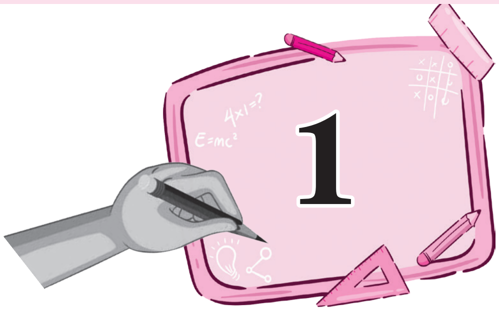


Rational Numbers

EXERCISE-1.1

1. (a) The additive inverse of $\frac{2}{-9}$ or $\left(\frac{-2}{9}\right) = \frac{2}{9}$

(b) The additive inverse of $\frac{31}{119} = \frac{-31}{119}$

(c) The additive inverse of 0 = 0

(d) The additive inverse of $\frac{-6}{-5}$ or $\left(\frac{6}{5}\right) = \frac{-6}{5}$

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

The additive inverse of $x = \frac{-2}{9}$ is $-x = \frac{2}{9}$

as $\frac{-2}{9} + \frac{2}{9} = 0$

The same equality $\frac{-2}{9} + \frac{2}{9} = 0$ shows that the additive inverse of $\frac{+2}{9}$ is $\frac{-2}{9}$ i.e., $-(-x) = x$

(ii) $x = \frac{-7}{12}$

The additive inverse of $x = \frac{-7}{12}$ *is* $-x = \frac{7}{2}$

as $\frac{-7}{12} + \frac{7}{2} = 0$

The same equality $\frac{-7}{12} + \frac{7}{12} = 0$, shows that the additive inverse of

$\frac{7}{12}$ is $\frac{-7}{12}$ or $-\left(\frac{7}{12}\right) = \frac{-7}{12}$ i.e., $-(-x) = x$.

(iii) $x = \frac{15}{17}$

The additive inverse of $x = \frac{15}{17}$ is $-x = \frac{-15}{17}$

as $\frac{15}{17} + \left(\frac{-15}{17}\right) = 0$

The same equality $\frac{15}{17} + \left(\frac{-15}{17}\right) = 0$, shows that the additive inverse of

$\frac{-15}{17}$ is $\frac{15}{17}$ or $\left(\frac{-15}{17}\right) = \frac{15}{17}$, i.e., $-(-x) = x$.

(iv) $x = \frac{5}{-6} = \frac{-5}{6}$

The additive inverse of $x = \frac{-5}{6}$ is $-x = \frac{5}{6}$ as $\frac{-5}{6} + \frac{5}{6} = 0$

The same equality $\frac{-5}{6} + \frac{5}{6} = 0$, shows that the additive inverse of $\frac{5}{6}$ is $\frac{-5}{6} = -\left(\frac{5}{6}\right) = \frac{-5}{6}$
i.e., – (– x) = x.

3. (a) The multiplicative inverse of = $\frac{-16}{19}$ is $\frac{-19}{16}$

(b) – 12

The multiplicative inverse of – 12 is = $\frac{-1}{12}$

(c) The multiplicative inverse of = $\frac{3}{7}$ is $\frac{7}{3}$

(d) The multiplicative inverse of – 1 is –1

4. (a) $\frac{7}{9} \times \frac{-1}{2} - \frac{7}{9} \times \frac{-3}{2} = \frac{7}{9}\left[\frac{-1}{2} + \left(\frac{+3}{2}\right)\right]$ (by distributivity)

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

(b) $\left[\left(\frac{-2}{7}\right) \times \left(\frac{-4}{9}\right)\right] + \left[\left(\frac{-3}{5}\right) \times \left(\frac{-4}{9}\right)\right]$

$= \left(\frac{-4}{9}\right)\left[\left(\frac{-2}{7}\right) + \left(\frac{-3}{5}\right)\right]$ (by distributivity)

$$= \frac{-4}{9} \times \left[\frac{-10 + (-21)}{35}\right] = \frac{-4}{9} \times \left[\frac{-31}{35}\right] = \frac{124}{315}$$

(c) $\left(\frac{3}{8} \times \frac{8}{10}\right) - \left[\left(\frac{-7}{9}\right) \times \frac{3}{8}\right] + \left[\frac{3}{8} \times \left(\frac{-4}{5}\right)\right] = \frac{3}{8}\left[\frac{8}{10} + \frac{7}{9} - \frac{4}{5}\right]$

$$= \frac{3}{8} \times \left[\frac{72 + 70 - 12}{90}\right] = \frac{\overset{1}{\cancel{3}}}{8} \times \frac{7\cancel{0}}{\underset{3\cancel{0}}{\cancel{90}}} = \frac{7}{24}$$

5. (a) 0 is the only rational number which negative is 0 its self.

(b) – 1 and 1 are the only rational number which are their own reciprocal.

(c) 0 is the rational number that does not have a reciprocal.

6. (a) $\frac{11}{16} \times \left(\frac{-2}{5}\right) = \left(\frac{-2}{5}\right) \times \frac{11}{16}$

$$\text{L.H.S} = \frac{11}{16} \times \frac{-2}{5} = \frac{\overset{11}{\cancel{-22}}}{\underset{40}{\cancel{80}}} = \frac{-11}{40}$$

$$\text{R.H.S} = \frac{-2}{5} \times \frac{11}{16} = \frac{\overset{11}{\cancel{-22}}}{\underset{40}{\cancel{80}}} = \frac{-11}{40}$$

$\therefore$ LHS = RHS

Commutative under multiplication property

(b) $\frac{8}{9} \times 1 = \frac{8}{9}$

L.H.S $= \frac{8}{9} \times 1 = \frac{8}{9}$

R.H.S $= \frac{8}{9}$

$\therefore$ LHS = RHS

Commutative under multiplication property

(c) $\left(\frac{-9}{11}\right) \times \frac{2}{5} = \frac{2}{5} \times \left(\frac{-9}{11}\right)$

L.H.S $= \left(\frac{-9}{11}\right) \times \frac{2}{5} = \frac{-18}{55}$

R.H.S $= \frac{2}{5} \times \frac{-9}{11} = \frac{-18}{55}$

$\therefore$ LHS = RHS

multiplicative identity

(d) $\left(\frac{3}{7} \times \frac{4}{9}\right) \times \left(\frac{-7}{12}\right) = \frac{3}{7} \times \left[\frac{4}{9} \times \left(\frac{-7}{12}\right)\right]$

L.H.S $= \left(\frac{3}{7} \times \frac{4}{9}\right) \times \left(\frac{-7}{12}\right) = \frac{4}{21} \times \frac{-7}{12} = \frac{-1}{9}$

R.H.S $= \frac{3}{7} \times \left[\frac{4}{9} \times \left(\frac{-7}{12}\right)\right] = \frac{3}{7} \times \left(\frac{-7}{27}\right) = \frac{-1}{9}$

$\therefore$ LHS = RHS

Associative property of multiplication property.

(e) $\frac{-7}{34} \times \frac{34}{-7} = 1$

L.H.S $= \frac{-7}{34} \times \frac{34}{-7} = \frac{-1}{-1} = 1$

R.H.S $= 1$

$\therefore$ LHS = RHS

Property of multiplicative inverse.

(f) $\left[\left(\frac{-8}{9}\right) \times \left(\frac{-1}{5}\right)\right] + \left[\left(\frac{-8}{9}\right) \times \left(\frac{-3}{7}\right)\right] = \left(\frac{-8}{9}\right) \times \left[\left(\frac{-1}{5}\right) + \left(\frac{-3}{7}\right)\right]$

L.H.S $= \left[\left(\frac{-8}{9}\right) \times \left(\frac{-1}{5}\right)\right] + \left[\left(\frac{-8}{9}\right) \times \left(\frac{-3}{7}\right)\right] = \frac{8}{45} + \frac{8}{21} = \frac{56 + 120}{315} = \frac{176}{315}$

R.H.S $= \left(\frac{-8}{9}\right) \times \left[\left(\frac{-1}{5}\right) + \left(\frac{-3}{7}\right)\right] = \frac{-8}{9} \times \left[\frac{-7 - 15}{35}\right] = \frac{-8}{9} \times \frac{-22}{35} = \frac{176}{315}$

$\therefore$ LHS = RHS

Distributive property.

7. (a) $\left[\left(\frac{-8}{5}\right)\times\frac{3}{4}\right]+\left[\frac{7}{8}\times\left(\frac{-16}{25}\right)\right]$

$=\left[\left(\frac{-8}{5}\right)\times\frac{3}{4}\right]+\left[\frac{7}{8}\times\left(\frac{-8\times 2}{5\times 5}\right)\right]=\left[\left(\frac{-8}{5}\right)\times\frac{3}{4}\right]+\left[\frac{7}{8}\times\frac{2}{5}\times\left(\frac{-8}{5}\right)\right]$

$=\left(\frac{-8}{5}\right)\times\left[\frac{3}{4}+\frac{7}{20}\right]=\frac{-8}{5}\times\left(\frac{15+7}{20}\right)=\frac{-8}{5}\times\frac{22}{20}=\frac{-44}{25}$

(b) $\left(\frac{2}{9}\times\frac{3}{6}\right)+\left(\frac{3}{4}\div\frac{12}{5}\right)-\left[\frac{1}{4}-\left(\frac{1}{4}\times\frac{2}{3}\right)\right]$

$=\left(\frac{2}{9}\times\frac{3}{6}\right)+\left(\frac{3}{4}\times\frac{5}{12}\right)-\left[\frac{1}{4}-\left(\frac{1}{2}\times\frac{1}{2}\times\frac{2}{3}\right)\right]=\left(\frac{2}{9}\times\frac{3}{6}\right)+\left(\frac{3}{4}\times\frac{5}{6}\times\frac{1}{2}\right)-\left[\frac{1}{4}-\frac{1}{6}\right]$

$=\frac{1}{9}+\frac{5}{16}-\left[\frac{3-2}{12}\right]=\frac{1}{9}+\frac{5}{16}-\frac{1}{12}=\frac{16+45-12}{144}=\frac{49}{144}$

(c) $=\left[\left(\frac{-3}{4}\right)\times\frac{8}{15}\right]-\left[\frac{2}{5}\times\left(\frac{-5}{8}\right)\right]-\left[\left(\frac{-3}{8}\right)\times\left(\frac{-2}{9}\right)\right]$

$=\left[\left(\frac{-3}{4}\right)\times\frac{8}{15}\right]-\left[1\times\left(\frac{-1}{4}\right)\right]-\left[\left(\frac{-1}{4}\right)\times\left(\frac{-1}{3}\right)\right]=\frac{1}{4}\left[\frac{-8}{5}+\frac{1}{1}+\frac{1}{3}\right]$

$=\frac{1}{4}\left(\frac{-24+15-5}{15}\right)=\frac{1}{4}\left(\frac{-24+10}{15}\right)=\frac{1}{\cancel{4}_{2}}\left(\frac{-14}{15}\right)=\frac{-7}{30}$

8. Additive inverse of 7 = – 7

Multiplicative inverse of 7 = $\frac{1}{7}$

Sum of additive inverse and multiplicative inverse = $\frac{-7}{1}+\frac{1}{7}=\frac{-49+1}{7}=\frac{-48}{7}$

EXERCISE-1.2

1. (a) $\frac{1}{3}$ and $\frac{1}{2}$

$=\left(\frac{1}{3}+\frac{1}{2}\right)\div 2=\left(\frac{2+3}{6}\right)\div 2=\frac{5}{6}\div 2$

$=\frac{5}{6}\times\frac{1}{2}=\frac{5}{12}=\frac{1}{3}<\frac{5}{12}<\frac{1}{2}$

$\therefore\ \frac{5}{12}$ is one rational number between these rational number.

(b) $\frac{-5}{6}$ and $\frac{-2}{5}$

$=\left(\frac{-5}{6}+\frac{-2}{5}\right)\div 2=\frac{(-25)+(-12)}{30}\div 2=\frac{-37}{30}\times\frac{1}{2}=\frac{-37}{60}$

$\frac{-37}{60}$ lies between $\frac{-5}{6}$ and $\frac{-2}{5}$

$\therefore\ \frac{-5}{6}<\frac{-37}{60}<\frac{-2}{5}$

(c) $\frac{-4}{9}$ and $\frac{11}{6}$

$= \left(\frac{-4}{9} + \frac{11}{6}\right) \div 2 = \left(\frac{-8+33}{18}\right) \div 2 = \frac{25}{18} \div 2 = \frac{25}{18} \times \frac{1}{2} = \frac{25}{36}$

$\frac{25}{36}$ lies between $\frac{-4}{9}$ and $\frac{11}{6}$

$\therefore \frac{-4}{9} < \frac{25}{36} < \frac{11}{6}$

2. (a) $\frac{-2}{3}$ and $\frac{1}{4}$

We first convert $\frac{-2}{3}$ and $\frac{1}{4}$ to rational with the same denominators.

$\frac{-2 \times 4}{3 \times 4} = \frac{-8}{12}$ and $\frac{1 \times 3}{4 \times 3} = \frac{3}{12}$

Thus, $\frac{-7}{12}, \frac{-6}{12}$ are the two rational number between $\frac{-2}{3}$ and $\frac{1}{4}$.

(b) – 2 and 2

$-2 < -1 < 1 < 2$

Thus, – 1 and 1 are two rational numbers between – 2 and 2.

3. (a) $\frac{1}{4}$ and $\frac{5}{3}$

First convert $\frac{1}{4}$ and $\frac{5}{3}$ to rational number with the same denominators.

$\frac{1 \times 3}{4 \times 3} = \frac{3}{12}$ and $\frac{5 \times 4}{3 \times 4} = \frac{20}{12}$

Thus, $\frac{3}{12} < \frac{4}{12} < \frac{5}{12} < \frac{6}{12} < \frac{20}{12}$

$\therefore \frac{4}{12}, \frac{5}{12}, \frac{6}{12}$ are three rational numbers between $\frac{1}{4}$ and $\frac{5}{3}$.

(b) -2 and $\frac{-7}{2}$

$\frac{-2}{1}$ and $\frac{-7}{2}$

$\frac{-2 \times 4}{1 \times 4} = \frac{-8}{4}$ and $\frac{-7 \times 2}{2 \times 2} = \frac{-14}{4}$

Thus, $\frac{-8}{4} > \frac{-9}{4} > \frac{-10}{4} > \frac{-11}{4} > \frac{-14}{4}$

$\therefore \frac{-9}{4}, \frac{-10}{4}$ and $\frac{-11}{4}$ are three rational numbers between -2 and $\frac{-7}{2}$.

4. (a) $\frac{-1}{4}$ and $\frac{-7}{8}$

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

Thus, $-\frac{2}{8}>\frac{-3}{8}>\frac{-4}{8}>\frac{-5}{8}>\frac{-6}{8}>\frac{-7}{8}$

$\therefore$ $\frac{-3}{8},\frac{-4}{8},\frac{-5}{8}$ and $\frac{-6}{8}$ are four rational numbers between $\frac{-1}{4}$ and $\frac{-7}{8}$.

(b) -1 and $\frac{-1}{2}$

$\frac{-1\times 10}{1\times 10}=\frac{-10}{10}$ and $\frac{-1\times 5}{2\times 5}=\frac{-5}{10}$

Thus, $\frac{-10}{10}<\frac{-9}{10}<\frac{-8}{10}<\frac{-7}{10}<\frac{-6}{10}<\frac{-5}{10}$

$\therefore$ $\frac{-9}{10},\frac{-8}{10},\frac{-7}{10},\frac{-6}{10}$ are four rational numbers between -1 and $\frac{-1}{2}$.

5. $\frac{1}{3}$ and $\frac{2}{3}$

$\frac{1}{3}$ as $\frac{10}{30}$ and $\frac{2}{3}$ as $\frac{20}{30}$

Thus, we have $\frac{11}{30},\frac{12}{30},\frac{13}{30},\frac{14}{30},\frac{15}{30},\frac{16}{30},\frac{17}{30},\frac{18}{30},\frac{19}{30}$ between $\frac{1}{3}$ and $\frac{2}{3}$.

$\therefore$ we can take any five rational numbers from these numbers.

6. $\frac{-3}{2}$ and $\frac{5}{3}$

$\frac{-3}{2}$ as $\frac{-9}{6}$ and $\frac{5\times 2}{3\times 2}=\frac{10}{6}$

Thus $\frac{-9}{6}<\frac{-8}{6}<\frac{-7}{6}<\frac{-6}{6}<\frac{-5}{6}<\frac{-4}{6}<\frac{-3}{6}<\frac{-2}{6}<.....<\frac{10}{6}$

$\therefore$ we can take any six rational numbers from these numbers.

7. $\frac{-2}{5}$ and $\frac{1}{2}$

$\frac{-2}{5}$ as $\frac{-8}{20}$ and $\frac{1}{2}$ as $\frac{10}{20}$

Thus, we have $\frac{-7}{20},\frac{-6}{20},\frac{-5}{20},......\frac{8}{20},\frac{9}{20}$ as rational between $\frac{-8}{20}$ and $\frac{10}{20}$

$\therefore$ we can take any ten rational numbers from these numbers.

8. $= \frac{-3}{13}$ and $\frac{9}{13} = \frac{-3}{13}$ as $\frac{-30}{130}$ and $\frac{9}{13}$ as $\frac{90}{130}$

Thus, we have

$= \frac{-29}{130}, \frac{-28}{130}, \frac{-27}{130}, \frac{-26}{130}, ...\frac{88}{130}, \frac{89}{130}$ as rational number between $\frac{-30}{130}$ and $\frac{90}{130}$

$\therefore$ we can take any 100 rational numbers from these numbers.

9. Infinite rational numbers.

NCERT CORNER

EXERCISE-1.1

1. (a) $\frac{-2}{3} \times \frac{3}{5} + \frac{5}{2} - \frac{3}{5} \times \frac{1}{6}$

$= \left(\frac{-2}{3} \times \frac{3}{5}\right) + \left(\frac{3}{5} \times \frac{1}{6}\right) + \frac{5}{2}$ (Using commutativity property)

$= \left(\frac{-3}{5}\right) \times \left(\frac{2}{3} + \frac{1}{6}\right) + \frac{5}{2}$ (Distributing property)

$= \frac{-3}{5} \times \left[\frac{4+1}{6}\right] + \frac{5}{2} = \frac{-3}{5} \times \frac{5}{6} + \frac{5}{2} = \frac{-1}{2} + \frac{5}{2} = \frac{4}{2} = 2$

(b) $\frac{2}{5} \times \left(\frac{-3}{7}\right) - \frac{1}{6} \times \frac{3}{2} + \frac{1}{14} \times \frac{2}{5}$

$= \left[\frac{2}{5} \times \left(\frac{-3}{7}\right)\right] + \left(\frac{1}{14} \times \frac{2}{5}\right) + \left(\frac{-1}{6} \times \frac{3}{2}\right)$ (By commutativity)

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

$= \frac{2}{5} \times \left(\frac{-6+1}{14}\right) - \frac{1}{4} = \frac{2}{5} \times \frac{-5}{14} - \frac{1}{4} = \frac{-2}{7} - \frac{1}{4} = \frac{-4-7}{28} = \frac{-11}{28}$

2. (a) Additive Inverse of $\frac{2}{8} = \frac{-2}{8}$

(b) Additive inverse of $\frac{-5}{9} = \frac{5}{9}$

(c) Additive inverse of $\frac{-6}{-5} = \frac{-6}{5}$

(d) Additive inverse of $\frac{2}{-9} = \frac{2}{9}$

(e) Additive inverse of $\frac{19}{-6} = \frac{19}{6}$

3. (a) $= x = \frac{11}{15}$

The additive inverse of $x = \frac{11}{15}$ is $-x = \frac{-11}{15}$ as $\frac{11}{15} + \left(\frac{-11}{15}\right) = 0$

This equality $\frac{11}{15} + \left(\frac{-11}{15}\right) = 0$, represent that the additive inverse of

$\frac{-11}{15}$ is $\frac{11}{15}$ or $-\left(\frac{-11}{15}\right) = \frac{11}{15}$, i.e., $-(-x) = x$.

(b) $x = \frac{-13}{17}$

The additive inverse of $x = \frac{-13}{17}$ is $-x = \frac{13}{17}$ as $\frac{-13}{17} + \frac{13}{17} = 0$

This equality $\frac{-13}{17} + \left(\frac{13}{17}\right) = 0$, represent that the additive inverse of

$\frac{13}{17}$ is $\frac{-13}{17}$ or $-\left(\frac{13}{17}\right) = \frac{-13}{17}$, i.e., $-(x) = x$.

4. (a) Multiplicative inverse of $-13 = \frac{-1}{13}$

(b) Multiplicative inverse of $\frac{-13}{19} = \frac{-19}{13}$

(c) Multiplicative inverse of $-$

(d) Multiplicative inverse of $\frac{-5}{8} \times \frac{-3}{7} = \frac{-8}{5} \times \frac{-7}{3} = \frac{56}{15}$

(e) Multiplicative inverse of $-1 \times \frac{-2}{5} = -1 \times \frac{-5}{2} = \frac{5}{2}$

(f) Multiplicative inverse of – 1 is – 1.

5. (a) $\frac{-4}{5} \times 1 = 1 \times \frac{-4}{5} = \frac{-4}{5}$

Multiplicative identify

(b) $\frac{-13}{17} \times \frac{-2}{7} = \frac{-2}{7} \times \frac{-13}{17}$

Commutativity

(c) $\frac{-19}{29} \times \frac{29}{-19} = 1$

Multiplicative inverse

6. $\frac{6}{13} \times \left(\text{reciprocal of } \frac{-7}{16}\right)$

$\frac{6}{13} \times \frac{16}{-7} = \frac{-96}{91}$

7. Associativity

8. $-1\frac{1}{8} = -\frac{9}{8}$

Multiplicative inverse of $\frac{-9}{8} = \frac{-8}{9}$

$\frac{-8}{9}$ is not equal to $\frac{8}{9}$

$\therefore$ $\frac{8}{9}$ is not the multiplicative inverse of $-1\frac{1}{8}$.

9. $3\frac{1}{3} = \frac{10}{3}$

$0.3 \times 3\frac{1}{3} = \frac{0\cancel{3}}{\cancel{10}} \times \frac{\overset{1}{\cancel{10}}}{\cancel{3}} = 1$

Here, the product is 1. Hence, 0.3 is the multiplicative inverse of $3\frac{1}{3}$.

10. (a) 0 is the rational number but its reciprocal is not defined.

(b) 1 and – 1 are the rational number that are equal to their reciprocals.

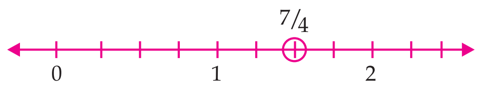
(c) 0 is the rational number that is equal to its negative.

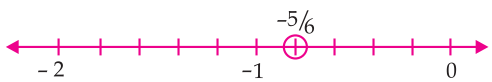
11. (a) No (b) 1, – 1

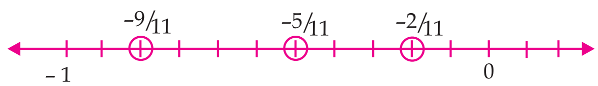
(c) $-\frac{1}{5}$ (d) x

(e) Rational number (f) Positive rational number

EXERCISE-1.2

1. (a) 

(b) 

2. 

3. 2 can be represented as $\frac{14}{7}$

∴ five rational numbers smaller than 2 are $\frac{13}{7}, \frac{12}{7}, \frac{11}{7}, \frac{10}{7}, \frac{9}{7}$

4. $\frac{-2}{5}$ and $\frac{1}{2}$ can be represented as $\frac{-8}{20}$ and $\frac{10}{20}$ respectively.

∴ ten rational number between $\frac{-2}{5}$ and $\frac{1}{2}$ are $\frac{-7}{20}, \frac{-6}{20}, \frac{-5}{20}, \frac{-4}{20}, \frac{-3}{20}, \frac{-2}{20}, \frac{-1}{20}, 0, \frac{1}{20}, \frac{2}{20}$.

5. (a) $\frac{2}{3}$ and $\frac{4}{5}$ can be represented as $\frac{30}{45}$ and $\frac{36}{45}$ respectively.

∴ five rational number between $\frac{2}{3}$ and $\frac{4}{5}$ are $\frac{31}{45}, \frac{32}{45}, \frac{33}{45}, \frac{34}{45}, \frac{35}{45}$.

(b) $\frac{-3}{2}$ and $\frac{5}{3}$ can be represented as $\frac{-9}{6}$ and $\frac{10}{6}$ respectively.

∴ five rational numbers between $\frac{-3}{2}$ and $\frac{5}{3}$ are $\frac{-8}{6}, \frac{-7}{6}, \frac{-6}{6}, \frac{-5}{6}, \frac{-4}{6}$.

(c) $\frac{1}{4}$ and $\frac{1}{2}$ can be represented as $\frac{8}{32}$ and $\frac{16}{32}$ respectively.

∴ five rational numbers between $\frac{1}{4}$ and $\frac{1}{2}$ are $\frac{9}{32}, \frac{10}{32}, \frac{11}{32}, \frac{12}{32}, \frac{13}{32}$.

6. – 2 can be represented as $= \frac{-14}{7}$

∴ five rational numbers greater than – 2 are $= \frac{-13}{7}, \frac{-12}{7}, \frac{-11}{7}, \frac{-10}{7}, \frac{-9}{7}$.

7. $\frac{3}{5}$ and $\frac{3}{4}$ can be represented as $\frac{48}{80}$ and $\frac{60}{80}$

∴ ten rational numbers between $\frac{3}{5}$ and $\frac{3}{4}$ are $\frac{49}{80}, \frac{50}{80}, \frac{51}{80}, \frac{52}{80}, \frac{53}{80}, \frac{54}{80}, \frac{55}{80}, \frac{56}{80}, \frac{57}{80}, \frac{58}{80}$.

SUBJECT ENRICHMENT EXERCISE

I. (1) $\frac{x+4}{2}$ (2) $\frac{11}{260}$ (3) $\frac{-2}{5}$ (4) $\frac{32}{63}$

(5) 0 (6) 4 (7) $6\frac{1}{3}$ (8) $\frac{65}{28}$

II. (a) Commutativity (b) Rational number (c) $\frac{1}{12}$ (d) 1

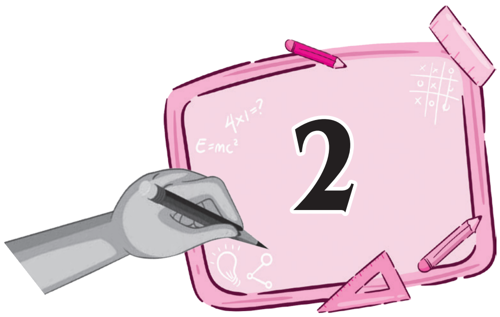
(e) Infinite (f) 1 and – 1 (g) $\frac{4}{7}$ (h) 0

(i) Distributive property

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

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

(i) True (j) True (k) False



Linear Equation in One Variable

EXERCISE-2.1

1. (a) $x - 7 = 5$

$x - 7 + 7 = 5 + 7$

$x = 12$

(b) $x - 5 = 4$

$x - 5 + 5 = 4 + 5$

$x = 9$

(c) $x - 7 = 18$

$x - 7 + 7 = 18 + 7$

$x = 25$

(d) $x - 30 = 72$

$x - 30 + 30 = 72 + 30$

$x = 102$

(e) $x + 35 = 175$

$x + 35 - 35 = 175 - 35$

$x = 140$

(f) $y - 15 = -22$

$y - 15 + 15 = -22 + 15$

$y = -7$

(g) $x - 10 = 63$

$x - 10 + 10 = 63 + 10$

$x = 73$

(h) $x - 40 = -50$

$x - 40 + 40 = -50 + 40$

$x = -10$

(i) $x - 15 = -29$

$x - 15 + 15 = -29 + 15$

$x = -14$

(j) $t - 114 = 26$

$t - 114 + 114 = 26 + 114$

$t = 140$

(k) $x - 86 = -42$

$x - 86 + 86 = -42 + 86$

$x = 44$

(l) $k - 64 = 164$

$k - 64 + 64 = -42 + 86$

$k = 228$

2. Let the number = x

A.T.Q

$\frac{1}{2}x + 7 = 42$

$\frac{1}{2}x + 7 - 7 = 42 - 7$

$\frac{1}{2}x = 35$

$x = 35 \times 2 = 70$

$\therefore$ The number = 70

3. Let the multiple of 8 = x

The next number = $x + 8$

The next to this is = $x + 8 + 8 = x + 16$

A.T.Q

$x + (x + 8) + (x + 16) = 96$

$3x + 24 = 96$

$3x + 24 - 24 = 96 - 24$

$3x = 72$

$\frac{3x}{3} = \frac{72}{3}$

$x = 24$

$\therefore$ the first multiple of 8 = 24

The second multiple of 8 = 24+8=32.

The third multiple of 8=32+8=40

4. Let the angles be $1x$ and $5x$
The sum of a right angled triangle = 180°
$x + 5x + 90° = 180°$
$6x + 90° = 180°$
$6x = 180° – 90°$
$6x = 90$
$$\frac{6x}{6} = \frac{90°}{6}$$
$\therefore$ The first angle = 15°

The second angle = $5x$ = 15 × 5 = 75°
The third angle = 90°

5. Let the second part = x
The first part = $3x + 4$
A.T.Q
$x + (3x + 4) = 1260$
$4x + 4 = 1260$
$4x + 4 – 4 = 1260 – 4$

$4x = 1256$
$$\frac{4x}{4} = \frac{1256}{4}$$
$x = 314$
$\therefore$ The second part = ₹ 314
The first part = $(3x + 4)$ = 3 (314) + 4
= 942 + 4 = ₹ 946

6. Let present age of Soma = $2x$
Present age of Renna = $3x$
After 5 years, Soma's age = $2x + 5$
After 5 years, Reena's age = $3x + 5$
A.T.Q
$(2x + 5) + (3x + 5) = 55$

$5x + 10 = 55$

$5x = 55 – 10$
$$\frac{5x}{5} = \frac{\cancel{45}^{9}}{5}$$
$x = 9$
$\therefore$ Soma's present age = $2x$ = 2(9) = 18 years
Reena's present age = $3x$ = 3(9) = 27 years

7. Let the vertex angle = x
and base angle = $4x$
Sum of the Δ = 180°
A.T.Q
$x + 4x + 4x = 180°$
$9x = 180°$
$$\frac{9x}{9} = \frac{180}{9}$$
$\therefore$ The vertex angle = x = 20

The equal base angle = 4 × 20 = 80 each

8. Let the length of rectangle = x
The breadth of rectangle = $\frac{x}{3} – 5$
Perimeter = 142 cm
2 (L + B) = 142
$$2\left(x + \frac{x}{3} - 5\right) = 142$$
$$2\left(\frac{3x + x - 15}{3}\right) = 142$$
$$\frac{\cancel{2}^{1}}{\cancel{2}}\left(\frac{4x - 15}{3}\right) = \frac{\cancel{142}^{71}}{\cancel{2}}$$
$$\frac{4x - 15}{3} = 71$$
$4x – 15 = 71 × 3$
$4x – 15 = 213$
$4x = 213 + 15$
$4x = 228$
$$x = \frac{228}{4}$$
$x = 57$
$\therefore$ Length = 57 cm
Breadth = $\frac{57}{3} - 5 = 19 - 5 = 14$ cm

9. Let the number of ₹ 125 tickets sold = x
Let the number of ₹ 75 tickets sold = $70 – x$
A.T.Q
$125x + 75 (70 – x) = 8000$

$125x + 5250 – 75x = 8000$

$50x = 8000 – 5250$

$50x = 2750$
$$x = \frac{2750}{50}$$
$x = 55$
So, the number of ₹ 125 tickets sold = 55
The number of ₹ 75 tickets sold = 70 – 55 = 15

10. Passing marks = 274 + 16 = 290

Total marks = x

Marks required to pass = 40% of x

$$290 = \frac{40}{100} \times x$$

$$290 \times \frac{100}{40} = \frac{40}{100} \times \frac{100}{40} x$$

$x = 725$

$\therefore$ Total marks = 725 marks

11. Let the number of ₹ 500 notes withdraw = x

Let the number of ₹ 100 notes withdraw = $150 - x$

A.T.Q

$500x + (150 - x)\ 100 = 25000$

$500x + 15000 - 100x = 25000$

$400x = 25000 - 15000$

$400x = 10000$

$$x = \frac{\cancel{10000}^{25}}{\cancel{400}}$$

$x = 25$ notes

$\therefore$ The number of ₹ 500 notes = 25 notes

The number of ₹ 100 notes - 150 – 25 = 125 notes

EXERCISE-2.2

1. (a) $5y - 3 = 9 + 2y$

$5y - 3 - 2y = 9 + 2y - 2y$

$3y - 3 = 9$

$3y - 3 + 3 = 9 + 3$

$3y = 12$

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

$y = 4$

Check:

LHS = 5(4) – 3 = 20 – 3 = 17

RHS = 9 + 2(4) = 9 + 8 = 17

LHS = RHS

(b) $4a + 3(a + 1) = 15 - (3a - 3)$

$4a + 3a + 3 = 15 - 3a + 3$

$7a + 3 = 18 - 3a$

$7a + 3a = 18 - 3$

$10a = 15$

$$a = \frac{\overset{3}{\cancel{15}}}{\underset{2}{\cancel{10}}} = \frac{3}{2}$$

Check:

$4a + 3(a + 1) = 15 – (3a – 3)$

$$\overset{2}{\cancel{4}}\left(\frac{3}{\cancel{2}}\right) + 3\left(\frac{3}{2} + 1\right) = 15 - \left[3\left(\frac{3}{2}\right) - 3\right]$$

$$6 + 3 \times \left(\frac{3+2}{2}\right) = 15 - \left[\frac{9}{2} - 3\right]$$

$$6 + 3 \times \frac{5}{2} = 15 - \left(\frac{9-6}{2}\right)$$

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

$$\frac{12+15}{2} = \frac{30-3}{2}$$

$$\frac{27}{2} = \frac{27}{2}$$

LHS = RHS

(c) $0.3 (2x – 3) = 0.4x + 1.1$

$0.6x – 0.9 = 0.4x + 1.1$

$0.6x – 0.4x = 1.1 + 0.9$

$0.2x = 2.0$

$$x = \frac{20}{02} \times \frac{\cancel{10}}{\cancel{10}}$$

$$x = \frac{\overset{10}{\cancel{20}}}{\cancel{2}} = 10$$

Check:

$0.3 [2(10) – 3] = 0.4 \times 10 + 1.1$

$0.3 [20 – 3] = 4.0 + 1.1$

$0.3 [17] = 5.1$

$5.1 = 5.1$

LHS = RHS

(d) $\dfrac{7x + 4}{3x - 2} = \dfrac{10}{3}$

$(7x + 4) 3 = 10 (3x – 2)$

$21x + 12 = 30x – 20$

$21x – 30x = – 20 – 12$

$– 9x = – 32$

$$x = \frac{-32}{-9}$$

Check:

$$\frac{7x+4}{3x-2} = \frac{10}{3}$$

$$\frac{7\left(\frac{32}{9}\right)+4}{3\left(\frac{32}{9}\right)-2} = \frac{10}{3}$$

$$\frac{\frac{224}{9}+4}{\frac{96}{9}-2} = \frac{10}{3}$$

$$\frac{\frac{260}{9}}{\frac{78}{9}} = \frac{10}{3}$$

$$\frac{260}{9} \times \frac{9}{78} = \frac{10}{3}$$

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

LHS = RHS

(e) $3.2\,(2 - x) = 0.8\,(2x - 4)$

$6.4 - 3.2x = 1.6x - 3.2$

$6.4 + 3.2 = 1.6x + 3.2x$

$9.6 = 4.8x$

$$\frac{9.6}{4.8} = x$$

$$\frac{\overset{2}{\cancel{96}}}{\cancel{10}} \times \frac{\cancel{10}}{\underset{1}{\cancel{48}}} = x$$

$$\frac{96}{48} = x$$

$x = 2$

Check:

$3.2\,(2 - 2) = 0.8\,[2\,(2) - 4]$

$3.2\,(0) = 0.8\,(4 - 4)$

$0 = 0.8\,(0)$

$0 = 0$

LHS = RHS

(f)

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

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

$$\frac{a+5}{3} = 3 + a - 4$$

$$\frac{a+5}{3} = a - 1$$

$a + 5 = 3\,(a - 1)$

$a + 5 = 3a - 3$

$3a - a = 5 + 3$

$2a = 8$

$a = 4$

Check:

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

$$4 - \frac{(8 - 5)}{3} = 3 + 0$$

$$4 - \frac{\overset{1}{\cancel{3}}}{\cancel{3}} = 3$$

$$4 - 1 = 3$$

$$3 = 3$$

LHS = RHS

(g) $$4 - \frac{2(z - 4)}{3} = \frac{1}{2}(2_z + 5)$$

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

$$\frac{12 - 2_z + 8}{3} = \frac{2_z + 5}{2}$$

$$\frac{20 - 2_z}{3} = \frac{2_z + 5}{2}$$

$$(20 - 2z)\,2 = (2z + 5)\,3$$

$$40 - 4z = 6z + 15$$

$$40 - 15 = 6z + 4z$$

$$25 = 10z$$

$$z = \frac{\overset{5}{\cancel{25}}}{\underset{2}{\cancel{10}}} = \frac{5}{2}$$

Check:

$$4 - \frac{2\left(\frac{5}{2} - 4\right)}{3} = \frac{1}{2}\left[2\left(\frac{5}{2}\right) + 5\right]$$

$$4 - \frac{5 - 8}{3} = \frac{1}{2}[5 + 5]$$

$$4 - \frac{(-\overset{1}{\cancel{3}})}{\cancel{3}} = \frac{1}{2}(10)$$

$$4 + 1 = 5$$

$$5 = 5$$

LHS = RHS

(h) $\frac{x-2}{3} - \left[\frac{3}{4} - \frac{x-3}{2}\right] = \frac{x-5}{6} - x$

$$\frac{x-2}{3} - \left[\frac{3-2x+6}{4}\right] = \frac{x-5-6x}{6}$$

$$\frac{x-2}{3} - \left[\frac{9-2x}{4}\right] = \frac{-5x-5}{6}$$

$$\frac{4x-8-27+6x}{12} = \frac{-5x-5}{6}$$

$$\frac{10x-35}{12} = \frac{-5x-5}{6}$$

$$6\,(10x-35) = (-5x-5)\,12$$

$$60x - 210 = -60x - 60$$

$$60x + 60x = -60 + 210$$

$$120x = 150$$

$$x = \frac{\overset{5}{\cancel{15}}\cancel{0}}{\underset{3}{\cancel{12}}\cancel{0}} = \frac{5}{4}$$

Check:

$$\frac{\frac{5}{4}-2}{3} - \left[\frac{3}{4} - \frac{\frac{5}{4}-3}{2}\right] = \frac{\frac{5}{4}-5}{6} - \frac{5}{4}$$

$$\frac{\frac{5-8}{4}}{3} - \left[\frac{3}{4} - \frac{\frac{5-12}{4}}{2}\right] = \frac{\frac{5-20}{4}}{6} - \frac{5}{4}$$

$$\frac{\frac{-3}{4}}{3} - \left[\frac{3}{4} - \frac{\frac{-7}{4}}{2}\right] = \frac{\frac{-15}{4}}{6} - \frac{5}{4}$$

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

$$\frac{-1}{4} - \left[\frac{6+7}{8}\right] = \frac{-5}{8} - \frac{5}{4}$$

$$\frac{-1}{4} - \frac{13}{8} = \frac{-5-10}{8}$$

$$\frac{-2-13}{8} \quad \frac{-15}{8}$$

$$\frac{-15}{8} \quad \frac{-15}{8}$$

LHS = RHS

2. Let the number = x

A.T.Q

$$\frac{7}{3}x = \frac{x}{6} + 13$$

$$\frac{7x}{3} = \frac{x + 78}{6}$$

$7x \times 6 = (x + 78)\,3$

$42x = 3x + 234$

$42x - 3x = 234$

$39x = 234$

$$x = \frac{\cancel{234}^{\cancel{78}^{6}}}{\cancel{39}_{\cancel{13}_{1}}} = 6$$

$\therefore$ The number = 6

3. Let the present age of Ramesh = x years

The present age of his father = $3x$ years

After 12 years, Ramesh's age = $x + 12$

After 12 years, Ramesh's father's age = $3x + 12$

A.T.Q

$2\,(x + 12) = 3x + 12$

$2x + 24 = 3x + 12$

$2x - 3x = 12 - 24$

$-x = -12$

$x = 12$

The present age of Ramesh = 12 years

The present age of Ramesh's father = 3 × 12 = 36 years

4. Let the total distance covered by Amit = x km

The distance covered by train = $\frac{2}{5}$ of $x = \frac{2}{5}x$

The distance covered by taxi = $\frac{1}{3}$ of $x = \frac{1}{3}x$

The distance covered by bus = $\frac{1}{6}$ of $x = \frac{x}{6}$

The distance covered by on foot = 6 km

A.T.Q

$$\frac{2}{5}x + \frac{1}{3}x + \frac{x}{6} + \frac{6}{1} = x$$

$$\frac{12x + 10x + 5x + 180}{30} = x$$

$$\frac{27x + 180}{30} = x$$

$27x + 180 = 30x$

$180 = 30x - 27x$

$180 = 3x$

$x = \frac{180}{3}$

$x = 60$ km

$\therefore$ The length of this journey = 60 km.

5. Let the present age of Shreya = x years

After 15 years, Shreya's age = $(x + 15)$ years

15 year ago, Shreya's age = $(x - 15)$ years

A.T.Q

$(x + 15) = 4(x - 15)$

$x + 15 = 4x - 60$

$4x - x = 15 + 60$

$3x = 75$

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

$x = 25$ years

$\therefore$ She is now = 25 years old.

6. Let the unit place = x

The ten's place = $8 - x$

$\therefore$ Original number = $10(8 - x) + x$

$= 80 - 10x + x = 80 - 9x$

On reserving the digits, we have x at the ten's place and $(8 - x)$ at the unit place.

$\therefore$ New number = $10x + (8 - x) = 9x + 8$

A.T.Q

$(80 - 9x) + 18 = 9x + 8$

$80 - 9x + 18 = 9x + 8$

$98 - 9x = 9x + 8$

$98 - 8 = 9x + 9x$

$90 = 18x$

$x = \frac{90}{18} = 5$

$\therefore$ The original number = $80 - 9x = 80 - 9(5) = 80 - 45 = 35$

7. Let the number be x

Ist number = $4x$

IInd number = $5x$

IIIrd number = $7x$

A.T.Q

$4x + 7x = 5x + 72$

$11x - 5x = 72$

$6x = 72$

$x = \frac{72}{6}$

$x = 12$

$\therefore$ Ist number = $4x = 4 \times 12 = 48$

IInd number = $5x = 5 \times 12 = 60$

IIIrd number = $7x = 7 \times 12 = 84$

8. Two cars start from the same place at the same time but in opposite direction their speeds 50 km/h and 65 km/h.

Time = $\frac{D}{S}$

Here the speed will be relative speed because the two cars move in opposite directions.

So, the relative speed = Speed of first car + speed of second car = (50 + 65) km/h = 115 km/h

Now, the time they will be 345 km apart = $\frac{345}{115} = 3$ hr

Hence, the two cars will be 345 km apart from 3 hours.

9. Let the distance = x km

Time = $\frac{D}{S}$

At 15 km/hr, he takes 2 minutes more than the usual time.

$T = \frac{x}{15} - \frac{2}{60}$ ...(1)

If speed increased by 5 km/hr, reaches 8 min early

$T = \frac{x}{20} + \frac{8}{60}$ ...(2)

From (1) and (2)

$$\frac{x}{15} - \frac{2}{60} = \frac{x}{20} + \frac{8}{60}$$

$$\frac{x}{15} - \frac{x}{20} = \frac{8}{60} + \frac{2}{60}$$

$$\frac{4x - 3x}{60} = \frac{8+2}{60}$$

$$\frac{1x}{60} = \frac{10}{60}$$

$$x = \frac{10}{60} \times 60 = 10 \text{ km}$$

Hence distance between school and his house = 10 km.

10. Let the C.P. of the table = x

Gain = $\frac{1}{3}$ of C.P. $= \frac{1}{3} \times x = \frac{x}{3}$

S.P. = C.P + G

$$4500 = x + \frac{x}{3}$$

$$4500 = \frac{3x + x}{3}$$

$$4500 = \frac{4x}{3}$$

$$x = \frac{4500 \times 3}{4}$$

$x = 3375$

∴ The cost price of table = ₹ 3375

11. Let the present age of Ankita = x years

Her grandfather's present age = $4x$ years

A.T.Q

$x + 42 = 4x$

$4x - x = 42$

$3x = 42$

$x = 14$

∴ The present age of Ankita = 14 years

The present age of Ankita's grandfather = $4x = 4\ (14) = 56$ years

EXERCISE-2.3

1. (a) $\frac{5x + 11}{3x + 8} = \frac{4}{1}$

$(5x + 11) = 4\ (3x + 8)$

$5x + 11 = 12x + 32$

$12x - 5x = 11 - 32$

$7x = -21$

$x = -3$

Verify:

$$\text{LHS} = \frac{5x + 11}{3x + 8} = \frac{5(-3) + 11}{3(-3) + 8} = \frac{-15 + 11}{-9 + 8} = \frac{-4}{-1} = 4 = \text{RHS}$$

LHS = RHS

(b) $\frac{3 + y}{7 - y} = \frac{3}{4}$

$4(3 + y) = 3(7 - y)$

$12 + 4y = 21 - 3y$

$12 - 21 = -3y - 4y$

$-9 = -7y$

$$y = \frac{\cancel{-}9}{\cancel{-}7} = \frac{9}{7}$$

Verify:

$$\text{LHS} = \frac{3+\frac{9}{7}}{7-\frac{9}{7}} = \frac{\frac{21+9}{7}}{\frac{49-9}{7}} = \frac{\cancel{30}}{\cancel{7}} \times \frac{\cancel{7}^{1}}{4\cancel{0}} = \frac{3}{4} = \text{RHS}$$

LHS = RHS

(c) $\frac{2x-3}{4-5x} = \frac{-4}{3}$

$3(2x - 3) = -4\ (4 - 5x)$

$6x - 9 = -16 + 20x$

$6x - 20x = -16 + 9\ -14x = -7$

$x = \frac{-7}{-14} = \frac{1}{2}$

Verify:

$$\text{LHS} = \frac{2\left(\frac{1}{2}\right)-3}{4-5\left(\frac{1}{2}\right)} = \frac{1-3}{4-\frac{5}{2}} = \frac{-2}{\frac{8-5}{2}} = \frac{-2}{\frac{3}{2}} = \frac{-2\times 2}{3} = \frac{-4}{3} = \text{RHS}$$

LHS = RHS

(d) $\frac{3x+5}{7x-4} = \frac{2}{5}$

$5\ (3x + 5) = 2\ (7x - 4)$

$15x + 25 = 14x - 8$

$15x - 14x = -8 - 25$

$x = -33$

Verify:

$$\text{LHS} = \frac{3x+5}{7x-4} = \frac{3(-33)+5}{7(-33)-4} = \frac{-99+5}{-231-4} = \frac{-94}{-235} = \frac{2}{5} = \text{RHS}$$

LHS = RHS

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

$(x + 5)\ (x - 2) = (x - 7)x$

$x(x - 2) + 5\ (x - 2) = x^2 - 7x$

$x^2 - 2x + 5x - 10 = x^2 - 7x$

$x^2 + 3x - x^2 + 7x = 10$

$10x = 10$

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

Verify:

$$\text{LHS} = \frac{1+5}{1} = \frac{6}{1} = 6$$

$$\text{RHS} = \frac{1-7}{1-2} = \frac{-6}{-1} = 6$$

LHS = RHS

(f) $2y + \frac{5}{3} = \frac{26}{3} - y$

$$2y + y = \frac{26}{3} - \frac{5}{3}$$

$$3y = \frac{26-5}{3}$$

$$3y = \frac{21}{3}$$

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

Verify:

$$\text{LHS} = 2\left(\frac{7}{3}\right) + \frac{5}{3} = \frac{14}{3} + \frac{5}{3} = \frac{19}{3}$$

$$\text{RHS} = \frac{26}{3} - \frac{7}{3} = \frac{19}{3}$$

LHS = RHS

(g) $\frac{(2-7x)(4+5x)}{(1-5x)(3+7x)} = 1$

$$\frac{2(4+5x) - 7x(4+5x)}{1(3+7x) - 5x(3+7x)} = 1$$

$$\frac{8 + 10x - 28x - 35x^2}{3 + 7x - 15x - 35x^2} = 1$$

$$\frac{8 - 18x - 35x^2}{3 - 8x - 35x^2} = \frac{1}{1}$$

$8 - 18x - 35x^2 = 3 - 8x - 35x^2$

$8 - 3 = -8x - \cancel{35x^2} + 18x + \cancel{35x^2}$

$5 = 10x$

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

Verify:

$$LHS = \frac{\left(2 - 7 \times \frac{1}{2}\right)\left(4 + 5 \times \frac{1}{2}\right)}{\left(1 - 5 \times \frac{1}{2}\right)\left[3 + 7\left(\frac{1}{2}\right)\right]} = \frac{\left(2 - \frac{7}{2}\right)\left(4 + \frac{5}{2}\right)}{\left(1 - \frac{5}{2}\right)\left(3 + \frac{7}{2}\right)} = \frac{\left(\frac{4-7}{2}\right)\left(\frac{8+5}{2}\right)}{\left(\frac{2-5}{2}\right)\left(\frac{6+7}{2}\right)} = \frac{\cancel{\left(-\frac{3}{2}\right)\left(-\frac{13}{2}\right)}}{\cancel{\left(-\frac{3}{2}\right)\left(-\frac{13}{2}\right)}} = 1 = \text{RHS}$$

LHS = RHS

(h) $\left(\frac{3x+1}{2}\right)+\left(\frac{2x+5}{3}\right)=26$

$\Rightarrow \frac{3(3x+1)+2(2x+5)}{6}=26$

$\Rightarrow \frac{9x+3+4x+10}{6}=26$

$\Rightarrow \frac{13x+13}{6}=26$

$\Rightarrow 13x + 13 = 26 \times 6$

$13x + 13 = 156$

$13x = 156 - 13$

$13x = 143$

$x = \frac{\cancel{143}^{11}}{\cancel{13}_{1}}$

Verify:

$$\text{LHS} = \frac{(3x+1)}{2}+\frac{(2x+5)}{3}=\frac{[3(11)+1]}{2}+\frac{[2(11)+5]}{3}=\frac{33+1}{2}+\frac{22+5}{3}=\frac{\cancel{34}^{17}}{\cancel{2}_{1}}+\frac{\cancel{27}^{9}}{\cancel{3}_{1}}$$

$= 17 + 9 = 26 = \text{RHS}$

LHS = RHS

(i) $\frac{a}{3}-\frac{2a}{9}+\frac{5a}{6}=\frac{34}{9}$

$\frac{6a-4a+15a}{18}=\frac{34}{9}$

$\frac{17a}{18}=\frac{34}{9}$

$a=\frac{\cancel{34}^{2}}{\cancel{9}_{1}}\times\frac{\cancel{18}^{2}}{\cancel{17}_{1}}$

$a = 4$

Verify:

$$\text{LHS} = \frac{a}{3}-\frac{2a}{9}+\frac{5a}{6}=\frac{4}{3}-\frac{2(4)}{9}+\frac{5(4)}{6}=\frac{4}{3}-\frac{8}{9}+\frac{20}{6}$$

$$=\frac{24-16+60}{18}=\frac{\cancel{68}^{34}}{\cancel{18}_{9}}=\frac{34}{9}=\text{RHS}$$

LHS = RHS

2. Let the numerator = x

Denominator = $x - 3$

Rational number = $\frac{x}{x-3}$

A.T.Q

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

$$\frac{2x}{x+12} = \frac{4}{5}$$

$10x = 4x + 48$

$10x - 4x = 48$

$6x = 48$

$$x = \frac{\cancel{48}^{8}}{\cancel{6}_{1}}$$

$\therefore$ The rational number $= \dfrac{x}{x-3} = \dfrac{8}{8-3} = \dfrac{8}{5}$

3. Let the age be = x

Age of Ram = $2x$

Age of Rahim = $3x$

After 4 years; Ram's age = $2x + 4$

After 4 years; Rahim's age = $3x + 4$

A.T.Q

$$\frac{2 \quad 4}{3 \quad 4} \quad \frac{3}{4}$$

$4\,(2x + 4) = 3\,(3x + 4)$

$8x + 16 = 9x + 12$

$8x - 9x = 12 - 16 \Rightarrow -x = -4 \Rightarrow x = 4$

$\therefore$ The present age of Ram = 2(4) = 8 years

The present age of Rahim = 3(4) = 12 years

NCERT CORNER

EXERCISE-2.1

1. $x - 2 = 7$

$x - 2 + 2 = 7 + 2$

$x = 9$

2. $y + 3 = 10$

$y + \cancel{3} - \cancel{3} = 10 - 3$

$y = 7$

3. $6 = z + 2$

$6 - 2 = z$

$4 = z$

4. $\dfrac{3}{7} + x = \dfrac{17}{7}$

$x = \dfrac{17}{7} - \dfrac{3}{7}$

$x = \dfrac{14}{7} = 2 \Rightarrow x = 2$

5. $6x = 12$

$\dfrac{6x}{6} = \dfrac{12}{6}$

$x = 2$

6. $\dfrac{t}{5} = 10$

$\dfrac{t}{\cancel{5}} \times \cancel{5} = 10 \times 5$

$t = 50$

7. $\frac{2x}{3} = 18$

$\frac{\cancel{2}x \times \cancel{3}}{\cancel{3} \times \cancel{2}} = \frac{\cancel{18}^{9}}{\cancel{2}_{1}} \times 3$

$x = 27$

8. $1.6 = \frac{y}{1.5}$

$1.6 \times 1.5 = \frac{y}{\cancel{1.5}} \times \cancel{1.5}$

$y = 2.4$

9. $7x - 9 = 16$

$7x - \cancel{9} + \cancel{9} = 16 + 9$

$7x = 16 + 9$

$7x = 25$

$x = \frac{25}{7}$

10. $14y - 8 = 13$

$14y - \cancel{8} + \cancel{8} = 13 + 8$

$14y = 21$

$y = \frac{\cancel{21}^{3}}{\cancel{14}_{2}} = \frac{3}{2}$

11. $17 + 6p = 9$

$\cancel{17} - \cancel{17} + 6p = 9 - 17$

$6p = -8$

$p = \frac{-8}{6} = \frac{-4}{3}$

12. $\frac{x}{3} + 1 = \frac{7}{15}$

$\frac{x}{3} + \cancel{1} - \cancel{1} = \frac{7}{15} - 1$

$\frac{x}{3} = \frac{7-15}{15}$

$\cancel{3} \times \frac{x}{\cancel{3}} = \frac{-8}{\cancel{15}_{5}} \times \cancel{3}^{1}$

$x = \frac{-8}{5}$

EXERCISE-2.2

1. Let the number = x

A.T.Q (According to question)

$\frac{1}{2}\left(x - \frac{1}{2}\right) = \frac{1}{8}$

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

$\frac{x}{2} = \frac{1}{8} + \frac{1}{4}$

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

$x = \frac{3}{{}_{4}\cancel{8}} \times \cancel{2}^{1} = \frac{3}{4}$

$\therefore$ The number $= \frac{3}{4}$

2. Let the breadth = (x) m

The length = ($2x$ + 2)m

Perimeter = 154 m

A.T.Q

2 (L + B) = 154

$2[(2x + 2) + x] = 154$

$2[2x + 2 + x] = 154$

$2[3x + 2] = 154$

$6x + 4 = 154$

$6x = 154 - 4$

$x = \frac{\overset{25}{\cancel{150}}}{\underset{1}{\cancel{6}}} = 25\text{ m}$

$\therefore$ Breadth = 25 m

Length = $(2x + 2) = (2 \times 25 + 2) = 52$ m

3. Let the length of equal side = x cm

A.T.Q

Perimeter = (x + x + base) cm = $4\frac{2}{15}$

$\left(2x + \frac{4}{3}\right)\text{cm} = \frac{62}{15}$

$2x + \frac{4}{3} = \frac{62}{15}$

$2x = \frac{62}{15} - \frac{4}{3}$

$2x = \frac{62 - 20}{15}$

$x = \frac{\overset{7}{\cancel{\overset{21}{\cancel{42}}}}}{\underset{5}{\cancel{15}}} \times \frac{1}{\underset{1}{\cancel{2}}}$

$x = \frac{7}{5}\text{ cm} = 1\frac{2}{5}\text{ cm}$

$\therefore$ The length of equal side $= 1\frac{2}{5}$ cm

4. Let the one number = x

The other number = $x + 15$

A.T.Q

$(x) + (x + 15) = 95$

$2x + 15 = 95$

$2x = 95 - 15$

$2x = 80$

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

$\therefore$ The one number = 40

The other number = 40 + 15 = 55

5. Let the common number = x

Ratio = $5x : 3x$

A.T.Q

$5x - 3x = 18$

$2x = 18$

$x = 9$

$\therefore$ The Ist number = 9(5) = 45

The IInd number = 9(3) = 27

6. Let the these consecutive number = x, $x + 1$, $x + 2$

A.T.Q

$x + (x + 1) + (x + 2) = 51$

$3x + 3 = 51$

$3x = 51 - 3$

$3x = 48$

$$x = \frac{\cancel{48}^{16}}{\cancel{3}_1} = 16$$

$\therefore$ The Ist integers = x = 16

The IInd integer = $x + 1 = 17$

The IIIrd integer = $x + 2 = 18$.

7. Let three consecutive multiples of 8 = $8x$; $(8x + 8)$, $8x + 16$

A.T.Q

$8x + (8x + 8) + (8x + 16) = 888$

$24x + 24 = 888$

$24x = 888 - 24$

$24x = 864$

$$x = \frac{\cancel{\cancel{864}^{216}}^{36}}{\cancel{24}\,\cancel{6}_1} = 36$$

$x = 36$

$\therefore$ The 3 consecutive multiples of 8 = 8 (36), [8 (36) + 8], [8 × (36) + 16]

= 288, 296 and 304

8. Let three consecutive integers = x, $x + 1$, $x + 2$

A.T.Q

$(2x) + 3(x + 1) + 4(x + 2) = 74$

$2x + 3x + 3 + 4x + 8 = 74$

$9x + 11 = 74$

$9x = 74 - 11$

$9x = 63$

$x = 7$

$\therefore$ The numbers are 7, 8, and 9.

9. Let the common ratio between Rahul's age and Haroon's age be x.

$\therefore$ The age of Rahul and Haroon will be $5x$ and 7x years respectively.

After 4 years the age of Rahul = $(5x + 4)$ years

After 4 years the age of Haroon = $(7x + 4)$ years

A.T.Q

$(5x + 4) + (7x + 4) = 56$

$12x + 8 = 56$

$12x = 56 - 8$

$12x = 48$

$x = \frac{\cancel{48}^{4}}{\cancel{12}_{1}} = 4$ years

Rahul's age = 5(4) = 20 years

Haroon's age = 7(4) = 28 years

10. Let the common ratio between the number of boys and girls = x

Number of boys = $7x$

Number of girls = $5x$

A.T.Q

$7x = 5x + 8$

$7x - 5x = 8$

$2x = 8$

$x = \frac{\cancel{8}^{4}}{\cancel{2}_{1}} = 4$

Number of boys = 7(4) = 28 and number of girls = 5(4) = 20

The total students in the class = boys + girls

= 28 + 20 = 48 students

11. Let Baichung's father's age = x years

Baichung's age = $(x - 29)$ years

Baichung's grand father's age = $(x + 26)$ years

A.T.Q

$(x) + (x - 29) + (x + 26) = 135$

$3x - 3 = 135$

$3x = 135 + 3$

$x = \frac{\cancel{138}^{46}}{\cancel{3}_{1}}$

$x = 46$ years

$\therefore$ Baichung's father age = 46 years

Baichung's age = (46 – 29) = 17 years

Baichung's grandfather's age = 46 + 26 = 72 years

12. Let present age of Ravi = x years

After 15 years Ravi's age = $(x + 15)$ years

A.T.Q

$4x = x + 15$

$4x - x = 15$

$3x = 15$

x = 5 years

$\therefore$ The present age of Ravi = 5 years.

