we get

Perfect square

$$2925 \div 13 = 225$$

$$225 = 3 \times 3 \times 5 \times 5$$

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

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

Smallest number = 13

Perfect square = 15

**16. The least number divisible by each of the number 8, 9 and 10 is their LCM.**

L.C.M. of 8, 9 and 10 is

$$360 = 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5$$

To make a perfect square it must be multiplied by  $2 \times 5$  i.e., 10

So, the required number =  $360 \times 10$

$$= 3600$$

**Ans.**

**17. Find the square root of the following numbers by the method of prime factorization:**

(i) 225

$$225 = 3 \times 3 \times 5 \times 5$$

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

$$= 3 \times 5$$

$$= 15 \quad \text{Ans.}$$

3	225
3	75
5	25
5	5
	1

(ii) 2601

$$\begin{aligned}
 2601 &= 3 \times 3 \times 17 \times 17 \\
 \sqrt{2601} &= \sqrt{3 \times 3 \times 17 \times 17} \\
 &= 3 \times 17 = 51 \\
 \sqrt{2601} &= 51 \text{ Ans.}
 \end{aligned}$$

3	2601
3	867
17	289
17	17
	1

(iii) 24336

$$\begin{aligned}
 24336 &= \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{13 \times 13} \\
 \sqrt{24336} &= 2 \times 2 \times 3 \times 13 \\
 &= 156 \text{ Ans.}
 \end{aligned}$$

2	24336
2	12168
2	6084
2	3042
3	1521
3	507
13	169
13	13
	1
7	47089
7	6727
31	961
31	3
	1

(iv) 47089

$$\begin{aligned}
 47089 &= 7 \times 7 \times 31 \times 31 \\
 \sqrt{47089} &= 7 \times 31 \\
 &= 217 \text{ Ans.}
 \end{aligned}$$

18. (i) 16384

	128
1	16384
	1
22	63
	44
248	1984
	1984
	×

$$\sqrt{16384} = 128$$

(ii) 49284

$$\sqrt{49284} = 222 \text{ ans.}$$

	222
2	49284
	4
42	92
	84
442	884
	884
	×

Ans.

(iii) 10609

$$\sqrt{10609} = 103$$

	103
1	10609
	1
203	0609
	609
	×

(iv) 1234321

	111
1	1234321
	1
21	23
	21
221	243
	221
2221	2221
	2221
	×

$$\sqrt{1234321} = 1111$$

**Ans.**

### EXERCISE 3(B)

1. Find the square root of:

(i) 3.0976

	1.76
1	3.0976
	-1
27	209
	189
346	2076
	2076

0 = Remainder

$$\sqrt{3.0976} = 1.76 \quad \text{Ans.}$$

(ii) 1.5876

	1.25
1	1.5876
	1
22	0.58
	-44
246	1476
	1476

0 = Remainder

$$\sqrt{1.5876} = 1.26$$

(ii) 0.172225

	.415
4	1.172225
	16
81	122
	-81
825	4125
	-4125

0 = Remainder

$$\sqrt{0.172225} = 0.415 \quad \text{Ans.}$$

(iv) 0.00367236

	.0606	
6	0.00367236	
	36	↓
1206	7236	
	7236	4125
	0	= Remainder

2. Find the value of the following numbers upto three places of decimals:

(i)  $\sqrt{3}$

	1.732	
1	3.000000	
	-1	
27	200	
+7	189	
343	1100	
+3	1029	
3462	7100	
	6924	
	176	Remainder

$$\sqrt{3} = 1.732$$

**Ans.**

(ii)  $\sqrt{5}$

	2.236	
2	5.000000	
	4	
42	100	
	84	
443	1600	
	- 1329	
4466	27100	
	26796	
	0304	Remainder

$$\sqrt{2.5} = 1.673 \text{ Ans.}$$

(iii)  $\sqrt{2.8}$

	1.673
1	2.800000
	1
26	180
	156
327	2400
	- 2289
3343	11100
	10029
	1071 Remainder

$\sqrt{2.5} = 1.673$

**Ans.**

(iv)  $\sqrt{1.21}$

	.347
3	.121000
	9
64	310
	256
687	5400
	- 4809
	591 Remainder

**3. Given**

Area of square playground = 362.1409

$(\text{side})^2 = 362.1409$

$\text{side} = \sqrt{362.1409}$

$\text{side} = 19.03$

	19.03
1	362.1409
	1
29	262
	261
3803	11409
	- 11409
	0 Remainder

Perimeter of playground =  $4 \times \text{side}$

$= 4 \times 19.03 = 76.12 \text{ meter}$

**Ans.**

## EXERCISE- 3(C)

1. Find the value of

(i)  $\sqrt{\frac{441}{961}}$

	21
2	441
	4 ↓
41	41
	41
	×

	31
3	961
	9 ↓
61	61
	61
	×

$\sqrt{961} = 31$

$\sqrt{441} = 21$

$$\sqrt{\frac{441}{961}} = \frac{21}{31}$$

**Ans.**

(ii)  $\sqrt{\frac{2401}{225}}$

	49
4	2401
	16
89	801
	801
	×

	15
1	225
	1
25	125
	125
	×

$\sqrt{2401} = 49$

$\sqrt{225} = 15$

**Ans.**

$$\sqrt{\frac{2401}{225}} = \frac{49}{15} \quad \text{Ans.}$$

2. Find the square root of the following numbers:

(i)  $1 \frac{56}{169} = \frac{169 \times 1 + 56}{169} = \frac{225}{169}$

$\sqrt{225} = 15, \sqrt{169} = 13$

$$\sqrt{\frac{225}{169}} = \frac{15}{13} \quad \text{Ans.}$$

	15
1	225
	1
25	125
	125
	×

	13
1	169
	1
23	169
	169
	×

(ii)  $34 \frac{15}{49} = \frac{34 \times 49 + 15}{49} = \frac{1666 + 15}{49} = \frac{1681}{49}$

$\sqrt{1681}$

	41
4	1681
	16
81	81
	81
	×

$$\sqrt{1681} = 41; \quad \sqrt{49} = 7$$

7
7
49
49
×

$$\sqrt{34\frac{15}{49}} = \sqrt{\frac{1681}{49}} = \frac{41}{7}$$

3. Find the value of:

(i)  $\sqrt{45 \times 20} = \sqrt{900} = 30$  Ans.

	30
3	900
	9
	00

$$\sqrt{4520} = \sqrt{900} = 30$$

Ans.

(ii)  $\frac{\sqrt{0.2304} + \sqrt{.1764}}{\sqrt{0.2304} - \sqrt{.1764}}$

	.48
4	.2304
	16
88	704
	704
	×

	.42
4	.1764
	16
82	164
	164
	×

$$\frac{\sqrt{0.2304} + \sqrt{0.1764}}{\sqrt{0.2304} - \sqrt{0.1764}} = \frac{0.48 \div 0.42}{0.48 \div 0.42} = \frac{0.96}{0.46} = \frac{90}{6} = 15$$

Ans.

### MULTIPLE CHOICE QUESTIONS

1. (c)  $\sqrt{a} \times \sqrt{b} = \sqrt{a \times b} = \sqrt{a} \times \sqrt{b}$

2. (d)  $\frac{\sqrt{a}}{\sqrt{b}} \Rightarrow \sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

3. (b)  $81^2 - 80^2 = (81-80)(81+80)$

$$= (161)(1) = 161$$

Hence, (b) is the required .

4. (a)  $\sqrt{0.0625}$

2	.25
45	.0625
	4
	225
	225
	×

$$\sqrt{0.0625} = 0.25$$

5. The sum of the first  $n$  odd natural numbers is  $n^2$  .

Hence (b) is the correct answer.



## Study of Cubes and Cube Roots



### EXERCISE -4A

1. Find the cubes of the following numbers:

(i) 8

$$(8)^3 = 8 \times 8 \times 8 = 64 \times 8 = 512 \quad \text{Ans.}$$

(ii) 12

$$(12)^3 = 12 \times 12 \times 12 = 144 \times 12 = 1728 \quad \text{Ans.}$$

(iii) 18

$$(18)^3 = 18 \times 18 \times 18 = 324 \times 18 = 5832 \quad \text{Ans.}$$

(iv) 23

$$(23)^2 = 23 \times 23 \times 23 = 529 \times 23 = 12167 \quad \text{Ans.}$$

2. Which of the following numbers are perfect cubes?

(i) 216

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

$$\sqrt[3]{216} = 2 \times 3 = 6 \quad \text{Ans.}$$

216 is a perfect cube of 6 . Yes

(ii) 1728

$$1728 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3}$$



$$\sqrt[3]{1728} = 2 \times 2 \times 3 = 12$$

1728 is a perfect cube.

(iii) 9261

$$9261 = \underline{3 \times 3 \times 3} \times 43$$

Hence, 9261 is not a perfect cube.

(No)

(iv) 4096

$$\begin{aligned} 4096 &= \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \\ &= 8 \times 8 \times 8 \times 8 \\ &= (8)^4 \end{aligned}$$

Hence, 4096 is not a perfect cube .

No

3. Resolving, 3087 in prime factor, we find that

$$3087 = 3 \times 3 \times 7 \times 7 \times 7$$

We observe, the prime factor 3087 can be grouped into triples of equal factor and one 3 is left over.

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

4.  $364500 = 2 \times 2 \times \underline{3 \times 3 \times 3} \times \underline{3 \times 3 \times 3} \times \underline{5 \times 5 \times 5}$

Observe the that prime factor 364500 can be grouped in triples of equal factor and are  $2 \times 2$  i.e., 4 is left over.

Clearly to make a perfect cube it must be divide by 4.

Observe that the prime factor 364500 can be grouped in triples of equal factor and are  $2 \times 2$  i.e., 4 is left over.

Clearly to make a perfect cube it must be divide by 4.

**Ans. (4)**

**Ans.**

(Yes)

3	9261
3	387
3	129
	43
2	4096
2	2048
2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

3	3087
3	1029
7	343
7	49
7	7
	1

2	364500
2	182250
3	91125
3	30375
3	10125
3	3375
3	1125
3	375
5	125
5	25
5	5
	1

5. Which of the following are cubes of odd numbers?

(i) 512

$$512 = 8 \times 8 \times 8 = (8)^3 \text{ (even)}$$

$$\sqrt[3]{512} = 8 \text{ (even)}$$

(No)

(ii) 729

$$729 = 3 \times 3 \times 3 \times 3 \times 3 \times 3 = 9 \times 9 \times 9 = (9)^3$$

$$\sqrt[3]{729} = 3 \times 3 = 9 \text{ (odd) Yes}$$

(iii) 125

$$125 = 5 \times 5 \times 5 = (5)^3$$

$$\sqrt[3]{125} = 5 \text{ (odd) Yes}$$

(iv) 1728

$$1728 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3} = 2 \times 2 \times 3 = 12$$

$$1728 = 12 \times 12 \times 12 = (12)^3$$

$$\sqrt[3]{1728} = 12 \text{ (even) No.}$$

**Ans.**

6. Which of the following are cubes of even numbers?

(i) 216

$$216 = 6 \times 6 \times 6 = (6)^3$$

$$\sqrt[3]{216} = 6 \text{ (even) Yes}$$

(ii) 512

$$512 = 8 \times 8 \times 8 = (8)^3$$

$$\sqrt[3]{512} = 8 \text{ (even) Yes}$$

(iii) 91125

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

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

$$= (45)^3$$

$$\sqrt[3]{91125} = 45 \text{ (odd) No.}$$

(iv) 9261

$$9261 = 3 \times 3 \times 3 \times 43$$

Here 9261 is not a perfect cube.

7. By using the Vedic method, find the cubes of the following:

(i) 35

$$a = 3 \text{ and } b = 5$$

$a^3$	$3a^2b$	$3b^2a$	$b^3$
$(3)^3$	$3 \times 9 \times 5$	$3 \times 25 \times 3$	
$= 27$	$135$	$225$	$125$
$15$	$23$	$12$	
<u>42</u>	<u>158</u>	<u>237</u>	

$$(35)^3 = 42875$$

**Ans**

(ii) 44

$$a = 4 \text{ and } b = 5$$

$a^3$	$3a^2b$	$3b^2a$	$b^3$
$(4)^3$	$3 \times 16 \times 4$	$3 \times 16 \times 4$	$(4)^3$
$64$	$192$	$192$	$64$
$+ 21$	$19$	$+ 6$	
<u>85</u>	<u>211</u>	<u>198</u>	

$$(44)^3 = 85184$$

**Ans.**

(iii) 65

$$a = 6 \text{ and } b = 5$$

$a^3$	$3a^2b$	$3b^2a$	$b^3$
$(6)^3$	$3 \times 36 \times 5$	$3 \times 25 \times 6$	$(5)^3$
$216$	$540$	$450$	$125$
$+ 58$	$+ 46$	$+ 12$	
<u>274</u>	<u>586</u>	<u>462</u>	

$$(65)^3 = 274625$$

**Ans.**

(iv) 75

$$a = 7 \text{ and } b = 5$$

$a^3$	$3a^2b$	$3b^2a$	$b^3$
$(7)^3$	$3 \times 49 \times 5$	$3 \times 25 \times 7$	$(5)^3$
$343$	$735$	$525$	$125$
$+ 78$	$+ 53$	$+ 12$	
<u>421</u>	<u>788</u>	<u>537</u>	

$$(75)^3 = 421875$$

**Ans.**

8. Given,

Side of cube = 15

$$\begin{aligned}\text{Volume of cube} &= (\text{side})^3 = (15)^3 \\ &= 15 \times 15 \times 15 \\ &= 225 \times 15 = 3375 \text{ m}^3\end{aligned}$$

**Ans.**

9. Find the volume of a cube whose side length is:

(i) 17.7 cm

Side = 17.7

$$\begin{aligned}\text{Volume of cube} &= (\text{side})^3 = (17.7)^3 \\ &= 17.7 \times 17.7 \times 17.7 \\ &= 5545.233 \text{ cm}^3\end{aligned}$$

**Ans.**

(ii) Side = 23.7

$$\begin{aligned}\text{Volume of cube} &= (\text{side})^2 \\ &= (23.7)^3 \\ &= 23.7 \times 23.7 \times 23.7 \\ &= 13312.053 \text{ cm}^3\end{aligned}$$

**Ans.**

10. Given the dimensions of cuboid = 6 cm × 8 cm × 11 cm

$$\begin{aligned}\text{Volume of cuboid} &= l \times b \times h \\ &= 6 \times 8 \times 11 = 528 \text{ cm}^3 \\ 528 &= 2 \times 2 \times 2 \times 33\end{aligned}$$

Here the prime factor 528 cannot be grouped in to triple of equal factor.

Hence 520 is not perfect cube.

To make perfect cube of  $528 \text{ cm}^3$  we removed  $16 \text{ cm}^3$

$$528 - 16 = 512$$

We get  $512 \text{ cm}^3 = 8 \times 8 \times 8 = (8)^3$

And add  $(201 \text{ cm}^3)$

$$\begin{aligned}528 + 201 &= 729 \text{ cm}^3 \\ 7 &= 9 \times 9 \times 9 = (9)^3\end{aligned}$$

$16 \text{ cm}^3$  of metal has to be removed or  $201 \text{ cm}^3$  of metal has to be added.

## MULTIPLE CHOICE QUESTIONS

1. (b) Negative

Because the cube root of a negative number is always negative.

$$(-2)^3 = (-2) \times (-2) \times (-2) = -8$$

2. (a)  $xy$  because  $\sqrt{x^3 y^3} = \sqrt{x \times x \times x \times y \times y \times y} = x \times y = xy$

3. (c)  $2916 = 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 = 2 \times 2 \times (3)^3 \times (3)^3$

It is not a perfect cube.

Because

(a)  $2197 = 13 \times 13 \times 13 = (13)^3$  it is a perfect cube.

(b)  $512 = 8 \times 8 \times 8 = (8)^3$  it is a perfect cube.

(c)  $343 = 7 \times 7 \times 7 = (7)^3$  it is a perfect cube.

4. (b) Odd  $\rightarrow 5 \times 5 \times 5 = \underline{125}$ ,  $7 \times 7 \times 7 = \underline{343}$ ,  $3 \times 3 \times 3 = \underline{27}$  (odd)

$$\sqrt[3]{125} = 5 \quad \sqrt[3]{343} = 7 \quad \sqrt[3]{27} = 3$$

5. (a) Even  $\rightarrow 2 \times 2 \times 2 = 8$ ,  $4 \times 4 \times 4 = 64$ ,  $6 \times 6 \times 6 = 216$

$$\sqrt[3]{8} = 2 \quad \sqrt[3]{64} = 4 \quad \sqrt[3]{216} = 6 \text{ (even)}$$



## Algebraic Expressions and Identities



### EXERCISE- 5A

1. Add the following algebraic expressions:

(i)  $9x^2 - 4x + 5$  and  $-3x^2 + 2x - 1$

$$(9x^2 - 4x + 5) + (-3x^2 + 2x - 1)$$

$$= 9x^2 - 4x + 5 - 3x^2 - 2x - 1$$

$$= 6x^2 - 6x + 4$$

Ans.

(ii)  $3l - 4m - 7n^2$  and  $2l + 3m - 4n^2$

$$3l - 4m - 7n^2 + (2l + 3m - 4n^2)$$

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

$$= 5l - m - 11n^2$$

Ans.

2. Subtract the following algebraic expressions:

(i)  $2x^3 - 4x^2 + 3x + 5$  from  $4x^3 + x^2 + x + 6$

$$(4x^3 + x^2 + x + 6) - (2x^3 - 4x^2 + 3x + 5)$$

$$= 4x^3 + x^2 + x + 6 - 2x^3 + 4x^2 - 3x + 5$$

$$= 2x^3 + 5x^2 - 2x + 11$$

Ans.

(ii)  $8a - 6a^2 + 9$  from  $8a - 6a^2 - 8$

$$(8a - 6a^2 + 9) - (8a - 6a^2 - 8)$$

$$= 8a - 6a^2 - 8 - 8a + 6a^2 - 9$$

$$= -17$$

**Ans.**

**3.** Find the product of each of the following:

(i)  $d^4$  and  $-3d^2$

$$d^4 \times (-3d^2) \quad (a^m \times a^n = a^{m+n})$$

$$= -3d^6$$

(ii)  $-c$  and  $9c^2y^5$

$$-c \times (9c^2y^5)$$

$$= 9 \times (-c)(c^2)(y^5) = -9c^3y^5$$

**Ans.**

(iii)  $5t^2$  and  $5t^3$

$$5t^2 \times 5t^3 \quad (a^m \times a^n = a^{m+n})$$

$$= 5 \times 5 \times t^2 \times t^3 = 25t^{2+3}$$

(iv)  $7a^2b^6c^4$  and  $9a^5bc^8$

$$= 7a^2b^6c^4 \times 9a^5bc^8$$

$$= 7 \times a \times a^2 \times a^5 \times b^6 \times b \times c^4 \times c^8$$

$$= 63a^7b^7c^{12}$$

**Ans.**

(v)  $3abc^2$  and  $2a^2b$

$$3abc^2 \times 2a^2b$$

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

$$= 6a^3b^2c^2$$

**Ans.**

(vi)  $-3pt^3$  and  $-6p^2t^2$

$$-3pt^3 \times -6p^2t^2$$

$$= (-3) \times (-6) \times p \times p^2 \times t^3 \times t^2 = 18p^3t^5$$

**Ans.**

**4.** Find the product

(i)  $2w$  and  $(3w+4)$

$$(a^m \times a^n = a^{m+n})$$

$$2w \times (3w+4)$$

$$= 2w \times 3w + 2w \times 4 = 6w^2 + 8w$$

**Ans.**

(ii)  $2xy^4 \times \left(-\frac{2}{7}\right)xy = 2 \times \left(-\frac{2}{7}\right) \times x \times x \times y^4 \times y = -\frac{4}{7}x^2y^5$

**Ans.**

(iii)  $5x^3$  and  $(2x^2+3x)$

$$5x^3 \times (2x^2+3x) = 5x^3 \times 2x^2 + 5x^3 \times 3x = 10x^5 + 15x^4$$

**Ans.**

5. Find the product:

(i)  $7y^2(-6y^2 + 6y - 32)$

$$= 7y^2 \times (-6y^2) + 7y^2 \times 6y + 7y^2 \times (-32)$$

$$= -42y^4 + 42y^3 - 224y^2$$

**Ans.**

(ii)  $-3x(x^2 - 7x + 1)$  ( $a^m \times a^n = a^{m+n}$ )

$$= -3x \times x^2 + 3x \times 7x + (-3x) \times 1$$

$$= -3x^3 + 21x^2 - 3x$$

**Ans.**

(iii)  $3x^2yz(7x^2 + 2y + z + 4w)$

$$= 3x^2yz \times 7x^2 + 3x^2yz \times 2y + 3x^2yz \times z + 3x^2yz \times 4w$$

$$= 21x^4yz + 6x^2y^2z + 3x^2yz^2 + 12x^2yzw$$

**Ans.**

### EXERCISE-5B

1. Find the product of the following expressions:

(i)  $(3y + 5)$  and  $(6y + 8)$

$$(3y + 5) \times (6y + 8)$$

$$= 3y \times (6y + 8) + 5 \times (6y + 8)$$

$$= 3y \times 6y + 3y \times 8 + 5 \times 6y + 5 \times 8$$

$$= 18y^2 + 24y + 30y + 40 = 18y^2 + 54y + 40$$

(ii)  $(3x - 4y)$  and  $(8x - 6y)$

$$(3x - 4y) \times (8x - 6y)$$

$$= 3x \times (8x - 6y) - 4y(8x - 6y)$$

$$= 3x \times 8x - 3x \times 6y - 4y \times 8x + 4y \times 6y$$

$$= 9x^2 - 18xy - 32xy + 24y^2$$

$$= 9x^2 - 50xy + 24y^2$$

(iii)  $(5x^2 + 3y^2)$  and  $(2x^2 + 4y^2)$

$$(5x^2 + 3y^2) \times (2x^2 + 4y^2)$$

$$= 5x^2 \times (2x^2 + 4y^2) + 3y^2 \times (2x^2 + 4y^2)$$

$$= 5x^2 \times 2x^2 + 5x^2 \times 4y^2 + 3y^2 \times 2x^2 + 3y^2 \times 4y^2$$

$$= 10x^4 + 20x^2y^2 + 6x^2y^2 + 12y^4$$

$$= 10x^4 + 26x^2y^2 + 12y^4$$

**Ans.**

(iv)  $(2x^2 + 14x)$  and  $(-x^2 + 1)$

$$\begin{aligned} & (2x^2 + 14x) \times (-x^2 + 1) \\ &= 2x^2 \times (-x^2 + 1) + 14x \times (-x^2 + 1) \\ &= 2x^2 \times (-x^2) + 2x^2 \times 1 + 14x \times (-x^2) + 14x \times 1 \\ &= -2x^4 + 2x^2 - 14x^3 + 14x \\ &= -2x^4 - 14x^3 + 2x^2 + 14x \end{aligned}$$

**Ans.**

2. Find the product of the following expressions. [Use horizontal method and column method]:

(i)  $(a^2 - 8a - 5) \times (7a^2 - 4a - 5)$

Horizontal method

$$\begin{aligned} & (a^2 - 8a - 5) \times (7a^2 - 4a - 5) \\ &= a^2 \times (7a^2 - 4a - 5) - 8a \times (7a^2 - 4a - 5) - 5 \times (7a^2 - 4a - 5) \\ &= 7a^2 \times a^2 - 4a^2 \times a^2 - 5 \times a^2 - 8a \times 7a^2 + 8a \times 4a \\ & \quad + 8a \times 5 - 5 \times 7a^2 + 4a \times 5 + 5 \times 5 \\ &= 7a^4 - 4a^3 - 5a^2 - 56a^3 + 32a^2 + 40a - 35a^2 + 20a + 25 \\ &= 7a^4 - 60a^3 - 8a^2 + 60a + 25 \end{aligned}$$

**Ans.**

- (ii) Horizontal method

$$\begin{aligned} & (b^3 - 4b^2 - 6) \times (3b^3 - 6b^2 - 8) \\ &= b^3 \times (3b^3 - 6b^2 - 8) - 4b^2 \times (3b^3 - 6b^2 - 8) - 6 \times (3b^3 - 6b^2 - 8) \\ &= b^3 \times 3b^3 + b^3 \times (-6b^2) + b^3 \times (-8) - 4b^2 \times 3b^3 - 4b^2 \times (-6b^2) \\ & \quad - 4b^2 \times (-8) - 6 \times 3b^3 - 6 \times (-6b^2) - 6 \times (-8) \\ &= 3b^6 - 6b^5 - 8b^3 - 12b^5 + 24b^4 + 32b^2 - 18b^3 + 36b^2 + 48 \\ &= 3b^6 - 18b^5 + 24b^4 - 26b^3 + 68b^2 + 48 \end{aligned}$$

**Ans.**

Column Method

$$\begin{array}{r} b^3 - 4b^2 - 6 \\ \times 3b^3 - 6b^2 - 8 \\ \hline 3b^6 - 12b^5 - 18b^3 \\ -6b^5 + 24b^4 + 36b^2 \\ -8b^3 + 32b^2 + 48 \\ \hline 3b^6 - 18b^5 + 24b^4 - 26b^3 + 68b^2 + 48 \end{array}$$

**Ans.**



3. Simplify the following algebraic expressions:

(i)  $5ab(a-1)-5a^2(b-c)$

$$= 5ab \times a + 5ab \times (-1) - 5a^2 \times b - 5a^2 \times (-c)$$

$$= 5a^2b - 5ab - 5a^2b + 5a^2c$$

$$= -5ab + 5a^2c = 5a^2c - 5ab$$

**Ans.**

(ii)  $c(c^2 + c) - (a^2 + b^2 - c^2)$

$$= c \times c^2 + c \times c - a^2 - b^2 + c^2$$

$$= c^3 + 2c^2 - a^2 - b^2$$

**Ans.**

(iii)  $(5x+3)(8x+6) + (-9x+10)(12x^2+5x-5)$

$$= 5x(8x+16) + 3(8x+6) - 9x(12x^2+5x-5) + 10(12x^2+5x-5)$$

$$= 5x \times 8x + 5x \times 6 + 3 \times 8x + 3 \times 6 - 9x \times 12x^2 - 9x \times 5x^2 - 9x \times (-5)$$

$$+ 10 \times 12x^2 + 10 \times 5x + 10 \times (-5)$$

$$= 40x^2 + 30x + 24x + 18 - 108x^2 - 45x^2 + 45x + 120x^2 + 50x - 50$$

$$= -108x^3 + 115x^2 + 99x + 50x - 32$$

$$= -108x^3 + 115x^2 + 149x - 32$$

**Ans.**

(iv)  $(4x+11)(12x-11) + (-8x^2-8x-9) + (-8x^2-7x+6)$

$$4x \times (12x-11) + (1 \times (12x-11) + (-8x^2-8x-9) + (-8x^2-7x+6))$$

$$= 4x \times 12x - 4x \times 11 + 11 \times 12x - 11 \times 11 - 8x^2 - 8x - 9 - 8x^2 - 7x + 6$$

$$= 48x^2 - 44x + 132x - 121 - 8x^2 - 8x - 9 - 8x^2 - 7x + 6$$

$$= 48x^2 - 8x^2 - 8x^2 - 44x + 132x - 8x - 7x - 121 - 9 + 6$$

$$= 48x^2 - 16x^2 + 132x - 59x - 121 - 3$$

$$= 32x^2 + 73x - 124$$

**Ans.**

4. Divide the following:

(i)  $9x^2yz \div 3xy$

$$a^m \div a^n = \frac{a^m}{a^n} = a^{m-n}$$

$$= \frac{9x^2yz}{3xy} = 3x^{(2-1)}y^{(1-1)}z$$

$$a^0 = 1$$

$$= 3xy^0z$$

$$(y^0 = 1)$$

$$= 3xz$$

**Ans.**

$$(ii) -3x^3 \div x^2$$

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

**Ans.**

$$(iii) 8m^2 n^2 z^2 \div 2mnz$$

$$= \frac{8m^2 n^2 z^2}{2mnz} = 4m^{2-1} n^{2-1} z^{2-1} = 4mnz$$

**Ans.**

$$(iv) 36xyz \div (-6xy)$$

$$= \frac{36xyz}{-6xy} = -6x^{1-1} y^{1-1} z$$

$$= -6x^0 y^0 z$$

$$x^0 = 1, y^0 = 1$$

$$= -6z$$

**Ans.**

**2. Divide the following:**

$$(i) (2a^3 b^2 - 10ab^3 c) \text{ by } 2ab^2$$

$$(2a^3 b^2 - 10ab^3 c) \div 2ab^2$$

$$= \frac{2a^3 b^2}{2ab^2} - \frac{10ab^3 c}{2ab^2}$$

$$= a^{(3-1)} b^{(2-2)} - 5a^{(1-1)} b^{(3-2)} c$$

$$a^0 = 1$$

$$= a^2 b^0 - 5bc$$

$$b^0 = 1$$

$$= a^2 - bc$$

**Ans.**

$$(ii) (2r^2 s^3 t + 2s^3 t^2 + rs^4 t^3) \text{ by } s^2 t$$

$$(2r^2 s^3 t + 2s^3 t^2 + rs^4 t^3) \div s^2 t$$

$$= \frac{2r^2 s^3 t}{s^2 t} + \frac{2s^3 t^2}{s^2 t} + \frac{rs^4 t^3}{s^2 t}$$

$$= 2r^2 s^{(3-2)} + 2s^{(3-2)} t^{(2-1)} + rs^{(4-2)} t^{(3-1)}$$

$$= 2r^2 s + 2st + rs^2 t^2 = 2r^2 s + 2st + rs^2 t^2$$

**Ans.**

$$(iii) (6x^2 y^3 + 12x^4 y^2) \text{ by } (-3xy)$$

$$= (6x^2 y^3 + 12x^4 y^2) \div (-3xy)$$

$$= \frac{6x^2 y^3}{-3xy} + \frac{12x^4 y^2}{(-3xy)}$$

$$= -2x^{(2-1)} y^{(3-1)} - 4x^{(4-1)} y^{(2-1)} = -2xy^2 - 4x^3 y$$

**Ans.**

$$(iv) (60x^{12} + 24x^{10} + 24x^3) \text{ by } 12x^2$$

$$= (60x^{12} + 24x^{10} + 24x^3) \div 12x^2$$

$$\begin{aligned}
 &= \frac{60x^2}{12x^2} + \frac{24x^{10}}{12x^2} + \frac{24x^3}{12x^2} \\
 &= 5x^{(12-2)} + 2x^{(10-2)} + 2x^{(3-1)} \\
 &= 5x^{10} + 2x^8 + 2x
 \end{aligned}$$

