Mathematics

(Chapter – 1) (Rational Numbers)

(Class – VIII)

Exercise 1.1

Question 1:

Using appropriate properties find:

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

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

Answer 1:

(i) $-\frac{2}{3}\times\frac{3}{5}+\frac{5}{2}-\frac{3}{5}\times\frac{1}{6} = -\frac{2}{3}\times\frac{3}{5}-\frac{3}{5}\times\frac{1}{6}+\frac{5}{2}$ [Using associative property]

$= \frac{3}{5}\left(\frac{-2}{3}-\frac{1}{6}\right)+\frac{5}{2}$ [Using distributive property]

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

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

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

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

$= \frac{2}{5}\times\left(\frac{-3}{7}+\frac{1}{14}\right)-\frac{1}{4}$ [Using distributive property]

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

$= \frac{-1}{7}-\frac{1}{4} = \frac{-4-7}{28} = \frac{-11}{28}$

Question 2:

Write the additive inverse of each of the following:

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

(ii) $\frac{-5}{9}$

(iii) $\frac{-6}{-5}$

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

(v) $\frac{19}{-6}$

Answer 2:

We know that additive inverse of a rational number $\frac{a}{b}$ is $\left(\frac{-a}{b}\right)$, such that $\frac{a}{b}+\left(\frac{-a}{b}\right)=0$.

(i) Additive inverse of $\frac{2}{8}$ is $\frac{-2}{8}$.

(ii) Additive inverse of $\frac{-5}{9}$ is $\frac{5}{9}$.

(iii) Additive inverse of $\frac{-6}{-5}$ is $\frac{-6}{5}$.

(iv) Additive inverse of $\frac{2}{-9}$ is $\frac{2}{9}$.

(v) Additive inverse of $\frac{19}{-6}$ is $\frac{19}{6}$.

Question 3:

Verify that $-(-x)=x$ for:

(i) $x=\frac{11}{15}$ (ii) $x=-\frac{13}{17}$

Answer 3:

(i) Putting $x=\frac{11}{15}$ in $-(-x)=x$,

$$-\left(-\frac{11}{15}\right)=\frac{11}{15} \quad \Rightarrow \quad \frac{11}{15}=\frac{11}{15}$$

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

Hence, verified.

(ii) Putting $x=\frac{-13}{17}$ in $-(-x)=x$,

$$-\left\{-\left(\frac{-13}{17}\right)\right\}=\frac{-13}{17} \quad \Rightarrow \quad \frac{-13}{17}=\frac{-13}{17}$$

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

Hence, verified.

Question 4:

Find the multiplicative inverse of the following:

(i) -13

(ii) $\frac{-13}{19}$

(iii) $\frac{1}{5}$

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

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

(vi) -1

Answer 4:

We know that multiplicative inverse of a rational number a is $\left(\frac{1}{a}\right)$, such that $a\times\frac{1}{a}=1$.

(i) Multiplicative inverse of -13 is $\frac{-1}{13}$.

(ii) Multiplicative inverse of $\frac{-13}{19}$ is $\frac{-19}{13}$.

(iii) Multiplicative inverse of $\frac{1}{5}$ is 5.

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

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

(vi) Multiplicative inverse of -1 is $\frac{1}{-1}$.

Question 5:

Name the property under multiplication used in each of the following:

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

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

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

Answer 5:

(i) 1 is the multiplicative identity.

(ii) Commutative property.

(iii) Multiplicative Inverse property.

Question 6:

Multiply $\frac{6}{13}$ by the reciprocal of $\frac{-7}{16}$.

Answer 6:

The reciprocal of $\frac{-7}{16}$ is $\frac{-16}{7}$.

According to the question,

$$\frac{6}{13}\times\left(\frac{-16}{7}\right)=\frac{-96}{91}$$

Question 7:

Tell what property allows you to compute $\frac{1}{3}\times\left(6\times\frac{4}{3}\right)$ as $\left(\frac{1}{3}\times 6\right)\times\frac{4}{3}$.