13. Let the number be x

A.T.Q

$$\frac{5x}{2} + \frac{2}{3} = \frac{-7}{12}$$

$$\frac{5x}{2} = \frac{-7}{12} - \frac{2}{3}$$

$$\frac{5x}{2} = \frac{-7-8}{12}$$

$$\frac{5x}{2} = \frac{-15}{12}$$

$$x = \frac{\overset{1}{3}\cancel{-15}}{\cancel{12}\,\cancel{4}_{2}} \times \frac{\cancel{2}^{1}}{\cancel{5}_{1}}$$

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

$\therefore$ The number $= \dfrac{-1}{2}$

14. Let the common ratio between the numbers of notes of different denominations be x.

$\therefore$ Number of ₹ 100 notes = $2x$

Number of ₹ 50 notes = $3x$

Number of ₹ 10 notes = $5x$

Amount of ₹ 100 notes = ₹ $(100 \times 2x) = 200x$

Amount of ₹ 50 notes = ₹ $(50 \times 30) = 150x$

Amount of ₹ 10 notes = ₹ $(10 \times 5x) = 50x$

Total amount = ₹ 4,00,000

A.T.Q

$200x + 150x + 50x = 400000$

$400x = 400000$

$x = \dfrac{400000}{400} = 1000$

$\therefore$ Number of ₹ 100 notes = 2(1000) = 2000

Number of ₹ 50 notes = 3(1000) = 3000

Number of ₹ 10 notes = 5(1000) = 5000

15. Let the number of ₹ 5 coins be x

Number of ₹ 2 coins = $3x$

Number of ₹ 1 coins = 160 – (Number of coins of ₹ 5 and ₹ 2) = $160 - (x + 3x) = 160 - 4x$

A.T.Q

$5x + 2(3x) + 1\,(160 - 4x) = 300$

$5x + 6x + 160 - 4x = 300$

$7x + 160 = 300$

$7x = 300 - 160$

$7x = 140$

$x = \frac{\cancel{140}^{20}}{\cancel{7}_1} = 20$

∴ Number of ₹ 1 coins = 160 – 4x = 160 – 4(20) = 160 – 80 = 80

Number of ₹ 2 coins = 3x = 3(20) = 60

Number of ₹ 5 coins = x = 20

16. Let the number of winner = x

The number of participants who did not win = 63 – x

Amount given to the winners = ₹ 100 × x = 100 x

Amount given to the participants who did not win = ₹ [25 (63 – x)] = ₹ [1575 – 25x]

A.T.Q

100x + 1575 – 25x = 3000

75x = 1425

$x = \frac{1425^{57^{19}}}{75_{3_1}} = 19$

Hence, number of winners = 19

EXERCISE-2.3

1. 3x = 2x + 18

3x – 2x = 18

x = 18

Verify:

3(18) = 2(18) + 18

54 = 36 + 18

54 = 54

LHS = RHS

2. 5t – 3 = 3t – 5

5t – 3t = – 5 + 3

2t = – 2

t = – 1

Verify:

5 (– 1) – 3 = 3 (– 1) – 5

– 5 – 3 = – 3 – 5

– 8 = – 8

LHS = RHS

3. 5x + 9 = 5 + 3x

5x – 3x = 5 – 9

2x = – 4

x = – 2

Verify:

5 (– 2) + 9 = 5 + 3 (– 2)

– 10 + 9 = 5 – 6

$-1 = -1$
LHS = RHS

4. $4z + 3 = 6 + 2z$
$4z - 2z = 6 - 3$
$2z = 3$
$z = \frac{3}{2}$
Verify:
$$^{2}\not{4}\left(\frac{3}{\not{2}_1}\right) + 3 = 6 + \not{2}^{1}\left(\frac{3}{\not{2}_1}\right)$$
$6 + 3 = 6 + 3$
$9 = 9$
LHS = RHS

5. $2x - 1 = 14 - x$
$2x + x = 14 + 1$
$3x = 15$
$x = 5$
Verify:
$2(5) - 1 = 14 - 5$
$10 - 1 = 14 - 5$
$9 - 9$
LHS = RHS

6. $8x + 4 = 3(x - 1) + 7$
$8x + 4 = 3x - 3 + 7$
$8x - 3x = 4 - 4$
$5x = 0$
$x = \frac{0}{5} = 0$
Verify:
$8(0) + 4 = 3\ (0 - 1) + 7$
$0 - 4 = 3\ (-1) + 7$
$4 = -3 + 7$
$4 = 4$
LHS = RHS

7.
$$x = \frac{4}{5}(x + 10)$$
$$x = \frac{4}{5}x + 8$$
$$x - \frac{4}{5}x = 8$$
$$\frac{5x - 4x}{5} = 8$$
$$\frac{x}{5} = 8$$

$x = 40$

Verify:
$$40 = \frac{4}{5}(40 + 10)$$
$$40 = \frac{4}{\cancel{5}_1}(\cancel{50}^{10})$$

$40 = 40$

LHS = RHS

8.
$$\frac{2x}{3} + 1 = \frac{7x}{15} + 3$$
$$\frac{2x}{3} - \frac{7x}{15} = 3 - 1$$
$$\frac{10x - 7x}{15} = 2$$
$$\frac{{}^{1}\cancel{3}x}{{}^{5}\cancel{15}} = 2$$

$x = 10$

Verify:
$$\frac{2(10)}{3} + 1 = \frac{7(10)}{15} + 3$$
$$\frac{20}{3} + 1 = \frac{70}{15} + 3$$
$$\frac{20 + 3}{3} = \frac{70 + 45}{15}$$
$$\frac{23}{3} = \frac{\cancel{115}^{23}}{\cancel{15}_3}$$
$$\frac{23}{3} = \frac{23}{3}$$

LHS = RHS

9. $2y + \frac{5}{3} = \frac{26}{3} - y$

$2y + y = \frac{26}{3} - \frac{5}{3}$

$3y = \frac{21}{3}$

$y = \frac{21}{3} \times \frac{1}{3} = \frac{7}{3}$

Verify:

$2\left(\frac{7}{3}\right) + \frac{5}{3} = \frac{26}{3} + \frac{7}{3}$

$\frac{14}{3} + \frac{5}{3} = \frac{26}{3} - \frac{7}{3}$

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

LHS = RHS

10. $3m = 5m - \frac{-8}{5}$

$3m - 5m = \frac{-8}{5}$

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

$m = \frac{\cancel{-}\ \cancel{8}^{4}}{\cancel{-}\ 5 \times \cancel{2}_{1}}$

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

Verify:

$3\left(\frac{4}{5}\right) = 5\left(\frac{4}{5}\right)\frac{-8}{5}$

$\frac{12}{5} = \frac{20}{5} - \frac{8}{5}$

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

LHS = RHS

EXERCISE-2.4

1. Let the number = x

A.T.Q

$8\left(x - \frac{5}{2}\right) = 3x$

$8x - 20 = 3x$

$8x - 3x = 20$

$5x = 20$

$x = 4$

$\therefore$ The number = 4

2. Let the number be x and $5x$

A.T.Q

$2\,(x + 21) = 5x + 21$

$2x + 42 = 5x + 21$

$5x - 2x = 42 - 21$

$3x = 21$

$x = 7.$

Hence, the numbers are 7 and 5(7) = 35

3. Let the one's place = x

The ten's place = $9 - x$

Original number = $10\,(9 - x) + x = 90 - 10x + x = 90 - 9x$

Interchanged Number = $10x + (9 - x) = 10x + 9 - x = 9x + 9$

A.T.Q

$90 - 9x + 27 = 9x + 9$

$90 + 27 - 9 = 9x + 9x$

$117 - 9 = 18x$

$108 = 18x$

$$\frac{\overset{\overset{6}{\cancel{36}}}{\cancel{108}}}{\cancel{18}\,\underset{1}{\cancel{6}}} = x$$

$x = 6$

Hence, the original number = $90 - 9x = 90 - 9(6) = 90 - 54 = 36$

One's place = 6

Ten's place = 3

4. Let the one's place = x

Ten's place = $3x$

$\therefore$ Original number = $10\,(3x) + x = 30x + x = 31x$

Interchanged the digits the new number = $10x + 3x = 13x$

A.T.Q

$31x + 12x = 88$

$44x = 88$

$x = 2$

$\therefore$ The original number = 31(2) = 62

5. Let the shobo's age = x years

His mother's age = $6x$ years

After 5 years Shobo's age = $x + 5$

After 5 years his mother's age = $6x + 5$

A.T.Q

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

$3x + 15 = 6x$

$6x - 3x = 15$

$3x = 15$

$x = 5$ years

Shobo's age = 5 years

His mother's age = 6(5) = 30 years

6. Let the common ratio between the length and breadth of the rectangular plot be x

$\therefore$ Length = $11x$

Breadth = $4x$

Perimeter of the plot = 2 (L + B) = 2 ($11x$ + $4x$) = 2 ($15x$) = $30x$ m

If the cost of fencing at the rate of Rs 100 per m is Rs 75,000

A.T.Q

$75000 = 100 \times 30x$

$75000 = 3000\,x$

$x = \frac{\overset{25}{\cancel{75000}}}{\underset{1}{\cancel{3000}}} = 25$

$\therefore$ Length = 11(25) = 275 m

Breadth = 4(25) = 100 m

7. Let trouser material = $2x$ m

Shirt material = $3x$ m

S.P. of 1m trouser = $90 + \frac{9\cancel{0}}{10\cancel{0}} \times 12 = 90 + \frac{108}{10}$ = ₹ (90 + 10.8) = ₹ 100.8

S.P. of 1m shirt = $\left(50 + 50 \times \frac{1\cancel{0}}{10\cancel{0}}\right)$ = ₹ $\left(50 + \frac{5\cancel{0}}{1\cancel{0}}\right)$ = ₹ 55

Total amount of selling = ₹ 36,660

$100.80\,(2x) + 55\,(3x) = 36660$

$201.60x + 165x = 36,600$

$366.60x = 36,660$

$x = \frac{\overset{10}{\cancel{36660}}}{\cancel{3666}} \times 10$

$x = 100$

$\therefore$ Trouser material = $2x$ m = 2 (100) = 200 m

8. Let the number of deer = x

Number of deer grazing in the field = $\frac{x}{2}$

Number of deer playing nearby = $\frac{3}{4} \times$ Number of remaining deer

$$= \frac{3}{4}\left(x - \frac{x}{2}\right) = \frac{3}{4}x - \frac{3x}{8} = \frac{6x - 3x}{8} = \frac{3x}{8}$$

Number of deer drinking water from the pond = 9

$$x - \left(\frac{x}{2} + \frac{3x}{8}\right) = 9$$

$$x - \left(\frac{4x}{8} + 3x\right) = 9$$

$$x - \frac{7x}{8} = 9$$

$$\frac{8x - 7x}{8} = 9$$

$$x = 72$$

∴ The total number of deer in the herd = 72.

9. Let the grand daughter's age = x years

Grandfather's age = $10x$ years

A.T.Q

$10x = x + 54$

$10x – x = 54$

$9x = 54$

$$x = \frac{\cancel{54}^{6}}{\cancel{9}_{1}}$$

∴ Grand daughter's age = 6 years

Grandfather's age = 10 × 6 = 60 years

10. Let the Aman's son's age = x years

Aman's age = $3x$ years

Ten years ago, their age was (x – 10) years and ($3x$ – 10) years

A.T.Q

$3x – 10 = 5 (x – 10)$

$3x – 10 = 5x – 50$

$3x – 5x = – 50 + 10$

$\cancel{-} 2x = \cancel{-} 40$

$x = 20$

∴ Aman's son's age = 20 years

Aman's age = 3(20) = 60 years

EXERCISE-2.5

1. $\frac{x}{5} - \frac{1}{5} = \frac{x}{3} + \frac{1}{4}$

$\frac{x}{2} - \frac{x}{3} = \frac{1}{4} + \frac{1}{5}$

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

$\frac{x}{6} = \frac{9}{20}$

$x = \frac{9}{\cancel{20}_{10}} \times \cancel{6}^{3} = \frac{27}{10}$

2. $\frac{n}{2} - \frac{3n}{4} + \frac{5n}{6} = 21$

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

$\frac{7n}{12} = 21$

$n = \frac{{}^{3}\cancel{21} \times 12}{\cancel{7}_{1}} = 36$

$n = 36$

3. $x + 7 - \frac{8x}{3} = \frac{17}{6} - \frac{5x}{2}$

$x + 7 - \frac{8x}{3} + \frac{5x}{2} = \frac{17}{6}$

$x - \frac{8x}{3} + \frac{5x}{2} = \frac{17}{6} - 7$

$\frac{6x - 16x + 15x}{6} = \frac{17 - 42}{6}$

$\frac{5x}{6} = \frac{25}{6}$

$x = \frac{25}{6} \times \frac{6}{5}$

$x = 5$

4. $\frac{x-5}{3} = \frac{x-3}{5}$

$5(x-5) = 3(x-3)$

$5x - 25 = 3x - 9$

$5x - 3x = -9 + 25$

$2x = 16$

$x = \frac{\cancel{16}^{8}}{\cancel{2}_{1}} = 8$

5. $\frac{3t - 2}{4} - \frac{2t + 3}{3} + \frac{2}{3} - t$

$\frac{3(3t - 2) - 4(2t + 3)}{12} = \frac{2 - 3t}{3}$

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

$\frac{t - 18}{12} = \frac{2 - 3t}{3}$

$t - 18 = \frac{{}^{4}\cancel{12}(2 - 3t)}{\cancel{3}_{1}}$

$t - 18 = 8 - 12t$

$t + 12t = 8 + 18$

$13t = 26$

$t = \frac{26}{13} = 2$

6. $m - \frac{m-1}{2} = 1 - \frac{m-2}{3}$

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

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

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

$3(m + 1) = 2(5 – m)$

$3m + 3 = 10 – 2m$

$3m + 2m = 10 – 3$

$5m = 7$

$m = \frac{7}{5}$

7. $3(t – 3) = 5(2t + 1)$

$3t – 9 = 10t + 5$

$3t – 10t = 5 + 9$

$– 7t = 14$

$t = – 2$

8. $15(y – 4) – 2(y – 9) + 5(y + 6) = 0$

$15y – 60 – 2y + 18 + 5y + 30 = 0$

$18y – 12 = 0$

$18y = 12$

$y = \frac{\cancel{12}^{2}}{\cancel{18}_{3}} = \frac{2}{3}$

9. $3(5z – 7) – 2(9z – 11) = 4 (8z – 13) – 17$

$15z – 21 – 18z + 22 = 32z – 52 – 17$

$– 3z + 1 = 32z – 69$

$– 3z – 32z = – 69 – 1$

$– 35z = – 70$

$z = \frac{\cancel{-}\ \cancel{70}^{2}}{\cancel{-}\ \cancel{35}} = 2$

$z = 2$

10. $0.25 (4f – 3) = 0.05 (10f – 9)$

$1.00f – 0.75 = 0.50f – 0.45$

$1.00f – 0.50f = – 0.45 + 0.75$

$0.50f = 0.30$

$f = \frac{0\cancel{.}30}{0\cancel{.}50} \times \frac{\cancel{100}}{\cancel{100}} = \frac{3}{5} = 0.6$

EXERCISE-2.6

1. $\frac{8x-3}{3x} = 2$

$8x - 3 = 2(3x)$

$8x - 3 = 6x$

$8x - 3 = 6x$

$2x = 3$

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

2. $\frac{9x}{7-6x} = 15$

$9x = 15\,(7 - 6x)$

$9x = 105 - 90x$

$9x + 90x = 105$

$99x = 105$

$x = \frac{\cancel{105}^{35}}{\cancel{99}^{33}} = \frac{35}{33}$

3. $\frac{z}{z+15} = \frac{4}{9}$

$9z = 4(z + 15)$

$9z = 4z + 60$

$9z - 4z = 60$

$5z = 60$

$z = \frac{\cancel{60}^{12}}{\cancel{5}_{1}}$

$z = 12$

4. $\frac{3y+4}{2-6y} = \frac{-2}{5}$

$5(3y + 4) = -2\,(2 - 6y)$

$15y + 20 = -4 + 12y$

$15y - 12y = -4 - 20$

$3y = -24$

$y = \frac{-24^{8}}{3}$

$y = -8$

5. $\frac{7y+4}{y+2} = \frac{-4}{3}$

$3(7y + 4) = -4(y + 2)$

$21y + 12 = -4y - 8$

$21y + 4y = -8 - 12$

$25\,y = -20$

$y = \frac{\cancel{20}^{4}}{\cancel{25}_{5}} = \frac{-4}{5}$

6. Let the common ratio between their ages be x years

$\therefore$ Hari's age = $5x$ years

Harry's age = $7x$ years

After 4 years, their ages will be $(5x + 4)$ years and $(7x + 4)$ years

A.T.Q

$\frac{5x+4}{7x+4} = \frac{3}{4}$

$4(5x + 4) = 3(7x + 4)$

$20x + 16 = 21x + 12$

$20x - 21x = 12 - 16$

$-x = -4$

$x = 4$

$\therefore$ Hari's age = 5(4) = 20 years

Harry's age = 7(4) = 28 years

7. Let the numerator = x

Denominator = $x + 8$

$\therefore$ Rational number = $\frac{x}{x+8}$

A.T.Q

$\frac{x+17}{x+8-1} = \frac{3}{2}$

$\frac{x+17}{x+17} = \frac{3}{2}$

$2(x + 17) = 3(x + 7)$

$2x + 34 = 3x + 21$

$2x - 3x = 21 - 34$

$-x = -13$

$x = 13$

$\therefore$ Numerator = 13

Denominator = $x + 8 = 13 + 8 = 21$

Required Number = $\frac{N}{D} = \frac{13}{21}$

SUBJECT ENRICHMENT EXERCISE

I. (1) $x = 7$

(2) 1

(3) $\frac{1}{2}$

(4) 15

(5) 7
(6) $m = 1$
(7) 3/2
(8) $a = 11$
(9) 7
(10) 12, 14, 16

II. (a) A linear
(b) 7
(c) One
(d) $\frac{-d}{c}$
(e) One
(f) 2
(g) 1
(h) 16
(i) Solution, roots
(j) Linear, two

III. (a) False
(b) True
(c) True
(d) True
(e) True
(f) True
(g) False
(h) True
(i) False

Understanding Quadrilateral

EXERCISE-3.1

1. (a) Simple closed curves, concave polygon
(b) Convex polygon
(c) Closed curves
(d) Simple closed curves
(e) Simple closed curves
(f) Not curves
(g) Concave polygon
(h) Not a simple curve
(i) Closed curve
(j) Simple closed curve, concave polygon
(k) Simple closed curve, convex polygon

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

3. (a) 

(b) 

(c) 

4. (a) Convex polygon
(b) Concave polygon
(c) Concave polygon

5. (a) From the figure it follows

$90° + 130° + x + x = 360°$ [sum of angles of a quad is 360°]

$220 + 2x = 360°$

$2x = 360° - 220$

$x = \frac{140°}{2} = 70°$

(b) $(x + 100° + 35°) + (x + 110° + 25°) = 180° + 180°$

$(x + 135°) + (x + 135°) = 180° + 180°$

$2x + 270° = 360°$

$2x = 360° - 270°$

$x = \frac{90°}{2} = 45°$

6. (a) 80° + 120° + 70° + 90° = 360°

Hence, this can be the four angles of a quadrilateral.

(b) 75° + 98° + 98° + 59° = 330°

Hence, this cannot be the four angles of quadrilateral.

(c) 120° + 185° + 40° + 15° = 360°

Hence, this can be the four angles of a quadrilateral.

7. Let the fourth angles of a quadrilateral = x

The sum of 4 angles of a quadrilateral = 360°

105° + 45° + 60° + x = 360°

210° + x = 360°

x = 360° – 210° = 150°

∴ The fourth angle of a quadrilateral = 150°

8. We know that the sum of all angles of quadrilateral is 360°

∴ PQOR is a quadrilateral

∴ ∠P + ∠Q + ∠O + ∠R = 360°

∠P + 90° + 50° + 90° = 360° ∠Q = ∠90° ∵ PQ ⊥ O

∠P = 360° – 230° ∠R = ∠90° ∵ PR ⊥ OA

∠P = 130°

∠RPQ = 130°

9. ABCD is a quadrilateral in which DC || AB

Since DC || AB and AD is a transversal

∴ ∠A + ∠D = 180° [sum of the same side of transversal is 180°]

∠A + 100° = 180°

∠A = 180° – 80° = 100°

DC || AB and CB is also transversal.

∴ ∠C + ∠B = 180° [sum of the same side of the transversal is 180°]

140° + ∠B = 180°

∠B = 180° – 140°

∠B = 40°

10. We know that sum of all angles of quadrilateral is 360°

Let the fourth angle = x

54° + 70° + 8° + x = 360°

210° + x = 360°

x = 360° – 210°

x = 150°

∴ The fourth angle = 150°

11. Two angles of quadrilateral = 45° each

Third angle of a quadrilateral = 135°

Let the fourth angle = x

Sum of all angles of quadrilateral = 360°

$45° + 45° + 135° + x = 360°$

$90° + 135° + x = 360°$

$225° + x = 360°$

$x = 360° - 225$

$x = 135°$

$\therefore$ The fourth angle = 135°

12. PQRS is a quadrilateral has all angles are same measure

$\therefore \angle P = \angle Q = \angle R = \angle S$

$\angle P + \angle Q + \angle R + \angle S = 360°$

$\angle P + \angle P + \angle P + \angle P = 360°$

$4\angle P = 360°$

$\angle P = \frac{360°}{4}$

$\angle P = \angle Q = \angle R = \angle S = 90°$

13. Let the common ratio between the angles = x

Ist angle = 2x

IInd angle = $3x$

IIIrd angle = $5x$

IVth angle = $8x$

$2x + 5x + 5x + 8x + 360°$ (sum of quadrilateral)

$18x = 360°$

$x = \frac{\overset{20}{360°}}{\cancel{18}}$

Ist angle = 2(20) = 40°

IInd angle = 3(20) = 60°

IIIrd angle = 5(20) = 100°

IVth angle = 8(20) = 160°

14. The average of that 3 of the angles are in the ratio of 2 : 3 : 7

Let those three angles be $2x$, $3x$ and $7x$

Let fourth angle $= y$

$2x + 3x + 7x + y = 360°$

$12x + y = 360°$

$y = 360° - 12x$

The mean of these angles is 80°

$\frac{^{4}\cancel{12}x}{_{1}\cancel{3}} = 80°$

4x = 80°

$x = \frac{\overset{20°}{\cancel{80°}}}{\cancel{4}}$

The four angles are 2(20°), 3(20°), 7(20°) and 360° – 12(20°) = 40°, 60°, 140° and 120°

EXERCISE-3.2

1. Let the other two angles be $2x$ and $3x$

Sum of angles of a quadrilateral = 360°

160° + $2x$ + $3x$ = 360°

$5x$ = 360° – 160°

$x = \frac{200}{} = 40°$

$\therefore$ The other two angles are 2(40°) and 3(40°) = 80° and 120°

2. Let the common ratio between the angles = x

$\therefore$ The four angles are $3x$, $5x$, $7x$ and $9x$

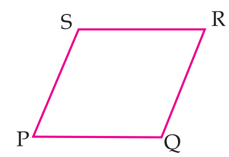
Sum of angles of a quadrilateral = 360°

$3x + 5x + 7x + 9x + 360°$

$24x = 360°$

$x = \frac{360°}{24} = 15°$

$\therefore$ The four angles are 3(15), 5(15), 7(15), 9(15) = 45°. 75°, 105°, 135°



3. $\angle P = 3\angle Q$, $\angle R = 4\angle S$

$\angle Q = \angle S$

$\angle P + \angle Q + \angle R + \angle S = 360°$

$3\angle Q + \angle Q + 4\angle S + \angle S = 360°$

$3\angle Q + \angle Q + 4\angle Q + \angle Q = 360°$

$9\angle Q = 360°$

$\angle Q = \frac{360°}{9} = 40°$

$\angle P = 3\angle Q = 3(40°) = 120°$

$\angle Q = 40°$

$\angle S = \angle Q = 40°$

$\angle R = 4\angle S = 4(40°) = 160°$

4. Let $\angle A$ and $\angle C$ = $3x$ and $7x$

Sum of a quadrilateral = 360°

$\angle A + \angle B + \angle C + \angle D = 360°$

$3x + 65° + 7x + 105° = 360°$

$10x + 170° = 360°$

$10x = 360° - 170°$

$x = \frac{190°}{10} = 19°$

$\angle A = 3(19°) = 57°$

$\angle C = 7(19°) = 133°$

$\angle A + x° = 190°$ ($\because$ linear pair)

$57° + x = 180°$

$x° = 180° - 57°$

$x° = 123°$

$\angle C + y° = 180°$ ($\because$ linear equation)

$133° + y° = 180°$

$y° = 180° – 133°$

$y° = 47°$

5. We know that the sum of interior angles of quadrilateral is 360°

$\angle P + \angle Q + \angle R + \angle S = 360°$

$\angle P + \angle Q = 360° – 160° = 200°$ ...(1)

OP and OQ are bisectors of $\angle P$ and $\angle Q$

$\angle P = 2\angle OPQ$ and $\angle Q = 2\angle OQP$

So from (i) we have

$2\angle OPQ + 2\angle OQP = 200°$

$2(\angle OPQ + \angle OQP) = 200°$

$\angle OPQ + \angle OQP = 100°$ ...(2)

In ΔPOQ

$\angle POQ + \angle OPQ + \angle OQP = 180°$

$\angle POQ = 180° – 100°$

$\angle POQ = 80°$

6. (a) $\angle ACB + 155° = 180°$ (linear pair)

$\angle ACB = 180° – 155°$

$\angle ACB = 25°$

and $\angle ABC = 180° – 105°$ (linear pair)

$\angle ABC = 75°$

$\angle ABC + \angle BAC + \angle ACB = 180°$ (sum of triangle)

$75° + \angle BAC + 25° = 180°$

$\angle BAC = 180° – 100°$

$\angle BAC = 80°$

$\therefore x = \angle BAC = 180°$ (linear pair)

$x = 180° – \angle BAC$

$x = 180° – 80°$

$x = 100°$

Alternate Method

$155° + 105° + x = 360°$ (sum of the exterior angles of polygon = 360°)

$260° + x = 360°$

$x = 360° – 260° = 100°$

(b) Sum of the exterior angles of polygon = 360°

$x + 50° + 90° + 60° + 90° = 360°$

$x = 360° – 290°$

$x = 70°$

7. (a) Sum of the exterior angles of polygon = 360°

Number of sides = 36 sides

Measure of each exterior angle = $\frac{\overset{10}{\cancel{360°}}}{\underset{1}{\cancel{36}}} = 10°$

(b) Sum of the exterior angles of polygon = 360°

Number of sides = 40 sides

Measure of each exterior angle of polygon = $\frac{\overset{9}{\cancel{360°}}}{\cancel{40}}$ = 9°

8. Each interior angle = 140°

$\therefore$ Each interior angle = (180° – 140) = 40°

Let the number of sides of the polygon be x

Then 40° × x = 360°

x = 9 sides

9. We know that the sum of all angles of a quadrilateral = 360°

105° + 165° + 55° + 45° = 360°

370° ≠ 360°

Hence, it is not possible to have quadrilateral whose angles are 105°, 165°, 55° and 45°.

10. In quadrilateral STUV

∠S + ∠T + ∠U + ∠V = 360° (sum of all angles of quadrilateral)

40° + 60° + 60° + ∠V = 360°

∠V = 360° –160°

∠V = 200°

This quadrilateral is a concave quadrilateral.

11. Let four angles of quadrilateral be 3x, 4x, 5x and 6x

$3x + 4x + 5x + 6x = 360°$

$18x = 360°$

$x = \frac{360}{18}$

$x = 20°$

The four angles of quadrilateral are 3(20), 4(20), 5(20) and 6(20) = 60°, 80°, 100° and 120°

12. Let the three equal angles of quadrilateral = x

Fourth angle = 90°

$\therefore$ Sum of all angles of quadrilateral is 360°

$x + x + x + 90° = 360°$

$3x = 360° – 90°$

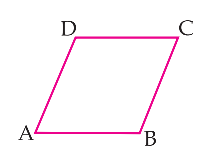
$x = \frac{\overset{90°}{\cancel{270°}}}{\cancel{3}_1}$

$x = 90°$

$\therefore$ Each angle of a quadrilateral is 90°

This quadrilateral is Rectangle.

13. ∠A = ∠C and ∠B = ∠D



∠A +∠ C = 180°

∠A + ∠A = 180°

2∠A = 180°

∠A = 90°

$\angle C = 90°$

So, $\angle B = \angle D = 90°$

So, all angles are 90°

14. OR and OS bisect $\angle QRS$ and $\angle PSR$ respectively

In ΔROS

$\angle ORS = 30°$, $\angle OSR = 30°$

Since $\angle SOR = 180° - 30° - 30°$

$= 180° - 60° = 120°$

Now, considering the quadrilateral PQRS, the angle sum should be 360°

$\angle PSR = 60°$, $\angle QRS = 60°$ and $\angle SPQ = 100°$

Hence, $\angle PSR + \angle QRS + \angle SPQ + \angle PQR = 360°$

$\angle PQR = 360° - (60° + 60° + 100°) = 360° - 220° = 140°$

EXERCISE-3.3

1. Fig (iii) and (iv) are parallelogram

2. (i) $x + 80° = 180°$ [adjacent is are supplementary]

$x = 180 - 80° = 100°$

$z = x = 100°$ (opposite angles are equal)

$y = 80° =$ (opposite angles are equal)

(ii) $\angle x = 130°$ (corresponding angles)

$\angle x + y = 180°$ (adjacent angles are supplementary)

$130° + y = 180°$

$y = 50°$

$x = z = 130°$ (opposite angles are equal)

(iii) $x = 90°$ (vertical opposite angles)

$z = 60°$ (alternate angles)

$z + y + 90° = 180°$

$60° + y = 90° = 180°$

$y = 180° - 150° = 30°$

(iv) $100° + y = 180°$ (adjacent angles are supplementary)

$y = 180 - 100°$

$y = 80°$

$z = 100°$ (opposite angles are equal)

$x = 100°$ (corresponding angles)

(v) $z = 112°$ (apposite angles of parallelogram)

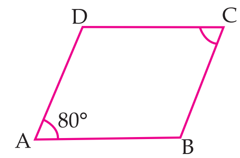
$z + y = 28° = 180°$ (sum of angles of triangle)

$112° + y + 28° = 180°$

$y = 180° - 140° = 40°$

$x = 40°$ (alternate interior angle)

3. One angle of a parallelogram = 80°



In parallelogram ABCD

$\angle A = 80^\circ$

$\angle C = \angle A = 80^\circ$ (opposite ∠s of parallelogram)

$\angle A + \angle B + 180^\circ$ (adjacent angle are supplementary only)

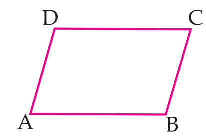
$80^\circ + \angle B = 180^\circ$

$\angle B = 100^\circ$

$\angle B = \angle D = 100^\circ$ (opposite ∠s of parallelogram are equal)

∴ The other three angles are 100, 80 and 100

4. Let the adjacent angles of a parallelogram are $2x$ and $3x$



$2x + 3x = 180^\circ$ (adjacent angles are supplementary)

$5x = 180^\circ$

$$x = \frac{\cancel{180^\circ}^{36}}{\cancel{5}_1} = 36^\circ$$

Let ABCD be the given parallelogram

Then ∠A and ∠B are its adjacent angles.

$\angle A = 2x$ and $\angle B = 3x$

$\angle A = 2(36^\circ)$ and $\angle B = 3(36^\circ)$

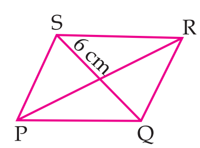
$\angle A = 72^\circ$ and $\angle B = 108^\circ$

$\angle C = \angle A = 72^\circ$ [opposite ∠s of parallelogram]

$\angle D = \angle B = 108^\circ$

∴ $\angle A = 72^\circ$, $\angle B = 108^\circ$, $\angle C = 72^\circ$ and $\angle D = 108^\circ$

5. If OS = 6 cm then OQ = 6 cm



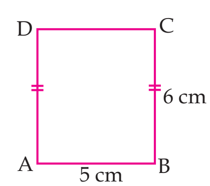
So SQ = 12 cm

∴ PR + 2 = SQ

PR + 2 = 12

PR = 10 cm

Hence $OP = \frac{1}{2}PR = \frac{1}{\cancel{2}_1} \times \cancel{10}^5 = 5$ cm



6. Let ABCD be the given parallelogram

Then adjacent sides of parallelogram are AB and BC

AB = 5 cm and BC = 6 cm

But AB = CD and BC = AD [∴ opposite sides of parallelogram are equal]

Then AB = CD = 5 cm and BC = AD = 6 cm

∴ AB + BC + CD + DA = perimeter of parallelogram

(5 + 6 + 5 + 6) cm = perimeter of parallelogram

22 cm = perimeter

7. Let the adjacent sides of parallelogram = $2x$, $5x$

∴ $2x + 5x + 2x + 5x = 56$

$7x + 7x = 56$

$14x = 56$

$x = \frac{56}{14}$

$\therefore$ First side of parallelogram = 2(4) = 8 cm

Second side of parallelogram = 5(4) = 20 cm

Third side of parallelogram = 2(4) = 8 cm

Fourth side of parallelogram = 5(4) = 20 cm

8. Perimeter of a parallelogram = 220 m

It is given that the length is one side exceeds another by 50 m

Let the larger side be l

The smaller side of s

l = s + 50

Perimeter of parallelogram = 2(l + s)

220 = 2(s + 50 + s) = 2 (2s + 50)

220 = 4s + 100

220 – 100 = 4s

120 = 4s

$s = \frac{120}{4} = 30$ m

Hence the smaller side = 30 m

and the larger side = s + 50 = (30 + 50) m = 80 m

9. $(3y + 10°) + (3y – 4°) = 180°$ (adjacent is of parallelogram are supplementary)

$6y + 6 = 180°$

$6y = 180° – 6 = 174°$

$y = \frac{176}{6} = 29°$

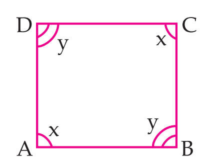
$(3y + 10°) = 3(29) + 10 = 87° + 10° = 97°$

$(3y – 4°) = 3(29) – 4 = 87° – 4 = 83°$

We know that opposite ∠s of a parallelogram are equal

$\therefore$ Four angles of parallelogram are 83°, 97°, 83° and 97°

10. Given: Quadrilateral ABCD in which ∠A = ∠C and ∠B = ∠D



To prove: ABCD is a parallelogram

Proof:

Consider a parallelogram ABCD with both pairs of opposite angles equal

We know that $2x + 2y = 360°$ [angle sum property]

$x + y = 180°$

i.e., ∠A + ∠B = 180°

So, AD || BC ...(1) [Since the co-interior angles are supplementary]

Similarly,

∠C + ∠B = 180°

$x + y = 180°$

So, AB || CD ...(2) [Since the co-interior angles are supplementary]

From (1) and (2) both opposite sides of ABCD are parallel

ABCD is a parallelogram

11. (a) OB = OD

Because diagonal of parallelogram are bisect each other into two equal parts.

(b) $\angle OBY = \angle ODX$

In ABCD parallelogram

AB || CD and BD is a transversal

$\therefore \angle B = \angle D$ (alternate interior angles are equal)

$\therefore \angle OBY = \angle ODX$

(c) $\therefore \angle DOX = \angle BOY$ (CPCT)

(d) In parallelogram ABCD

AD || BC and XY is a transversal

$\angle DXY = \angle BYX$ (alternate interior is)

In ΔDOX and ΔBOY

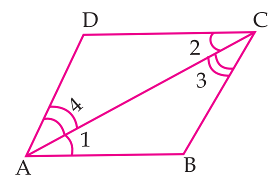
OD = OB (proved in (i))

$\angle D = \angle B$ (proved in (ii))

$\angle OXD = \angle OYB$ (alternate interior is)

$\therefore \Delta DOX \cong \Delta BOY$ (AAS)

12. Given: ABCD is a parallelogram in which AC is a diagonal



To prove: $\Delta ABC \cong \Delta ADC$

Proof:

In ΔABC and ΔCDA

AB = CD (opposite sides of parallelogram)

$\angle 1 = \angle 2$ (alternate angles)

$\angle 3 = \angle 4$ (alternate angles)

AC = AC (common)

So, $\Delta ABC \cong \Delta CDA$ (ASA)

EXERCISE-3.4

1. (a) Yes
(b) Yes
(c) No
(d) No
(e) Yes
(f) Yes
(g) Yes
(h) No

2. All sides of squares are equal

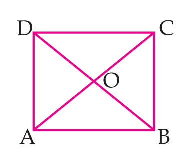
So, perimeter of square = 4 × side

14.4 = 4 × side

$$\text{Side} = \frac{\cancel{144}^{\cancel{72}^{36}}}{\cancel{4}_{\cancel{2}_{1}} \times 10} = \frac{36}{10} = 3.6 \text{ m}$$

$\therefore$ Side of square field = 3.6 m

3. Let ABCD be the rhombus whose diagonals AC and BD are of lengths 16 cm and 30 cm respectively



AC and BD intersect at O.

Since the diagonals of a rhombus bisect each other at right angles.

$\therefore$ AO = $\frac{1}{2}$AC $= \frac{1}{2} \times 16 = 8$ cm

and BO = $\frac{1}{2}$BD $= \frac{1}{2} \times 30 = 15$ cm

$\therefore$ ΔAOB is a right angled triangle at O.

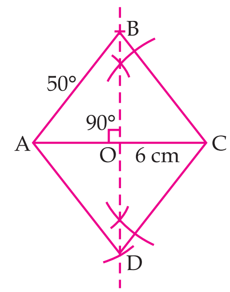
$AB^2 = OB^2 + OA^2$ (by pythagoras theorem)

$AB^2 = (15)^2 + (8)^2 = 225 + 64 = 289$

AB = $\sqrt{289} = \sqrt{17 \times 17} = 17$ cm

The length of each side of the rhombus = 17 cm

4. AC and BD bisect each other at 90°



$\therefore$ In ΔAOB

$AB^2 = OA^2 + OB^2$

$(5\text{ cm})^2 = (3\text{ cm})^2 + OB^2$

$25 = 9 + OB^2$

$OB^2 = 25 - 9$

$OB^2 = 16$

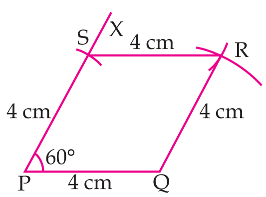
OB = $\sqrt{4 \times 4} = 4$ cm

$\therefore$ OB = $\frac{1}{2} \times$ BD

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

$\therefore$ BD = 4 × 2 = 8 cm

5.



6. No, it is not a rhombus because diagonal of a rhombus bisect each other at 90°. Whose, diagonals must be perpendicular.

7. (a) Yes
(b) No
(c) Yes
(d) Yes
(e) No
(f) No
(g) Yes
(h) No

8. No, cardboard is not a rectangle, because diagonals of rectangle are equal in length.

9. Let the length and breadth = x and $2x$

Perimeter = 2(L + B)

$24 = 2(x + 2x)$

$24 = 2(3x)$

$\frac{\cancel{24}^{12}}{\cancel{2}_1} = 3x$

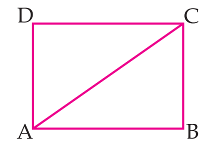
$x = \frac{\cancel{12}}{\cancel{3}} = 4$ cm

∴ Length = x = 4 cm

Breadth = $2(x) = 2(4) = 8$ cm

10. (a) Yes BC = DA

Since opposite sides of rectangle are equal



(b) Yes, AB = CD

Since opposite sides of rectangle are equal

(c) Yes $\angle B = \angle D$

Since each angle is 90°

(d) Yes, $\Delta ABC \cong \Delta CDA$

In ΔABC and ΔCDA

AB = CD [opposite sides of rectangle are equal]

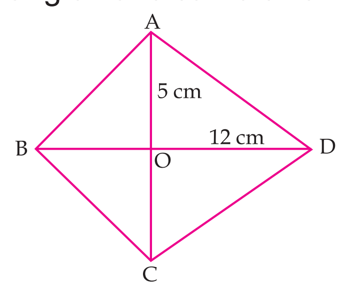
BC = AD

AC = AC (common)

∴ $\Delta ABC = \Delta CDA$ (SSS)

11. No, the window frame is not rectangular because the diagonal of rectangle have same size.

12. Let the diagonals AC and BD intersect at right angled at O



Join AB, BC CD and DA

Then AO = 5 cm; BO = 12 cm

And AOB is a right triangle.

∴ AB = $\sqrt{(5)^2 + (12)^2} = \sqrt{25 + 144} = \sqrt{169} = 13$ cm

Similarly AD, DC and DC are 13 cm

Hence, each side is 13 cm and it will be a rhombus.

13. No, if the diagonals of quadrilateral are perpendicular to each other than such quadrilateral is not always a rhombus. As you know conditions of rhombus.

(1) It should be parallelogram

(2) All sides should be equal

(3) Diagonals are perpendicular to each other

14. Length of rectangle = 24 cm

Breadth of rectangle = 10 cm

Diagonal of rectangle = $\sqrt{(L)^2 + B^2}$

$= \sqrt{(24)^2 + (10)^2} = \sqrt{576 + 100} = \sqrt{676} = 26$ cm

∴ The length of the diagonal of a rectangle = 26 cm

NCERT CORNER

EXERCISE-3.1

1. (a) 1, 2, 5, 6, 7

(b) 1, 2, 5, 6, 7

(c) 1, 2

(d) 2

(e) 1

2. (a) There are 2 diagonals in a convex quadrilateral.

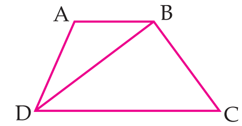
(b) There are 9 diagonals in a regular hexagon.

(c) A triangle does not have any diagonal in it.

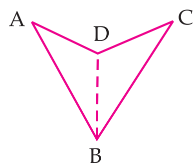
3. The sum of the measures of the angles of a convex quadrilateral is 360° as a convex quadrilateral is made of two triangles.

Here ABCD is a convex quadrilateral, made of two triangles ∆ABD and ∆BCD.

∴ The sum of all the interior angles of this quadrilateral will be same as the sum of all the interior angles of these two triangles i.e., 180° + 180° = 360°



Yes, this property also holds true for a quadrilateral which is not convex. This is because any quadrilateral can be divided into two triangles.



Here, again ABCD is a concave quadrilateral made of two triangles ∆ABD and ∆BCD. Therefore, sum of all the interior angles of this quadrilateral will also be 180° + 180º = 360°

4. (a) (7 – 2) × 180° = 900°
(b) (8 – 2) × 180° = 1080°
(c) (10 – 2) × 180° = 1440°
(d) (n – 2) × 180°

5. A polygon with equal sides and equal angles is called a regular polygon.
(i) Equilateral triangle
(ii) Square
(iii) Regular Hexagon

6. (a) Sum of all interior angles of quadrilateral = 360°
$50° + 130° + 120° + x = 360°$
$300° + x = 360°$
$x = 60°$

(b) From figure
$a + 90° = 180°$ (linear pair)
$a = 90°$
Sum of all angles of quadrilateral = 360°
$90° + 60° + 70° + x = 360°$
$x + 220° = 360°$
$x = 140°$

(c) From figure
$a + 70° = 180°$ (linear pair)
$a = 110°$
$b + 60° = 180°$ (linear pair)
$b = 120°$
Sum of all angles of pentagon = 540°
$30° + x + x + 120° + 110° = 540°$
$2x + 260° = 540°$
$2x = 540° – 260° = 280°$
$x = 140°$

(d) Sum of all angles of a pentagon = 540°

$5x = 540°$

$x = 108°$

7. (a) $x + 90° = 190°$ (linear pair)

$x = 90°$

$z + 30° = 180°$ (linear pair)

$z = 150°$

$y = 90° + 130° = 120°$ (exterior angle)

$x + y + z = 90° + 120° + 150° = 360°$

(b) $x + 120° = 180°$ (linear pair)

$x = 60°$

$y = 180° – 80° = 100°$ (linear pair)

$z = 180° –60° = 120°$ (linear pair)

$60° + 80° + 120° + a = 360°$ (sum of angles of quadrilateral)

$a = 360° – 260°$

$a = 100°$

$w + 100° = 180°$

$w = 80°$

$x + y + z + w = 60° + 100° + 120° + 80° = 360°$

EXERCISE-3.2

1. We know that the sum of all exterior angles of any polygon = 360°

(a) $x + 125° + 125° = 360°$

$x = 360° – 250° = 110°$

(b) $60° + 70° + 90° + x + 90° = 360°$

$x + 310° = 360°$

$x = 50°$

2. (a) Sum of all exterior angles of the polygon = 360°

Number of sides of regular polygon = 9 sides

∴ Measure of each exterior angle of a regular polygon = $\frac{360°}{9} = 40°$

(b) Sum of all exterior angles of the polygon = 360°

Number of sides of regular polygon = 15 sides

∴ Measure of each exterior angle of a regular polygon = $\frac{\overset{\overset{24°}{\cancel{120}}}{\cancel{360°}}}{\underset{\underset{1}{\cancel{5}}}{\cancel{15}}} = 24°$

3. Sum of all exterior angles of polygon = 360°

Each angle = 24°

Number of sides = $\frac{\overset{15}{\cancel{360°}}}{\cancel{24}} = 15$ sides

4. Measure of each interior angle = 165°

Measure of each exterior angle = 180° – 165° = 15°

The sum all exterior angles of any polygon = 360°

$\therefore$ Number of sides of the polygon = $\frac{\overset{24}{\cancel{360°}}}{\cancel{15}_1} = 24$ sides

5. (a) Sum of all exterior angles of any polygon = 360°

Each exterior angle = 22°

Number of sides = $\frac{\overset{180}{\cancel{360°}}}{\cancel{22}_{11}} = 16\frac{4}{11}$ sides --

Which is not a whole number

So, it is not possible to have a regular polygon each of whose exterior angles is 22°.

(b) Interior angle = 22°

Exterior angle = 180° – 22° = 158°

Number of sides = $\frac{360°}{158} = 2\frac{44}{158} = 2\frac{22}{79}$ sides

So, it is not possible to have a regular polygon each of whose interior angle is 22°.

6. A regular polygon having the lowest possible number of sides. The exterior angle of this triangle will be maximum exterior angle possible for any regular polygon.

Exterior angle of an equilateral triangle = $\frac{360°}{3} = 120°$

Hence, maximum possible measure of exterior angle for any polygon is 120°. Also, we know that an exterior angle and an interior angles are always in a linear pair.

Hence, minimum interior angle = 180° – 120° = 60°

EXERCISE-3.3

1. (a) In a parallelogram, opposite sides are equal in length AB = BC.

(b) In a parallelogram, opposite angles are equal in measure ∠DCB = ∠DAB.

(c) In a parallelogram, diagonals bisect each other OC = OA.

(d) In a parallelogram, adjacent angles are supplementary to each other m ∠DAB + m ∠CDA = 180°.

2. (I) $x + 100 = 180°$ (adjacent is are supplementary)

$x = 180 – 100$

$x = 80°$

$z = x = 80°$ (opposite angles are equal)

$y = 100°$ (opposite angles are equal)

(II) $50° + y = 180°$ (adjacent ∠s are supplementary)

$y = 130°$

$x = y = 130°$ (opposite ∠s are equal)

$z = x = 130°$ (corresponding ∠s)

(III) $x = 90°$ (vertical opposite ∠s)

$x + y + 30° = 180°$ (sum angles of triangles)

$90° + y + 30° = 180°$

$y = 60°$

$z = y = 60°$ (alternate interior ∠s)

(IV) $z = 80°$ (corresponding $\angle$s)

$80° + x = 180°$ (adjacent $\angle$s are 180°)

$x = 100°$

$y = z = 80°$ (opposite is are equal)

(V) $y = 112°$ (opposite angles are equal)

$x + y = 40° = 180$ (sum of angles of triangles)

$x = 180° – 152° = 28°$

$z = x = 28°$ (alternate interior $\angle$s)

3. (a) $\angle B + \angle D = 180°$, quadrilateral ABCD may or may not be a parallelogram. Along with this condition, the following conditions should also be fulfilled.

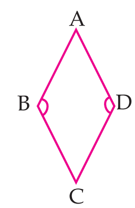
The sum of measures of adjacent angles should be 180°.

Opposite angles should also be of same measure.

(b) No opposite sides AD and BC are of different lengths.

(c) No opposite angles A and C have different measure.

4. Here, quadrilateral ABCD (kite) has two of its interior angles, $\angle B$ and $\angle D$ of same measures. However, still the quadrilateral ABCD is not a parallelogram as the measures of the remaining pair of opposite angles $\angle A$ and $\angle C$ are not equal.



5. Let the measures of two adjacent angles $\angle A$ and $\angle B$ of parallelogram ABCD are in the ratio of 3 : 2.

Let $\angle A = 3x$ $\angle B = 2x$

$\angle A + \angle B = 180°$ (adjacent $\angle$s are supplementary)

$3x + 2x + 180°$

$5x = 180°$

$x = \frac{180°}{5} = 36°$

$\angle A = \angle C = 3x = 180°$ [opposite $\angle$s are equal]

$\angle B = \angle D = 2x = 2(36) = 72°$

6. Sum of adjacent angles = 180°

$\angle A + \angle B = 180°$

$2\angle A = 180°$ ($\angle A = \angle B$)

$\angle A = 90°$

$\angle B = \angle A = 90°$

$\angle C = \angle A = 90°$ (opposite $\angle$s)

$\angle D = \angle B = 90°$ (opposite $\angle$s)

Thus, each angles of the parallelogram measure 90°.

7. $y = 40°$ (alternate interior $\angle$s)

$70° = z + 40°$ (corresponding $\angle$s)

$z = 70° – 40° = 30°$

$x + (z + 40°) = 180°$

$x = 180° – 70° = 110°$

8. (a) GU = SN

$3y – 1 = 26$

$y = \frac{27}{3} = 9$

SG = NU

$3x = 18$

$x = \frac{\cancel{18}^{6}}{\cancel{3}_{1}} = 6$

Hence, the measure of x and y are 6 cm and 9 cm respectively.

(b) We know that the diagonals of parallelogram bisect each other.

$y + 7 = 20°$

$y = 13$

$x + y = 16$

$x + 13 = 16$

$x = 3$

Hence, the measure of x and y are 3 cm and 13 cm

9. Adjacent angles of a parallelogram are supplementary.

In a parallelogram RISK

∠RKS + ∠ISK = 180°

120° + ∠ISK = 180°

∠ISK = 60°

Also, opposite ∠s of a parallelogram are equal

In parallelogram CLUE,

∠ULC = ∠CEU = 70°

The sum of the measure of all the interior angles of a triangle is 180°

$x = 60° + 70° = 180°$

$x = 50°$

10. If a transversal line is intersecting two given lines such that the sum of the measure of the angles, on the same side of transversal is 180° then the given two lines will be parallel to each other.

∠NML + ∠MLK = 180°

Hence NM || LK

As quadrilateral KLMN has a pair of parallel lines.

Therefore, it is trapezium.

11. AB || CD

∠B + ∠C = 180° (angles on same side of transversal)

120° + ∠C = 180°

∠C = 60°

12. ∠P + ∠Q = 180°(angles on the same side of transversal)

∠P = 180° – 130° = 50°

∠R + ∠S = 180°(angles on the same side of transversal)

90° + ∠S = 180°

∠S = 180° – 90° = 90°

Yes, there is one more method to find the measure of m ∠P.

EXERCISE-3.4

1. (a) False. All squares are rectangles but all rectangles are not squares.

(b) True, opposite sides of a rhombus are equal and parallel to each other.

(c) True. All squares are rhombus as all sides of a square are of equal lengths. All square are also rectangles as each internal angle measure 90°.
(d) False. All squares are parallelogram as opposite sides are equal and parallel.
(e) False. A kite does not have all sides of the same length.
(f) True. A rhombus also has two distinct consecutive pairs of sides of equal length.
(g) True. All parallelograms have a pair of parallel sides.
(h) True. All squares have a pair of parallel sides.

2. (a) Rhombus and square are the quadrilateral that have 4 sides of equal length.
(b) Square and rectangle

3. (a) A square is a quadrilateral since it has four sides.
(b) A square is a parallelogram since its opposite sides are parallel to each other.
(c) A square is a rhombus since its four sides are equal.
(d) A square is a rectangle since each interior angle measure 90°.

4. (a) Parallelogram, rhombus, square, rectangle
(b) Rhombus and square
(c) Square and rectangle

5. In a rectangle, there are two diagonals, both lying in the interior of the rectangle, Hence, it is a convex quadrilateral.

6. Construction: Draw lines AD and CD such that AD || BC, AB || DC.
AD = BC, AB = DC
ABCD is a rectangle as opposite sides are equal and parallel to each other and all the interior angles are of 90°.
In a rectangle, diagonals are of equal length and also these bisect each other.
Hence, AO = OC = OB = OD
Thus, O is equidistant from A, B and C.

SUBJECT ENRICHMENT EXERCISE

I. (1) 360°
(2) 1620°
(3) Kite
(4) Rectangle
(5) Rectangle
(6) A special type of rectangle
(7) Trapezium
(8) 144°
(9) 360°
(10) 150°

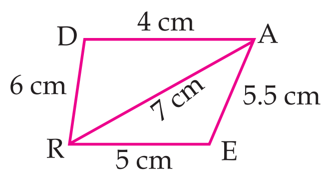
II. (a) 70°
(b) 120°, 60°, 120°
(c) y = 120°, z = 90°, x = 60°
(d) 3
(e) 100°, 80°, 100°, 80°
(f) Sides
(g) 60°
(h) $(n - 2) \times 180°$
(i) Supplementary
(j) 90°

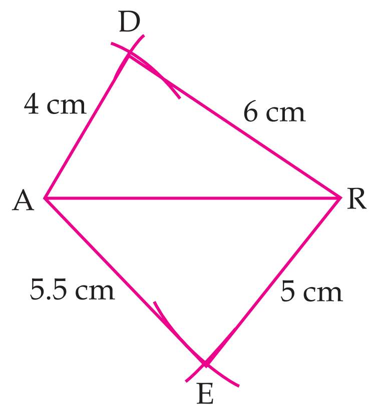
III. (a) False
(b) True
(c) False
(d) False
(e) False
(f) False
(g) True
(h) False

Practical Geometry

EXERCISE-4.1

1. Firstly, a rough sketch of this quadrilateral can be drawn as follows:-



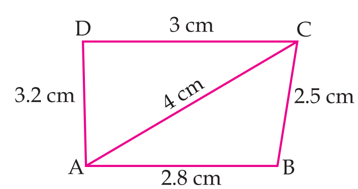


Steps of construction:-

1. ΔARD can be constructed by using the given measurements as follows.
2. Vertex E is 5 cm away from vertex R. Therefore, while taking R as centre, draw an arc of radius 5 cm.
3. Taking A as centre, draw an arc of radius 5.5 cm, cutting the previous arc at point E. Join R to A and R.

∴ READ is the required quadrilateral.

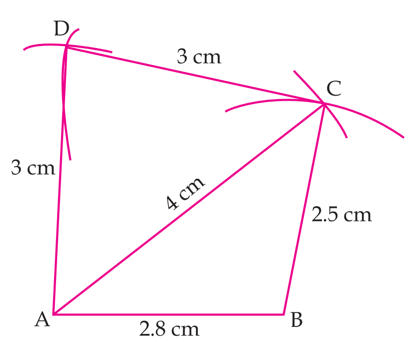
2. Firstly, a rough sketch of this quadrilateral can de drawn as follow:-



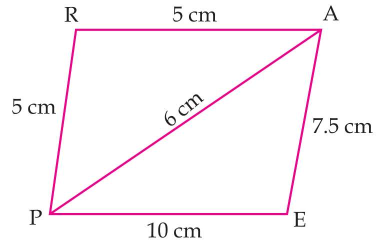
Steps of construction:-

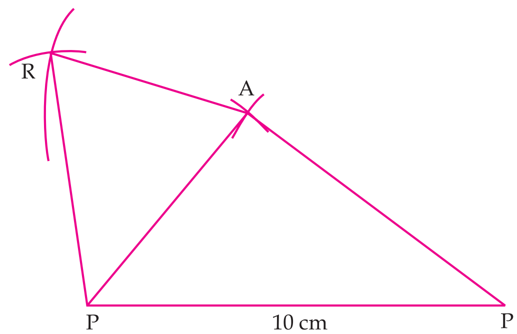
1. ABC can be constructed by using the given measurements as follow:
2. Vertex D is 3 cm away from Vertex C, while taking C as centre, drawn an arc of radius 3 cm.
3. Taking A as centre, draw an arc of radius = 3.2 cm, cutting the previous arc at point D. Join CD and AD.

∴ ABCD is the required quadrilateral.



3. Firstly, a rough sketch of this quadrilateral can be drawn as follows:-



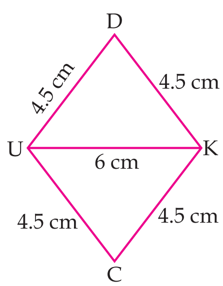


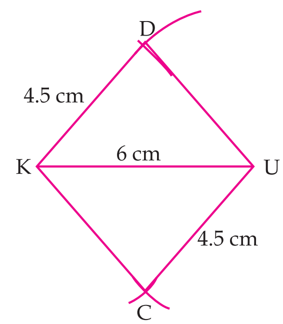
Steps of construction as are above Q2:

4. We know that all sides of a rhombus are of the same measure.

DU = UC = CK = KD = 4.5 cm

A rough sketch of this rhombus can be drawn as follow.



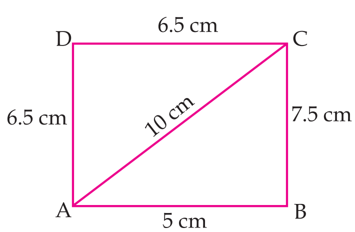


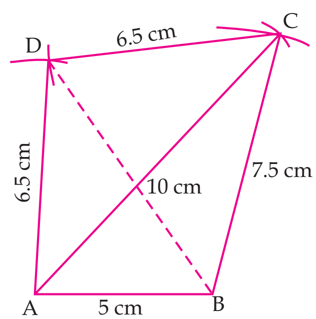
Step of construction:

1. KUD can be constructed by using the given measurements as follow:-
2. Vertex D is 4.5 cm away from Vertex K, while taking U as centre, drawn an arc of radius 4.5 cm.
3. Taking K and U as centre, drawn two arc of radius = 4.5 cm, cutting at point C. Join CK and CU.

∴ KDUC is the required quadrilateral.

5.





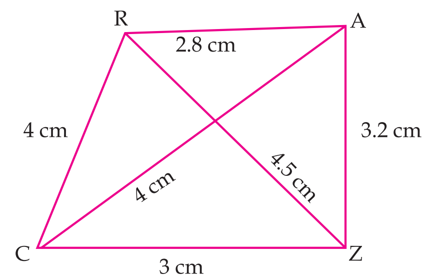
Step of Construction:

1. Take AB = 5 cm. A as a centre draw arc, then B as a centre cut previous are at C.
2. Again A as a centre. Draw another arc and C as a centre draw another arc cutting at D.
3. Join DC and AD.
4. Join DB.

Measure of BD = 8 cm

EXERCISE-4.2

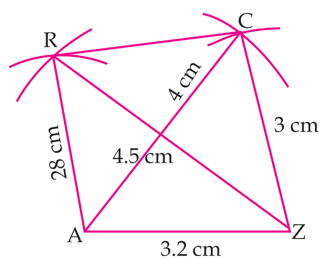
1. First we draw a rough sketch of quadrilateral CZAR and write down its dimensions as shown.



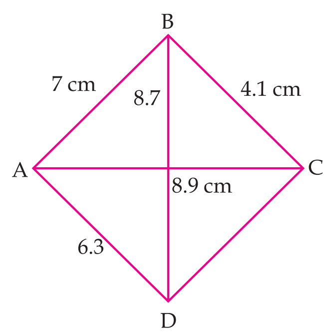
Steps of construction:

1. Draw AZ = 3.2 cm
2. With Z as centre and radius = 4.5 cm, draw an arc.
3. With A as centre and radius = 2.8 cm, draw another arc, cutting the previous arc at R.
4. Join AR and ZR.
5. With A as centre and radius = 4 cm, draw an arc.
6. With Z as centre and radius = 3 cm, draw another arc, cutting the previous arc at C.
7. Join CZ and AC and CR.