**Ans.**

3. Divide the following:

(i)  $(x^3 - 2x^2 - 4)$  by  $(x - 2)$

$$\begin{array}{r}
 (x^3 - 2x^2 - 4) \div (x - 2) \\
 \begin{array}{r}
 x - 2 \overline{) x^3 - 2x^2 - 4} \\
 \underline{-x^3 + 2x^2} \phantom{-4} \\
 -4 \phantom{-4} \text{ R}
 \end{array}
 \end{array}$$

Quotient  $-x^2$

Remainder  $= -4$

**Ans.**

(ii)  $(6x^3 - x^2 - 10x - 3)$  by  $(2x - 3)$

$$\begin{array}{r}
 (2x - 3) \overline{) 6x^3 - x^2 - 10x - 3} \left( 3x^2 + 4x + 1 \right. \\
 \underline{-6x^3 + 9x^2} \phantom{-10x - 3} \\
 8x^2 - 10x - 3 \\
 \underline{-8x^2 + 12x} \phantom{-3} \\
 2x - 3 \\
 \underline{-2x + 3} \\
 0 \text{ R}
 \end{array}$$

Quotient  $= 3x^2 + 4x + 1$

Remainder  $= 0$

4. Given, cost of  $5x$  books  $= (10x^2 + 20x)$

Cost of each book  $= (10x^2 + 20x) \div 5x$

$$= \frac{10x^2}{5x} + \frac{20x}{5x} = 2x^{(2-1)} + 4x^{(1-1)}$$

$$= 2x + 4x^0 \quad (x^0 = 1)$$

$$= 2x + 4 \quad \text{Ans.}$$

### EXERCISE-5(D)

1. Find the products of the following using suitable identities:

(i)  $(y + 3)(y + 5)$   $[(x + a)(x + b) = x^2 + (a + b)x + ab]$

$$= y^2 + (3 + 5)y + 3 \times 5$$

$$= y^2 + 8y + 15$$

$$\begin{aligned}
 \text{(ii)} \quad & (p+6)(p-2) \\
 &= (p+6)(p+(-2)) \\
 &= p^2 + (6+(-2))p + 6 \times (-2) \quad [(x+a)(x+b) = x^2 + (a+b)x + ab] \\
 &= p^2 + (6-2)p - 12 = p^2 + 4p - 12 \quad \text{Ans.}
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii)} \quad & (x-8)(x+2) \\
 &= [x+(-8)][x+2] \\
 &= x^2 + ((-8)+(2))x + (-8) \times 2 \\
 &= x^2 + (-8+2)x - 16 = x^2 - 6x - 16 \quad \text{Ans.}
 \end{aligned}$$

$$\begin{aligned}
 \text{(iv)} \quad & (x-7)(x-5) \\
 &= (x+(-7))(x+(-5)) \\
 &= x^2 + [(-7)+(-5)]x + (-7) \times (-5) \\
 &= x^2 - 12x + 35 \quad \text{Ans.}
 \end{aligned}$$

2. Evaluate using identities:

$$\begin{aligned}
 \text{(i)} \quad & 53 \times 55 \\
 &= (50+3)(50+5) \\
 &= (50)^2 + (3+5)50 + (3 \times 5) \\
 &= 2500 + (8)(50) + 15 = 2500 + 400 + 15 = 2915 \quad \text{Ans.}
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii)} \quad & 34 \times 36 \\
 &= (30+4)(30+6) \\
 &= (30)^2 + (4+6)(30) + 6 \times 4 \\
 &= 900 + 10 \times 30 + 24 \\
 &= 900 + 300 + 24 = 1224 \quad \text{Ans.}
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii)} \quad & 103 \times 96 \\
 &= (100+3)(100-4) \\
 &= (100)^2 + (3+(-4))100 + 3 \times (-4) \\
 &= 10000 + (-1) \times 100 - 12 \\
 &= 10000 - 100 - 12 = 9888 \quad \text{Ans.}
 \end{aligned}$$

$$\begin{aligned}
 \text{(iv)} \quad & 97 \times 95 \\
 &= (100-3) \times (100-5) \\
 &= (100)^2 + (-3-5) \times 100 + (-3)(-5) \\
 &= 10000 + (-8) \times 100 + 15 \\
 &= 10000 - 800 + 15 = 9215 \quad \text{Ans.}
 \end{aligned}$$

$$(v) 95 \times 105$$

$$= (100 - 5)(100 + 5)$$

$$[(a - b)(a + b) = a^2 - b^2]$$

$$= (100)^2 - (5)^2$$

$$= 10000 - 25 = 9975$$

**Ans.**

$$3. (i) (z - 6)^2$$

$$\text{We know that } (a - b)^2 = a^2 - 2ab + b^2$$

Here  $a = 2$  and  $b = 6$ . Therefore

$$(z - 6)^2 = z^2 - 2(z)(6) + (6)^2$$

$$= z^2 - 12z + 36$$

**Ans.**

$$(ii) (3x + 2y)^2$$

$$\text{We know that } (a + b)^2 = a^2 + 2ab + b^2$$

Here  $a = 3x$  and  $b = 2y$ , therefore

$$(3x + 2y)^2 = (3x)^2 + 2(3x)(2y) + (2y)^2$$

$$= 9x^2 + 12xy + 4y^2$$

**Ans.**

$$(iii) (x^2 + 5)^2$$

$$\text{We know that } (a + b)^2 = a^2 + 2ab + b^2$$

Here  $a = x^2$  and  $b = 5$ . Therefore

$$(x^2 + 5)^2 = (x^2)^2 + 2(x^2)(5) + (5)^2$$

$$= x^4 + 10x^2 + 25$$

**Ans.**

$$4. (i) (54)^2 = (50 + 4)^2$$

$$\text{We know that } (a + b)^2 = a^2 + 2ab + b^2$$

Here  $a = 50$  and  $b = 4$

$$(50 + 4)^2 = (50)^2 + 2(50)(4) + (4)^2$$

$$= 2500 + 400 + 16 = 2916$$

**Ans.**

$$(ii) (103)^2 = (100 + 3)^2$$

$$\text{We know that } (a + b)^2 = a^2 + 2ab + b^2$$

Here  $a = 100$  and  $b = 3$

$$(100 + 3)^2 = (100)^2 + 2(100)(3) + (3)^2$$

$$= 10000 + 600 + 9 = 10609$$

**Ans.**

$$(iii)(198)^2 = (200-2)^2$$

$$\text{We know that } (a-b)^2 = a^2 - 2ab + b^2$$

$$\text{Here } a = 200 \text{ and } b = 2$$

$$\begin{aligned}(200-2)^2 &= (200)^2 - 2 \times (200)(2) - (2)^2 \\ &= 40000 - 800 + 4 = 40004 - 800 = 19204\end{aligned}$$

$$(iv) 102 \times 98$$

$$(100+2)(100-2)$$

$$\text{We know that } (a+b)(a-b) = (a^2 - b^2)$$

$$\text{Here } a = 100 \text{ and } b = 2. \text{ Therefore,}$$

$$\begin{aligned}(100+2)(100-2) &= (100)^2 - (2)^2 \\ &= 10000 - 4 = 9996\end{aligned}$$

**Ans.**

$$5. \text{ We have } a + \frac{1}{a} = 8$$

Squaring on both sides

$$\left(a + \frac{1}{a}\right)^2 = (8)^2 \quad (a+b)^2 = a^2 + b^2 + 2ab$$

$$\Rightarrow a^2 + \frac{1}{a^2} + 2 \times a \times \frac{1}{a} = 64$$

$$\Rightarrow a^2 + \frac{1}{a^2} + 2 = 64$$

$$\Rightarrow a^2 + \frac{1}{a^2} = 64 - 2 = 62$$

$$\Rightarrow a^2 + \frac{1}{a^2} = 62$$

**Ans.**

## MULTIPLE CHOICE QUESTIONS

$$1. (2m^2 - 3n^2)(3m^2 + 2n^2) = ?$$

$$\begin{aligned}&2m^2(3m^2 + 2n^2) - 3n^2(3m^2 + 2n^2) \\ &= 6m^4 + 4m^2n^2 - 9m^2n^2 - 6n^4 \\ &= 6m^4 - 5m^2n^2 - 6n^4\end{aligned}$$

**Ans.**

Hence (c) is required solution.

$$2. \text{ The value of } (403)^2 \text{ is :}$$

$$(403)^2 = (400+3)^2 = (400)^2 + 2 \times (400)(3) + 9$$

$$= 160000 + 2400 + 9$$

$$= 162409$$

**Ans.**

Hence (c) is the correct solution.

3. The value of  $2x^2 y^2 \times 6x^3 y$  is

$$2x^2 y^2 \times 6x^3 y = 2 \times 6 \times x^2 \times x^3 \times y^2 \times y$$

$$= 12x^5 y^3$$

Hence (a) is the correct solution.

4. The value of  $2ab \times 3a^2 b^3 \times \frac{4}{3} a$  is

$$2ab \times 3a^2 b^3 \times \frac{4}{3} a = 2 \times 2 \times \frac{4}{3} \times ab \times a^3 b^3 \times a$$

$$= 8a^4 b^4$$

**Ans.**

Hence (b) is the correct solution.

5. Subtract  $4p^2 - 2q + 7r^3 - 3$  from  $3q + 7p^2 - 2r^3 + 4$ , result is

$$(3q + 7p^2 - 2r^3 + 4) - (4p^2 - 2q + 7r^3 - 3)$$

$$= 3p^2 + 5q - 9r^3 + 7$$

Hence (d) is the correct solution.



## Factorization



### EXERCISE- 6A

1. Factorize the following algebraic expressions:

(i)  $13y + 26 = 13(x + 2)$

**Ans.**

(ii)  $15y - 21y^2 = 3y(5 - 7y)$

**Ans.**

(iii)  $4u^2 - 12u = 4u(u - 3)$

**Ans.**

(iv)  $10pq - 14p^2q = 2pq(5 - 7p)$

**Ans.**

(v)  $7x^2 y^3 + 14x^3 y^2 - 28x^2 y^2$

Here common factor is  $7x^2 y^2$  therefore

$$7x^2 y^3 + 14x^3 y^2 - 28x^2 y^2$$

$$= 7x^2 y^2 (y + 2x - 4)$$

**Ans.**

2. Factorize the following algebraic expressions:

(i)  $3x(a-4b)-2y(a-4b)=(a-4b)(3x-2y)$  **Ans.**

(ii)  $7(m-n)^2-8(m-n)=(m-n)(7(m-n)-8)$   
 $= (m-n)(7m-7n-8)$  **Ans.**

(iii)  $3a(a-2b)+4b(a-2b)=(a-2b)(3a+4b)$   
 (iv)  $a^3(2x-y)+a^2(2x-y)=a^2(2x-y)(a+1)$  **Ans.**

3. Factorize the following algebraic expressions:

(i)  $ax+bx+ay+by=x(a+b)+y(a+b)$   
 $= (a+b)(x+y)$  **Ans.**

(ii)  $x^2-ax-bx+ab=x(x-a)-b(x-a)$   
 $= (x-a)(x-b)$  **Ans.**

(iii)  $4pm+6mq+8pn+12qn=2m(2p+3q)+4n(2p+3q)$   
 $= (2p+3q)(2m+4n)$   
 $= 2(m+2n)(2p+3q)$  **Ans.**

(iv)  $ab^2-bc^2-ab+c^2=ab^2-ab-bc^2+c^2$   
 $= ab(b-1)-c^2(b-1)$   
 $= (b-1)(ab-c^2)$  **Ans.**

## EXERCISE- 6B

Factorize the following:

(i)  $x^2+8x+16$   
 $= (x)^2+2 \times x \times 4 + (4)^2$   $[(a+b)^2 = a^2+2ab+b^2]$   
 $= (x+4)^2$  **Ans.**

(ii)  $m^2-4mn+4n^2$   $[(a-b)^2 = a^2-2ab+b^2]$   
 $= (m)^2-2 \times m \times 2n + (2n)^2$   
 $= (m-2n)^2$

(iii)  $9y^2-12y+4$   
 $= (3y)^2-2 \times 3y \times 2 + (2)^2$   $[(a-b)^2 = a^2-2ab+b^2]$   
 $= (3y-2)^2$

(iv)  $9m^2+24m+16$   
 $= (3m)^2+2 \times 3m \times 4 + (4)^2 = (3m+4)^2$



2. Factorize the following:

(i)  $49c^2 - 25d^2$

$$a^2 - b^2 = (a + b)(a - b)$$

$$= (7c)^2 - (5d)^2$$

$$= (7c + 5d)(7c - 5d)$$

**Ans.**

(ii)  $(3x + 4y)^2 - x^2$

$$= (3x + 4y + x)(3x + 4y - x)$$

$$= (4x + 4y)(2x + 4y)$$

$$= 4(x + y) \cdot 2(x + 2y) = 8(x + y)(x + 2y)$$

**Ans.**

(iii)  $32a^2b - 72b^3$

$$= 8b(4a^2 - 9b^2) = 8b((2a)^2 - (3b)^2)$$

$$= 8b(2a + 3b)(2a - 3b)$$

**Ans.**

(iv)  $81 - (x - 7)^2$

$$= (9)^2 - (x - 7)^2 = (9 + x - 7)(9 - x + 7)$$

$$= (x + 2)(16 - x)$$

**Ans.**

(v)  $\frac{9}{16} - 25a^2b^2$

$$= \left(\frac{3}{4}\right)^2 - (5ab)^2 = \left(\frac{3}{4} + 5ab\right)\left(\frac{3}{4} - 5ab\right)$$

(vi)  $\frac{x^2}{9} - \frac{y^2}{4}$

$$= \left(\frac{x}{3}\right)^2 - \left(\frac{y}{2}\right)^2 = \left(\frac{x}{3} + \frac{y}{2}\right)\left(\frac{x}{3} - \frac{y}{2}\right)$$

**Ans.**

(vii)  $4(2a + b)^2 - (a - b)^2$

$$= (2(2a + b))^2 - (a - b)^2$$

$$= (2(2a + b) + a - b)(2(2a + b) - (a - b))$$

$$= (4a + 2b + a - b)(4a + 2b - a + b)$$

$$= (5a + b)(3a + 3b) = 3(5a + b)(a + b)$$

**Ans.**

(viii)  $25x^3y - 49xy^3$

$$= xy(25x^2 - 49y^2) = xy((5x)^2 - (7y)^2)$$

$$= xy(5x + 7y)(5x - 7y)$$

**Ans.**

$$(ix) x^4 - 625$$

$$= (x^2)^2 - (25)^2 = (x^2 + 25)(x^2 - 25)$$

$$= (x^2 + 25)(x + 5)(x - 5)$$

**Ans.**

$$(x) x^2 - 0.25 = (x)^2 - (0.5)^2$$

$$= (x + 0.5)(x - 0.5)$$

**Ans.**

**3. Factorize the following:**

$$(i) x^2 - 2xy + y^2 - z^2$$

$$(x - y)^2 = x^2 - 2xy + y^2$$

$$= (x - y)^2 - z^2$$

$$= (x - y + z)(x - y - z)$$

**Ans.**

$$(ii) 25a^2 - 4b^2 + 28bc - 49c^2$$

$$= 25a^2 - (4b^2 - 28bc + 49c^2)$$

$$= (5a)^2 - ((2b)^2 - 2 \times 2b \times 7c + (7c)^2)$$

$$= (5a)^2 - (2b - 7c)^2$$

$$= (5a + 2b - 7c)(5a - 2b + 7c)$$

**Ans.**

$$(iii) x^2 - y^2 - 2y - 1 = x^2 - (y^2 + 2y + 1)$$

$$= x^2 - (y + 1)^2 = (x + y + 1)(x - y - 1)$$

**Ans.**

$$(iv) 9x^2 - y^2 + 4y - 4$$

$$= 9x^2 - (y^2 - 4y + 4)$$

$$= (3x)^2 - (y - 2)^2 = (3x + y - 2)(3x - y + 2)$$

**Ans.**

**4. Factorize and find the values of the following:**

$$(i) x^2 - 16y^2, \text{ when } x = 1, y = 2$$

$$= (x)^2 - (4y)^2$$

$$= (x + 4y)(x - 4y)$$

$$\text{Put } x = 1, y = 2$$

$$= (1 + 4 \times 2)(1 - 4 \times 2)$$

$$= (1 + 8)(1 - 8) = (9)(-7) = -63$$

**Ans.**

$$(ii) 4x^2 + 20xy + 25y^2, \text{ when } x = -1, y = 3$$

$$4x^2 + 20xy + 25y^2 = (2x)^2 + 2 \times 2x \times 5y + (5y)^2$$

$$= (2x + 5y)^2$$

$$\text{Putting } x = -1, y = 3$$

$$\begin{aligned}(2x + 5y)^2 &= (2(-1) + 5(3))^2 \\ &= (-2 + 15)^2 = (13)^2 = 169\end{aligned}$$

**Ans.**

### EXERCISE-6C

1. (i)  $x^2 + 5x - 6$

$$= x^2 + 6x - x - 6$$

$$= x(x + 6) - 1(x + 6)$$

$$= (x + 6)(x - 1) \quad \text{Ans.}$$

$$\text{Factor of } 6 = 6 \times 1$$

$$\text{Difference of factor} = 6 - 1 = 5$$

$$\text{Product of factor} = 6 \times 1 = 6$$

(ii)  $x^2 + 14x + 45$

$$= x^2 + (9 + 5)x + 45$$

$$= x^2 + 9x + 5x + 45$$

$$= x(x + 9) + 5(x + 9)$$

$$= (x + 9)(x + 5) \quad \text{Ans.}$$

$$\text{Factor of } 45 = 9 \times 5$$

$$\text{Sum of factor} = 9 + 5 = 14$$

$$\text{Product of factor} = 9 \times 5 = 45$$

(iii)  $48 + 22x - x^2$

$$= -x^2 + 22x + 48$$

$$= -(x^2 - 22x - 48)$$

$$= -(x^2 - (24 - 2)x - 48)$$

$$= -(x^2 - 24x + 2x - 48)$$

$$= -(x(x - 24) + 2(x - 24))$$

$$= -(x - 24)(x + 2) = (24 - x)(x + 21)$$

$$\text{Factor of } 48 = 24 \times 2$$

$$\text{Sum of factor} = (24 - 2) = 22$$

$$\text{Product of factor} = 24 \times 2 = 48$$

**Ans.**

(iv)  $x^2 + 13x + 12$

$$= x^2 + 12x + x + 12 = x(x + 12) + 1(x + 12)$$

$$= (x + 12)(x + 1)$$

**Ans.**

(v)  $y^2 - 10y + 16$

$$= y^2 - 8y - 2y + 16$$

$$= y(y - 8) - 2(y - 8) = (y - 8)(y - 2)$$

**Ans.**

(vi)  $a^2 - 23a + 42$

$$= a^2 - 21a - 2a + 42$$

$$= a(a - 21) - 2(a - 21)$$

$$= (a - 21)(a - 2)$$

**Ans.**

2. Factorize the following:

$$\begin{aligned}\text{(i)} \quad & 14x^2 - 23x + 8 \\ &= 14x^2 - (16 + 7)x + 8 \\ &= 14x^2 - 16x - 7x + 8 \\ &= 14x^2 - 7x - 16x + 8 \\ &= 7(2x - 1) - 8(2x - 1) \\ &= (2x - 1)(7x - 8)\end{aligned}$$

Factor of  $14 \times 8 = 112 = 16 \times 7$   
Sum of factor  $= (16 + 7) = 23$   
Product of factor  $= 16 \times 7 = 112$

**Ans.**

$$\begin{aligned}\text{(ii)} \quad & 2x^2 + 11x + 12 \\ &= 2x^2 + (8 + 3)x + 12 \\ &= 2x^2 + 8x + 3x + 12 \\ &= 2x(x + 4) + 3(x + 4) \\ &= (x + 4)(2x + 3)\end{aligned}$$

Factor of  $(12 \times 2)24 = 8 \times 3$   
Sum of factor  $= (8 + 3) = 11$   
Product of factor  $= 8 \times 3 = 24$

**Ans.**

$$\begin{aligned}\text{(iii)} \quad & 7b^2 - 8b + 1 \\ &= 7b^2 - (7 + 1)b + 1 \\ &= 7b^2 - 7b - b + 1 \\ &= 7b(b - 1) - 1(b - 1) \\ &= (b - 1)(7b - 1)\end{aligned}$$

Factor of  $(7 \times 1) = 7$   
Sum of factor  $= (7 + 1) = 8$   
Product of factor  $= 7 \times 1 = 7$

**Ans.**

$$\begin{aligned}\text{(iv)} \quad & 3a^2 - 5a + 2 \\ &= 3a^2 - (3 + 2)a + 2 \\ &= 3a^2 - 3a - 2a + 2 \\ &= 3a(a - 1) - 2(a - 1) \\ &= (3a - 2)(a - 1)\end{aligned}$$

Factor of  $(3 \times 2) = 6$  is  $3 \times 2$   
Sum of factor  $= (3 + 2) = 5$   
Product of factor  $= (3 \times 2) = 6$

**Ans.**

$$\begin{aligned}\text{(v)} \quad & 4x^2 - 8x + 3 \\ &= 4x^2 - (6 + 2)x + 3 \\ &= 4x^2 - 6x - 2x + 3 \\ &= 2x(2x - 3) - 1(2x - 3) \\ &= (2x - 3)(2x - 1)\end{aligned}$$

Factor of  $(4 \times 3) = 12$  is  $6 \times 2$   
Sum of factor  $= (6 + 2) = 8$   
Product of factor  $= (6 \times 2) = 12$

**Ans.**

$$\begin{aligned}\text{(vi)} \quad & 15x^4 + 3x^2 - 18 \\ &= 3[5x^4 + x^2 - 6] \\ &= 3[5x^4 + 6x^2 - 5x^2 - 6] \\ &= 3[5x^4 + 6x^2 - 5x^2 - 6]\end{aligned}$$

$$\begin{aligned}
&= 3[5x^4 - 5x^2 + 6x^2 - 6] \\
&= 3[5x^2(x^2 - 1) + 6(x^2 - 1)] \\
&= 3[(x^2 - 1)(5x^2 + 6)] \\
&= 3(x^2 - 1)(5x^2 + 6) \\
&= 3(x+1)(x-1)(5x^2 + 6) \\
&\text{or } (3x^2 - 3)(5x^2 + 6)
\end{aligned}$$

**Ans.**

### MULTIPLE CHOICE QUESTIONS

1. Are the two factors of  $x^2 + 14x + 49$  same:

$$\begin{aligned}
x^2 + 14x + 49 &= x^2 + 7x + 7x + 49 \\
&= x(x+7) + 7(x+7) = (x+7)(x+7)
\end{aligned}$$

**Ans.** (a) Yes

2.  $x^2 + 10x + 24$

$$\begin{aligned}
x^2 + 10x + 24 &= x^2 + 6x + 4x + 24 = x(x+6) + 4(x+6) \\
&= (x+6)(x+4)
\end{aligned}$$

3.  $(x-3)$  and  $(x+2)$  are the factors of:

$$\begin{aligned}
(x-3)(x+2) &= x(x+2) - 3(x+2) \\
&= x^2 + 2x - 3x - 6 = x^2 - x - 6
\end{aligned}$$

**Ans.**

4. The HCF of  $x^3 y^4$  and  $x^5 y^7$  is:

$$\begin{aligned}
x^3 y^4 &= x^3 \times y^4 & \text{HCF} &= x^3 y^4 \\
x^5 y^7 &= x^3 \times x^2 \times y^4 \times y^3 = x^3 y^4
\end{aligned}$$

**Ans.** (c)  $x^3 y^4$

5. One of the factors of  $a^2 - b^2$  is:

$$(a^2 - b^2) = (a-b)(a+b) \quad \text{Ans.} \quad \text{(a) } (a-b)$$

6. Factor of the  $\left(x^2 - \frac{1}{4}\right)$  is :

$$\left(x^2 - \frac{1}{4}\right) = x^2 - \left(\frac{1}{2}\right)^2 = \left(x - \frac{1}{2}\right)\left(x + \frac{1}{2}\right)$$

Hence, (b) is correct answer.



## Linear Equations in One Variable



### EXERCISE- 7A

1. Solve the following equations and verify the answers:

(i)  $4x + 3 = 5x - 4$   
 $4x - 5x = -4 - 3$   
 $-x = -7 \Rightarrow x = 7$

**Verification :** Now we put the value of  $x = 7$  in the equation

L.H.S. = $4x + 3$	R.H.S. = $5x - 4$
$= 4 \times 7 + 3$	$= 5 \times 7 - 4$
$= 28 + 3$	$= 35 - 4$
$= 31$	$= 31$

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

(ii)  $3x + 1 = 7x + 9$   
 $3x - 7x = 9 - 1$   
 $-4x = 8$   
 $-x = \frac{8}{4} = 2 \Rightarrow x = -2$

**Verification :** Now we put the value of  $x = -2$  in the equation

L.H.S. = $3x + 1$	R.H.S. = $7x + 9$
$= 3(-2) + 1$	$= 7(-2) + 9$
$= -6 + 1$	$= -14 + 9$
$= -5$	$= -5$

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

(iii)  $3(2x - 1) = 9x + 27$

Now, put the value of  $x = -10$  in the equation

$3(2x - 1) = 9x + 27$	L.H.S. = $3(2x - 1)$	R.H.S. = $9x + 27$
$6x - 3 = 9x + 27$	$= 3(2(-10) - 1)$	$= 9(-10) + 27$
$6x - 1 = 27 + 3$	$= 3(-20 - 1)$	$= -90 + 27$
$-3x = 30$	$= 3(-21)$	$= -63$
$-x = \frac{30}{3} = 10$	$= -63$	
$x = -10$	Hence, L.H.S. = R.H.S.	

$$(iv) -10 + x + 4 - 5 = 7x - 5$$

$$-10 - 5 + 4 + x = 7x - 5$$

$$-15 + 4 + x = 7x - 5$$

$$x - 11 = 7x - 5$$

$$x - 7x = -5 + 11$$

$$-6x = 6 \Rightarrow -x = \frac{6}{6} = 1 \Rightarrow x = -1$$

Now, put the value of  $x = -1$  in the equation

$$\text{L.H.S.} = -10 + x + 4 - 5$$

$$\text{R.H.S.} = 7x - 5$$

$$= -10 - 1 + 4 - 5$$

$$= 7(-1) - 5$$

$$= -16 + 4$$

$$= -12$$

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

2. Solve the following equations and check the result:

$$(i) 2x - 4 = 3x + 2$$

$$2x - 3x = 2 + 4$$

$$-x = 6$$

put  $x = -6$  in the equation

$$\text{L.H.S.} = 2x - 4$$

$$\text{R.H.S.} = 3x + 2$$

$$= 2(-6) - 4$$

$$= 3(-6) + 2$$

$$= -12 - 4$$

$$= -18 + 2$$

$$= -16$$

$$= -16$$

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

$$(ii) \frac{2x-17}{2} - x + \frac{x-1}{3} = 12$$

L.C.M. of 2 and 3 is 6.

$$\frac{3(2x-17) - 6x + 2(x-1)}{6} = 12$$

$$\Rightarrow 3(2x-17) - 6x + 2(x-1) = 12 \times 6$$

$$\Rightarrow 6x - 51 - 6x + 2x - 2 = 72$$

$$\Rightarrow 6x + 2x - 6x - 51 - 2 = 72$$

$$\Rightarrow 2x = 72 + 53 = 125$$

$$\Rightarrow x = \frac{125}{2} = 62.5$$

Check put  $x = 62.5$  in the equation

$$\begin{aligned}
 \text{L.H.S.} &= \frac{2x-17}{2} - x + \frac{x-1}{3} & \text{R.H.S.} &= 12 \\
 &= \frac{2 \times (62.5) - 17}{2} - 62.5 + \frac{62.5 - 1}{3} \\
 &= \frac{125 - 17}{2} - 62.5 + \frac{61.5}{3} = \frac{108}{2} - 62.5 + 20.5 \\
 &= 54 - 62.5 + 20.5 = 54 - 42 = 12
 \end{aligned}$$

$$\text{L.H.S.} = \text{R.H.S.}$$

$$(iii) \quad \frac{5}{9}x - \frac{1}{2} = 0$$

$$\Rightarrow \frac{5}{9}x = \frac{1}{2} \Rightarrow x = \frac{1}{2} \div \frac{5}{9} \Rightarrow x = \frac{1}{2} \times \frac{9}{5} = \frac{9}{10}$$

Check, Put  $x = \frac{9}{10}$  in the equation

$$\text{L.H.S.} \quad \frac{5}{9}x - \frac{1}{2} \Rightarrow \frac{5}{9} \times \frac{9}{10} - \frac{1}{2} = \frac{5}{10} - \frac{1}{2} = \frac{1}{2} - \frac{1}{2} = 0, \text{ R.H.S.} = 0$$

$$\text{L.H.S.} = \text{R.H.S.}$$

$$(iv) \quad \frac{9x-4}{3x} = \frac{5}{4}$$

$$4(9x-4) = 5(3x)$$

$$36x - 16 = 15x \Rightarrow 36x - 15x = 16$$

$$21x = 16 \Rightarrow x = \frac{16}{21}$$

Put  $x = \frac{16}{21}$  in the equation ,

$$\text{L.H.S.} = \frac{9x-4}{3x} \qquad \text{R.H.S.} = \frac{5}{9}$$

$$\begin{aligned}
 &= \frac{9 \times \frac{16}{21} - 4}{3 \times \frac{16}{21}} = \frac{\frac{48}{7} - 4}{\frac{16}{7}} \\
 &= \frac{\frac{48-28}{7}}{\frac{16}{7}} = \frac{20}{16} \times \frac{7}{16} = \frac{20}{16} = \frac{5}{4}
 \end{aligned}$$

$$\begin{aligned}
 &= \frac{\frac{48-28}{7}}{\frac{16}{7}} = \frac{20}{16} \times \frac{7}{16} = \frac{20}{16} = \frac{5}{4}
 \end{aligned}$$

Hence,  $\text{L.H.S.} = \text{R.H.S.}$



3. Match the correct value of  $x$

(i)  $5x - 17 = 2x - 8$

$$5x - 2x = -8 + 17$$

$$\Rightarrow 3x = 9$$

$$\Rightarrow x = \frac{9}{3} = 3$$

$$\Rightarrow x = 3$$

(i) (d)

(ii)  $3(x - 2) = 4x + 5$

$$\Rightarrow 3x - 6 = 4x + 5$$

$$\Rightarrow 3x - 4x = 5 + 6$$

$$\Rightarrow -x = 11$$

$$\Rightarrow x = 11$$

(ii) (a)

(iii)  $2x - (1 - 2x) = 5 - 3(1 + x)$  (iv)  $\frac{x^2 - 9}{5 + x^2} = -\frac{5}{9}$

$$2x - 1 + 2x = 5 - 3 - 3x$$

$$4x - 1 = 2 - 3x$$

$$4x + 3x = 2 + 1$$

$$7x = 3$$

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

(iii)(b)

$$\Rightarrow 9(x^2 - 9) = -5(5 + x^2)$$

$$\Rightarrow 9x^2 - 81 = -25 - 5x^2$$

$$\Rightarrow 9x^2 + 5x^2 = -25 + 81$$

$$\Rightarrow 14x^2 = 56$$

$$\Rightarrow x^2 = \frac{56}{14} = 4$$

(iv) (c)

Ans. (i) (d) (ii) (a) (iii) (b) (iv) (c)

### EXERCISE 7(B)

Solve the following equation and verify the solution.

1.  $15(x - 4) - 2(x - 9) = 2(x - 1)$

$$\Rightarrow 15x - 60 - 2x + 18 = 2x - 2$$

$$\Rightarrow 15x - 2x - 60 + 18 = 2x - 2$$

$$\Rightarrow 15x - 2x - 60 + 18 = 2x - 2$$

$$\Rightarrow 13x - 42 = 2x - 2$$

$$\Rightarrow 13x - 2x = -2 + 42$$

$$\Rightarrow 11x = 40$$

$$\Rightarrow x = \frac{40}{11}$$

**Verification :** Put  $x = \frac{40}{11}$  in the equation

L.H.S.

$$15(x - 4) - 2(x - 9)$$

R.H.S.

$$2(x - 1)$$

$$\begin{aligned}
&\Rightarrow 15\left(\frac{40}{11}-4\right)-2\left(\frac{40}{11}-9\right) &&= 2\left(\frac{40}{11}-1\right) \\
&\Rightarrow 15\left(\frac{40-44}{11}\right)-2\left(\frac{40-99}{11}\right) &&= 2\left(\frac{40-11}{11}\right) \\
&\Rightarrow 15\left(-\frac{4}{11}\right)-2\left(-\frac{59}{11}\right) &&= 2\left(\frac{29}{11}\right)=\frac{58}{11} \\
&\Rightarrow \frac{-60}{11}+\frac{118}{11}=\frac{58}{11}
\end{aligned}$$

Hence,  $\text{L.H.S.} = \text{R.H.S.} = \frac{58}{11}$  Verified.

2. 
$$x+7=\frac{17}{6}-\frac{5x}{5}$$

$$\Rightarrow x+\frac{5x}{5}=\frac{17}{6}-7$$

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

$$\Rightarrow 2x=\frac{-25}{6} \Rightarrow 12x=-25 \Rightarrow x=\frac{-25}{12}$$

**Verification :** Put  $x = -\frac{25}{12}$  in the equation

$$\text{L.H.S.} \quad x+7=\frac{-25}{12}+7=\frac{-25+84}{12}=\frac{59}{12}$$

$$\text{R.H.S.} \quad \frac{17}{6}-\frac{5x}{5}=\frac{17}{6}-x=\frac{17}{6}-\left(-\frac{25}{12}\right)=\frac{17}{6}+\frac{25}{12}=\frac{34+25}{12}=\frac{59}{12}$$

$\text{L.H.S.} = \text{R.H.S.}$  **Hence verified.**

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

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

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

**Verification :** Put  $x = -\frac{3}{5}$  in the equation

$$\text{L.H.S.} = x-\frac{x-5}{2}=\frac{2x-x+5}{2}=\frac{x+5}{2}=\frac{-\frac{3}{5}+5}{2}=\frac{\frac{22}{5}}{2}=\frac{22}{5}\times\frac{1}{2}=\frac{22}{10}=\frac{11}{5}$$

$$\text{R.H.S.} = (1-2x) = \left(1-2\left(-\frac{3}{5}\right)\right) = 1 + \frac{6}{5} = \frac{5+6}{5} = \frac{11}{5}$$

$$\text{L.H.S.} = \text{R.H.S.} = \frac{11}{5}$$

Hence verified.

$$\begin{aligned} 4. \quad \frac{x-2}{3} + 1 &= \frac{2x}{7} \Rightarrow \frac{x-2+3}{3} = \frac{2x}{7} \Rightarrow \frac{x+1}{3} = \frac{2x}{7} \\ \Rightarrow 7(x+1) &= 3 \times 2x \Rightarrow 7x+7=6x \Rightarrow 7x-6x=-7 \\ \therefore x &=-7 \end{aligned}$$

**Verification :** Put  $x = -7$  in the equation

$$\text{L.H.S.} \frac{x-2+1}{3} = \frac{-7-2}{3} + 1 = \frac{-9}{3} + 1 = -3+1 = -2$$

$$\text{R.H.S.} = \frac{2x}{7} = \frac{2 \times (-7)}{7} = 2 \times (-1) = -2$$

$$\text{L.H.S.} = \text{R.H.S.} \quad \text{Hence verified.}$$

$$\begin{aligned} 5. \quad \frac{3x-1}{4} - \frac{-2x+2}{6} &= \frac{5}{2} - 2x \\ \Rightarrow \frac{3x-1}{4} - \frac{2x+2}{6} &= \frac{5}{2} - 2x \\ \Rightarrow \frac{3x-1}{4} - \frac{2x+2}{6} + 2x &= \frac{5}{2} \\ \Rightarrow \frac{6(3x-1) - 4(2x+2) + 24 \times 2x}{24} &= \frac{5}{2} \\ \Rightarrow \frac{18x-6-8x-8+48x}{24} &= \frac{5}{2} \\ \Rightarrow \frac{18x-8x+48x-6-8}{24} &= \frac{5}{2} \\ \Rightarrow 58x-14=60 &\Rightarrow 58x=60+14=74 \\ \Rightarrow x &= \frac{74}{58} = \frac{37}{29} \end{aligned}$$

**Verification:** Put  $x = \frac{37}{29}$  in the equation

$$\begin{aligned} \text{L.H.S.} \frac{3x-1}{4} - \frac{2x+2}{6} &= \frac{3 \times \frac{37}{29} - 1}{4} - \frac{2 \times \frac{37}{29} + 2}{6} \\ &= \frac{\frac{111-29}{29}}{4} - \frac{\frac{34+58}{29}}{6} = \frac{82}{29} - \frac{132}{29} = \frac{82}{29} \times \frac{1}{4} - \frac{132}{29} \times \frac{1}{6} \end{aligned}$$

$$= \frac{41}{29 \times 2} - \frac{22}{29} = \frac{41-44}{58} = \frac{-3}{58}$$

$$\text{R.H.S. } \frac{5}{2} - 2x = \frac{5}{2} - 2 \times \frac{37}{29} = \frac{5 \times 29 - 74 \times 2}{58} = \frac{145-148}{58} = \frac{-3}{58}$$

$$\text{L.H.S.} = \text{R.H.S.} = \frac{-3}{58}$$

Hence verified.

$$6. \frac{x+2}{4} + \frac{x-3}{5} = \frac{3x-5}{8}$$

L.C.M. of 4 and 5 is 20

$$\Rightarrow \frac{5(x+2) + 4(x-3)}{20} = \frac{3x-5}{8}$$

$$\Rightarrow \frac{5x+10+4x-12}{20} = \frac{3x-5}{8}$$

$$\Rightarrow \frac{9x-2}{20} = \frac{3x-5}{8}$$

$$\Rightarrow 8(9x-2) = 20(3x-5)$$

$$\Rightarrow 72x-16 = 60x-100$$

$$\Rightarrow 72x-60x = -100+16$$

$$\Rightarrow 12x = -84 \Rightarrow x = \frac{-84}{12} = -7 \Rightarrow x = -7$$

**Verification :** Put  $x = -7$  in the equation

$$\text{L.H.S. } \frac{x+2}{4} + \frac{x+3}{5}$$

$$= \frac{-7+2}{4} + \frac{-7-3}{5}$$

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

$$= \frac{-5}{4} - 2$$

$$= \frac{-5-8}{4} = \frac{-13}{4}$$

$$\text{R.H.S. } \frac{3x-5}{8}$$

$$= \frac{3(-7)-5}{8}$$

$$= \frac{-21-5}{8}$$

$$= \frac{-26}{8}$$

$$= \frac{-13}{4}$$

L.H.S. = R.H.S. Hence verified.

## MULTIPLE CHOICE QUESTIONS

1. If  $5 = \frac{2}{3}(2x-1)$ , the value of  $x$  is:

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

$$5 \times 3 = 4x - 2 \Rightarrow 15 = 4x - 2$$

$$4x = 15 + 2 = 17 \Rightarrow x = \frac{17}{4}$$

**Ans.**

Hence, (c) is the correct answer.

2. If  $x - \frac{x}{2} = \frac{7}{2}$ , then the value of  $x$  is :

$$x - \frac{x}{2} = \frac{7}{2} \Rightarrow \frac{2x-x}{2} = \frac{7}{2} \Rightarrow \frac{x}{2} = \frac{7}{2} \Rightarrow x = \frac{7}{2} \times 2 \Rightarrow x = 7$$

Hence, (b) is the correct answer.

3. If  $2x - 3 = x + 2$ , then  $x = ?$

$$2x - 3 = x + 2 \Rightarrow 2x - x = 2 + 3 \Rightarrow x = 5$$

Hence, (b) is the correct answer.

4. (a) -1



## Percentage and Its Applications



### EXERCISE 8A

1. Solve the following questions:

- (i) Decrease the length 21m 48 cm by 5%.

$$\begin{aligned} \text{We have } 21 \text{ m } 48 &= (21 \times 100)\text{cm} + 48\text{cm} \\ &= 2100\text{cm} + 48\text{cm} = 2148\text{cm} \end{aligned}$$

$$\begin{aligned} \text{Decrease value} &= \left( \frac{100-5}{100} \right) \times 2148 \\ &= \frac{95}{100} \times 2148 = \frac{19}{20} \times 2148 = \frac{19}{10} \times 1074 \\ &= 20406\% = 2040.6\text{cm} \end{aligned}$$

**Ans.**

- (ii) Increase the amount ₹ 60 by 8%.

$$\begin{aligned} \text{Increase value} &= \frac{(100+8)}{100} \times 60 = \frac{108}{100} \times 60 = \frac{54}{50} \times 60 \\ &= \frac{54 \times 12}{10} = \frac{648}{10} = 64.8 \end{aligned}$$

**Ans.**

- (iii) Original value of a boy = 625

$$\text{New value of a bag} = 575$$

$$\text{Decrease in value} = (625 - 575) = 50$$

$$\begin{aligned}\text{Percentage decrease} &= \left( \frac{\text{Decrease value}}{\text{Original value}} \times 100 \right) \% \\ &= \left( \frac{50}{625} \times 100 \right) \% = \left( \frac{50}{25} \times 4 \right) \% \\ &= (2 \times 4) \% = 8\%\end{aligned}$$

**Ans.**

(iv) Original value of 1 kg almonds = 750

New value of 1 kg almonds = 810

$$\text{Increase in value} = (810 - 750) = 60$$

$$\begin{aligned}\text{Increase percentage} &= \left( \frac{\text{Increase value}}{\text{Original value}} \times 100 \right) \% \\ &= \left( \frac{60}{750} \times 100 \right) \% = \left( \frac{60}{30} \times 4 \right) \% \\ &= (2 \times 4) \% = 8\%\end{aligned}$$

**Ans.**

2. Find the Selling Price (S.P.), when:

(i) Marked price = ₹ 800, Discount = 10%

$$\text{Discount} = \text{Discount}\% \text{ of marked price}$$

$$= 10\% \times 800 = \frac{10}{100} \times 800 = 80\%$$

$$\text{S.P.} = (\text{M.P.} - \text{Discount})$$

$$\text{S.P.} = 800 - 80 = 720$$

**Ans.**

(ii) Marked price = 5000, Discount = 20%

$$\text{Discount} = \text{Discount \% of Marked Price}$$

$$= 20\% \text{ of } 5000 = \frac{20}{100} \times 5000 = 20 \times 50 = 1000$$

$$\text{Selling Price} = \text{Marked price} - \text{Discount}$$

$$= 5000 - 1000 = 4000$$

**Ans.**

3. Find the Marked Price (M.P.), when:

(i) Selling price = 500, Discount = 10%

$$\text{Marked price} = \left( \frac{100}{100 - \text{Discount \%}} \right) \text{selling price}$$

$$= \left( \frac{100}{100 - 10} \right) \times 500 = \left( \frac{100}{90} \times 500 \right)$$

$$= \frac{50000}{90} = ₹ 555.55 \text{ (approx)}$$

- (ii) S.P. = ₹ 900, Discount = 10%

We know that

$$\begin{aligned} \text{M.P.} &= \left( \frac{100}{100 - \text{Discount \%}} \right) \text{S.P.} \\ &= \left( \frac{100}{100 - 10} \right) \times 900 = \frac{100}{90} \times 900 \\ &= 100 \times 10 = 1000 \end{aligned}$$

**Ans.**

4. Find the discount and the discount per cent when:

- (i) Mark price = ₹ 400, Selling price = ₹ 360

We know that,

$$\begin{aligned} \text{Discount} &= \text{M.P.} - \text{S.P.} \\ &= 400 - 360 = 40 \end{aligned}$$

**Ans.**

$$\begin{aligned} \text{Discount \%} &= \left( \frac{\text{Discount}}{\text{Marked price}} \times 100 \right) \% \\ &= \left( \frac{40}{400} \times 100 \right) \% = \left( \frac{40}{4} \right) \% = 10\% \end{aligned}$$

**Ans.**

- (ii) Marked price = ₹ 1600, Selling price = ₹ 1400

We know that

$$\begin{aligned} \text{Discount} &= \text{M.P.} - \text{S.P.} \\ &= 1600 - 1400 = 200 \\ \text{Discount \%} &= \left( \frac{\text{Discount}}{\text{Marked price}} \times 100 \right) \% \\ &= \left( \frac{200}{1600} \times 100 \right) \% = \left( \frac{200}{16} \right) \% \\ &= \left( \frac{50}{4} \right) \% = 12.5\% \end{aligned}$$

**Ans.**

## EXERCISE 8 B

1. Rakesh Sharma purchased a Radio ₹ 600

The rate of sales tax is = 10%

Let the selling price of Radio be  $x$

Then  $A$  to  $Q$ ,  $x + 10\%x = 660$

$$x + \frac{10}{100}x = 660$$

$$x + \frac{1}{10}x = 660$$

$$\frac{10x + x}{10} = 660$$

$$11x = 660 \times 10$$

$$x = \frac{660 \times 10}{11} = 60 \times 10 = 600$$

Hence, selling price of radio ₹ 600.

**Ans.**

2. Kartik buys a pair of shoes casting ₹ 470.00

Rate of sales tax = 7%

$$\text{Sales Tax} = 7\% \text{ of } 470 = \frac{7}{100} \times 470 = \frac{3290}{100} = 32.90$$

Hence total amount to be paid = ₹ 470 + ₹ 32.90 = ₹ 502.90

**Ans.**

3. Marked price of watch = ₹ 1150

During season S.P. of watch = 1100

$$\text{Discount} = \text{M.P.} - \text{S.P.}$$

$$= 1150 - 1100 = 50$$

$$\text{Discount \%} = \left( \frac{50}{1150} \times 100 \right) = 4$$

4. Let C.P. of Radio = 100

Then M.P. of Radio = 125

Given Discount = 10%

$$\text{S.P. of Radio} = \left( \frac{100 - \text{Discount \%}}{100} \right) \times \text{M.P.}$$

$$= \left( \frac{100 - 10}{100} \right) \times 125$$

$$= \frac{90}{100} \times 125 = 112.5$$

**Ans.**

$$\text{S.P.} > \text{C.P.}$$

$$\text{Gain} = 112.5 - 100 = 12.5$$

$$\text{Gain \%} = \left( \frac{\text{Gain}}{\text{C.P.}} \times 100 \right) \% = \left( \frac{12.5}{100} \times 100 \right) \% = 12.5\%$$

5. Discount = 25%, S.P. = ₹ 240, M.P. = ?

We know that



$$\begin{aligned}\text{Marked price} &= \left( \frac{100}{100 - \text{Discount \%}} \right) \times \text{S.P.} \\ &= \left( \frac{100}{100 - 25} \right) \times 240 = \left( \frac{100}{75} \right) \times 240 \\ &= \frac{4}{3} \times 240 = 4 \times 80 = 320\end{aligned}$$

**Ans.**

Hence, marked price of the shirt is ₹ 320.

6. Market price of scooty = 46000

Discount = 5% of 46000

$$= \frac{5}{100} \times 46000 = 5 \times 460 = ₹ 2300$$

Net price of scooty = (₹ 46000 - ₹ 2300) = 43700

$$\text{Sales tax} = 10\% \text{ of } 43700 = \frac{10}{100} \times 43700 = ₹ 4370$$

Babita has paid = ₹ (43700 + 4370) = ₹ 48070

**Ans.**

### MULTIPLE CHOICE QUESTION

1. Profit or loss per cent are always calculated on:

(b) C.P.

$$\text{Profit \%} = \left( \frac{\text{Profit}}{\text{C.P.}} \times 100 \right), \text{Loss \%} = \left( \frac{\text{Loss}}{\text{CP}} \times 100 \right)$$

2. The correct relationship is

(c) S.P. = M.P. - Discount

[Discount = M.P. - S.P.]

3. Let C.P. of 1 apple = ₹ 1

C.P. of 100 apples = ₹ 10

S.P. of 110 apple = C.P. of 120 apple = ₹ 120

Gain |120 - 110| = ₹ 10,

$$\text{Gain \%} = \frac{\text{Gain}}{\text{C.P.}} \times 100 = \frac{10}{110} \times 100 = 9\frac{1}{10}\%$$

**Ans.**

4. By selling a watch .....

Let C.P. of watch = x

Profit = 10% of x

S.P. = C.P + Profit

$$418 = x + \frac{10}{100}x \Rightarrow 418 = \frac{11x}{10}$$

$$\Rightarrow 418 \times 10 = 11x \Rightarrow x = \frac{4180}{11} = 380$$

**Ans.** (d) 380

5. If C.P. of 4 articles .....

Let C.P. of 4 articles = ₹ 1

$$\text{C.P. of 20 articles} = \frac{20}{4} = 5$$

S.P. of 5 article = ₹ 1

We observe that CP > SP (Its loss)

$$\text{Loss} = \text{CP} - \text{SP} = 5 - 4 = 1$$

$$\text{Loss \%} = \left( \frac{\text{Loss}}{\text{C.P.}} \times 100 \right) \%$$

$$= \frac{1}{5} \times 100 = 20\%$$

**Ans.** (b) Loss



## Study of Compound Interest



### EXERCISE-9(A)

1. Given,

(P) Principal = 8000

Rate ( $r$ ) = 5% ,    ( $n$ ) time = 3 year

We know that

$$A = P \left( 1 + \frac{r}{100} \right)^n$$

$$= 8000 \left( 1 + \frac{5}{100} \right)^3 = 8000 \left( 1 + \frac{1}{20} \right)^3 = 8000 \left( \frac{21}{20} \right)^3$$

$$= 8000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20}$$

$$= 21 \times 21 \times 21 = 441 \times 21 = 9261$$

Compound interest = Amount – Principal

$$= 9261 - 8000 = 1261$$

**Ans.**

2. Given, Principal ( $P$ ) = 2500

Rate ( $r$ ) = 10%

Time ( $n$ ) = 3 years

$$\text{S.I.} = \frac{PRI}{100} = \frac{2500 \times 10 \times 3}{100} = 25 \times 10 \times 3 = 750$$

For C.I. first we find

$$\begin{aligned} A &= P \left( 1 + \frac{r}{100} \right)^n \\ A &= 2500 \left( 1 + \frac{10}{100} \right)^3 = 2500 \left( \frac{1+10}{10} \right)^3 = 2500 \left( \frac{11}{10} \right)^3 \\ &= 2500 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10} = \frac{25 \times 121 \times 11}{10} \\ &= \frac{275 \times 121}{10} = 3327.50 \end{aligned}$$

$$\text{C.I.} = A - P$$

$$= 3327.5 - 2500 = 827.50$$

Now difference between C.I. and S.I.

$$= 827.50 - 750$$

$$= 77.50$$

**Ans.**

3. Principal ( $P$ ) = 1500, Rate ( $r$ ) = 7%, Time ( $n$ ) = 3 years

For C.I. first we find  $A$

$$\begin{aligned} A &= P \left( 1 + \frac{r}{100} \right)^n \\ &= 1500 \left( 1 + \frac{7}{100} \right)^3 = 1500 \left( \frac{107}{100} \right)^3 \\ &= 1500 \times \frac{107 \times 107 \times 107}{100 \times 100 \times 100} = \frac{15 \times 107 \times 107 \times 107}{100 \times 100} \\ &= \frac{15 \times 11449 \times 107}{10000} \\ A &= \frac{15 \times 1225043}{10000} = 1837.5645 \end{aligned}$$

$$\text{C.I.} = A - P$$

$$= 1837.5645 - 1500$$

$$= 337.56$$

**Ans.**

4.  $P = 10,000$

Rate ( $r$ ) = 10% , Time ( $n$ ) = 3 years

For C.I. first, we find amount

$$\begin{aligned} A &= P \left( 1 + \frac{r}{100} \right)^n \\ &= 10,000 \left( 1 + \frac{10}{100} \right)^3 = 10000 \left( 1 + \frac{1}{10} \right)^3 = 10000 \left( \frac{1+10}{10} \right)^3 \\ &= 10,000 \left( \frac{11}{10} \right)^3 = 10000 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10} \\ &= 10 \times 121 \times 11 = 13310 \end{aligned}$$

$$\text{C.I.} = A - P$$

$$= 13310 - 10000 = 3310$$

**Ans.**

5. (i) Given, Principle ( $P$ ) = 93750

Rate ( $r$ ) = 9.6% , Time ( $n$ ) = 2 year

$$\begin{aligned} A &= \left( P + \frac{r}{100} \right)^n \\ A &= 93750 \left( 1 + \frac{9.6}{100} \right)^2 = 93750 \left( 1 + \frac{96}{1000} \right)^2 \\ &= 93750 (1 + 0.96)^2 = 93750 (1.096)^2 \\ &= 93750 \times 1.096 \times 1.096 \\ &= 93750 \times 1.201216 = 112614 \end{aligned}$$

**Ans.**

(ii)  $P = 112614$ ,  $r = 9.6$ ,  $t = 1$  year

$$\text{S.I.} = \frac{Prt}{100} = \frac{112614 \times 9.6 \times 1}{100} = 10810.94$$

**Ans.**

### EXERCISE-9(B)

1. Given,  $P = 5000$ , Rate ( $r$ ) = 5% ,

time ( $n$ ) = 2 years 3 month =  $2\frac{1}{4}$  years (say)

$$\begin{aligned} A &= P \left( 1 + \frac{r}{100} \right)^2 \left( 1 + \frac{(1/4)r}{100} \right) \\ &= 5000 \left[ \left( 1 + \frac{6}{100} \right)^2 \times \left( 1 + \frac{\frac{1}{4} \times 6}{100} \right) \right] \end{aligned}$$

$$\begin{aligned}
&= 5000 \left[ \left( 1 + \frac{3}{50} \right)^2 \times \left( 1 + \frac{3}{200} \right) \right] \\
&= 5000 \left[ \left( \frac{53}{50} \right)^2 \times \left( \frac{203}{200} \right) \right] = 5000 \left[ \frac{53}{50} \times \frac{53}{50} \times \frac{203}{200} \right] \\
&= 5000 \left[ \frac{53 \times 53 \times 203}{50 \times 50 \times 200} \right] = 5000 \left[ \frac{53 \times 53 \times 203}{1250 \times 4 \times 100} \right] \\
&= 5000 \left[ \frac{570227}{5000 \times 100} \right] = 5702.27
\end{aligned}$$

$$\text{C.I.} = \text{A.} - \text{P.}$$

$$= 5702.27 - 5000 = 702.27$$

Hence, Amount = 5702.27 and C.I. = 702.27

**Ans.**

2. Given Principle (P) = ₹ 31250

Rate (R) = 8%

time (n) =  $2\frac{3}{4}$  years

$$\begin{aligned}
A &= \left( 1 + \frac{R}{100} \right)^2 \times \left( 1 + \frac{\frac{3}{4}R}{100} \right) \\
&= 31250 \left( 1 + \frac{8}{100} \right)^2 \left( 1 + \frac{\frac{3}{4} \times 8}{100} \right) \\
&= 31250 \left( 1 + \frac{2}{25} \right)^2 \left( 1 + \frac{6}{100} \right) \\
&= 31250 \left( \frac{27}{25} \right)^2 \left( \frac{106}{100} \right) = 31250 \times \frac{27}{25} \times \frac{27}{25} \times \frac{106}{100} \\
&= 31250 \times \frac{27}{25} \times \frac{27}{25} \times \frac{53}{50} \\
&= \frac{625 \times 729 \times 53}{625} = 729 \times 53 = 38637
\end{aligned}$$

$$\text{C.I.} = \text{A} - \text{P}$$

$$= 38637 - 31250 = 7387$$

**Ans.**

3. Given Principle ( $P$ ) = ₹ 15000

Rate ( $R$ ) = 10%, time ( $n$ ) = 3 years

$$\begin{aligned}A &= P \left( 1 + \frac{R}{100} \right)^n \\A &= 15000 \left( 1 + \frac{10}{100} \right)^3 \\&= 15000 \left( 1 + \frac{1}{10} \right)^3 = 15000 \left( \frac{11}{10} \right)^3 \\&= 15000 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10} \\&= 15 \times 11 \times 11 = 15 \times 1331 = 19,965\end{aligned}$$

$$\text{C.I.} = A - P$$

$$= 19965 - 15000 = 4965$$

**Ans.**

4. Given Principle ( $P$ ) = ₹ 22000

Rate ( $R$ ) = 12.5%, time ( $n$ ) = 2 years

$$\begin{aligned}A &= P \left( 1 + \frac{R}{100} \right)^n \\A &= 22000 \left( 1 + \frac{12.5}{100} \right)^2 \\&= 22000 \left( \frac{1125}{1000} \right)^2 = 22000 \times \frac{1125}{1000} \times \frac{1125}{1000} \\&= \frac{22 \times 1125 \times 1125}{1000} \\&= 22 \times 1265.625 = 27843.75\end{aligned}$$

$$\text{C.I.} = A - P$$

$$= 27843.75 - 22000 = 5843.75$$

**Ans.**

5. Given Principle ( $P$ ) = ₹ 10,000

Rate ( $R$ ) = 8%, time ( $n$ ) =  $1\frac{1}{2}$  years

$$A = P \left( 1 + \frac{R}{100} \right)^1 \left( 1 + \frac{\frac{1}{2}R}{100} \right)$$

$$\begin{aligned}
&= 10,000 \left( 1 + \frac{8}{100} \right) \left( 1 + \frac{\frac{1}{2} \times 8}{100} \right) \\
&= 10,000 \left( 1 + \frac{2}{25} \right) \left( 1 + \frac{1}{25} \right) \\
&= 10,000 \left( \frac{27}{25} \right) \left( \frac{26}{25} \right) = 400 \left( \frac{27 \times 26}{25} \right) \\
&= 16 \times 27 \times 26 = 11,232 \\
\text{C.I.} &= A - P \\
&= 11,232 - 10,000 = 1232
\end{aligned}$$

**Ans.**

## MULTIPLE CHOICE QUESTIONS

1. Compound interest is

(d) always greater or equal to the simple interest.