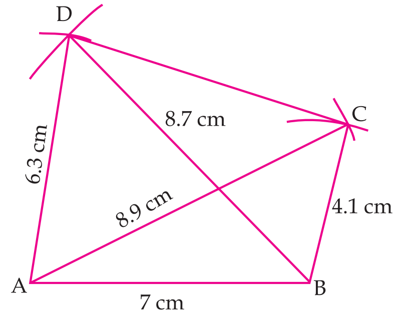
Then CZAR is the required quadrilateral.



2. First we draw a rough sketch of quadrilateral ABCD and write down its dimensions as shown.



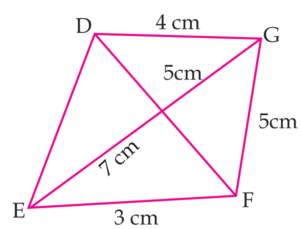
Steps of construction:



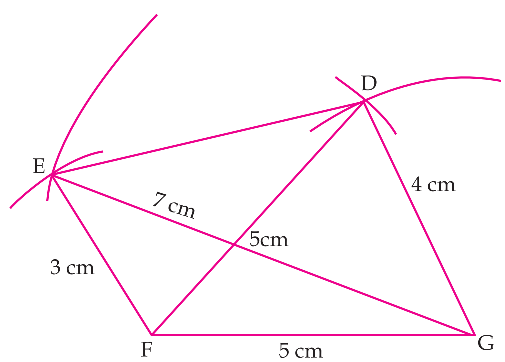
1. Draw AB = 7 cm
2. With B as centre and radius = 4.1 cm, draw an arc.
3. With A as centre and radius = 8.9 cm, draw another arc, cutting the previous arc at C.
4. Join AC and BC.
5. With A as centre and radius = 6.3 cm, draw an arc.
6. With C as centre and radius = 8.7 cm, draw another arc, cutting the previous arc at D.
7. Join AD and AB and BD.

Then ABCD is the required quadrilateral.

3. First we draw a rough sketch of quadrilateral DEFG and write down its dimensions as shown:-



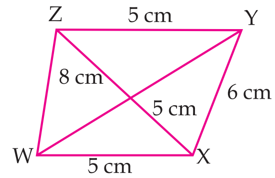
Steps of construction:



1. Draw FG = 5 cm
2. With F as centre and radius = 3 cm, draw an arc.
3. With G as centre and radius = 7 cm, draw another arc, cutting the previous arc at F.
4. Join EF and EG.
5. With C as centre and radius = 4 cm, draw an arc.
6. With F as centre and radius = 5 cm, draw another arc, cutting the previous arc at D.
7. Join FD and DG and EG.

Then FGDE is the required quadrilateral.

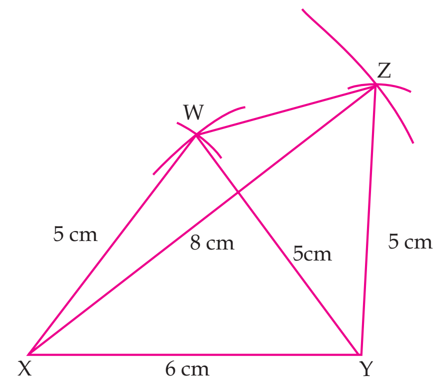
4. First we draw an rough sketch of quadrilateral WXYZ and write down its dimensions as shown.



Steps of construction:-

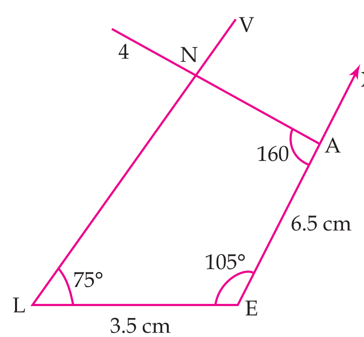
1. Draw XY = 6 cm
2. With X as centre and radius = 8 cm, draw an arc.
3. With Y as centre and radius = 5 cm, draw another arc, cutting the previous arc at Z.
4. Join XZ and YZ.
5. With X as centre and radius = 5 cm, draw an arc.
6. With Y as centre and radius = 5 cm, draw another arc, cutting the previous arc at Z.
7. Join XW and WZ and WY.

Then XYZW is the required quadrilateral.



EXERCISE-4.3

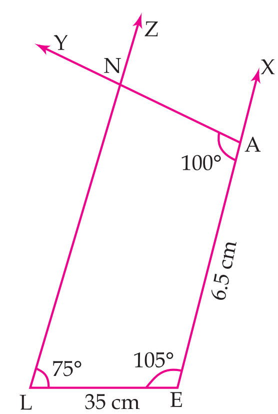
1. First we draw a rough sketch of quadrilateral LEAN and write down its dimensions as shown.



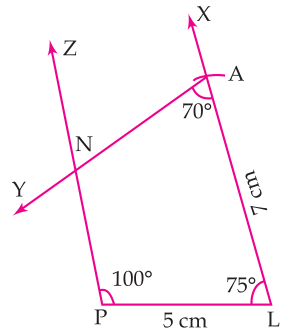
Steps of construction:

1. Draw LE = 3.5 cm
2. Make ∠LEA = 105°
3. With E as centre and radius 6.5 cm, draw an arc, cutting EX at A.
4. Make ∠EAY = 100°
5. Make ∠ELZ = 75° so that LZ and AY intersect each other at N.

Then, LEAN is the required quadrilateral.



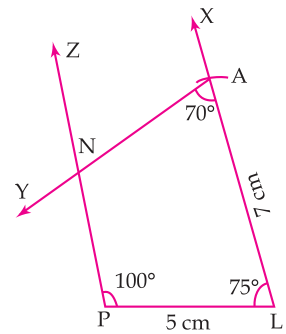
2. First we draw a rough sketch of quadrilateral PLAN and write down its dimensions as shown.



Steps of Construction:

1. Draw PL = 5 cm
2. Make ∠PLA = 75°
3. With L as centre and radius 7 cm, draw an arc, cutting ∠LA at A.
4. Make ∠LPZ = 100°
5. Make ∠NAL = 70° so that PZ and AY intersect each other at N.

Then, PLAN is the required quadrilateral.

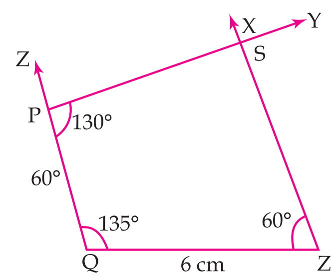


3. $\angle P + \angle Q + \angle R + \angle S = 360°$

$\angle P + 135° + 60° + 35° = 360°$

$\angle P = 360° - 230°$

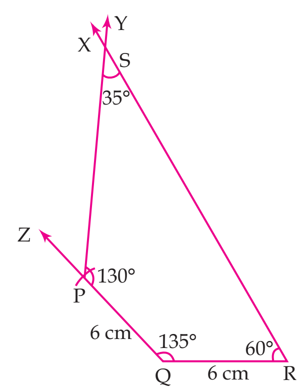
$= 130°$



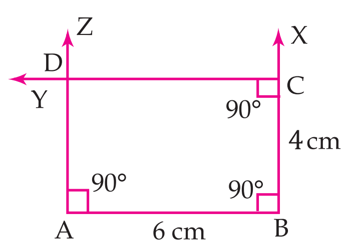
Steps of construction:

1. Draw QR = 6 cm
2. Make ∠RQZ = 135°
3. With Q as centre and radius 6 cm, draw an arc, cutting QZ at P.
4. Make ∠QRX = 60°
5. Make ∠QPY = 130° so that PX and RY intersect each other at S.

Then, QRSP is the required quadrilateral.



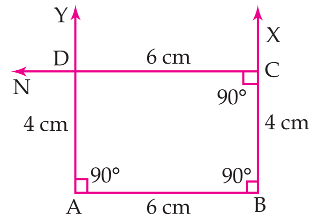
4. First we draw an rough sketch of quadrilateral ABCD and write down its dimensions as shown.



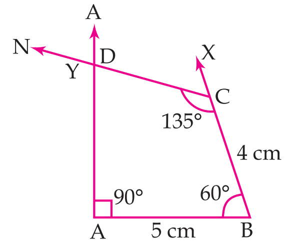
Steps of construction:-

1. Draw AB = 6 cm
2. Make ∠BAD = 90°
3. With B as centre and radius 4 cm, draw an arc, cutting BX at C.
4. Make ∠BCD cutting at = 90°
5. join AD and CD.

Then, ABCD is the required quadrilateral.



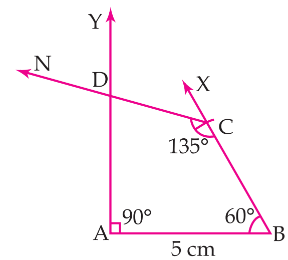
5. First we draw an rough sketch of quadrilateral WXYZ and write down its dimensions as shown.



Steps of construction:

1. Draw AB = 5 cm
2. Make ∠BAD = 90° and ∠ABC = 60°
3. With B as centre and radius 4 cm, draw an arc, cutting BX at C.
4. Make ∠BCD = 135° intersecting AY at point D.
5. Join the lines.

Then, ABCD is the required quadrilateral.

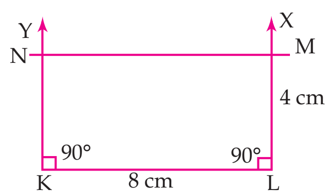


6. No, its not possible at all to construct a quadrilateral PQRS because the sum of measures of all angles of quadrilateral PQRS is 360°. But the sum of three angles of quadrilateral is 360° and fourth angle = 0°. Fourth angle is 0° is not possible because 0° angle means angle not exist in quadrilateral PQRS.

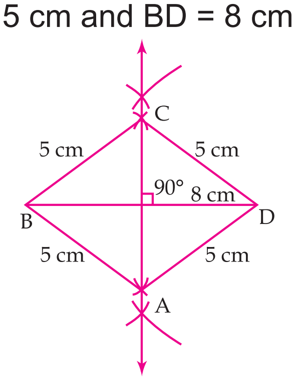
∴ PQRS is not said that quadrilateral

EXERCISE-4.4

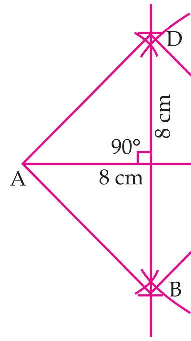
1. We know that each angles of rectangle is 90° and a point of opposite sides are parallel and equal i.e., ∠K = ∠L = ∠M = ∠N = 90° and KL = MN and LM = NK



2. We know that all sides of rhombus are equal and diagonals are perpendicular bisect each other i.e., AB = BC = CD = DA = 5 cm and BD = 8 cm



3. We know that squares have all sides are equals and length of diagonals are equal and perpendicular bisector each other i.e., AB = BC = CD = DA and AC = BD

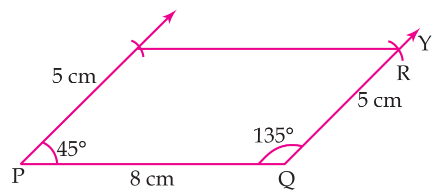


4. We know that the diagonals of a parallelogram bisect each other and opposite sides are parallel and equal and opposite angles are equal i.e., PQ = RS and QR = RP and ∠P = ∠R and ∠Q = ∠S.

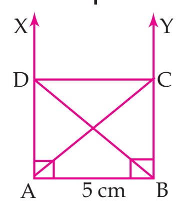
∠P = ∠Q = 180°

∠Q = 180° – 45°

∠Q = 135°



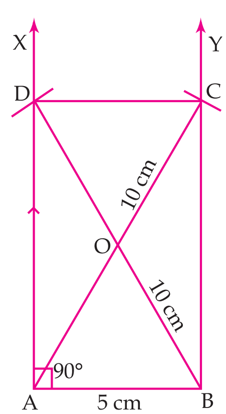
5. We know that diagonals of rectangle are equal and bisect each other i.e., AC = BD



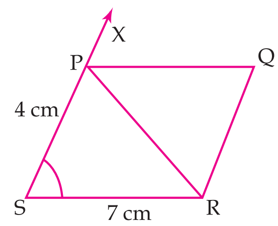
Steps of construction:

1. Draw AB = 5 cm
2. Make ∠XAB = 90° on point A and ∠YBA = 90° at point B.
3. Taking A as centre and radius = 10 cm, draw an arc, cutting BY at C.
4. Taking B as centre and radius = 10 cm, draw an arc, cutting AX at D.
5. Join AC, BD and CD

Thus, ABCD is the required rectangle.

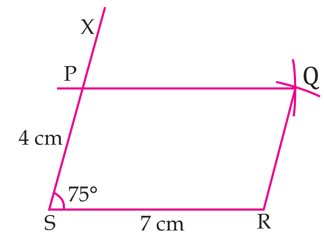


6. We know that opposite is and sides of parallelogram are equal and sides are parallel.



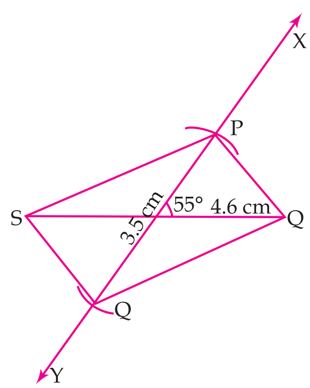
Steps of construction:

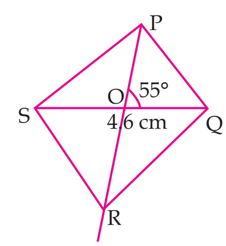
1. Draw SR = 7 cm
2. Make ∠XSR = 75° on point S.
3. Taking S as centre and radius = 4 cm, draw an arc, cutting SX at P.
4. Taking P as centre and radius = 7 cm, draw an arc
5. Taking R as centre and radius - 4 cm, draw an arc which cut the previous arc at Q.
6. Join PQ and QR.



Thus, PQRS is the required parallelogram.

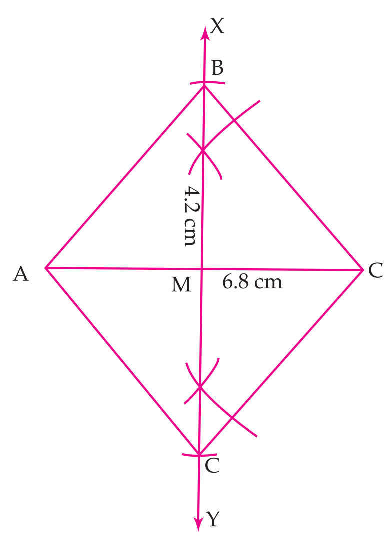
7. We know that diagonals of parallelogram are bisect each other at O i.e., OP = OR and SO = OQ.



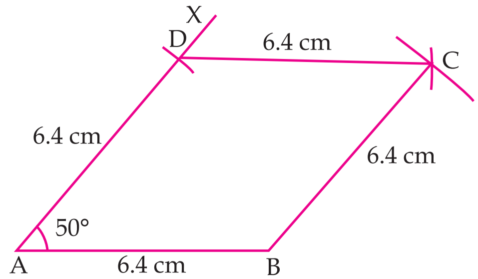


Rough sketch

8. We know that diagonals of a rhombus bisect each other at right angles.

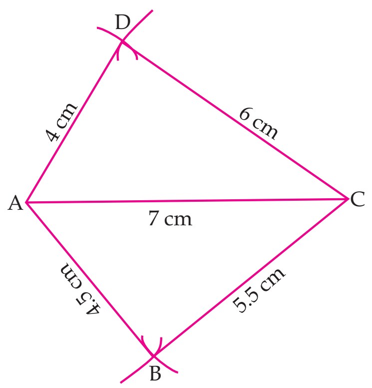


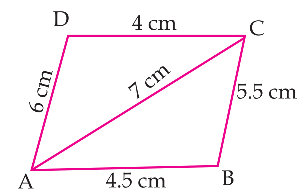
9. We know that all sides of rhombus are equal and



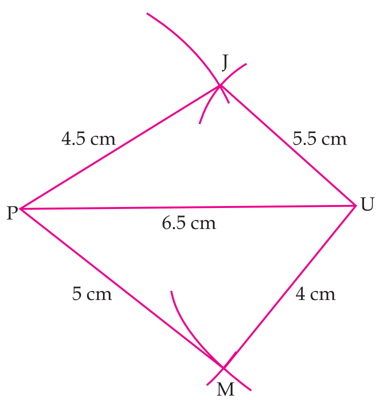
NCERT CORNER

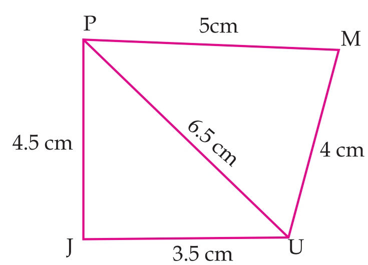
EXERCISE-4.1

1. 

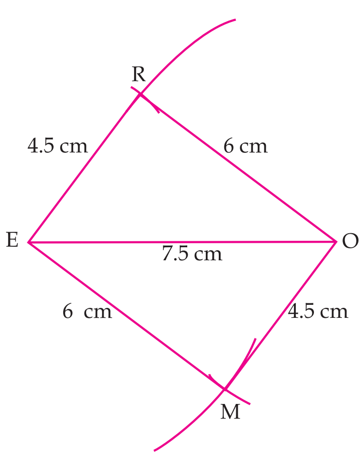


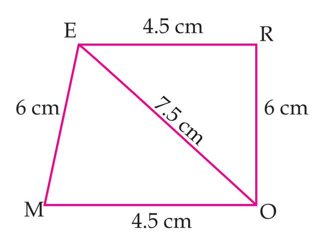
Rough sketch

2. 



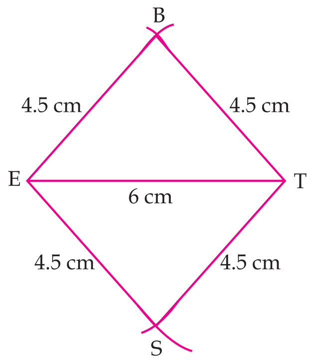
Rough sketch

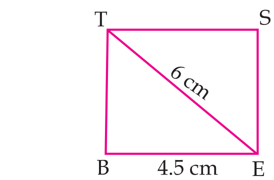
3. 



Rough sketch

4.

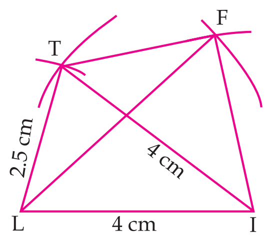


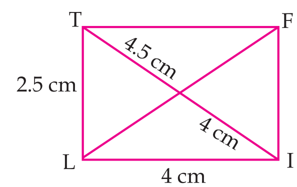


Rough sketch

EXERCISE-4.2

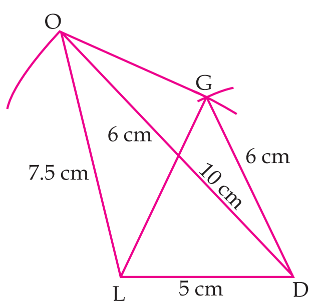
1.

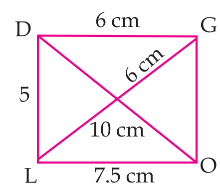




Rough sketch

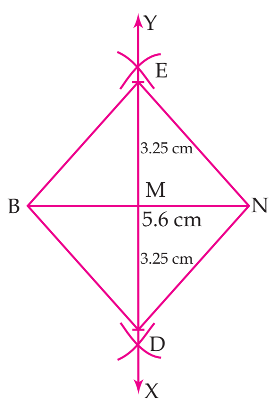
2.





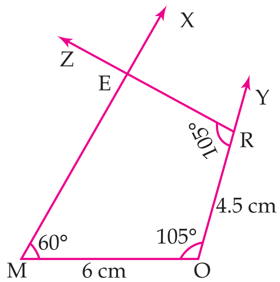
Rough sketch

3.

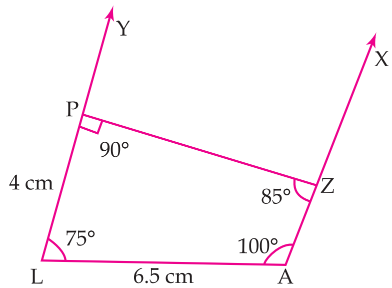


EXERCISE-4.3

1.



2.



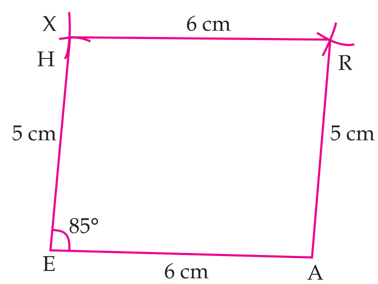
$\angle P + \angle A + \angle L + \angle N = 360°$

$90° + 110° + \angle L + 85° = 360°$

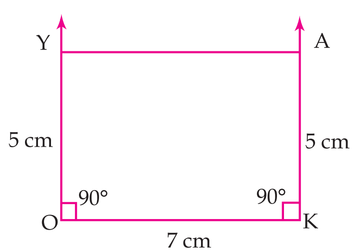
$\angle L + 360° – 285°$

$\angle L = 75°$

3. We know that opposite sides and angles of parallelogram are equal i.e., $\angle R = \angle E$ and $\angle A = \angle H$.

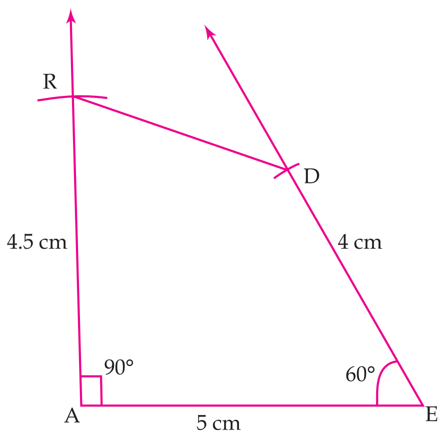


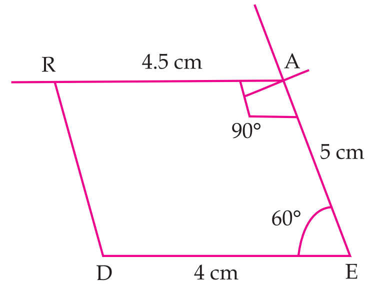
4.



EXERCISE-4.4

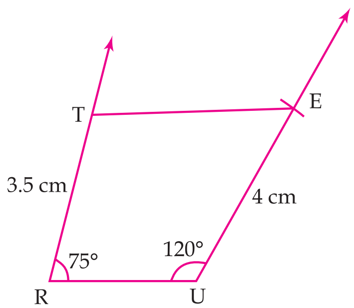
1.

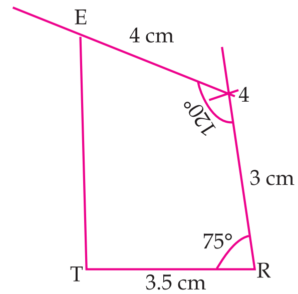




Rough sketch

2.

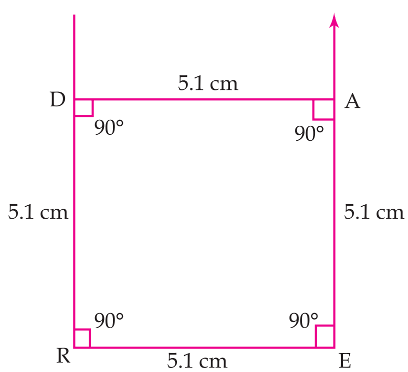




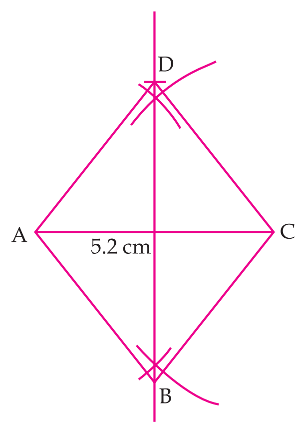
Rough sketch

EXERCISE-4.5

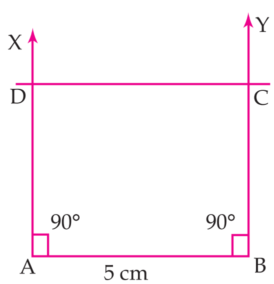
1.

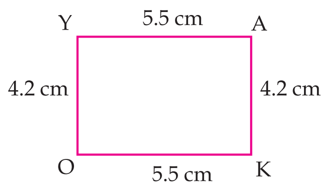


2.



3.



4. 

In parallelogram OKAY

Opposite sides are equal

∴ YA = OK = 5.5 cm and OY = AK = 4.2 cm

So, we have 4 sides

But we require 5 measurements to make a quadrilateral. Since we can have any angle as ∠O, there can be more than 1 parallelogram with the same side.

So, parallelogram is not unique.

SUBJECT ENRICHMENT EXERCISE

I. (1) Rectangle

(2) Diagonal

(3) Diagonal

(4) When its three angles and any two sides are given

(5) No

II. (a) 5

(b) Two diagonals

(c) A rough sketch

(d) Sides or diagonals

(e) Rectangle

(f) Less than 5 measurements

(g) Trapezium

III. (a) False

(b) True

(c) False

(d) True

Data Handling

EXERCISE-5.1

1. The minimum marks = 1 and the maximum marks = 20
So range of data = 20 – 1 = 19
So suitable class interval is 0 – 5, 5 – 10, ...

Marks	Tally Marks	Frequency
0—5	IIII	4
5—10	~~IIII~~	5
10—15	~~IIII~~ ~~IIII~~ IIII	14
15—20	~~IIII~~ ~~IIII~~	10
20—25	III	3
		36

(a) 20 marks
(b) 1 marks
(c) Range of the marks = 20 – 1 = 19

2. Minimum weight = 30
Maximum weight = 98
So suitable class interval is 30 - 40, 40 - 50, ...
(a) 60 – 70
(b) 90 – 100
(c) 60
(d) Class mark of second interval = $\frac{40+50}{2} = \frac{90}{2} = 45$

Class mark of third interval = $\frac{50+60}{2} = \frac{110}{2} = 55$

Marks	Tally Marks	Frequency
30—40	卌 |	6
40—50	卌	5
50—60	||||	4
60—70	卌 卌 |	11
70—80	卌 |	6
80—90	卌 |	6
90—100	||	2
		40

3. Maximum temperature = 42.3°C
Minimum temperature = 24.5°C

Marks	Tally Marks	Frequency
20—25	|	1
25—30	||	2
30—35	卌 ||||	9
35—40	卌 卌	10
40—45	卌 |	6
		28

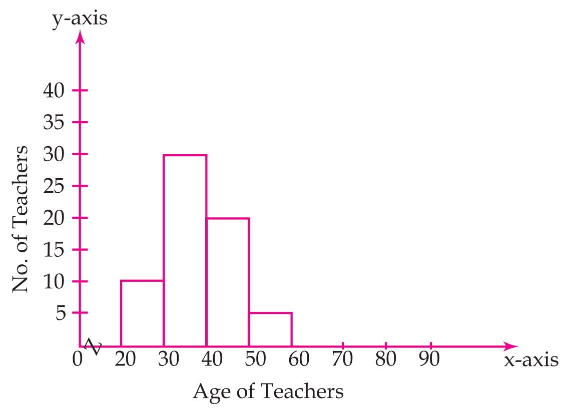
4. Minimum rainfall (in mm) = 5
Maximum rainfall (in mm) = 52

Marks	Tally Marks	Frequency
0—10	卌	5
10—20	卌 |||	8
20—30	卌 ||||	9
30—40	卌 ||	7
40—50	||||	4
50—60	||	2
		35

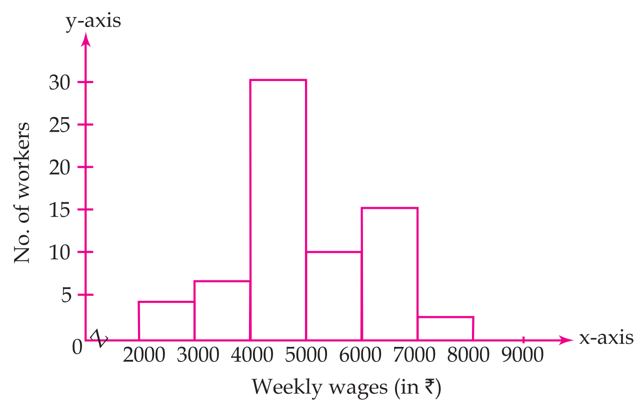
(a) Class size = upper limit - lower limit = 10 - 0 = 10
(b) 20
(c) 30
(d) Class marks = $\frac{20+30}{2} = \frac{50}{2} = 25$

EXERCISE-5.2

1.



2.



(a) 4000 - 5000
(b) 7000 - 8000
(c) 40 workers
(d) 50 workers

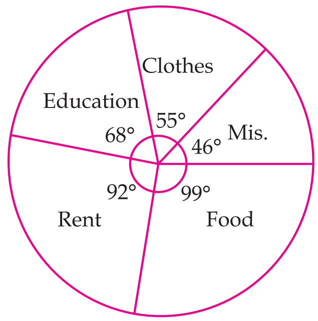
3. (a) In this histogram, weight (in kg) of students are given
(b) 30 - 40
(c) 150 students
(d) 50 students

EXERCISE-5.3

1. We find the central angle of each sector.

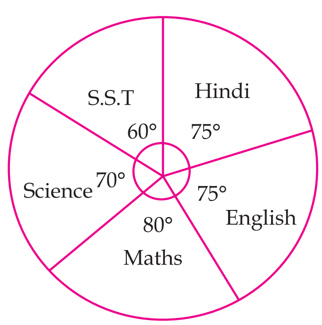
Items	Amount (in ₹)	Central Angle
Food	9600	$\frac{9600}{35040} \times 360° = 99°$
Rent	9000	$\frac{9000}{35040} \times 360° = 92°$

Education	6600	$\frac{6600}{35040} \times 360° = 68°$
Clothes	5400	$\frac{5400}{35040} \times 360° = 55°$
Miscellaneous	4440	$\frac{4440}{35040} \times 360° = 46°$
Total	**35,040**	



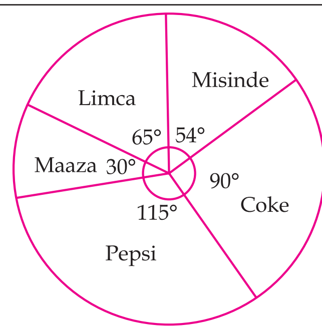
2. We find the central angle of each sector.

Subjects	Marks	Central Angle
Hindi	90	$\frac{90}{432} \times 360° = 75°$
English	90	$\frac{90}{432} \times 360° = 75°$
Maths	96	$\frac{96}{432} \times 360° = 80°$
Science	84	$\frac{84}{432} \times 360° = 70°$
SST	72	$\frac{72}{432} \times 360° = 60°$
Total	**432**	



3.

Drinks	% of favorite drinks	Central Angle
Mirinda	15%	$\frac{15}{100} \times 360° = 54°$
Coke	25%	$\frac{25}{100} \times 360° = 90°$
Pepsi	32%	$\frac{32}{100} \times 360° = 115°$
Maaza	10%	$\frac{10}{100} \times 360° = 36°$
Limca	18%	$\frac{18}{100} \times 360° = 65°$



4. (a) $\frac{60°}{360°} \times 4320 = ₹\ 720$

(b) $\frac{80°}{360°} \times 4320 = ₹\ 960$

(c) Different = ₹ 960 – ₹ 720 = ₹ 240

(d) $\frac{40°}{360°} \times 4320 = ₹\ 480$

5.

Subjects	Central angle	Marks obtained
Maths	80°	$\frac{80}{360} \times 450 = 100$
English	68°	$\frac{68}{360} \times 450 = 85$
Hindi	60°	$\frac{60}{360} \times 450 = 75$
Science	80°	$\frac{80}{360} \times 450 = 100$
SST	72°	$\frac{72}{360} \times 450 = 90$

(a) SST
(b) Maths and Science
(c) He scores 10 marks more in English than in HIndi.
(d) He scores 10 marks more in Science than in SST.

EXERCISE-5.4

1. Total number of outcomes i.e., sample space, s = {1, 2, 3, 4, 5, 6} = 6

Odd numbers = 1, 3, 5

∴ Favourite outcomes = 3

Hence, P (getting odd number) = $\frac{3}{6} = \frac{1}{2}$

2. All possible outcomes are H and T.

∴ Total number of all possible outcomes = 2

Number of Heads = 1

∴ P (getting a head) = $\frac{1}{2}$

3. Total number of outcomes are i.e., s {1, 2, 3, 4, 5, 6} = 6

Multiples of 3 are 3, and 6

∴ Favourite outcomes = {3, 6} = 2

Hence, P (getting a multiple of 3) = $\frac{\text{Number of favourite outcomes}}{\text{Total number of outcomes}} = \frac{2}{6} = \frac{1}{3}$

4. Total number of balls = (5 + 2 + 3) = 10 balls

(a) Favourable outcomes for getting red balls = 5

∴ P (getting red balls) = $\frac{5}{10} = \frac{1}{2}$

(b) Total number of green ball = 2

∴ P (getting green ball) = $\frac{2}{10} = \frac{1}{5}$

(c) Total number of ball either yellow or a red ball = 5 + 3

∴ P (getting a yellow or a red ball) = $\frac{8}{10} = \frac{4}{5}$

5. Total number of bulbs = 20

Defective bulbs = 5

Not defective bulbs = 15

Ritu says a number of bulbs are not defective = 15

∴ P (getting Ritu buying the bulb) = $\frac{15}{20} = \frac{3}{4}$

6. Total number of cards = 30

Number of cards contain the prizes = 5

Number of cards not contain the prizes = 25

∴ P (getting winning a prize) = $\frac{5}{30} = \frac{1}{6}$

P (getting losing a prize) = $\frac{25}{30} = \frac{5}{6}$

7. Total number of card in deck = 52

(a) The total number of diamond card in a deck = 13

∴ P (getting a diamond) = $\frac{13}{52} = \frac{1}{4}$

(b) There are 4 ace in a deck

P (getting an ace) = $\frac{4}{52} = \frac{1}{13}$

(c) There are 2 a black queen in a deck

P (a black queen) = $\frac{2}{52} = \frac{1}{26}$

8. Total number of card in deck = 52

(a) There are 26 red cards in a deck

$\therefore$ P (getting a red card) = $\frac{26}{52} = \frac{1}{2}$

(b) There are 26 black cards in a deck

$\therefore$ P (getting a black card) = $\frac{26}{52} = \frac{1}{2}$

(c) There are 6 red face cards in a deck

$\therefore$ P (getting a red face cards) = $\frac{6}{52} = \frac{3}{26}$

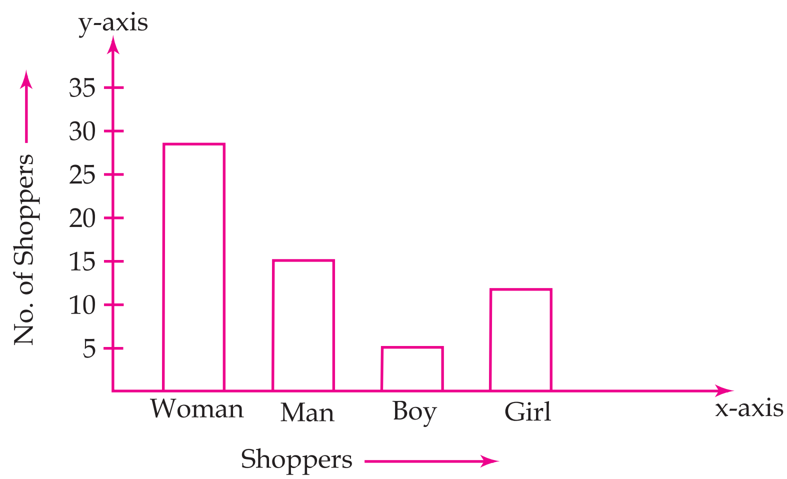
NCERT CORNER

EXERCISE-5.1

1. In case of the data given in alternative (b) and (d), we will use histogram as we can divide the given data in class intervals.

2.

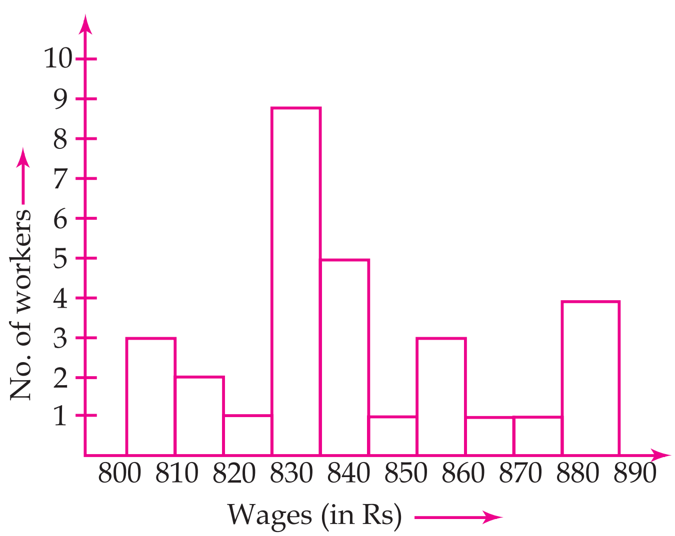
Shopper	Tally Marks	Number
W	𝍸 𝍸 𝍸 𝍸 𝍸 III	28
M	𝍸 𝍸 𝍸	15
B	𝍸	5
G	𝍸 𝍸 II	12



3.

Interval	Tally Marks	Frequency
800–810	|||	3
810–820	||	2
820–830	|	1
830–840	~~||||~~ ||||	9
840–850	~~||||~~	5
850–860	|	1
860–870	|||	3
870–880	|	1
880–890	|	1
890–900	||||	4
		30

4. (i) 830-840
(ii) 10 workers
(iii) 20 workers



5. (i) 4-5 hours
(ii) 34 students
(iii) 14 students spent more than 5 hours in watching TV.

EXERCISE-5.2

1. (a) Number of people who like classical music = 10%
This 10% represents 20 people

100% represents = $\frac{20}{10} \times 100 = 200$ people

$\therefore$ 200 young people were surveyed.

(b) Light type of music is liked by the maximum number of people.

(c) Number of CD's of classical music = 10% of 1000 = $\frac{10}{100} \times 1000 = 100$

Number of CD's of semi-classical music = $\frac{20}{100} \times 1000 = 200$

Number of CD's of light music = $\frac{40}{100} \times 1000 = 400$

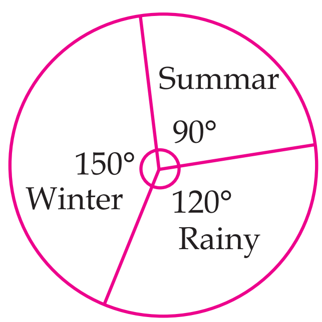
Number of CD's folk music = $\frac{30}{100} \times 1000 = 300$

2. (a) Winter

(b) Total number of votes = 90 + 120 + 150 = 360

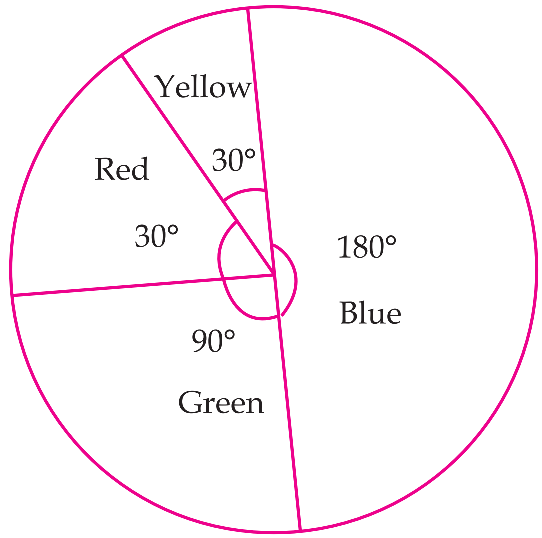
Season	Number of votes	Central angle
Summer	90	$\frac{90}{360} \times 360 = 90°$
Rainy	120	$\frac{120}{360} \times 360 = 120°$
Winter	150	$\frac{150}{360} \times 360 = 150°$

(c)



3. We find the central angle of each sector.

Colours	Number of people	In fraction	Central angle
Blue	18	$\frac{18}{36}$	$\frac{18}{36} \times 360° = 180°$
Green	9	$\frac{9}{36}$	$\frac{9}{36} \times 360° = 90°$
Red	6	$\frac{6}{36}$	$\frac{6}{36} \times 360° = 60°$
Yellow	3	$\frac{3}{36}$	$\frac{3}{36} \times 360° = 30°$



4. (a) Total marks obtained by the students are 540.

Central angle for 105 marks = $\frac{105}{540} \times 360° = 70°$

Hindi is the subject having its central angle as 70°

$\therefore$ The student scored 105 marks in Hindi.

(b) Different between central angles of Mathematics and Hindi = 90° – 70° = 20°

Marks for 20° central angle = $\frac{20}{360} \times 540 = 30$

$\therefore$ 30 more marks were obtained by the students in Mathematics than in Hindi.

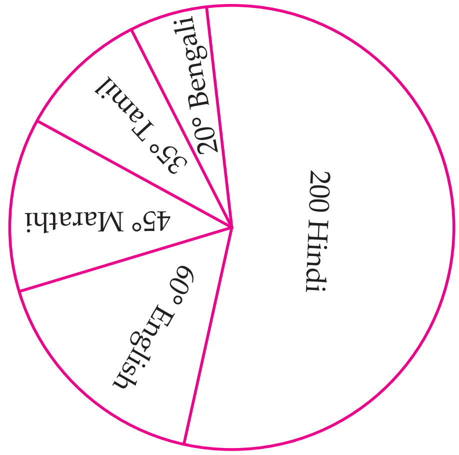
(c) Sum of central angles of Social science and Mathematics = 90° + 65° = 155°

Sum of central angles of Science and Hindi = 80° + 70° = 150°

$\therefore$ The students scored more in Social science and Mathematics than in Science and Hindi.

5.

Language	Number of students	Central angle
Hindi	40	$\frac{40}{72} \times 360 = 200°$
English	12	$\frac{12}{72} \times 360 = 60°$
Marathi	9	$\frac{9}{72} \times 360 = 45°$
Tamil	7	$\frac{7}{72} \times 360 = 35°$
Bengali	4	$\frac{4}{72} \times 360 = 20°$



EXERCISE-5.3

1. (a) On spinning the given wheel, the possible outcomes are A, B, C, D.

(b) By tossing two coins together, the possible outcomes are HT, TH, HH, TT where H and T represent Head and Tail of the coins respectively.

2. When a dice is thrown, the possible outcomes = 1, 2, 3, 4, 5 and 6 = 6

(a) Prime number = 2, 3, 5 = 3

(b) Not a prime number is 1, 4, 6

(c) A number of greater than 5 is 6

(d) Outcomes, a number not greater than 5 are 1, 2, 3, 4, 5

3. (a) The pointer can stop at one of the following region

A, A, B, C, D

Out of these 5 cases, it is possible only in 1 case that the pointer will stop at region D.

$\therefore$ P (getting the pointer stopping on D) = $\frac{1}{5}$

(b) There are 52 cards in a deck and there are 4 ace in 1 deck of cards.

P (getting an ace from a well-shuffled deck of 52 card) = $\frac{4}{52} = \frac{1}{13}$

(c) There are a total of 7 apples, out of which 4 red and 3 green.

P (getting a red apple) = $\frac{4}{7}$

4. There are 10 slips in the box. However, 6 is written only on 1 slip.

(a) P (getting a number 6) = $\frac{1}{10}$

(b) P (getting a number less than 6) = $\frac{5}{10} = \frac{1}{2}$

(c) P (getting a number greater than 6) = $\frac{4}{10} = \frac{2}{5}$

(d) P (getting a 1 digit number) = $\frac{9}{10}$

5. Total sectors = 3 + 1 + 1 = 5

There are 5 sectors and we can get a green sector in three cases.

$\therefore$ P (getting a green sector) = $\frac{3}{5}$

$\therefore$ P (getting a non blue sector) = $\frac{4}{5}$

6. (a) P (a prime number) = $\frac{3}{6} = \frac{1}{2}$

(b) P (not a prime number) = $\frac{3}{6} = \frac{1}{2}$

(c) P (a number greater than 5) = $\frac{1}{6}$

(d) P (a number not greater than 5) = $\frac{5}{6}$

SUBJECT ENRICHMENT EXERCISE

I. (1) Frequency table

(2) Histogram

(3) Sample space

(4) Pie chart

(5) $\frac{1}{12}$

(6) 1

II. (a) Space/gap

(b) 0, 1

(c) Frequency

(d) Pie chart

(e) 1

(f) Class mark

(g) Pie-chart

III. (a) True

(b) False

(c) False

(d) True

(e) True

(f) True

(g) False

Square and Square Roots

EXERCISE-6.1

1. We know that if a number has its units's place digit as a, then its square will end with the unit digit of the multiplication a × a.

(a) 52

Since its unit's place is 2, its square will end with the unit digit of the multiplication (2 × 2) = 4

(b) 36

Since its unit's place is 6, its square will end with the unit digit of the multiplication (6 × 6) = 6

(c) 532

Since its unit's place is 2, its square will end with the unit digit of the multiplication (2 × 2) = 4

(d) 9563

Since its unit's place is 3,its square will end with the unit digit of the multiplication (3 × 3) = 9

2. (a) 35^2

$= (30 + 5)^2 = (30 + 5)\,(30 + 5)$

$= 30\,(30 + 5) + 5\,(30 + 5)$

$= 900 + 150 + 150 + 25$

$= 1225$

(b) $78^2 = (70 + 8)^2 = (70 + 8)\,(70 + 8)$

$= 70\,(70 + 8) + 8\,(70 + 8)$

$= 4900 + 560 + 560 + 64$

$= 6084$

(c) $95^2 = (90 + 5)^2 = (90 + 5)\,(90 + 5)$

$= 90\,(90 + 5) + 5\,(90 + 5)$

$= 8100 + 450 + 450 + 25$

$= 9025$

(d) $(108)^2 = (100 + 8)^2 = (100 + 8)\,(100 + 8)$

$= 100\,(100 + 8) + 8\,(100 + 8)$

$= 10000 + 800 + 800 + 64$

$= 11664$

3. The squares of numbers may end with any one of the digit 0, 1, 4, 5, 6 or 9. Also a perfect square has even number of zeroes at the end of it.

(a) 698 has its unit place digit as 8. Therefore it cannot be a perfect square.

(b) 81000 has 3 zeroes at the end of it. However, since a perfect square cannot end with odd number of zeroes, it is not a perfect square.

(c) 24964 has its unit place digit as 4. Therefore it can be a perfect square.

(d) 67500 has 2 zeroes at the end of it. Since a perfect square can end with even number of zeroes, it is a perfect square.

But this number is not a perfect square because factor of 67500 is 2 × 2 × 3 × 3 × 3 × 5 × 5 × 5 × 5. Since all the factors are not in pairs so, 67500 is not a perfect square.

2	67500
2	33750
3	16875
3	5625
3	1875
5	625
5	125
5	25
5	5
	1

4. (a) $19^2 = 361$

The possible number of digit in the square of 19 = 3

(b) 153

The possible number of digit in the square if 153 = 5

(c) 2031

The possible number of digit in the square of 2031 = 7

(d) 13502

The possible number of digit in the sequence of 13502 = 9

5. (a) Square of 156 is even

(b) Square of 625 is odd

(c) Square of 2401 is odd

(d) $(1089)^2$ = odd

(e) Square of 1525 is odd

(f) Square of 7395 is odd

(g) $(10404)^2$ = Even

(h) Square of 6561 is odd

6. (a) $5 = m^2 - 1$

$m^2 = 1 + 5$

$m^2 = 6$

Then the value of m will not be an integers.

So, we try to take $m^2 + 1 - 5$, Then $m^2 = 4$ will give an integer value for m

Then $m^2 = 4 = 2 \times 2 = (2)^2$

$m = 2$

Thus $m^2 - 1 = (2)^2 - 1 = 3$

$m^2 + 1 = (2)^2 + 1 = 5$

$\therefore$ The required triplet is 3, 4, 5.

(b) If we take $m^2 + 1 = 10$, then $m^2 = 9$

The value of m will be an integer

Then $m = 3$

$\therefore$ The pythagorean triplets are $2m$, $m^2 + 1$, $m^2 - 1$

$= 2(3), (3)^2 + 1, (3)^2 - 1 = 6, 10, 8$

(c) 16

If we take $m^2 + 1 = 16$, Then $m^2 = 15$

The value of m will not be an integer

If we take $m^2 - 1 = 16$, Then $m^2 = 17$

Again the value of m is not an integer

Let $2m = 16$, Then $m = 8$

Thus $m^2 - 1 = (8)^2 - 1 = 63$ and $(m^2 + 1) = (8)^2 + 1 = 65$

$\therefore$ The pythagorean triplets are, 8, 63 and 65.

(d) 35

If we take $m^2 - 1 = 35$, then $m^2 = 36$

The value of m will be integer

$m = \sqrt{36} = 6$

Thus $2m = 2 \times 6 = 12$ $m^2 - 1 = (6)^2 + 1 = 37$

$\therefore$ The pythagorean triplets are 12, 35, 37.

7. (a) Here we have to find the sum of first 9 odd natural numbers.

$1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 = (9)^2 = 81$

(b) Here we have to find the sum of first 7 odd natural

$1 + 3 + 5 + 7 + 9 + 11 + 13 = (7)^2 + 49$

8. We know that there will be $2n$ numbers in between the squares of the numbers n and (nth)

(a) Between 6^2 and 7^2, there will be $2 \times 6 = 12$ numbers

(b) Between 10^2 and 11^2, there will be $2 \times 10 = 20$ numbers

(c) Between 20^2 and $(21)^2$, there will be $2 \times 20 = 40$ numbers

(d) Between $(29)^2$ and $(30)^2$, there will be $2 \times 29 = 58$ numbers

9. (a) $15^2 = 225 = 3 \times 75 = 3 \times 3 \times 25$

(b) $9^2 = 81 = 3 \times 27 = 3 \times 3 \times 9 = 3 \times 3 \times 3 \times 3$

(c) $18^2 = 364 = 4 \times 91 = 4 \times 13 \times 7$

(d) $20^2 = 400 = 4 \times 100 = 4 \times 4 \times 25$

(e) $(8)^2 = 64 = 4 \times 16 = 4 \times 4 \times 4$

10. In all the cases,

Let one integers be x

Since the integers are consecutive, other integer = $x + 1$

(a) $17^2 = x + (x + 1)$

$289 = 2x + 1$

$289 - 1 = 2x$

$288 = 2x$

$x = \frac{288}{2}$

$x = 144$, $x + 1 = 145$

So, the integers are 144 and 145

(b) $(35)^2 = x + (x + 1)$

$1225 = 2x + 1$

$1225 - 1 = 2x$

$2x = 1224$

$x = 612$, $x + 1 = 613$

So, the integers are 612 and 613.

(c) $(11)^2 = x + (x + 1)$

$121 = 2x + 1$

$121 - 1 = 2x$

$120 = 2x$

$x = 60$

$x = 1 = 61$

So, the integers are 60 and 61.

(d) $(27)^2 = x + (x + 1)$

$729 = 2x + 1$

$729 - 1 = 2x$

$728 = 2x$

$x = 364$

$x + 1 = 365$

So, the integers are 364 and 365.

(e) $(19)^2 = x + (x + 1)$

$361 = 2x + 1$

$360 = 2x$

$x = 180$

$x + 1 = 181$

So, integers are 180 and 181.

EXERCISE-6.2

1. (a) 432

Prime factor 432 = $\underline{2 \times 2} \times \underline{2 \times 2} \times \underline{3 \times 3} \times 3$

Factor of 3 has no pair

∴ 432 is not a perfect square.

2	432
2	216
2	108
2	54
3	27
3	9
3	3
	1

(b) 650

Prime factor of 650 = $2 \times \underline{5 \times 5} \times 13$

Factor of 2 and 12 have no pair

∴ 650 is not a perfect square.

2	650
5	325
5	65
13	13
	1

(c) 729

Prime factor of 729 = $\underline{3 \times 3} \times \underline{3 \times 3} \times \underline{3 \times 3}$

All factors have a pair

∴ 729 is a perfect square of 27.

(d) 810

Prime factor of 810 = $2 \times \underline{3 \times 3} \times \underline{3 \times 3} \times 5$

Factor of 2 and 5 have no pairs

∴ 810 is not a perfect square.

2	810
3	405
3	135
3	45
3	15
5	5
1	

(e) 343

Prime factor 343 = $\underline{7 \times 7} \times 7$

Factor of 7 has no pair

∴ 343 is not a perfect square.

2. (a)

$100 - 1 = 99$
$99 - 3 = 96$
$96 - 5 = 91$
$91 - 7 = 84$
$84 - 9 = 75$
$75 - 11 = 64$
$64 - 13 = 51$
$51 - 15 = 36$
$36 - 17 = 19$
$19 - 19 = 0$

Here the total number of subtraction is 10

$\therefore \sqrt{100} = 10$

(b)

$64 - 1 = 63$
$63 - 3 = 60$
$60 - 5 = 55$
$55 - 7 = 48$
$48 - 9 = 39$
$39 - 11 = 28$
$28 - 13 = 15$
$15 - 15 = 0$

Here the total number of subtraction is 8

$\therefore \sqrt{64} = 8$

(c)

$225 - 1 = 224$
$224 - 3 = 221$
$221 - 5 = 216$
$216 - 7 = 209$
$209 - 9 = 200$
$200 - 1 = 189$
$189 - 13 = 176$
$176 - 15 = 161$
$161 - 17 = 144$
$144 - 19 = 125$
$125 - 21 = 104$
$104 - 23 = 81$
$81 - 25 = 56$
$56 - 27 = 29$
$29 - 29 = 0$

Here the total number of subtraction is 15

$\therefore \sqrt{225} = 15$

(d)

$144 - 1 = 143$
$143 - 3 = 140$
$140 - 5 = 135$
$135 - 7 = 128$
$128 - 9 = 119$
$118 - 11 = 108$
$108 - 13 = 95$
$95 - 15 = 80$
$80 - 17 = 63$
$63 - 19 = 44$
$44 - 21 = 23$
$23 - 23 = 0$

Here the total number of subtraction is 12

$\therefore \sqrt{144} = 12$

(e)

$324 - 1 = 323$
$323 - 3 = 320$
$320 - 5 = 315$
$315 - 7 = 308$
$308 - 9 = 299$
$299 - 11 = 288$
$288 - 13 = 275$
$275 - 15 = 260$
$260 - 17 = 243$
$243 - 19 = 224$
$224 - 21 = 203$
$203 - 23 = 180$
$180 - 25 = 155$
$155 - 27 = 128$
$128 - 29 = 99$
$99 - 31 = 68$
$68 - 33 = 35$
$35 - 35 = 0$

Here the total number of subtraction is 18

$\therefore \sqrt{324} = 18$

(f) 400 – 1 = 399
399 – 3 = 396
396 – 5 = 391
391 – 7 = 384
384 – 9 = 375
375 – 11 = 364
364 – 13 = 351
351 – 15 = 336
336 – 17 = 319
319 – 19 = 300
300 – 21 = 279
279 – 23 = 256
256 – 25 = 231
231 – 27 = 204
204 – 29 = 175
175 – 31 = 144
144 – 33 = 111
111 – 35 = 76
76 – 37 = 39
39 – 39 = 0

Here the total number of subtraction is 20.

$\therefore \sqrt{400} = 20$

3. (a) $6400 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{5 \times 5}$

$\therefore \sqrt{6400} = 2 \times 2 \times 2 \times 2 \times 5 = 80$

2	6400
2	3200
2	1600
2	800
2	400
2	200
2	100
2	50
5	25
5	5
	1

(b) $6084 = \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{13 \times 13}$

$\therefore \sqrt{6084} = 2 \times 3 \times 13 = 78$

2	6084
2	3042
3	1521
3	507
13	169
13	13
	1

(c) $441 = \underline{3 \times 3} \times \underline{7 \times 7}$

$\therefore \sqrt{441} = 3 \times 7 = 21$

(d) $900 = \underline{3 \times 3} \times \underline{10 \times 10} = \underline{3 \times 3} \times \underline{2 \times 2} \times \underline{5 \times 5}$

$\therefore \sqrt{900} = 3 \times 10 = 30$

(e) $784 = \underline{4 \times 4} \times \underline{7 \times 7} = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{7 \times 7}$

$\therefore \sqrt{784} = 2 \times 2 \times 7 = 28$

(f) $3136 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{7 \times 7}$

$\therefore \sqrt{3136} = 2 \times 2 \times 2 \times 7 = 56$

2	3136
2	1568
2	784
2	392
2	196
2	98
7	49
7	7
	1

(g) $5625 = \underline{3 \times 3} \times \underline{5 \times 5} \times \underline{5 \times 5}$

$\therefore \sqrt{5625} = 3 \times 5 \times 5 = 75$

3	5625
3	1875
5	625
5	125
5	25
5	5
	1

(h) $2304 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{3 \times 3}$

$\therefore \sqrt{2304} = 2 \times 2 \times 2 \times 2 \times 3 = 48$

2	2304
2	1152
2	576
2	288
2	144
2	72
2	36
2	18
3	9

4. (a) $675 = \underline{3 \times 3} \times 3 \times \underline{5 \times 5}$

Here, factor 3 does not have a pair

$675 \times 3 = \underline{3 \times 3} \times \underline{3 \times 3} \times \underline{5 \times 5}$

$\therefore$ 675 × 3 = 2025 is perfect square

$\therefore$ 3 is the least number by which 675 should be multiplied to get a perfect square.

3	675
3	225
3	75
5	25
5	5
	1

(b) $9604 = \underline{2 \times 2} \times \underline{7 \times 7} \times \underline{7 \times 7}$

Here, all factor have a pair

So, 9604 is perfect square

∴ 9604 should be multiplied by 1 to make a perfect square.

2	9604
2	4802
7	2401
7	343
7	49
7	7
	1

(c) $11250 = 2 \times \underline{3 \times 3} \times \underline{5 \times 5} \times \underline{5 \times 5}$

Here, factor 2 does not have a pair

∴ 11250 should be multiplied by least number is 2 to make a perfect square.

2	11250
3	5625
3	1875
5	625
5	125
5	25
5	5
	1

5. Total number of soldiers = 1156

Number of soldiers in each row = $\sqrt{1156}$

$1156 = \underline{2 \times 2} \times \underline{17 \times 17}$

∴ $\sqrt{1156} = 2 \times 17 = 34$

Hence, the number of soldiers in each row is 34.

2	1156
2	578
17	289
17	17
	1

6. L.C.M of 6, 12, 15 and 18 = 2 × 2 × 3 × 3 × 5 = 180

2	6, 12, 15, 18
2	3, 6, 15, 9
3	3, 3, 15, 9
3	1, 1, 5, 3
5	1, 1, 5, 1
	1, 1, 1, 1

Hence, 5 have not a pair

So, to make if perfect square, we have to multiple it by 5

Now, 180 × 5 = 900

Hence, the answer is 900

7. Area of square = 1600 cm^2

$(\text{side})^2 = 1600 \text{ cm}^2$

side = $\sqrt{1600} = \sqrt{\underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{5 \times 5}}$

= 2 × 2 × 2 × 5 = 40

Side of square = 40 cm

8. LCM of 2, 3, 4 and 6 = $\underline{2 \times 2} \times 3 = 12$

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

Here, prime factor 3 does not have a pair.

∴ 12 is not a perfect square. If we multiply 12 with 3, then the number will become a perfect square.

∴ The required square number = 12 × 3 = 36

9. (a) $1250 = 2 \times \underline{5 \times 5} \times \underline{5 \times 5}$

Here, prime factor 2 does not have a pair

If we divide this number by 2, then the number will become a perfect square.

1250 ÷ 2 = 625 = 5 × 5 × 5 × 5 which is a perfect square

∴, the required smallest number = 2

∴ $\sqrt{625}$ 5 × 5 = 25

2	1250
5	625
5	125
5	25
5	5
	1

(b) $2048 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times 2$

Here, prime factor 2 does not have a pair

If we divide this number by 2 than the number will became perfect square

$2048 \div 2 = 1024 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2}$ which is a perfect square

∴ The required smallest number is 2

and $\sqrt{1024} = \underline{2 \times 2} \times 2 \times \underline{2 \times 2} = 32$

2	2048
2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

(c) $2187 = \underline{3 \times 3} \times \underline{3 \times 3} \times \underline{3 \times 3} \times 3$

Here, factor 3 does not have a pair

If we divide this number by 3, then the number will become a perfect square.