2.  $P = 30,000$ ,  $R = 7\%$ , C.I. = 4347,  $n = ?$

$$\text{C.I.} = A - P$$

$$A = \text{C.I.} + P$$

$$A = 4347 + 30000 = 34347$$

$$A = P \left( 1 + \frac{R}{100} \right)^n$$

$$34347 = 30000 \left( 1 + \frac{7}{100} \right)^n$$

$$\frac{34347}{30000} = \left( \frac{107}{100} \right)^n \Rightarrow \frac{11449}{10000} = \left( \frac{107}{100} \right)^n$$

$$\Rightarrow \left( \frac{107}{100} \right)^2 = \left( \frac{107}{100} \right)^n$$

$$\Rightarrow n = 2 \text{ years}$$

Hence, (a) is correct answer.

3. For Aditya,  $P = 1500$ ,  $r = 8\%$ ,  $n = 2$

$$\text{S.I.} = \frac{PRT}{100} = \frac{1500 \times 8 \times 2}{100} = 240$$

For Raj,  $P = 1500$ ,  $r = 10\%$ ,  $n = 2$

$$A = P \left( 1 + \frac{r}{100} \right)^n$$

$$A = 1500 \left( 1 + \frac{10}{100} \right)^2$$

$$\Rightarrow 1500 \left( \frac{11}{10} \right)^2 \Rightarrow 1500 \times \frac{121}{100}$$

$$\Rightarrow 15 \times 21 = 1815$$

$$\text{C.I.} = A - P = 1815 - 1500 = 315$$

Hence, Aditya profit is  $= 315 - 240 = 75$

Hence, (a) is correct answer.

4. The rule of simple interest is  $\frac{PRT}{100}$ .

Hence, (b) is correct answer.

5.  $A = 8427$ ,  $P = 7500$ ,  $n = 2$ ,  $R = ?$

$$A = P \left( 1 + \frac{R}{100} \right)^n$$

$$8427 = 7500 \left( 1 + \frac{R}{100} \right)^2$$

$$\Rightarrow \frac{8427}{7500} = \left( 1 + \frac{R}{100} \right)^2$$

$$\Rightarrow \frac{2809}{2500} = \left( 1 + \frac{R}{100} \right)^2$$

$$\Rightarrow \left( \frac{53}{50} \right)^2 = \left( 1 + \frac{R}{100} \right)^2$$

$$\Rightarrow \frac{53}{50} = 1 + \frac{R}{100}$$

$$\Rightarrow \frac{53}{50} - 1 = \frac{R}{100}$$

$$\Rightarrow \left( \frac{53 - 50}{50} \right) \times 100 = R$$

$$\Rightarrow R = \frac{3}{50} \times 100 = 3 \times 2 = 6\%$$

**Ans. (c) 6%**





## Direct and Inverse Variation



### EXERCISE-10 (A)

Q. 1. If  $m$  varies directly as  $n$ , then fill in the blanks:

(i)

$m$	25	7
$n$	75	—

Let missing no. be  $x$ .

Then for direct varies

$$m : n = 25 : 75 = 7 : x$$

$$\frac{m}{n} = \frac{25}{75} = \frac{7}{x}$$

$$25 \times x = 7 \times 75$$

$$x = \frac{7 \times 75}{25}$$

$$x = 7 \times 3 = 21$$

**Ans.**

(iii)

$m$	5	15
$n$	15	—

Let missing no. be  $x$ .

Then for directly varies

$$5 : 15 = 15 : x$$

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

$$5 \times x = 15 \times 15$$

$$x = \frac{15 \times 15}{5}$$

$$x = 3 \times 15 = 45$$

**Ans.**

(v)

$m$	9	$x$
$n$	36	72

Let missing no. be  $x$

For directly varies  $9 : 36 = x : 72$

$$\frac{9}{36} = \frac{x}{72} \Rightarrow 36x = 9 \times 72 \Rightarrow x = \frac{9 \times 72}{36}$$

$$\Rightarrow x = 9 \times 2 = 18$$

**Ans.**

(ii)

$m$	2	6
$n$	—	18

Let missing no. be  $x$ .

Then for directly varies

$$2 : x = 6 : 18$$

$$\frac{2}{x} = \frac{6}{18}$$

$$x = \frac{18 \times 2}{6}$$

$$= 3 \times 2 = 6$$

$$x = 6$$

**Ans.**

(iv)

$m$	17	51
$n$	51	—

Let missing no. be  $x$ .

Then for directly varies

$$17 : 51 = 5 : x$$

$$\frac{17}{51} = \frac{5}{x}$$

$$17x = 51 \times 5$$

$$x = \frac{51 \times 5}{17}$$

$$x = 3 \times 51 = 153$$

**Ans.**

2. Let IInd value of  $m$  be  $x$

$$\text{Ratio of Ist value of } m \text{ and } n = 25 : 75 = \frac{25}{75}$$

$$\text{Ratio of IInd value of } m \text{ and } n = x : 225 = \frac{x}{225}$$

for  $m$  directly  $n$

$$\text{then} \quad \frac{25}{75} = \frac{x}{225}$$

$$\Rightarrow \quad x = \frac{225 \times 25}{75} = \frac{225}{3} = 75$$

Hence, IInd value of  $m$  is 75.

3. Let the cost of 18 pens be  $x$ .

$$\begin{array}{ll} \text{No. of pen} & 15 \qquad \qquad 18 \end{array}$$

$$\begin{array}{ll} \text{Cost in (Rs)} & 180 \qquad \qquad x \end{array}$$

For directly varies

$$\frac{15}{180} = \frac{18}{x}$$

$$15 \times x = 18 \times 180$$

$$x = \frac{18 \times 180}{15} \Rightarrow x = 18 \times 12 = 216$$

Hence, IInd value of  $m(x) = 216$

4. Speed      60       $x$

$$\begin{array}{ll} \text{Time} & 30 \qquad 20 \end{array}$$

(Indirect variation)

$$20 \times x = 60 \times 30$$

$$20x = \frac{60 \times 30}{20} = 3 \times 30 = 90 \text{ km/h}$$

5. No. of boys      500       $x$

$$\begin{array}{ll} \text{Days} & 4 \qquad \qquad 20 \end{array}$$

(Indirect variation)

$$500 \times 4 = 20 \times x$$

$$x = \frac{500 \times 4}{20} = \frac{500}{5} = 100$$

$$\Rightarrow \quad \mathbf{x = 100}$$

Hence, 100 students have gone out of the hostel.

6. Cost of 52 books = 525

$$\text{Cost of 1 book} = \frac{525}{52} = 10.10$$

Each book were cost ₹ 21 more than each book

$$\text{Then new cost} = 10.10 + 21 = 31.10$$

Number of books the shopkeeper able to buy with ₹ 525

$$= \frac{525}{31.10} = 16.88$$

Hence, he can buy 16 books with ₹ 525.

7. Given  $x = 80$   $x = 64$   
 $y = 100$   $y = ?$

For directly varies

$x$	80	64
$y$	100	$y_2$

Let the IInd value of  $y$  be  $y_2$

$$\frac{80}{100} = \frac{64}{y_2}$$

$$80 \times y_2 = 64 \times 100$$

$$\Rightarrow y_2 = \frac{64 \times 100}{80} = 80 \times 10 = 80$$

$$\Rightarrow y_2 = 80$$

8. Given  $l = 5$   $l = ?$   
 $m = \frac{2}{3}$   $m = \frac{16}{3}$

For directly varies

$l$	5	$l_2$
$m$	$\frac{2}{3}$	$\frac{16}{3}$

Let IInd value of  $l$  be  $l_2$ .

$$5 \div \frac{2}{3} = l_2 \div \frac{16}{3}$$

$$5 \times \frac{3}{2} = l_2 \times \frac{3}{16} \Rightarrow l_2 = 5 \times \frac{3}{2} \times \frac{16}{3}$$

$$\Rightarrow l_2 = 8 \times 5 = 40$$

Ans.

9. Given,  $p = 282$                        $p = p_2$   
 $q = 5.1$                                        $q = 6.8$

For directly varies

$$\frac{282}{5.1} = \frac{p_2}{6.8}$$

$$5.1 \times p_2 = 282 \times 6.8$$

$$p_2 = \frac{282}{5.1} \times 6.8 = \frac{282}{3} \times 4 = 94 \times 4 = 376 \quad \text{Ans.}$$

10. Distance (km)                      80                       $x$   
 Petrol (l)                                      10                      40

For direct varies

$$\frac{x}{40} = \frac{80}{10}$$

$$\Rightarrow x = \frac{80}{10} \times 40$$

$$\Rightarrow x = 80 \times 4 = 320 \text{ km}$$

Hence, car travels in 40 l petrol = 320 km Ans.

### EXERCISE-10B

1. Let  $x_1$  and  $x_2$  be the missing no. in Row Ist and  $y_1$  and  $y_2$  in IInd.

then  $4 \times x_1 = 8 \times 5$

$$x_1 = \frac{8 \times 5}{4} = 2 \times 5 = 10$$

$\Rightarrow x_1 = 10$  Ans.

$$x_2 \times 20 = 8 \times 5$$

$$\Rightarrow x_2 = \frac{8 \times 5}{20} = \frac{8}{4} = 2$$

$\Rightarrow x = 2$  Ans.

Now  $40 \times y_1 = 8 \times 5$

$$y_1 = \frac{8 \times 5}{40} = \frac{40}{40} = 1$$

$\Rightarrow y_1 = 1$  Ans.

$$2.5 \times y_2 = 8 \times 5$$

$$\Rightarrow y_2 = \frac{8 \times 5}{2.5} = \frac{8}{5} \times 10 = 8 \times 2 = 16$$

**Ans.**

$m$	10	8	2	40	2.5
$n$	4	5	20	1	16

- | 3. | Persons | Days |
|----|---------|------|
|----|---------|------|

$\begin{array}{ccc} 240 & \uparrow & 30 \\ 300 & & x \end{array}$   
 $\frac{x}{30} = \frac{240}{300} \Rightarrow x = \frac{240}{300} \times 30 = 24 \text{ day}$

4. Here              Speed = 60 km/h

$$\text{Time} = 3 \text{ hr } 200 \text{ min} = 180 \text{ min} + 20 \text{ min} = 200 \text{ min}$$

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Distance} = \text{Speed} \times \text{time} = 60 \times 200 = 12000$$

$$\text{Time taken} = \frac{12000}{40} = 300\text{min} = 5 \text{ hrs}$$

**Ans.**

5. Cost of 1 kg Tomato = ₹ 5

Cost of 4 kg Tomato =  $4 \times 5 = ₹ 20$

Now, I can buy at the rate of ₹  $8 = \frac{20}{8} = 2.5\text{kg}$

**Ans.**

- | 6.  | Horse | Days |
|-----|-------|------|
| 1   | 1     | 1    |
| 2   | 2     | 2    |
| 3   | 3     | 3    |
| 4   | 4     | 4    |
| 5   | 5     | 5    |
| 6   | 6     | 6    |
| 7   | 7     | 7    |
| 8   | 8     | 8    |
| 9   | 9     | 9    |
| 10  | 10    | 10   |
| 11  | 11    | 11   |
| 12  | 12    | 12   |
| 13  | 13    | 13   |
| 14  | 14    | 14   |
| 15  | 15    | 15   |
| 16  | 16    | 16   |
| 17  | 17    | 17   |
| 18  | 18    | 18   |
| 19  | 19    | 19   |
| 20  | 20    | 20   |
| 21  | 21    | 21   |
| 22  | 22    | 22   |
| 23  | 23    | 23   |
| 24  | 24    | 24   |
| 25  | 25    | 25   |
| 26  | 26    | 26   |
| 27  | 27    | 27   |
| 28  | 28    | 28   |
| 29  | 29    | 29   |
| 30  | 30    | 30   |
| 31  | 31    | 31   |
| 32  | 32    | 32   |
| 33  | 33    | 33   |
| 34  | 34    | 34   |
| 35  | 35    | 35   |
| 36  | 36    | 36   |
| 37  | 37    | 37   |
| 38  | 38    | 38   |
| 39  | 39    | 39   |
| 40  | 40    | 40   |
| 41  | 41    | 41   |
| 42  | 42    | 42   |
| 43  | 43    | 43   |
| 44  | 44    | 44   |
| 45  | 45    | 45   |
| 46  | 46    | 46   |
| 47  | 47    | 47   |
| 48  | 48    | 48   |
| 49  | 49    | 49   |
| 50  | 50    | 50   |
| 51  | 51    | 51   |
| 52  | 52    | 52   |
| 53  | 53    | 53   |
| 54  | 54    | 54   |
| 55  | 55    | 55   |
| 56  | 56    | 56   |
| 57  | 57    | 57   |
| 58  | 58    | 58   |
| 59  | 59    | 59   |
| 60  | 60    | 60   |
| 61  | 61    | 61   |
| 62  | 62    | 62   |
| 63  | 63    | 63   |
| 64  | 64    | 64   |
| 65  | 65    | 65   |
| 66  | 66    | 66   |
| 67  | 67    | 67   |
| 68  | 68    | 68   |
| 69  | 69    | 69   |
| 70  | 70    | 70   |
| 71  | 71    | 71   |
| 72  | 72    | 72   |
| 73  | 73    | 73   |
| 74  | 74    | 74   |
| 75  | 75    | 75   |
| 76  | 76    | 76   |
| 77  | 77    | 77   |
| 78  | 78    | 78   |
| 79  | 79    | 79   |
| 80  | 80    | 80   |
| 81  | 81    | 81   |
| 82  | 82    | 82   |
| 83  | 83    | 83   |
| 84  | 84    | 84   |
| 85  | 85    | 85   |
| 86  | 86    | 86   |
| 87  | 87    | 87   |
| 88  | 88    | 88   |
| 89  | 89    | 89   |
| 90  | 90    | 90   |
| 91  | 91    | 91   |
| 92  | 92    | 92   |
| 93  | 93    | 93   |
| 94  | 94    | 94   |
| 95  | 95    | 95   |
| 96  | 96    | 96   |
| 97  | 97    | 97   |
| 98  | 98    | 98   |
| 99  | 99    | 99   |
| 100 | 100   | 100  |

$\frac{x}{50} = \frac{8}{20} \Rightarrow x = \frac{8 \times 50}{20} = \frac{40}{2} = 20 \text{ day}$

7. Men Day

$\frac{x}{7} = \frac{24}{14} \Rightarrow x = \frac{24}{14} \times 7 = \frac{24}{2} = 12$  days

Hence, 14 men dig a trench in 12 days.

**Ans.**

8.	Men		Days
	18		50
	15		$x$ 

$$\frac{x}{50} = \frac{18}{15}$$

$$\Rightarrow x = \frac{18}{15} \times 50 = \frac{18 \times 10}{3} = 6 \times 10 = 60 \text{ days}$$

Hence, 15 men can do piece of work in 60 days.

**Ans.**

9.	Men		Days
	630		25
	$x$		30 

$$\frac{x}{630} = \frac{25}{30}$$

$$\Rightarrow x = \frac{25}{30} \times 630 \Rightarrow x = 25 \times 21 = 105 \text{ Men}$$

10. The cost

Packets	Weight	Rate
16	900	84
27	1000	$x$

$$\frac{x}{84} = \frac{1000}{900} \times \frac{27}{16}$$

$$\frac{x}{84} = \frac{10}{9} \times \frac{27}{16} = \frac{10 \times 3}{16} = \frac{5 \times 3}{8} = \frac{15}{8}$$

$$\Rightarrow x = \frac{15}{8} \times 84 = \frac{1260}{8} = 157.5$$

**Ans.**

Hence cost of 27 packets of 1 kg in ₹ 157.5.

**Ans.**

### EXERCISE-10C

1. Amit can do in = 15 hrs

$$\text{Amit 1 hr work} = \frac{1}{15}$$

Bablu can do in = 12 hrs

$$\text{Bablu 1 hr work} = \frac{1}{12}$$

$$\text{Both can do (1 hr work)} = \frac{1}{15} + \frac{1}{12} = \frac{12+15}{15 \times 12} = \frac{27}{12 \times 15} = \frac{3}{20}$$

$$\text{Amit and Bablu (1 hr work)} = \frac{3}{20}$$

$$\begin{aligned}\text{Amit and Bablu together can finish the work} &= \frac{20}{3} \text{ hr} = \frac{20}{3} \times 60 \\ &= 20 \times 20 = 400 \text{ min}\end{aligned}$$

$$400 \text{ min} = 360 \text{ min} + 40 \text{ min} = 4 \text{ hr } 40 \text{ min}$$

Hence, Amit and Bablu together can finish the work in 6 hr 40 min. **Ans.**

2. Ramkishan can work = 12 days

$$\text{Ramkishan 1 day work} = \frac{1}{12}$$

$$\text{Bhishan can do work} = 15 \text{ days}$$

$$\text{Bishan 1 day work} = \frac{1}{15}$$

$$\text{Both can do (1 day work)} = \frac{1}{12} + \frac{1}{15} = \frac{15+12}{12 \times 15} = \frac{27}{12 \times 15} = \frac{3}{20}$$

$$\text{Both can finish work} = \frac{20}{3} \text{ days} = 6\frac{2}{3} \text{ days} \quad \textbf{Ans.}$$

3. Anil and Sanju can over haul in 6 hrs

$$\text{Both's 1 hr work} = \frac{1}{6}$$

$$\text{Anil alone can do} = 15 \text{ hrs}$$

$$\therefore \quad 1 \text{ hrs work} = \frac{1}{15}$$

$$\text{Sanju alone can do} = \frac{1}{6} - \frac{1}{15} = \frac{15-6}{90} = \frac{9}{90} = \frac{1}{10}$$

Hence, Sanju will complete in 10 hours. **Ans.**

4. A can do work = 8 days ; A (1 day's) work =  $\frac{1}{8}$  days

$$\text{B can do work} = 12 \text{ days ; B (1 day's) work} = \frac{1}{12}$$

$$\text{C can do work} = 15 \text{ days; C (1 day's) work} = \frac{1}{15}$$

$$\begin{aligned}\text{(A + B + C) together can do 1 day work} &= \frac{1}{8} + \frac{1}{12} + \frac{1}{15} \\ &= \frac{15+10+8}{120} = \frac{33}{120} = \frac{11}{40}\end{aligned}$$

$$\text{Hence, A, B and C together can finish work} = \frac{40}{11} \text{ days} = 3\frac{7}{11} \text{ days} \quad \textbf{Ans.}$$

5. Ram, Shyam and Krishna can do work together = 8 hr

$$1 \text{ hr work} = \frac{1}{8}$$

Ram alone can do work = 20 hr

$$\text{Ram (1 hr work)} = \frac{1}{20}$$

Shyam alone can do work = 24

$$\text{Shyam (1 hr work)} = \frac{1}{24}$$

$$\begin{aligned}\text{Krishna's (1 hr work)} &= \frac{1}{8} - \left( \frac{1}{20} + \frac{1}{24} \right) = \frac{1}{8} - \frac{1}{20} - \frac{1}{24} \\ &= \frac{15-6-5}{120} = \frac{15-11}{120} = \frac{4}{120} = \frac{1}{30}\end{aligned}$$

Hence, Krishna alone can do in 30 days.

6. Ist Ram can do work in =  $x$  days

$$1 \text{ day work} = \frac{1}{x}$$

Let Kumar can do work in =  $y$  days

$$1 \text{ day work} = \frac{1}{y}$$

Ist Hari can do work in =  $z$  days

$$(1 \text{ day work}) = \frac{1}{z}$$

**According to the question**

Ram and Kumar can do it 12 days.

$$\text{Both (1 day) work} = \frac{1}{12}$$

$$\Rightarrow \frac{1}{x} + \frac{1}{y} = \frac{1}{12} \quad \dots(1)$$

$$\text{Similarly,} \quad \frac{1}{y} + \frac{1}{z} = \frac{1}{15} \quad \dots(2)$$

$$\frac{1}{z} + \frac{1}{x} = \frac{1}{20} \quad \dots(3)$$

Adding (1) + (2) + (3), we get



$$2\left(\frac{1}{x} + \frac{1}{y} + \frac{1}{z}\right) = \frac{1}{12} + \frac{1}{15} + \frac{1}{20} = \frac{10+8+6}{120} = \frac{24}{120} = \frac{1}{5}$$

$$2\left(\frac{1}{x} + \frac{1}{y} + \frac{1}{z}\right) = \frac{1}{5}$$

$$\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = \frac{1}{10} \quad \dots(4)$$

So all three will do it in 10 days.

Now Hari can do separately = eq. (4) – eq. (1)

$$\frac{1}{z} = \frac{1}{10} - \frac{1}{12}$$

$$\frac{1}{z} = \frac{12-10}{120} = \frac{2}{120} = \frac{1}{60}$$

$$z = 60 \text{ days}$$

Hence Hari will do in 60 days.

Eq. (4) – eq. (2)

$$\frac{1}{x} = \frac{1}{10} - \frac{1}{15}$$

$$\frac{1}{x} = \frac{3-2}{30} = \frac{1}{30}$$

$$x = 30$$

**Ram will do in 30 days**

**Ans.**

Eq. (4) – eq. (3)

$$\frac{1}{y} = \frac{1}{10} - \frac{1}{20}$$

$$\frac{1}{y} = \frac{2-1}{20} = \frac{1}{20}$$

$$\Rightarrow y = 20 \text{ days}$$

**Kumar will do in 20 days.**

7. A can do work = 14 days

$$\text{A's 1 day work} = \frac{1}{14}$$

B can do work = 21 days

$$\text{B's 1 day work} = \frac{1}{21}$$

$$\text{Both's 1 day work} = \frac{1}{14} + \frac{1}{21} = \frac{3+2}{42} = \frac{5}{42}$$

$$\text{Both's 5 day work} = \frac{5}{42} \times 5 = \frac{25}{42}$$

$$\text{Remaining work} = 1 - \frac{25}{42} = \frac{42-25}{42} = \frac{17}{42}$$

$$\frac{1}{21} \text{ work B can do in } = 1 \text{ day}$$

$$1 \text{ ,, ,, ,, } = 21 \text{ days}$$

$$\frac{17}{42} \text{ ,, ,, ,, } = 21 \times \frac{17}{42} = \frac{17}{2} = 8 \frac{1}{2}$$

**Ans.**

**Hence the work is completed in  $8 \frac{1}{2}$  days.**

8. The pipe can fill cistern = 9 hrs

$$\text{Pipe's 1 hr work} = \frac{1}{9}$$

Due to leak the Cistern full in = 10 hrs

$$1 \text{ hr work} = \frac{1}{10}$$

$$\text{Leak in 1 hrs} = \frac{1}{9} - \frac{1}{10} = \frac{10-9}{90} = \frac{1}{90}$$

$\therefore$  The leak can empty the Cistern in 90 hrs.

**Ans.**

9. Top 'A' to fill the Cistern = 12 hrs

$$\text{A's 1 hr work} = \frac{1}{12}$$

Top 'B' to fill the Cistern = 16 hrs

$$\text{B's 1 hr work} = \frac{1}{16}$$

Tap 'C' to empty the full cistern = 8 km

$$\text{C's 1 hr work} = -\frac{1}{8} \text{ (Cistern being emptied by C)}$$

$$\begin{aligned} \text{Three taps (A + B + C)'s 1 hr net work} &= \left( \frac{1}{12} + \frac{1}{16} - \frac{1}{8} \right) \\ &= \left( \frac{4+3-6}{48} \right) = \left( \frac{7-6}{48} \right) = \frac{1}{48} \end{aligned}$$

Hence time taken by (A + B + C) to fill the Cistern = 48 hrs.

**Ans.**

10. Time taken by pipe  $A = 10$  hrs

Time taken by pipe  $B = 15$  hr

$$\text{Work done by } A \text{ in 1 hr} = \frac{1}{10}$$

$$\text{Work done by } B \text{ in 1 hr} = \frac{1}{15}$$

$$\text{Both } (A+B) \text{ work done by 1 hr} = \left( \frac{1}{10} + \frac{1}{15} \right) = \frac{3+2}{30} = \frac{5}{30} = \frac{1}{6}$$

Both taken by  $(A+B)$  to fill tank = 6 hours.