$2187 \div 3 = 729 = \underline{3 \times 3} \times \underline{3 \times 3} \times \underline{3 \times 3}$ which is a perfect square

∴ The required smallest number is 3

and $\sqrt{729}$ = 3 × 3 × 3 = 27

3	2187
3	729
3	243
3	81
3	27
3	9
3	3
	1

(d) $7200 = \underline{2 \times 2} \times \underline{2 \times 2} \times 2 \times \underline{3 \times 3} \times \underline{5 \times 5}$

Here, factor 2 does not have a pair

If we divide this number by 2, then the number will become a perfect square.

$7200 \div 2 = 3600 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{5 \times 5}$ which is a perfect square.

∴ The required smallest number = 2

and $\sqrt{3600} = 2 \times 2 \times 3 \times 5 = 60$

2	7200
2	3600
2	1800
2	1900
2	450
3	225
3	75
5	25
5	5
	1

EXERCISE-6.3

1. (a) By placing, bars, we obtain

$256 = \overline{2}\,\overline{56}$

Since there are two bars, the square root of 256 will have 2 digit in it.

(b) 7569

By placing bars, we obtain

$7569 = \overline{75}\,\overline{69}$

Since, there two bars, the square root of 7569 will have 2 digit in it.

(c) $\overline{10}\,\overline{36}\,\overline{84}$

Since, there are three bars, the square root of 103684 will have 3 digit in it.

(d) $\overline{16}\,\overline{22}\,\overline{47}\,\overline{84}$

Since, there are 4 bars, the square root of 162247854 will have 4 digit in it.

2. (a) $\sqrt{27225}$

	165
1	$\overline{2}\,\overline{72}\,\overline{25}$ −1
26	172 −156
325	1625 −1625
	x

$\therefore \sqrt{27225} = 165$

(b) $\sqrt{57121}$

	239
2	$\overline{5}\,\overline{71}\,\overline{21}$
	– 4
43	171
	–129
469	4221
	– 4221
	x

$\therefore \sqrt{57121} = 239$

(c) $\sqrt{40401}$

	201
2	$\overline{4}\,\overline{04}\,\overline{01}$
	– 4
401	00401
	– 401
	x

$\therefore \sqrt{40401} = 201$

(d) $\sqrt{17424}$

	132
1	$\overline{1}\,\overline{74}\,\overline{24}$
	–1
23	074
	–69
262	524
	–524
	x

$\therefore \sqrt{17424} = 132$

(e)

	263
2	$\overline{6}\,\overline{91}\,\overline{69}$
	– 4
46	291
	– 276
523	1569
	–1569
	x

$\therefore \sqrt{69169} = 263$

(f)

	524
5	$\overline{27}\,\overline{45}\,\overline{76}$
	– 25
102	245
	– 204
1044	4176
	– 4176
	x

$\therefore \sqrt{274576} = 524$

3. Greatest 5 digit number = 99999

$\sqrt{99999}$

	316
3	$\overline{9}\,\overline{99}\,\overline{99}$
	– 9
61	099
	– 61
626	3899
	– 3756
	143

This shows that $(316)^2$ is less than 99999 by 143.

So, the lest number to be subtracted is 143.

Hence, the required perfect square is 99999 – 143 = 99856

and = $\sqrt{99856} = 316$

4. The smallest 4 digit number = 1000

$\sqrt{1000}$

	31
3	$\overline{10}\,\overline{00}$
	– 9
61	100
	– 61
	39

$(31)^2 < 1000 < (32)^2$

The least number to be added = $(32)^2$ – 1000 = 1024 – 1000 = 24

Hence, the required number = 1000 + 24 = 1024

Also $\sqrt{1024} = 32$

5.

	191
1	$\overline{3}\,\overline{68}\,\overline{60}$
	– 1
29	268
	– 261
381	760
	– 381
	379

$(19)^2 < 36860 < (192)^2$

The required number to be added = $(192)^2 - 36860$

$= 36864 - 36860 = 4$

EXERCISE-6.4

1. (a) $\sqrt{12.0409}$

	3.47
3	$\overline{12}.\overline{04}\,\overline{09}$
	– 9
64	304
	– 256
687	4809
	– 4809
	x

$\therefore \sqrt{12.0409} = 3.47$

(b) $\sqrt{1.2544}$

	1.12
1	$\overline{1}.\overline{25}\,\overline{44}$
	– 1
21	25
	– 21
222	444
	– 444
	x

$\therefore \sqrt{1.2544} = 1.12$

(c) $\sqrt{225.6004}$

	15.02
1	$\overline{2}\,\overline{25}.\overline{60}\,\overline{04}$ – 1
25	125 – 125
300	0060 – 0000
3002	6004 –6004
	x

$\therefore \sqrt{225.6004} = 15.02$

(d) $\sqrt{147.1369}$

	12.13
1	$\overline{1}\,\overline{47}.\overline{13}\,\overline{69}$ – 1
22	047 – 44
241	313 – 241
2423	7269 – 7269
	x

$\therefore \sqrt{147.1369} = 12.13$

2. (a) $\sqrt{5}$ = 2.236 = 2.44 app.

	2.236
2	$\overline{5}.\overline{00}\,\overline{00}\,\overline{00}$ – 4
42	100 – 84
443	1600 – 1329
4466	27100 – 26796
	304

(b) $\sqrt{2} = 1.41$

	1.41
1	$\overline{2}.\overline{00}\,\overline{00}$ – 1
24	100 – 96
281	400 – 281
282	119

(c) $\sqrt{6.5} = 2.549 = 2.55$ app.

	2.549
2	$\overline{6}.\overline{50}\,\overline{00}\,\overline{00}$ – 4
45	250 – 225
504	2500 – 2016
5089	48400 – 45801
	2599

(d) $\sqrt{175} = 13.228 = 13.23$ app.

	13.228
1	$\overline{1}\,\overline{75}.\overline{00}\,\overline{00}$ – 1
23	075 – 69
262	600 – 524
2642	7600 – 5284
26448	231600

3. (a) $\sqrt{\dfrac{289}{144}} = \sqrt{\dfrac{17 \times 17}{12 \times 12}} = \dfrac{17}{12}$

(b) $\sqrt{\dfrac{22500}{169}} = \sqrt{\dfrac{15 \times 15 \times 10 \times 10}{13 \times 13}} = \dfrac{15 \times 10}{13} = \dfrac{150}{13}$

(c) $\sqrt{80\frac{224}{729}} = \sqrt{\frac{58564}{729}} = \sqrt{\frac{242 \times 242}{27 \times 27}} = \frac{242}{27}$

(d) $\sqrt{\frac{1296}{2916}} = \sqrt{\frac{36 \times 36}{54 \times 54}} = \frac{36}{54} = \frac{2}{3}$

4. (a) $\sqrt{81 \times 144} = \sqrt{\underline{9 \times 9} \times \underline{12 \times 12}} = 9 \times 12 = 108$

(b) $\sqrt{2.56 \times 5.29} = \sqrt{\underline{1.6 \times 1.6} \times \underline{2.3 \times 2.3}} = 1.6 \times 2.3 = 3.68$

(c) $\sqrt{0.0081 \times 256} = \sqrt{\underline{0.09 \times 0.09} \times \underline{16 \times 16}} = 0.09 \times 16 = 1.44$

(d) $\sqrt{13225 \times 6561} = \sqrt{\underline{115 \times 115} \times \underline{81 \times 81}} = 115 \times 81 = 9315$

5. The product of a decimal number = 51.84

The decimal number = $\sqrt{51.84} = \sqrt{\underline{7.2 \times 7.2}} = 7.2$

	7.2
7	$\overline{51}.\overline{84}$ – 49
142	284 – 284
	x

∴ The required number = 7.2

6. $\sqrt{1025} = 32.015$

	32.015
3	$\overline{10}\,\overline{25}.\overline{00}$ – 9
62	125 –124
6401	10000 – 6401
64025	359900 – 320125
	39775

7. (a) 225

$\sqrt{225} = \sqrt{\underline{15 \times 15}} = 15$

(b) $\sqrt{550}$

We know that 400 < 550 < 625

$\sqrt{400} < \sqrt{550} < \sqrt{625}$

$20 < \sqrt{550} < 25$

But still we are not very close to the square number

We know $(23)^2 = 529$
$(24)^2 = 576$
$23 < \sqrt{550} < 24$ and 529 is much closer to 550 than 576
So, $\sqrt{550} = 23$ app.

(c) $\sqrt{178}$
We know that 100 > 178 < 225
$\sqrt{100} < \sqrt{178} < \sqrt{225}$
$10 < \sqrt{178} < 15$
But still we are not very close to the square number
We know $13^2 = 169$
$14^2 = 196$
$13 < \sqrt{178} < 196$ and 169 is much closer to 178 than 196
So, $\sqrt{178} = 13$ app.

(d) $\sqrt{85}$
We know that 25 < 85 < 100
$\sqrt{25} < \sqrt{85} < \sqrt{100}$
$5 < \sqrt{85} < 10$
But still we are not very close to the square number
We know $9^2 = 81$
$10^2 = 100$
$9 < \sqrt{85} < 10$ and 9 is much closer to 85 than 100.
So, $\sqrt{85} = 9$ app.

NCERT CORNER

EXERCISE-6.1

1. We know that if a number has its units place digit as a, then its square will end with the unit digit of the multiplication a × a.

(a) 81
Since, its unit place is 1, its square will end with the unit digit of the multiplication (1 × 1) = 1

(b) 272
Since, its unit place is 2, its square will end with the unit digit of the multiplication (2 × 2) = 4

(c) 799
Its square will end with the unit digit of the multiplication (9 × 9) = 1

(d) 3853
Since, its unit place is 3, its square will end with its unit digit of the multiplication (3 × 3) = 9

(e) 1234
Its square will end with the unit digit of the multiplication (4 × 4) = 6

(f) 26387
Its square will end with the unit digit of the multiplication (7 × 7) = 9

(g) 52698
Its square will end with the unit digit of the multiplication (8 × 8) = 4

(h) 99880

Its square will end with the unit digit of the multiplication (0 × 0) = 0

(i) 12796

Its square will end with the unit digit of the multiplication (6 × 6) = 6

(j) 55555

Its square will end with the unit digit of the multiplication (5 × 5) = 5

2. (a) 1057 has its unit place is 7. Therefore, it cannot be a perfect square.

(b) 23453 has its unit place is 3. Therefore, it cannot be a perfect square.

(c) 7928 has its unit place is 8. Therefore, it cannot be a perfect square.

(d) 222222 has its unit place is 2. ∴ it cannot be a perfect square.

(e) 6400 has 3 zeroes at the end of it. ∴ it is not be a perfect square.

(f) 89722 has its unit place is 2. ∴ it cannot be a perfect square.

(g) 222000 has 3 zeroes at the end of it. However, since a perfect square cannot end with odd number of zeroes. It is not a perfect square.

(h) 505050 has one zero at the end of fit. ∴ it cannot be a perfect square.

3. The square of an odd number is odd and the square of an even number is even.

Here 431 and 7779 are odd number is 2

Thus, the square of 431 and 7779 will be an odd number.

4. 100001^2 = 10000 2 00001

$(10000001)^2$ = 1000000 200000001

5. 1010101^2 = 10 20 30 40 30 20 1

101010101^2 = 10 20 30 40 50 40 30 201

6. $4^2 + 5^2 + (20)^2 = 21^2$

$5^2 + (6^2) + 30^2 = 31^2$

$6^2 + 7^2 + (42)^2 = 43^2$

7. (a) Here, we have to find the sum of first 5 odd natural number.

$\therefore 1 + 3 + 5 + 7 + 9 = (5)^2 = 25$

(b) $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 = (10)^2 = 100$

(c) $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21 + 23 = (12)^2 = 144$

8. (i) $49 = (7)^2$

$49 = 1 + 3 + 5 + 7 + 9 + 11 + 13$

(ii) $121 = (11)^2$

$121 = 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21$

9. We know that there will be $2n$ numbers in between the squares of the numbers n and $n + 1$

(a) There will be 2 × 12 = 24 numbers

(b) There will be 2 × 25 = 50 numbers

(c) There will be 2 × 99 = 198 numbers

EXERCISE-6.2

1. (a) $32^2 = (30 + 2)^2$

$= (30 + 2)(30 + 2)$

$= 30(30 + 2) + 2(30 + 2)$

$= 900 + 60 + 60 + 4 = 1024$

(b) $(35)^2 = (30 + 5)^2$

$= (30 + 5)(30 + 5)$

$= 30(30 + 5) + 5(30 + 5)$

$= 900 + 150 + 150 + 25 = 1225$

(c) $86^2 + (80 + 6)^2$
$= (80 + 6)(80 + 6)$
$= 80(80 + 6) + 6(80 + 6)$
$= 6400 + 480 + 480 + 36 = 7396$

(d) $93^2 = (90 + 3)^2$
$= (90 + 3)(90 + 3)$
$= 90(90 + 3) + 3(90 + 3)$
$= 8100 + 270 + 270 + 9 = 8649$

(e) $71^2 = (70 + 1)^2$
$= (70 + 1)(70 + 1)$
$= 70(70 + 1) + 1(70 + 1)$
$= 4900 + 70 + 70 + 1 = 5041$

(f) $46^2 = (40 + 6)^2$
$= (40 + 6)(40 + 6)$
$= 40(40 + 6) + 6(40 + 6)$
$= 1600 + 240 + 240 + 36 = 2116$

2. (a) 6
If we taken $m^2 + 1 = 6$
then m2 = 5
The value of m will not be an integer.
If we take $m^2 - 1 = 6$, then $m^2 = 7$
Again the value of m is not an integer
Let $2m = 6$, $m = 3$
$m^2 - 1 = (3)^{2-1} = 8$, $m^2 + 1 = (3)^2 + 1 = 10$
∴ The pythagorean triplet are 6, 8 and 10

(b) If we take $m^2 + 1 = 14$, than $m^2 = 13$
The value of m will not be an integer
If we take $m^2 - 1 = 14$, then $m^2 = 15$
Again, the value of m will not be an integer
Let $2m = 14$, then $m = 7$
$m^2 + 1 = (7)^2 + 1 = 50$, $m^2 - 1 = (7)^2 - 1 = 48$
∴ The pythagorean triplets are 14, 48 and 50.

(c) If we take $m^2 + 1 = 16$, then $m^2 = 15$
The value of m will not be an integers
If we take $m^2 - 1 = 16$, then $m^2 = 17$
Again, the value of m will not be an integer
Let $2m = 16$, then $m = 8$
$m^2 - 1 = (8)^2 - 1 = 63$ and $m^2 + 1 = (8)^2 + 1 = 65$
∴ The pythagorean triplets are 16, 63, 65

(d) If we take $m^2 + 1 = 18$, then $m^2 = 17$
The value of m will not be an integer
If we take $m^2 - 1 = 18$, then $m^2 = 19$
The value of m will not be an integer
Let $2m = 18$, then $m = 9$
$m^2 - 9 = (9)^2 - 1 = 80$ and $m^2 + 1 = (9)^2 + 1 = 82$
∴ The pythagorean triplets are 18, 80 and 82

EXERCISE-6.3

1. (a) If the number ends with 1, then the one's digit of the square root of that number may be 1 or 9.
∴ One's digit of the square root of 9801 is either 1 or 9.

(b) If the number ends with 6, then the one's digit of the square root of that number may be 4 or 6.

$\therefore$ One's digit of the square root of 99856 is either 4 or 6.

(c) If the number ends with 1, then the one's digit of the square root of that number may be 1 or 9.

$\therefore$ One's digit of the square root of 988001 is either 1 or 9.

(d) If the number ends with 5, then the one's digit of the square root of that number may be 5.

$\therefore$ One's digit of the square root of 657666025 is 5.

2. The perfect square of a number can end with any of the digit 0, 1, 4, 5, 6, or 9 at unit's place. Also, a perfect square will end with even number of zeroes.

(a) Since the number 153 has its unit's place digit as 3, it is not a perfect square.

(b) Since the number 257 has its unit's place digit as 7, it is not a perfect square.

(c) Since the number 408 has its unit's place digit as 8, it is not a perfect square.

(d) Since the number 441, has its unit's place digit as 1, it is a perfect square.

3. We know that the sum of first *n* odd natural number is n^2

(a) Consider = $\sqrt{100}$

100 – 1 = 99

99 – 3 = 96

96 – 5 = 91

91 – 7 = 84

84 – 9 = 75

75 – 11 = 64

64 – 13 = 51

51 – 15 = 36

36 – 17 = 19

19 – 19 = 0

Here, the total number of subtraction is 10

$\therefore \sqrt{100} = 10$

(b) $\sqrt{169}$

169 – 1 = 168

168 – 3 = 165

165 – 5 = 160

160 – 7 = 153

153 – 9 = 144

144 – 11 = 133

133 – 13 = 120

120 – 15 = 105

105 – 17 = 88

88 – 19 = 69

69 – 21 = 48

48 – 23 = 25

25 – 25 = 0

Here, the total number of subtraction is 13

$\therefore \sqrt{169} = 13$

4. (a) $\sqrt{729}$

3	729
3	243
3	81
3	27
3	9
3	3
	1

$729 = \underline{3 \times 3} \times \underline{3 \times 3} \times \underline{3 \times 3}$

$\therefore \sqrt{729} = 3 \times 3 \times 3 = 27$

(b) $400 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{5 \times 5}$

$\therefore \sqrt{400} = 2 \times 2 \times 5 = 20$

2	400
2	200
2	100
2	50
5	25
5	5
	1

(c) $1764 = \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{7 \times 7}$

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

2	1764
2	882
3	441
3	147
7	49
7	7
	1

(d) $4096 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2}$

$\therefore \sqrt{4096} = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 64$

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

(e) $7744 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{11 \times 11}$

$\therefore \sqrt{7744} = 2 \times 2 \times 2 \times 11 = 88$

2	7744
2	3872
2	1936
2	968
2	484
2	242
11	121
11	11
	1

(f) $9604 = \underline{2 \times 2} \times \underline{7 \times 7} \times \underline{7 \times 7}$

$\therefore \sqrt{9604} = 2 \times 7 \times 7 = 98$

2	9604
2	4802
7	2401
7	343
7	49
7	7
	1

(g) $5929 = \underline{7 \times 7} \times \underline{11 \times 11}$

$\therefore \sqrt{5929} = 7 \times 11 = 77$

7	5929
7	847
11	121
11	11
	1

(h) $9216 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{3 \times 3}$

$\therefore \sqrt{9216} = 2 \times 2 \times 2 \times 2 \times 2 \times 3 = 96$

2	9216
2	4608
2	2304
2	1152
2	576
2	288
2	144
2	72
2	36
2	18
3	9
3	3
	1

(i) $529 = 23 \times 23$

$\therefore \sqrt{529} = 23$

23	529
23	23
	1

(j) $8100 = \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{3 \times 3} \times \underline{5 \times 5}$

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

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

5. (a)

2	252
2	126
3	63
3	21
7	7
	1

$252 = \underline{2 \times 2} \times \underline{3 \times 3} \times 7$

Here, prime factor 7 does not have its pair.

If 7 gets a pair, then the number will become a perfect square

$\therefore\ 252 \times 7 = \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{7 \times 7} = 1764$ is a perfect square

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

(b)

2	180
2	90
3	45
3	15
5	5
	1

$180 = \underline{2 \times 2} \times \underline{3 \times 3} \times 3 \times 5$

Here, prime factor 5 does not have its pair

If 5 gets a pair, then the number will become a perfect square

$\therefore\ 180 \times 5 = \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{5 \times 5} = 900$ is a perfect square

$\therefore\ \sqrt{900} = 2 \times 2 \times 5 = 30$

(c)

2	1008
2	504
2	252
2	126
3	63
3	21
7	7
	1

$1008 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{3 \times 3} \times 7$

Here, prime factor 7 does not have its pair

If 7 gets a pair, then the number will become a perfect square

$1008 \times 7 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{7 \times 7} = 7056$ is a perfect square

$\therefore\ \sqrt{7056} = 2 \times 2 \times 3 \times 7 = 84$

(d)

2	2028
2	1014
3	507
13	169
13	13
	1

$2028 = \underline{2 \times 2} \times 3 \times \underline{13 \times 13}$

Here, prime factor 3 does not have its pair

If 3 gets a pair, then the number will become a perfect square

$\therefore$ $2028 \times 3 = \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{13 \times 13} = 6084$ is a perfect square

$\therefore$ $\sqrt{6084} = 2 \times 3 \times 13 = 78$

(e)

2	1458
3	729
3	243
3	81
3	27
3	9
3	3
	1

$1458 = 2 \times \underline{3 \times 3} \times \underline{3 \times 3} \times \underline{3 \times 3}$

Here, prime factor 2 does not have its pair

If 2 gets a pair, then the number will become a perfect square

$\therefore$ $1458 \times 2 = \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{3 \times 3} \times \underline{3 \times 3} = 2916$ is a perfect square

$\therefore$ $\sqrt{2916} = 2 \times 3 \times 3 \times 3 = 54$

(f)

2	768
2	384
2	192
2	96
2	48
2	24
2	12
2	6
3	3
	1

$768 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times 3$

Here, prime factor 3 does not have its pair

If 3 gets a pair, then the number will become a perfect square

$\therefore$ $768 \times 3 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 = 2304$ is a perfect square

$\therefore$ $\sqrt{2304} = 2 \times 2 \times 2 \times 2 \times 3 = 48$

6. (a)

2	252
2	126
3	63
3	21
7	7
	1

$252 = \underline{2 \times 2} \times \underline{3 \times 3} \times 7$

Here, prime factor 7 does not have its pair

If we divide this number by 7, than the number will become a perfect square

$\therefore\ 252 \div 7 = \underline{2 \times 2} \times \underline{3 \times 3} \times 7 \div 7 = 36$ is a perfect square

$36 = 2 \times 2 \times 3 \times 3$

$\therefore\ \sqrt{36} = 2 \times 3 = 6$

(b)

$$\begin{array}{r|r} 3 & 2925 \\ \hline 3 & 975 \\ \hline 5 & 325 \\ \hline 5 & 65 \\ \hline 13 & 13 \\ \hline & 1 \end{array}$$

$2925 = \underline{3 \times 3} \times 5 \times 5 \times 13$

Here, prime factor 13 does not have its pair

If we divide this number by 13, then the number will become a perfect square

$2925 \div 13 = 225$ is a perfect square

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

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

(c)

$$\begin{array}{r|r} 2 & 396 \\ \hline 2 & 198 \\ \hline 3 & 99 \\ \hline 3 & 33 \\ \hline 11 & 11 \\ \hline & 1 \end{array}$$

$396 = \underline{2 \times 2} \times \underline{3 \times 3} \times 11$

Here, prime factor 11 does not have its pair

If we divide this number by 11, then the number will become a perfect square

$396 \div 11 = 36$ is a perfect square

$\therefore\ \sqrt{36} = 2 \times 3 = 6$

(d)

$$\begin{array}{r|r} 5 & 2645 \\ \hline 23 & 529 \\ \hline 23 & 23 \\ \hline & 1 \end{array}$$

$2645 = 5 \times 23 \times 23$

Here, prime factor 5 does not have its pair

If we divide this number by 5, then the number will become a perfect square

$2645 \div 5 = 529$ is a perfect square

$\therefore\ \sqrt{529} = 23$

(e)

2	2800
2	1400
2	700
2	350
5	175
5	35
7	7
	1

$2800 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{5 \times 5} \times 7$

Here, prime factor 7 does not have its pair

If we divide this number by 7, then the number will become a perfect square.

$2800 \div 7 = 400$ is a perfect square

$\therefore \sqrt{400} = \underline{2 \times 2} \times 5 = 20$

(f)

2	1620
2	810
3	405
3	135
3	45
3	15
5	5
	1

$1620 = \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{3 \times 3} \times 5$

Here, prime factor 5 does not have its pair

If we divide this number by 5, then the number will become a perfect square

$1620 \div 5 = 324$ is a perfect square

$\therefore \sqrt{324} = 2 \times 3 \times 3 = 18$

7. The total amount of donation is Rs 2401

Number of students in the class = $\sqrt{2401}$

$2401 = \underline{7 \times 7} \times \underline{7 \times 7}$

$\therefore \sqrt{2401} = 7 \times 7 = 49$

Hence, the number of students in the class is 49.

8. Number of rows = Number of plants in each row

Total number of plants = Number of rows × Number of plants in each row

Number of rows × Number of plants in each row = 2025

$(\text{Number of rows})^2 = 2025$

$2025 = \underline{5 \times 5} \times \underline{3 \times 3} \times \underline{3 \times 3}$

$\therefore \sqrt{2025} = 5 \times 3 \times 3 = 45$

9. LCM of 4, 9, 10 = $\underline{2 \times 2} \times \underline{3 \times 3} \times 5 = 180$

2	4, 9, 10
2	2, 9, 5
3	1, 9, 5
3	1, 3, 5
5	1, 1, 5
	1, 1, 1

Here prime factor 5 does not have its pair

∴ 180 is not a perfect square, if we multiply 180 with 5, then the number will become a perfect square.

Hence, the required square number is 180 × 5 = 900

10. LCM of 8, 15 and 20 = $\underline{2 \times 2} \times 2 \times 3 \times 5 = 120$

Here prime factor 2, 3, and 5 do not have their respective pairs. Therefore, 120 is not a perfect square.

∴ 120 should be multiplied by 2 × 3 × 5 = 30

Hence, the required number is 120 × 2 3 × 5 = 3600

EXERCISE-6.4

1. (a) $\sqrt{2304}$

	48
4	$\overline{23}\,\overline{04}$
	– 16
88	704
	– 704
	x

∴ $\sqrt{2304} = 48$

(b) $\sqrt{4489}$

	67
6	$\overline{44}\,\overline{89}$
	– 36
127	889
	– 889
	x

∴ $\sqrt{4489} = 67$

(c) $\sqrt{3481}$

	59
5	$\overline{34}\,\overline{81}$
	– 25
109	981
	– 981
	x

∴ $\sqrt{3481}$ 59

(d) $\sqrt{529}$

	23
2	$\overline{5}\,\overline{29}$
	– 4
43	129
	– 129
	x

∴ $\sqrt{529} = 23$

(e) $\sqrt{3249}$

	57
5	$\overline{32}\,\overline{49}$
	− 25
107	749
	− 749
	x

$\therefore \sqrt{3249} = 57$

(f) $\sqrt{1369}$

	37
	$\overline{13}\,\overline{69}$
67	469
	469

$\therefore \sqrt{1369} = 37$

(g) $\sqrt{5776}$

	76
7	$\overline{57}\,\overline{76}$
	− 49
146	876
	− 876
	x

$\therefore \sqrt{5776} = 76$

(h) $\sqrt{7921}$

	89
8	$\overline{79}\,\overline{21}$
	− 64
169	1521
	− 1521
	x

$\therefore \sqrt{7921} = 89$

(i) $\sqrt{576}$

	24
2	$\overline{5}\,\overline{76}$
	− 4
44	176
	− 176
	x

$\therefore \sqrt{576} = 24$

(j) $\sqrt{1024}$

	32
3	$\overline{10}\,\overline{24}$
	−9
62	124
	− 124
	x

$\therefore \sqrt{1024} = 32$

(k) $\sqrt{3136}$

	56
5	$\overline{31}\,\overline{36}$
	− 25
106	636
	− 636
	x

$\therefore \sqrt{3136} = 56$

(l) $\sqrt{900}$

	30
3	$\overline{9}\,\overline{00}$
	− 9
60	× 00
	0
	0

$\therefore \sqrt{900} = 30$

2. (a) 64

By placing bars, we obtain

$\overline{64}$

Since, there is one bar, the square root of 64 will have 1 digit in it.

(b) $\overline{1}\,\overline{44}$

Since, there are two bars, the square root of 144 will have 2 digit in it.

(c) $\overline{44}\,\overline{89}$

Since, there are two bars, the square root of 4489 will have 2 digit in it.

(d) $\overline{2}\,\overline{72}\,\overline{25}$

Since, there are three bars, the square root of 27225 will have 3 digit in it.

(e) $\overline{39}\,\overline{06}\,\overline{25}$

Since, there are 3 bars, the square root of 390625 will have 3 digit in it.

3. (a) $\sqrt{2.56}$

	1.6
1	$\overline{2}.\overline{56}$
	-1
26	156
	-156
	x

$\therefore\ \sqrt{2.56} = 1.6$

(b) $\sqrt{7.29}$

	2.7
2	$\overline{7}.\overline{29}$
	-4
47	329
	-329
	x

$\therefore\ \sqrt{7.29} = 2.7$

(c) $\sqrt{51.84}$

	7.2
	$\overline{51}.\overline{84}$
	49
142	284
	284

$\therefore\ \sqrt{51.84} = 7.2$

(d) $\sqrt{42.25}$

	6.5
6	$\overline{42}.\overline{25}$
	-36
125	625
	-625
	x

$\sqrt{42.25} = 6.5$

(e) $\sqrt{31.36}$

	5.6
5	$\overline{31}.\overline{36}$
	-25
106	636
	-636
	x

$\sqrt{31.36} = 5.6$

4. (a) $\sqrt{402}$

	20
2	$\overline{4}\,\overline{02}$
	–4
40	002

$20^2 < 402$ by 2

So, the least number to be subtracted is 2.

Hence, the required perfect square is 402 – 2 = 40 and $\sqrt{400} = 20$

(b) $\sqrt{1989}$

	44
4	$\overline{19}\,\overline{89}$
	–16
84	389
	–336
	53

$(44)^2 < 1989$ by 53

So, the least number to be subtracted is 53

Hence, the required perfect square = 1989 – 53 = 1936 and $\sqrt{1936} = 44$

(c)

	57
5	$\overline{32}\,\overline{50}$
	–25
107	750
	– 749
	1

$(57)^2 < 3250$ by 1

So, the least number to be subtracted is 1

Hence, the required number = 3250 – 1 = 3249 and $\sqrt{3249} = 57$

(d)

	28
2	$\overline{8}\,\overline{25}$
	–4
48	425
	– 384
	41

(28)2 < 825 by 41

So, the least number to be subtracted is 41

Hence, the required number = 825 – 41 = 784 and $\sqrt{784} = 28$

(e)

	28
6	4000
	–36
123	400
	–369
	31

$(63)^2 < 4000$ by 31

So, the least number to be subtracted is 31

Hence, the required perfect square = 4000 – 31 = 3969 and $\sqrt{3969} = 63$

5. (a)

	22
2	525
	–4
43	125
	–86
	39

$(22)^2 < 525 < (23)^2$

$\therefore$ The least number to be added = $(23)^2 - 525 = 529 - 525 = 4$

Hence, the required number = 525 + 4 = 529

and $\sqrt{529} = 23$

(b)

	41
4	1750
	–16
81	150
	–81
	69

$(41)^2 < 1750 < (42)^2$

So, the least number to be added = $(42)^2 - 1750 = 1764 - 1750 = 14$

Hence, the required number = 1750 + 14 = 1764 and $\sqrt{1764} = 42$

(c)

	15
1	252
	– 1
25	152
	– 125
	27

$(15)^2 < 252 < (16)^2$

So, the least number to be added is = $(16)^2 - 252$

= 256 – 252 = 4

Hence, the required number = 252 + 4 = 256 and $\sqrt{256} = 16$

(d)

	42
4	$\overline{18}\,\overline{25}$
	-16
82	225
	-164
	61

$(42)^2 < 1825 < (43)^2$

So, the least number to be added = $(43)^2 - 1825 = 1849 - 1825 = 24$

Hence, the required number = 1825 + 24 = 1849

and $\sqrt{1849} = 43$

(e)

	80
8	$\overline{64}\,\overline{12}$
	-64
160	012
	0
	12

$(80)^2 < 6412 < (81)^2$

So, the least number to be added = $(81)^2 - 6412$

= 6561 – 6412 = 149

Hence, the required number = 6412 + 149 = 6561 and $\sqrt{6561} = 81$

6. Let the length of square = x m

Area of square = 441

$(\text{side})^2 = 441$

side = $\sqrt{441} = 21\,m$

$\therefore$ The length of the square is 21 m

7. (i) If AB = 6 cm, BC = 8 cm

We use pythagoras theorem

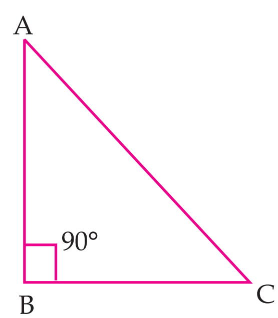
$AB^2 + BC^2 = AC^2$

$(6)^2 + (8)^2 = AC^2$

$36 + 64 = AC^2$

$AC^2 = 100$

$AC = \sqrt{100} = 10$ cm



(ii) If AC = 13 cm, BC = 5 cm

$AC^2 = AB^2 + BC^2$

$(13)^2 = AB^2 + (5)^2$

$169 - 25 = AB^2$

$AB^2 = 144$

AB = 12 cm

8. The gardener has 1000 plants. The number of rows and the columns is the same

$\sqrt{1000}$

	31
3	$\overline{10}\,\overline{00}$ –9
61	100 –61
	39

$(31)^2 < 1000 < (32)^2$

So, the least number to be added = $(32)^2 - 1000 = 1024 - 1000 = 24$

Thus, the required number of plants is 24.

9. Number of children in the school = 500

They have to stand for a P.T. drill such that the number of rows is equal to the number of columns

The number of children who will be left out in this arrangement has to be calculated. That is the number which should be subtracted from 500 to make it perfect square has to be calculated.

$\sqrt{500}$

	22
2	$\overline{5}\,\overline{00}$ –4
42	100 –84
	16

The remainder is 16

It shows that the square of 22 < 500 by 16

If we subtract 16 from 500, we will obtain a perfect square

Required perfect square = 500 – 16 = 484

Thus, the number of children who will be left out is 16.

SUBJECT ENRICHMENT EXERCISE

I. (1) An even number

(2) $10^2 = 6^2 + 8^2$

(3) 16

(4) 2

(5) $\frac{15}{21}$

(6) 0.04

(7) 0.3

(8) $\frac{n(n+1)}{2}$

(9) 8

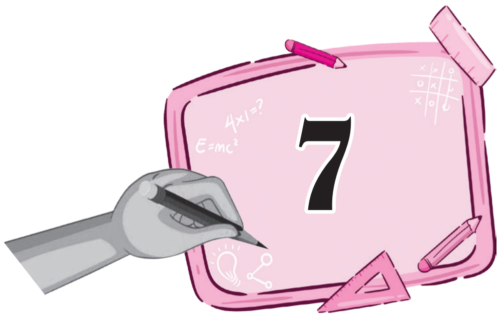
(10) $\frac{3}{4}$

II. (a) Odd

(b) $n/2$

(c) 22
(d) 199
(e) 3
(f) 5/12
(g) Odd

III. (a) True
(b) False
(c) True
(d) False
(e) True
(6) True



Cubes and Cube Roots

EXERCISE-7.1

1. (a) $4^3 = 4 \times 4 \times 4 = 64$

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

(c) $(61)^3 = 61 \times 61 \times 61 = 226981$

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

(e) $\left(\frac{4}{5}\right)^3 = \frac{4 \times 4 \times 4}{5 \times 5 \times 5} = \frac{64}{125}$

(f) $\left(\frac{-4}{7}\right)^3 = \frac{-4 \times -4 \times -4}{7 \times 7 \times 7} = \frac{-64}{343}$

(g) $(2.2)^3 = 2.2 \times 2.2 \times 2.2 = 10.648$

(h) $(-0.4)^3 = -0.4 \times -0.4 \times -0.4 = -0.064$

2. (a) Let the first odd integer be x

$\therefore x + x + 2 + x + 4 + x + 6 + x + 8 + x + 10 + x + 12 = (7)^3$

$7x + 42 = 343$

$7x = 343 - 42$

$7x = 301$

$x = 43$

$\therefore 43 + 45 + 47 + 49 + 51 + 53 + 55 = (7)^3 = 343$

(b) Let the first odd integer be x

$x + x + 2 + x + 4 + x + 6 + x + 8 + x + 10 + x + 12 + x + 14 + x + 16 + x + 18 + x + 20 + x + 22 = (12)^3$

$12x + 132 = 1728$

$12x = 1728 - 132$

$x = \frac{1728 - 132}{12} = \frac{1596}{12} = 133$

$\therefore 133 + 135 + 137 + 139 + 141 + 143 + 145 + 147 + 149 + 151 + 153 + 155 = (12)^3 = 1728$

(c) Let the first odd integer be x

$x + x + 2 + x + 4 + x + 6 = (4)^3$

$4x + 12 = 64$

$x = \frac{64 - 12}{4} = \frac{\cancel{52}^{13}}{\cancel{4}_1} = 13$

$13 + 15 + 17 + 19 = (4)^3 = 64$

3. (a) $23328 = \underline{2 \times 2 \times 2} \times 2 \times 2 \times \underline{3 \times 3 \times 3} \times \underline{3 \times 3 \times 3}$

2	23328
2	11664
2	5832
2	2916
2	1458
3	729
3	243
3	81
3	27
3	9
3	3
	1

Here all factors are not in group of 3's

∴ 23328 is not a perfect cube number.

(b) $10648 = \underline{2 \times 2 \times 2} \times \underline{11 \times 11 \times 11}$

2	10648
2	5324
2	2662
11	1331
11	121
11	11
	1

Here all factors are in groups of 3's

∴ 10648 is a perfect cube number

(c) $52488 = \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3} \times \underline{3 \times 3 \times 3} \times 3 \times 3$

2	52488
2	26244
2	13122
3	6561
3	2187
3	729
3	243
3	81
3	27
3	9
3	3
	1

Here, factor of 3 are not in groups of 3's

∴ 52488 is not a perfect cube number

(d) $74088 = \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3} \times \underline{7 \times 7 \times 7}$

2	74088
2	37044
2	18522
3	9261
3	3087
3	1029
7	343
7	49
7	7
	1

Here all factors are in groups of 3's

∴ 74088 is a perfect cube number

(e) $36864 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times 3 \times 3$

2	36864
2	18432
2	9216
2	4608
2	2304
2	1152
2	576
2	288
2	144
2	72
2	36
2	18
3	9
3	3
	1

Here factor 3 are not in groups of 3's

∴ 36864 is not a perfect cube number

(f) $15625 = \underline{5 \times 5 \times 5} \times \underline{5 \times 5 \times 5}$

5	15625
5	3125
5	625
5	125
5	25
5	5
	1

Here all factors are in groups of 3's

$\therefore$ 15625 is a perfect cube number.

4. (a) $(387)^3$ = The unit place of this digit is 7. Therefore, the unit digits of $(387)^3 = 3$.

(b) $(83)^3$ = Its unit digit is 3. Therefore, the unit digits of $(83)^3 = 7$.

(c) $(-81)^3$ = Its unit digit is 1. Therefore, the unit digits of $(-81)^3 = 1$.

(d) $(680)^3$ = Its unit digit is 0. Therefore, the unit digits of $(680)^3 = 0$.

(e) $(863)^3$ = Its unit digit is 3. Therefore, the unit digits of $(863)^3 = 7$.

(f) $(55)^3$ = Its unit digit is 5. Therefore, the unit digits of $(55)^3 = 5$.

EXERCISE-7.2

1. (a) $8^3 = 8 \times 8 \times 8 = 512$

(b) $(-7)^3 = -7 \times -7 \times -7 = -343$

(c) $\left(\frac{-1}{6}\right)^3 = \frac{-1 \times -1 \times -1}{6 \times 6 \times 6} = \frac{-1}{216}$

(d) $\left(\frac{2}{7}\right)^3 = \frac{2^3}{7^3} = \frac{2 \times 2 \times 2}{7 \times 7 \times 7} = \frac{8}{343}$

(e) $(0.4)^3 = 0.4 \times 0.4 \times 0.4 = 0.064$

(f) $(3.7)^3 = (3.7) \times (3.7) \times (3.7) = 50.653$

(g) $(-3.1)^3 = (-3.1) \times (-3.1) \times (-3.1) = -29.791$

2. (a) 9261

3	9261
3	3087
3	1029
7	343
7	49
7	7
	1

$\sqrt[3]{9261} = \sqrt[3]{3 \times 3 \times 3 \times 7 \times 7 \times 7}$

$\sqrt[3]{9261} = 3 \times 7 = 21$

(b) 3375

3	3375
3	1125
3	375
5	125
5	25
5	5
	1

$\sqrt[3]{3375} = \sqrt[3]{3 \times 3 \times 3 \times 5 \times 5 \times 5}$

$\sqrt[3]{3375} = 3 \times 5 = 15$

(c) 4913

17	4913
17	289
17	17
	1

$= \sqrt[3]{4913} = \sqrt[3]{17 \times 17 \times 17} = 17$

(d) $\frac{1331}{2744}$

2	2744
2	1372
2	686
7	343
7	49
7	7
	1

11	1331
11	121
11	11
	1

$$\sqrt[3]{\frac{1331}{2744}} = \frac{\sqrt[3]{1331}}{\sqrt[3]{2744}}$$

$$\frac{\sqrt[3]{1331}}{\sqrt[3]{2744}} = \frac{\sqrt[3]{11 \times 11 \times 11}}{\sqrt[3]{2 \times 2 \times 2 \times 7 \times 7 \times 7}}$$

$$\frac{\sqrt[3]{1331}}{\sqrt[3]{2744}} = \frac{11}{2 \times 7} = \frac{11}{14}$$

$$\sqrt[3]{\frac{1331}{2744}} = \frac{11}{14}$$

(e) $\sqrt[3]{\frac{-343}{9261}}$

21	9261
21	441
21	21
	1

$$\frac{\sqrt[3]{-7 \times -7 \times -7}}{\sqrt[3]{21 \times 21 \times 21}} = \frac{-7}{21} = \frac{-1}{3}$$

(f) $\sqrt[3]{-1536}$

2	1536
2	768
2	384
2	192
2	96
2	48
2	24
2	12
2	6
3	3
	1

$= \sqrt[3]{-2 \times -2 \times -2 \times -2 \times -2 \times -2 \times -2 \times -2 \times -2 \times -3}$

$= -2 \times -2 \times -2 \sqrt[3]{-3}$

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

(g) $\sqrt[3]{-0.001} = \sqrt[3]{-0.1 \times -0.1 \times -0.1}$

$= -00.1$

3. (a) $\sqrt[3]{17576}$ = Its unit place is 6. So, the unit place of $\sqrt[3]{17576}$ is also 6.

(b) $\sqrt[3]{42875}$ = Its unit place is 5. So, the unit place of $\sqrt[3]{42875}$ is also 5.

(c) $\sqrt[3]{343000}$ = Its last three digit is zeroes. $\therefore$ So, the unit place of $\sqrt[3]{343000}$ = 0.

(d) $\sqrt[3]{205379}$ = Its unit place is 9. So, the unit place of $\sqrt[3]{205379}$ = 9.

(e) $\sqrt[3]{-32768}$ = Its unit place is 8. So, the unit place of $\sqrt[3]{-32768}$ = 2.

(f) $\sqrt[3]{-103823}$ = Its unit place is 3. So, the unit place of $\sqrt[3]{-103823}$ = 7.

(g) $\sqrt[3]{21952}$ = Its unit place is 2. So, the unit place of $\sqrt[3]{21952}$ = 8.

(h) $\sqrt[3]{2197}$ = Its unit place is 7. So, the unit place of $\sqrt[3]{2197}$ = 3.

4. (a) 592704

We divide 592704 in 2 group which has three digit

Take 704

Unit digit of 704 = 4

Unit digit of cube root = 4

Take the other group 592

$\therefore (8)^3 < 592 < (9)^3$

The smaller number among 8 and 9 is 8

The one's place of 2 is 8 itself. Take 8 as ten's place of the cube root of 592704.

Thus, $\sqrt[3]{592704} = 84$

(b) 24389

Take 389

Unit digit of 389 = 9

$\therefore$ Unit digit of cube root = 9

Take the other group 24

$(2)^3 < 24 < (3)^3$

The smaller number among 2 and 3 is 2

Take 2 as ten's place of cube root of 24389

$\sqrt[3]{24389} = 29$

(c) $\underline{438}\ \underline{976}$

Take 976

Unit digit of 976 = 6

$\therefore$ Unit digit of cube root = 6

Take the other group are, 438

$(7)^3 < 438 < (8)^3$

The smaller number among 7 and 8 is 7

Take 7 as ten's place of 438976

$\sqrt[3]{438976} = 76$

(d) $-\ \underline{185}\ \underline{193}$

Take 193

Unit digit of 193 = 3

$\therefore$ Unit digit of cube root = 7

Take the other group i.e., 185

$(5)^3 < 185 < (6)^3$

The smaller number among 5 and 6 is 5

Take 5 as ten's place of – 185193

$\sqrt[3]{-185193} = -57$

(e) $\underline{778}\ \underline{688}$

Take 688

Unit digit of 688 is 8

$\therefore$ Unit digit of cube root = 2

Take the other group i.e., 778

(9)3 < 778 < (10)3

The smaller number among 9 and 10 is 9

Take 9 as ten's place of 778688

$\sqrt[3]{778688} = 92$

(f) $\underline{166}\ \underline{375}$

Take 375

Unit digit of 375 = 5

$\therefore$ Unit digit of cube root = 5

Take the other group i.e., 166

$(5)^3 < 166 < (6)^3$

The smaller number among 5 and 6 is 5

Take 5 as ten's place of 166375

$\sqrt[3]{166375} = 55$

5. (a) 1728 = There are 2 digits in the cube root of 1728

(b) 216

By placing bars, we obtain

216

Since, there is one bar, the cube root of 216 will have 1 digit in it.

(c) 729

Since, there is one bar, the cube root of 729 will have 1 digit in it.

(d) 1331

Since, there are two bars, the cube root of 1331 will have 2 digit in it.

(e) 132651

Since, there are two bars, the cube root of 132651 will have 2 digit in it.

(f) 1860867

Since, there are 3 bars, the cube root of 1860867 will have 3 digit in it.

(g) $9\ \underline{663}\ \underline{597}$

Since, there are 3 bars, the cube root of 9663597 will have 3 digit in it.

(h) $\underline{205}\ \underline{379}$

Since, there are 2 bars, the cube root of 205379 will have 2 digit in it.

NCERT CORNER

EXERCISE-7.1

1. (a) 216

Prime factor of 216 = $\underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3}$

Here all factors are in groups of 3's

$\therefore$ 216 is a perfect cube number.

(b) 128

Prime factor of 128 = $\underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times 2$

Here factor 2 does not appear in a 3's

$\therefore$ 128 is not perfect cube.

(c) 1000

Prime factor of 1000 = $\underline{2 \times 2 \times 2} \times \underline{5 \times 5 \times 5}$

Here all factors appears in 5's groups

$\therefore$ 1000 is a perfect cube.

(d) 100

Prime factor of 100 = $\underline{2 \times 2} \times \underline{5 \times 5}$

Here all factors do not appear in 3's group

∴ 100 is not a perfect cube.

(e) 46656

Prime factor of 46656 = $\underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3} \times \underline{3 \times 3 \times 3}$

Here all factors appears in groups of 3's

∴ 46656 is a perfect cub.

2. (a) 243

Prime factor of 243 = $\underline{3 \times 3 \times 3} \times 3 \times 3$

Here 3 does not appear in 3's group

∴ 243 must be multiplied by 3 to make it a perfect cube.

(b) 256

Prime factor of 256 = $\underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times 2 \times 2$

Here one factor 2 does not appear in 3's group

∴ 256 must be multiplied by 2 to make it a perfect cube.

(c) 72

Prime factor of 72 = $\underline{2 \times 2 \times 2} \times 3 \times 3$

Here 3 does not appear in 3's group

∴ 72 must be multiplied by 3 to make it a perfect cube.

(d) 675

Prime factor of 675 = $\underline{3 \times 3 \times 3} \times 5 \times 5$

Here 5 does not appear in 3's group

∴ 675 must be multiplied by 5 to make it a perfect cube.

(e) 100

Prime factor of 100 = $2 \times 2 \times 5 \times 5$

Here factor 2 and 5 both do not appear in 3's group

∴ 100 must be multiplied by $2 \times 5 = 10$ to make it a perfect cube.

3. (a) 81

Prime factor of 81 = $\underline{3 \times 3 \times 3} \times 3$

Here one factor 3 is not grouped in triplets

∴ 81 must be divided by 3 to make it a perfect cube.

(b) 128

Prime factor of 128 = $\underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times 2$

Here one factor 2 does not appear in 3's group

∴ 128 must be divided by 2 to make it a perfect cube.

(c) 135

Prime factor of 135 = $\underline{3 \times 3 \times 3} \times 5$

Here one factor 5 does not appear in a triplets

∴ 135 must be divided by 5 to make it a perfect cube.

(d) 192

Prime factor of $92_1 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times 3$

Here one factor 3 does not appear in a triplets

$\therefore$ 192 must be divided by 3 to make it a perfect cube.

(e) 704

Prime factor of 704 = $\underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times 11$

Here one factor 11 does not appear in a triplets

$\therefore$ 704 must be divided by 11 to make it a perfect cube.

4. Given numbers = 5 × 2 × 5

Since factors of 5 and 2 both are not in group of 3

$\therefore$ The number must be multiplied by 2 × 2 × 5 = 20 to make it a perfect cube

Hence, he needs 20 cuboids

EXERCISE-7.2

1. (a) 64

$$\sqrt[3]{64} = \sqrt[3]{\underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2}} = 2 \times 2 = 4$$

(b) 512

$$\sqrt[3]{512} = \sqrt[3]{\underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2}} = 2 \times 2 \times 2 = 8$$

(c) 10648

$$\sqrt[3]{10648} = \sqrt[3]{\underline{2 \times 2 \times 2} \times \underline{11 \times 11 \times 11}} = 2 \times 11 = 22$$

(d) 27000

$$\sqrt[3]{27000} = \sqrt[3]{\underline{3 \times 3 \times 3} \times \underline{2 \times 2 \times 2} \times \underline{5 \times 5 \times 5}} = 3 \times 2 \times 5 = 30$$

(e) 15625

$$\sqrt[3]{15625} = \sqrt[3]{\underline{5 \times 5 \times 5} \times \underline{5 \times 5 \times 5}} = 5 \times 5 = 25$$

(f) 13824

$$\sqrt[3]{13824} = \sqrt[3]{\underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3}} = 2 \times 2 \times 2 \times 3 = 24$$

(g) 110592

$$\sqrt[3]{110592} = \sqrt[3]{\underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3}}$$
$$= 2 \times 2 \times 2 \times 2 \times 3$$
$$= 48$$

(h) 46656

$$= \sqrt[3]{46656} = \sqrt[3]{\underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3} \times \underline{3 \times 3 \times 3} \times 3}$$
$$= 2 \times 2 \times 3 \times 3 = 36$$

(i) 175616

$$\sqrt[3]{175616} = \sqrt[3]{\underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{7 \times 7 \times 7}}$$
$$= 2 \times 2 \times 2 \times 7 = 56$$

(j) 91125

$$\sqrt[3]{91125} = \sqrt[3]{\underline{3 \times 3 \times 3} \times \underline{3 \times 3 \times 3} \times \underline{5 \times 5 \times 5}}$$
$$= 3 \times 3 \times 5 = 45$$

2. (a) False
(b) True
(c) False
(d) False
(e) False
(f) False
(g) True

3. We know that $10^3 = 1000$ and possible cube of $11^3 = 1331$
Since cube of units digit $1^3 = 1$
Cube root of 1331 = 11
4913
We know that $7^3 = 343$
Next number comes with 7 as unit place $17^3 = 4913$
Hence cube root of 4913 = 17
12167
We know that $3^3 = 27$
Now next number with 3 as ones digit = $13^3 = 2197$
and next number with 3 as ones digit = $23^3 = 12167$
Hence cube root of 12167 = 23
32768
We know that $2^3 = 8$
Now next number with 2 as ones digit $12^3 = 1728$
and next number with 2 as ones digit $22^3 = 10648$
and next number with 2 as ones digit $32^3 = 32768$
Hence cube root of 32768 = 32

SUBJECT ENRICHMENT EXERCISE

I. (1) An odd natural number
(2) An even natural number
(3) 9
(4) 4
(5) – 5
(6) 6
(7) – 11

II. (a) Even
(b) Odd, even
(c) 125
(d) Always negative
(e) Square
(f) Cube

III. (a) True
(b) False
(c) True
(d) False
(e) True

Comparing Quantities

EXERCISE-8.1

1. (a) 28 (b) 42 (c) 45

2. (a) 40% (b) 58% (c) 7%

3. (a) $\frac{1}{25} = \frac{x}{100} = y\%$

$\frac{1}{25} = \frac{x}{100}$

$x = \frac{100}{25}$

$x = 4$

$\frac{x}{100} = y\%$

$\frac{4}{100} = 4\% = y\%$

$\therefore x = 4$ and $y = 4$

(b) $\frac{7}{10} = \frac{x}{100} = y\%$

$\frac{7}{10} = \frac{x}{100}$

$x = \frac{700}{10}$

$x = 70$

$\frac{x}{100} = y\%$

$\frac{70}{100} = y\%$

$70\% = y\%$

$\therefore x = 70, y = 70$

4. $18\% = \frac{18}{100} = \frac{9}{50} = 9 : 50$

5. 20% of x = 40

$\frac{20}{100} \times x = 40$

$\frac{2x}{10} = 40$

$x = \frac{40 \times 10}{2} = 200$

6. Her monthly saving = ₹ 860
Saving = 12% of income
Let the monthly income = x
Her saving = 12% of x

$860 = \frac{12}{100} \times x$

$x = \frac{\cancel{860}^{\cancel{430}^{215}} \times 100}{\cancel{12}_{\cancel{6}_{3}}} = \frac{215 \times 100}{3} = 7166.67$

$\therefore$ Her monthly income = ₹ 7166.67

7. Let the percent = $x\%$

A.T.Q

$x\%$ of 50 kg = 65

$$\frac{x}{\cancel{100}_2} \times \cancel{50}^1 = 65$$

$$x = 65 \times 2 = 130$$

∴ The percent of 50 kg is 130.

8. A man saves his monthly income = 10% of income

After 6 months, his saving is ₹ 5400

Let the monthly income = x

Saving in one month = 10% of income = $\frac{10}{100} \times x = \frac{10x}{100}$

The saving in 6 months

$$6 \times \frac{10x}{100} = \frac{60x}{100} = \frac{6}{10}x$$

$$5400 = \frac{6}{10}x$$

$$x = \frac{5400 \times 10}{6} = ₹9000$$

His monthly income = ₹ 9000

9. Number of students are good in mathematics = 72% of 25 = $\frac{72}{100} \times 25 = 18$

Number of students are not good in mathematics = 25 – 18 = 7 students

EXERCISE-8.2

1. (a) P = ₹ 35,000 and P% = $\frac{\cancel{35000}^7}{\cancel{45000}_{23}} \times 100\%$ = 30.43%

(b) Loss = C.P. – S.P. = ₹ (1250 – 900) = ₹ 350

$$L\% = \frac{\cancel{35\,0}^7}{\cancel{125\,0}_{\cancel{25}_1}} \times \cancel{100}\% = 28\%$$

(c) P = S.P. – C.P. = ₹ (5150 – 4460) = ₹ 690

$$P\% = \frac{P}{CP} \times 100\% = \frac{690}{4460} \times 100\% = 15.47\%$$

(d) P = SP – CP = ₹ (4900 – 4892) = ₹ 8

$$P\% = \frac{P}{CP} \times 100\% = \frac{8}{4892} \times 100\% = 0.16\%$$

(e) P = SP – CP

= ₹ (381400 – 367000) = ₹ 14400

$$P\% = \frac{14400}{367000} \times 100\% = 3.92\%$$

(f) P = SP – CP = ₹ (800 – 735) = ₹ 65

$$P\% = \frac{65}{735} \times 100 = 8.84\%$$

2. (a) S.P. = CP + P
= ₹ (7282 + 208)
= ₹ 7490

(b) CP = SP – P
= ₹ (572 – 72)
= ₹ 500

(c) S.P. = C.P. – L
= ₹ (9684 – 684)
= ₹ (9000) = ₹ 9000

(d) C.P. = S.P. – P
= ₹ (1973 –273)
= ₹ 1700

(e) S.P. = C.P. – L
= ₹ 6,76,000 – 18,500
= ₹ 6,57,500

(f) C.P. = S.P. + L
= ₹ (7894 + 306)
= ₹ 8200

3. S.P. of a frock = ₹ 600
Loss = 20% of C.P.
Let C.P. = x

$$\text{Loss} = \frac{20}{100} \times x = \frac{x}{5}$$

S.P. = C.P. – L

$$600 = x - \frac{x}{5}$$

$$600 = \frac{4x}{5}$$

$$x = 600 \times \frac{5}{4} = 750$$

∴ C.P. = ₹ 750

4. C.P. = ₹ 5580 + ₹ 170 = ₹ 5750
S.P. = ₹ 6440
P = SP – CP = ₹ 6440 – ₹ 5750 = ₹ 690

$$P\% = \left(\frac{P}{CP} \times 100\right)\% = \frac{690}{5750} \times 100\% = 12\%$$

5. C.P. of car = ₹ 73,500 + ₹ 10,300 + ₹ 2,600 = ₹ 86,400
S.P. of car = ₹ 84,240
SP < CP
Loss = C.P. – S.P. = ₹ 86400 – ₹ 84240 = ₹ 2,160

$$\text{Loss\%} = \left(\frac{\text{Loss}}{CP} \times 100\right)\% = \frac{2160}{864\cancel{00}} \times 1\cancel{00} = 2.5\%$$

6. (a) $D = \frac{D\%}{100} \times MP = \frac{20}{100} \times 2300 = 460$

SP = MP – Discount = ₹ (2300 – 460) = ₹ 1840

(b) $D = \frac{25}{100} \times 4700$ = ₹ 1175

SP = MP – Discount = ₹ (4700 – 1175) = ₹ 3525

(c) $D = \frac{25}{200} \times 3224$ = ₹ 403

SP = MP – D = ₹ 3224 – ₹ 403 = ₹ 2821

(d) $D = \frac{1\cancel{0}}{1\cancel{00}} \times 985\cancel{0}$ = ₹ 985

SP = MP – D = ₹ 9850 – ₹ 98 = ₹ 8865

7. Increased in population = 15%

Let us take the population one year ago = x

The the population after one year = $\frac{115x}{100}$

But it is given 20700

A.T.Q

$$20700 = \frac{115x}{100}$$

$$x = \frac{20700 \times 100}{115} = 18000$$

∴ The population one year was 18000

8. Let the income of Akhil be x

Then the income of Nikhil will be 20% less than Akhil = x – 20% of x

$$= x - \frac{\overset{1}{\cancel{20}}}{\underset{5}{\cancel{100}}} \times x = x - \frac{x}{5} = \frac{4x}{5}$$

Akhil's income is more than Nikhil's by = $x - \frac{4x}{5} = \frac{x}{5}$

∴ The require % of Akhil's income is more than Nikhil's = $\frac{\frac{x}{5}}{\frac{4x}{5}} \times 100\% = 25\%$

∴ Akhil's income is 25% more than the Nikhil's income

9. Present value of the car = ₹ 2,25,000

The value of car decrease annually = 20% of 225000

$$= \frac{20 \times 2250\cancel{00}}{1\cancel{00}} = ₹\ 45,000$$

The value of car after 1 year = ₹ 2,25,000 – ₹ 45,000 = ₹ 1,80,000

The value of car after two year, ₹ 1,80,000 – 20% of ₹ 1,80,000

$$= ₹\left(1,80,000 - \frac{20}{100} \times 1,80,000\right) = ₹\ (1,80,000 - 36,000) = ₹\ 1,44,000$$

∴ The value of car after two year = ₹ 1,44,000

10. Let the total % at starting at the bus = 100%

Then 40% got down at station x,

So remaining in the bus = 60%

Then 75% of the remaining got down at station y = 60% – 75% of 60%

$$= 60\% - \frac{\overset{3}{\cancel{75}}}{\underset{4_1}{\cancel{100}}} \times \overset{15}{\cancel{60}}\,\% = 60\% - 45\%$$

Remaining passengers = 15%

So, 15% passenger = 12 passengers

So, 100% passenger = 80 passengers

11. Number of school A's students = 140

Number of school B's students = 70

Number of school C's students = 105

Number of school D's students = 35

Total students in the camp = 140 + 70 + 105 + 35 = 350

% of representation from school A = $\dfrac{\overset{20}{\cancel{140}}}{\underset{5}{\cancel{35}\,\cancel{0}}} \times \overset{2}{\cancel{10}\,\cancel{0}} = 40\%$

% of representation from school B = $\dfrac{{}^{1}\cancel{70}}{\underset{5}{\cancel{35}\,\cancel{0}}} \times \overset{20}{\cancel{100}} = 20\%$

% of representation from school C = $\dfrac{\overset{15}{\cancel{105}}}{{}_{7}\cancel{35}\,\cancel{0}} \times \overset{2}{\cancel{10}\,\cancel{0}} = 30\%$

% of representation from school D = $\left(\dfrac{35}{350} \times 100\right) = 10\%$

12. Cost of 1 quintal = ₹ 700

Cost of 100 quintal = ₹ 700 × 100 = ₹ 70,000

S.P. of 1 quintal = ₹ 1000

S.P. of 50 quintal = ₹ 1000 × 50 = ₹ 50,000

S.P. of 1 quintal = ₹ 800

S.P. of 50 quintal = ₹ 50 × 800 = ₹ 40,000

Total S.P. of 100 quintal = ₹ 50000 + ₹ 40000 = ₹ 90000

Gain = SP – CP = ₹ 90000 – ₹ 70000 = ₹ 20000

$$\text{Gain\%} = \frac{G}{CP} \times 100$$

$$= \left(\frac{20000}{70000} \times 100\right)\% = \frac{200}{7}\% = 28.57\%$$

13. 1 dozen = 12 pieces

C.P. of 1 dozen of Bananas = ₹ 15

C.P. of 1 Bananas $= \frac{15}{12} = ₹\ 1.25$

S.P. of 1 dozen of Bananas $=$ ₹ 20

S.P. of 1 Bananas $= \frac{20}{12} = ₹\ 1.66$

Gain = S.P. – C.P. = ₹ 1.66 – ₹ 1.25 = ₹ 0.41

$$= P\% = \left(\frac{P}{CP} \times 100\right)\% = \left(\frac{0.41}{1.25} \times 100\right)\% = \frac{1.64}{5} = 32.8\%$$

EXERCISE-8.3

1. P = ₹ 3000, R = 5%, T = 2 years

$$S.I. = \frac{P \times R \times T}{100} = \left(\frac{3000 \times 5 \times 2}{100}\right) = ₹\ 300$$

2. P = ₹ 4000, T = 2 years, R = 5% p.a.

$$S.I. = \frac{P \times R \times T}{100} = ₹\left(\frac{40\cancel{00} \times 2 \times 5}{1\cancel{00}}\right) = ₹\ 400$$

3. P = ₹ 8000, T = 3 years, R = 15%

$$S.I. = \frac{P \times R \times T}{100} = \left(\frac{80\cancel{00} \times 15 \times 3}{1\cancel{00}}\right) = ₹\ 3600$$

Amount = P + I = ₹ 8000 + ₹ 3600 = ₹ 11,600

4. P = ₹ 5000, R = 6%, T = 2 years

$$S.I. = \frac{P \times R \times T}{100} = \left(\frac{50\cancel{00} \times 6 \times 2}{1\cancel{00}}\right) = ₹\ 600$$

5. P = ₹ 25000, R = 8%, T = 2 year

$$S.I. = \frac{P \times R \times T}{100} = \left(\frac{250\cancel{00} \times 8 \times 2}{1\cancel{00}}\right) = ₹\ 40000$$

Amount = P + I = ₹ 25000 + ₹ 40000 = ₹ 29000

6. P = ₹ 20000, R = 12%, T = 1 year

$$S.I. = \frac{P \times R \times T}{100} = \left(\frac{200\cancel{00} \times 12 \times 1}{1\cancel{00}}\right) = ₹\ 2400$$

Amount = I + P

= ₹ 20,000 + ₹ 2400 = ₹ 22,400

∴ He will pay ₹ 22,400 to his friend

7. P = 64000, R = 7%, T = 3 years

$$S.I. = \frac{P \times R \times T}{100} = \left(\frac{640\cancel{00} \times 3 \times 7}{1\cancel{00}}\right) = ₹\ 13,440$$

Amount = P + I

= ₹ 64,000 + ₹ 13,440 = ₹ 77,440

∴ ₹ 77,440 will she get on maturity

EXERCISE-8.4

1. Let the population 2 years ago be P

Then, present population = $P \times \left(1+\frac{4}{100}\right)^2$

$$5408 = P\left(\frac{104}{100}\right)^2$$

$$5408 = P\left(\frac{26}{25}\right)^2$$

$$P = 5408 \times \frac{625}{26 \times 26} = 5000$$

The population 2 years ago = 5000

2. The present population of town = 48000

It is increased = 5% every year, Time = 5 year

The population of town next 5 year = $P\left(1+\frac{R}{100}\right)^n$

$$= 48000\left(1+\frac{5}{100}\right)^5$$

$$= 48000\left(\frac{21}{20}\right)^5$$

$$= 48000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20}$$

66,261.5

So, the estimated population of town next 5 years = 66261

The increase in population in next 5 year = 61261 – 48000 = 13,261

3. The population two year ago = 6250

Rate of decrease of population = 8% p.a.