**Ans.**

11. Time taken by Tap  $A = 8$  hrs

Time taken by Tap  $B = 4$  hrs

$$\text{Work done by } A \text{ in 1 hr} = \frac{1}{8}$$

$$\text{Work done by } B \text{ in 1 hr} = \frac{1}{4}$$

$$\text{Both's 1 hour work} = \frac{1}{8} + \frac{1}{4} = \frac{1+2}{8} = \frac{3}{8}$$

Therefore, both taps will fill the cistern in  $\frac{8}{3} = 2\frac{2}{3}$

**Ans.**

12. Work done by  $A = 15$  days

Work done by  $B = 12$  days

Work done by  $C = 30$  days

$$A's \text{ 1 day work} = \frac{1}{15}, \quad B's \text{ 1 day work} = \frac{1}{12}, \quad C's \text{ 1 day work} = \frac{1}{30}$$

$$(A+B+C)'s \text{ 1 day work} = \left( \frac{1}{15} + \frac{1}{12} + \frac{1}{30} \right) = \left( \frac{4+5+2}{60} \right) = \frac{11}{60}$$

$$A, B \text{ and } C \text{ 2 days work} = 2 \times \frac{11}{60} = \frac{22}{60}$$

$$\text{Remaining work} = 1 - \frac{22}{60} = \frac{38}{60}$$

$$(A+B)'s \text{ 1 day work} = \frac{1}{15} + \frac{1}{12} = \frac{4+5}{60} = \frac{9}{60}$$

$$\frac{9}{60} \text{ work } (A+B) \text{ can do in } = 1 \text{ day}$$

$$1 \text{ work can do in } = \frac{60}{9} \text{ days}$$

$$\frac{38}{60} \text{ work can do in } = \frac{60}{9} \times \frac{38}{60} = \frac{38}{9} = 4 \frac{2}{9} \text{ days}$$

Hence  $A$  and  $B$  complete Remaining work in  $4 \frac{2}{9}$  days.

### EXERCISE-10D

1. (i) 63 km/h (ii) 450 km/h

To convert in m/s we multiply by  $\frac{5}{18}$

$$(i) \ 63 \text{ km/h} = 63 \times \frac{5}{18} \text{ m/sec} = \frac{7 \times 5}{2} \text{ m/s} = \frac{35}{2} = 17.5 \text{ m/s} \quad \text{Ans.}$$

$$(ii) \ 450 \text{ km/h} = 450 \times \frac{5}{18} \text{ m/sec} \\ = 150 \times \frac{5}{6} \text{ m/s} = 50 \times \frac{5}{2} \text{ m/s} = 25 \times 5 = 125 \text{ m/sec} \quad \text{Ans.}$$

2. To convert in km/h we multiply by  $\frac{18}{5}$

$$(i) \ 12.5 \text{ m/sec} = 12.5 \times \frac{18}{5} \text{ km/h} \\ = 2.5 \times 18 \text{ km/h} = 45.0 \text{ km/h} = 45 \text{ km/h} \quad \text{Ans.}$$

$$(ii) \ 300 \text{ m/s} = 300 \times \frac{18}{5} \text{ km/h} = 60 \times 18 \text{ km/h} = 1080 \text{ km/h}$$

3. Let distance =  $d$ , speed =  $x$ , time =  $t$

$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$

$$x = \frac{d}{t} \Rightarrow d = xt$$

$$\text{Now speed} = 12.5 \quad \text{then} \quad 12.5(t+3) = d \quad \dots(1)$$

$$\text{When speed} = 15 \text{ km then} \quad 15(t-5) = d \quad \dots(2)$$

$$\frac{(1)}{(2)} \quad \frac{12.5(t+3)}{15(t-5)} = 1 \Rightarrow \frac{5(t+3)}{6(t-5)}$$

$$\Rightarrow 5(t+3) = 6(t-5) \Rightarrow 5t+15 = 6t-30$$

$$\Rightarrow 6t-5t = 45$$

$$\Rightarrow t = 45 \text{ min} = \frac{3}{4} \text{ hr}$$

Put value of  $t = \frac{3}{4}$  hr in eqn. (1)

$$12.5 \left( \frac{3}{4} + 3 \right) = \text{distance}$$

$$3 \text{ min} = \frac{3}{60} \text{ hr}$$

$$12.5 \left( \frac{3}{4} + \frac{3}{60} \text{ hrs} \right) = \text{distance}$$

$$12.5 \left( \frac{3}{4} + \frac{1}{20} \right) = \text{distance}$$

$$12.5 \left( \frac{15+1}{20} \right) = \text{distance}$$

$$\text{Distance} = \frac{12.5 \times 16}{20} = \frac{12.5 \times 4}{5} = \frac{50.0}{5} = \frac{50}{5} = 10 \text{ km}$$

Hence required distance = 10 km

**Ans.**

OR

3. Let distance =  $x$

If speed = 12.5 km/h, distance =  $x$

$$\text{Then} \quad \text{Time} = \frac{\text{Distance}}{\text{Speed}} = \frac{x}{12.5}$$

$$\text{Time} = \frac{x}{12.5 \div 60 \text{ min}} = \frac{60x}{12.5} = \frac{12x}{2.5} \text{ min}$$

$$\text{Time} = \frac{12x}{2.5} \text{ min}$$

If, speed = 15 km/h =  $15 \div 60 \text{ km/min} = \frac{1}{4} \text{ km/min}$ , distance =  $x$

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}} = \frac{x}{1/4} \text{ km/min} = 4x \text{ min}$$

$$\text{Time} = 4x \text{ min}$$

Therefore, according to question,

$$\frac{12x}{2.5} + 3 = 4x - 5$$

$$\frac{12x}{2.5} = 4x - 5 - 3 = 4x - 8$$

$$12x = 2.5(4x - 8)$$

$$12x = 10x - 20$$

$$12x - 10x = -20$$

$$2x = -20$$

(-ve sign is removed)

$$x = 10 \text{ km}$$

Distance = 10 km

4. Let  $s$  = usual walking speed

then  $\frac{5}{6}s$  = slower speed

Let  $t$  = usual time to walk to school

Then  $(t + 4)$  = time required when walking slower speed

**Write a distance equation**

Distance = speed  $\times$  time

$$ts = (t + 4)\left(\frac{5}{6}s\right)$$

Multiply both side by 6

$$6ts = (t + 4)5s$$

$$6ts = 5ts + 20s$$

$$6ts - 5ts = 20s$$

$$ts = 20s$$

Divide by  $s$  both side

$$t = 20 \text{ min}$$

Hence time taken by Rakesh 20 min to reach the school.

**Ans.**

5. (i) Time = 8 min, speed = 36 km/h, distance =

$$\text{Time} = 8 \text{ min} = \frac{8}{60} \text{ hour}$$

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

Distance = speed  $\times$  time

$$= 36 \times \frac{8}{60} = \frac{6 \times 8}{10} = \frac{48}{10} = 4.8 \text{ km}$$

**Ans.**

- (ii) Time = 10 second, Distance = 250 m Speed (in km/h)

$$\text{Distance} = 250 \text{ m} = 0.250 \text{ km}$$

$$\text{Time} = 10 \text{ second}$$

$$= \frac{10}{3600} = \frac{1}{360} \text{ hour}$$

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{0.250}{\frac{1}{360}} = 0.250 \times 360$$

$$= \frac{230 \times 360}{1000} = \frac{25 \times 36}{10} = \frac{900}{10} = 90 \text{ km/h}$$

**Speed = 90 km/h**

**Ans.**

(iii) Speed = 36 km/h, distance = 40 m, time (in second) = ?

$$\text{Speed} = 36 \text{ km/h}$$

$$= 36 \times \frac{5}{18} \text{ m/sec}$$

$$= 2 \times 5 \text{ m/sec} = 10 \text{ m/sec}$$

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}} = \frac{40}{10} = 4 \text{ seconds}$$

**Time = 4 second**

(iv) Speed = 4 km/hr, Time = 2 hr 45 min =  $\frac{11}{4}$  hr

$$\text{Distance} = \text{Speed} \times \text{Time}$$

$$= 4 \times \frac{11}{4} = 11 \text{ km}$$

Now

$$\text{Speed} = 16.5 \text{ km/hr}$$

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}} = \frac{11}{16.5} = 0.66 \text{ hr}$$

$$1 \text{ hr} = 60 \text{ min}$$

$$66 \text{ hr} = 60 \times 0.66 = 40 \text{ min}$$

**Ans.**

7. In 3 hrs he covers a distance of = 10.2 km

$$\text{In 1 hr he covers a distance of} = 10.2 \div 3$$

$$\text{In 5 hr he cover a distance of} = \frac{10.2}{3} \times 5 = \frac{51}{3} = 17 \text{ km}$$

$$\text{In 5 hr he covers distance } 17 \text{ km}$$

**Ans.**

8. Work done by Dev = 8 days

$$\text{Dev's 1 day work} = \frac{1}{8}$$

$$\text{Work done by Raj} = 12 \text{ days}$$

$$\text{Rajs 1 day work} = \frac{1}{12}$$

$$\text{Dev and Raj 1 day work} = \left( \frac{1}{8} + \frac{1}{12} \right) = \frac{3+2}{24} = \frac{5}{24}$$

$$\text{Work finished by Dev and Raj} = \frac{24}{5} = 4 \frac{4}{5} \text{ days}$$

**Ans.**

9. Cistern filled by one tap = 8 hr

$$\text{Work done by one tap} = \frac{1}{8}$$

Cistern filled by another tap = 12 hr

$$\text{Work done by another tap} = \frac{1}{12} \text{ hr}$$

$$\text{Work done by both tap in 1 hour} = \frac{1}{8} + \frac{1}{12} = \frac{3+2}{24} = \frac{5}{24}$$

$$\text{Both tap completely fill it in} = \frac{24}{5} \text{ hr} = 4\frac{4}{5} \text{ hr} = 4 \text{ hr } 48 \text{ min}$$

**Ans.**

10. A can do work = 10 days

$$\text{A's 1 day work} = \frac{1}{10}$$

B's can do work = 16 days

$$\text{B's 1 day work} = \frac{1}{16}$$

$$\text{Both 1 day work} = \frac{1}{10} + \frac{1}{16} = \frac{8+5}{80} = \frac{13}{80}$$

A, B, C can do work in = 4 days.

$$\text{Work done by A, B, C in one day} = \frac{1}{4}$$

$$\begin{aligned} \text{So, the work done by C in one day} &= (A + B + C) - (A + B) \\ &= \frac{1}{4} - \frac{13}{80} = \frac{20-13}{80} = \frac{7}{80} \end{aligned}$$

$$\text{So, C can do the work in} = \frac{80}{7} = 11\frac{3}{7} \text{ days}$$

**Ans.**

11. Work done by A and B = 20 days

$$\text{A and B's one day work} = \frac{1}{20}$$

$$\text{A's 15 days work} = \frac{1}{4}$$

$$\text{Therefore A's 1 day work} = \frac{1}{4} \times \frac{1}{15} = \frac{1}{60}$$

$$\text{B's 1 day work} = \frac{1}{20} - \frac{1}{60} = \frac{3-1}{60} = \frac{2}{60} = \frac{1}{30}$$

B alone polish the floor of the building in 30 days.

**Ans.**



12. Anu can do  $\frac{1}{5}$ th work in = 5 days

„ „ 1 „ „ =  $5 \times 5$  days = 25 days

Sonu can do  $\frac{2}{3}$  work = 8 days

„ „ 1 work =  $8 \times \frac{3}{2} = 12$  days

Annu's 1 day work =  $\frac{1}{25}$

Sonu's 1 day work =  $\frac{1}{12}$

Both's 1 day work =  $\frac{1}{25} + \frac{1}{12} = \frac{12+25}{25 \times 12} = \frac{37}{300}$

Both can do it in =  $\frac{300}{37}$  days

13. Ravi can do work = 15 hr

Ravi's 1 hr work =  $\frac{1}{15}$

Raman can do work in = 12 hr

Raman's 1 hr work =  $\frac{1}{12}$

Both's 1 hr work =  $\frac{1}{15} + \frac{1}{12} = \frac{4+5}{60} = \frac{9}{60}$

Both's can do work =  $\frac{60}{9} = 6\frac{6}{9} = 6\frac{2}{3}$  hr

= 6hr 40 min

**Ans.**

### MULTIPLE CHOICE QUESTIONS

1. Work done by 1st tap = 10 hr

Work done in 1 hr by 1st tap =  $\frac{1}{10}$

Work done by 2nd tap = 12 hrs

Work done in 1 hr by 2nd tap =  $\frac{1}{12}$

Work done both tap in 1 hour =  $\frac{1}{10} + \frac{1}{12} = \frac{6+5}{60} = \frac{11}{60}$

Work done by 3rd pipe = 20 hrs

$$\text{Work done in 1 hr by 3rd tap} = \frac{1}{20}$$

$$\text{Work done by three pipes in 1 hr} = \left( \frac{11}{60} - \frac{1}{20} \right) = \frac{11-3}{60} = \frac{8}{60}$$

$$\text{Tank fill by three pipes} = \frac{60}{8} \text{ hr} = 7\frac{4}{8} \text{ hr} = 7\frac{1}{2} \text{ hr} = 7 \text{ hr } 30 \text{ min}$$

Hence, (c) is a correct answer.

2. Work done by Pipe  $A = 20$  min

$$\text{Work done in 1 min} = \frac{1}{20}$$

$$\text{Work done by Pipe } B = 15 \text{ min}$$

$$\text{Work done by Pipe } B \text{ in 1 min} = \frac{1}{15}$$

$$\text{Work done by Pipe } C = 12 \text{ m}$$

$$\text{Work done in 1 min} = \frac{1}{12}$$

$$\begin{aligned} \text{Word done by three pipes } (A, B, C) \text{ in min} &= \frac{1}{20} + \frac{1}{15} + \frac{1}{12} \\ &= \frac{3+4+5}{60} = \frac{12}{60} = \frac{1}{5} \end{aligned}$$

Three pipes fill the Cistern in 5 min.

Hence, (a) is correct answer.

3.  $A, B$  and  $C$  can finish a work = 4 days

$$(A+B+C)'s \text{ 1 day work} = \frac{1}{4}$$

$$\text{Work done by } A = 12; \quad A's \text{ 1 day work} = \frac{1}{12}$$

$$\text{Work done by } B = 18; \quad B's \text{ 1 day work} = \frac{1}{18}$$

$$(A+B)'s \text{ 1 day work} = \frac{1}{12} + \frac{1}{18} = \frac{3+2}{36} = \frac{5}{36}$$

$$\begin{aligned} C's \text{ 1 day work} &= (A+B+C) - (A+B) \\ &= \frac{1}{4} - \frac{5}{36} = \frac{9-5}{36} = \frac{4}{36} = \frac{1}{9} \end{aligned}$$

Hence, work done by  $C$  alone 9 days.

Hence (d) is a correct answer.

**Ans.**

4.  $A$  can do  $\frac{2}{3}$  work = 12 days

$A$ 's 12 days work =  $\frac{2}{3}$

$A$ 's 1 day work =  $\frac{2}{3} \times \frac{1}{12} = \frac{1}{18}$

$B$  can do  $\frac{1}{6}$  work = 4 days

$B$ 's 4 days work =  $\frac{1}{6}$

$B$ 's 1 day work =  $\frac{1}{6} \div 4 = \frac{1}{6} \times \frac{1}{4} = \frac{1}{24}$

Both's 1 day work =  $\frac{1}{18} + \frac{1}{24} = \frac{4+3}{72} = \frac{7}{72}$

Both's  $\frac{7}{72}$  work done = 1 day

Both's 1 work done =  $\frac{72}{7} = 10\frac{2}{7}$  days

**Ans.**

Hence,  $A$  and  $B$  together complete the work in  $10\frac{2}{7}$  days.

Hence (c) is a correct answer.

5. Work done by  $A$  = 15 days

$A$ 's 1 day work =  $\frac{1}{15}$ ;

Work done by  $B$  = 10

$B$ 's 1 day work =  $\frac{1}{10}$

$B$ 's 5 days work =  $5 \times \frac{1}{10} = \frac{1}{2}$

Remaining work =  $1 - \frac{1}{2} = \frac{1}{2}$

$\frac{1}{15}$  work done by  $A$  in = 1 day

$\frac{1}{2}$  work done by  $A$  in =  $\frac{1}{2} \div \frac{1}{15} = \frac{1}{2} \times \frac{15}{1} = \frac{15}{2} = 7\frac{1}{2}$  days

Hence  $A$  alone can finish remaining work in  $7\frac{1}{2}$  days.

Hence, (b)  $7\frac{1}{2}$  days.



## Understanding Quadrilaterals



### EXERCISE 11-A

1. Given the ratio of angle  $1 : 2 : 3 : 4$ .

Let the angle be  $(x)^\circ$ ,  $(2x)^\circ$ ,  $(3x)^\circ$ ,  $(4x)^\circ$

We know that sum of angle of quadrilateral be  $360^\circ$ .

Therefore  $(x)^\circ + (2x)^\circ + (3x)^\circ + (4x)^\circ = 360^\circ$

$$10x = 360^\circ$$

$$x = 36^\circ$$

Hence,

The first angle of quadrilateral  $= x = 36^\circ$

The 2nd angle of quadrilateral  $= 2x = 2 \times 36^\circ = 72^\circ$

The 3rd angle of quadrilateral  $= 3x = 3 \times 36^\circ = 108^\circ$

The fourth angle of quadrilateral  $= 4x = 4 \times 36^\circ = 144^\circ$

Hence four angle of quadrilateral are  $36^\circ, 72^\circ, 108^\circ, 144^\circ$

**Ans.**

2. Given: The angle of quadrilateral are in the ratio  $= 3 : 4 : 5 : 6$

Let the angle be  $(3x)^\circ$ ,  $(4x)^\circ$ ,  $(5x)^\circ$ ,  $(6x)^\circ$

Therefore  $3x + 4x + 5x + 6x = 360^\circ$

$$18x = 360^\circ$$

$$\Rightarrow x = \frac{360^\circ}{18} = 20^\circ$$

Hence,

The first angle of quadrilateral  $= 3x = 3 \times 20^\circ = 60^\circ$

The 2nd angle of quadrilateral  $= 4x = 4 \times 20^\circ = 80^\circ$

The 3rd angle of quadrilateral  $= 5x = 5 \times 20^\circ = 100^\circ$

The fourth angle of quadrilateral  $= 6x = 6 \times 20^\circ = 120^\circ$

Hence four angles  $60^\circ, 80^\circ, 100^\circ, 120^\circ$

**Ans.**

3. Given the angle of quadrilateral are  $110^\circ, 72^\circ, 55^\circ$  and  $x^\circ$

We know that the sum of angles of quadrilateral in  $360^\circ$ .

Therefore  $110^\circ + 72^\circ + 55^\circ + x^\circ = 360^\circ$

$$237^\circ + x^\circ = 360^\circ$$

$$x^\circ = 360^\circ - 237^\circ$$

$$\Rightarrow x^\circ = 123^\circ$$

**Ans.**

4. Given, One angle =  $108^\circ$

Let the remaining three equal angle be  $x^\circ$

$$\text{Now } 108 + x^\circ + x^\circ + x^\circ = 360^\circ$$

$$108 + 3x^\circ = 360^\circ$$

$$3x^\circ = 360^\circ - 108^\circ$$

$$3x^\circ = 152^\circ \Rightarrow x = 84^\circ$$

Hence three equal remaining angles are  $84^\circ$ .

**Ans.**

5. Given, Two angles of quadrilateral are  $80^\circ$  each

Let two equal angle of quadrilateral be  $x^\circ$

We know the sum of angles of quadrilateral is  $360^\circ$

$$80^\circ + 80^\circ + x^\circ + x^\circ = 360^\circ$$

$$160^\circ + 2x^\circ = 360^\circ$$

$$2x = 360^\circ - 160^\circ$$

$$2x = 200^\circ$$

$$x = \frac{200}{2} = 100^\circ$$

Hence other two angles are  $100^\circ, 100^\circ$

**Ans.**

### EXERCISE- 11(B)

1. Given

$$AB \parallel DC$$

$$\angle A = 60^\circ, \angle B = 40^\circ$$

Let other two angles be  $\angle D = \angle 1, \angle C = \angle 2$

$\angle A$  and  $\angle D$  are adjacent angle, then

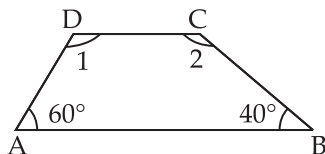
$$\angle A + \angle D = 180^\circ$$

$$60^\circ + \angle 1 = 180^\circ$$

$$\angle 1 = 180^\circ - 60^\circ$$

$$\angle 1 = 120^\circ$$

$$\angle D = \angle 1 = 120^\circ$$



Similarly,  $\angle B$  and  $\angle C$  are adjacent angle

$$\angle B + \angle C = 180^\circ$$

$$40^\circ + \angle 2 = 180^\circ$$

$$\angle 2 = 180^\circ - 40^\circ$$

$$\angle 2 = 140^\circ$$

$$\angle B = \angle 2 = 140^\circ$$

Hence two remaining angles are  $120^\circ, 140^\circ$ .

**Ans.**

2. In the adjacent figure,  $ABCD$  is rectangle if  $BM$  and  $DN$  are from  $B$  and  $D$  on  $AC$ . Prove that  $\triangle BMC \cong \triangle DNA$  it is true that  $BM = DN$ .

$$AD = BC \quad (\text{opp. side of rectangle})$$

$$\angle MCB = \angle NAD \quad (\text{Alt } \angle \text{ and } AC \text{ is transversal})$$

$$\angle DNA = \angle BMC = 90^\circ$$

$$\angle CBM = \angle ADN \quad (\text{3rd angle})$$

$$\therefore \triangle BMC \cong \triangle DNA \quad (\text{by ASA})$$

$$\therefore BM = DN \quad (\text{GP. C.T.})$$

Yes, it is true that  $BM = DN$

**Proved.**

3. Given, one angle of parallelogram is  $80^\circ$ .

$$\angle A + \angle B = 180^\circ \quad (\text{Co-interior } \angle s)$$

$$\angle B = 180^\circ - 80^\circ$$

$$\angle B = 100^\circ$$

$$\angle C = \angle A$$

$$(\text{Opp. } \angle s \text{ of parallelogram are equal})$$

$$= 80^\circ$$

$$\angle D = \angle B = 100^\circ \quad (\text{Opp. } \angle s \text{ of } \parallel \text{ gm equal})$$

Here three remaining angles are  $80^\circ, 100^\circ, 100^\circ$ .

**Ans.**

4. Given : Two adjacent angles of a parallelogram are in the ratio = 3 : 2

Let the angles be  $5x$  and  $3x$

We know that sum of adjacent angle be  $180^\circ$

$$\text{Therefore } 3x + 2x = 180^\circ$$

$$5x = 180^\circ \Rightarrow x = \frac{180^\circ}{5} = 36^\circ$$

$$\text{Here the angles are } 3x = 3 \times 36^\circ = 108^\circ$$

$$2x = 2 \times 36^\circ = 72^\circ$$

**Ans.**

5. **Given :** The ratio of sides of parallelogram is 3 : 4.

Let the side be  $3x$  and  $4x$

Here both sides are different. Hence it is a rectangle.

Also given perimeter of parallelogram (rectangle) = 56

$$l = 4x, b = 3x$$

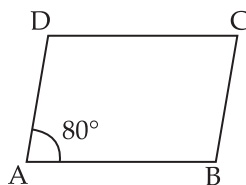
$$\text{Perimeter of rectangle} = 2(l + b) = 56$$

$$2(4x + 3x) = 56$$

$$7x = 28 \Rightarrow x = \frac{28}{7} = 4$$

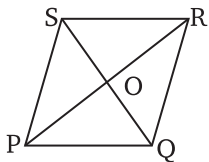
$$\text{Hence the sides are } 4x = 4 \times 4 = 16$$

$$3x = 4 \times 3 = 12$$



## MULTIPLE CHOICE QUESTIONS

1. A quadrilateral  $PQRS$  may be parallelogram if:



**Ans.** Here  $\angle P$  and  $\angle Q$  are adjacent angle whose sum is  $180^\circ$ .

(a)  $\angle P + \angle Q = 180^\circ$

2. A parallelogram having sides 8.9 cm, 7.2 cm with the angle  $90^\circ$  will be a rectangle.

**Ans.** (b) rectangle

Because both sides are different with the angle  $90^\circ$ .

3. The area of trapezium is  $\frac{(a+b)}{2} \times h$ .

**Ans.** (c)  $\frac{(a+b)}{2} \times h$

4. If the perimeter of a square is 16 cm. Then it area equal to :

**Sol.** Perimeter of square = 16

$$4 \times \text{Side} = 16$$

$$\text{Side} = \frac{16}{4} = 4$$

$$\text{Area of square} = (\text{side})^2 = (4)^2 = 16 \text{ cm}^2$$

**Ans.** (a)  $16 \text{ cm}^2$

5. Sum of angles of a hexagon is:

**Ans.** (c)  $720^\circ$

**Sol.** No. of sides in hexagon  $n = 6$

To find sum of angle polygon . Therefore  
we use this formula where  $n$  is number of sides.

$$\begin{aligned} \text{Use } & (n-2) \times 180^\circ \\ & (6-2) \times 180^\circ \\ & = 4 \times 180^\circ \\ & = 720^\circ \end{aligned}$$

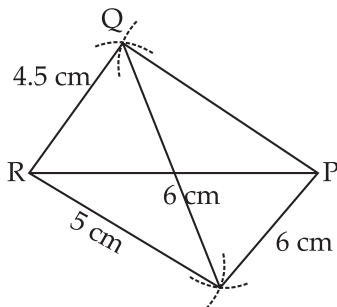


## Construction

1. First we draw a rough sketch of a quadrilateral  $PQRS$  and write down its dimensions as shown :

### Steps of construction :

1. First draw a line  $PR = 6$  cm, which is diagonal of a quadrilateral  $PQRS$ .
2. Now mark an arc which length is 5 cm from point  $R$  below the line  $RP$  and also mark on arc which length is 6 cm from point  $P$  below the line  $RP$ .
3. Instruction of arc given point  $S$ .
4. Now mark an arc which length is 4.5 cm from point  $R$  above the line  $RP$  and also mark an arc which length is 6 cm from point  $S$  above the line  $PR$ .
5. Here, instrection of arc given point  $Q$ .
6. Now, join  $R$  to  $S$ ,  $P$  to  $S$ ,  $R$  to  $Q$  and  $P$  to  $Q$  with help of line, which figure quadrilateral  $PQRS$ .



### 2. Steps of Construction :

**Step 1.** Draw a line segment  $SR = 6.2$  cm

**Step 2.** With 5 cm as radius, draw an arc from  $S$ .

**Step 3.** Similarly, with radius as 5 cm from point  $R$  cut the arc just drawn.

**Step 4.** They will intersect at point  $Q$ .

**Step 5.** Join  $SQ$  and  $QR$ .

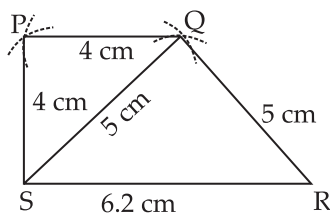
**Step 6.** With 4 cm as radius, draw an arc from  $S$ .

**Step 7.** Similarly, with radius as 4 cm from point  $Q$ .

**Step 8.** They will intersect at  $P$ .

**Step 9.** Join  $S$  to  $P$  and  $Q$  to  $P$ .

**Step 10.**  $PQRS$  is the required quadrilateral.





3. Given  $PQ = 3 \text{ cm}$ ,  $RS = 3 \text{ cm}$  [Because  $PQ = RS = 3 \text{ cm}$ ]

$PS = SP = 7.5 \text{ cm}$ ,  $QS = 4 \text{ cm}$  and  $PR = 8 \text{ cm}$   
cm

With the given measurements triangle PQS is not possible to construct.

$\therefore PQ + QS < PS$

The arcs which drawn from  $P$  and  $Q$  are not intersecting.

$\therefore$  We cannot obtain vertex "S".

Without vertex "S" we cannot get a quadrilateral PQRS.

4. Construct a quadrilateral ABCD.

Let us first draw a rough sketch of quadrilateral.

Construct of quadrilateral can be done in two parts. First construct triangle ABC and then triangle ACD.

Let us find based on given measurement whether it is possible to construct the triangles.