$\therefore$ Present population = $6250 \times \left(1-\frac{8}{100}\right)^2$

$$= 6250 \times \left(\frac{23}{25}\right)^2 = 6250 \times \frac{23}{25} \times \frac{23}{25}$$

= 5290

The decrease in its population in the last 2 years = 6250 – 2590 = 960

4. The value of machine at the end of 2 year = ₹ 97200

The value of machine at the end of 3 years = ₹ 97200 – 10% of 97200

= ₹ 97200 – 9720 = ₹ 87,480

Value at the end of second year = 90% of value of at the end of first year

$$97200 = x\left(1 - \frac{10}{100}\right)$$

$$x = 97200 \times \frac{10}{9} = 1{,}08{,}000$$

Value at the end of first year = $x\left(1 - \frac{10}{100}\right)$

$$10800 = \frac{9x}{10}$$

$$x = \frac{108000}{9} \times 10 = 1{,}20{,}000$$

5. Present value = ₹ 4,11,540

Rate of depreciation = 5% p.a.

T = 3 years

Value 3 years ago = $P\left(1 - \frac{R}{100}\right)^n$

$$4{,}11{,}540 = P\left(1 - \frac{5}{100}\right)^3$$

$$4{,}11{,}540 = P\left(\frac{19}{20}\right)^3$$

$$P = \frac{20}{19} \times \frac{20}{19} \times \frac{20}{19} \times 411540 = ₹\ 4{,}80{,}000$$

NCERT CORNER

EXERCISE-8.1

1. (a) Ratio = $\frac{\text{speed of a cycle}}{\text{speed of a scootor}} = \frac{15 \text{ km/h}}{30 \text{ km/h}} = \frac{1}{2} = 1 : 2$

(b) 5 m to 10 km

10 km = 10000 m

5 m to 10000 m

Ratio = $\frac{5}{10000} = 1 : 2000$

(c) 50 p to ₹ 5 = 50 p to 500 p

₹ 5 = 5 × 100 = 500 p

Ratio = $\frac{50}{500} = \frac{1}{10} = 1 : 10$

2. (a) 3 : 4

$$\left(\frac{3}{4} \times 100\right)\% = (3 \times 25)\% = 75\%$$

(b) 2 : 3

$$\left(\frac{2}{3} \times 100\right)\% = \left(\frac{200}{3}\right)\% = 66\frac{2}{3}\%$$

3. Total number of students = 25

Students interested in mathematics = 72% of 25

$$\frac{72}{100} \times 25 = 18 \text{ students}$$

Number of students are not interested in mathematics 25 – 18 = 7 students

% of students are not interested in mathematics = $\frac{7}{25} \times 100 = 28\%$

4. Let the total number of matches = x

Number of win matches = 40% of total matches

Number of matches won = $\frac{40}{100} \times x$

$$10 = \frac{40}{100} \times x$$

$$x = \frac{10 \times 100}{40}$$

∴ 25 matches are total number of matches that they play in all.

5. Let the amount of money which Chameli had in the beginning be x

Spending money = 75%

Left money = ₹ 600 = (100 – 75)% = 25% of x

$$600 = \frac{25}{100} \times x$$

$$\frac{600 \times 100}{25} = x$$

₹ 2400 = x

Thus she had ₹ 2400 in the beginning.

6. People in city like cricket = 60%

People in city like football = 30%

People in city like other games = (100 – 60 – 30)% = 10%

Total number of people = 50 lakh

∴ Number of people who like cricket = $\frac{60}{1\cancel{00}} \times 50,00,0\cancel{00} = 30,00,000$

∴ Number of people who like football = $\frac{30}{1\cancel{00}} \times 50,00,0\cancel{00} = 15,00,000$

Number of people who like other games = $\frac{10}{1\cancel{00}} \times 50,00,0\cancel{00} = 5,00,000$

EXERCISE-8.2

1. Let the original salary be x

His new salary = ₹ 1, 54,000

New salary = Original salary + Increment

154000 = x + Increment

Increment = 10% of salary

$$\frac{\quad}{10}$$

$$154000 = \quad + \frac{\quad}{10}$$

$$154000 \quad \frac{11}{10}$$

$$\frac{\overset{14000}{\cancel{154000}} \times 10}{\cancel{11}} \quad 1,40,000$$

Thus, the original salary was ₹ 1,40,000.

2. On Sunday, number of people went to the zoo = 845

On Monday, number of people went to the zoo = 169

Decrease in the number of people = 845 – 169 = 676

$$\% \text{ decrease} = \left(\frac{\text{Decrease in the number of people}}{\text{Total number of people who went to zoom sunday}} \times 100 \right)\%$$

$$= \left(\frac{676}{845} \times 100 \right)\% = 80\%$$

3. The cost of 80 articles = ₹ 2400

$$\text{The cost of 1 articles} = \frac{\overset{30}{\cancel{240}}\cancel{0}}{{}_{1}\cancel{80}} = 30$$

P% = 16%

$$\text{P\%} = \frac{\text{P}}{30} \times 100$$

$$16 = \frac{\text{P}}{30} \times 100$$

$$\text{P} = \frac{16 \times 30}{100} = \frac{48}{10} = 4.80$$

SP = CP + P = ₹ (30 + 4.80) = ₹ 34.80

4. The total cost of 1 article = ₹ 15,500 + ₹ 450 = ₹ 15950

P% = 15%

$$15 = \frac{\text{P}}{15950} \times 100$$

$$\text{P} = \frac{15 \times 15950}{100} = 2392.50$$

$\therefore$ SP = CP + P = ₹ 15950 + ₹ 2392.50 = ₹ 18342.50

5. C.P. of VCR = ₹ 8000

The shopkeeper made a loss on VCR = 4%

Loss = $\frac{4}{100} \times 8000 = ₹320$

S.P. of VCR = ₹ (18000 – 320) = ₹ 7680

C.P. of TV = ₹ 8000

The shopkeeper made a profit on TV = 8%

P = $\frac{8}{\cancel{100}} \times 80\cancel{00} = 640$

S.P. of TV = ₹ 8000 + ₹ 640 = ₹ 8640

Total S.P. = ₹ (7680 + 8640) = ₹ 16320

Total CP = ₹ (800 + 8000) = ₹ 16000

P = SP – CP = ₹ (16320 – 16000) = ₹ 320

P% = $\frac{320}{16000} \times 100 = 2\%$

6. Total marked price = ₹ (1450 + 3 × 850)

= ₹ (1450 + 1700) = ₹ 3150

Discount% = 10%

Discount = $\left(\frac{10}{100} \times 3150\right) = 315$

Discount = MP – SP

₹ 315 = ₹ (3150 – SP)

SP = ₹ (3150 – 315) = ₹ 2835

7. SP of each buffalo = ₹ 20,000

The milkman made a gain of 5% while selling one buffalo

This means in CP = ₹ 100, then SP is ₹ 105

CP of buffalo = ₹ $\left(20000 \times \frac{100}{105}\right) = 19047.62$

Also the second buffalo was sold at a loss of 10%

This means if CP = ₹ 100, than SP = ₹ 90

$\therefore$ CP of other buffalo = ₹ $\left(20000 \times \frac{100}{90}\right)$ = ₹ 22222.22

Total CP = ₹ (19047.62 + 22222.22) = ₹ 41269.84

Total SP = ₹ 400000

Loss = C.P. – S.P. = ₹ (41269.84 – 40000) = ₹ 1269.84

8. Price of TV = ₹ 13000

Sales Tax = 12% of price = $\frac{12}{100} \times 13000$ = ₹ 1560

SP of TV = ₹ 1560 + ₹ 13000 + ₹ 14560

9. Let the M.P. = x

D% = 20%

$$D = \frac{20}{100} \times x$$

S.P. = M.P. + Discount

$$₹\ 1600 = x - \frac{x}{5}$$

$$₹\ 1600 = \frac{4x}{5}$$

$$1600 \times \frac{5}{4} = x$$

x = ₹ 2000

10. C.P. of hair dryer after including VAT ₹ 5400

Let the original price = ₹ x

VAT% = 8%

$$\text{VAT} = \frac{8}{100} \times x = \frac{\overset{2}{\cancel{8}}x}{\cancel{100}_{25}} = \frac{2x}{25}$$

CP = Original price + VAT

$$5400 = x + \frac{2x}{25}$$

$$5400 = \frac{27x}{25}$$

$$x = \overset{200}{\cancel{5400}} \times \frac{25}{\cancel{27}_1} = 5000$$

11. The cost of an article after including GST = ₹1239

GST = 18%, let the price of the article before

GST = x, GST = $\frac{18}{100} \times x$

CP = Original price + GST

$$1239 = x + \frac{18x}{100}$$

$$1239 = \frac{118x}{100}$$

$$x = \frac{\overset{21}{\cancel{1239}} \times \overset{50}{\cancel{100}}}{\underset{\cancel{59}_1}{\cancel{118}}} = ₹1050$$

EXERCISE-8.3

1. (a) P = ₹ 10,800, R = $12\frac{1}{2}\%$, T = 3 year

$$A = P\left(1+\frac{r}{100}\right)^n$$

$$= 10{,}800\left(1+\frac{\overset{1}{\cancel{25}}}{\underset{8}{\cancel{200}}}\right)^3$$

$$= 10800\left(\frac{9}{8}\right)^3$$

$$= \overset{1350}{\cancel{10800}} \times \frac{9\times 9\times 9}{\cancel{8}\times 8\times 8} = \frac{984150}{64} = \text{Rs } 15{,}377.34$$

C.I = A – P = ₹ (15377.34 – 10,800) = ₹ 4577.34

(b) P = ₹ 18000, R = 10%, T = $2\frac{1}{2}$ year , = 2 year 6 months

For just 2 year

$$A = P\left(1+\frac{r}{100}\right)^n$$

$$A = 18000\left(1+\frac{1\cancel{0}}{10\cancel{0}}\right)^2$$

$$= 18000\left(\frac{11}{10}\right)^2$$

$$= 18000\left(\frac{11}{10}\right)\left(\frac{11}{10}\right) = ₹\ 21{,}780$$

Amount for next 6 months = $\frac{6}{12}$

$$I = \frac{P\times R\times T}{100} = \frac{\overset{1089}{\cancel{2178}}\ \cancel{0}\times 1\cancel{0}\times \cancel{6}}{1\cancel{0}\cancel{0}\times \cancel{12}\ \cancel{2}_1} = \frac{2178}{2} = 1089 = ₹\ 1089$$

(Ist 2 year + 6 months)

A = ₹ 21780 + ₹ 1089 = ₹ 22,869

C.I. = A – P = ₹ 22869 – ₹ 18000 = ₹ 4869

(c) P = ₹ 62500, R = 8% p.a. = 4% per half yearly

Time = $1\frac{1}{2}$ years $= \frac{3}{2}\times 2 = 3$ half yearly

$$= A = P\left(1+\frac{r}{100}\right)^n = ₹\ 62500\times\left(1+\frac{\overset{1}{\cancel{4}}}{\cancel{100}_{25}}\right)^3$$

$$= ₹\ 62500\times\left(\frac{26}{25}\right)^3$$

$$= ₹\ \overset{100}{\cancel{62500}}\times\frac{26\times 26\times 26}{\cancel{25}_1\times\cancel{25}_1\times\cancel{25}_1}$$

$$= ₹\ 70304$$

C.I. = A – P = ₹ 70,304 – ₹ 62500 = ₹ 7,804

(d) P = ₹ 8000, T = 1 year = 2 half years

R = 9% p.a. = $\frac{9}{2}\%$ per half year

$$A = P\left(1+\frac{r}{100}\right)^n$$

$$= 8000\left(1+\frac{9}{200}\right)^2$$

$$= 9000\left(\frac{209}{200}\right)^2$$

$$= {}^{1}\cancel{4}\,\cancel{80}\,\cancel{00}\left(\frac{209}{\underset{1}{\cancel{200}}}\right)\left(\frac{209}{\underset{5}{\cancel{20}\,\cancel{0}}}\right) = \frac{43681}{5} = \text{Rs } 8736.20$$

C.I. = A – P = ₹ 8736.20 – ₹ 8000 = ₹ 736.20

(e) P = ₹ 10,000, T = 1 year = 2 half year, R = 8% p.a. = 4% half yearly

$$A = P\left(1+\frac{r}{100}\right)^n$$

$$= 10000\left(1+\frac{4}{100}\right)^2$$

$$= 10000\left(\frac{26}{25}\right)^2$$

$$= 10000\left(\frac{26}{25}\right)\left(\frac{26}{25}\right) = ₹\ 10,816$$

C.I. = A – P = (₹ 10,816 – ₹ 10,000) = ₹ 816

2. P = ₹ 26,400, R = 15% p.a., T = 2 year 4 months

Amount for first 2 years

$$A = P\left(1+\frac{r}{100}\right)^n = 26400\times\left(1+\frac{15}{100}\right)^2$$

$$= \overset{\overset{66}{\cancel{132}}}{\cancel{264}}\,\cancel{00}\left(\frac{23}{{}_1\cancel{20}}\right)\left(\frac{23}{{}_1\cancel{20}}\right) = 66\times 23\times 23 = ₹\ 34,914$$

By taking ₹ 34,914 as principal, the SI for the next $\frac{7}{3}$ months will be calculated.

$$\text{SI} = ₹\left(\frac{34914\times 15\times 1}{100\times 3}\right) = ₹1745.70$$

Total amount = P + I = ₹ 34914 + ₹ 1745.7 = ₹ 36,659.70

C.I. = A – P = ₹ 36,659.70 – ₹ 26,400 = ₹ 10,259.70

3. S.I. paid by Fabina = $\frac{P\times R\times T}{100}$ = ₹ $\left(\frac{125\cancel{00}\times 12\times 3}{1\cancel{00}}\right)$ = ₹ 4500

Amount paid by Radha at the end of 3 years = $A = P\left(1+\frac{r}{100}\right)^n$

$$A = 12500\left(1+\frac{10\!\!\!/}{100\!\!\!/}\right)^3 = 12500\left(\frac{11}{10}\right)^3$$

$$= 12500\left(\frac{11}{10}\right)\times\left(\frac{11}{10}\right)\times\left(\frac{11}{10}\right) = \frac{125\times 11\times 11\times 11}{10} = ₹\ 16,637.50$$

C.I. = A – P = ₹ (16637.50 – 12,500) = ₹ (4,137.50)

Int paid by Fabina = ₹ 4500 and by Radha = ₹ 4137.50

Thus, Fabina pays more interest = ₹ 4500 – ₹ 4137.50 = ₹ 362.50

4. P = ₹ 12000, R = 6% p.a., T = 2 year

$$\text{S.I.} = \frac{P\times R\times T}{100} = \frac{12000\times 6\times 2}{100} = ₹\ 1440$$

$$\text{C.I.} = P\left(1+\frac{r}{100}\right)^n - P$$

$$= P\left[\left(1+\frac{r}{100}\right)^n - 1\right]$$

$$= ₹\ 12000\left[\left(1+\frac{\overset{3}{6\!\!\!/}}{\underset{50}{100\!\!\!\!/}}\right)^n - 1\right] = ₹\ 12000\left[\left(\frac{53}{50}\right)^2 - 1\right]$$

$$= ₹\ 12000\left[\frac{2809}{2500} - 1\right] = ₹\ 12000\left[\frac{309}{2500}\right]$$

$$= ₹\ \frac{37,08,0\not{0}\not{0}}{25\not{0}\not{0}} = ₹\ 1483.20$$

Thus, the extra amount to be paid = C.I. – S.I.

= ₹ 1483.20 – ₹ 1440 = ₹ 43.20

5. (i) P = ₹ 60,000, R = $\frac{12}{2}$% p.a., T = 6 months = 1 half year

$$A = P\left(1+\frac{r}{100}\right)^n = ₹\ 60,000\left(1+\frac{12}{2\times 100}\right)^1$$

$$= ₹\ 60,000 - \left(\frac{53}{50}\right)$$

$$= ₹\ 63,600$$

(ii) There are 2 half years in 1 year, n = 2

$$A = ₹\left[60000\left(1+\frac{6}{100}\right)^2\right]$$

$$= ₹\left[\overset{\overset{250}{\cancel{1250}}}{\cancel{600}}\,\cancel{00}\left(\frac{53}{{}_1\cancel{50}}\right)\left(\frac{53}{{}_1\cancel{50}}\right)\right]$$

$$= ₹\,67{,}416$$

6. (i) P = ₹ 80,000, R = 10% p.a., T = $1\frac{1}{2}$ year

Amount for 1 year = $P\left(1+\frac{r}{100}\right)^n$

$$= 80000\left(1+\frac{1\cancel{0}}{10\cancel{0}}\right)^1$$

$$= 80000\left(\frac{11}{10}\right)$$

$$= ₹\,88{,}000$$

Amount for next 1/2 year, then P = 88000, R = 5% half yearly

T = 1/2 year = 1 half year

$$A = ₹\,88000\left(1+\frac{5}{100}\right)^1 = ₹\,88000\left(\frac{21}{20}\right)$$

$$= ₹\,92{,}400$$

(ii) The int. is compounded half yearly

P = ₹ 80000, R = 10% p.a. = 5% half year

T = $1\frac{1}{2}$ year $= \frac{3}{2}\times 2 = 3$ half year

$$A = ₹\,80000\left(1+\frac{{}^1\cancel{5}}{\underset{20}{\cancel{100}}}\right)^3 = ₹\,80000\left(\frac{21}{20}\right)^3$$

$$= ₹\,\overset{\overset{\overset{10}{\cancel{20}}}{\cancel{40}}}{\cancel{80}}\,\cancel{000}\left(\frac{21}{{}_1\cancel{20}}\right)\left(\frac{21}{{}_1\cancel{20}}\right)\left(\frac{21}{{}_1\cancel{20}}\right)$$

$$= ₹\,92610$$

Difference between the Amt's = ₹ 92610 – ₹ 92400 = ₹ 210

7. (i) P = ₹ 8000, R = 5% p.a. = T = 2 year

$$A = ₹\left[8000\left(1+\frac{5}{100}\right)^2\right]$$

$$= ₹\left[80000\left(\frac{21}{20}\right)^2\right] = ₹\left[8000\left(\frac{21}{20}\right)\left(\frac{21}{20}\right)\right]$$

$$= ₹\,8820$$

(ii) The int. for the next one year, i.e., the third year

By taking P = ₹ 8820, then S.T = $\frac{P \times R \times T}{100}$

$= \text{S.I.} = ₹ \left(\frac{8820 \times 5 \times 1}{100}\right) = ₹\ 441$

8. P = ₹ 10,000, R = 10% p.a. = 5% per half year

Time = $1\frac{1}{2}$ year = 3 half year

$$A = ₹\left[10000\left(1+\frac{5}{100}\right)^3\right] = ₹\left[10000\left(\frac{21}{20}\right)^3\right]$$

= ₹ 11,576.25

C.I. = A – P = ₹ 11,576.25 – ₹ 10,000 = ₹ 1,576.25

The amount for 1 year and 6 months can be calculated by first calculating the amount for 1 year using the compound interest formula, and then calculating the S.I. for 6 months on the amount obtained at the end of 1 year.

Amount for 1 first year = ₹ $\left[10000\left(1+\frac{1}{10}\right)\right] = ₹\ 10000\left(\frac{11}{10}\right) = ₹\ 11{,}000$

$$\text{S.I.} = ₹\ \frac{11000 \times 10 \times 1}{100 \times 2} = ₹\ 550$$

$$\text{Amt} = P + I = ₹\ 11000 + ₹\ 550 = ₹\ 11550$$

$$\text{C.I.} = ₹\ 11550 - ₹\ 10000 = ₹\ 1550$$

Yes, the interest would be more than compounded half yearly then the interest when compounded annually.

9. P = ₹ 4,096

R = $12\frac{1}{2}$% p.a. $= \frac{25}{4}$% per half yearly

T = 18 months = 3 half years

$$A = ₹\left[4096\left(1+\frac{25}{400}\right)^3\right] = ₹\left[4096\left(\frac{17}{16}\right)^3\right] = ₹\ 4913$$

10. (i) The population in the year 2003 = 54000

Let the population in the year 2001 = x

$$54000 = \left(1+\frac{\cancel{5}^{1}}{\cancel{100}_{20}}\right)^2 \times x$$

$$54000 = \left(\frac{21}{20}\right)^2 \times x$$

$$x = 54000 \times \frac{20}{21} \times \frac{20}{21} = \frac{21600000}{441}$$

$$= 48979.59$$

(ii) Population in the year 2005 = $54000\left(1+\frac{1}{20}\right)^2$

$= \overset{135}{\cancel{\overset{270}{\cancel{540}}}}\,\cancel{00}\left(\frac{21}{{}_1\cancel{20}}\right)\left(\frac{21}{{}_1\cancel{20}}\right) = 59535$

11. The initial count of bacteria is given as 5,06,000

Bacteria at the end of 2 hours = $506000\left(1+\frac{2.5}{1000}\right)^2$

$= 506000\left(\frac{41}{40}\right)\left(\frac{41}{40}\right)$

$= 531616.25 = 5{,}31{,}616$ app.

12. C.P. of the scooter = ₹ 42,000

Depreciation = 8% of ₹ 42,000 per year

$=$ Rs $\left(\frac{42000 \times 8 \times 1}{100}\right)$ = ₹ 3360

Value after 1 year = ₹ 42000 – ₹ 3360 = ₹ 38,640

SUBJECT ENRICHMENT EXERCISE

I. (1) 25% (2) 20%
(3) ₹ 480 (4) ₹ 4000
(5) 1% loss (6) 60%
(7) 30 m (8) 1 : 10
(9) ₹ 210 (10) 3 year
(11) 168.75%

II. (a) C.P. (b) M.P.
(c) $\left(\frac{y}{x} \times 100\%\right)$ (d) ₹ 10
(e) 22% (f) 6.25%
(g) S.P. (h) Excise tax

III. (a) False (b) True
(c) True (d) True
(e) False

Algebraic Expression and Identities

EXERCISE-9.1

1. (a) Yes, this is a polynomial.
(b) No, it is not a polynomial.
(c) Yes, it is a polynomial.
(d) Yes, it is a polynomial.
(e) No, it is not a polynomial.
(f) No, it is not a polynomial.
(g) No, it is not a polynomial.
(h) Yes, it is a polynomial.
(i) No, it is not a polynomial.
(j) Yes, it is a polynomial.
(k) No, it is not a polynomial.
(l) Yes, it is a polynomial.

2. (a) Monomials – x^3, 9.
(b) Binomials – $4x^2 - 1/y$; $b^{2/3} + b^3$; $4s - t^{-1}$; $x^3y - 5x^4y^6$
(c) Trinomial $-(a^2) + 7a + 12; \dfrac{5}{x} + x + 3$

3. (a) degree = 1
(b) degree = 3
(c) degree = 1
(d) degree = 2
(e) degree = 3
(f) degree = 4
(g) degree = 6
(h) degree = 6
(i) degree = 3

4. (a) $-7x^4 + 4x^3 + 7x^2 + 3x + 128$
(b) $4x^5 + 8x^4 + x^3 - 8x^2 + 8x + 125$
(c) $3x^3 - x^2 + 4x + 6$
(d) $x^3 - 5x^2 + 4x + 7$

EXERCISE-9.2

1. (a)
$$\begin{array}{r} 3x^2 + 5x + 7 \\ x^2 \quad\quad + 1 \\ +5x^2 + 4x + 2 \\ \hline 9x^2 + 9x + 10 \\ \hline \end{array}$$

(b)
$$\begin{array}{r} 5x^3 + 3x^2 + 3x \quad\quad \\ + 4x^2 - 7x + 5 \\ + \; x^3 \quad\quad\quad\quad - 3 \\ \hline 6x^3 + 7x^2 - 4x + 2 \\ \hline \end{array}$$

(c)
$$\begin{array}{r} 3a + 2b \\ + 6a + 9b \\ \hline 9a + 11b \\ \hline \end{array}$$

(d)
$$\begin{array}{r} 5x^2 + 7x + 3 \\ 12x^2 - 3x + 8 \\ + 6x^2 - 4x + 11 \\ \hline 23x^2 + 0x + 22 \\ \hline \end{array} = 23x^2 + 22$$

(e)
$$\begin{array}{r} x^2 - 6xy + y^2 \\ -\ x^2 - 6xy + y^2 \\ x^2 - 6xy - y^2 \\ +\ -6xy - y^2 \\ \hline x^2 - 24xy + 0 \\ \hline \end{array}$$

(f)
$$\begin{array}{r} -x^2 - x + 2 \\ x^2 + x + 3 \\ +\ 4x^2 + 5x + 111 \\ \hline 4x^2 + 5x + 116 \\ \hline \end{array}$$

(g)
$$\begin{array}{l} \quad 2x^4 \quad + x^3 \quad + 4x^2 \\ \quad 4x^4 \qquad\qquad - 4x^2 + x^8 \\ + \qquad\qquad\qquad\qquad x^5 + x^7 \\ \hline \quad 6x4 + x^3 + 0 + x^8 + x^5 + x^7 \\ \hline \end{array}$$

Ans : $x^8 + x^7 + x^5 + 6x^9 + x^3$

2. I[st] side = $3x^2 – y^2$

II[nd] side = $4x^2 – 7xy + 4y^2$

III[rd] side = $– 3x^2 + 7xy + 8y^2$

Perimeter = sum of all sides of a triangle

$$\begin{array}{r} 3x^2 \qquad\quad - y^2 \\ 4x^2 - 7xy + 4y^2 \\ +\quad -3x^2 + 7xy + 8y^2 \\ \hline 4x^2 + 0 \quad + 11y^2 \\ \hline \end{array}$$

Perimeter of triangle = $4x^2 + 11y^2$

3. Length of rectangle = $x^2 + 3y^2$

Breadth of rectangle = $x^3 – y^2$

Perimeter of rectangle = 2 (L + B)

= $2 (x^2 + 3y^2 + x^3 – y^2)$

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

= $2x^3 + 2x^2 + 4y^2$

4. (a)
$$\begin{array}{r} -3x^2 + 4z \\ -9x - 7z \\ + \qquad + \\ \hline 6x + 11z \\ \hline \end{array}$$

(b)
$$\begin{array}{r} m^2 - 9 \\ 3m^2 + 3 + 6m \\ - \quad - \quad - \\ \hline -2m^2 - 12 - 6m \\ \hline \end{array}$$

(c)
$$\begin{array}{r} 14r - 30s \\ 16r + 12s \\ - \qquad - \\ \hline -2r - 42s \\ \hline \end{array}$$

(d)
$$\begin{array}{r} 19a + 8b - 9c \\ 3a \qquad - 4c \\ - \qquad\quad + \\ \hline 6a + 8b - 5c \\ \hline \end{array}$$

5. $(x^4 + 3x^2 – 4x + 4) – (3x + 4x^2 – 7)$

= $x^4 + 3x^2 – 4x + 4 – 3x – 4x^2 + 7$

= $x^4 – x^2 – 7x + 11$

6. $(9ab – 13ac + 14bc – 4b^2 + 11) – (4ab – 7bc + 12ac – 6)$

= $9ab – 13ac + 14bc – 4b^2 + 11 – 4ab + 7bc – 12ac + 6$

$= 5ab - 25ac + 21bc - 4b^2 + 17$

7. $(8x^3 + 7x + 8x^2 - 3) - (7 + 8x^2 + 7x + x^3)$

$= 8x^3 + 7x + 8x^2 - 3 - 7 - 8x^2 - 7x - x^3$

$= 7x^3 - 10$

8. $(5x^2 + 3x + 7) - (2x^3 - 2x + 5)$

$= 5x^2 + 3x + 7 - 2x^3 + 2x - 5$

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

9. $(8x^2 - 9y^2) - (3x^2 - 2y^2)$

$= 8x^2 - 9y^2 - 3x^2 + 2x^2 = 5x^2 - 7y^2$

10. The cost of shirt = ₹ $5x + 20$

The cost of belt = ₹ $2x - 10$

Total cost = ₹ $(5x + 20 + 2x - 10)$ = ₹ $(7x + 10)$

∴ He spend ₹ $(7x + 10)$ in all

11. $(3x^2 + 4x + 1) - (2x^2 - 4x\ \ 35)$

$3x^2 + 4x + 1 - 2x^2 + 4x - 35 = x^2 + 8x - 34$

EXERCISE-9.3

1. (a) y^3 (b) a^2

(c) p^3q^3 (d) $4a^2b^2$

(e) $20a^2b^2c^2$ (f) $8a^5b^5$

2. (a) $(4x^2y) \times (6x)$

$= 24\ x^3y$

(b) $\left(\sqrt{2x}\right)\left(\sqrt{2x}\right) = \left(\sqrt{2} \times \sqrt{2}\right)\left(x \times x\right) = 2x^2$

(c) $6x^2y\ (-4xy) = (6x - 4)\ (x^2 \times x)\ (x^2 \times x)\ (y \times y) = -24\ x^3y^2$

(d) $(ab)\ (4a^2b)\ (5ab^2) = (4 \times 5) \times (a \times a^2 \times a)\ (b \times b \times b^2) = 20\ a^4\ b^4$

(e) $(x + 2)\ (x + 2) = (x + 2)\ x + (x + 2)2$

$= x^2 + 2x + 2x + 4 = x^2 + 4x + 4$

(f) $(4x - 9y)(4x - 9y) = 4x\ (4x - 9y) - 9y\ (4x - 9y)$

$= 16x^2 - 36xy - 36xy + 81y^2$

$= 16x^2 - 72xy + 81y^2$

3. (a) $a(a - b) = a^2 - ab$

(b) $2(x + 3) = 2x + 6$

(c) $5\ (x^2 - y^2) = 5x^2 - 5x^2$

(d) $3x^2y\ (4x + 5y) = 3x^2y\ (4x) + 3x^2y\ (5y) = 12\ x^3y + 15\ x^2y$

(e) $3ab\ (a^2b - ab^2) = 3ab\ (a^2b) + 3ab\ (-ab^2)$

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

(f) $5a^2b^3\ (4a^3b + 2ab^3)$

$= 5a^2b^3\ (4a^3b) + 5a^2b^3\ (2ab^3)$

$= 20a^5b^4 + 10a^3b^6$

4. (a) $(y + 2)\ (y - 4)$

$= y\ (y - 4) + 2\ (y - 4)$

$= y^2 - 4y + 2y - 8$

$= y^2 - 2y - 8$

(b) $(x - 7)\ (x - 6)$

$= x(x - 6) - 7\ (x - 6)$

$= x^2 - 6x - 7x + 42$

$= x^2 - 13x + 42$

(c) $(x^2 + 5)\ (x^2 + 10)$

$x^2(x^2 + 10) + 5\ (x^2 + 10)$

$x^4 + 10x^2 + 5x^2 + 50$

$x^4 + 15x^2 + 50$

(d) $(7x + 3y)\ (2x - 5y)$

$= 7x\ (2x - 5y) + 3y\ (2x - 5y)$

$= 14x^2 - 35xy + 6xy - 15y^2$

$= 14x^2 - 29xy - 15y^2$

(e) $(2x^2y - 3y)\ (3xy - x)$

$= 2x^2y\ (3xy - x) - 3y\ (3xy - x)$

$= 6x^3y^2 - 2x^3y - 9xy^2 + 3xy$

(f) $(x - y)\ (x - 2y)$

$= x\ (x - 2y) - y\ (x - 2y)$

$= x^2 - 2xy - xy + 2y^2$

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

5. (a) $(5 - 2d - d^2)\ (3 - 2d)$

$= 5\ (3 - 2d) - 2d\ (3 - 2d) - d^2\ (3 - 2d)$

$= 15 - 10d - 6d + 4d^2 - 3d^2 + 2d^3 = 15 - 16d + d^2 + 2d^3$

(b) $(a^2 + ab + b^2)\ (a - b)$

$= a^2\ (a - b) + ab\ (a - b) + b^2\ (a - b)$

$= a^3 \cancel{- a^2b} \cancel{+ a^2b} \cancel{- ab^2} \cancel{+ ab^2} - b^3$

$= a^3 - b^3$

(c) $(2x - 1)\ (x^2 + 2x + 7)$

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

$= 2x^3 + 4x^2 + 14x - x^2 - 2x - 7$

$= 2x^3 + 3x^2 + 12x - 7$

(d) $(a^2b^2 - 2ab + 4)(a + 2)$
$= (a^2b^2 - 2ab + 4)a + 2(a^2b^2 - 2ab + 4)$
$= a^3b^2 - 2a^2b + 4a + 2a^2b^2 - 4ab + 8$
$= a^3b^3 - 2a^2b + 2a^2b^2 - 4ab + 4a + 8$

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

(f) $(x^2 + y^2)(x^2 + xy + y^2)$
$= x^2(x^2 + xy + y^2) + y^2(x^2 + xy + y^2)$
$= x^4 + x^3y + x^2y^2 + x^2y^2 + xy^3 + y^4$
$= x^4 + x^3y + 2x^2y^2 + xy^3 + y^4$

(g) $(3x + 4y + 5z)(4x + 3y + 4z)$
$= 3x(4x + 3y + 4z) + 4y(4x + 3y + 4z) + 5z(4x + 3y + 4z)$
$= 12x^2 + 9xy + 12xz + 16xy + 12y^2 + 16yz + 20xz + 15yz + 20z^2$
$= 12x^2 + 12y^2 + 20z^2 + 25xy + 31yz + 32xz$

(h) $(3x^2 - 2x - 1)(2x^2 + x - 5)$
$= 3x^2(2x^2 + x - 5) - 2x(2x^2 + x - 5) - (2x^2 + x - 5)$
$= 6x^4 + 3x^3 - 15x^2 - 4x^3 - 2x^2 + 10x - 2x^2 - x + 5$
$= 6x^4 - x^3 - 19x^2 + 9x + 5$

(i) $(1 - 4x)(1 + x + x^2)$
$= 1(1 + x + x^2) - 4x(1 + x + x^2)$
$= 1 + x + x^2 - 4x - 4x^2 - 4x^3$
$= 1 - 3x - 3x^2 - 4x^3$

EXERCISE-9.4

1. (a) $(a + 2)(a + 2) = (a + 2)^2$
$= (a)^2 + 2(a)(2) + (2)^2$ $\quad [(a + b)^2 = a^2 + 2ab + b^2]$
$= a^2 + 4a + 4$

(b) $(3x + 5)(3x + 5) = (3x + 5)^2$
$= (3x)^2 + 2(3x)(5) + (5)^2$ $\quad [(a + b)^2 = a^2 + 2ab + b^2]$
$= 9x^2 + 30x + 25$

(c) $(pq + r)(pq + r) = (x - 3)^2$
$= (pq)^2 + 2(pq)(r) + r^2$ $\quad [(a + b)^2 = a^2 + 2ab + b^2]$
$= p^2q^2 + 2pqr + r^2$

(d) $(x - 3)(x - 3) = (pq + r)^2$
$= x^2 - 2(x)(3) + (3)^2$ $\quad [(a - b)^2 = a^2 - 2ab + b^2]$
$= x^2 - 6x + 9$

(e) $(6x-9y)(6x-9y)=(6x-9y)^2$

$= (6x)^2 - 2(6x)(9y) + (9y)^2 \quad [(a-b)^2 = a^2 - 2ab + b^2]$

$= 36x^2 - 108xy + 81y^2$

(f) $\left(\frac{1}{7}y - z\right)\left(\frac{1}{7}y - z\right) = \left(\frac{1}{7}y - z\right)^2$

$$= \left(\frac{1}{7}y\right)^2 - 2\left(\frac{1}{7}y\right)(z) + (z)^2 = [(a-b)^2 = a^2 - 2ab + b^2)$$

$$= \frac{1}{49}y^2 - \frac{2yz}{7} + z^2$$

(g) $(5yz + 6x^2)(5yz - 6x^2) = (5yz)^2 - (6x^2)^2 = [(x+y)(x-y) = (x^2 - y^2)]$

$= 25y^2z^2 - 36x^4$

(h) $(2a^3 - b^3)(2a^3 + b^3) = (2a^3)^2 - (b)^3$

$= 4a^6 - b^3 \quad [\because (a+b)(a-b) = a^2 - b^2]$

(i) $(yz^2 + x^2)(yz^2 - x^2) = (yz^2)^2 - (x^2)^2$

$= y^2z^9 - x^4 = y^2z^4 - x^4$

(j) $\left(4a + \frac{1}{4a}\right)^2 = (4a)^2 + 2(\not{4}a)\left(\frac{1}{\not{4}a}\right) + \left(\frac{1}{4a}\right)^2$

$$= 16a^2 + 2 + \frac{1}{16a^2}$$

(k) $(3x + 5y)^2 = (3x)^2 + 2(3x)(5y) + (5y)^2$

$= 9x^2 + 30xy + 25y^2$

(l) $\left(\frac{1}{4}x^2 + \frac{1}{2}y^2\right)^2 = \left(\frac{1}{4}x^2\right)^2 + {}^1\not{2}\left(\frac{1}{\not{4}_2}x^2\right)\left(\frac{1}{2}y^2\right) + \left(\frac{1}{2}y^2\right)^2$

$$= \frac{1}{16}x^4 + \frac{x^2y^2}{4} + \frac{1}{4}y^4$$

2. (a) $\left(3a + \frac{1}{3}\right)^2 = (3a)^2 + 2(\not{3}a)\left(\frac{1}{\not{3}}\right) + \left(\frac{1}{3}\right)^2$

$$= 9a^2 + 2a + \frac{1}{9}$$

(b) $\left(5x - \frac{1}{4}\right)^2 = (5x)^2 - \not{2}(5x)\left(\frac{1}{\not{4}_2}\right) + \left(\frac{1}{4}\right)^2$

$$= 25x^2 - \frac{5}{2}x + \frac{1}{16}$$

(c) $\left(m - \frac{3}{2}n\right)^2 = (m)^2 - \not{2}(m)\left(\frac{3}{\not{2}}n\right) + \left(\frac{3}{2}n\right)^2$

$$= m^2 - 3mn + \frac{9}{4}n^2$$

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

$= a^2 + \frac{2a}{b} + \frac{1}{b^2}$

3. (a) $(2m + 3)^2 - (2m - 3)^2$

$= [(2m)^2 + 2(2m)(3) + (3)^2] - [(2m)^2 - 2(2m)(3) + (3)^2]$

$= (4m^2 + 12m + 9) - (4m^2 - 12m + 9)$

$= 4m^2 + 12m + 9 - 4m^2 + 12m - 9 = 24m$

(b) $(3a^2 + 2b^2)^2 + (3a^2 - 2b^2)^2$

$= (9a^4 + 12a^2b^2 + 4b^4) + (9a^4 - 12a^2b^2 + 4b^4)$

$= 9a^4 + \cancel{12a^2b^2} + 4b^4 + 9a^4 - \cancel{12a^2b^2} + 4b^4$

$= 18a^4 + 16b^4$

$= 2(9a^4 + 8b^4)$

4. (a) $(81)^2 = (80 + 1)^2$

$= (80)^2 + 2(80)(1) + (1)^2$ $\quad [(a + b)^2 = a^2 + b^2 + 2ab]$

$= 6400 + 160 + 1 = 6561$

(b) $(107)^2 = (100 + 7)^2$

$= (100)^2 + 2(100)(7) + (7)^2$

$= 10,000 + 1,400 + 49 = 11,449$

(c) $45 \times 45 = (45)^2$

$= (50 - 5)^2$

$= (50)^2 - 2(50)(5) + (5)^2$

$= 2500 - 500 + 25 = 2025$

(d) $197 \times 203 = (200 - 3)(200 + 3)$

$= (200)^2 - (3)^2$

$= 40000 - 9 = 39,991$

(e) $100.4 \times 99.6 = (100 + 0.4)(100 - 0.4)$

$= (100)^2 - (0.4)^2$

$= 10000 - 0.16 = 9999.84$

(f) $12 \times 18 = (10 + 2)(10 + 8)$

$= (10)^2 + (2 + 8)(10) + (2 \times 8)$ $[(x + a)(x + b) = x^2 + (a + b)x + ab]$

$= 100 + 100 + 16$

$= 216$

(g) $95 \times 102 = (100 - 5)(100 + 2)$

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

$= 10,000 - 300 - 10$

$= 10000 - 310$

$= 9.690$

5. $x + y = 9$ and $xy = 6$

$x^2 + y^2 = ?$

$(x + y)^2 = (9)^2$

$(x^2 + y^2) + 2xy = 81$

$x^2 + y^2 + 2(6) = 81 \Rightarrow x^2 + y^2 = 81 - 12 = 69$

6. $x - y = 11$ and $xy = 6$

$(x - y)^2 = (11)^2$

$x^2 + y^2 - 2xy = 121$

$x^2 + y^2 - 2(6) = 121$

$x^2 + y^2 = 121 + 2$

$x^2 + y^2 = 133$

7. $\left(x - \frac{1}{x}\right)^2 = (12)^2$

$x^2 + \frac{1}{x^2} + 2(\cancel{x})\left(\frac{1}{\cancel{x}}\right) = 144$

$x^2 + \frac{1}{x^2} = 144 - 2$

$x^2 + \frac{1}{x^2} = 142$

8. $\left(x^2 + \frac{1}{x^2}\right) = 66$

$\left(x - \frac{1}{x}\right)^2 = x^2 + \frac{1}{x^2} - 2(\cancel{x})\left(\frac{1}{\cancel{x}}\right)$

$\left(x - \frac{1}{x}\right)^2 = x^2 + \frac{1}{x^2} - 2$

$\left(x - \frac{1}{x}\right)^2 = 66 - 2$

$\left(x - \frac{1}{x}\right)^2 = 64$

$\left(x - \frac{1}{x}\right)^2 = (8)^2$

$\therefore x - \frac{1}{x} = 8$

9. If $x + \frac{1}{x} = \sqrt{5}$

square both side

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

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

$x^2 + \frac{1}{x^2} = 3$

Again square both side

$\left(x^2 + \frac{1}{x^2}\right)^2 = 9$

$x^4 + \frac{1}{x^4} + 2 = 9$

$x^4 + \frac{1}{x^4} = 9 - 2$

$x^4 + \frac{1}{x^4} = 9 - 2$

$x^4 + \frac{1}{x^4} = 7$

10. (a) $(61)^2 - (39)^2 = (61 + 39)(61 - 39)$
$= (100)(22)$
$= 2200$

(b) $(850)^2 - (750)^2 = (850 + 750)(850 - 750)$
$= (1600)(100)$
$= 1,60,000$

(c) $(215)^2 - (205)^2 = (215 + 205)(215 - 205)$
$= (420)(10) = 4200$

11. (a) $\dfrac{94 \times 94 - 6 \times 6}{94 - 6}$

$= \dfrac{(94)^2 - (6)^2}{94 - 6}$

$= \dfrac{(94 + 6)\cancel{(94 - 6)}}{\cancel{(94 - 6)}}$

$= 100$

(b) $\dfrac{6.34 \times 6.34 - 0.34 \times 0.34}{6.68}$

$= \dfrac{(6.34)^2 - (0.34)^2}{6.68}$

$= \dfrac{(6.34 + 0.34)(6.34 - 0.34)}{6.68}$

$= \dfrac{\cancel{6.68}\,(6.00)}{\cancel{6.68}} = 6$

12. (a) $23x = 68 \times 68 - 45 \times 45 = (68)^2 - (45)^2$
$23x = (68 + 45)(68 - 45)$
$23x = (113)\,23$
$23x = 23\,(113)$
$x = 113$

(b) $12x = (34)^2 - (26)^2 = (34 + 26)(34 - 26)$
$12x = (60)(8)$

$x = \dfrac{{}^{5}\cancel{60} \times 8}{\cancel{12}_{1}} = 40$

13. $(5x + 3y)(5x - 3y)(25x^2 + 9y^2)$
$= (25x^2 - 9y^2)(25x^2 + 9y^2)$
$= (25x^2)^2 - (9y^2)^2$
$= 625\,x^4 - 81\,y^2$
If $x = 1$, $y = 2$
Verify:-
L.H.S $= (5x + 3y)(5x - 3y)(25x^2 + 9y^2)$
$= [5(1) + 3(2)]\,[5(1) - 3(2)]\,[25(1)^2 + 9(2)^2]$

$= (5 + 6)\ (5 - 6)\ [25 + 9 \times 4]$
$= 11\ (-1)\ (25 + 36)$
$= 11\ (-1)\ (61) = -671$
R.H.S $= (625)\ (x)^4 - 81y^4$
$= 625\ (1)^4 - 81\ (2)^4$
$= 625 - 81\ (16)$
$= 625 - 1296 - 671$
LHS = RHS

14. (a) $(x + 3)\ (x - 3)\ (x^2 + 9)$
$(x^2 - 9)\ (x^2 + 9)$
$(x^2)^2 - (9)^2 = x^4 - 81$

(b) $(6x - 1)\ (6x + 1)\ (36x^2 + 1)$
$= [(6x)^2 - (1)^2]\ [36x^2 + 1]$
$= (36x^2 - 1)\ (36x^2 + 1)$
$= (36x)^2 - (1)^2$
$= 1296\ x^4 - 1$

(c) $(px + q)\ (px - q)\ (p^2x^2 + q^2)$
$= [(px)^2 - (q)^2]\ [p^2x^2 + q^2]$
$= (p^2x^2 - q^2)\ (p^2x^2 + q^2)$
$= (p^2x^2)^2 - (q^2)^2$
$= p^4z^4 - q^4$

(d) $\left(x + \frac{1}{x}\right)\left(x - \frac{1}{x}\right)\left(x^2 + \frac{1}{x^2}\right)$

$$\left[(x)^2 - \left(\frac{1}{x}\right)^2\right]\left[x^2 + \frac{1}{x^2}\right]$$

$$\left(x^2 - \frac{1}{x^2}\right)\left(x^2 + \frac{1}{x^2}\right)$$

$$(x^2)^2 - \left(\frac{1}{x^2}\right)^2 = x^4 - \frac{1}{x^4}$$

15. If $a - b = 6$ and $a^2 + b^2 = 42$
$(a - b) = 6$
Square both side
$(a - b)^2 = (6)^2$
$a^2 + b^2 - 2ab = 36$
$42 - 2ab = 36$
$-2ab = 36 - 42$
$-2ab = -6$

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

NCERT CORNER

EXERCISE-9.1

1. (I) Terms → $5xyz^2$, $-3zy$
Coefficient → + 5, – 3

(II) Terms → 1, x, x^2
Coefficient → 1, 1, 1

(III) Terms → $4x^2y^2$, $-4x^2y^2z^2$, z^2
Coefficient → 4, – 4, 1

(IV) Terms → 3, $-pq$, $-qr$, $-rp$
Coefficient → 3, – 1, + 1, – 1

(V) Terms → $\frac{x}{2}, \frac{y}{2}, -xy$

Coefficient → $\frac{1}{2}, \frac{1}{2}, -1$

(VI) Terms → $0.3a$, $0.6ab$, $0.5b$
Coefficient → 0.3, – 0.6, 0.5

2. Monomials → 1000, pqr
Binomials → $x + y$, $2y - 3y^2$, $4z - 15z^2$, $p^2q + pq^2$, $2p + 2q$
Trinomials → $7 + y + 5x$, $2y - 3y^2 + 4y^3$, $5x - 4y + 3xy$
Polynomials that do not fit in any of these categories are → $x + x^2 + x^3 + x^4$, $ab + bc + cd + da$

3. (a)
$$\begin{array}{l} ab \quad -bc \\ \qquad\quad bc - ca \\ + \; -ab \qquad\quad + ca \\ \hline \qquad 0 \\ \hline \end{array}$$

(b) $(a - b + ab) + (b - c + bc) + (c - a + ac)$
$= a - b + ab + b - c + bc + c - a + ac$
$= ab + bc + ac$

(c) $(2p^2q^2 - 3pq + 4) + (5 + 7pq - 3p^2q+)$
$= 2p^2q^2 - 3pq + 4 + 5 + 7pq - 3p^2q^2$
$= -p^2q^2 = 4pq + 9$

(d) $(l^2 + m^2) + (m^2 + n^2) + (n^2 + l^2) + (2lm + 2mn + 2ml)$
$= l^2 + m^2 + m^2 + n^2 + n^2 + l^2 + 2lm + 2mn + 2nl$
$= 2l^2 + 2m^2 + 2n^2 + 2lm + 2mn + 2nl$
$= 2(l^2 + m^2 + n^2 + lm + mn + ml)$

4. (a) $(12a - 9ab + 5b - 3) - (4a - 7ab + 3b + 12)$
$= 12a - 9ab + 5b - 3 - 4a + 7ab - 3b - 12$
$= 8a - 2ab + 2b - 15$

(b) $(5xy - 2yz - 2zx + 10xyz) - (3xy + 5yz - 7zx)$
$= (5xy - 2yz - 2zx + 10xyz - 3xy - 5yz + 7zx)$
$= 2xy - 7yz + 5zx + 10xyz$

(c) $(18 - 3p - 11q + 5pq - 2p^2 + 5p^2q) - (4p^2q - 3pq + 5pq^2 - 8p + 7q - 10)$
$= 18 - 3p - 11q + 5pq - 2pq^2 + 5p^2q - 4p^2q + 3pq - 5pq^2 + 8p - 7q + 10$
$= 28 + 5p - 18q + 8pq - 7pq^2 + p^2q$
$= p^2q - pq^2 + 8pq - (8q + 5p + 28)$

EXERCISE-9.2

1. (a) $4 \times 7p = 28p$
(b) $-4p \times 7p = -28\,p^2$
(c) $-4p \times 7pq = -28\,p^2q$
(d) $4p^3\,(-3p) = -12\,p^4$
(e) $4p \times (0) = 0$

2. Area of Ist rectangle = $p \times q = pq$
Area of IInd rectangle = $10m \times 5m = 50\,mn$
Area of IIIrd rectangle = $(20x^2) - (5y^2) = 100\,x^2y^2$
Area of IVth rectangle = $4x \times 3x^2 = 12\,x^3$
Area of Vth rectangle = $3mn \times 4np = 12\,mn^2p$

3.