In  $\triangle ABC$ ,  $6.5 \text{ cm} + 4 \text{ cm} > 8 \text{ cm}$  and  $6.5 \text{ cm} - 4 \text{ cm} < 8 \text{ cm}$

$$8 \text{ cm} + 4 \text{ cm} > 5.5 \text{ cm} \text{ and } 8 \text{ cm} - 4 \text{ cm} < 6.5 \text{ cm}$$

$$6.5 \text{ cm} + 8 \text{ cm} > 4 \text{ cm} \text{ and } 8 \text{ cm} - 6.5 \text{ cm} < 4 \text{ cm}$$

It is possible to draw a triangle ABC.

In  $\triangle ACD$ ,  $8 \text{ cm} + 5.5 \text{ cm} > 5.4 \text{ cm}$  and  $8 \text{ cm} - 5.4 \text{ cm} < 5.5 \text{ cm}$

$$5.4 \text{ cm} + 8 \text{ cm} > 5.5 \text{ cm} \text{ and } 8 \text{ cm} - 5.4 \text{ cm} < 5.5 \text{ cm}$$

$$5.4 \text{ cm} + 5.5 \text{ cm} > 8 \text{ cm} \text{ and } 5.4 \text{ cm} - 5.4 \text{ cm} < 8 \text{ cm}$$

So construction of a triangle ACD is also possible.

Let us construct the quadrilateral.

**Step 1.** Draw a line segment  $AB = 4 \text{ cm}$ .

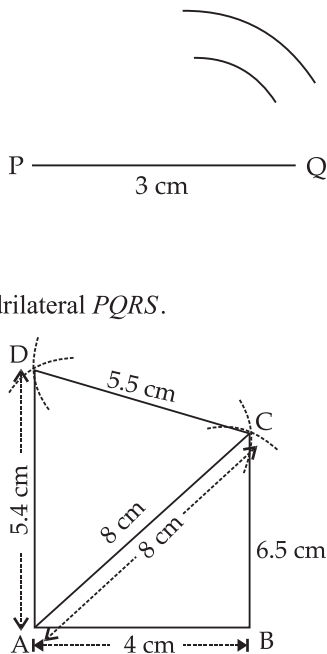
**Step 2.** Draw angle  $ABP$  of  $90^\circ$ .

**Step 3.** Taking  $A$  as centre draw arc of radius  $5 \text{ cm}$  which cuts the segment BP. Point of intersection is  $C$ .

**Step 4.** Join  $A$  to  $C$ .

**Step 5.** Draw angle  $ACD$  of  $90^\circ$ .

**Step 6.** Taking  $A$  as centre draw arc of radius  $5.5 \text{ cm}$  which cuts the



segment  $CF$ . Point of intersection is  $D$ .

**Step 7.** Join  $A$  to  $D$ .

**Step 8.**  $ABCD$  is the required a quadrilateral.

5. Given,  $AB = 4$  cm,  $AC = 5$  cm,  $AD = 5.5$  cm,  $\angle ABC = \angle ACD = 90^\circ$

**Step 1:** Draw a line segment  $AB = 4$  cm.

**Step 2 :** Draw angle  $ABP$  of  $90^\circ$ .

**Step 3 :** Taking  $A$  as centre draw arc of radius 5 cm which cuts the segment  $BP$ . Point of intersection is  $C$ .

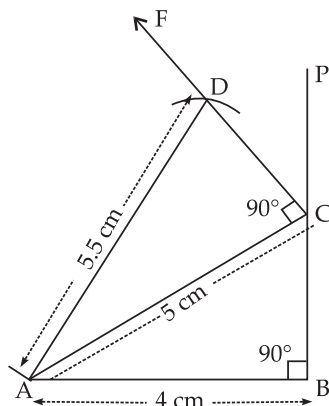
**Step 4 :** Joint  $A$  to  $C$ .

**Step 5 :** Draw angle  $ACD$  of  $90^\circ$ .

**Step 6 :** Taking  $A$  as centre draw arc of radius 5.5 cm which cuts the segment  $CF$ . Point of intersection is  $D$ .

**Step 7 :** Joint  $A$  to  $D$ .

**Step 8 :**  $ABCD$  is the required a quadrilateral.



6. **Steps of construction.**

**Step 1 :** Draw a line  $QR = 4$  cm.

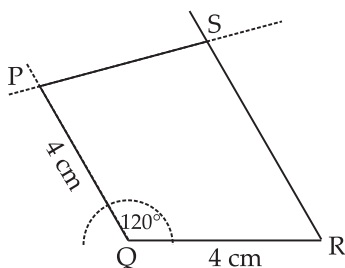
**Step 2 :** Draw angle  $PQR$   $120^\circ$ .

**Step 3 :** With  $Q$  as the center and taking a radius equal to 4 cm, cuts an arc at point  $P$ .

**Step 4 :** Join  $Q$  to  $P$ .

**Step 5 :** Now make  $\angle P = 60^\circ$  and make another angle  $\angle R = 60^\circ$  intersect each other at the point  $S$ .

**Step 6 :**  $PQRS$  is the required a quadrilateral.

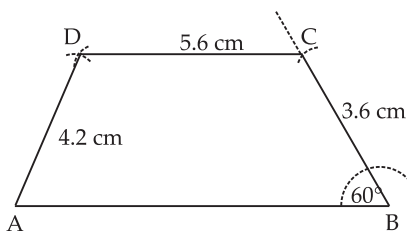


7. Draw a rough sketch of the quadrilateral and write down its dimension.

**Step of construction :**

**Step 1 :** Draw a line segment  $AB = 4.5$  cm

**Step 2 :** Make  $\angle ABC = 60^\circ$



**Step 3 :** With  $B$  as centre and radius equal to  $3.6$  cm, cut of  $BC = 3.6$ .

**Step 4 :** With  $A$  as centre and radius  $4.2$  cm draw an arc.

**Step 5 :** With  $C$  as centre and radius  $5.6$  cm draw another arc to cut the previously drawn arc at  $D$ .

**Step 6 :** Join  $A$  to  $D$  and  $C$  to  $D$ .

**Step 7 :**  $ABCD$  is the required quadrilateral.

## EXERCISE 12 B

1. Draw a rough sketch of the required parallelogram and write down the given dimensions.

**Steps of construction :**

**Step 1.** Draw a line segment  $AB = 6.2$  cm

**Step 2.** With  $A$  as centre and radius  $7$  cm draw an arc.

**Step 3.** With  $B$  as centre and radius  $4.5$  cm draw an another arc to cut the previous arc at  $C$ .

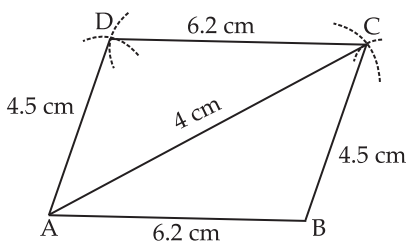
**Step 4.** Join  $BC$  and  $AC$ .

**Step 5.** With  $A$  as centre and radius  $4.5$  cm draw an arc.

**Step 6.** With  $C$  as centre and radius  $6.2$  cm draw another arc to cut the previous drawn arc at  $D$ .

**Step 7.** Join  $AD$  and  $DC$ .

**Step 8.**  $ABCD$  is the requierd parallelogram.



2. Draw a rough sketch of the required rectangle and write down the given dimensions.

**Steps of construction**

**Step 1.** Draw a line segment  $BC = 5.5$  cm

**Step 2.** At  $C$ , construct  $\angle BCX = 90^\circ$

**Step 3.** Taking  $B$  as the cente and  $6.5$  cm as radius, draw an arc to cut  $CX$  at  $D$ .

**Step 4.** With  $D$  and  $C$  as centres  $5.5$  cm and  $6.5$  cm respectively as radii, draw to arcs to intersect each other at point  $A$ .

**Step 5.** Join  $D$  to  $A$  and  $B$  to  $A$  to form the required rectangle  $ABCD$ . Hence the required rectangles is  $ABCD$ .

3. Clearly, the adjacent angle  $(180^\circ - 75^\circ) = 105^\circ$ . So we may proceed according to the steps given below :

**Steps of construction :**

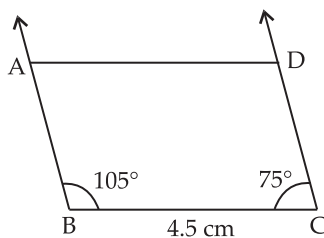
**Step 1.** Draw  $BC = 4.5$  cm

**Step 2.** Make  $\angle XBC = 105^\circ$  and  $\angle BCY = 75^\circ$

**Step 3.** Set off  $BA = 4.5$  cm along  $BX$  and  $DD = 4.5$  cm along  $CY$ .

**Step 4.** Join  $AD$ .

**Step 5.**  $ABCD$  is a required rhombus.



**4. Steps of construction :**

Let  $AC$  and  $BD$  are the diagonals of the parallelogram which intersect each other at  $O$ .

Now  $AO = OC = \frac{6}{2}$  cm = 3 cm and

$BO = \frac{6.2}{2}$  cm = 3.25 cm

**Step 1.** Draw a line segment 5 cm long.

**Step 2.** Now take  $A$  as centre and draw an arc of 3 cm.

**Step 3.** Take  $B$  as centre and draw an arc of 3.25 cm, which intersects at previous arc at point  $O$ .

**Step 4.** Now join  $AO$  and  $BO$ .

**Step 5.** Extend  $AO$  to  $C$  such that  $AC = 6$  cm

**Step 6.** Extend  $BO$  to  $D$  such that  $BD = 6.5$  cm

**Step 7.** Now join  $AD, CD$  and  $BC$ .

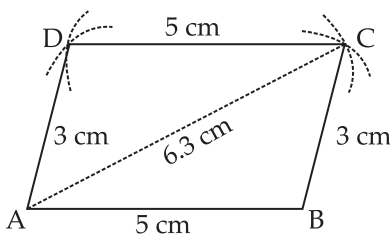
Hence the required a Parallelogram.

5. Draw a rough sketch of the required parallelogram and write down the given dimension.

**Steps of construction :**

**Step 1.** Draw a line segment  $AB = 5$  cm.

**Step 2.** With  $A$  as centre and radius 6.3 cm draw an arc.



**Step 3.** With B as centre and radius 3 cm draw another arc to cut the previous arc at C.

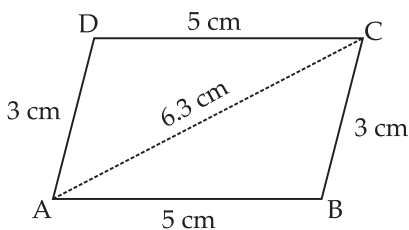
**Step 4.** Join BC and AC.

**Step 5.** With A as centre and radius 3 cm draw an arc.

**Step 6.** With C as centre and radius 5 cm draw another arc to cut the previous drawn arc at D.

**Step 7.** Join DA and DC.

**Step 8.** ABCD is the required parallelogram.



6. Draw a rough sketch of the required rhombus and write down the given dimensions.

Steps of construction :

**Step 1.** Construct  $AC = 8.2$  cm

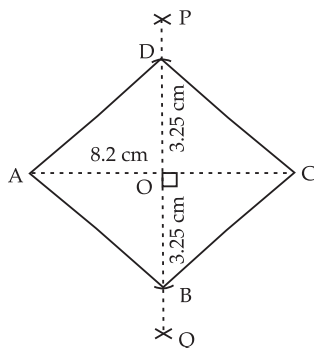
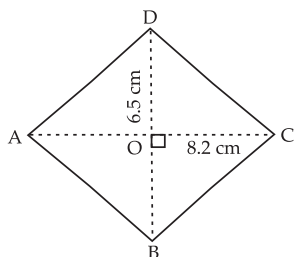
**Step 2.** Construct one bisector  $PQ$  of  $AC$  to meet it at the point  $O$ .

**Step 3.** From  $POQ$  cut off  $OD$  such that

$$\begin{aligned} OB &= OD \\ &= \frac{BD}{2} \\ &= \frac{6.5}{2} \text{ cm} \\ &= 3.25 \text{ cm} \end{aligned}$$

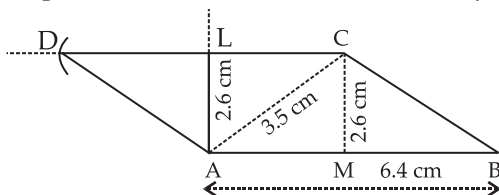
**Step 4.** Now join AB, BC, CD and DA.

**Step 5.** ABCD is the required rhombus.



7. Steps of construction.

**Step 1.** At first draw a base line of 6.4 cm by scale.



**Step 2.** Then draw a line perpendicular to  $AB$  from  $A$  with the help of protractor.

**Step 3.** The from  $A$  draw an arc of radius 2.6 cm on the perpendicular line. That intersecting point is  $L$ .

**Step 4.** Then from  $L$  draw a perpendicular line with respect to  $AL$ .

**Step 5.** Now from  $A$  draw an arc of radius 3.5 cm on the new line perpendicular to  $AL$ . That point is  $C$ .

**Step 6.** From  $C$  draw an arc of radius 6.4 cm on the perpendicular line  $CL$ . That intersecting point is  $D$ .

**Step 7.** Join  $A$  to  $D$  and  $B$  to  $C$ . According to the question,  $AL = 2.6$  cm which is the altitude from point  $A$ .

Similarly from point  $C$  altitude is  $CM$ , which is of same length of  $AL = 2.6$  cm.

#### 8. Steps of construction :

**Step 1.** Draw a line segment  $CD = 8.8$  cm

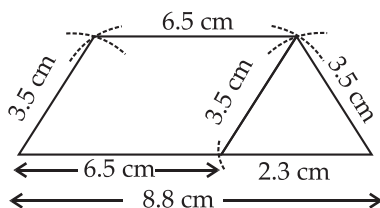
**Step 2.** On line  $CD$ , cut off  $EC = 2.3$  cm

**Step 3.** With  $C$  as centre and radius 3.5 cm and with  $E$  as centre and radius 3.5 cm, draw two arcs to cut each other at point  $B$ .

**Step 4.** With  $D$  as centre and radius 3.5 cm and  $B$  as centre radius 6.5 cm, draw two arcs to cut each other at point  $A$ .

**Step 5.** Join  $A$  to  $D$  and  $A$  to  $B$ .

Therefore  $ABCD$  is the required trapezium.



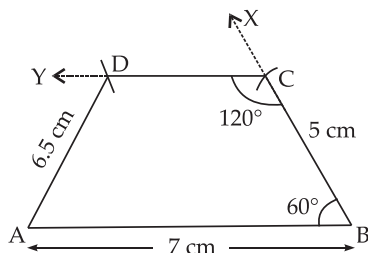
#### 9. Steps of construction :

**Step 1.** Draw a line segment  $AB = 7$  cm.

**Step 2.** With  $B$  as the centre, draw a ray  $BX$  such that  $\angle ABX = 60^\circ$ .

**Step 3.** Again with  $B$  as centre and radius  $BC = 5$  cm draw an arc on ray  $BX$ . Mark the intersection point as  $C$ .

**Step 4.** With  $C$  as the centre, draw a ray  $CY$  such that  $\angle BCY = 120^\circ$ .

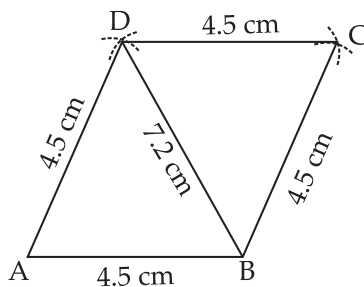


**Step 5.** Next with  $A$  as centre and radius,  $AD = 6.5$  cm draw an arc such that it intersects the ray  $CY$ . Mark the intersection point as  $D$ .

**Step 6.** Join  $AD$ .

**Step 7.** Thus  $ABCD$  is the required trapezium.

#### 10. Steps of construction :



**Step 1.** Construct  $AB = 4.5$  cm

**Step 2.** Taking  $A$  as centre and  $4.5$  cm radius, construct an arc.

**Step 3.** Taking  $B$  as centre and  $7.2$  cm radius, construct an arc which meets the previous arc at  $D$ .

**Step 4.** Taking  $B$  as centre and  $4.5$  cm radius, construct an arc.

**Step 5.** Taking  $D$  as centre and  $4.5$  cm radius, construct an arc which meets the previous arc at point  $C$ .

**Step 6.** Now, join  $A$  to  $D$ ,  $B$  to  $C$  and  $C$  to  $D$ .

Therefore,  $ABCD$  is the required rhombus.

### MUTIPLE CHOICE QUESTIONS

- The sum of the interior angles of a quadrilateral is  $360^\circ$ .  
Hence the correct option is (d).
- The value of  $x$  in the right angle figure is  $45^\circ$ .  
Hence the correct option is (a).
- The value of  $(x + y)^\circ$  is  $90^\circ$ .  
Hence the correct option is (b).
- The diagonal of  $ABCD$  is  $BD = AC$ .  
Hence the correct option is (c).
- Perimeter of constructing square figure is  $16$  cm.  
Hence the correct option is (c).



## Area of Polygons



### EXERCISE-13(A)

1. Given : Parallel sides of trapezium 20 m and 16 m  
Distance between them ( $h$ ) = 8 m

$$\begin{aligned}\text{Area of trapezium} &= \frac{1}{2} (\text{sum of parallel sides}) \times h \\ &= \frac{1}{2} (20 + 16) \times 8 \\ &= \frac{1}{2} \times 36 \times 8 = 18 \times 8 = 144 \text{ m}^2\end{aligned}$$

**Ans.**

2. Given : Area of trapezium =  $78 \text{ cm}^2$   
Here  $a = 12 \text{ cm}$ ,  $b = 8 \text{ cm}$ ,  $h = ?$

$$\begin{aligned}\text{Area of trapezium} &= \frac{1}{2} (a + b) \times h \\ 78 &= \frac{1}{2} (12 + 8) \times h \\ 78 &= \frac{1}{2} \times 20 \times h \\ h &= \frac{78 \times 2}{20} = \frac{78}{10} = 7.8 \text{ cm}\end{aligned}$$

**Ans.**

Hence the height of trapezium ( $h$ ) = 7.8 cm.

3. Given : Area =  $480 \text{ cm}^2$   
 $a = 24$ ,  $b = ?$ ,  $h = 8$
- $$\begin{aligned}\text{Area of trapezium} &= \frac{1}{2} (a + b) \times h \\ 480 &= \frac{1}{2} \times (24 + b) \times 8 \\ \frac{1}{2} \times (24 + b) \times 8 &= 480 \\ (24 + b) &= \frac{480 \times 2}{8} = 60 \times 2 \\ 24 + b &= 120 \\ b &= 120 - 24\end{aligned}$$



$$b = 96 \text{ cm}$$

Hence the length of other side (b) = 96 cm.

**Ans.**

4. Area = ?

Parallel sides of trapezium 14 are 14, 6.

$$\begin{aligned} BM &= AB - AM \\ &= 14 - 6 = 8 \\ AM &= DC - 6 \end{aligned}$$

Height ( $h$ ) =  $PC$

To find height ( $h$ ) =  $PC$

First we find area of  $\triangle BMC$  by Heron formula

Here  $a = 5$ ,  $b = 5$ ,  $c = 8$

$$s \text{ (semiperimeter)} = \frac{5+5+8}{2} = \frac{18}{2} = 9$$

$$\begin{aligned} \text{Area of } \Delta &= \sqrt{s(s-a)(s-b)(s-c)} \\ &= \sqrt{9(9-5)(9-5)(9-8)} \\ &= \sqrt{4 \times 4 \times 9} = \sqrt{144} = 12 \text{ cm}^2 \end{aligned} \quad \dots(1)$$

$$\begin{aligned} \text{Area of } \Delta &= \frac{1}{2} \times \text{base} \times h \\ &= \frac{1}{2} \times 8 \times h \end{aligned} \quad \dots(2)$$

From (1) and (2),

$$\frac{1}{2} \times 8 \times h = 12$$

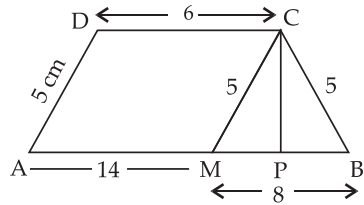
$$h = \frac{12 \times 2}{8} = \frac{12}{4} = 3 \text{ cm}$$

$$\begin{aligned} \text{Area of trapezium} &= \frac{1}{2} \times (\text{sum of parallel side}) \times h \\ &= \frac{1}{2} \times (14 + 6) \times 3 \\ &= \frac{1}{2} \times 20 \times 3 = 10 \times 3 = 30 \text{ cm}^2 \end{aligned}$$

5. Given, Area =  $125 \text{ cm}^2$

Here,  $a = 15$ ,  $b = ?$   $h = 10$

Let the length of other side be  $x$ .



$$\text{Area of trapezium} = \frac{1}{2}(a+b) \times h$$

$$125 = \frac{1}{2}(a+x) \times h$$

$$125 = \frac{1}{2}(15+x) \times 10$$

$$\frac{1}{2} \times (15+x) \times 10 = 125$$

$$15+x = \frac{125 \times 2}{10} = \frac{125}{5} = 25$$

$$15+x = 25$$

$$x = 25 - 15 = 10$$

Hence, the length of the other side  $x = 10$  cm

$$b = 10 \text{ cm}$$

6. Given,  $a = 5$  cm,  $b = 23$  cm,  $h = 12$  cm

$$\begin{aligned} \text{Area of trapezium} &= \frac{1}{2}(a+b) \times h \\ &= \frac{1}{2}(5+23) \times 12 = \frac{1}{2}(28) \times 12 \\ &= 28 \times 6 = 168 \text{ cm}^2 \end{aligned}$$

$$\text{Hence area of trapezium} = 168 \text{ cm}^2$$

**Ans.**

7. Given,  $a = 7$  cm,  $b = 15.6$  cm,  $h = 8$  cm

$$\begin{aligned} \text{Area of trapezium} &= \frac{1}{2} \times (a+b) \times h = \frac{1}{2} \times (7+15.6) \times 8 \\ &= \frac{1}{2} \times (22.6) \times 8 = 22.6 \times 4 = 90.4 \text{ cm}^2 \end{aligned}$$

$$\text{Hence the area of trapezium} = 90.4 \text{ cm}^2$$

**Ans.**

8. Area of the following figure-

- (i) Here,  $a = 5$ ,  $b = 12$ ,  $h = 7$

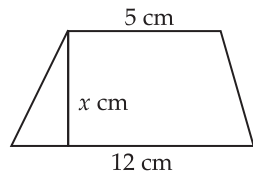
$$\text{Area of trapezium} = \frac{1}{2} \times (a+b) \times h$$

$$= \frac{1}{2} \times (5+12) \times 7 = \frac{1}{2} \times 17 \times 7$$

$$= 17 \times 3.5 = 59.5 \text{ cm}^2$$

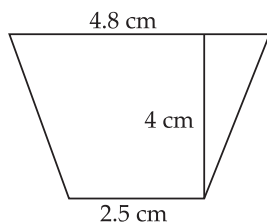
$$\text{Hence, Area} = 59.5 \text{ cm}^2$$

**Ans.**



(ii) Here  $a = 2.5\text{ cm}$ ,  $b = 4.8\text{ cm}$ ,  $h = 4\text{ cm}$

$$\begin{aligned}\text{Area of trapezium} &= \frac{1}{2}(a+b) \times h \\ &= \frac{1}{2}(2.5+4.8) \times 4 \\ &= \frac{1}{2} \times (7.3) \times 4 = 7.3 \times 2 \\ &= 14.6\text{ cm}^2\end{aligned}$$



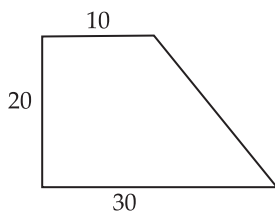
Hence, Area =  $14.6\text{ cm}^2$

**Ans.**

(iii) Here,  $a = 10$ ,  $b = 30$ ,  $h = 20$

Therefore,

$$\begin{aligned}\text{Area of trapezium} &= \frac{1}{2} \times (a+b) \times h \\ &= \frac{1}{2} \times (10+30) \times 20 \\ &= \frac{1}{2} \times 40 \times 20 \\ &= 20 \times 20 \\ &= 400\text{ cm}^2\end{aligned}$$



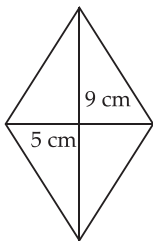
Hence, Area =  $400\text{ cm}^2$

**Ans.**

### EXERCISE-13(B)

1. Find the area of each of the following figures.

(i)

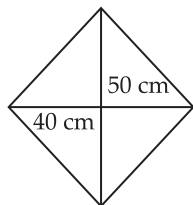


Here  $d_1 = 9$   $d_2 = 5$

$$\begin{aligned}\text{Area of Rhombus} &= \frac{1}{2} \times d_1 \times d_2 \\ &= \frac{1}{2} \times 9 \times 5 = 9 \times 2.5 \\ &= 22.5\text{ cm}^2\end{aligned}$$

**Ans.**

(ii)



Here  $d_1 = 50$  and  $d_2 = 40$

$$\begin{aligned}\text{Area of rhombus} &= \frac{1}{2} \times d_1 \times d_2 \\ &= \frac{1}{2} \times 17 \times 11 \\ &= \frac{1}{2} \times 187 = 93.5\end{aligned}$$

**Ans.**

2. Find sum of length of bases  $(a + b) = ?$

Given Area of trapezium  $= 4.2 \text{ m}^2$

height  $(h) = 280 \text{ cm} = 2.8 \text{ m}$

$$\text{Area of trapezium} = \frac{1}{2} (\text{sum of length bases}) \times h$$

$$4.2 = \frac{1}{2} (\text{sum of length}) \times 2.8$$

$$\text{Sum of length} = \frac{4.2 \times 2}{2.8} = \frac{4.2}{1.4} = 3 \text{ meter}$$

Hence the sum of length is 3 meter.

3. Given Area of rhombus  $= 96 \text{ cm}^2$

One diagonal  $(d_1) = 16 \text{ cm}$

Let the other diagonal be  $d_2$

$$\text{Area of rhombus} = \frac{1}{2} \times d_1 \times d_2$$

$$96 = \frac{1}{2} \times d_1 \times d_2$$

$$d_2 = \frac{96 \times 2}{16} = 6 \times 2 = 12 \text{ cm}$$

Hence the length of other diagonal  $(d_2) = 12 \text{ cm}$

4. Given : Perimeter of rhombus  $= 68 \text{ cm}$

$$4 \times \text{side} = 68$$

$$\text{side} = 68 \div 4 = 17 \text{ cm}$$

One diagonal  $(d_1) = 30 \text{ cm}$

We know that diagonal of rhombus bisect each other at  $90^\circ$ .

Now in  $\triangle AOB$  by pyg

$$AB^2 = OA^2 + OB^2$$

$$(17)^2 = OA^2 + (15)^2$$

$$OA^2 = 289 - 225$$

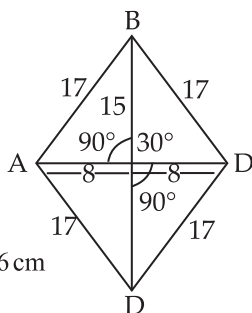
$$OA^2 = 64$$

$$OA = \sqrt{64} = 8$$

$$AB = 2 \times OA = 2 \times 8 = 16 \text{ cm}$$

Other diagonal  $AB(d_2) = 16 \text{ cm}$

$$\text{Area of rhombus} = \frac{1}{2} \times d_1 \times d_2$$



$$= \frac{1}{2} \times 30 \times 16$$

$$= 30 \times 8 = 240 \text{ cm}^2$$

5. Give, Area = 36,  $d_1 = 12$ ,  $d_2 = ?$

$$\text{Area of rhombus} = \frac{1}{2} \times d_1 \times d_2$$

$$d_2 = \frac{36 \times 2}{12} = 3 \times 2 = 6 \text{ cm}$$

Hence length of other diagonal is 6 cm.

**Ans.**

6. Given  $d_1 = 12$ ,  $d_2 = 26$

$$\text{Area of rhombus} = \frac{1}{2} \times d_1 \times d_2 = \frac{1}{2} \times 12 \times 26 = 12 \times 13 = 156 \text{ cm}^2$$

Hence area of rhombus = 156 cm<sup>2</sup>

**Ans.**

7. Given,  $d_1 = 20$ ,  $d_2 = 26$

$$\text{Area of rhombus} = \frac{1}{2} \times d_1 \times d_2$$

$$= \frac{1}{2} \times 20 \times 26 = 20 \times 13 = 260 \text{ cm}^2$$

Hence area of rhombus = 260 cm<sup>2</sup>

**Ans.**

8. Given : The ratio of the length of parallel side of trapezium = 3 : 2

$$\text{Area} = 450 \text{ cm}^2, h = 15 \text{ cm}$$

Let the sides of trapezium be  $3x$  and  $2x$

$$\text{Area of trapezium} = \frac{1}{2} \times (\text{sum of parallel side}) \times h$$

$$450 = \frac{1}{2} \times (3x + 2x) \times 15$$

$$\frac{1}{2} \times 5x \times 15 = 450$$

$$5x = \frac{450 \times 2}{15}$$

$$\Rightarrow x = \frac{450 \times 2}{15 \times 5} = \frac{30 \times 2}{5} = 6 \times 2 = 12$$

Hence length of parallel sides  $3x = 3 \times 12 = 36 \text{ cm}$

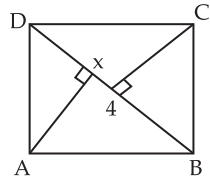
„ „ „ „  $2x = 2 \times 12 = 24 \text{ cm}$

**Ans.**

### EXERCISE-13(C)

1. Given, Quadrilateral  $ABCD$  in which (d) diagonal  $BD = 14$  cm  
and Perpendicular  $h_1 = AX = 10$  cm,  $h_2 = CY = 4$  cm

$$\begin{aligned}\text{Area of quadrilateral } ABCD &= \frac{1}{2} \times d_1 \times (h_1 + h_2) \\ &= \frac{1}{2} \times 14 \times (10 + 4) \\ &= \frac{1}{2} \times 14 \times 24 \\ &= 14 \times 12 = 168 \text{ cm}^2\end{aligned}$$



2. Find the area of following figure

- (i) In this figure,

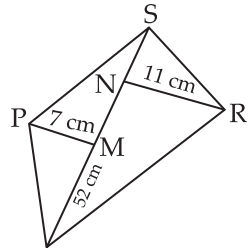
We have  $PS$  (Diagonal) = 52

Perpendicular  $h_1 PM = 7$  cm

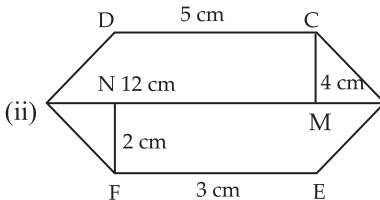
and  $h_2 RN = 11$  cm

Therefore, area of quadrilateral

$$\begin{aligned}PQRS &= \frac{1}{2} \times d \times (h_1 + h_2) \\ &= \frac{1}{2} \times 52 \times (7 + 11) \\ &= \frac{1}{2} \times 52 \times 18 \\ &= 52 \times 9 = 468 \text{ cm}^2\end{aligned}$$



**Ans.**



$$\begin{aligned}\text{Area of trapezium } ABCD &= \frac{1}{2} \times (\text{sum of parallel side}) \times h \\ &= \frac{1}{2} \times (AB + DC) \times CM \\ &= \frac{1}{2} \times (12 + 5) \times 4 = 17 \times 2 = 34 \text{ cm}^2\end{aligned}$$

Similarly,

$$\begin{aligned}
 \text{Area of trapezium } ABEF &= \frac{1}{2} \times (\text{sum of parallel side}) \times h \\
 &= \frac{1}{2} \times (AB + EF) \times h \\
 &= \frac{1}{2} \times (AB + EF) \times h \\
 &= \frac{1}{2} \times (12 + 3) \times 2 = \frac{1}{2} \times 15 \times 2 = 15 \text{ cm}^2
 \end{aligned}$$

Hence area of total figure ( $ADCBEF$ )

$$\begin{aligned}
 &= \text{Area of } ABCD + \text{Area of } ABEF \\
 &= 34 + 15 = 49 \text{ cm}^2 \quad \text{Ans.}
 \end{aligned}$$

3. Find the area of agricultural field

$$\begin{aligned}
 \text{(i) (1) Area of } \triangle DEI &= \frac{1}{2} \times b \times h \\
 &= \frac{1}{2} \times 50 \times 30 \\
 &= 750 \text{ m}^2
 \end{aligned}$$

$$\begin{aligned}
 \text{(2) Area of rectangle } EFGH &= l \times b \\
 &= 80 \times 50 \\
 &= 4000 \text{ cm}^2
 \end{aligned}$$

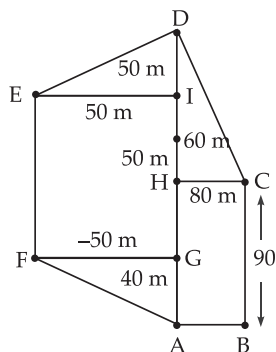
$$\begin{aligned}
 \text{(3) Area of } \triangle AFG &= \frac{1}{2} \times b \times h \\
 &= \frac{1}{2} \times 50 \times 40 \\
 &= 1000 \text{ m}^2
 \end{aligned}$$

$$\begin{aligned}
 \text{(4) Area of rectangle } ABCH &= l \times b \\
 &= 90 \times 80 = 7200 \text{ m}^2
 \end{aligned}$$

$$\text{5. Area of } \triangle CDH = \frac{1}{2} \times b \times h = \frac{1}{2} \times 80 \times 60 = 80 \times 30 = 2400 \text{ m}^2$$

Hence the area of given figure

$$\begin{aligned}
 &= \text{Ar}DEI + \text{Ar}EFGI + \text{Ar}[AGF] + \text{Ar}[ABCH] + \text{Ar}[CDH] \\
 &= 750 + 4000 + 1000 + 7200 + 2400 \\
 &= 15,350 \text{ m}^2 \quad \text{Ans.}
 \end{aligned}$$



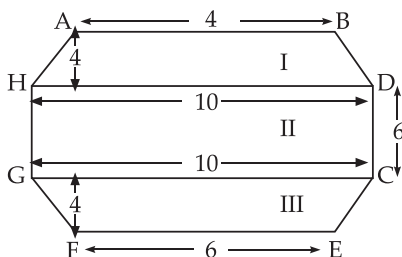
5. In part I  $ABPH$

$$a = 10, b = 6, h = 4$$

Then,

Area of trapezium ( $ABDH$ )

$$\begin{aligned} &= \frac{1}{2} (\text{Sum of } \parallel \text{ side}) \times h \\ &= \frac{1}{2} \times (a + b) \times h \\ &= \frac{1}{2} \times (10 + 6) \times 4 \\ &= 16 \times 2 = 32 \text{ m}^2 \end{aligned}$$



6. In part II ( $HDCG$ )

$$l = 10, b = 6$$

Then, Area of rectangle ( $HDCG$ ) =  $l \times b$

$$= 10 \times 6 = 60 \text{ m}^2$$

In Part III ( $EFGC$ )

$$a = 10, b = 6, h = 4$$

Then

$$\begin{aligned} \text{Area of trapezium } (EFGC) &= \frac{1}{2} \times (\text{sum of } \parallel \text{ side}) \times h \\ &= \frac{1}{2} \times (a + b) \times h \\ &= \frac{1}{2} \times (10 + 6) \times 4 = 16 \times 2 = 32 \text{ mL} \end{aligned}$$

Total area of top surface of table

$$\begin{aligned} &= Ar(ABDH) + Ar(HDCG) + Ar(EFGC) \\ &= 32 + 60 + 32 \\ &= 124 \text{ m}^2 \end{aligned}$$

6. Given (in the figure)

$$AD = 8 \text{ cm}$$

$$AH = 6 \text{ cm}$$

$$AG = 4 \text{ cm}$$

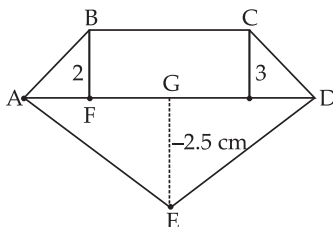
$$AF = 3 \text{ cm}$$

Perpendicular

$$BF = 2 \text{ cm}$$

$$CH = 3 \text{ cm}$$

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



The given figure consists of 3 triangles and one trapezium.



$$\text{Now, Area of } \triangle CDH = \frac{1}{2} \times HD \times CH = \frac{1}{2} (AD - AH) \times CH$$

$$= \frac{1}{2} \times (8 - 6) \times 3 = \frac{1}{2} \times 2 \times 3 = 3 \text{ cm}^2$$

$$\text{Area of } \triangle ABF = \frac{1}{2} \times AF \times BF = \frac{1}{2} \times 3 \times 2 = 3 \text{ cm}^2$$

$$\text{Area of } \triangle AED = \frac{1}{2} \times AD \times EG = \frac{1}{2} \times 8 \times 2.5 = 10 \text{ cm}^2$$

$$\text{Area of trapezium} = \frac{1}{2} \times (\text{sum of parallel side}) \times h$$

$$= \frac{1}{2} \times (AF + CH) \times FH$$

$$= \frac{1}{2} \times (2 + 3) [AD - (DH + AF)]$$

$$= \frac{1}{2} \times 5 \times (8 - 5) = \frac{1}{2} \times 5 \times 3 = 2.5 \times 3 = 7.5 \text{ cm}^2$$

$$\text{Area of } ABCDE = \text{Ar}CHD + \text{Ar}(ABF) + \text{Ar}(AED) + \text{Ar}(BFHC)$$

$$= 3 \times 3 + 10 + 7.5 = 16 + 7.5 = 23.5 \text{ cm}^2$$

**Ans.**

7. Given      Area rhombus =  $420 \text{ cm}^2$

$$\text{Perimeter} = 140 \text{ cm}$$

$$\text{Perimeter of rhombus} = 140$$

$$4 \times \text{side} = 140$$

$$\text{Side} = \frac{140}{4} = 35$$

Now,      Area of rhombus = 420

$$\text{Base} \times \text{altitude} = 420$$

$$35 \times \text{altitude} = 420$$

$$\text{Altitude} = 420 \div 35 = \frac{420}{35} = \frac{60}{5} = 12 \text{ cm}$$

Hence, required altitude of rhombus = 12 cm

**Ans.**

8. Given  $d_1 = 40 \text{ cm}$ ,  $d_2 = 50 \text{ cm}$

$$\text{Area of rhombus} = \frac{1}{2} \times d_1 \times d_2$$

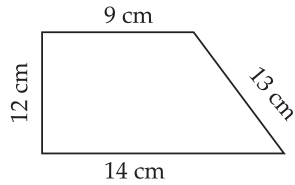
$$= \frac{1}{2} \times 40 \times 50 = 20 \times 50 = 1000 \text{ cm}^2$$

9. Same as Q 4 Exercise 13(A).

## MULTIPLE CHOICE QUESTIONS

$$\begin{aligned}
 1. \text{ Area of trapezium} &= \frac{1}{2} (\text{sum of all side}) \times h \\
 &= \frac{1}{2} (14 + 9) \times 12 \\
 &= 23 \times 6 = 138 \text{ cm}^2
 \end{aligned}$$

**Ans. (c) = 138 cm<sup>2</sup>**



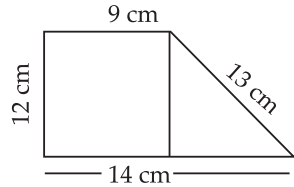
2. Given,

$$\text{Area of trapezium} = 100 \text{ cm}^2$$

$$\text{Area of trapezium} = \frac{1}{2} (\text{sum of IIInd side}) \times h$$

$$100 = \frac{1}{2} (6 + 14) \times h = \frac{1}{2} \times 20 \times h$$

$$h = \frac{100 \times 2}{20} = 5 \times 2 = 10 \text{ cm}$$



**Ans.**

3. Given  $a = 10$ ,  $b = 6$ ,  $h = 5$

$$\begin{aligned}
 \text{Area of trapezium} &= \frac{1}{2} (a + b) \times h = \frac{1}{2} \times (10 + 6) \times 5 \\
 &= \frac{1}{2} \times 16 \times 5 = 8 \times 5 = 40 \text{ cm}^2
 \end{aligned}$$

4. Area = 385,  $h = 11$  cm, Ratio = 3 : 4

Let IIInd sides be =  $3x$  and  $4x$

$$\text{Area} = \frac{1}{2} \times (3x + 4x) \times 11$$

$$\Rightarrow 384 = \frac{1}{2} \times 7x \times 11$$

$$\Rightarrow \frac{384 \times 2}{11} = \frac{7x}{2} \Rightarrow x = \frac{384 \times 2}{11 \times 7}$$

$$\Rightarrow x = \frac{35 \times 2}{7} = \frac{70}{7} = 10$$

Hence longer side =  $4x$

$$= 4 \times 10 = 40 \text{ cm}$$

**Ans. (c) 40 cm**

$$5. \text{ Area of rhombus} = \frac{1}{2} \times d_1 \times d_2$$

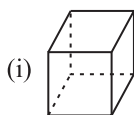


## 14 Visualising Solid Shapes

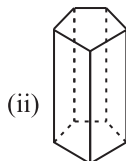


### EXERCISE-14

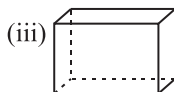
1. Name the following solid shapes



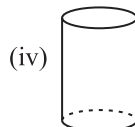
Square prism



Pentagonal prism



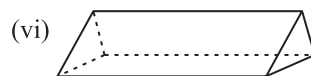
cuboid



Cylinder



Hemisphere



Triangular prism

2. In both sides, the lateral surface meet at one vertex. A cone is not a polyhedron.
3. In both sides the box and TOP surface are congruent. A cylinder is not a polyhedron.
4. Find number of faces, vertices and edges for each solid also verify Euler formula.

Cuboid  $F = 6, V = 8, E = 12$

Euler formula  $F + V - E = 2$

$$6 + 8 - 12 = 2$$

$$2 = 2$$

L.H.S. = R.H.S. Hence verified.

**Triangular pyramid :**

$$F = 4, V = 4, E = 6$$

To verify Euler formula,

$$F + V - E = 2$$

$$4 + 4 - 6 = 2$$

$$8 - 6 = 2$$

$$2 = 2$$

$$\text{L.H.S.} = \text{R.H.S.}$$

Hence verified.

**Pentagonal pyramid :**  $F = 6, V = 6, E = 10$

To verify Euler formula

$$F + V - E = 2$$

$$6 + 6 - 10 = 2$$

$$12 - 10 = 2$$

$$2 = 2$$

$$\text{L.H.S.} = \text{R.H.S.}$$

Hence verified.

**Square prism :**  $F = 6, V = 8, E = 12$

To verify

$$F + V - E = 2$$

$$6 + 8 - 12 = 2$$

$$14 - 12 = 2$$

$$2 = 2$$

$$\text{L.H.S.} = \text{R.H.S.}$$

Hence verified.

**Hexagonal prism :**  $F = 8, V = 12, E = 18$

To verify :

$$F + V - E = ?$$

$$8 + 12 - 18 = 2$$

$$20 - 18 = 2$$

$$2 = 2$$

$$\text{L.H.S.} = \text{R.H.S.}$$

Hence verified.

## MULTIPLE CHOICE QUESTIONS

1. The common name of square prism is cube.

Hence, (b) is a correct answer.

2. A rectangular pyramid has 5 faces.

Hence, (c) is a correct answer.

3. By Euler formula,  $F + V - E = 2$

$$7 + 10 - E = 2$$

$$E = 7 + 10 - 2 = 17 - 2 = 15$$

Hence, (b) is correct answer.

4. A solid with only one vertex is a cone.

Hence, (c) is correct answer.

5. A hexagonal prism has 18 edges.

Hence, (b) is correct answer.



## Mensuration of 3-D Figures



### EXERCISE-15A

1. (i) 7 cm

Given : Edge of cube = 7,  $a = 7$  cm

$$\begin{aligned}\text{Volume of cube} &= (\text{edge})^3 \\ &= (7)^3 = 7 \times 7 \times 7 = 343 \text{ cm}^3\end{aligned}$$

$$\text{Lateral surface area of cube} = 4a^2 = 4(7)^2 = 4 \times 7 \times 7 = 4 \times 49 = 196 \text{ cm}^2$$

$$\text{Total surface area of cube} = 6a^2 = 6 \times 7 \times 7 = 4 \times 49 = 294 \text{ cm}^2$$

- (ii) 2.5

Given : Edge of cube  $a = 2.5$

$$\begin{aligned}\text{Volume of cube} &= a^3 = (2.5)^3 = 2.5 \times 2.5 \times 2.5 \\ &= 6.25 \times 2.5 = 15.625 \text{ cm}^3\end{aligned}$$

$$\begin{aligned}\text{Lateral surface area of cube} &= 4a^2 \\ &= 4 \times 2.5 \times 2.5 = 25.00 \text{ cm}^2\end{aligned}$$

$$\begin{aligned}\text{Total surface area of cube} &= 6a^2 \\ &= 6 \times 2.5 \times 2.5 = 6 \times 6.25 = 37.50 \text{ cm}^2\end{aligned}$$

2. (i) Length = 6 cm, breadth = 4 cm, height = 3 cm

$$\begin{aligned}\text{Volume of cuboid} &= l \times b \times h \\ &= 6 \times 4 \times 3 = 72 \text{ cm}^3\end{aligned}$$

$$\begin{aligned}\text{Total surface area of cuboid} &= 2(lb + bh + hl) \\ &= 2(6 \times 4 + 4 \times 3 + 3 \times 6) \\ &= 2(24 + 12 + 18) = 2(54) = 108 \text{ cm}^2\end{aligned}$$

$$\begin{aligned}\text{Lateral surface area of cuboid} &= 2(l + b) \times h \\ &= 2(6 + 4) \times 3 = 2(10) \times 3 \\ &= 20 \times 3 = 60 \text{ cm}^2\end{aligned}$$

- (ii)  $l = 10$  cm,  $b = 6.5$  cm,  $h = 5$  cm

$$\begin{aligned}\text{Volume of cuboid} &= l \times b \times h \\ &= 10 \times 6.5 \times 6 = 325 \text{ cm}^2\end{aligned}$$

$$\begin{aligned}\text{Total surface area of cuboid} &= 2(lb + bh + hl) \\ &= 2(10 \times 6.5 + 6.5 \times 5 + 5 \times 10)\end{aligned}$$

$$= 2(65 + 32.5 + 50)$$

$$= 2(115 + 32.5) = 2(147.5) = 295.0 = 295 \text{ cm}^2$$

$$\text{Lateral surface area of cuboid} = 2(l + b) \times h$$

$$= 2(10 + 6.5) \times 5 = 2(16.5) \times 5$$

$$= 33.0 \times 5 = 165 \text{ cm}^2$$

3. Given, length of water tank  $= l = 10 \text{ m}$

$$\text{breadth of water tank} = b = 6 \text{ m}$$

$$\text{height of water tank} = h = 4 \text{ m}$$

$$\text{Volume of water tank} = l \times b \times h = 10 \times 6 \times 4 = 240 \text{ m}^3$$

$$1 \text{ m}^3 = 1000 \text{ l}$$

$$240 \text{ m}^3 = 240000 \text{ l}$$

Hence, water tank contain 240000 l water.

**Ans.**

4. Given,  $l = 15 \text{ m}$ ,  $b = 10 \text{ m}$ ,  $h = 5 \text{ m}$

$$\text{Total area to be painted} = 2(lb + bh + hl) - lb$$

$$= 2(15 \times 10 + 10 \times 5 + 5 \times 15) - 15 \times 10$$

$$= 2(150 + 50 + 75) - 150$$

$$= 2(275) - 150 = 550 - 150 = 400 \text{ m}^2$$

$$\text{Cost of } 1 \text{ m}^2 = ₹ 5.50$$

$$\text{Cost of } 400 \text{ m}^2 = 5.50 \times 400 = 2200$$

**Ans.**

5. Given, side of cube ( $a$ )  $= 4 \text{ cm}$

$$\text{Diagonal of cube} = \sqrt{3} a$$

$$= 4\sqrt{3} = 4 \times 1.73 = 6.92 \text{ m}$$

**Ans.**

Hence, required diagonal is 6.92 m.

6. Here,  $l = 8 \text{ m}$ ,  $b = 8 \text{ m}$ ,  $c = 3 \text{ m}$

$$\text{Longest pole of the room} = \text{Diagonal of cuboid}$$

$$= \sqrt{l^2 + b^2 + h^2}$$

$$= \sqrt{8^2 + 8^2 + 3^2}$$

$$= \sqrt{64 + 64 + 9} = \sqrt{137} = 11.7 \text{ m}$$

$$\text{Required longest pole of room} = 11.7 \text{ m}$$

**Ans.**

7. Here,  $l = 1 \text{ m} = 100 \text{ cm}$ ,  $b = 80 \text{ cm}$ ,  $h = 60 \text{ cm}$

$$\text{Surface area of iron box} = 2(lb + bh + hl) - l \times b$$

$$= 2(100 \times 80 + 80 \times 60 + 60 \times 100) - 8000$$

$$\begin{aligned}
 &= 2(8000 + 4800 + 6000) \\
 &= 2(18800) - 8000 \\
 &= 37600 - 8000 = 29600 \text{ cm}^2 = 2.96 \text{ m}^2
 \end{aligned}$$

$$\text{Cost of } 1 \text{ m}^2 = ₹ 0.35$$

$$\text{Cos of } 2.96 \text{ m}^2 = 2.96 \times 0.35 = ₹ 1.036$$

**Ans.**

8. Here internal length = 12 m

$$\text{Internal breadth} = 9 \text{ m}$$

$$\text{Internal height} = 4 \text{ m}$$

$$\text{Internal volume} = l \times b \times h$$

$$= 12 \times 9 \times 4 = 108 \times 4 = 432 \text{ m}^3$$

Since short being 2m wide

$$\text{Then external length} = (12 + 2) = 14 \text{ m}$$

$$,, \quad ,, \quad \text{breadth} = (9 + 2) = 11 \text{ m}$$

$$,, \quad ,, \quad \text{height} = (4 + 2) = 6 \text{ m}$$

$$\text{External volume} = l \times b \times h$$

$$= 14 \times 11 \times 6 = 924 \text{ m}^3$$

$$\text{Volume of required sheet} = \text{Exterior volume} - \text{Internal volume}$$

$$= 924 - 432 = 492 \text{ m}^3$$

$$\text{Cost of } 1 \text{ m}^3 \text{ sheet} = ₹ 5$$

$$\text{Cost of } 492 \text{ m}^3 \text{ sheet} = 492 \times 5 = ₹ 2460$$

**Ans.**

9. Given, ratio of volume of two cube = 1 : 27

$$\text{Volume of Ist cube } (V_1) = (a_1)^3 = (1)^3$$

$$a_1 = 1$$

$$\text{Volume of IInd cube } (V_2) = (a_2)^3 = 27 = (3)^3$$

$$a_2 = 3$$

$$\text{Now surface area of Ist cube} = 6(a_1)^2 = 6(1)^2 = 6$$

$$\text{Surface area of IInd cube} = 6(a_2)^2 = 6(3)^2 = 6 \times 9 = 54$$

$$\text{Ratio} = \frac{\text{Surface area of Ist cube}}{\text{Surface area of IInd cube}} = \frac{6}{54} = \frac{1}{9}$$

Hence, ratio of surface area of two cube = 1 : 9

10. Side of cube = 3 cm

$$\text{Volume of cube} = (\text{side})^3 = (3)^3 = 27 \text{ cm}^3$$

$$\text{For cuboid } l = 21 \text{ cm}, b = 9 \text{ cm}, b = 5 \text{ cm}$$

$$\text{Volume of cuboid} = l \times b \times h = 21 \times 9 \times 5 = 945 \text{ cm}^3$$

$$\text{No. of cube} = \frac{\text{Volume of cuboid}}{\text{Volume of cube}} = \frac{945}{27} = 35$$

**Ans.**

Hence, required number of cube is 35.

**Ans.**

$$11. 100 \text{ paise} = 1 \text{ ₹} = 15 \text{ paise} = ₹ 0.15$$

Cost of painting whole surface area  $1 \text{ cm}^2 = ₹ 0.15$

For ₹ 0.15. The area is  $1 \text{ cm}^2$

$$\text{For ₹ 518.40 the area is } \frac{518.40}{0.15} = 3456 \text{ cm}^2$$

Surface area of cube = 3456

$$6a^2 = 3456$$

$$a^2 = 3456 \div 6 = 576$$

$$a^2 = 576 \Rightarrow a = 24$$

$$\text{Volume of cube} = (\text{side})^3 = (24)^3$$

$$= 24 \times 24 \times 24 = 576 \times 24 = 13824 \text{ cm}^3$$

**Ans.**

Hence, the volume of die cube =  $13824 \text{ cm}^3$

$$12. \text{ Given, surface area of volume of cube} = 216 \text{ cm}^2$$

$$6a^2 = 216$$

$$a^2 = 216 \div 6 = 36$$

$$a^2 = 36$$

$$\text{Side of cube } a = 6$$

$$\text{Volume of cube} = (\text{side})^3$$

$$= (6)^3 = 6 \times 6 \times 6 = 216 \text{ cm}^3$$

## EXERCISE 15 B

$$1. \text{ Here } h = 7 \text{ m, Radius } (r) = 6 \text{ mm} = 0.006 \text{ m}$$

$$\text{Lateral surface area of wire} = 2\pi rh$$

$$= 2 \times \frac{22}{7} \times 0.006 \times 7$$

$$= 44 \times 0.006 = 0.264 \text{ m}^2$$

**Ans.**

$$2. \text{ Here, Height of well } (h) = 12 \text{ m}$$

$$\text{Diameter } (D) = 3.5$$



Then radius ( $r$ ) =  $\frac{3.5}{2}$

$$\text{Volume of well} = \pi r^2 h = \frac{22}{7} \times \left(\frac{3.5}{2}\right)^2 \times 12$$

Now, length of platform ( $l$ ) = 10.5 m

Breadth of platform ( $b$ ) = 8.8 m

height ( $h$ ) =  $H$

Volume of platform =  $l \times b \times h$

$$= 10.5 \times 8.8 \times H$$

$$\begin{aligned} \text{Height of platform } (H) &= \frac{\pi r^2 h}{l \times b} = \frac{\frac{22}{7} \times \frac{3.5}{2} \times \frac{3.5}{2} \times 12}{10.5 \times 8.8} \\ &= \frac{22 \times 3.5 \times 3.5 \times 12}{7 \times 10.5 \times 8.8 \times 2 \times 2} \\ &= \frac{35 \times 12}{7 \times 4 \times 12} = \frac{5}{4} = 1.25 \text{ m} \end{aligned}$$

Hence, required height of platform  $H = 1.25$  m

**Ans.**

3. Here, radius of roller ( $r$ ) = 0.7 m

$$h = 2 \text{ m}$$

Lateral surface area of roller =  $2\pi rh$

No. of revolution ( $n$ ) = 10

Area covered in 10 revolution =  $2\pi rh \times 10$

$$= 2 \times \frac{22}{7} \times 0.7 \times 2 \times 10 = 88 \times 2 = 176 \text{ m}^2$$

Hence area covered in 10 revolution 176 m<sup>2</sup>

**Ans.**

4. CSA of cylinder = 1320 cm<sup>2</sup>

Radius ( $r$ ) = 10.5 cm,  $h = ?$

CSA of cylinder =  $2\pi rh = 1320$

$$2 \times \frac{22}{7} \times 10.5 \times h = 1320$$

$$h = \frac{1320 \times 7}{2 \times 22 \times 10.5} = \frac{60 \times 7 \times 10}{2 \times 105}$$

$$= \frac{30 \times 10}{15} = 2 \times 10 = 20 \text{ cm}$$

**Ans.**

$$\begin{aligned}
 \text{Volume of cylinder} &= \pi r^2 h = \frac{22}{7} \times (10.5)^2 \times 20 \\
 &= \frac{22}{7} \times (10.5)^2 \times 20 \\
 &= \frac{22}{7} \times 10.5 \times 10.5 \times 20 \\
 &= \frac{48510}{7} = 6930 \text{ cm}^3
 \end{aligned}$$

Hence, height = 20 cm and volume = 6930 cm<sup>3</sup>.