First monomial → Second monomial	$2x$	$-5y$	$3x^2$	$-4xy$	$7x^2y$	$-9x^2y^2$
$2x$	$4x^2$	$-10xy$	$15x^3$	$-8x^2y$	$14x^3y$	$-18x^3y^2$
$-5y$	$-10xy$	$25y^2$	$-15x^2y$	$20xy^2$	$-35xy^2$	$45x^2y^3$
$3x^2$	$6x^3$	$-15x^2y$	$9x^4$	$-12x^3y$	$21x^2y$	$-27x^4y^2$
$-4xy$	$-8x^2y$	$20xy^2$	$-12x^3y$	$16x^2y^2$	$-28x^3y^2$	$36x^3y^3$
$7x^2y$	$14x^4y$	$-35x^2y^2$	$21x^4y$	$-28x^3y^2$	$49x^4y^2$	$-63x^4y^3$
$-9x^2y^2$	$-18x^3y^2$	$45x^2y^3$	$-27x^4y^2$	$36x^3y^3$	$-63x^4y^3$	$81x^4y^4$

4. (a) V. of rectangular box = l × b × h = $5a \times (3a^2) \times (7a^4) = 105a^7$
(b) V. of rectangular box = $2p \times 4q \times 8r = 64\,pqr$
(c) V. of rectangular box = $(xy)\,(2x^2y)\,(2xy^2) = 4x^4y^4$
(d) V. of rectangular box = $(a)\,(2b)\,(3c) = 6abc$

5. (a) $(xy) \times (yz) \times (zx) = x^2y^2z^2$
(b) $(a)\,(-a^2)\,(a^3) = -a^6$
(c) $(2)\,(4y)\,(8y^2)\,(16y^3) = 1024y^6$
(d) $(a)\,(2b)\,(3c)\,(6abc) = 36ba^2b^2c^2$
(e) $(m)\,(-mn)\,(mnp) = -m^3n^2p$

EXERCISE-9.3

1. (a) $(4p)\,(q + r)$
$= 4p(q) + 4p(r)$
$= 4pq + 4pr$
(b) $(ab)\,(a - b)$
$= ab(a) + ab\,(-b)$
$= a^2b - ab^2$

(c) $(a + b)(7a^2b^2)$
$= 7a^2b^2(a) + 7a^2b^2(b)$
$= 7a^3b^2 + 7a^2b^3$

(d) $(a^2 - 9)(4a)$
$= a^2(4a) - 9(4a)$
$= 4a^3 - 36a$

(e) $(pq + qr + rp)(o)$
$= o(pq) + o(qr) + o(rp)$
$= o + o + o = o$

2. (a) $a(b + c + d) = ab + ac + ad$

(b) $5xy(x + y - 5) = 5x^2y + 5xy^2 - 25xy$

(c) $p(6p^2 - 7p + 5) = 6p^3 - 7p^2 + 5p$

(d) $4p^2q^2(p^2 - q^2) = 4p^4q^2 - 4p^2q^4$

(e) $(a + b + c)(abc) = a^2bc + ab^2c + abc^2$

3. (a) $(a^2) \times (2a^{22}) \times (4a^{26}) = 8a^{50}$

(b) $\left(\frac{2}{3}xy\right)\left(\frac{-9}{10}x^2y^2\right) = \frac{-3}{5}x^3y^3$

(c) $\left(\frac{-10}{3}pq^3\right)\left(\frac{6}{5}p^3q\right) = \left(\frac{-\cancel{10}^{2}}{\cancel{3}_{1}} \times \frac{\cancel{6}^{2}}{\cancel{5}_{1}}\right)(p \times p^3)(q^3 \times q) = -4p^4q^4$

(d) $x \times x^2 \times x^3 \times x^4 = x^{10}$

4. (a) $3x(4x - 5) + 3$

$12x^2 - 15x + 3$

(i) If $x = 3$ when $12x^2 - 15 + 3 = 12(3)^2 - 15(3) + 3$
$= 12(9) - 45 + 3$
$= 108 - 42$
$= 66$

(ii) If $x = \frac{1}{2}$ when $12x^2 - 15x + 3$

$= 12\left(\frac{1}{2}\right)^2 - 15\left(\frac{1}{2}\right) + 3$

$= {}^{3}\cancel{12}\left(\frac{1}{\cancel{4}}\right) - \frac{15}{2} + 3$

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

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

(b) $a(a^2 + a + 1) + 5$

$a^3 + a^2 + a + 5$

(i) If $a = 0$

$0 + 0 + 0 + 5 = 5$

(ii) If $a = 1$

$1 + 1 + 1 + 5 = 8$

(iii) If $a = -1$

$(-1)^3 + (-1)^2 + (-1) + 5$

$-\cancel{1} + \cancel{1} - 1 + 5 = 4$

5. (a) $p(p - q) + q(q + r) + r(r - p)$

$= p^2 - pq + q^2 - qr + r^2 - rp$

$= p^2 + q^2 + r^2 - pq - qr - rp$

(b) $2x(z - x - y) + 2y(z - y - x)$

$= 2zx - 2x^2 - 2xy + 2yz - 2y^2 - 2xy$

$= -2x^2 - 2y^2 - 4xy + 2yz + 2zx$

(c) Sub $3l(l - 4m + 5n)$ from $4l(10n - 3m + 2l)$

$= (40ln - 12ml + 8l^2) - (3l^2 - 12ml + 15nl)$

$= 8l^2 + 40nl - \cancel{12ml} - 3l^2 + \cancel{12m} - 15nl$

$= 5l^2 + 25nl$

(d) $4c(-a + b + c) - [3a(a + b + c) - 2b(a - b + c)]$

$= -4ac + 4bc + 4c^2 - [3a^2 + 3ab + 3ca - 2ab + 2b^2 - 2bc]$

$= -4ac + 4c^2 + 4bc - 3a^2 - ab - 3ca - 2b^2 + 2bc$

$= -3a^2 - 2b^2 + 4c^2 - ab + 6bc - 7ac$

EXERCISE-9.4

1. (a) $(2x + 5)(4x - 3)$

$= 2x(4x - 3) + 5(4x - 3)$

$= 8x^2 - 6x + 20x - 15$

$= 8x^2 + 14x - 15$

(b) $(y - 8)(3y - 4)$

$= y(3y - 4) - 8(3y - 4)$

$= 3y^2 - 4y - 24y + 32$

$= 3y^2 - 28y + 32$

(c) $(2.5l - 0.5m)(2.5l + 0.5m)$

$= 2.5l(2.5l + 0.5m) - 0.5m(2.5l + 0.5m)$

$= 6.25l^2 + 1.25ml - 1.25ml \;\; 0.25m^2$

$= 6.25l^2 - 0.25m^2$

(d) $(a + 3b)(x + 5)$

$= a(x + 5) + 3b(x + 5)$

$= ax + 5a + 3bx + 15b$

$= ax + 5a + 3bx + 15b$

(e) $(2pq + 3q^2)(3pq - 2q^2)$

$= 2pq(3pq - 2q^2) + 3q^2(3pq - 2q^2)$

$= 6p^2q^2 - 4pq^3 + 9pq^3 - 6q^4$

$= 6p^2q^2 + 5pq^3 - 6q^4$

(f) $\left(\frac{3}{4}a^2 + 3b^2\right)4\left(a^2 - \frac{2}{3}b^2\right)$

$= \frac{3}{4}a^2\left(4a^2 - \frac{8}{3}b^2\right) + 3b^2\left(4a^2 - \frac{8}{3}b^2\right)$

$= 3a^4 - -a^2b^2 + 12a^2b^2 - 8b^4$

$= 3a^4 - 2a^2b^2 + 12a^2b^2 - 8b^4$

$= 3a^4 - 10a^2b^2 - 8b^4$

2. (a) $(5 - 2x)(3 + x)$

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

$= 15 + 5x - 6x - 2x^2$

$= 15 - x - 2x^2$

(b) $(x + 7y)(7x - y)$

$= x(7x - y) + 7y(7x - y)$

$= 7x^2 - xy + 49xy - 7y^2$

$= 7x^2 + 48xy - 7y^2$

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

$= a^2(a + b^2) + b(a + b^2)$

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

(d) $(p^2 - q^2)(2p + q)$

$= p^2(2p + q) - q^2(2p + q)$

$= 2p^3 + p^2q - 2pq^2 - q^3$

3. (a) $(x^2 - 5)(x + 5) + 25$

$= x^2(x + 5) - 5(x + 5) + 25$

$= x^3 + 5x^2 - 5x - \cancel{25} + \cancel{25}$

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

(b) $(a^2 + 5)(b^3 + 3) + 5$

$= a^2(b^3 + 5) + 5(b^3 + 3) + 5$

$= a^2b^3 + 3a^2 + 5b^3 + 15 + 5$

$= a^2b^3 + 3a^2 + 5b^3 + 20$

(c) $(t + s^2)(t^2 - s)$

$= t(t^2 - s) + s^2(t^2 - s)$

$= t^3 - st + s^2t^2 - s^3$

$= t^3 - st + s^2t^2 - s^3$

(d) $(a + b)(c - d) + (a - b)(c + d) + 2(ac + bd)$

$= (ac + bc - ad - bd) + (ac + ad - bc - bd) + 2ac + 2bd$

$= ac + \cancel{bc} - \cancel{ad} - bd + ac + \cancel{ad} - \cancel{bc} - bd + 2ac + 2bd$

$= 2ac - \cancel{2bd} + \cancel{2bd} + 2ac = 4ac$

(e) $(x + y)(2x + y) + (x + 2y)(x - y)$

$= x(2x + y) + y(2x + y) + x(x - y) + 2y(x - y)$

$= 2x^2 + \cancel{xy} + 2xy + y^2 + x^2 - \cancel{xy} + 2xy - 2y^2$

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

(f) $(x + y)(x^2 - xy + y^2)$

$= x(x^2 - xy + y^2) + y(x^2 - xy + y^2)$

$= x^3 - \cancel{x^2y} + \cancel{xy^2} + \cancel{x^2y} - \cancel{xy^2} + y^3$

$= x^3 + y^3$

(g) $(1.5x - 4y)(1.5x + 4y + 3) - 4.5x + 12y$

$= 1.5x(1.5x + 4y + 3) - 4y(1.5x + 4y + 3) - 4.5x + 12y$

$= 2.25x^2 + \cancel{6.0xy} + \cancel{4.5x} - \cancel{6.0xy} - 16y^2 - \cancel{12y} - \cancel{4.5x} + \cancel{12y}$

$= 2.25x^2 - 16y^2$

(h) $(a + b + c)(a + b - c)$

$= a(a + b - c) + b(a + b - c) + c(a + b - c)$

$= a^2 + ab - \cancel{ac} + ab + b^2 - \cancel{bc} + \cancel{ac} + \cancel{bc} - c^2$

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

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

EXERCISE-9.5

1. (a) $(x + 3)(x + 3) = (x + 3)^2$

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

$= x^2 + 6x + 9$

(b) $(2y + 5)^2 = (2y)^2 + 2(2y)(5) + (5)^2$

$= 4y^2 + 20y + 25$

(c) $(2a - 7)^2 = (2a)^{2} - 2(2a)(7) + (7)^2$

$= 4a^2 - 28a + 49$

(d) $\left(3a - \frac{1}{2}\right)\left(3a - \frac{1}{2}\right) = \left(3a - \frac{1}{2}\right)^2$

$$= (3a)^2 - \cancel{2}(3a)\left(\frac{1}{\cancel{2}}\right) + \left(\frac{1}{2}\right)^2$$

$$= 9a^2 - 3a + \frac{1}{4}$$

(e) $(1.1m - 0.4)\ (1.1m + 0.4) = (1.1m)^2 - (0.4)^2$
$= 1.21m^2 - 0.16$

(f) $(a^2 + b^2)\ (-a^2 + b^2)$
$= (b^2 + a^2)\ (b^2 - a^2)$
$= (b^2)^2 - (a^2)^2 = b^4 - a^4$

(g) $(6x - 7)\ (6x + 7) = (6x)^2 - (7)^2$
$= 36x^2 - 49$

(h) $(-a + c)\ (-a + c) = (c - a)\ (c - a) = (c - a)^2$
$= (c)^2 - 2(c)\ (a) + (a)^2 = c^2 - 2ca + a^2$
$= a^2 - 2ca + c^2$

(i) $\left(\frac{x}{2} + \frac{3y}{4}\right)\left(\frac{x}{2} + \frac{3y}{4}\right) = \left(\frac{x}{2} + \frac{3y}{4}\right)^2 = \left(\frac{x}{2}\right)^2 + 2\left(\frac{x}{2}\right)\left(\frac{3y}{4}\right) + \left(\frac{3y}{4}\right)^2 = \frac{x^2}{4} + \frac{3xy}{4} + \frac{9y^2}{16}$

(j) $(7a - 9b)\ (7a - 9b) = (7a - 9b)^2$
$= 49a^2 - 2(7a)\ (9b) + 81b^2$
$= 49a^2 - 126ab + 81b^2$

2. (a) $(x + 3)\ (x + 7)$
$= (x)^2 + (3 + 7)x + 3 \times 7$
$= x^2 + 10x + 21$

(b) $(4x + 5)\ (4x + 1)$
$= (4x)^2 + (5 + 1)4x + (5 \times 1)$
$= 16x^2 + 24x + 5$

(c) $(4x - 5)\ (4x - 1)$
$= (4x)^2 + (-5 - 1)\ 4x + (-5)\ (-1)$
$= 16x^2 - 24x + 5$

(d) $(4x + 5)\ (4x - 1)$
$= (4x)^2 + (5 - 1)4x + (5)\ (-1)$
$= 16x^2 + 16x - 5$

(e) $(2x + 5y)\ (2x + 3y)$
$= (2x)^2 + (5y + 3y)\ (2x) + 5y\ (3y)$
$= 4x^2 + 16xy + 15y^2$

(f) $(2a^2 + 9)\ (2a^2 + 5)$
$= (2a^2)^2 + (9 + 5)\ (2a^2) + (9 \times 5)$
$= 4a^4 + 28a^2 + 45$

(g) $(xyz - 4)\ (xyz - 2) = (xyz)^2 + (-4 - 2)\ xyz + (-4)\ (-2)$
$= x^2y^2z^2 - 6xyz + 8$

3. (a) $(b-7)^2 = (b)^2 - 2(b)(7) + (7)^2$
$= b^2 - 14b + 49$

(b) $(xy + 3z)^2$
$= (xy)^2 + 2(xy)(3z) + (3z)^2$
$= x^2y^2 + 6xyz + 9z^2$

(c) $(6x^2 - 5y)^2$
$= (6x^2)^2 - 2(6x^2)(5y) + (5y)^2$
$= 36x^4 - 60x^2y + 25y^2$

(d) $\left(\frac{2}{3}m + \frac{3}{2}n\right)^2 = \left(\frac{2}{3}m\right)^2 + 2\left(\frac{\cancel{2}}{\cancel{3}}m\right)\left(\frac{\cancel{3}}{\cancel{2}}\right) + \left(\frac{3}{2}n\right)^2$

$= \frac{4}{9}m^2 + 2mn + \frac{9}{4}n^2$

(e) $(0.4p - 0.5q)^2$
$= (0.4p)^2 - 2(0.4p)(0.5q) + (0.5q)^2$
$= 0.16p^2 - 0.40pq + 0.25q^2$

(f) $(2xy + 5y)^2$
$= (2xy)^2 + 2(2xy)(5y) + (5y)^2$
$= 4x^2y^2 + 20xy^2 + 25y^2$

4. (a) $(a^2 - b^2)^2$
$= (a^2)^2 - 2(a^2)(b^2) + (b^2)^2$
$= a^4 - 2a^2b^2 + b^4$

(b) $(2x + 5)^2 - (2x - 5)^2$
$= (2x + \cancel{5} + 2x - \cancel{5})(\cancel{2x} + 5 - \cancel{2x} + 5)$
$= 4x(10) = 40x$

(c) $(7m - 8n)^2 + (7m + 8n)^2 = [(7m)^2 - 2(7m)(8n) + (8n)^2 + (7m)^2 + 2(7m)(8n) + (8n)^2]$
$= 49m^2 - \cancel{112mn} + 64n^2 + 49m^2 + \cancel{112mn} + 64n^2$
$= 98m^2 + 128n^2$

(d) $(4m + 5n)^2 + (5m + 4n)^2$
$= 16m^2 + 40mn + 25n^2 + 25m^2 + 40mn + 16m^2$
$= 41m^2 + 80mn + 41n^2$

(e) $(2.5p - 1.5q)^2 - (1.5p - 2.5q)^2$ $[a^2 - b^2 = (a + b)(a - b)]$
$= (2.5p - 1.5q + 1.5p - 2.5q)(2.5p - 1.5q - 1.5p + 2.5q)$
$= 1.0p + 1.0q$
$= (4.0p - 4.0q)$
$= (4p - 4q)(p + q)$
$= 4p^2 - \cancel{4pq} + \cancel{4pq} - 4q^2$
$= 4p^2 - 4q^2$

(f) $(ab + bc)^2$
$= a^2b^2 + b^2c^2 + 2(ab)(bc) - 2ab^2c$
$= a^2b^2 + b^2x^2 + \cancel{2b^2c} - \cancel{2ab^2}c$
$= a^2b^2 + b^2c^2$

(g) $(m^2 - n^2 m)^2 + 2m^3n^2$

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

$= m^4 - \cancel{2m^3n^2} + m^2n^4 + \cancel{2m^3n^2}$

$= m^4 + m^2n^4$

5. (a) $(3x + 7)^2 - 84x = (3x - 7)^2$

$(3x)^2 + 2(3x)(7) + 49 - 84x = (3x - 7)^2$

$(3x)^2 \;\; 42x + (7)^2 - 84x = (3x - 7)^2$

$(3x)^2 - 42x + 49 = (3x - 7)^2$

$(3x)^2 - 2(3x)(7) + (7)^2 = (3x - 7)^2$

$(3x - 7)^2 = (3x - 7)^2$

LHS = RHS

(b) $(9p - 5q)^2 + 180pq = (9p + 5q)^2$

LHS $= (9p)^2 + (5q)^2 - 2(9p)(5q) + 180pq$

$= (9p)^2 + (5q)^2 - 90pq + 180pq$

$= (9p)^2 + (5q)^2 + 90pq$

$= (9p)^2 + 2(9p)(5q) + (5q)^2$

$= (9p + 5q)^2 =$ RHS

(c) $\left(\frac{4}{3}m - \frac{3}{4}n\right)^2 + 2mn = \frac{16}{9}m^2 + \frac{9}{16}n^2$

$$\text{LHS} = \left(\frac{4}{3}m\right)^2 + \left(\frac{3}{4}n\right)^2 - 2\left(\frac{4}{3}m\right)\left(\frac{3}{4}n\right) + 2mn$$

$$= \frac{16}{9}m^2 + \frac{9}{16}n^2 - 2mn + 2mn$$

$$= \frac{16}{9}m^2 + \frac{9}{16}n^2 = \text{RHS}$$

(d) $(4pq + 3q)^2 - (4pq - 3q)^2 = 48pq^2$

LHS $= [(4pq)^2 + (3q)^2 + 2(4pq)(3q)] - [(4pq)^2 - 2(4pq)(3q) + (3q)^2]$

$= 16p^2q^2 + 9q^2 + 24pq^2 - 16p^2q^2 + 24pq^2 - 9q^2$

$= 48pq^2 =$ RHS

(e) $(a - b)(a + b) + (b - c)(b + c) + (c - a)(c + a) = 0$

LHS $= (a^2 - b^2) + (b^2 - c^2) + (c^2 - a^2)$

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

0 = RHS

6. (a) $(71)^2 = (70 + 1)^2$

$= (70)^2 + 2(70)(1) + (1)^2$

$= 4900 + 140 + 1 = 5041$

(b) $(99)^2 = (100 - 1)^2 = (100)^2 - 2(100)(1) + (1)^2$

$= 10000 - 200 + 1$

$= 9801$

(c) $(102)^2 = (100 + 2)^2$

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

$= 10000 + 400 + 4$
$= 10404$

(d) $(198)^2 = (1000 - 2)^2$
$= (1000)^2 - 2(1000)(2) + (2)^2$
$= 10,00,000 - 4000 + 4 = 996004$

(e) $(5.2)^2 = (5 + 0.2)^2$
$= 25 + 2(5)(0.2) + (0.2)^2$
$= 25 + 2 + 0.04 = 27.04$

(f) 297×3.03
$= (300 - 3)(300 + 3)$
$= (300)^2 - (3)^2$
$= 90000 - 9 = 89,991$

(g) 78×82
$= (80 - 2)(80 + 2)$
$= (80)^2 - (2)^2$
$= 6400 - 4 = 6396$

(h) $(8.9)^2 = (9 - 0.1)^2$
$= 81 + 0.01 - 2(9)(0.1)$
$= 81.01 - 1.8$
$= 79.21$

(i) 10.5×9.5
$= (10 + 0.5)(10 - 0.5)$
$= (10)^2 - (0.5)^2$
$= 100 - 0.25 = 99.75$

7. (a) $(51)^2 - (49)^2$
$= (51 + 49)(51 - 49)$
$= 100(2) = 200$

(b) $(1.02)^2 - (0.98)^2$
$= (1.02 + 0.98)(1.02 - 0.98)$
$= (2.00)(0.04)$
$= 0.08$

(c) $(153)^2 - (147)^2$
$= (153 + 147)(153 - 147)$
$= 300 \times 6 = 1800$

(d) $(12.1)^2 - (7.9)^2$
$= (12.1 + 7.9)(12.1 - 7.9)$
$= (20.0) \times (4.2)$
$= 84$

8. (a) 103×104
$= (100 + 3)(100 + 4)$
$= (100)^2 + (3 + 4)(100) + 3 \times 4$

= 10000 + 700 + 12

= 10,712

(b) 5.1 × 5.2

= (5 + 0.1) (5 + 0.2)

= 25 + (0.1 + 0.2) 5 + (0.1 × 0.2)

= 25 + 1.5 + 0.02

= 26.52

(c) 103 × 98

= (100 + 3) (100 – 2)

= 10000 + (3 – 2) (100) + (3) (– 2)

= 10,000 + 100 – 6 = 10,094

(d) 9.7 × 9.8

= (10 – 0.3) (10 – 0.2)

= $(10)^2$ + (– 0.3 – 0.2) (10) + (– 0.3) (– 0.2)

= 100 – 0.5(10) + 0.06

= 100 + 5 + 0.06 = 100.06 – 5 = 95.06

SUBJECT ENRICHMENT EXERCISE

I. (1) – 3x (2) $2p^2 + 2pq$

(3) 35 (4) 66

(5) 8 (6) 800

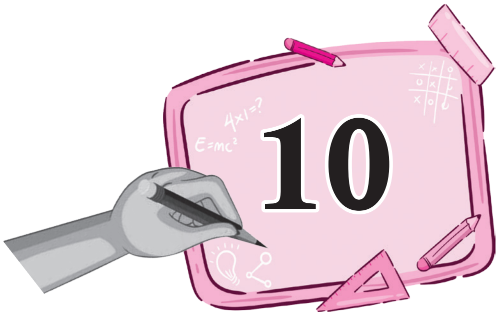
(7) 9984

II. (a) False (b) True

(c) False (d) True

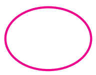
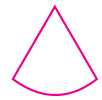
(e) False (f) True

(g) False

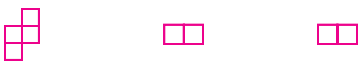


Visualising Solid Shapes

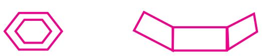
EXERCISE-10.1

1. (a)  (b)  (c) 

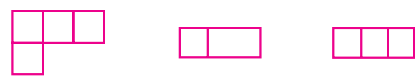
2. **Top view** **Side view** **Front view**

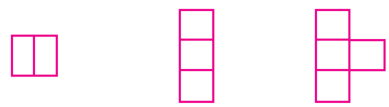
(a) 

(b) 

(c) 

(d) 

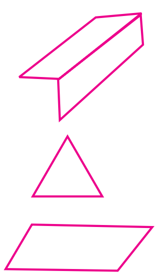
(e) 

(f) 

3. Do it yourself

4. Do it yourself

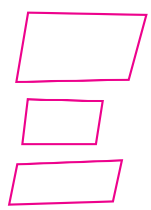
5. Do it yourself

6. (a) 

Top view

Side view

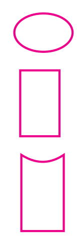
Front vew

(b) 

Top view

Front view

Side view

(c) 

Top view

Front view

Side view

7. Do it yourself

EXERCISE-10.2

1. (a) Film city

(b) West

(c) East

(d) IT Park

(e) Side View

2. Do it yourself

3. North = 0°

North East = 45°

East = 90°

South East = 135°

South = 180°
South West = 225°
West = 270°
North West = 315°

4. Do it yourself

EXERCISE-10.3

1.

	Faces	Edges
(a) Hexagonal prism	8	18
(b) Square prism	6	12
(c) Cuboid	6	12
(d) Rectangular pyramid	5	8
(e) Tetrahedron	4	6

2. Do it yourself

3. (a) F = 8, V = 12, E = 18
F + V – E = 8 + 12 – 18 = 2

(b) F = 6, V = 8, E = 12
F + V – E = 6 + 8 – 12 = 2

(c) F = 7, V = 8, E = 13
F + V – E = 15 – 13 = 2

(d) F = 4, V = 4, E = 6
F + V – E = 4 + 4 – 6 = 2

4. By Euler's formula, we have
F + V – E = 2

(i) 6 + 8 – E = 2
14 – E = 2
14 – 2 = E
E = 12

(ii) A + 10 – 15 = 2
A – 5 = 2
A = 5 + 2
A = 7

(iii) 5 + 6 – B = 2
11 – B = 2
11 – 2 = B
B = 9

(iv) C + 12 – 30 = 2
C – 18 = 2
C = 20

9. (i) Hexagonal Pyramid (ii) Triangular Pyramid

NCERT CORNER

EXERCISE-10.1

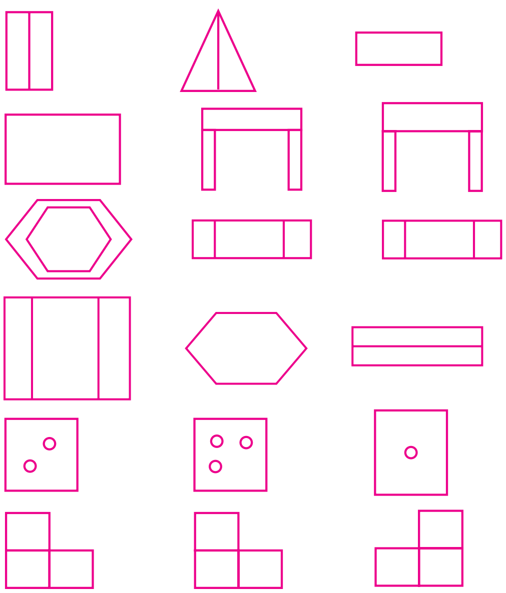
1. (a) → (iii) → (iv)
(b) → (i) → (v)
(c) → (iv) → (ii)
(d) → (v) → (iii)
(e) → (ii) → (i)

2. (a) (i) → Front, (ii) → Side, (iii) → Top
(b) (i) → Side, (ii) → Front (iii) → Top
(c) (i) → Front, (ii) → Side, (iii) → Top
(d) (i) → Front, (ii) → Side, (iii) → Top

3. (a) (i) → Top, (ii) → Front, (iii) → Side
(b) (i) → Side, (ii) → Front, (iii) → Top
(c) (i) → Top, (ii) → Side, (iii) → Front
(d) (i) → Side, (ii) → Front, (iii) → Top
(e) (i) → Front, (ii) → Top, (iii) → Side

4. **Top** **Front** **Side**

(a)
(b)
(c)
(d)
(e)
(f)



EXERCISE-10.2

1. (d) The city park is further east
(e) Senior secondary school is further south

2. Do it yourself

3. Do it yourself

4. Do it yourself

EXERCISE-10.3

1. (a) No, such a polyhedron is not possible. A polyhedron has minimum 4 faces.
(b) Yes, a triangular pyramid has 4 triangular faces.
(c) Yes, a square pyramid has 4 square face and 4 triangular faces.

2. A polyhedron has a minimum of 4 faces.

3. (i) It is not a polyhedron as it has a curved surface
$\therefore$ It will not be a prism also.
(ii) It is a prism.
(iii) It is not a prism. It is a pyramid.
(iv) It is a prism.

4. (a) A cylinder can be thought of as a circular prism, i.e., a prism that has a circle as its base.
(b) A cone can be thought of as a circular pyramid i.e., a pyramid that has a circle as its base.

5. A square prism has a square as its base. However, its height is not a necessarily same as the side of the square. Thus a square prism can also be a cuboid.

6. (i) F = 7, V = 10, E = 15
F + V – E = 2 = 7 + 10 – 15 = 2
Hence, Euler's formula is verified

(ii) F = 9, V = 9, E = 16
F + V – E = 2 = 9 + 9 – 16 = 2
Hence, Euler's formula is verified

7. By Euler's formula, we have
F + V – E = 2
(i) F + 6 – 12 = 2
F – 6 = 2
F = 8
(ii) 5 + V – 9 = 2
V – 4 = 2
V = 6
(iii) 20 + 12 – E = 2
32 – E = 2
32 – 2 = E
E = 30

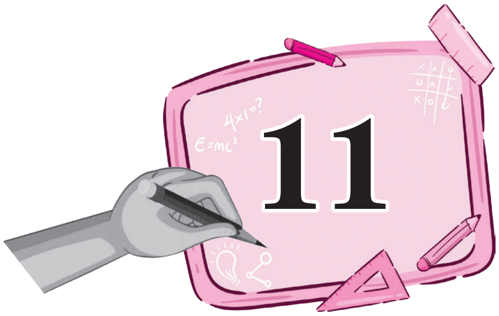
8. F = 10, V = 15, E = 20
According F + V – E = 2
10 + 15 – 20 = 2
25 – 20 = 2
$5 \neq 2$
Since Euler's formula is not satisfied, such a polyhedron is not possible.

SUBJECT ENRICHMENT EXERCISE

I. (1) Triangles
(2) a prism
(3) Rectangular pyramid
(4) 10
(5) Rectangles
(6) 2
(7) 2

II. (a) Euler's formula
(b) Prism
(c) 10
(d) Pyramidal
(e) Concave Polyhedrons

III. (a) True
(b) False
(c) True
(d) True
(e) False



Mensuration

EXERCISE-11.1

1. Let the side of first square = a

Side of another square = $a - 5$

Area of Ist square = a^2

Area of IInd square = $(a - 5)^2$

A.T.Q

$a^2 + (a - 5)^2 = 325$

$a^2 + a^2 + 25 - 10a = 325$

$2a^2 - 10a = 325 - 25$

$2a^2 - 10a = 300$

$2a^2 - 10a - 300 = 0$

$(2a^2 - 300) + (2a - 300) = 0$

$2a\,(a - 15) + 20\,(a - 15) = 0$

$(a - 15)\,(2a + 20) = 0$

$a = 15 - 10$

We take $a = 15$ and $a \neq -10$

$\therefore$ The side of Ist square = 15 cm

The side of another square = (15 – 5) = 10 cm

2. Side of square = 44 cm

Perimeter of square = 4 × side

= 4 × 44 = 176 cm

The perimeter of square = Circumference of circle

$44 = 2\pi r$

$$44 = 2\pi\frac{22}{7} \times r$$

$$r = \frac{{}^{2}\cancel{44} \times 7}{\cancel{2} \times \cancel{22}_{1}} = 7 \text{ cm}$$

3. Length of rectangular floor = 8.4 m

Breadth of rectangular floor = 5.4 m

Area of floor = L × B = $(8.4 \times 5.4)\text{m}^2 = 45.36\ \text{cm}^2$

$= 453600\ \text{cm}^2$

Area of 1 triangle marble tile = $\frac{1}{2} \times b \times h = \frac{1}{2} \times 40 \times 30 = 600 \text{ cm}^2$

Number of tiles = $\frac{\text{Area of floor}}{\text{Area of 1 tile}} = \frac{{}^{756}\cancel{4536}\,\cancel{00}}{\cancel{6}\,\cancel{00}}$ = 756 tiles

∴ 756 marble pieces will be required to cover the floor.

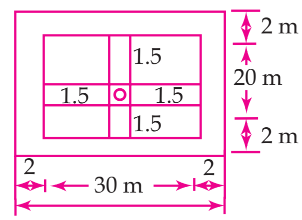
4. The hour hand will go round the clock 4 times in 2 days.
The distance covered by the hour hands in 1 round = $2\pi r$

$= 2 \times \frac{22}{\cancel{7}_1} \times \frac{\cancel{63}^9}{10}$

$= \frac{396}{10} = 39.6 \text{ cm}$

∴ The distance covered by the hour hand in 4 rounds
= 39.6 × 4 = 158.4 cm

5. Area of rectangular field = L × B



(a) Area of flower beds including
(Base of lamp post area)
= 30 × 1.5 + 1.5 × 20 = 45 + 30 = 75 m^2
Now we subtract twice the base of lamp post area as we include that area two times include area of flower bed = 75 – 2 (1.5 × 1.5)
= 75 – 2 (2.25) = 75 – 4.50 = 70.50 m^2

(b) To find area of walking path first
We find the area of outer rectangle
L = 30 = 2 + 2 + 34 m
B = 2 + 20 + 2 = 24 m
Area = 34 × 24 = 816 m^2
Area of rectangular park = 30 × 20 = 600
Area of walking park = Area of outer rectangle – Area of park
= (816 – 600)m^2 = 216 m^2

6. Radius of a circular plot (R) = 42 m
Width of the rood inside of the plot (w) = 3.5 m
Radius of the inner circle (r) = (R – w)
= 42 m – 3.5 m = 38.5 m
Area of the road = Area of outer circle – Area of inner circle
= $\pi R^2 - \pi r^2 = \pi(R^2 - r^2)$
= $\pi(R + r)(R - r) = \pi(42 + 3.5)(42 - 38.5)$

$= \frac{22}{7} \times (45.5) \times w$

$= \frac{{}^{11}\cancel{22}}{\cancel{7}_1} \times 45.5 \times \frac{{}^{1}\cancel{5}\;\cancel{35}}{\cancel{10}\;\cancel{2}_1}$

$= 22 \times 45.5 \times \frac{5}{10}$

$= 11 \times 45.5 = 500.5 \text{ m}^2$

The cost of paving 1 m^2 road = ₹ 45

The cost of paving 500.5m^2 road = 45 × 500.5 = ₹ 22522.50

7. Area of shaded region = Area of square – Area of two triangle (unshaped region)

$$= (5+7)^2 - \cancel{2}\left(\frac{1}{\cancel{2}} \times 7 \times 7\right) = 144 - 2\left(\frac{49}{2}\right) = 144 - 49 = 95 \text{ cm}^2$$

EXERCISE-11.2

1. Area of trapezium $\frac{1}{2} \times$ (Sum of the parallel sides $\times$ height)

$$= = \frac{1}{2} \times (20 + 24) \times 15 \text{ cm}^2$$

$$= \frac{1}{\cancel{2}_1} \times (\cancel{44}^{22}) \times 15 = 330 \text{ cm}^2$$

2. Area of rhombus = $\frac{1}{2} \times d_1 \times d_2$

$$= \frac{1}{\cancel{2}_1} \times \cancel{8}^4 \times 15 = 60 \text{ cm}^2$$

3. Area of trapezium = 1080 cm^2

Sun of parallel sides = (55 + 35) cm = 90 cm

Height = h cm

Area of trapezium = $\frac{1}{2} \times$ (Sum of parallel side $\times$ height)

$$1080 = \frac{1}{2} \times 90 \times h$$

$$\frac{^{12}\cancel{108}\cancel{0} \times 2}{\cancel{9}\cancel{0}} = h$$

$$h = 24 \text{ cm}$$

4. Area of trapezium = 1586 m^2

Distance between the parallel sides (h) = 26 m

One parallel side = 84 m

Other parallel side = x cm

Area of trapezium = $\frac{1}{2} \times$ (Sum of parallel side) $\times$ height

$$1586 = \frac{1}{2} \times (84 + x) \times 26$$

$$\frac{^{61}\cancel{1586} \times 2}{\cancel{26}_1} = 84 + x$$

$$122 = 84 + x$$

$$x = 122 - 84$$

$$x = 38$$

5. Let parallel sides are $4x$ and $5x$

Area of trapezium = $\frac{1}{2} \times$ (Sum of parallel sides $\times$ height)

$$405 \text{ cm}^2 = \frac{1}{2}(4x + 5x) \times 18$$

$$\frac{{}^{45}\cancel{405} \times \cancel{2}^1}{\cancel{18}_9} = 9x$$

$$\frac{45}{9} = x$$

The length of each of the parallel side are 4(5) and 5(5) = 20 cm and 25 cm

6. Area of rhombus $= \frac{1}{2} \times d_1 \times d_2 = \frac{1}{{}_1\cancel{2}} \times 45 \times {}^{15}\cancel{30}$

$= 675 \text{ cm}^2 = 0.0675 \text{ m}^2$

Number of tiles = 3000, Polish area = 3000 × 0.0675 = 202.5 m^2

The cost of polishing 1m^2 of floor = Rs 4

The cost of polishing 202.5 m^2 of floor = Rs 4 × 202.5 = Rs 810.0

7. Area of quadrilateral = $\frac{1}{2} \times$ diagonal $\times$ (sum of the perpendicular distance of the other vertices to the diagonal)

$= \frac{1}{2} \times 24 \times (7 + 8) \text{ cm}^2 = \frac{1}{\cancel{2}_1} \times {}^{12}\cancel{24} \times 15 \text{ cm}^2$

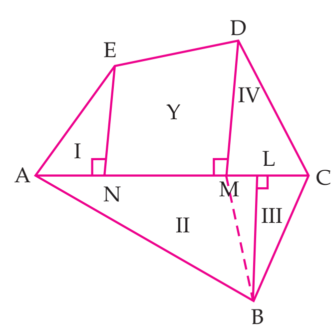
$= 180 \text{ cm}^2$

8. Area of field = $\frac{1}{2} \times \text{BD} \times (\text{AL} + \text{CM})$

$= \frac{1}{2} \times 36 \times (19 + 11) \text{ m}^2$

$= \frac{1}{\cancel{2}_1} \times 36 \times {}^{15}\cancel{30} = 540 \text{ m}^2$

9. Join BM



Area of I figure = $\frac{1}{2} \times \text{AN} \times \text{EN}$

$= \frac{1}{\cancel{2}_1} \times {}^3\cancel{6} \times 9$

$= 27 \text{ cm}^2$

Area of IInd figure = $\frac{1}{2} \times \text{AM} \times \text{BL}$

$= \frac{1}{\cancel{2}_1} \times {}^7\cancel{14} \times 4 = 28 \text{ cm}^2$

Area of IIIrd figure = $\frac{1}{2} \times MC \times BL$

$= \frac{1}{2} \times (AC - AM) \times 4$

$= \frac{(18 - 14) \times 4}{2} = 4 \times 2 = 8 \text{ cm}^2$

Area of IVth figure = $\frac{1}{2} \times MC \times DM$

$= \frac{1}{\cancel{2}_1} \times \cancel{4}^2 \times 12 = 24 \text{ cm}^2$

Area of Vth figure = $- \times (EN + DM) \times MN$

$= - \times (9 + 12) \times (AM - AN)$

$= \frac{21}{\ } \times (14 - 6)$

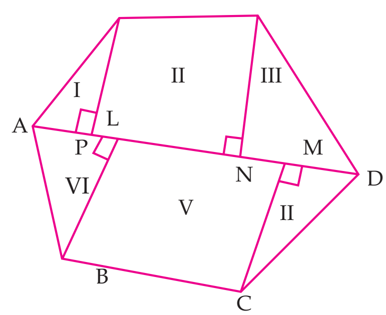
$= \frac{21}{/} \times \cancel{8}^4 = 84 \text{cm}^2$

Area of pentagon = Area of I figure + Area of IInd figure + Area of IIIrd figure + Area of IVth figure + Area of Vth figure

= $(27 + 28 + 8 + 24 + 84) \text{ cm}^2 = 171 \text{ cm}^2$

10. Area of Ist figure = $\frac{1}{2} \times FP \times AP$

$= \frac{1}{\cancel{2}_1} \times \cancel{8}^4 \times 6 = 24 \text{ cm}^2$



Area of IInd figure = $\frac{1}{2} \times (FP \times EN) \times PN$

$= \frac{1}{2}(8 + 12) \times (PL + LN)$

$= \frac{1}{\cancel{2}_1} \times \overset{10}{\cancel{20}} \times (2 + 8) = 100 \text{ cm}^2$

Area of IIIrd figure = $\frac{1}{2} \times EN \times ND$

$= \frac{1}{\cancel{2}_1} \times \cancel{12}^6 \times (NM \times MD)$

$= \frac{1}{2} \times 12 \times (2 + 3)$

$= 6(5) = 30 \text{ cm}^2$

Area of IVth figure = $\frac{1}{2} \times MD \times CM = \frac{1}{\cancel{2}_1} \times 3 \times \cancel{6}^3 = 9 \text{ cm}^2$

Area of Vth figure = $\frac{1}{2} \times (BL \times CM) \times LM$

$= \frac{1}{2}(8 + 6) \times (LN + NM)$

$= \frac{1}{\not{2}_1} \times \not{14}^7 \times (8 + 2)$

$= 70 \text{ cm}^2$

Area of VIth figure $= \frac{1}{2}(AP + PL) \times 8$

$= \frac{1}{2} \times (6 + 2) \times 8$

$= \frac{1}{\not{2}_1} \times \not{8}^4 \times 8 = 32 \text{ cm}^2$

Area of hexagon = Area of (I + II + III + IV + V + VI)
= (24 + 100 + 30 + 9 + 70 + 32) cm^2 = 265 cm^2

11. Area of Δ ABC = $\frac{1}{2} \times AC \times BL = \left(\frac{1}{\not{2}_1} \times \not{10}^5 \times 3\right) \text{cm}^2$

$= 15 \text{ cm}^2$

Area of Δ ADC = $\frac{1}{2} \times AD \times CM$

$= \left(\frac{1}{\not{2}_1} \times \not{12}^6 \times 7\right) \text{cm}^2$

$= 42 \text{ cm}^2$

Area of Δ ADE = $\frac{1}{2} \times AD \times NE$

$= \left(\frac{1}{\not{2}_1} \times \not{12}^6 \times 5\right) \text{cm}^2$

$= 30 \text{ cm}^2$

Area of pentagon ABCDE = Area of Δ ABC + Area (Δ ADC) + Area (Δ ADE)
= (15 + 42 + 30) cm^2
= 87 cm^2

NCERT CORNER

EXERCISE-11.1

1. Perimeter of square = 4 (side) = 4 (60) m = 240 m

Perimeter of rectangle = 2 (L + B) = 2 (80 + B) = (160 + 2B) m

It is given that the perimeter of the square and the rectangle are the same

240 = 160 + 2B

240 – 160 = 2B

$B = \frac{80}{2} = 40\text{ m}$

Area of square = side × side = (60 × 60) m^2 = 3600 m^2

Area of rectangle = L × B = (80 × 40) m^2 = 3200 m^2

Thus, the area of the square field is larger than the area of the rectangle.

2. Area of square plot = (25) m^2 = 625 m^2

Area of the house = (15 × 20) m^2 = 300 m^2

Area of the remaining portion = Area of square plot – Area of house

= (625 – 300) m^2 = 325 m^2

The cost of developing the garden around the house = 55 per m^2

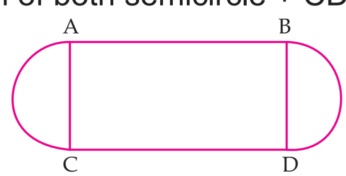
The cost of developing the garden of area 325 m^2 = 55 × 325 = Rs 17875.

3. Length of the rectangle = (20 – 3.5 – 3.5) m = 13 m

Circumference of 1 semicircle = $\pi r = \frac{22}{7} \times \frac{7}{2} = 11\text{ m}$

Circumference of 2 semicircle = 2(11) = 22m

Perimeter of garden = AB + length of both semicircle + CD = 13 + 22 + 13 = 48 m



Area of garden = Area of rectangle + 2 × Area of semi circle

$= \left[(13 \times 7) + 2\left(\frac{\pi r^2}{2}\right)\right] m^2$

$= \left[91 + \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}\right] m^2$

$= \left(91 + \frac{77}{2}\right) m^2 = (91 + 38.5)\, m^2$

$= 129.5\, m^2$

4. Area of parallelogram = Base × height

Hence, area of one tile = 24 × 10 = 240 cm^2

$$\text{Number of tiles} = \frac{\text{Area of floor}}{\text{Area of each tile}} = \frac{\overset{9}{\cancel{27}}\ \cancel{54}\ \cancel{108}\ \cancel{0}}{\cancel{24}\ \cancel{0}\ \cancel{12}\ \cancel{6}\ \underset{1}{\cancel{3}}} \times \overset{5000}{\cancel{10000}} = 45000 \text{ tiles}$$

Thus, 45000 tiles are required to cover a floor of area 1080 m^2.

5. (a) $r = 2.8$ cm

Circumference of semi circle = $\pi r + r$

$$= \frac{^{11}\cancel{22}}{\cancel{7}} \times \frac{\cancel{28}^{4}}{\cancel{20}_{10}} + 2.8$$

$$= \frac{44}{10} + 2.8$$

$$= 4.4 + 2.8 = 7.2 \text{ cm}$$

(b) r of semi-circle part = 1.4 cm

Perimeter of given figure = $[1.5 + 2.8 + 1.5 + \pi(r)]$ cm

$$= \left[5.8 + \frac{22}{\cancel{7}_1} \times \frac{\overset{2}{\cancel{14}}}{10}\right] \text{cm}$$

$$= [(5.8) + 4.4] \text{ cm} = 10.2 \text{ cm}$$

(c) Radius of semi-circle part = 1.4 cm

Perimeter of given figure = $(2 + 2 + \pi r)$ cm

$$= \left[4 + \frac{22}{7} \times 1.4\right] \text{cm} = 4 + 4.4 = 8.4 \text{ cm}$$

Thus, the ant will have to take a longer round for the food piece (b), because the perimeter of the figure given in alternative (b) is the greatest among all.

EXERCISE-11.2

1. Area of trapezium = $\frac{1}{2} \times$ (sum of parallel sides) $\times$ height

$$= \left[\frac{1}{2} \times (1 + 1.2) \times 0.8\right] m^2 = \left[\frac{1}{2_1}(\overset{1.1}{\cancel{2.2}}) \times 0.8\right] m^2$$

$$= 0.88 \text{ m}^2$$

2. Area of trapezium = 34 cm^2

Length of one side of the parallel = 10 cm

Height = 4 cm

Length of the other parallel side = x

Area of trapezium = $\frac{1}{2} \times$ (sum of parallel side) $\times$ height

$$34 = \frac{1}{\cancel{2}_1} \times (10 + x) \times \cancel{4}^2$$

$$\frac{^{17}\cancel{34}}{\cancel{2}} = 10 + x$$

$$x = 17 - 10 = 7 \text{ cm}$$

Thus, the length of the other parallel side = 7 cm

3. Length of the fence of trapezium ABCD = 120 m

AB + BC + CD + DA = 120 m

(AB + 48 + 17 + 40) m = 120 m

AB + 105 m = 120 m

AB = 15 m

Area of the field ABCD = $\frac{1}{2} \times (AD + BC) \times AB$

$$= \left[\frac{1}{2}(40 + 48) \times 15\right] \text{m}^2$$

$$= \frac{1}{\cancel{2}_1} \times \cancel{88}^{44} \times 15 = 660 \text{ m}^2$$

4. Area of quadrilateral = $\frac{1}{2} \times d \times (h_1 + h_2)$

$$= \left[\frac{1}{\cancel{2}_1} \times \overset{12}{\cancel{24}} \times (8 + 13)\right] \text{m}^2$$

$$= (12 \times 21) \text{ m}^2 = 252 \text{ m}^2$$

5. Area of rhombus = $\frac{1}{2} \times d_1 \times d_2$

$$= \left[\frac{1}{\cancel{2}_1} \times 7.5 \times {}^6\cancel{12}\right] \text{cm}^2$$

$$= (7.5 \times 6) \text{ cm}^2 = 45.0 \text{ cm}^2 = 45 \text{ cm}^2$$

6. Let the length of the other diagonal of rhombus = x

A rhombus is a special case of parallelogram

The area of parallelogram is given by the product of its base × height

Thus, area of the given rhombus = B × H = 6 × 4 = 24 cm^2

Also, area of rhombus = $\frac{1}{2} \times d_1 \times d_2$

$$24 = \frac{1}{2} \times 8 \times x$$

$$\frac{^3\cancel{24} \times 2}{\cancel{8}} = x$$

$$x = 6 \text{ cm}$$

Thus, the length of the other diagonal of the rhombus is 6 cm.

7. Area of rhombus = $\frac{1}{2}(d_1 \times d_2)$

Area of each tile = $\frac{1}{2} \times (45 \times 30)\,\text{cm}^2 = 675\,\text{cm}^2$

Area of 3000 tiles = 3000 × 675 = 2025000 cm^2 = 202.5 m^2

The cost of polishing of 1 m^2 = Rs 4

The cost of polishing of 202.5 m^2 = Rs (4 × 202.5) = Rs 810

8. Let the length of the filed along the road be lm. Hence, the length of the field along the river will be 2 lm.

Area of trapezium = $\frac{1}{2} \times (\text{sum of parallel sides}) \times \text{height}$

$$10500\,\text{m}^2 = \frac{1}{2} \times (l + 2l) \times 100$$

$$\frac{105\cancel{00} \times 2}{1\cancel{00}} = 3l$$

$$\frac{\overset{70}{210}}{\cancel{3}} = l$$

$$70\,\text{m} = l$$

Thus, length of the filed along the river = 2 × 70 m = 140 m

9. Side of regular octagon = 5 cm

Area of 1 trapezium = $\frac{1}{2} \times (\text{sum of parallel side}) \times \text{height}$

$$= \frac{1}{\cancel{2}} \times (\cancel{4}^2)(11 + 5) = 32\,\text{m}^2$$

Area of 2 trapezium = 2 × 32 = 64 m^2

Area of rectangle = 11 × 5 = 55 m^2

Area of octagon = Area of rectangle + Area of 2 trapezium = (55 + 64) m^2 = 119 m^2

10. Jyoti's way of finding area is as follows:

Area of pentagon = $2\,(\text{Area of trapezium})$

$$= 2\left[\frac{1}{2} \times (30 + 15) \times \frac{15}{2}\right]\text{m}^2$$

$$= \cancel{2}\left[\frac{1}{\cancel{2}} \times 45 \times \frac{15}{2}\right]\text{m}^2$$

$$= \frac{675}{2} = 337.5\,\text{m}^2$$

Kavita's way of finding area is as follows:

Area of pentagon = Area of triangle + Area of square

$$= \left[\frac{1}{2} \times 15 \times (30 - 15) + 15 \times 15\right] m^2$$

$$= \left[\frac{1}{2} \times 15 \times 15 + 225\right] m^2$$

$$= \left[\frac{225}{2} + 225\right] m^2$$

$$= [112.5 + 225]\, m^2$$

$$= 337.5\, m^2$$

11. Each section of the frame have a trapezium shape

There 4 section of the frame but opp. section of frame are equal

Area of trapezium = $\frac{1}{2} \times (20 + 28) \times \left(\frac{24 - 16}{2}\right)$

$$= \frac{1}{\cancel{2}} \times 48 \times \frac{\overset{2}{\cancel{\overset{4}{\cancel{8}}}}}{\cancel{2}_1} = 96\ cm^2$$

Area of other trapezium = whose parallel sides are 16 and 24 and height = (28 – 20) = $\frac{8}{2}$ cm

$$= \frac{1}{2} \times (16 + 24) \times \frac{8}{2}$$

$$= \frac{1}{\cancel{2}_1} \times 40 \times {}^2\cancel{4} = 80\ cm^2$$

$\therefore$ The area of each section of frame = 96 cm^2, 80 cm^2, 96 cm^2 and 80 cm^2.

EXERCISE-11.3

1. We know that

Total surface area of the cuboid = 2 (lb + bh + lb)

= 2 [60 × 40 + 40 × 50 + 50 × 60] cm^2

= 2 [2400 + 2000 + 3000] cm^2

= 2 [7400] = 14800 cm^2

Total surface area of cube = 6 $(side)^2$

= 6 $(50)^2$ = 6 × 2500

= 15,000 cm^2

Thus, the cuboidal box will require lesser amount of material

2. Total surface area of suitcase = 2 (80 × 48 + 48 × 24 + 24 × 80)

= 2 [3840 + 1152 + 1920] = 13824 cm^2

Total surface area of 100 suitcase = 13824 × 100 = 1382400 cm^2

Required tarpaulin = L × B

1382400 = L × 96

Length = $\frac{1382400}{96}$ cm = 14400 cm = 144 m

3. (a) Let the length of side of cube = x cm

S.A. of cube = 6 $(\text{side})^2$

$600 = 6x^2$

$x^2 = 100$

$x = 10$ cm

4. Length of the cabinet = 2m

Breadth of the cabinet = 1m

Height of the cabinet = 1.5 m

Area of the cabinet that was pointed = 2h (l + b) + lb

= 2 (1.5) (2 + 1) + (2 × 1)

= 6 (1.5) + 2

= 9.0 + 2 = 11 m^2

5. l = 15 m, b = 10 m, h = 7 m

Area of hall to be pointed = Area of wall + Area of ceiling

= 2h (l + b) + lb

= 2(7) (15 + 10) + (15 × 10)

= 2(7) (25) + 150

= [7 × 50 + 150] m^2

= (350 + 150) m^2 = 500 m^2

100 m^2 area can be pointed from each can

Number of cans required to paint an area of 500 m^2

$= \frac{500}{100} = 5$ cans

6. Similarly between both the figures is that both have the same heights.

The difference between the two figures is that one is a cylinder and the other is a cube.

L.S.A of the cube = $4l^2 = 4(7)^2 = 196$ cm^2

L.S.A of the cylinder = $2\pi rh = {}^1\cancel{2} \times \frac{22}{\cancel{7}} \times \frac{\cancel{7}}{\cancel{2}_1} \times 7$

$= 154 \text{ cm}^2$

Hence, the cube has larger lateral surface area.

7. T.S.A of cylinder = $2\pi r(r + h)$

$= 2 \times \frac{22}{7} \times 7\,(7 + 3)$

$= 2 \times \frac{22}{{}_1\cancel{7}} \times \cancel{7}^1 \times 10 = 440 \text{ m}^2$

8. A hollow cylinder is cut along its height to form a rectangular sheet

Area of cylinder = Area of rectangular sheet

4224 = 33 × L

$L = \frac{4224}{33} = 128$ cm

Thus, the length of the rectangle sheet = 128 cm

Perimeter of the rectangular sheet = 2 (L + B)

= 2 (128 + 33)

= 2 (161) cm = 322 cm

9. In one revolution, the roller will cover an area equal to its lateral surface area.

Thus, in 1 revolution, area of the road covered = $2\pi rh$

$$= \left(2 \times \frac{22}{\not{7}_1} \times \frac{\overset{6}{\not{42}}}{100} \times 1\right) m^2$$

$$= \frac{264}{100} m^2$$

In 750 revolution, area of the road covered = $\left(750 \times \frac{264}{100}\right) m^2$

$$= 1980 \text{ m}^2$$

10. Height of the label = 20 cm – 2 cm – 2 cm = 16 cm

Radius of the label = $\frac{\not{14}^7}{\not{2}} = 7$ cm

Label is in the form of cylinder having its radius and height as 7 cm and 16 cm

Area of label = $2\pi rh$

$$= 2 \times \frac{22}{\not{7}} \times \not{7} \times 16$$

= 44 × 16 = 704 cm^2.

EXERCISE-11.4

1. (a) In this situation, we will find the volume.

(b) In this situation, we will find the surface area.

(c) In this situation, we will find the volume.

2. The heights and diameters of these cylinders A and B are interchanged.

We know that

Volume of cylinder = $\pi r^2 h$

If measure of r and h are same, then the cylinder with greater radius will have greater area

Radius of cylinder A = $\frac{7}{2}$ cm

Radius of cylinder B = $\frac{14}{2} = 7$ cm

As the radius of cylinder B is greater

Therefore the volume of cylinder B will be greater

Verify: by calculating the V of both the cylinders

V of cylinder A = $\pi r^2 h$

$$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 14 = 539 \text{ cm}^3$$

V of cylinder B = $\frac{22}{7} \times 7 \times 7 \times 7 = 1078 \text{ cm}^3$

V of cylinder B is greater.

S.A. of cylinder A = $2\pi r\,(r + h)$

$$= 2\left[\not{2} \times \frac{22}{\not{7}} \times \frac{\not{7}}{\not{2}}\left(\frac{7}{2} + 14\right)\right] \text{cm}^2$$

$$= {}^{11}\not{22}\left(\frac{7 + 28}{\not{2}}\right) = 11 \times 35 \text{ cm}^2$$

$$= 385 \text{ cm}^2$$

S.A of cylinder B = $2 \times \frac{22}{\not{7}} \times \not{7}\ (7 + 7)$

$$= 44\,(14) \text{ cm}^2 = 616 \text{ cm}^2$$

Thus, the surface area of cylinder B is also greater than the surface area of cylinder A.

3. Base area of cuboid (L × B) = 180 cm^2

V of cuboid = l × b × h

900 cm^3 = (l × b) × h

900 = 180 × h

h = $\frac{{}^{5}\not{90}\not{0}}{{}_{1}\not{18}\not{0}}$

h = 5 cm

4. V of cuboid = (60 × 54 × 30) cm^3

= 97200 cm^3

Side of cube = 6 cm

V of cube = (6)3 = 216 cm^3

Number of cubes = $\frac{\text{V of cuboid}}{\text{V of cube}} = \frac{97200}{216} = 450$ cubes

5. Diameter of the base = 140 cm

r = $70 \text{ cm} = \frac{70}{100}$ m

V of cylinder = $\pi r^2 h$

$$.54m^2 = \frac{22}{7} \times \frac{70}{100} \times \frac{70}{100} \times h$$

$$\frac{\overset{1}{\not{22}}\ \not{154} \times \not{7} \times 1\not{0}\not{0} \times 1\not{0}\not{0}}{1\not{0}\not{0} \times \not{22} \times \not{7}\not{0} \times 7\not{0}} = h$$

$h = 1$m

6. Radius of cylinder = 1.5 m

Length of cylinder = 7 m

V of cylinder = $\pi r^2 h$

$$= \frac{\overset{11}{\cancel{22}}}{\cancel{7}} \times \frac{\overset{3}{\cancel{15}}}{\cancel{10}_2} \times \frac{\overset{3}{\cancel{15}}}{\cancel{10}_2} \times \cancel{7}$$

$$= \frac{99}{2} = 49.5\ \text{m}^3$$

1 m^3 = 1000 l

required quantity = (49.5 × 1000) l = 49500 l

7. (i) Let initially the edge of the cube = l

Initial S.A. = $6l^2$

If each edge of the cube is doubled, then it becomes 2l.

New surface area = $6(2l)^2 = 24l^2 = 4 \times 6l^2$

Clearly the surface area will be increase by 4 times.

(ii) Initial V of the cube = l^3

When each edge of the cube is doubled it becomes 2l.

New volume = $(2l)^3 = 8l^3 = 8 \times l^3$

Clearly, the volume of the cube will be increased by 8 times.

8. V of cuboidal reservoir = 108 m^3 = (108 × 1000) L

= 108000 L

It is given that water is being poured at the rate of 60 L per minute.