**Ans.**

5. Given the length of rectagnular sheet = 44 cm  
and breadth = 18 cm

To made cylinder by rolling its length

Therefore,  $2\pi r = 44$

$$r = \frac{44 \times 7}{2 \times 22} = 7 \text{ cm}$$

$$r = 7, \quad h = 18$$

$$\begin{aligned}
 \text{Volume of cylinder} &= \pi r^2 h = \frac{22}{7} \times 7 \times 7 \times 18 \\
 &= 22 \times 7 \times 18 = 154 \times 18 = 2772 \text{ cm}^3
 \end{aligned}$$

Hence, required volume of cylinder 2772 cm<sup>3</sup>.

6. Here Ratio of two cylinder = 2 : 3

$$\text{Ratio of Ist cylinder } r_1 = 2r$$

$$\text{Ratio of IInd cylinder } r_2 = 3r$$

$$\text{Ratio of highest of two cylinder} = 5 : 4$$

$$\text{Height of Ist cylinder } (h_1) = 5h$$

$$\text{Height of 2nd cylinder } (h_2) = 4h$$

$$\begin{aligned}
 \text{Ratio} &= \frac{\text{Volume of Ist cylinder}}{\text{Volume of 2nd cylinder}} = \frac{\pi (2r)^2 (5h)}{\pi (3r)^2 (4h)} \\
 &= \frac{4 \times 5r^2 h}{9 \times 4r^2 h} = \frac{5}{9} = 5 : 9
 \end{aligned}$$

Hence, ratio of their volume 5 : 9.

**Ans.**

7. Here, radius ( $r$ ) = 7 cm

$$\text{height } (h) = 10 \text{ cm}$$

$$\text{Curved surface area of cylinder} = 2\pi rh$$

$$= 2 \times \frac{22}{7} \times 7 \times 10$$

$$= 2 \times 22 \times 10 = 440 \text{ cm}^2$$

$$\text{Total surface area of cylinder} = 2\pi r(h + r)$$

$$= 2 \times \frac{22}{7} \times 7 (10 + 7)$$

$$= 2 \times 22 \times (17) = 44 \times 17 = 748 \text{ cm}^2$$

$$\text{Volume of cylinder} = \pi r^2 h = \frac{22}{7} \times 7 \times 7 \times 18$$

$$= 22 \times 7 \times 18 = 154 \times 18 = 2772 \text{ cm}^3$$

Hence, required volume of cylinder  $2772 \text{ cm}^3$

8. Here, diameter of pillar  $(2r) = 48 \text{ m}$

$$r = 24 \text{ m} = 0.24 \text{ km}$$

$$\text{Height } (h) = 7 \text{ m}$$

$$\text{C.S.A. of 1 pillar} = 2\pi rh$$

$$\text{C.S.A. of 15 pillar} = 15 \times 2\pi rh$$

$$= 15 \times 2 \times \frac{22}{7} \times 0.24 \times 7$$

$$= 44 \times 15 \times 0.24 = 158.40 \text{ m}^2$$

Hence required height of embankment is  $4 \text{ m}$ .

**Ans.**

9. Inner diameter of well =  $14 \text{ m}$

$$\text{radius } (r) = 14 \div 2 = 7 \text{ m}$$

$$\text{depth } (h) = 12$$

$$\text{Volume of well earth taken out} = \pi r^2 h$$

$$= \frac{22}{7} \times 7 \times 7 \times 12 = 22 \times 84 = 1848 \text{ cm}^3$$

$$\text{(R) Outer radius} = 7 + 7 = 14 \text{ cm}$$

$$\text{Volume of embankment} = \pi h (R^2 - r^2)$$

$$= \frac{22}{7} \times h (14^2 - 7^2)$$

$$\text{Volume of embankment} = \pi h (R^2 - r^2) = \frac{22}{7} \times h (14^2 - 7^2)$$

$$\text{Volume of embankment} = \text{volume of well earth taken out}$$

$$\frac{22}{7} \times h \times (14^2 - 7^2) = 1848$$

$$\frac{22}{7} \times h \times (196 - 49) = 1848$$

$$\frac{22}{7} \times h \times 147 = 1848$$

$$\Rightarrow h = \frac{1848 \times 7}{22 \times 147} = \frac{1848}{22 \times 21} = \frac{1848}{462} = 4 \text{ m}$$

Hence, required height of embankment is 4 m.

**Ans.**

- 10.** Here, plastic with square base side = 5 cm, Height = 14 cm

Then its  $l = 5$ ,  $b = 5$ ,  $h = 14$

Volume of square base can =  $l \times b \times h = 5 \times 5 \times 14 = 350 \text{ cm}^3$

Also given,

Radius of circular base can ( $r$ ) = 3.5 cm

Height ( $h$ ) = 12 cm

$$\begin{aligned} \text{Volume of circular base can} &= \pi r^2 h = \frac{22}{7} \times 3.5 \times 3.5 \times 12 \\ &= 6 \times 22 \times 3.5 = 132 \times 3.5 = 462.0 \text{ cm}^3 \end{aligned}$$

Vol. of circular base can – Vol. of square base can

$$= 462 - 350 = 112 \text{ cm}^3$$

Can with circular base is greater capacity  $112 \text{ cm}^3$ .

- 11.** Ratio of radius of height of cylinder = 7 : 2

Then radius =  $7x$

height =  $2x$

Volume of cylinder = 8316

$$\pi r^2 h = 8316$$

$$\frac{22}{7} (7x)^2 \times (2x) = 8316$$

$$22 \times 14x^3 = 8316$$

$$x^3 = \frac{8316}{308} = 27$$

$$x^3 = 27, (x = 3)$$

Now radius =  $7x = 7 \times 3 = 21$

Height =  $2x = 2 \times 3 = 6$

$$\text{Total surface area of cylinder} = 2\pi r(h + r) = 2 \times \frac{22}{7} \times 21(21 + 6)$$

$$= 2 \times 22 \times 3 \times 27 = 2 \times 66 \times 27$$

$$= 132 \times 27 = 3564 \text{ cm}^2$$

**Ans.**

Hence, T.S.A. of cylinder  $3564 \text{ cm}^2$ .

12. Here  $h = 14 \text{ m}$ , lateral surface  $= 220 \text{ m}^2$

$$2\pi rh = 220$$

$$2 \times \frac{22}{7} \times r \times 14 = 220$$

$$r = \frac{220 \times 7}{22 \times 2 \times 14} = \frac{10}{4} = \frac{5}{2} = 2.5$$

Volume of cylinder  $= \pi r^2 h$

$$= \frac{22}{7} \times 2.5 \times 2.5 \times 14$$

$$= 22 \times 6.25 \times 2 = 275 \text{ cm}^3$$

Hence volume of cylinder  $275 \text{ cm}^3$ .

13. Here height of pole ( $h$ )  $= 7 \text{ m}$

Radius of pole ( $r$ )  $= 10 \text{ cm} = 0.10 \text{ m}$

$$\text{Volume of pole} = \pi r^2 h = \frac{22}{7} \times 0.10 \times 0.10 \times 7 = 0.22 \text{ m}^3$$

Weight of  $1 \text{ m}^3 = 225 \text{ kg}$

Weight of  $0.22 \text{ m}^3 = 225 \times 0.22 = 49.5 \text{ kg}$

Hence weight of required wood  $= 49.5 \text{ kg}$

**Ans.**

## MULTIPLE CHOICE QUESTIONS

1. Here three cubes edges are  $6 \text{ cm}$ ,  $8 \text{ cm}$ ,  $10 \text{ cm}$ ,

Then vol. of 1st cube  $= (6)^3 = 216 \text{ cm}^3$

Vol. of 2nd cube  $= (8)^3 = 512 \text{ cm}^3$

Vol. of 3rd cube  $= (10)^3 = 1000 \text{ cm}^3$

Total vol. of three cube  $= 216 + 512 + 1000 = 1728 \text{ cm}^3$

Three cube melted and formed a single new cube

Ist edge of single cube ' $a$ '

Then  $a^3 = 1728 \text{ cm}^3$

$$a = \sqrt[3]{1728} = \sqrt{12 \times 12 \times 12} = 12 \text{ cm}$$

Hence, edge of single cube  $12 \text{ cm}$ .

2. Here five equal cubes whose each edge  $5 \text{ cm}$

Vol. of 1 cube  $= (5)^3 = 125 \text{ cm}^3$

$$\text{Vol. of 5 cube} = 5 \times 125 = 625 \text{ cm}^3$$

Hence volume of new solid is  $625 \text{ cm}^3$ .

$$3. \text{ Here Diameter } (2r) = 2 \text{ m} \Rightarrow r = \frac{2}{2} = 1 \text{ m}$$

$$\text{Depth } (h) = 14 \text{ m}$$

$$\text{Volume of earth dug out} = \pi r^2 h = \frac{22}{7} \times 1 \times 1 \times 14 = 22 \times 2 = 44 \text{ cm}^3$$

Hence correct answer is (d).

$$4. \text{ Here ratio of edges of cuboid} = 1 : 2 : 3$$

$$\text{Zet length of cuboid} = x$$

$$\text{breadth of cuboid} = 2x, \text{ height of cuboid} = 3x$$

$$\text{Surface area of cuboid} = 88 \text{ cm}^2$$

$$2(lb + bh, + hl) = 88$$

$$2(x \times 2x + 2x \times 3x + 3x \times x) = 88$$

$$2(2x^2 + 6x^2 + 3x^2) = 88$$

$$2(11x^2) = 88 \Rightarrow 2x^2 = 88$$

$$\Rightarrow x^2 = 88 \div 22 = 4 \Rightarrow x^2 = 4 \Rightarrow x = 2$$

$$\text{Hence length of cuboid} = x = 2 \text{ cm}$$

$$\text{breadth} = 2x = 2 \times 2 = 4 \text{ cm}$$

$$\text{height} = 3x = 3 \times 2 = 6 \text{ cm}$$

$$\text{Volume of cuboid} = l \times b \times h = 2 \times 4 \times 6 = 480 \text{ cm}^3$$

Hence, (a) is the correct answer.

$$5. \text{ Here, 1 brick measuring } = l = 25 \text{ cm, } b = 11.25 \text{ cm, } h = 6 \text{ cm}$$

$$\text{Vol. of 1 brick} = l \times b \times h = 25 \times 11.25 \times 6$$

$$\text{Measuring of wall} = l = 8 \text{ m} = 800 \text{ cm, } b = 22.5 \text{ cm, } h = 6 \text{ m} = 600 \text{ cm}$$

$$\text{Vol of wall} = l \times b \times h$$

$$= 800 \times 22.5 \times 600$$

$$\text{No. of bricks} = \frac{\text{Vol. of wall}}{\text{Vol. of 1 brick}}$$

$$= \frac{800 \times 22.5 \times 600}{25 \times 11.25 \times 6} = \frac{32 \times 22.5 \times 100}{11.25}$$

$$= 32 \times 2 \times 100 = 6400$$

$$\text{Hence required no. of bricks} = 6400$$

Hence (c) is a correct answer.



## Study About Data Handling



### EXERCISE-16

1. (i) First we arrange the above data in ascending order :  
128, 132, 139, 140, 142, 143, 146, 148, 149, 152, 154  
(ii) The height of the shortest student is 128 cm  
(iii) The range of the given class  
Range = 128 to 154 that is,  $154 - 128 = 26$  cm

#### 2. Frequency Table

No. of Tomatoes	Tally Marks	No. of Tomato Plants (Frequency)
5		3
6		3
7		2
8		5
10		2
	Total	15

#### 3. Frequency Table

No. of images (Observation)	Tally Marks	No. of Pages (Frequency)
1		2
2		2
3		1
4		4
5		4
6		2
7		3
	Total	18

4. **Frequency Table**

Marks of students	Tally Marks	No. of students
3		3
4		1
5		4
6		5
7		2
8		1
9		4
	Total	20

5. **Frequency Table**

Daily consumption of electricity (in unit)	Tally Mark	No. of consumers
20		4
25		4
30		7
35		3
40		2
	Total	20

## MULTIPLE CHOICE QUESTIONS

- Data** is the collection of numerical facts relating to a particular information.  
Hence (c) is the correct answer.
- Primary data** is the one which is collected directly from the source.  
Hence (a) is the correct answer.
- Raw data** is the data obtained in the original form.  
Hence (b) is the correct answer.
- The number of times an observation is repeated is called as **frequency**.  
Hence (c) is the correct answer.





## Construction of Pie-Diagrams

### EXERCISE-17

1. Total number of student = 1260

Central angle for a mode of transport

$$= \frac{\text{No. of students using that mode}}{\text{Total no. of student}} \times 360^\circ$$

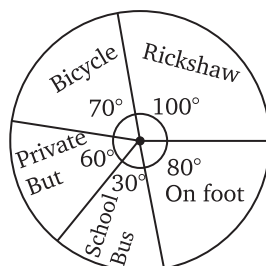
#### Calculation of Central Angle

Mode of transport	No. of students	Central Angle
Rickshaw	350	$\left( \frac{350}{1260} \times 360^\circ \right) = 100^\circ$
Bicycle	245	$\left( \frac{245}{1260} \times 360^\circ \right) = 70^\circ$
Private Bus	210	$\left( \frac{210}{1260} \times 360^\circ \right) = 60^\circ$
School Bus	175	$\left( \frac{175}{1260} \times 360^\circ \right) = 50^\circ$
On foot	280	$\left( \frac{280}{1260} \times 360^\circ \right) = 80^\circ$

2. Construction of Pie Diagram

1. Draw circle of any convenient radius
2. Draw a horizontal radius of this circle.
3. Starting with the horizontal radius. Draw sectors whose central angles are  $100^\circ$ ,  $70^\circ$ ,  $60^\circ$ ,  $50^\circ$  and  $80^\circ$  respectively.
4. Shade the sectors so obtained differently and label each one of them.

Thus we obtain the required Pi-diagram, as shown in the adjoining figure.



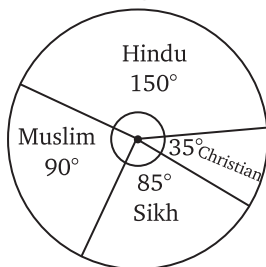
2. Total no. of workers = 1080

$$\text{Central angle of religion} = \frac{\text{No. of workers religionwise}}{\text{Total no. of workers}} \times 360^\circ$$

### Calculation of Central Angle

Religion	No. of workers	Central Angle
Hindu	450	$\left(\frac{450}{1080} \times 360^\circ\right) = 150^\circ$
Muslim	270	$\left(\frac{270}{1080} \times 360^\circ\right) = 90^\circ$
Sikh	255	$\left(\frac{255}{1080} \times 360^\circ\right) = 85^\circ$
Christian	105	$\left(\frac{105}{1080} \times 360^\circ\right) = 35^\circ$

### Construction of Pie diagram



1. Draw circle of any Convenient radius.

2. Draw a horizontal radius of this circle.

3. Starting with the horizontal radius.

Draw sectors whose central angles are 150°, 90°, 85° and 35° respectively.

4. Shade the sectors so obtained differently and label each one of them.

Thus we obtain the required pie-diagram as shown in the adjoining figure.

3. Toal marks = 540

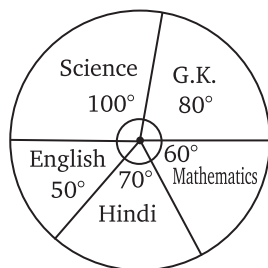
$$\text{Central angle} = \frac{\text{No. of Marks}}{\text{Total marks}} \times 360^\circ$$

### Calculation of Central Angle

Subject	Marks obtained	Central Angle
Hindi	105	$\left(\frac{105}{540} \times 360^\circ\right) = 70^\circ$
English	75	$\left(\frac{75}{540} \times 360^\circ\right) = 50^\circ$
Mathematics	90	$\left(\frac{90}{540} \times 360^\circ\right) = 60^\circ$
Science	150	$\left(\frac{150}{540} \times 360^\circ\right) = 100^\circ$
G.K.	120	$\left(\frac{120}{540} \times 360^\circ\right) = 80^\circ$

### Construction of Pie-diagram

1. Draw a circle of any convenient radius.
2. Draw a horizontal radius of the circle.
3. Starting with the horizontal radius.
4. Draw sectors whose central angle are  $70^\circ$ ,  $50^\circ$ ,  $60^\circ$ ,  $100^\circ$  and  $80^\circ$  respectively.
5. Shade the sectors so obtained differently and label each one of them.



Thus, we obtain the required pie-diagram as shown in the adjoining figure.

### MULTIPLE CHOICE QUESTIONS

1. (b) 1 : 1

2. (d) 15000

$$12\frac{1}{2}\% \text{ of } 120,000$$

$$\left(\frac{25}{2} \times \frac{120,000}{100}\right) = 25 \times 600 = ₹ 15000$$

3. (c) Cricket

4. (d) Hockey and Football



## Concept of Probability



### EXERCISE-18

1. A green marbel = 10

No. of blue marbel = 10

No. of green marbel = 8

No. of red marbel = 4

No. of yellow marbel = 12

Total no. of Marbel =  $18 + 8 + 4 + 12 = 34$

(i) Probability of green marbel =  $\frac{8}{34} = \frac{4}{17}$

**Ans.**

- (ii) A yellow marbel

Probability of yellow marbel =  $\frac{12}{34} = \frac{6}{17}$

**Ans.**

(iii) A red marbel =  $\frac{4}{34} = \frac{2}{17}$

**Ans.**

2. Total no. of trials = 200

No. of times tail appeared = 128

Probability of getting a tail =  $\frac{\text{No. of times tail appeared}}{\text{Total no. of trials}}$   
 $= \frac{128}{200} = \frac{16}{25}$

Hence, probability of getting a tail is  $\frac{16}{25}$

**Ans.**

3. Total no. of trials = 20

- (i) A head

Total no. of trials = 20

No. of times head appeared = 13

Probability of getting head =  $\frac{13}{20}$

**Ans.**

- (ii) A tail

No. of times tail appeared =  $(20 - 13) = 7$

Probability of getting tail =  $\frac{7}{20}$

**Ans.**

4. No. of blue balls = 9

No. of green balls = 9

Total no. of balls =  $9 + 9 = 18$

(i) A blue ball

Probability of getting blue ball =  $\frac{9}{18} = \frac{1}{2}$  **Ans.**

(ii) A green ball

Probability of getting green ball =  $\frac{9}{18} = \frac{1}{2}$  **Ans.**

5. Probability getting 5 =  $\frac{42}{100} = \frac{21}{50}$  **Ans.**

### MULTIPLE CHOICE QUESTIONS

1. Total no. of playing cards = 52

No. of black king cards = 2

Probability of black king =  $\frac{2}{52} = \frac{1}{26}$  **Ans.**

Hence, (b) is the correct answer.

2. Probability of winning =  $\frac{1}{3}$

Probability of lossing =  $1 - \frac{1}{3} = \frac{3-1}{2} = \frac{2}{3}$  **Ans.**

Hence, (d) is the correct answer.

3. Total no. of marble =  $4 + 7 + 4 = 15$

Red = 4, blue = 7, Green = 4

Probability of red marble =  $\frac{4}{15}$  **Ans.**

Hence, (b) is the correct answer.

4. No. of girls = 13, No. of boys = 17

Total student =  $17 + 13 = 30$

Probability of selecting girl =  $\frac{13}{30}$  **Ans.**

Hence, (d) is the correct answer.



## 19 The Cartesian System and Line Graph

1. (i)  $(3, -3)$  IV Quadrant

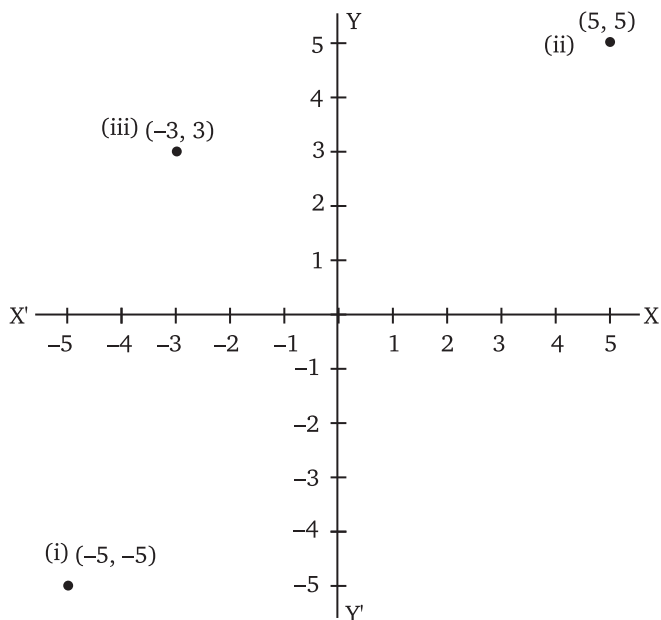
(ii)  $(-4, 3)$  II Quadrant

(iii)  $(2, 4)$  I Quadrant

2. (i)  $(-5, -5)$

(ii)  $(5, 5)$

(iii)  $(-3, 3)$



3. Write the coordinate of  $A$ ,  $B$ ,  $C$  and  $D$ .

From the graph—

Coordinate of  $A = (2, 2)$

Coordinate of  $B = (-4, 2)$

Coordinate of  $C = (-2, -3)$

Coordinate of  $D = (1, -4)$

4.  $Y = 2x - 5$

We have to find values of  $x$  and  $y$  to draw graph :

Put  $x = 1$

$$y = 2(1) - 5$$

$$y = 2 - 5$$

$$y = -3$$

$$x = 2$$

$$\Rightarrow y = 2(2) - 5$$

$$y = 4 - 5$$

$$y = -1$$

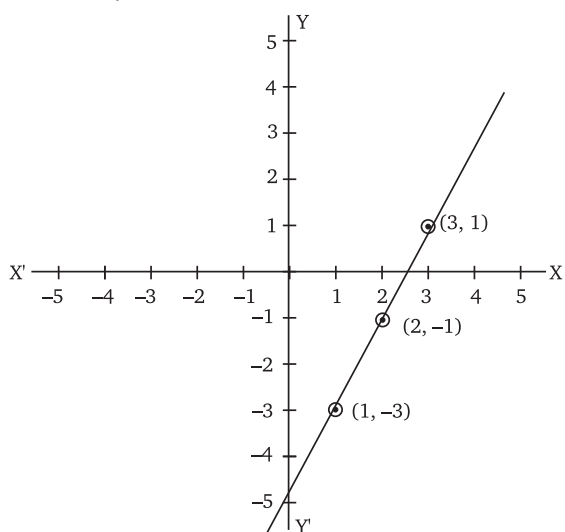
$$x = 3$$

$$\Rightarrow y = 2(3) - 5$$

$$y = 6 - 5$$

$$y = 1$$

x	1	2	3
y	-3	-1	1



5.  $Y = x^2$

We have to find values of  $x$  and  $y$  to draw the graph :

Put  $x = -1$

$$y = x^2$$

$$y = (-1)^2$$

$$y = 1$$

$$x = 0;$$

$$y = (0)^2$$

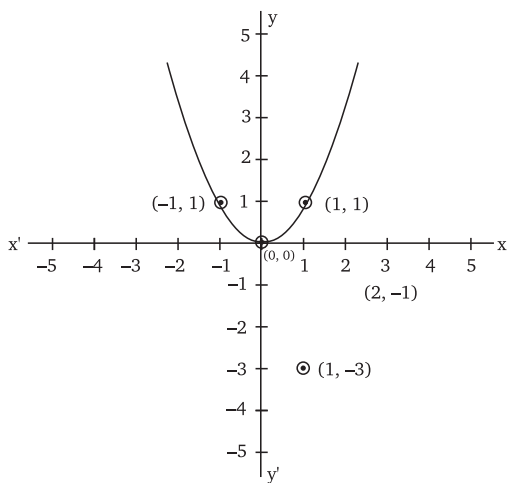
$$y = 0$$

$$x = 1;$$

$$y = (1)^2$$

$$y = 1$$

x	-1	0	1
y	1	0	1



6. (i)  $y = 2x + 11$

Put  $x = 1$

$$y = 2(1) + 11$$

$$y = 2 + 11$$

$$y = 13$$

Put  $x = 2$

$$y = 2(2) + 11$$

$$y = 4 + 11$$

$$y = 15$$

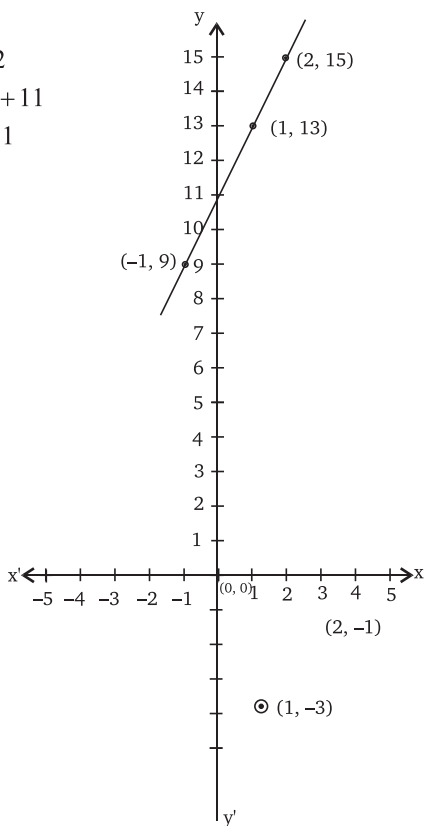
Put  $x = 3$

$$y = 2(-1) + 11$$

$$y = -2 + 11$$

$$y = 9$$

$x$	-1	1	2
$y$	9	13	15





(ii)  $y = 3x + 2$

Put  $x = -2$

$y = 3(-2) + 2$

$y = -6 + 2$

$y = -4$

$x = -1$

$y = 3(-1) + 2$

$y = -3 + 2$

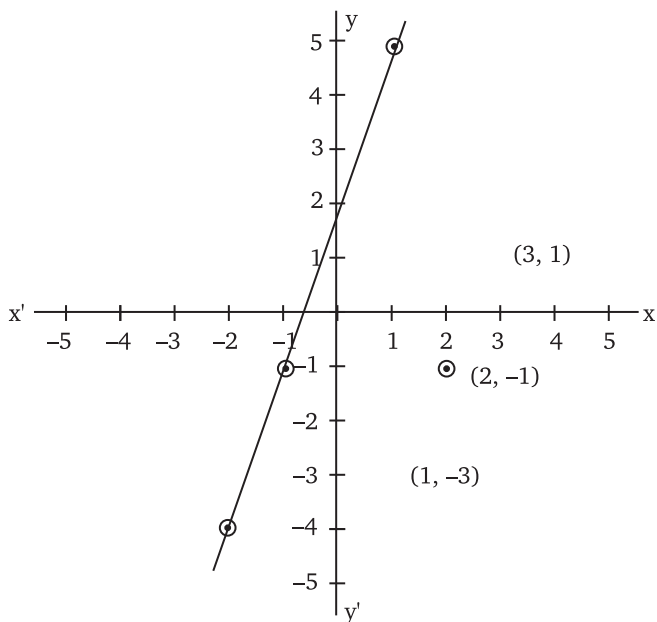
$y = -1$

$x = 1$

$y = 3(1) + 2$

$y = 3 + 2$

$y = 5$



7. (i) When  $x = 1$

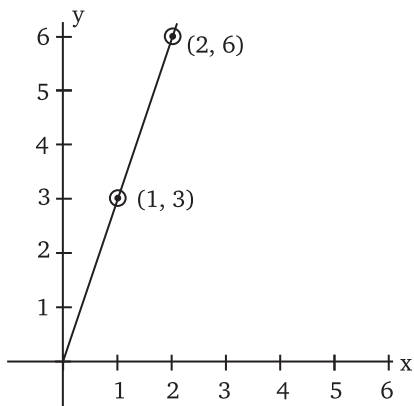
$P = 3 \times 1 = 3$

$P = 3 \quad (1, 3)$

(ii) When  $x = 2$

$P = 3 \times 2 = 6$

$P = 6 \quad (2, 6)$



## MULTIPLE CHOICE QUESTIONS

1. The point  $(4, -3)$  lies in the **IV** quadrant.

Hence, (d) is correct answer.

2. The point  $(5, 8)$  lies in the **I** quadrant.

Hence, (a) is correct answer.

3. The equation representing  $y$ -axis is  $x = 0$ .

Hence, (a) is correct answer.

4. The ordinate of a point is its distance from the  $x$ -axis.

Hence, (b) is correct answer.