That is, 60 × 60 L = 3600 L per hour

Required number of hours = $\frac{\overset{30}{\cancel{1080}}\ \cancel{00}}{\underset{1}{\cancel{36}}\ \cancel{00}} = 30\ \text{hrs}$

Thus, it will take 30 hours to fill the reservoir

SUBJECT ENRICHMENT EXERCISE

I. (1) $2x$ (2) 400 cm^2

(3) 24 cm^2 (4) 6 $breadth^3$

(5) 3000 l (6) $5\pi r^3$

(7) $\sqrt{pqr}$ (8) 486 cm^2

II. (a) $4a^2$ (b) Volume

(c) $2\pi rh$ (d) Side

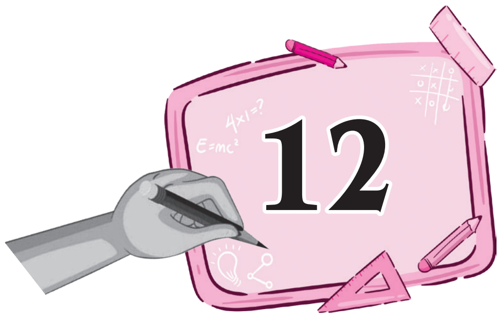
(e) 3 : 1 (f) One cubic unit

III. (a) False (b) True

(c) False (d) True

(e) True (f) True

(g) False



Exponents and Powers

EXERCISE-12.1

1. (a) $\left(\frac{1}{4}\right)^3 = \frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} = \frac{1}{64}$

(b) $\left(\frac{6}{5}\right)^4 = \frac{6}{5} \times \frac{6}{5} \times \frac{6}{5} \times \frac{6}{5} = \frac{1296}{625}$

(c) $\left(\frac{-7}{3}\right)^3 = \frac{-7}{3} \times \frac{-7}{3} \times \frac{-7}{3} = \frac{-343}{27}$

(d) $\left(\frac{-1}{3}\right)^5 = \frac{-1}{3} \times \frac{-1}{3} \times \frac{-1}{3} \times \frac{-1}{3} \times \frac{-1}{3} = \frac{-1}{243}$

(e) $\left(\frac{7}{10}\right)^3 = \frac{7}{10} \times \frac{7}{10} \times \frac{7}{10} = \frac{343}{1000}$

(f) $\left(\frac{-6}{8}\right)^4 = \frac{-6}{8} \times \frac{-6}{8} \times \frac{-6}{8} \times \frac{-6}{8} = \frac{1296}{4096}$

(g) $\left(\frac{1}{2}\right)^3 = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}$

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

(i) $\left(\frac{-3}{5}\right)^4 = \frac{-3}{5} \times \frac{-3}{5} \times \frac{-3}{5} \times \frac{-3}{5} = \frac{81}{625}$

2. (a) $64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 2^6$

(b) $\frac{-27}{343} = \frac{-3 \times -3 \times -3}{7 \times 7 \times 7} = \left(\frac{-3}{7}\right)^3$

(c) $\frac{25}{49} = \frac{5 \times 5}{7 \times 7} = \frac{5^2}{7^2} = \left(\frac{5}{7}\right)^2$

(d) $\frac{81}{100} = \frac{9 \times 9}{10 \times 10} = \left(\frac{9}{10}\right)^2$

(e) $\frac{125}{216} = \frac{5 \times 5 \times 5}{6 \times 6 \times 6} = \left(\frac{5}{6}\right)^3$

(f) $\dfrac{512}{2197} = \dfrac{8 \times 8 \times 8}{13 \times 13 \times 13} = \dfrac{8^3}{13^3} = \left(\dfrac{8}{13}\right)^3$

3. (a) $\left(\dfrac{1}{7}\right)^{-2}$ (b) $\left(\dfrac{5}{2}\right)^{-4}$

(c) $\left(\dfrac{-8}{1}\right)^{-4}$ (d) $\left(\dfrac{10}{-8}\right)^{-4}$

(e) $\left(\dfrac{8}{1}\right)^{+3}$ (f) $\left(\dfrac{1}{9}\right)^{4}$

(g) $(-3)^3$ (h) $(3)^4$

(i) $\left(\dfrac{7}{3}\right)^{-2}$

4. (a) $\left(\dfrac{1}{4}\right)^3 = (4)^{-3} = \left(\dfrac{1}{4}\right)^3 = \dfrac{1}{64}$

(b) $\left(\dfrac{-2}{6}\right)^4 = \left(\dfrac{-6}{2}\right)^{-4} = \left(\dfrac{-2}{6}\right)^4 = \dfrac{\cancel{16}^{\,1}}{\cancel{12}_{\,81}} = \dfrac{1}{81}$

(c) $\left(\dfrac{3}{6}\right)^{-3} = \left(\dfrac{6}{3}\right)^3 = \dfrac{\overset{8}{\cancel{216}}}{\cancel{27}_{\,1}} = 8$

(d) $\left(\dfrac{7}{3}\right)^{-3} = \left(\dfrac{3}{7}\right)^3 = \dfrac{27}{343}$

5. (a) $\left(\dfrac{1}{5}\right)^5 \times \left(\dfrac{1}{5}\right)^4 = \left(\dfrac{1}{5}\right)^{5+4} = \left(\dfrac{1}{5}\right)^9$

(b) $\left(\dfrac{5}{6}\right)^6 \times \left(\dfrac{5}{4}\right)^4 = \left(\dfrac{5}{4}\right)^{6+4} = \left(\dfrac{5}{10}\right)^{10}$

(c) $\left(\dfrac{-4}{3}\right)^7 \times \left(\dfrac{-4}{3}\right)^{-4} = \left(\dfrac{-4}{3}\right)^{7+(-4)} = \left(\dfrac{-4}{3}\right)^{7-4} = \left(\dfrac{-4}{3}\right)^3$

(d) $\left(\dfrac{6}{8}\right)^{-3} \times \left(\dfrac{6}{8}\right)^{-4} = \left(\dfrac{6}{8}\right)^{(-3)+(-4)} = \left(\dfrac{6}{8}\right)^{-3-4} = \left(\dfrac{6}{8}\right)^{-7}$

(e) $\left[\left(\dfrac{7}{10}\right)^2\right]^3 = \left(\dfrac{7}{10}\right)^{2\times 3} = \left(\dfrac{7}{10}\right)^6$

(f) $\left(\dfrac{-7}{10}\right)^9 \div \left(\dfrac{-7}{10}\right)^7 = \left(\dfrac{-7}{10}\right)^{9-7} = \left(\dfrac{-7}{10}\right)^2$

(g) $\left(\dfrac{3}{7}\right)^6 \times \left(\dfrac{3}{7}\right)^5 = \left(\dfrac{3}{7}\right)^{6+5} = \left(\dfrac{3}{7}\right)^{11}$

(h) $\left(\frac{-3}{4}\right)^{-3} \div \left(\frac{-3}{4}\right)^{-3} = \left(\frac{-3}{4}\right)^{-3-(-3)} = \left(\frac{-3}{4}\right)^{-3+3} = \left(\frac{-3}{4}\right)^{0}$

(i) $\left(\frac{8}{6}\right)^{6} \times \left(\frac{8}{9}\right)^{-3} = \left(\frac{8}{9}\right)^{6+(-3)} = \frac{8}{9}^{3}$

(j) $\left[\left(\frac{3}{2}\right)^{2}\right]^{7} = \left(\frac{3}{2}\right)^{2\times7} = \left(\frac{3}{4}\right)^{14}$

(k) $\left[\left(\frac{5}{6}\right)^{3}\right]^{-4} = \left(\frac{5}{6}\right)^{3\times-4} = \left(\frac{5}{6}\right)^{-12}$

(l) $\left[\left(\frac{4}{5}\right)^{3}\right]^{-4} = \left(\frac{4}{5}\right)^{3\times-4} = \left(\frac{4}{5}\right)^{-12}$

6. (a) $\left(\frac{3}{8}\right)^{3} \times \left(\frac{4}{9}\right)^{3}$

$= \frac{\cancel{3}\times\cancel{3}\times\cancel{3}}{\cancel{8}_2\times\cancel{8}_2\times\cancel{8}_2} \times \frac{\cancel{4}\times\cancel{4}\times\cancel{4}}{\cancel{9}_3\times\cancel{9}_3\times\cancel{9}_3} = \frac{1}{8}\times\frac{1}{27} = \frac{1}{216}$

(b) $\left(\frac{20}{27}\right)^{4} \times \left(\frac{9}{10}\right)^{4} \times \left(\frac{2}{3}\right)^{4}$

$= \left(\frac{\cancel{20}^{2}}{\cancel{27}_{3}} \times \frac{\cancel{9}}{1\cancel{0}} \times \frac{2}{3}\right)^{4} = \left(\frac{4}{9}\right)^{4} = \frac{256}{6561}$

(c) $\left(\frac{6}{25}\right)^{4} \times \left(\frac{5}{3}\right)^{4} \div \left(\frac{2}{5}\right)^{3}$

$\left(\frac{\cancel{6}^{2}}{\cancel{25}_{5}} \times \frac{\cancel{5}_{1}}{\cancel{3}_{1}}\right)^{4} \div \left(\frac{2}{5}\right)^{3}$

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

(d) $\left(\frac{2}{5}\right)^{3} \times \left(\frac{2}{5}\right)^{5} \div \left(\frac{2}{5}\right)^{7} = \left(\frac{2}{5}\right)^{3+5} \div \left(\frac{2}{5}\right)^{7}$

$= \left(\frac{2}{5}\right)^{8} \div \left(\frac{2}{5}\right)^{7} = \left(\frac{2}{5}\right)^{8-7} = \left(\frac{2}{5}\right)^{1} = \frac{2}{5}$

(e) $\left(\frac{1}{3}\right)^{5} \div \left(\frac{1}{3}\right)^{1} \times \left(\frac{1}{3}\right)^{-4}$

$= \left(\frac{1}{3}\right)^{5-1} \times \left(\frac{1}{3}\right)^{-4} = \left(\frac{1}{3}\right)^{4} \times \left(\frac{1}{3}\right)^{-4} = \left(\frac{1}{3}\right)^{4+(-4)} = \left(\frac{1}{3}\right)^{0} = 1$

(f) $\left[\left(\frac{-3}{4}\right)^5 \times \left(\frac{-3}{4}\right)^3\right]^4 \div \left[\left(\frac{9}{16}\right)^3\right]^4$

$= \left[\left(\frac{-3}{4}\right)^{5+3}\right]^4 \div \left[\left(\frac{9}{16}\right)^3\right]^4$

$= \left[\left(\frac{-3}{4}\right)^8\right]^4 \div \left(\frac{9}{16}\right)^{12}$

$= \left(\frac{-3}{4}\right)^{8\times 4} \div \left(\frac{9}{16}\right)^{12}$

$= \left(\frac{-3}{4}\right)^{32} \div \left(\frac{(-3)^2}{(4)^2}\right)^{12}$

$= (-1)^{32}\left(\frac{3}{4}\right)^{32} \div \left[\left(\frac{3}{4}\right)^2\right]^{12}$

$= \left(\frac{3}{4}\right)^{32} \div \left(\frac{3}{4}\right)^{24}$

$= \left(\frac{3}{2}\right)^{32-24} = \left(\frac{3}{2}\right)^8 = \frac{6561}{256}$

7. (a) $\frac{-2}{27}$ (b) 1 (c) 2^4

8. (a) $\left(\frac{4}{5}\right)^3 \times \left(\frac{4}{5}\right)^{-6} = \left(\frac{4}{5}\right)^{2p-1}$

$= \left(\frac{4}{5}\right)^{3+(-6)} = \left(\frac{4}{5}\right)^{2p-1}$

$= \left(\frac{4}{5}\right)^{3-6} = \left(\frac{4}{5}\right)^{2p-1}$

$= \left(\frac{4}{5}\right)^{-3} = \left(\frac{4}{5}\right)^{2p-1}$

Comparing power of $\frac{4}{5}$

$-3 = 2p - 1$

$-3 + 1 = 2p$

$-2 = 2p$

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

(b) $p(3)^{-5} = 3$

$p\left(\frac{1}{3}\right)^{5} = 3$

$p(3)^{-5} = 3$

$p = \frac{3}{(3)^{-5}} = \frac{3}{(3)^{-5}} = 3 \times (3)^5 = 3^6$

(c) $p(-5) \div p^2 = 5$

$\frac{\not{p}(-5)^4}{p^{\not{2}}} = 5$

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

$\frac{(-5)^4}{5} = p$

$p = \frac{(-5)^{4}}{5}$

$p = \frac{(-1)^4 \cdot (5)^3}{5} = 1(5)^3 = 125$

9. (a) $\left(\frac{+1}{7}\right)^{-2} \div \left(\frac{2}{7}\right)^{-3}$

$= (7)^2 \div \left(\frac{7}{2}\right)^3$

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

$= \frac{\not{7} \times \not{7} \times 2 \times 2 \times 2}{\not{7} \times \not{7} \times 7} = \frac{8}{7}$

Reciprocal of $\frac{8}{7} = \frac{7}{8}$

(b) $\left(\frac{2}{3}\right)^3 \div \left(\frac{5}{6}\right)^2$

$\left(\frac{2}{3}\right)^3 \times \left(\frac{6}{5}\right)^2$

$= \frac{2}{3} \times \frac{2}{\not{3}_1} \times \frac{2}{\not{3}_1} \times \frac{\not{6}^2 \times \not{6}^2}{5 \times 5}$

$= \frac{32}{75}$

Reciprocal of $\frac{32}{75} = \frac{75}{32}$

10. (a) $(2^{-3})^2 = 2^{-6}$

(b) $5^2 \times 5^3 = 5^{2+3} = 5^5 = \left(\frac{1}{5}\right)^5$

(c) $\left[\left(\frac{-2}{5}\right)^{-1}\right]^{-2} = \left(\frac{-2}{5}\right)^{-1\times-2} = \left(\frac{-2}{5}\right)^2 = \left(\frac{-5}{2}\right)^{-2}$

11. (a) $\left(\frac{-4}{5}\right)^4 \div \left(\frac{-4}{5}\right)^3 = \left(\frac{-4}{5}\right)$

$\Rightarrow \left(\frac{-4}{5}\right)^{4\quad 3} = \left(\frac{-4}{5}\right)$

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

than 1

(b) $(-5)^4 \div (-5)^2 = 5^m$

$(-5)^{4-2} = 5^m$

$(-5)^2 = 5^m = (-1)^2\,(5)^2 = 5m$

than $m = 2$

(c) $\left(\frac{5}{11}\right)^{-3} \div \left(\frac{5}{11}\right)^5 = \left(\frac{5}{11}\right)^m$

$\left(\frac{5}{11}\right)^{-3-5} = \left(\frac{5}{11}\right)^m$

$\left(\frac{5}{11}\right)^{-8} = \left(\frac{5}{11}\right)^m$

then $m = -8$

EXERCISE-12.2

1. (a) 1.496×10^8 (b) 2.5×10^6

(c) 1.0×10^5 (d) 2.28×10^8

(e) 3.844×10^5 (f) 6.95×10^5

(g) 1.2756×10^7 (h) 1.42984×10^8

(i) 5.913×10^9 (j) 5.8×10^7

(k) 2.5×10^8 (l) 5×10^{-3} to 1.0×10^{-3}

2. (a) $625003298.25 = 6.2500329825 \times 10^8$

(b) 3.298×10^{-9}

(c) $8.0 \times 10^{-2} \times 10^{-5} = 8 \times 10^{-7}$

(d) 1.00001×10^5

(e) 2.16×10^7

3. (a) $6 \times 10^{-7} = 6 \times \frac{1}{10^7} = \frac{6}{10000000} = 0.0000006$

(b) $3.457 \times 10^{-3} = \frac{3.457}{1000} \times \frac{1}{10^3} = \frac{3457}{10^6} = 0.003457$

4. (a) $\frac{1}{2.5}$ mm $= \frac{\cancel{10}^{2}}{\cancel{25}_{5}}$ mm $= 0.4$ mm

Convert 0.4 mm into m

$1\,\text{mm} = \frac{1}{1000}\,\text{m}$

$0.4\,\text{mm} = \frac{0.4}{1000} = 0.4 \times 10^{-3} = 4.0 \times 10^{-4}$

(b) 0.005 cm

$1\,\text{cm} = \frac{1}{100}\,\text{m}$

$\frac{0.005}{1000 \times 1000}\,\text{m} = \frac{5}{1000000}\,\text{m} = 5 \times 10^{-6}$

5. Mass of 1 cell = 1600×10^{-20} g

Mass of 200 cells = $200 \times 1600 \times 10^{-20}$

$= 320000 \times 10^{-20}$

$= 3.2 \times 10^{-20} \times 10^5$

$= 3.2 \times 10^{-20+5} = 3.2 \times 10^{-15}$

NCERT CORNER

EXERCISE-12.1

1. (a) $3^{-2} = \left(\frac{1}{3}\right)^2 = \frac{1}{9}$

(b) $(-4)^{-2} = \left(\frac{-1}{4}\right)^2 = \frac{1}{16}$

(c) $\left(\frac{1}{2}\right)^{-5} = \left(\frac{2}{1}\right)^5 = 32$

2. (a) $(-4)^5 \div (-4)^8$

$(-4)^{5-8} = (-4)^{-3} = \left(\frac{1}{-4}\right)^3 = \left(\frac{-1}{4}\right)^3$

(b) $\left(\frac{1}{2^3}\right)^2 = \frac{1}{(2^3)^2} = \frac{1}{2^6}$

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

$= (-1)^4\,(\cancel{3})^4 \times \frac{5}{\cancel{3}^4} = 1 \times 5^4$

(d) $(3^{-7} \div 3^{-10}) \times 3^{-5}$

$= 3^{-7-(-10)} \times 3^{-5}$

$= 3^{-7+10} \times 3^{-5}$

$= 3^{3} \times 3^{-5} = 3^{3-5} = 3^{-2} = \dfrac{1}{3^2}$

(e) $2^{-3} \times (-7)^{-3}$

$\dfrac{1}{2^3} \times \dfrac{1}{(-7)^3} = \dfrac{1}{(2 \times -7)^3} = \dfrac{1}{(-14)^3}$

3. (a) $(3^0 + 4^{-1}) \times 2^2$

$= \left(1 + \dfrac{1}{4}\right) \times 4 = \dfrac{5}{\cancel{4}} \times \cancel{4} = 5$

(b) $(2^{-1} \times 4^{-1}) \div 2^{-2}$

$\left(\dfrac{1}{2} \times \dfrac{1}{4}\right) \div \left(\dfrac{1}{2}\right)^2$

$\dfrac{1}{8} \div \left(\dfrac{1}{2}\right)^2 = \left(\dfrac{1}{2}\right)^3 \div \left(\dfrac{1}{2}\right)^2 = \left(\dfrac{1}{3}\right)^{3-2} = \dfrac{1}{2} = 2^{-1}$

(c) $\left(\dfrac{1}{2}\right)^{-2} + \left(\dfrac{+1}{3}\right)^{-2} \left(\dfrac{1}{4}\right)^{-2}$

$= (2)^2 + (3)^2 + (4)^2 = 4 + 9 + 16 = 29$

(d) $(3^{-1} + 4^{-1} + 5^{-1})^0 = \left(\dfrac{1}{3} + \dfrac{1}{4} + \dfrac{1}{5}\right)^0$

$= \left(\dfrac{20 + 15 + 12}{60}\right)^0 = \left(\dfrac{47}{60}\right)^0 = 1$

(e) $\left[\left(\dfrac{-2}{3}\right)^{-2}\right]^2 = \left(\dfrac{-2}{3}\right)^{-2 \times 2} = \left(\dfrac{-2}{3}\right)^{-4} = \left(\dfrac{3}{-2}\right)^4$

$= \left(\dfrac{3}{-2}\right)^4 = \dfrac{81}{16}$

4. (i) $\dfrac{8^{-1} \times 5^3}{2^{-4}} = \dfrac{2^4 \times 5^3}{8} = \dfrac{2^4 \times 5^3}{2^3} = 2^{4-3} \times 5^3$

$= 2 \times 5^3 = 2 \times 125 = 250$

(ii) $(5^{-1} \times 2^{-1}) \times 6^{-1} = \left(\dfrac{1}{5} \times \dfrac{1}{2}\right) \times \dfrac{1}{6} = \dfrac{1}{60}$

5. $5^m \div 5^3 = 5^5$

$\Rightarrow \quad 5^{m-(-3)} = 5^5$

$\Rightarrow \quad 5^{m+3} = 5^5 \Rightarrow m + 3 = 5$

$m = 5 - 3 = 2$

6. (i) $\left\{\left(\frac{1}{3}\right)^{-1} - \left(\frac{1}{4}\right)^{-1}\right\}^{-1} = (3-4)^{-1} = (-1)^{-1} = \frac{1}{-1} = -1$

(ii) $\left(\frac{5}{8}\right)^{-7} \times \left(\frac{8}{5}\right)^{-4} = \left(\frac{5^{-7}}{8^{-7}}\right) \times \left(\frac{8^{-4}}{5^{-4}}\right)$

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

$= 8^{7-4} \times 5^{4-7} = 8^3 \times 5^{-3} = \frac{8^3}{5^3} = \frac{512}{125}$

7. (i) $\frac{25 \times t^{-4}}{5^{-3} \times 10 \times t^{-8}} = \frac{5^2 \times t^{-4}}{5^{-3} \times 5 \times 2 \times t^{-8}}$

$= \frac{5^2 \times t^{-4-(-8)}}{5^{-3+1} \times 2} = \frac{5^2 \times t^{-4+8}}{5^{-2} \times 2}$

$= \frac{5^2 \times 5^2 \times t^4}{2} = \frac{5^4 \times t^4}{2} = \frac{625 \times t^4}{2}$

(ii) $\frac{3^{-5} \times 10^{-5} \times 125}{5^{-7} \times 6^{-5}} \Rightarrow \frac{3^{-5} \times 10^{-5} \times 5^3}{5^{-7} \times 6^{-5}}$

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

$= 3^{-5+5} \times 5^5 = 3^0 \times 5^5 = 1 \times 5^5$

$= 5^5$

EXERCISE-12.2

1. (a) 8.5×10^{-12}

(b) 9.42×10^{-12}

(c) 6.02×10^{15}

(d) 8.37×10^{-9}

(e) 3.186×10^{10}

2. (a) 0.0000032 (b) 45000

(c) 0.00000003 (d) 1000100000

(e) 5800000000000 (f) 3614920

3. (a) 1×10^{-6}

(b) 1.6×10^{-19}

(c) 5×10^{-7}

(d) 1.275×10^{-5}

(e) 7×10^{-2}

4. Thickness of each book = 20 mm

Thickness of 5 books = (5 × 20) mm = 100 mm

Thickness of each paper sheet = 0.016 mm

Thickness of 5 paper sheet = 5 × 0.016 = 0.080 mm

Total thickness of the stack = Thickness of 5 books + Thickness of 5 paper sheets

= (100 + 0.080) mm = 100.08 mm

= 1.0008×10^2 mm

SUBJECT ENRICHMENT EXERCISE

I. (1) 0.25×10^{-1}

(2) 1

(3) 3

(4) a = – 6, b = – 1

(5) $p^6 q^{-5} r^{-11}$

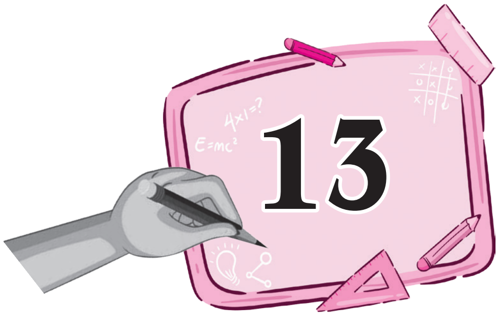
(6) 32

(7) 5

II. (a) False (b) False

(c) False (d) False

(e) True (f) False



Direct and Inverse Proportions

EXERCISE-13.1

1. Option (c):- The time taken for a fixed journey and the speed of a car will not a vary directly.

2. (a) $\frac{x}{y} = \frac{\cancel{5}^{1}}{\cancel{20}_{4}}, \frac{\cancel{8}^{1}}{\cancel{32}_{4}}, \frac{\cancel{15}^{1}}{\cancel{60}_{4}}, \frac{\cancel{18}^{1}}{\cancel{72}_{4}}, \frac{\cancel{20}^{1}}{\cancel{80}_{4}}$

$\frac{x}{y} = \frac{1}{4}, \frac{1}{4}, \frac{1}{4}, \frac{1}{4}, \frac{1}{4}$

$\Rightarrow$ Therefore, (a) is in vary direct proportion.

(b) $\frac{x}{y} = \frac{\overset{5}{\cancel{100}}}{\underset{3}{\cancel{60}}}, \frac{20\cancel{0}}{3\cancel{0}}, \frac{30\cancel{0}}{2\cancel{0}}, \frac{\overset{80}{\cancel{400}}}{\cancel{15}_{3}}$

$\Rightarrow \frac{5}{3}, \frac{20}{3}, \frac{15}{1}, \frac{80}{3}$

$\therefore$ (b) is not in vary directly proportion.

(c) $\frac{x}{y} = \frac{6}{4}, \frac{10}{8}, \frac{14}{11}, \frac{18}{16}, \frac{22}{20}$

$\Rightarrow \frac{3}{2}, \frac{5}{4}, \frac{14}{11}, \frac{9}{8}, \frac{11}{10}$

$\therefore$ (c) is not in vary directly proportion.

3. (a) $y = 6x$ is a direct variance

So, equation of form $\frac{y}{x} = c$ direct variance

So, $\frac{y}{x} = 6$

$\therefore$ Variation Constant = 6

(b) $5x = 4y$ is a direct variance

So, equation of form $\frac{y}{x} = c$ direct variance

So, $\frac{y}{x} = \frac{5}{4}$

$\therefore$ Variation constant = $\frac{5}{4}$

(c) $3x = y$ is a direct variance

So, equation of form $\frac{y}{x} = c$ direct variance

So, $\frac{y}{x} = \frac{3}{1} = 3$

$\therefore$ Variation constant = 3

(d) $y + 3x = 0$ is a direct variation

So, equation of form $\frac{y}{x} = c$ direct variance

So, $\frac{y}{x} = \frac{-3}{1} = -3$

$\therefore$ Variation constant = – 3

(e) $y = 2x$ is a direct variation

So, equation of form $\frac{-y}{x} = c$ direct variance

So, $\frac{y}{x} = 2$

$\therefore$ Variation constant = 2

4. (a) $\frac{x_1}{y_1} = \frac{2}{10}, \frac{x_2}{y_2} = \frac{10}{50}, \frac{x_3}{y_3} = \frac{p}{125}, \frac{x_4}{y_4} = \frac{15}{75}, \frac{x_5}{y_5} = \frac{21}{q}$

$\therefore \frac{x_1}{y_1} = \frac{x_3}{y_3}$ gives $\frac{2}{10} = \frac{P}{125}$

$\Rightarrow P - \frac{{}^{1}\cancel{2} \times \overset{25}{\cancel{125}}}{\cancel{10}_{5_1}} = 25$

$\therefore \frac{x_1}{y_1} = \frac{x_5}{y_5} \Rightarrow \frac{2}{10} = \frac{21}{q}$

$\Rightarrow q = \frac{21 \times \cancel{10}^{5}}{\cancel{2}} = 105$

(b) In this case of direct proportion

That is $\frac{x_1}{y_1} = \frac{x_2}{y_2}$

If $\frac{1}{8} = \frac{P_1}{28}$

$P_1 = \frac{{}^{7}\cancel{28} \times 1}{\cancel{8}_2} = \frac{7}{2} = 3.5$

If $\frac{1}{8} = \frac{P_2}{60}$

$$P_2 = \frac{\overset{15}{\cancel{60}}}{\cancel{8}_2} = 7.5$$

If $\frac{1}{8} = \frac{P_3}{160}$

$$P_3 = \frac{\overset{20}{\cancel{160}}}{\cancel{8}_1}$$

$P_3 = 20$

If $\frac{1}{8} = \frac{13}{Q}$

$Q = 13 \times 8 = 104$

(c) In this case of direct proportion

$$\frac{x_1}{y_1} = \frac{x_2}{y_2}$$

If $\frac{2.5}{7.5} = \frac{P_1}{3.3}$

$$P_1 = \frac{\overset{1}{\cancel{2.5}} \times \overset{1.1}{\cancel{3.3}}}{\underset{3}{\cancel{7.5}}} = 1.1$$

If $\frac{2.5}{7.5} = \frac{5.68}{Q_1}$

$$Q_1 = \frac{5.68 \times \overset{3}{\cancel{7.5}}}{\cancel{2.5}_1} = 17.04$$

If $\frac{2.5}{7.5} = \frac{5.21}{Q_2}$

$$Q_2 = \frac{5.21 \times \overset{3}{\cancel{7.5}}}{\cancel{2.5}_1} = 15.63$$

If $\frac{2.5}{7.5} = \frac{P_2}{30.33}$

$$P_2 = \frac{{}^1\cancel{2.5} \times \overset{10.11}{\cancel{30.33}}}{\underset{\cancel{3}_1}{7.5}} = 10.11$$

5.

Pens	5	12
Cost (in ₹)	70	x

According to direct proportion

$$\frac{5}{70} = \frac{12}{x} \Rightarrow x = \frac{12 \times \cancel{70}^{14}}{\cancel{5}_1} = 168$$

∴ The cost of 12 pencils ₹ 168

6.

Containers	48	x
Time	6	48

According to direct proportion

$$\frac{48}{6} = \frac{x}{48}$$

$$x = \frac{48 \times \cancel{48}^{8}}{\cancel{6}} = 384$$

∴ 384 containers can be filled in 48 hours

7.

Weight of fish (in kg)	2	4.5
Pole to bend (in cm)	6	x

According to direct proportion

$$\frac{2}{6} = \frac{4.5}{x}$$

$$x = \frac{4.5 \times \cancel{6}^{3}}{\cancel{2}} = 13.5 \text{ cm}$$

∴ The fishing pole bend for a 4.5 kg fish = 13.5 cm

8.

Number of sheets	500	275
Thickness (in cm)	3.5	x

According to direct proportion

$$\frac{500}{3.5} = \frac{275}{x}$$

$$x = \frac{275 \times \cancel{35}^{7}}{\cancel{500}_{100} \times 10} = 1.925$$

∴ 1.925 cm be the thickness of 275 sheets of paper.

9.

Length of cloth (in m)	7	3	5	9	15
Cost (in Rs)	322	x_1	x_2	x_3	x_4

According to direct proportion

$$\frac{7}{322} = \frac{3}{x_1}$$

$$x_1 = \frac{3 \times \overset{46}{\cancel{322}}}{\cancel{7}_1} = 138$$

$$x_2 = \frac{5 \times \overset{46}{\cancel{322}}}{\cancel{7}_1} = 230$$

$$x_3 = \frac{9 \times \overset{46}{\cancel{322}}}{\cancel{7}_1} = 414$$

$$x_4 = \frac{15 \times \overset{46}{\cancel{322}}}{\cancel{7}_1} = 690$$

∴ The cost of 3 m of cloth = Rs 138

The cost of 5 m of cloth = Rs 230

The cost of 9 m of cloth = Rs 414

The cost of 15 m of cloth = Rs 690

10.

Petrol (in l)	3	12.5
Distance (in km)	75	x

According to direct proportion

$$\frac{3}{75} = \frac{12.5}{x}$$

$$x = \frac{12.5 \times \overset{25}{\cancel{75}}}{\cancel{3}_1} = 312.5$$

∴ 312.5 km will be the car travel using 12.5 l of petrol.

11.

Time	12	25
Number of tools	240	x

$$\frac{12}{240} = \frac{25}{x}$$

$$x = \frac{25 \times \overset{20}{\cancel{240}}}{\cancel{12}} = 500$$

∴ 500 tools will be cut in 25 hrs.

12.

Time (in hrs)	5	x
Distance (in km)	210	546

$$\frac{5}{210} = \frac{x}{546}$$

$$x = \frac{5 \times 546}{210} = \frac{\overset{13}{\cancel{273}}\,\cancel{0}}{{}_{1}\cancel{21}\,\cancel{0}} = 13$$

$\therefore$ 13 hrs will it take to cover a distance of 546 km.

13.

Map scale (in cm)	0.6	70.5
Actual distance (in km)	6.6	x

$$\frac{0.6}{6.6} = \frac{70.5}{x}$$

$$x = \frac{70.5 \times 6.6}{0.6} = \frac{465.3}{0.6} = 775.5$$

14. (i) The cost of one box of dark chocolates is

$$\frac{2}{3} = \frac{x}{345}$$

$$x = \frac{2 \times 345}{3} = ₹\ 230$$

(ii) The cost of 5 boxes of dark chocolates = 230 × 5

= ₹ 1150

15.

Bottles	1350	2997
Cartons	50	x

$$\frac{1350}{50} = \frac{2997}{x}$$

$$x = \frac{2997 \times 50}{1350} = \frac{\overset{111}{\cancel{14985}}\,\cancel{0}}{\underset{1}{\cancel{135}}\,\cancel{0}} = 111 \text{ cartoons}$$

16.

Number of words	1020	x
Time (in min)	60	23

$$\frac{1020}{60} = \frac{x}{23}$$

$$x = \frac{\overset{\overset{17}{\cancel{34}}}{\cancel{102}}\,\cancel{0} \times 23}{{}_{1}\cancel{2}\,\cancel{60}} = 391 \text{ words}$$

17. 3 men or 4 women earn = ₹ 480

1 men earn = ₹ $\frac{480}{3}$ = ₹ 160

1 women earn = ₹ $\frac{480}{4}$ = ₹ 120

6 men earn = ₹ 160 × 6 = ₹ 960

11 women earn = ₹ 120 × 11 = ₹ 1320

EXERCISE-13.2

1. (a) $x_1y_1 = x_2y_2$

$$\frac{x_1}{x_2} = \frac{y_2}{y_1} \Rightarrow \frac{6}{8} = \frac{9}{12} \Rightarrow \frac{3}{4} = \frac{3}{4}$$

$$\frac{6}{3} = \frac{24}{12} \Rightarrow \frac{2}{1} = \frac{2}{1}$$

$$\frac{6}{18} = \frac{4}{12} \Rightarrow \frac{1}{3} = \frac{1}{3}$$

$$\frac{6}{12} = \frac{36}{12} \Rightarrow \frac{1}{2} \neq \frac{3}{1}$$

∴ (a) is not in vary inverse proportion

$$\frac{x_1}{x_2} = \frac{y_2}{y_1}$$

(b) $$\Rightarrow \frac{5}{16} = \frac{625}{2000} \Rightarrow \frac{5}{16} = \frac{5}{16}$$

$$\frac{5}{25} = \frac{4}{20} \Rightarrow \frac{1}{5} = \frac{1}{5}$$

$$\frac{50}{125} = \frac{8}{20} \Rightarrow \frac{2}{5} = \frac{2}{5}$$

∴ (b) is in vary inverse proportion

2. In the case of inverse proportion

$x_1 y_1 = y_2 x_2$

$x_1 = 5, y_1 = b_1$

$x_2 = a_1, y_2 = 10$

$x_3 = 4, y_3 = 20$

$x_4 = 40, y_4 = b_2$

$x_5 = a_2, y_5 = 80$

$$\frac{x_2}{x_3} = \frac{y_3}{y_2}$$

$\Rightarrow x_2\, y_2 = y_2\, y_3$

$\Rightarrow a_1(10) = 20(4)$

$10a_1 = 80$

$a_1 = 8$ $\boxed{a_1 = 8}$

$\Rightarrow x_1\, y_1 = x_3\, y_3$

$5 \times b_1 = 4 \times 20$

$$b_1 = \frac{\cancel{80}^{16}}{\cancel{5}} = 16 \qquad \boxed{b_1 = 16}$$

$\Rightarrow x_3\, y_3 = x_4\, y_4$

$4 \times 20 = 40 \times b_2$

$80 = 40b_2$

$$b_2 = \frac{^2\cancel{80}}{_1\cancel{40}} = 2 \qquad \boxed{b_2 = 2}$$

$\Rightarrow x_3\, y_3 = x_5\, y_5$

$4 \times 20 = a_2 \times 80$

$80 = a_2 \times 80$

$a_2 = 1$

3. $x_1\, y_1 = x_2\, y_2$

$10 \times 8 = y_2 \times 5$

$80 = y_2 \times 5$

$y = 16$

4. $x_1\, y_1 = y_2\, x_1$

$15 \times 9 = 15\,(x)$

$$\frac{\cancel{15} \times 9}{\cancel{15}} = x$$

$x = 9$

5.

Labour	20	16
Number of days	12	x

$x_1\, y_1 = y_2\, x_2$

$20 \times 12 = x(16)$

$$\frac{^5\cancel{20} \times \cancel{12}^3}{\cancel{16}\,\cancel{4}_1} = x$$

$x = 15$

6.

Time (in hrs)	3	x
Speed (km/h)	60	90

$3 \times 60 = x \times 90$

$$\frac{\not{3} \times \not{60}^{2}}{\not{90}_{\not{30}_{1}}} = x$$

x = 2 hours

7.

Pipes	8	5
Times (in hrs)	2	x

$8 \times 2 = 5 \times x$

$x = \frac{8 \times 2}{5} = \frac{16}{5} = 3\frac{1}{5}$ hrs

8.

Soldiers	1200	900	1500
Number of days	30	*x*	*y*

(a) $1200 \times 30 = 900 \times x$

$$\frac{\overset{4}{\not{1200}} \times \overset{10}{\not{30}}}{\underset{3}{\not{900}}} = x$$

x = 40 days

(b) $1200 \times 30 = 1500\, y$

$$\frac{\overset{4}{12\not{00}} \times \overset{6}{\not{30}}}{\underset{1}{\not{15}\,\not{00}}} = y$$

y = 24 days

9.

Speed (km/h)	15	x
Times (min)	20	15

Time = (20 – 5) = 15 min

$15 \times 20 = x \times 15$

x = 20 km/h

∴ She increase her speed = 5 km/h (20 – 15) = 5 km/h

10. Total duration of school = 8 × 40

= 320 min

If the school has 6 period and a recess 20 min a day and the number of hours are the same, then

$6 \times x + 20 = 320$ min

$6x = 300$

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

11.

Number of trousers	64	*x*
Cost of trousers each	825	1056 (825 + 231)

$64 \times 825 = (x)1056$

$$x = \frac{\overset{2}{\cancel{64}} \times \overset{25}{\cancel{825}}}{\underset{\underset{1}{\cancel{33}}}{\cancel{1056}}} = 50$$

12. Since 120 soldiers leave after 5 days. ∴ the remaining food is sufficient for 720 men for 30 days.

Suppose the remaining food lasts for x days for the remaining 600 soldiers

Number of soldiers	720	600
Number of days	30	x

720 × 30 = 600x

$$x = \frac{\overset{\overset{36}{\cancel{360}}}{\cancel{720}} \times \cancel{30}}{\underset{\underset{10}{\cancel{20}}}{\cancel{60}}\ \cancel{0}} = 36 \text{ days}$$

∴ The remaining soldiers will consume the food in 36 days

NCERT CORNER

EXERCISE-13.1

1.

Number of hours	4	8	12	24
Parking charges (in ₹)	60	100	140	180

The ratio of parking charges to the respective number of hours can be calculated as

$$\frac{60}{4} = 15, \frac{\overset{\overset{2}{\cancel{50}}}{\cancel{100}}}{\underset{\cancel{4}_2}{\cancel{8}}} = \frac{25}{2}, \frac{\overset{70^{35}}{140}}{12_{6_3}} = \frac{35}{3}, \frac{\overset{\overset{\overset{15}{\cancel{45}}}{\cancel{90}}}{\cancel{180}}}{\underset{\underset{\underset{2}{\cancel{6}}}{\cancel{12}}}{\cancel{24}}} = \frac{15}{2}$$

As each ratio is not same, therefore, the parking charges are not in a direct proportion to the parking time.

2. $\frac{1}{8} = \frac{4}{y_1} \quad \Rightarrow \quad y = 8 \times 4 = 32$

$\frac{1}{8} = \frac{7}{y_2} \quad \Rightarrow \quad y_2 = 7 \times 8 = 56$

$\frac{1}{8} = \frac{12}{y_3} \quad \Rightarrow \quad y_3 = 12 \times 8 = 96$

$\frac{1}{8} = \frac{20}{y_4} \quad \Rightarrow \quad y_4 = 20 \times 8 = 160$

3. Let the parts of red pigment required to mix with 1800 ml of base be x

Red pigment	1	x
Base (in ml)	75	1800

$$\frac{1}{75} = \frac{x}{1800}$$

$$\frac{1800}{75} = x$$

$x = 24$

4.

Number of bottles	840	x
Time taken (in hrs)	6	5

$$\frac{840}{6} = \frac{x}{5}$$

$$x = \frac{\overset{140}{\cancel{840}} \times 5}{\cancel{6}} = 700 \text{ bottles}$$

5.

Length of bacteria (in cm)	5	x	y
Number of times photograph of bacteria was engaged	50000	1	2000

$$\frac{5}{50000} = \frac{x}{1}$$

$$x = \frac{1}{10000} = 10^{-4} \text{ cm}$$

$$\frac{5}{50000} = \frac{y}{20000}$$

$$y = \frac{\cancel{5} \times 2\cancel{0000}}{\cancel{5}\cancel{0000}} = 2 \text{ cm}$$

6.

Model ship	9 cm	x
Actual ship	12 m	28 m

$$\frac{9}{12} = \frac{x}{28}$$

$$x = \frac{{}^{3}\cancel{9} \times \cancel{28}^{7}}{\cancel{12}_{4}} = 21 \text{ cm}$$

$\therefore$ The length of the model ship = 21 cm

7. (i) Let the number of sugar crystals in 5 kg of sugar be x

Amount of sugar (in kg)	2	5
Number of crystals	9×10^6	x

$$\frac{2}{9 \times 10^6} = \frac{5}{x}$$

$$\Rightarrow x = \frac{5 \times 9 \times 10^6}{2} = \frac{45 \times 10^6}{2} = 2.25 \times 10^7$$

(ii) Let the number of sugar crystals in 1.2 kg of sugar by y. The given information in the form of a table:

Amount of sugar (in kg)	2	1.2
Number of crystals	9×10^6	y

$$\frac{2}{9 \times 10^6} = \frac{1.2}{y}$$

$$y = \frac{1.2 \times 9 \times 10^6}{2 \times 10} = \frac{54 \times 10^6}{10}$$

$$= 54 \times 10^5 = 5.4 \times 10^6$$

8.

Distance covered on road (in km)	18	72
Distance presented on map (in cm)	1	x

$$\frac{18}{1} = \frac{72}{x}$$

$$x = \frac{\cancel{72}^{4}}{\cancel{18}_{1}} = 4 \text{ cm}$$

9. (i) Let the length of the shadow of the other pole = x

1 m = 100 cm

Height of pole (in m)	5.60	10.50
Length of shadow (in m)	3.20	x

$$\frac{5.60}{3.20} = \frac{10.50}{x}$$

$$x = \frac{10.50 \times 3.20}{5.60} = 6 \text{ m}$$

(ii)

Height of pole (in m)	5.60	y
Length of shadow (in m)	3.20	5

$$\frac{5.60}{3.20} = \frac{y}{5}$$

$$y = \frac{5 \times 5.60}{3.20} = 8.75 = 8 \text{ m } 75 \text{ cm}$$

10. Let the distance travelled by the truck in 5 hrs be x km

1 hour = 60 min

5 hrs = 60 × 5 = 300 min

Distance (in km)	14	x
Time (in min)	25	300

$$\frac{14}{25} = \frac{x}{300}$$

$$x = \frac{\overset{\overset{12}{\cancel{60}}}{\cancel{300}} \times 14}{\cancel{25}_{5}} = 168 \text{ km}$$

EXERCISE-13.2

1. (i) These are in inverse proportion because if there are more workers, then it will take lesser time to complete that job.

(ii) No, these are not in inverse proportion because in more time, we may cover more distance with a uniform speed.

(iii) No, these are not in inverse proportion because in more area, more quantity of crop may be harvested.

(iv) These are in inverse proportion because with more speed, we may complete a certain distance in a lesser time.

(v) These are in inverse proportion because if the population is increasing, then the area of the land per person will be decreasing accordingly.

2. $1 \times 1000000 = 4 \times x_1$

$$\Rightarrow x_1 = 25000$$

$1 \times 100000 = 5 \times x_2$

$$\Rightarrow x_2 = \frac{\cancel{100000}^{20000}}{\cancel{5}}$$

$100000 \times 1 = 8 \times x_3$

$$\Rightarrow \frac{100000}{8} = x_3$$

$$\Rightarrow x_3 = 12500$$

$100000 \times 1 = 10 \times x_4$

$$\Rightarrow x_4 = \frac{100000}{10} = 10000$$

$100000 \times 1 = 20 \times x_5$

$$\Rightarrow x_5 = \frac{\cancel{100000}^{5000}}{\cancel{20}_1} = 5{,}000$$

3.

Number of spokes	4	6	8	10	12
Angle between	90°	60°	x_1	x_2	x_3

$4 \times 90 = 8 \times x_1$

$$x_1 = \frac{\cancel{4}^1 \times \cancel{90}^{45}}{\cancel{8}_{\cancel{2}_1}} = 45°$$

$$x_2 = \frac{4 \times 9\cancel{0}}{1\cancel{0}} = 36°$$

$$x_3 = \frac{\cancel{4}^1 \times \cancel{90}^{30}}{\cancel{12}_{\cancel{3}}} 30°$$

(i) Yes

(ii) $x = \frac{4 \times \cancel{90}^{6}}{\cancel{15}_1} = 24°$

Hence, the angle between a pair of consecutive spokes of a wheel, which has 15 spokes in it, is 24°

(iii) Let the number of spokes in a wheel, which has 40° angles between a pair of consecutive spokes by y.

$4 \times 90° = y \times 40$

$$y = \frac{\cancel{4} \times 9\cancel{0}}{\cancel{40}} = 9$$

4. Number of remaining children = 24 – 4 = 20

Number of students	24	20
Number of sweets	5	x

$24 \times 5 = 20 \times x$

$$x = \frac{{}^{6}\cancel{24} \times \cancel{5}^{1}}{\cancel{20}_{4}} = 6 \text{ sweets}$$

5.

Number of animals	20	20 + 10 = 30
Number of days	6	x

$20 \times 6 = 30 \times x$

$$\frac{2\cancel{0} \times \cancel{6}^{2}}{{}_{1}\cancel{30}} = x$$

$$x = 4 \text{ days}$$

6.

Number of days	4	x
Number of person	3	4

$4 \times 3 = 4x$

$12 = 4x$

$x = 3$ days

7.

Number of bottles	12	20
Number of boxes	25	x

$12 \times 25 = 20 \times x$

$$\frac{12 \times 25}{20} = x$$

$$15 = x$$

8.

Number of machines	42	x
Number of days	63	54

$42 \times 63 = x \times 54$

$$x = \frac{\cancel{42}^{7} \times \cancel{63}^{7}}{\cancel{54}\ \cancel{9}_{1}} = 49 \text{ machines}$$

9.

Speed (in km/hr)	60	80
Time taken (in hrs)	2	x

In the case of inverse proportion

$60 \times 2 = 80 \times x$

$$x = \frac{60 \times 2}{80} = 1\frac{1}{2} \text{ hrs} = 1 \text{ hr } 30 \text{ min}$$

10. (i)

Number of person	2	1
Number of days	3	x

$2 \times 3 = 1 \times x$

$x = 6$

Hence, the number of days taken by 1 man to fit all the window = 6

(ii)

Number of persons	2	y
Number of days	3	1

$2 \times 3 = y \times 1$

$y = 6$

Hence, 6 persons are required to fit all the windows in one day.

11.

Duration of each period (in min)	45	x
Number of periods	8	9

$45 \times 8 = x \times 9$

$$\Rightarrow \frac{{}^{5}\cancel{45} \times 8}{\cancel{9}} = x$$

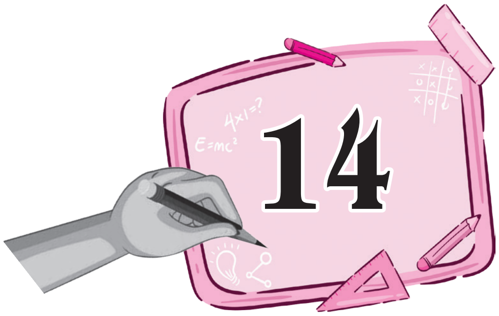
$$\Rightarrow x = 40 \text{ min}$$

SUBJECT ENRICHMENT EXERCISE

I. (1) 9m (2) 60
(3) 40 (4) 240
(5) $xy = k$ (6) Vary directly
(7) 6 days

II. (a) Direct (b) More
(c) Direct (d) Less
(e) Direct (f) Direct
(g) Inversely

III. (a) True (b) False
(c) True (d) True
(e) True (f) True
(g) True



Factorisation

EXERCISE-14.1

1. (a) Factor of $25\,ab^2 = 1, 25ab^2, 25, ab^2, 25a, b^2, 25ab, b, 25b^2, a, 5ab^2, 5, 5a, 5b^2, 5ab, 5b$

(b) Factor of $40x^2y^2 = 1, 40x^2y^2, 40, x^2y^2, 40x^2, y^2, 40y^2, x^2, 40x, xy^2, 40y, x^2y, 2x^2y^2, 5, 8x^2, 5y^2, 8, 5x^2y^2, 8xy, 5xy$, etc

(c) $12xyz = 1, 12xyz, 12, xyz, 12x, yz, 12xy, z, 12xz, y, 12yz, x, 2xyz, 6, 6xyz, 2, 2x, 6yz$ etc

(d) $18p^2qr^2 = 1, 18p^2qr^2, 18, p^2qr^2, 6, 3, p^2qr^2, 6p^2qr^2, 3, 3p^2qr^2, 6, 3p^2, 6qr^2$ etc

2. (a) $3ab^2 = \underline{3} \times \underline{a} \times \underline{b} \times b$

$6ab = 2 \times \underline{3} \times \underline{a} \times \underline{b}$

Common factor = 3, a, b

(b) $8p^2q = \underline{2} \times \underline{2} \times 2 \times \underline{p} \times p \times q$

$4p = \underline{2 \times 2} \times \underline{p}$

Common factor = 2, 2, p

(c) $24xyz = \underline{2 \times 2} \times 2 \times \underline{3} \times \underline{x} \times \underline{y} \times \underline{z}$

$12xy^2z = \underline{2 \times 2} \times \underline{3} \times \underline{x} \times \underline{y} \times y \times \underline{z}$

Common factor = 2, 2, 3, x, y, z

(d) $10mn = 5 \times 2 \times m \times n$

$5m^3 = 5 \times m \times m \times m$

Common factor = 5, m

3. (a) $2p - 4$

$= 2\,(p - 2)$

(b) $3xy - 6x^2y^2$

$= 3xy\,(1 - 2xy)$

(c) $12a - 24ab^2 = 12a\,(1 - 2b^2)$

(d) $24a^3b - 36a^2b^2c^2 = 12a^2b\,(2a - 3bc^2)$

(e) $15x - 20xy^2z^3 = 5x\,(3 - 4y^2z^2)$

(f) $m^2n - 5m^3n^3 = m^2n\,(1 - 5mn^2)$

(g) $15xyz - 5z^2y + 10xyz^3 = 5y(z)\,(3x - z + 2xz^2)$

$= 5yz\,(3x + 2z^2x - z)$

(h) $4mn^2\,p - 8mp^2 + m^2p^3n^2$

$= mp\,(4n^2 - 8p + mp^2n^2)$

4. (a) $x(y-1)+3(y-1)=(y-1)(x+3)$

(b) $a(3x-1)-b(3x-1)=(3x-1)(a-b)$

(c) $2p(q-1)-7(q-1)=(q-1)(2p-7)$

(d) $x(2m-m)+6(2m-n)=(2m-n)(x+6)$

(e) $x(6-y)-1(6-y)=(6-y)(x-1)$

(f) $a(a-4)+4(4-a)=a(a-4)-4(a-4)$

$=(a-4)(a-4)$

(g) $(a+b)(3a-4)-(a+b)(2a-3)$

$=(a+b)[(3a-4)-(2a-3)]$

$=(a+b)[3a-4-2a+3]$

$=(a+b)(a-1)$

(h) $p(p-2q)+r(p-2q)+1(2q-p)$

$=p(p-2q)+r(\underline{p}-2q)-1(p-2q)$

$=(p-2q)(p+r-1)$

5. (a) $2b^2+4a^2+a^2b^2+8$

$=(2b^2+a^2b^2)+(4a^2+8)$

$=b^2(2+a^2)+4(2+a^2)$

$=(2+a^2)(b^2+4)$

$=(a^2+2)(b^2+4)$

(b) $5a+6ab+3b+10a^2$

$=(5a+10a^2)+(3b+6ab)$

$=5a(1+2a)+3b(1+2a)$

$=(1+2a)(5a+3b)$

(c) $(8xz+4yz)+(6xw+3yw)$

$=4z(2x+y)+3w(2x+y)$

$=(2x+y)(4z+3w)$

(d) $(6xy^2+2b^2y^2)+(3x+b^2)$

$=2y^2(3x+b^2)+1(3x+b^2)$

$=(3x+b^2)(2y^2+1)$

(e) $(xyz-xy)+(1-z)$

$=xy(z-1)-1(z-1)$

$=(z-1)(xy-1)$

(f) $m^2n-mr^2-mn+r^2$

$=m^2n-mn-mr^2+r^2$

$=mn(m-1)-r^2(m-1)$

$=(m-1)(mn-r^2)$

EXERCISE-14.2

1. (a) $64a^2+80ab+25b^2$

$=(8a)^2+2(8a)(5b)+(5b)^2$

$=(8a+5b)^2$ $\quad [x^2+2xy+y^2=(x+y)^2]$

(b) $36y^2 + 12y + 1$

$= (6y)^2 + 2\,(6y)\,(1) + (1)^2$

$= (6y + 1)^2$ $\quad [\because x^2 + 2xy + y^2 = (x + y)^2]$

(c) $9x^2y^2 + 6xyz + z^2$

$= (3xy)^2 + 2(3xy)\,(z) + (z)^2$

$= (xy + z)^2 = (3xy + z)^2$ $\quad [\because x^2 + 2xy + y^2 = (x + y)^2]$

(d) $16t^{\,2} – 72lm + 81m^2$

$= (4l)^2 – 2\,(4l)\,(9m) + (9m)^2$

$= (4l – 9m)^2$ $\quad [\because x^2 – 2xy + y^2 = (x – y)^2]$

(e) $a^2 + 4ab + 4b^2$

$= (a)^2 + 2(a)\,(2b) + (2b)^2$

$= (a + 2b)^2$ $\quad [\because x^2 + 2xy + y^2 = (x + y)^2]$

(f) $4x^4 + 20x^2y^2 + 25y^4$

$= (2x^2)^2 + 2(2x^2)\,(5y^2) + (5y^2)^2$

$= (2x^2 + 5y^2)^2$ $\quad [\therefore x^2 + 2xy + y^2 = (x + y)^2]$

(g) $\frac{1}{4} + x + x^2$

$= \left(\frac{1}{2}\right)^2 + 2\left(\frac{1}{2}\right)(x) + (x)^2$

$= \left(\frac{1}{2} + x\right)^2$ $\quad [\because x^2 + 2xy + y^2 = (x + y)^2]$

(h) $(x + 1)^2 – 4x$

$= x^2 + 2x + 1 – 4x$

$= x^2 – 2x + 1$

$= (x^2) – 2\,(x)\,(1) + (1)^2 = (x – 1)^2$ $\quad [\because x^2 – 2xy + 1 = (x – 1)^2]$

(i) $2a^2 + 8a + 8 – 2b^2$

$$\left[\left(\sqrt{2a}\right)^2 + 2\left(\sqrt{2a}\right)\left(2\sqrt{2}\right) + \left(2\sqrt{2}\right)^2\right] - \left(\sqrt{2b}\right)^2$$

$$= \left(\sqrt{2a} + 2\sqrt{2}\right)^2 - \left(\sqrt{2}b\right)^2$$

$$= \left(\sqrt{2}a + 2\sqrt{2} - \sqrt{2}b\right)\left(\sqrt{2}a + 2\sqrt{2} + b\sqrt{2}\right)\left[a^2 - b^2 = (a+b)(a-b)\right]$$

$$= \sqrt{2} \times \sqrt{2}\left(a + \sqrt{2} - b\right)\left(a + \sqrt{2} + b\right) = 2\left(a - b + \sqrt{2}\right) = 2\left(a - b + \sqrt{2}\right)\left(a + b + \sqrt{2}\right)$$

2. (a) $169 – 25y^2$

$= (13)^2 – (5y)^2$ $\quad$ [using $a^2 – b^2 = (a – b)\,(a + b)$]

$= (13 – 5y)\,(13 + 5y)$

(b) $49b^2 – a^2c^2$

$= (7b)^2 – (ac)^2 = (7b – ac)\,(7b + ac)$

(c) $100a^2 - 16$

$= (10a)^2 - (4)^2 = (10a - 4)(10a + 4)$

$= 2 \times 2 (5a + 2)(5a - 2)$

$= 4 (5a + 2)(5a - 2)$

(d) $12a^3x - 3ax^3$

$= 3ax [4a^2 - x^2]$

$= 3ax [(2a)^2 - (x)^2]$

$= 3ax (2a - x)(2a + x)$

(e) $9a^2 - 16b^2$

$= (3a)^2 - (4b)^2$

$= (3a + 4b)(3a - 4b)$

(f) $m^4 - 256$

$= (m^2)^2 - (16)^2$

$= (m^2 - 16)(m^2 + 16)$

$= [(m)^2 - (4)^2] (m^2 + 16)$

$= (m - 4)(m + 4)(m^2 + 16)$

(g) $27x^3 - 75xy^2$

$= 3x (9x^2 - 25y^2)$

$= 3x [(3x)^2 - (5y)^2]$

$= 3x (3x - 5y)(3x + 5y)$

(h) $4p^2 - 20pq + 25q^2 - 81r^2$

$= [(2p)^2 - 2(2p)(5q) + (5q)^2] - (9r)^2$

$= [(2p - 5q)^2] - (9r)^2$

$= (2p - 5q + 9r)(2p - 5q - 9r)$

(i) $a^2 + c^2 - b^2 + 2ac$

$= (a^2 + 2ac + c^2) - b^2$

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

$= (a + c - b)(a + c + b)$

(j) $16a^4 - 81b^4$

$= (4a^2)^2 - (9b^2)^2$

$= (4a^2 - 9b^2)(4a^2 + 9b^2)$

$= [(2a)^2 - (3b)^2] [4a^2 + 9b^2]$

$= (2a + 3b)(2a - 3b)(4a^2 + 9b^2)$

(k) $4x^2 + 12xy + 9y^2 - 50x - 75y$

$= [(2x)^2 + 2 (2x)(3y) - (3y)^2] - 25 (2x + 3y)$

$= (2x + 3y)^2 - 25 (2x + 3y)$

$= (2x + 3y) [2x + 3y - 25]$

$= (2x + 3y)(2x + 3y - 25)$

3. (a) $a^2 - 3a - 108$

$a^2 - 12a + 9a - 108$

$= (a^2 - 12a) + (9a - 108)$ P = $ab = 1 \times - 108 = - 108 = 12 \times 9$

$= a (a - 12) + 9 (a - 12)$ S = $(a + b) = - 3 = - 12 + 9$

$= (a - 12)(a + 9)$

(b) $x^2 - 14x + 45$

$x^2 - 9x - 5x + 45$

$= (x^2 - 9x) - (5x - 45)$ P = 45 = (– 9) × (5)

$= x(x - 9) - 5(x - 9)$ S = – 14 = (– 9) + (– 5)

$= (x - 9)(x - 5)$

(c) $y^2 - 22y + 121$

$= y^2 - 11y - 11y + 121$ P = 121 = (– 11) × (– 11)

$= y(y - 11) - 11(y - 11)$ S = – 22 = (– 11) + (– 11)

$= (y - 11)(y - 11)$

(d) $40 + 3p - p^2$

$= -p^2 + 3p + 40$

$= -(p^2 - 3p - 40)$ P = – 40 = (– 8) × (5)

$= -[(p^2 - 8p) + (5p - 40)]$ S = – 3 = – 8 + 5

$= -[p(p - 8) + 5(p - 8)]$

$= -[(p - 8)(p + 5)]$

$= -(p - 8)(p + 5)$

(e) $x^2 - 6x + 5$

$= (x^2 - 5x) + (-x + 5)$ P = 5 = 5 × 1

$= x(x - 5) - (x - 5)$ S = – 6 = – 5 + (– 1)

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

(f) $m^2 - 2m - 63$

$= (m^2 - 9m) + (7m - 63)$ P = – 63 = (– 9) × 7

$= m(m - 9) + 7(m - 9)$ S = – 2 = – 9 + 7

$= (m - 9)(m + 7)$

EXERCISE-14.3

1. (a) $156x^4y^2z^3 \div (-4xyz)$

$$\frac{156x^4y^2z^3}{-4xyz} = \frac{\cancel{2} \times \cancel{2} \times 3 \times 13x^{\cancel{4}^3}y^{\cancel{2}}z^{\cancel{3}^2}}{-\cancel{2} \times \cancel{2}\,\cancel{x}\cancel{y}\cancel{z}}$$

$= -3 \times 13x^3yz^2 = -39x^3yz^2$

(b) $90a^5bc^3 \div (-18a^2bc)$

$$= \frac{90a^5bc^3}{-18a^2bc} = \frac{\cancel{2} \times \cancel{3} \times \cancel{3} \times 5 \times a^{\cancel{5}^3} \times \cancel{b} \times c^{\cancel{3}^2}}{-\cancel{2} \times \cancel{3} \times \cancel{3} \times \cancel{a^2} \times \cancel{b} \times \cancel{c}}$$

$= -5a^3c^2$

(c) $(3x^2 + 2x) \div x$

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

(d) $504\,a^3x^3y^3 \div 9xy^2a$

$= \dfrac{504a^3x^3y^3}{9xy^2a} = \dfrac{2 \times 2 \times 2 \times \cancel{3} \times \cancel{3} \times 7 \times a^{\cancel{3}^2} \times x^{\cancel{3}^2} \times y^{\cancel{3}^2}}{\cancel{3} \times \cancel{3} \times \cancel{x} \times \cancel{y^2} \times \cancel{a}}$

$= 8 \times 7 \times a^2x^2y$

(e) $7p^2q^2(9r - 27) \div 63pq(r - 3)$

$= \dfrac{7p^2q^2(9r - 27)}{63pq(r - 3)} = \dfrac{\cancel{7} \times p^{\cancel{2}} \times q^{\cancel{2}^1} \times 9^{3^1} \times \cancel{(r - 3)}}{\cancel{3} \times \cancel{3} \times \cancel{7} \times \cancel{p} \times \cancel{q} \times \cancel{(r - 3)}}$

$= p_q$

2. (a) $\dfrac{24x^3 + 12x^2 - 8x}{4x}$

$= \dfrac{\cancel{4x}(6x^2 + 3x - 2)}{\cancel{4x}}$

$= (6x^2 + 3x - 2)$

(b) $\dfrac{16x^2y^2 + 12xy^2 - 8xy}{-2xy}$

$= \dfrac{\overset{2}{\cancel{4xy}}\,[4xy + 3y - 2]}{-\underset{-1}{\cancel{2xy}}} = -2\,[4xy + 3y - 2]$

(c) $\dfrac{18a^2b - 45a^3b^5}{9a^2b} = \dfrac{\cancel{9a^2b}(2 - 5ab^4)}{\cancel{9a^2b}}$

$= 2 - 5ab^4$

(d) $\dfrac{\cancel{22}^2(x^2yz^3 - x^2y^2z^2 + x^2y^2z^2)}{{}_1\cancel{11}x^2yz}$

$= \dfrac{2\,\cancel{x^2}\cancel{y}\,\cancel{z}^{\cancel{2}^1}(z - \cancel{y} + \cancel{y})}{\cancel{x^2yz}}$

$= 2\,(z)\,(z) = 2z^2$

(e) $\dfrac{26l^3m^4 - 52l^2m + 13l^4m^3}{13l^2m}$

$= \dfrac{\cancel{13l^2}\,\cancel{m}\,(2lm^3 - 4 + l^2m^2)}{\cancel{13l^2}\,\cancel{m}}$

$= 2lm^3 - 4 + l^2m^2$

(f) $\dfrac{\frac{1}{15}x^3y^3 - \frac{1}{18}xy^2}{\frac{1}{3}xy}$

$= \dfrac{\frac{1}{15}x^3y^3}{\frac{1}{3}xy} - \dfrac{\frac{1}{18}xy^2}{\frac{1}{3}xy}$

$= \dfrac{1\,x^{\cancel{3}\,2}\,y^{\cancel{3}\,2} \times \cancel{3}^1}{\cancel{15}_5 \times 1 \times \cancel{xy}} - \dfrac{1}{\cancel{18}_6} \times \dfrac{\cancel{3}^1}{1} \times \dfrac{\cancel{xy^2}}{\cancel{xy}}$

$= \dfrac{x^2y^2}{5} - \dfrac{y}{6} = \dfrac{6x^2y^2 - 5y}{30}$

$= y\dfrac{(6x^2y - 5)}{30}$

$= \dfrac{1}{30}y(6x^2y - 5)$

3. (a) $\dfrac{15x^2 + 3x}{5x + 1} = \dfrac{3x\,\cancel{(5x+1)}}{\cancel{(5x+1)}} = 3x$

(b) $(x^2 + 14x - 32) \div x + 2$

$= \dfrac{x^2 - 14x - 32}{x + 2} = \dfrac{(x^2 - 16x) + (2x - 32)}{x + 2}$

$= \dfrac{x(x - 16) + 2\,(x - 16)}{x + 2} = \dfrac{(x - 16)\cancel{(x + 2)}}{\cancel{(x + 2)}} = (x - 16)$

(c) $\dfrac{-24xyz\,(2x + 4)}{6xy\,(x + 2)}$

$= \dfrac{-\cancel{24}^{4}\,\cancel{xy}z \times 2\,\cancel{(x + 2)}}{{}_1\cancel{6}\,\cancel{xy} \times \cancel{(x + 2)}}$

$= -8z = -8z$

(d) $\dfrac{4a^3\,(5 - 7a)}{2a\,(7a - 5)} = \dfrac{\cancel{4}^2 a^{\cancel{3}\,2}\,(-1)\,\cancel{(7a - 5)}}{\cancel{2}\,\cancel{a}\,\cancel{(7a - 5)}}$

$= 2a^2(-1) = -2a^2$

(e) $\dfrac{\cancel{28}^2\,(2y - 6)(y + 4)}{{}_1\cancel{14}\,(y - 3)}$

$= \dfrac{2\,[2\,(y - 3)]\,(y + 4)}{(y - 3)} = \dfrac{4\,\cancel{(y - 3)}\,(y + 4)}{\cancel{(y - 3)}} = 4\,(y + 4)$

(f) $\frac{9x^3y^3(3x-18)}{27xy(x-6)} = \frac{\cancel{9}^1 x^{\cancel{3}^2} y^{\cancel{3}^2} \times {}^1\cancel{3}\ \cancel{(x-6)}}{\cancel{27}_{\cancel{3}_1}\ \cancel{xy}\ \cancel{(x-6)}} = \frac{\cancel{3}x^2y^2}{\cancel{3}} = x^2y^2$

(g) $\frac{{}^3\cancel{30}\,\cancel{x}yz\ \cancel{(x+y)}\ \cancel{(y+z)}\ (z+x)}{\cancel{10}\,\cancel{x}\ \cancel{(y+z)}\ \cancel{(x+y)}}$

$= 3yz(z+x)$

(h) $\frac{(3x+1)(2x^2+5x+1)}{6x+2}$

$= \frac{\cancel{(3x+1)}(2x^2+5x+1)}{2\cancel{(3x+1)}} = \frac{1}{2}(2x^2+5x+1)$

4. (a) $= \frac{25(x^2-y^2)}{5(x-y)} = \frac{\cancel{5} \times 5 \times \cancel{(x-y)}(x+y)}{\cancel{5}\ \cancel{(x-y)}}$

$= 5(x+y)$

(b) $= \frac{16+40y+25y^2}{5y+4} = \frac{(4)^2 + 2(4)(5y) + (5y)^2}{5y+4}$

$= \frac{(5y+4)^2}{(5y+4)} = \frac{\cancel{(5y+4)}(5y+4)}{\cancel{5y+4}} = 5y+4$

(c) $\frac{3x^2+2x-54}{3(x-2)} = \frac{\cancel{3}(x^2+7x-18)}{\cancel{3}(x-2)}$

$= \frac{x^2+9x-2x-18}{x-2} = \frac{x(x+9)-2(x+9)}{(x-2)}$

$= \frac{\cancel{(x-2)}(x+9)}{\cancel{(x-2)}} = x+9$

(d) $\frac{(x^2-25)(y^2-16)}{(x+5)(y-4)} = \frac{(x-5)\cancel{(x+5)}(y+4)(y-4)}{\cancel{(x+5)}(y-4)}$

$= (x-5)(y+4)$

(e) $\frac{-15ab(a^2-18a+81)}{5b(a-9)} = \frac{-{}^3\cancel{15}a\cancel{b}[(a)^2 - 2(a)(9) + (9)^2]}{\cancel{5}\cancel{b}(a-9)}$

$= \frac{-3a(a-9)^2}{(a-9)} = \frac{-3a(a-9)(a-9)}{(a-9)}$

$= -3a(a-9)$

(f) $\dfrac{27xy\,(4x^2 - 36y^2)}{4x\,(x + 3y)}$

$= \dfrac{27xy \times 4\,(x^2 - 9y^2)}{4 \times (x + 3y)}$

$= \dfrac{27\cancel{x}y \times \cancel{4}\,(x - 3y)\,\cancel{(x + 3y)}}{\cancel{4}\,\cancel{x}\,\cancel{(x + 3y)}}$

$= 27y\,(x - 3y)$

(g) $\dfrac{4a\,(18a^2 - 128)}{8a\,(3a - 8)} = \dfrac{\cancel{4}^1\,\cancel{a} \times \cancel{2}^1\,(9a^2 - 64)}{\cancel{8}_{\cancel{2}_1}\,\cancel{a}\,(3a - 8)}$

$= \dfrac{\cancel{(3a - 8)}\,(3a + 8)}{\cancel{(3a - 8)}} = 3a + 8$

(h) $\dfrac{256 - x^4}{x + 4} = \dfrac{(16)^2 - (x)^2}{x + 4} = \dfrac{(16 - x^2)(16 + x^2)}{(x + 4)}$

$= \dfrac{(4 - x)\,\cancel{(4 + x)}\,(16 + x^2)}{\cancel{(x + 4)}}$

$= (x^2 + 16)\,(4 - x)$

(i) $\dfrac{p^2 + 18p + 32}{p + 16} = \dfrac{p^2 + 16p + 2p + 32}{(p + 16)}$

$= \dfrac{p(p + 16) + 2(p + 16)}{p + 16} = \dfrac{\cancel{(p + 16)}(p + z)}{\cancel{(p + 16)}}$

$= (p + 2)$

(j) $\dfrac{81x^2 - 90xy + 25y^2}{9x - 5y}$

$= \dfrac{(9x)^2 - 2(9x)(5y) + (5y)^2}{9x - 5y}$

$= \dfrac{(9x - 5y)^2}{9x - 5y} = \dfrac{(9x - 5y)\,\cancel{(9x - 5y)}}{\cancel{(9x - 5y)}} = (9x - 5y)$

NCERT CORNER

EXERCISE-14.1

1. (I) $12x = 2 \times 2 \times 3 \times x$

$36 = 2 \times 2 \times 3 \times 3$

The common factors are 2, 2, 3 = 12

(II) $2y$, $22xy$

$2y = 2 \times y$

$22xy = 2 \times 11 \times x \times y$

The common factors are $2, y = 2y$

(III) $14pq = 2 \times 7 \times p \times q$

$28\, p^2q^2 = 2 \times 2 \times 7 \times p \times p \times q \times q$

The common factors are 2, 7, p, q and $2 \times 7 \times p \times q = 14pq$

(IV) $2x = 2 \times x$

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

$4 = 2 \times 2$

The common factors is 1

(V) $6abc = 2 \times 3 \times a \times b \times c$

$24ab^2 = 2 \times 2 \times 2 \times 3 \times a \times b \times b$

$12a^2b = 2 \times 2 \times 3 \times a \times a \times b$

The common factors are 2, 3, a, b and $2 \times 3 \times a \times b = 6ab$

(VI) $16x^3 = 2 \times 2 \times 2 \times 2 \times x \times x \times x$

$-14x^2 = -1 \times 2 \times 2 \times x \times x$

$32x = 2 \times 2 \times 2 \times 2 \times 2 \times x$

The common factors are 2, 2, x and $2 \times 2 \times x = 4x$

(VII) $10pq = \underline{2} \times \underline{5} \times p \times q$

$20qr = 2 \times 2 \times \underline{5} \times q \times r$

$30rp = \underline{2} \times 3 \times \underline{5} \times r \times p$

The common factors are 2, 5 and $2 \times 5 = 10$

(VIII) $3x^2y^3 = 3 \times \underline{x} \times \underline{x} \times y \times y \times y$

$10x^3y^2 = 2 \times 5 \times \underline{x} \times \underline{x} \times x \times y \times y$

$6x^2y^2z = 2 \times 3 \times x \times x \times \underline{y} \times \underline{y} \times z$

The common factors are x, x, y, y and $x \times x \times y \times y = x^2y^2$

2. (I) $7x - 42$

$= 7(x - 6)$

(II) $6p - 12q = 6(p - 2q)$

(III) $7a^2 + 14a = 7a(a + 2)$

(IV) $-16z + 20z^3 = -4z\,(4 - 5z^2)$

$= 4z\,(5z^2 - 4)$

(V) $20l^2m + 30alm = 10lm(2l + 3a)$

(VI) $5x^2y - 15xy^2 = 5xy(x - 3y)$

(VII) $10a^2 - 15b^2 + 20c^2 = 5(2a^2 - 3b^2 + 4c^2)$

(VIII) $-4a^2 + 4ab - 4ca = 4a(-a + b - c)$

(IX) $x^2yz + xy^2z + xyz^2 = xyz\,(x + y + z)$

(X) $ax^2y + bxy^2 + cxyz = xy\,(ax + by + cz)$

3. (I) $(x^2 + xy) + (8x + 8y)$

$= x(x + y) + 8(x + y)$

$= (x + y)\,(x + 8)$

(II) $(15xy - 6x) + (5y - 2)$

$= 3x\ (5y - 2) + 1\ (5y - 2)$
$= (5y - 2)\ (3x + 1)$

(III) $(ax + bx) - (ay + by)$
$= x(a + b) - y\ (a + b)$
$= (a + b)\ (x - y)$

(IV) $15pq + 15 + 9q + 25p$
$= 15pq + 9q + 15 + 25p$
$= (15pq + 25p) + (9q + 15)$
$= 5p\ (3q + 5) + 3(3q + 5)$
$= (5q + 3)\ (3q + 5)$

(V) $(z - 7) + (7xy - xyz)$
$= 1(z - 7) + xy(7 - z)$
$= 1(z - 7) - xy(z - 7)$
$= (z - 7)\ (1 - xy)$

EXERCISE-14.2

1. (I) $(a)^2 + 2(a)\ (4) + (4)^2$
$= (a + 4)^2$ $[\because\ (x + y)^2 = x^2 + y^2 + 2xy]$

(II) $(p)^2 - 2(p)\ (5) + (5)^2$
$(p - 5)^2$ $[\because\ (x - y)^2 = x^2 - 2xy + y^2]$

(III) $25m^2 + 30\ m + 9$
$(5m)^2 + 2(5m)\ (3) + (3)^2$
$(5m + 3)^2$ $[(x + y)^2 = x^2 + 2xy + y^2]$

(IV) $49y^2 + 84yz + 36z^2$
$= (7y)^2 + 2(7y)\ (6z) + (6z)^2$
$= (7y + 6z)^2$ $[(x + y)^2 = x^2 + 2x + y^2]$

(V) $4x^2 - 8x + 4$
$(2x)^2 - 2(2x)\ (2) + (2)^2$
$(2x - 2)^2 = (2)^2\ (x - 1)^2$ $[(x + y)^2 = x^2 + 2xy + y^2]$
$= 4(x - 1)^2$

(VI) $121b^2 - 88bc + 16c^2$
$= (11b)^2 - 2(11b)\ (4c) + (4c)^2$
$= (11b - 4c)^2$ $[(x - y)^2 = x^2 - 2xy + y^2]$

(VII) $(l + m)^2 - 4lm$
$= l^2 + 2lm + m^2 - 4lm$
$= l^2 - 4lm + m^2$
$= (l - m)^2$

(VII) $a^4 + 2a^2b^2 + b^4$
$(a^2)^2 + 2(a^2)\ (b^2) + (b^2)^2$
$(a^2 + b^2)^2$

2. (I) $(2p)^2 - (3q)^2$

$(2p + 3q)\,(2p - 3q) \qquad [x^2 - y^2 = (x - y)\,(x + y)]$

(II) $63a^2 - 112b^2$

$= 7(9a^2 - 16b^2)$

$= 7[(3a)^2 - (4b)^2]$

$= 7(3a - 4b)\,(3a + 4b)$

(III) $49x^2 - 36$

$= (7x)^2 - (\text{b})^2 = (7x - 6)\,(7x + 6)$

(IV) $16x^5 - 144x^3$

$= 16x^3\,(x^2 - 9)$

$= 16x^3\,(x^2 - 3^2)$

$= 16x^3\,(x - 3)\,(x + 3)$

(V) $(l + m)^2 - (l - m)^2$

$= (\cancel{l} + m - \cancel{l} + m)\,(l + \cancel{m} + l - \cancel{m})$

$= (2m)\,(2l) = 4ml$

(VI) $9x^2y^2 - 16$

$(3xy)^2 - (4)^2$

$(3xy + 4)\,(3xy - 4)$

(VII) $(x^2 - 2xy + y^2) - z^2$

$(x - y)^2 - z^2$

$(x - y + z)\,(x - y - z)$

(VIII) $25a^2 - 4b^2 + 28bc - 49c^2$

$= (5a)^2 - (4b^2 - 28bc + 49c^2)$

$= (5a)^2 - [(2b)^2 - 2(2b)\,(7c) + (7c)^2]$

$= (5a)^2 - [2b - 7c]^2$

$= [5a - 2b + 7c]\,(5a + 2b - 7c)$

3. (I) $ax^2 + bx$

$= x\,(ax + b)$

(II) $7p^2 + 21p^2 = 7(p^2 + 3q^2)$

(III) $2x^3 + 2xy^2 + 2xz^2 = 2x\,(x^2 + y^2 + z^2)$

(IV) $(\text{a}m^2 + bm^2) + bn^2 + an^2$

$= m^2\,(a + b) + n^2\,(\text{b} + \text{a})$

$= (a + b)\,(m^2 + n^2)$

(V) $(lm + l) + (m + 1)$

$l(m + 1) + 1\,(m + 1)$

$(m + 1)\,(l + 1)$

(VI) $y(y + z) + 9(y + z) = (y + z)\,(y + 9)$

(VII) $5y^2 - 20y - 8z + 2yz$

$= (5y^2 - 20y) + (2yz - 8z) = 5y\,(y - 4) + 2z\,(y - 4)$

$= (y - 4)\,(5y + 2z)$

(VIII) $(10ab + 4a) + (5b + 2) = 2a\,(5b + 2) + 1\,(5b + 2)$

$= (5b + 2)\,(2a + 1)$

(IX) $6xy - 4y + 6 - 9x$

$= (6xy - 9x) - (4y - 6)$

$= 3x\,(2y - 3) - 2\,(2y - 3)$

$= (2y - 3)\,(3x - 2)$

4. (I) $a^4 - b^4$

$= (a^2)^2 - (b^2)^2$

$= (a^2 - b^2)\,(a^2 + b^2)$

$= (a - b)\,(a + b)\,(a^2 + b^2)$

(II) $p^4 - 81 = (p^2 - 9)\,(p^2 + 9)$

$= (p - 3)\,(p + 3)\,(p^2 + 9)$

(III) $x^4 - (y + z)^4 = (x^2)^2 - [(y + z)^2]^2$

$= [x^2 - (y + z)^2]\,[x^2 + (y + z)^2]$

$= (x + y + z)\,(x - y - z)\,[x^2 + (y + z)^2]$

(IV) $x^4 - (x - z)^4 = (x)^2 - [(x - z)^2]^2$

$= [x^2 - (x - z)^2]\,[x^2 + (x - z)^2]$

$= (x - x + z)\,(x + x - z)\,[x^2 + (x - z)^2]$

$= z(2x - z)\,[x^2 + (x - z)^2]$

$= z(2x - z)\,(x^2 + x^2 + z^2 - 2xz)$

$= z(2x - z)\,(2x^2 - 2xz + z^2)$

(V) $a^4 - 2a^2b^2 + b^4$

$= (a^2)^2 - 2(a^2)\,(b^2) + (b^2)^2$

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

$= (a - b)^2\,(a + b)^2$

5. (I) $p^2 + 6p + 8$

$= (p^2 + 4p) + (2p + 8)$ $P = 8 = 4 \times 2$

$= p(p + 4) + 2\,(p + 4)$ $S = 6 = 4 + 2$

$= (p + 4)\,(p + 2)$

(II) $q^2 - 10q + 21$

$= (q^2 - 7q) - (3q - 21)$ $P = 21 = -7 \times 3$

$= q(q - 7) - 3\,(q - 7) = (q - 7)\,(q - 3)$ $S = -10 = (-7) + (-3)$

(III) $p^2 + 6p - 6$

$= p^2 + 8p - 2p - 16$ $P = -16 = -8 \times -2$

$= p(p + 8) - 2\,(p + 8)$ $S = 6 = 8 + (-2)$

$= (p + 8)\,(p - 2)$

EXERCISE-14.3

1. (I) $\dfrac{\cancel{28}^{1}\,x^{\cancel{4}^{3}}}{\cancel{56}_{2}\,\cancel{x}} = \dfrac{x^3}{2}$ (II) $\dfrac{-\cancel{36}^{4}\,y^{\cancel{3}}}{\cancel{9}\,\cancel{y^2}} = -4y$

(III) $\dfrac{\cancel{66}^{6}pq^{\cancel{2}}r^{\cancel{3}}}{\cancel{11}_{1}\cancel{q}\,\cancel{r^{2}}} = 6pqr$

(IV) $\dfrac{\cancel{34}^{2}x^{\cancel{3}^{2}}y^{\cancel{3}}z^{\cancel{3}}}{\cancel{51}_{3}\cancel{x}\,\cancel{y^{2}}\,z^{\cancel{3}^{2}}} = \dfrac{2x^{2}y}{3}$

(V) $\dfrac{{}^{2}\cancel{12}a^{\cancel{8}^{2}}b^{\cancel{8}^{4}}}{-\cancel{6}_{1}\cancel{a^{6}}\,\cancel{b^{4}}} = -2a^{2}b^{4}$

2. (I) $\dfrac{(5x^{2}-6x)}{3x} = \dfrac{\cancel{x}(5x-6)}{3\cancel{x}} = \dfrac{5x-6}{3}$

(II) $\dfrac{3y^{8}-4y^{6}+5y^{4}}{y^{4}} = \dfrac{\cancel{y^{4}}(3y^{4}-4y^{2}+5)}{\cancel{y^{4}}}$

$= 3y^{4}-4y^{2}+5$

(III) $\dfrac{8(x^{3}y^{2}z^{2}+x^{2}y^{3}z^{2}+x^{2}y^{2}z^{3})}{4x^{2}y^{2}z^{2}}$

$= \dfrac{{}^{2}\cancel{8}\,\cancel{x^{2}y^{2}z^{2}}\,(x+y+z)}{{}_{1}\cancel{4}\,\cancel{x^{2}y^{2}z^{2}}}$

$= 2(x+y+z)$

(IV) $\dfrac{(x^{3}+2x^{2}+3x)}{2x} = \dfrac{\cancel{x}(x^{2}+2x+3)}{2\cancel{x}} = \left(\dfrac{x^{2}+2x+3}{2}\right)$

(V) $\dfrac{(p^{3}q^{6}-p^{6}q^{3})}{p^{3}q^{3}} = \dfrac{\cancel{p^{3}q^{3}}\,(q^{3}-p^{3})}{\cancel{p^{3}q^{3}}}$

$= q^{3}-p^{3}$

3. (I) $\dfrac{(10x-25)}{5} = \dfrac{\cancel{5}(2x-5)}{\cancel{5}} = (2x-5)$

(II) $\dfrac{10x-25}{(2x-5)} = \dfrac{5\,\cancel{(2x-5)}}{\cancel{(2x-5)}} = 5$

(III) $\dfrac{10y(6y+21)}{5(2y+7)} = \dfrac{{}^{2}\cancel{10}y\times 3\,\cancel{(2y+7)}}{{}_{1}\cancel{5}\,\cancel{(2y+7)}}$

$= 6y$

(IV) $\dfrac{9x^{2}y^{2}(3z-24)}{27xy(z-8)} = \dfrac{{}^{1}\cancel{9}\,x^{2}y^{2}\times\cancel{3}\,\cancel{(z-8)}}{{}_{1}\cancel{3}\,\cancel{27}\,xy\,\cancel{(z-8)}} = xy$

(V) $\dfrac{96abc\,(3a-12)(5b-30)}{144(a-4)(b-6)}$

$= \dfrac{{}^{2}\cancel{96}\times abc\times{}^{1}\cancel{3}\,\cancel{(a-4)}\times 5\,\cancel{(b-6)}}{\underset{1}{\cancel{\underset{48}{\cancel{144}}}}\times\cancel{(a-4)}\,\cancel{(b-6)}}$

$= 5\times 2\,abc = 10\,abc$

4. (I) $\dfrac{5\cancel{(2x+1)}(3x+5)}{\cancel{(2x+1)}} = 5(3x+5)$

(II) $\dfrac{^{2}\cancel{26}\,\cancel{x}y(x+5)\cancel{(y-4)}}{_{1}\cancel{13}\,\cancel{x}\,\cancel{(y-4)}} = 2y(x+5)$

(III) $\dfrac{^{1}\cancel{52}\,pqr\,(p+q)\cancel{(q+r)}\,\cancel{(r+p)}}{_{2}\cancel{104}\,pq\,\cancel{(q+r)}\,\cancel{(r+p)}}$

$= \dfrac{r}{2}(p+q)$

(IV) $\dfrac{^{4}\cancel{20}\,\cancel{(y+4)}(y^2+5y+3)}{_{1}\cancel{5}\,\cancel{(y+4)}}$

$= 4(y^2+5y+3)$

(V) $\dfrac{\cancel{x}\,\cancel{(x+1)}(x+2)(x+3)}{\cancel{x}\,\cancel{(x+1)}} = (x+2)(x+3)$

5. (I) $\dfrac{(y^2+7y+10)}{y+5} = \dfrac{y^2+5y+2y = 10}{y+5}$

$= \dfrac{\cancel{(y+5)}(y+2)}{\cancel{(y+5)}} = y+2$

(II) $\dfrac{(m^2-14m-32)}{m+2} = \dfrac{m^2-16m+2m-32}{m+2}$

$= \dfrac{(m-16)\cancel{(m+2)}}{\cancel{(m+2)}} = m-16$

(III) $5p^2 - 25p + 20 - (p-1)$

$= \dfrac{5(p^2-5p+4)}{(p-1)} = \dfrac{5(p^2-4p-p+4)}{(p-1)}$

$= \dfrac{5(p-4)\cancel{(p-1)}}{\cancel{(p-1)}} = 5\,(p-4)$

(IV) $\dfrac{4yz(z^2+6z-16)}{2y(z+8)} = \dfrac{^{2}\cancel{4y}\,z(z^2+8z-2z-16)}{_{1}\cancel{2y}\,(z+8)}$

$= \dfrac{2z\,\cancel{(z+8)}(z-2)}{\cancel{(z+8)}} = 2z(z-2)$

(V) $\dfrac{5\cancel{p}q(p^2-q^2)}{2\cancel{p}(p+q)} = \dfrac{5q(p-q)\cancel{(p+q)}}{2\,\cancel{(p+q)}} = \dfrac{5}{2}q\,(p-q)$

(VI) $\dfrac{{}^{3}\cancel{12xy}(9x^2 - 16y^2)}{{}_{1}\cancel{4xy}(3x + 4y)}$

$$= \frac{3[(3x)^2 - (4y)^2]}{3x + 4y} = \frac{3\cancel{(3x + 4y)}(3x - 4y)}{\cancel{(3x + 4y)}} = 3(3x - 4y)$$

(VII) $\dfrac{39y^3(50y^2 - 98)}{26y^2(5y + 7)}$

$$= \frac{{}^{3}\cancel{39}y^{\cancel{3}} \times 2(25y^2 - 49)}{{}_{2}\cancel{26}\, \cancel{y^2}(5y + 7)} = \frac{3y\cancel{(5y + 7)}(5y - 7)}{\cancel{(5y + 7)}} = 3y(5y - 7)$$

EXERCISE-14.4

1. LHS = $4(x - 5) = 4x - 20 \neq$ RHS
The correct statement is $4(x - 5) = 4x - 20$

2. LHS = $x(3x + 2) = 3x^2 + 2x \neq 3x^2 + 2$
LHS $\neq$ RHS
The correct statement is $x(3x + 2) = 3x^2 + 2x$

3. LHS $2x + 3y \neq$ RHS
The correct statement is $2x + 3y = 2x + 3y$

4. LHS = $x + 2x + 3x = 6x \neq$ RHS
The correct statement is $x + 2x + 3x = 6x$

5. LHS = $5y + 2y + y - 7y = y \neq$ RHS
The correct statement is $5y + 2y + y - 7y = y$

6. LHS = $3x + 2x = 5x \neq$ RHS
The correct statement is $3x + 2x = 5x$

7. LHS = $(2x)^2 + 4(2x) + 7 = 4x^2 + 8x + 7 \neq$ RHS
The correct statement is $(2x)^2 + 4(2x) + 7 = 4x^2 + 8x + 7$

8. LHS = $(2x)^2 + 5x = 4x^2 + 5x \neq$ RHS
The correct statement is $(2x)^2 + 5x = 4x^2 + 5x$

9. LHS = $(3x + 2)^2 = 9x^2 + 4 + 12x \neq$ RHS
The correct statement is $(3x + 2)^2 = 9x^2 + 12x + 4$

10. (i) LHS = $x^2 + 5x + 4 = (-3)^2 + 5(-3) + 4 = 9 - 15 + 4 = -2 \neq$ RHS
The correct statement is $(-3)^2 + 5(-3) + 4 = 9 \;\; 15 + 4 = -2$
(ii) LHS = $(-3)^2 - 5(-3) + 4 = 9 + 15 + 4 = 28 \neq$ RHS
The correct statement is $(-3)^2 - 5(-3) + 4 = 9 + 15 + 4 = 28$
(iii) LHS = $(-3)^2 + 5(-3) = 9 - 15 = -6 \neq$ RHS
The correct statement is $(-3)^2 + 5(-3) = 9 - 15 = -6$

11. LHS = $(y - 3)^2 = y^2 + 9 - 6y \neq$ RHS
The correct statement is $(y - 3)^2 = y^2 - 6y + 9$

12. LHS = $(z + 5)^2 = z^2 + 10z + 25 \neq$ RHS
The correct statement is $(z + 5)^2 + z^2 + 10z + 25$

13. LHS = $(2a + 3b)(a - b) = 2a^2 + 3ab - 2ab - 3b^2$
$= 2a^2 + ab - 3b^2 \neq$ RHS
The correct statement is $(2a + 3b)(a - b) = 2a^2 + ab - 3b^2$

14. LHS = $(a + 4)(a + 2) = a^2 + 4a + 2a + 8 = a^2 + 6a + 8 \neq$ RHS

The correct statement is $(a + 4)(a + 2) = a^2 + 6a + 8$

15. LHS = $(a - 4)(a - 2) = a^2 - 4a - 2a + 8 = a^2 - 6a + 8 \neq$ RHS

The correct statement is $(a - 4)(a - 2) = a^2 - 6a + 8$

16. LHS = $\frac{3x^2}{3x^2} = 1 =$ RHS

The correct statement is $\frac{3x^2}{3x^2} = 1$

17. LHS = $\frac{3x^2 + 1}{3x^2} = \frac{\cancel{3x^2}}{\cancel{3x^2}} + \frac{1}{3x^2} = 1 + \frac{1}{3x^2} =$ RHS

The correct statement is $\frac{3x^2 + 1}{3x^2} = \frac{3x^2}{3x^2} + \frac{1}{3x^2} = 1 + \frac{1}{3x^2}$

18. LHS = $\frac{3x}{3x + 2} = \frac{3}{3x + 2} \neq$ RHS

The correct statement is $\frac{3x}{3x + 2} = \frac{3}{3x + 2}$

19. LHS = $\frac{3}{4x + 3} \neq$ RHS

The correct statement is $\frac{3}{4x + 3} = \frac{3}{4x + 3}$

20. LHS = $\frac{4x + 5}{4x} = \frac{\cancel{4x}}{\cancel{4x}} + \frac{5}{4x} = 1 + \frac{5}{4x} \neq$ RHS

The correct statement is $\frac{4x + 5}{4x} = \frac{\cancel{4x}}{\cancel{4x}} + \frac{5}{4x} = 1 + \frac{5}{4x}$

21. LHS = $\frac{7x + 5}{5} = \frac{7x}{5} + \frac{\cancel{5}}{\cancel{5}} = \frac{7x}{5} + 1 \neq$ RHS

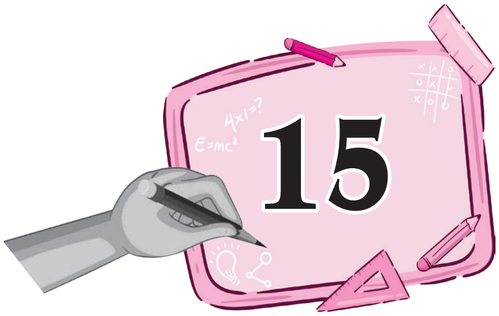
The correct statement is $\frac{7x + 5}{5} = \frac{7x}{5} + \frac{5}{5} = \frac{7x}{5} + 1$

SUBJECT ENRICHMENT EXERCISE

I. (1) $6ab$ (2) $(x + 1)(y + 1)$
(3) $(z - 6)(z + 2)$ (4) $(y + 1)$
(5) $m^2 - n^2$ (6) $(x - 2y)(x - 2y)$
(7) $2a + 1$ (8) $25x^2 + 10x + 1$

II. (a) $(1 + x - y)$ (b) 138
(c) $4 - x^2$ (d) $(x - 4)(a - 2b)$
(e) 193

III. (a) True (b) False
(c) True (d) True
(e) False (f) True



15 Introduction to Graphs

EXERCISE-15.1

1. (a) 10 min. (b) 300 Km. (c) 3.75 Min.

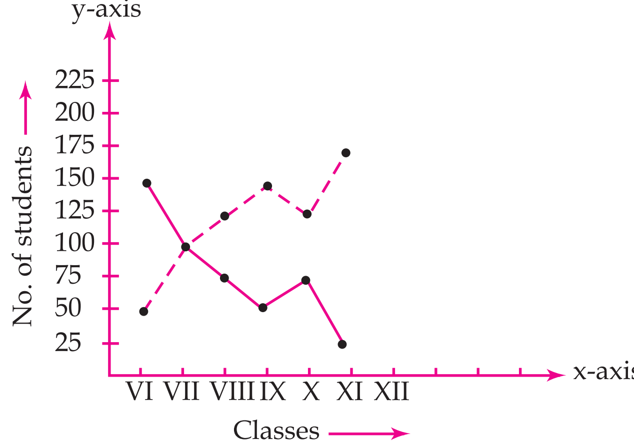
2. (a) 3 hours (b) 10 Km/hr. $\left[\because \frac{30}{3} = 10\right]$
(c) 55 Km (d) 1/2 hours

3. (a) 3 hours
(b) Sunday and Friday
(c) Difference between time on saturday and sunday = 5 – 4 = 1 hours
(d) Total hours = 19 hours

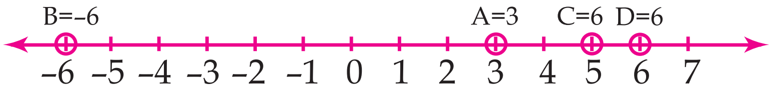
4. (a) Indoor Temperature at 10:am = 23°C
Outdoor Temperature at 10: am = 26°C
(b) At 12 noon
(c) The difference in indoor and outdoor temperature at 2 pm is (39-30)°C = 9°C
(d) At 9 am
(e) Between 12 noon to 2 pm. The indoor temperature remained constant.

5. (a) February
(b) Rs.15000 is the minimum amount collected and it was collected in March month.
(c) Total amount = Rs 1,60,000 (Rs 25000 + Rs 32500 + Rs 22500 + Rs 30000 + Rs 35000 + Rs 15000)
(d) The difference in amount collected during the month of December and January is Rs 7,500
(e) December and March

6. Scale – X-axis 1 unit = 1 class
Y-axis unit =
________________ Pen
.... Pencil



EXERCISE 15.2

1. 

2. (a) Ordinate- –2

Abscissa- 3

(b) Ordinate- 4

Abscissa- 8

(c) Ordinate- 4

Abscissa- 9

(d) Ordinate - 9

Abscissa- 9/2

3. (a) (4, 5) lies on I quadrant.

(b) (14, – 2) lies on IV quadrant

(c) (–4, –8) lies on III quadrant

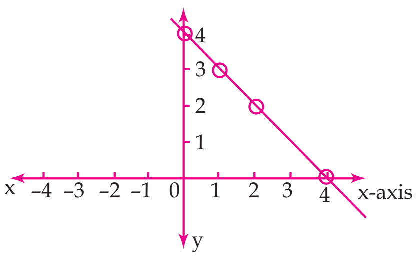
(d) (–8, –2) lies on II quadrant.

4. Do it yourself

5. (a) (16, 8)

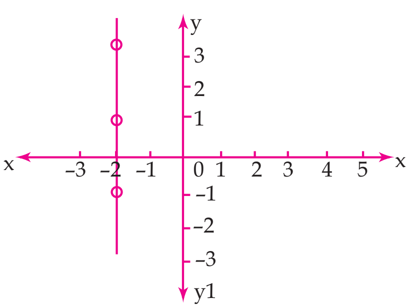
(b) (a, b)

6. (a)



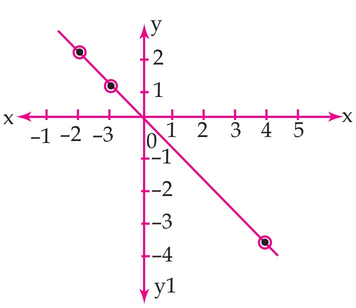
These point are collinear.

(b)



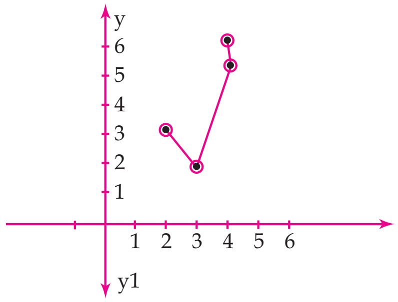
These points are colinear

(c)



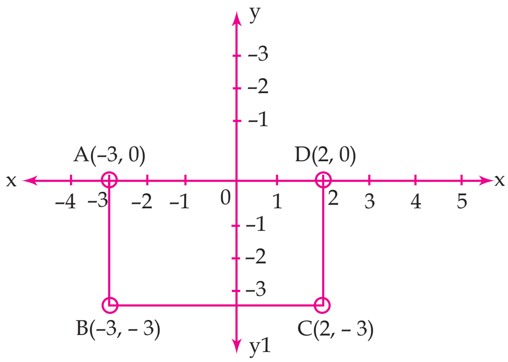
These points are collinear

(d)



These points are not collinear

7.

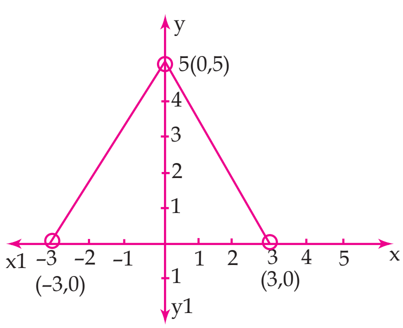


This figures a rectangle ∴ ABCD is a rectangle

8. P (2, 8), Q (–4, –4), R (6, –4)

9. (a) A (3, 0) → This points lies on x-axis not on y-axis
(b) B (0, 3) → This points lies on y-axis.
(c) C (–4, 4) = This point is not lie on y-axis and x-axis.
(d) D (0,2) = This point lies on y-axis.
Draw diagram do it yourself

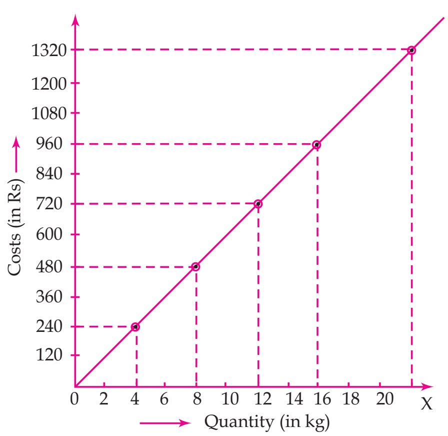
10.



Isosceles Triangle.

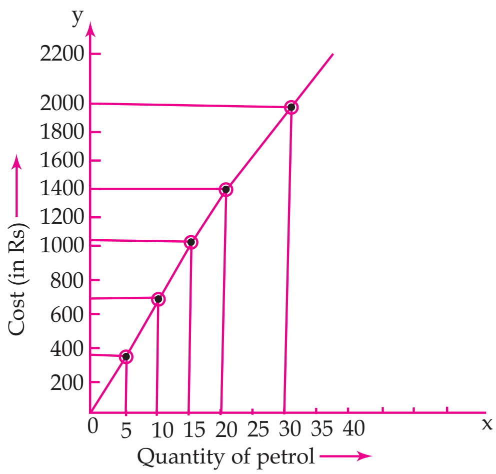
EXERCISE 15.3

1.



The cost of 22 kg mangers is Rs 1320.

2.



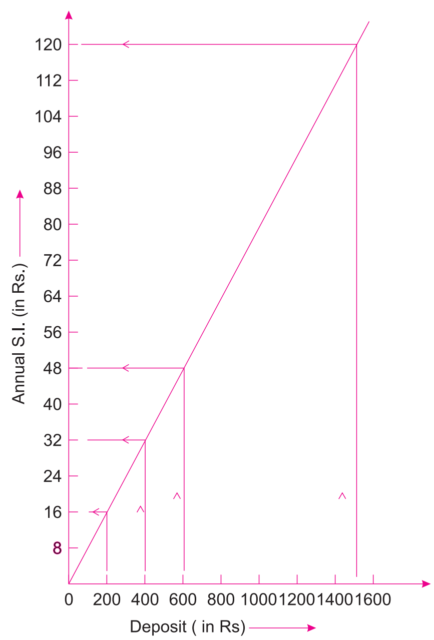
28 l of petrol can be purchased in Rs 1960

3.

Deposit (in Rs)	100	200	300	400	500
Annual S.I. (in Rs)	8	16	24	32	40

(i) Corresponding to Rs. 800 on horizontal axis, we get the int. to be Rs. 64 on vertical axis.

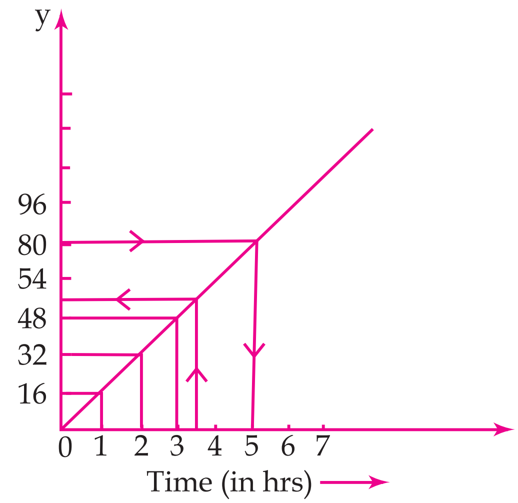
(ii) Corresponding to Rs 1500 on horizontal axis, we get the int to be Rs 120 on vertical axis.



4.

Time (in hrs)	1	2	3
Distance Covered (in Km)	16	32	48

(i) Corresponding to $3\frac{1}{2}$ hrs on the horizontal axis, the distance covered is 56 km on the vertical axis.



(ii) Corresponding to 80 km on the vertical axis, we get the time to be 5 hours on the horizontal axis

NCERT CORNER

EXERCISE 15.1

1. (a) At 1 p.m., the patients temperature was 36.5°C

(b) 12 noon

(c) 1 p.m. and 2 p.m.

(d) The graph between he times 1 p.m. and 2 p.m. is parallel to the x-axis. The temperature at 1 p.m. and 2 p.m. is 36.5°C. So, the temperature at 1:30 p.m. is 36.5°C.

(e) During the following periods, the patient's temperature showed an upward trend. 9 am to 10 am, 10 am to 11 am, 2 pm to 3 pm

2. (a) (i) In 2002, the sales were Rs 4 crores.

(ii) In 2006, the sales were Rs 8 crores.

(b) (i) In 2003, the sales were Rs 7 crores.

(ii) In 2005, the sales were Rs 10 crores.

(c) (i) In 2002, the sales were Rs, 4 crores and In 2006 the sales were Rs 8 crores.

Difference between the sales in 2002 and 2006 = Rs (8 – 4) crores = Rs 4 crores

(d) Difference between the sales of the year 2006 and 2005 = Rs 2 crores.

Difference between the sales of the year 2005 and 2004 = Rs 4 crores

Difference between the sales of the year 2004 and 2003 = Rs 1 crores.

Difference between the sales of the year 2003 and 2002 = Rs 3 crores.

Hence the difference was the maximum in the year 2005 as compared to its previous year 2004.

3. (a) (i) 7 cm (ii) 9 cm

(b) (i) 7 cm (ii) 10 cm

(c) Growth of plant A during 3rd week = 9 cm – 7 cm = 2 cm

(d) Growth of plant B from the end of the 2nd week to the end of the 3rd week = 10cm – 7cm = 3cm

(e) Growth of plant A during 1st week = 2 cm

2nd week = 5 cm

3rd week = 2 cm

∴ Plant A grew the most, i.e. 5 cm during the 2nd week

(f) Growth of plant B during 1st week = 1cm

2nd week = 6 cm

3rd week = 3 cm

∴ Plant B grew the least i.e. 1cm during the 1st week

(g) At the end of the 2nd week, the height of both plants were same

4. (a) Tuesday, Friday, Sunday

(b) 35°C

(c) 15°C

(d) Thursday

5. Do it yourself on graph paper

6. (a) 4 units = 1 hours

(b) The person travelled during the time 8 am - 11:30 am. Therefore, the person took $3\frac{1}{2}$ hrs to travel.

(c) The merchant is 22km for from the twon.

(d) Yes, this is indicate by the horizontal part of graph (10am – 10:30 am).

(e) Between 8am and 9 am.

7. (i) This can be a time temperature graph, as the temperature can increase with the increase in time

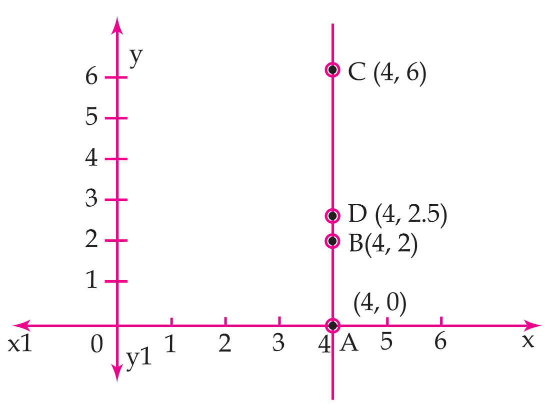
(ii) This can be a time temperature graph as the temperature can decreases witht he decrease in time

(iii) This cannot be a time temperature graph

(iv) This can be a time temperature graph as same temperature at different times is possible.

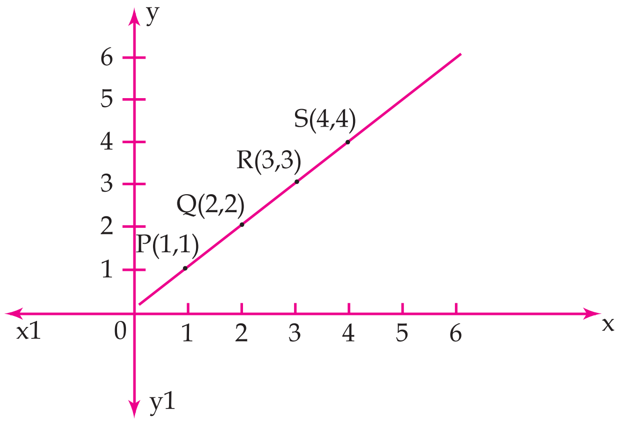
EXERCISE 15.2

1. (a)



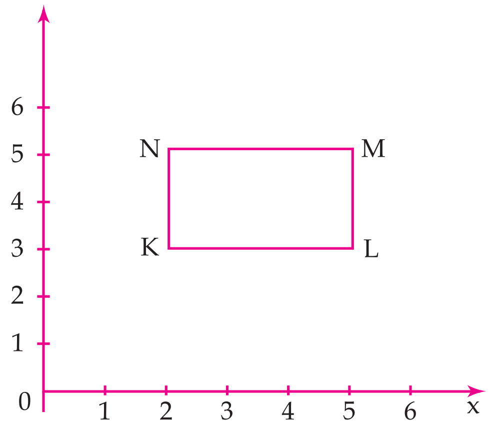
From the graph it can be observed that the points A, B, C and D lie on the same line

(b)



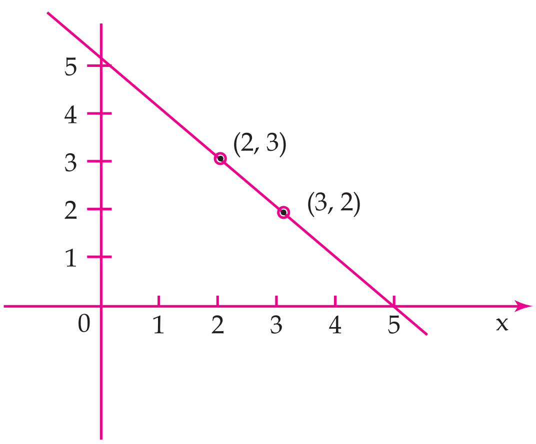
Hence, Point P, Q, R and S lie on the same line.

(c)



Hence, the point K, L, M and N are not lying on the same line.

2.



The line will cut x-axis at (5,0) and y-axis at (0,5).

3. O(0,0); A (2,0); B (2,3); C(0, 3); P (4,3); Q (6,1); R (6,5); S (4,7); K (10,5); L (7,7); M (10,8)

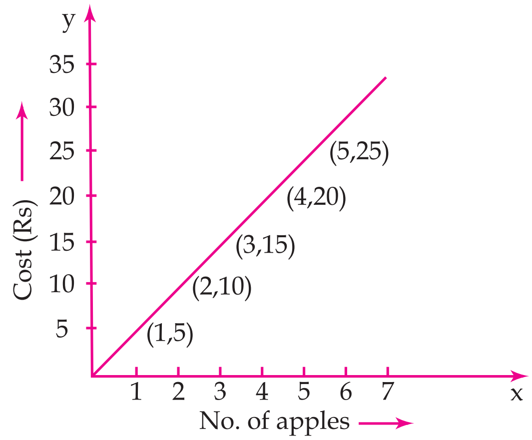
4. (i) True

(ii) False

(iii) True

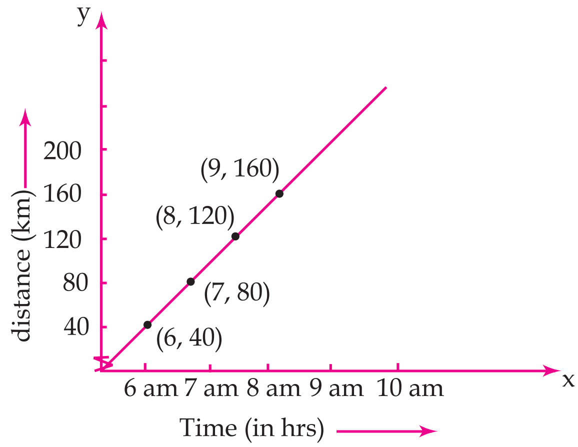
EXERCISE 15.3

1. (a)



x – axis
1 unit = 1 apple
y – axis
1 unit = ₹5

(b)

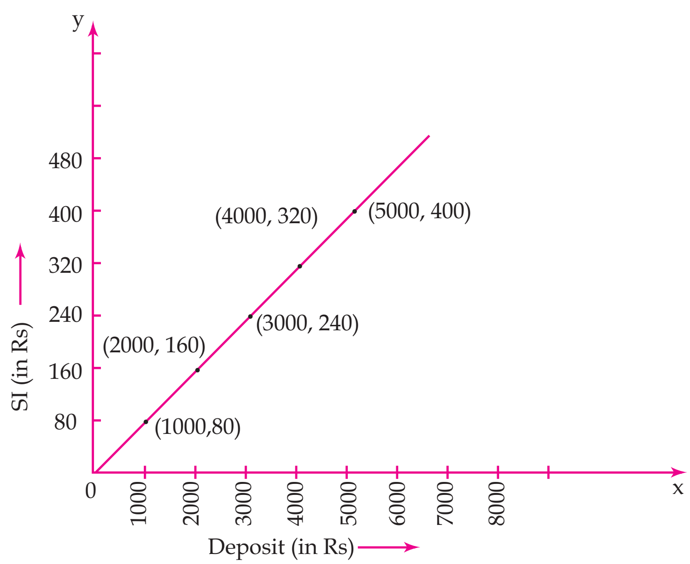


x – axis, 1 unit, 1 hrs.
y – axis, 1 unit = 40 km

(i) During the period 7:30 am to 8:00 am, the car covered a distance of 20 km

(ii) The car covered a distance of 100 km at 7:30 am. Since its start

(c)



X-axis, 1 unit = Rs 1000

Y-axis, 1 unit = Rs 80

(i) Yes, the graph passes through the origin

(ii) The int. earned in a year on a deposit of Rs 2500 is Rs 200.

(iii) To get an interest of Rs 280 per year, Rs 3500 Should be deposited.

2. (i) Draw a graph do it yourself

Yes, it is a linear graph.

(ii) Graph- Do it yourself.

No, it is not a linear graph.

SUBJECT ENRICHMENT EXERCISE

I 1. IVth quadrant

2. Ist quadrant

3. (–, +)

4. (6,0)

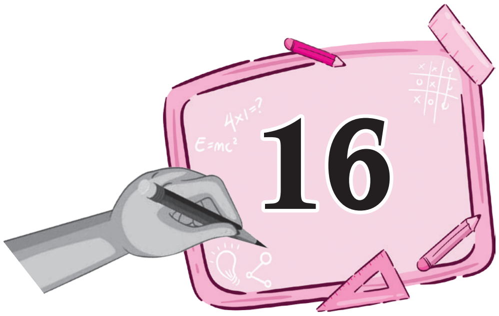
5. X-axis

2. (a) True (b) True

(c) False (d) True

(e) True (f) False

(g) False



Playing with Number

EXERCISE 16.1

1. (a) $29 = (2 \times 10) + (9 \times 1) = (2 \times 10^1) + (9 \times 10^0)$

(b) $71 = 70 + 1 = (7 \times 10) + (7 \times 1) = (7 \times 10^1) + (1 \times 10^0)$

(c) $852 = 800 + 50 + 2 = (8 \times 100) + (5 \times 10) + (2 \times 1) = (8 \times 10^2) + (5 \times 10^1) + (2 \times 10^0)$

(d) $406 = 400 + 6 = (4 \times 100) + (6 \times 1) = (4 \times 10^2) + (6 \times 10^0)$

2. (a)

$$\begin{array}{rrr} & 4 & A \\ + & 7 & 9 \\ \hline C & B & 5 \\ \hline \end{array}$$

A=6 B=2 C=1

$$\begin{array}{rrr} & 4 & 6 \\ + & 7 & 9 \\ \hline 1 & 2 & 5 \\ \hline \end{array}$$

(b)

$$\begin{array}{rrrr} & Q & 2 & 4 \\ + & Q & P & 6 \\ \hline 1 & P & 3 & P \\ \hline \end{array}$$

p = 0 Q = 5

$$\begin{array}{rrrr} & 5 & 2 & 4 \\ + & 5 & 0 & 6 \\ \hline 1 & 0 & 3 & 0 \\ \hline \end{array}$$

(c)

$$\begin{array}{rrrr} 1 & 8 & 4 & B \\ + & C & 8 & 1 \\ \hline A & 0 & A & 9 \\ \hline \end{array}$$

A = 2 B = 8 C = 1

$$\begin{array}{rrrr} 1 & 8 & 4 & 8 \\ + & 1 & 8 & 1 \\ \hline 2 & 0 & 2 & 9 \\ \hline \end{array}$$

(d)

$$\begin{array}{rrr} & A & A \\ & \times & A \\ \hline 3 & 9 & A \\ \hline \end{array}$$

A = 6

$$\begin{array}{rrr} & 6 & 6 \\ & \times & 6 \\ \hline 3 & 9 & 6 \\ \hline \end{array}$$

(e)

$$\begin{array}{rrr} & A & B \\ \times & A & B \\ \hline C & C & B \\ \hline \end{array}$$

A = 2 B = 1 C = 4

$$\begin{array}{rrr} & 2 & 1 \\ \times & 2 & 1 \\ \hline 4 & 4 & 1 \\ \hline \end{array}$$

3. Now, we can explain by this method:-

Let's construct a 3-digit no. where a is the hundreds digit, b is the tenth digit and C is the ones digit.

So, the no. would be 100 a + 10 b+ c

Add 7 to it.

100a + 10b + c + 7

Double it

2(100a + 10b + c + 7)

200a + 20b + 2c + 14

Substract 4

200a + 20b + 2c + 14 – 4

200a + 20b + 2c + 10

Divide by 2

$\frac{200a + 20b + 2c + 10}{2}$ = 100a + 10b + c + 5

Subtract the original no. from it

$\cancel{100a} + \cancel{10b} + \cancel{c} + 5 - \cancel{100a} - \cancel{10b} - \cancel{c} = 5$

We are left with 5.

EXERCISE 16.2

1. Option (a), (b) and (c) are divisible by 2.

Because its least digit is divisible by 2.

2. Option (a) is divisible by 5 and 10

For a no. to be divisible by 5, it should end with 0 or 5.

For a no. to be divisible by 10 it should end with 0.

Every no. divisible by 10 is divisible by 5, therefore we can only check for the divisibility by 10

3. A no. is divisible by 3 and 9 if the sum of the digit is divisible by 3 and 9 respectively.

(a) 285

Sun of the digits = 2 + 8 + 5 = 15

15 is divisible by 3 but not by 9. Hence 285 is divisible by 3 but not divisible by 9.

(b) 4071

Sum of the digits = 4 + 0 + 7 + 1 = 12

12 is divisible by 3 but not by 9. Hence 4071 is divisible by 3 but not divisible by 9.

(c) 891135

Sum of the digits = 8 + 9 + 1 + 1 + 3 + 5 = 27

27 is divisible by both 3 and 9. Hence, 891135 is divisible by both 3 and 9.

(d) 6271

Sum of the digit = 6 + 2 + 7 + 1 = 16

16 is not divisible by both 3 and 9. hence, 6271 is not divisible by both 3 and 9.

4. (a) 7 ☐ 615

whenever the sum of the digits of a no. is such that it is divisible by 9, then the no. itself is divisible by 9.

Here in this given no., the sum of the digit is 7 + ☐ + 6 + 1 + 5 = 19 + ☐

So, the smallest no, that can be substituted in place of ☐ such that the no. is divisible by 9 is 8.

So, the no. is 78615.

(b) 439 $\square$ 9

Here in this given no, the sum of the digit is 4 + 3 + 9 + $\square$ + 9 = 25 + $\square$

So, the smallest no, that can be substituted in place of $\square$ such that the no. is divisible by 9 is 2.

So, the no. is 43929

(c) 5 $\square$ 8

Here in this given no., the sum of the digits is 5 + $\square$ + 8 = 13 + $\square$

So, the smallest no. that can be substituted in place of $\square$ such that the no. is divisible by 9 is 5

So, the no. is 558.

(d) 73 $\square$ 0

Here in this given no., the sum of the digit is 7 + 3 + $\square$ + 0 = 10 + $\square$

So, the smallest no. that can be substituted in place of $\square$ such that the no. is divisible by 9 is 8

So, the no. is 7380

5.

Number	Divisible by 2	Divisible by 5	Divisible by 9	Divisible by 10
281	No	No	No	No
6942	Yes	No	No	No
87840	Yes	Yes	Yes	Yes
195	No	Yes	No	No
280	Yes	Yes	No	Yes
4386	Yes	Yes	No	No

NCERT CORNER

EXERCISE 16.1

1.
$$\begin{array}{rcc} & 3 & A \\ + & 2 & 5 \\ \hline & B & 2 \\ \hline \end{array}$$

The addition of A and 5 is giving 2 i.e., no. whose ones digit is 2. This is possible only when digit A is 7. In that case, the addition of A (7) and 5 will give 12 and thus, I will be the carry for the next step 1 + 2 + 3 = 6

$$\therefore \quad \begin{array}{rcc} & 3 & 7 \\ + & 2 & 5 \\ \hline & 6 & 2 \\ \hline \end{array}$$

Clearly B = 6

2.
$$\begin{array}{ccc} & 4 & A \\ + & 9 & 8 \\ \hline C & B & 3 \\ \hline \end{array}$$

First step - A + 8 = 13 then, 5 + 8 = 13 so, A= 5

Next step - 4 + 9 + 1 = 14

$$\therefore \begin{array}{r} 4\ 5 \\ +\ 9\ 8 \\ \hline 1\ 4\ 3 \\ \hline \end{array}$$

Clearly C = 1, B = 4

3. $\begin{array}{r} 1\ A \\ \times\ A \\ \hline 9\ A \\ \hline \end{array}$

The multiplication of with A itself gives a no. whose ones digit is A again. This happens only when A = 1, 5, or 6.

If A = 1, then the multiplication will be 11 × 1 = 11

However, here the tens digit is given as 9 ∴ A = 1 is not possible .

similarly, if A = 5, than the multiplication will be 15 × 5 = 75, thus, A = 5 is not possible.

If we take A = 6, then 16 × 6 = 96. Therefore, A should be 6.

$$\begin{array}{r} 1\ 6 \\ \times\ 6 \\ \hline 9\ 6 \\ \hline \end{array}$$

Hence A = 6

4. $\begin{array}{r} A\ B \\ +\ 3\ 7 \\ \hline 6\ A \\ \hline \end{array}$

The addition of A + 3 = 6. There can be two cases.

(i) First step is not producing a carry.

In that case, A comes to be 3 as 3 + 3 = 6. In which B + 7 giving A, B should be a no. such that the units digit of this addition comes to be 3.

It is possible only when B = 6. in this case A = 6 + 7 = 13. However, A is a single digit no. Hence it is not possible.

(ii) First step is producing a carry

In that case, A comes to be 2 as 1 + 2 + 3 = 6. Considering the first step in which the addition of B and 7 is giving A, B should be a no. Such that the units digit of this addition comes to be 2. It is possible only when B = 5 and 5 + 7 = 12

$$\begin{array}{r} 2\ 5 \\ +\ 3\ 7 \\ \hline 6\ 2 \\ \hline \end{array}$$

Hence A = 2, B = 5

5. $\begin{array}{r} A\ B \\ \times\ 3 \\ \hline C\ A\ B \\ \hline \end{array} = \begin{array}{r} 5\ 0 \\ \times\ 3 \\ \hline 1\ 5\ 0 \\ \hline \end{array}$

Hence A = 5, B = 0, C = 1

6. $\begin{array}{r} A\ B \\ \times\ 5 \\ \hline C\ A\ B \\ \hline \end{array} = \begin{array}{r} 5\ 0 \\ \times\ 5 \\ \hline 2\ 5\ 0 \\ \hline \end{array}$

Hence A = 0, B = 5, C = 2

7.

$$\begin{array}{r} A\ B \\ \times\ 6 \\ \hline B\ B\ B \\ \hline \end{array} = \begin{array}{r} 7\ 4 \\ \times\ 6 \\ \hline 4\ 4\ 4 \\ \hline \end{array}$$

Hence A = 7, B = 4

8.

$$\begin{array}{r} A\ 1 \\ +\ 1\ B \\ \hline B\ 0 \\ \hline \end{array} \rightarrow \begin{array}{r} 7\ 1 \\ +\ 1\ 9 \\ \hline 9\ 0 \\ \hline \end{array}$$

Hence A = 7, B = 9

9.

$$\begin{array}{r} 2\ A\ B \\ +\ A\ B\ 1 \\ \hline B\ 1\ 8 \\ \hline \end{array} \rightarrow \begin{array}{r} 2\ 4\ 7 \\ +\ 4\ 7\ 1 \\ \hline 7\ 1\ 8 \\ \hline \end{array}$$

Hence A = 4, B = 7

10.

$$\begin{array}{r} 1\ 2\ A \\ +\ 6\ A\ B \\ \hline A\ 0\ 9 \\ \hline \end{array} \rightarrow \begin{array}{r} 1\ 2\ 8 \\ +\ 6\ 8\ 1 \\ \hline 8\ 0\ 9 \\ \hline \end{array}$$

Hence A = 8, B = 1

EXERCISE 16.2

1. If a no. is a multiple of 9, then he sum of its digit will be divisible by 9.
Sum of digits of 21 y 5 = 2 + 1 + y + 5 = 8 + y
Hence, 8 + y should be a multiple by 9
This is possible when 8 + y is any one of these no is 0, 9, 18, 27 and so on....
However, since y is a single digit no. this sum can be 9 only. Therefore y should be 1 only.

2. Here, in this given no., the sum of the digits is 3 + 1 + z + 5 = 9 + z
Hence, the smallest no. that can be substituted in place of Z such that no. is divisible by 9 is 0 or 9
So, the value of z is 0 or 9

3. Since 24x is a multiple of 3, the sum of its digit is a multiple of 3
Sum of digit of 24x = 2 + 4 + x = 6 + x
Hence, 6 + x is a multiple of 3
This is possible when 6 + x is an one of these no. 0, 3, 6, 9 and so on.....
Since x is a single digit no. the sum of the digits can be 6 or 9 or 12 or 15 and thus, the value of x comes to 0 or 3 or 6 or 9 respectively
Thus, x can have its value as any of the four different values 0, 3, 6 or 9

4. Since 31z5 is a multiple of 3, the sum of its digit will be a multiple of 3.
That is 3 + 1 + z + 5 = 9 + z is a multiple of 3
this is possible when 9 + z any one of 0, 3, 6, 9, 12, 15 and so on....
Since z is a single digit no. the values of 9+z can only be 9 or 12 or 15 or 18 and thus, the value of x comes to 0 or 3 or 6 or 9 respectively
Thus, z can have its value as any one of the four different values 0, 3, 6 or 9.

SUBJECT ENRICHMENT EXERCISE

I. 1. A = 7, B =

2. 2

3. Both 9 and 5

4. 3

5. an even no. or 0

6. 5 or 0

7. 3

II. (a) 30 + 7 = 3 × 10 + 7 × 1

(b) 9 and 11

(c) 10 paise

(d) $100a + 10b + c$

(e) 0

(f) 2, 5 or 10.

III. (a) False

(b) True

(c) True

(d) False

(e) True

(f) False

(g) False