Answer 7:

By using associative property of multiplication, $a\times(b\times c)=(a\times b)\times c$.

Question 8:

Is $\frac{8}{9}$ the multiplicative inverse of $-1\frac{1}{8}$? Why or why not?

Answer 8:

Since multiplicative inverse of a rational number a is $\left(\frac{1}{a}\right)$, if $a\times\frac{1}{a}=1$.

Therefore, $\frac{8}{9}\times\left(-1\frac{1}{8}\right) = \frac{8}{9}\times\frac{-9}{8} = -1$

But its product must be positive 1.

Therefore, $\frac{8}{9}$ is not the multiplicative inverse of $\left(-1\frac{1}{8}\right)$.

Question 9:

Is 0.3 the multiplicative inverse of $3\frac{1}{3}$? Why or why not?

Answer 9:

Since multiplicative inverse of a rational number a is $\left(\frac{1}{a}\right)$, if $a\times\frac{1}{a}=1$.

Therefore, $0.3\times 3\frac{1}{3} = \frac{3}{10}\times\frac{10}{3} = 1$

Therefore, Yes 0.3 is the multiplicative inverse of $3\frac{1}{3}$.

Question 10:

Write:

(i) The rational number that does not have a reciprocal.

(ii) The rational numbers that are equal to their reciprocals.

(iii) The rational number that is equal to its negative.

Answer 10:

(i) 0

(ii) 1 and -1

(iii) 0

Question 11:

Fill in the blanks:

(i) Zero has _____ reciprocal.

(ii) The numbers _____ and _____ are their own reciprocals.

(iii) The reciprocal of -5 is _____.

(iv) Reciprocal of $\frac{1}{x}$, where $x \neq 0$ is _____.

(v) The product of two rational numbers is always a _____.

(vi) The reciprocal of a positive rational number is _____

Answer 11:

(i) No

(ii) $1, -1$

(iii) $\frac{-1}{5}$

(iv) x

(v) Rational Number

(vi) Positive

Exercise 1.2

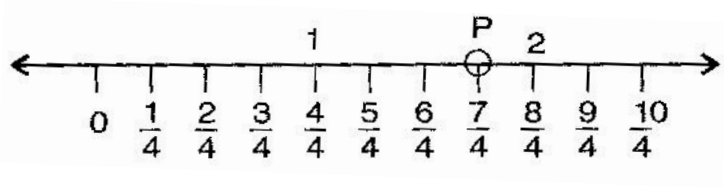
Question 1:

Represent these numbers on the number line:

(i) $\frac{7}{4}$ (ii) $\frac{-5}{6}$

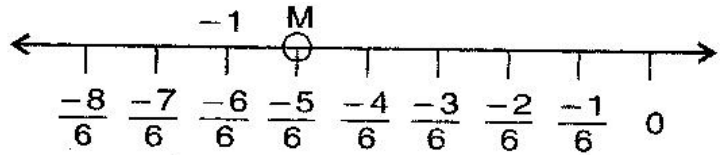
Answer 1:

(i) $\frac{7}{4}=1\frac{3}{4}$



Here, P is $1\frac{3}{4}=\frac{7}{4}$

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



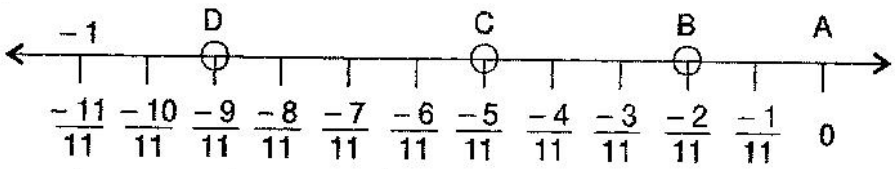
Here, M is $\frac{-5}{6}$

Question 2:

Represent $\frac{-2}{11}, \frac{-5}{11}, \frac{-9}{11}$ on the number line.

Answer 2:

Here, B = $\frac{-2}{11}$, C = $\frac{-5}{11}$ and D = $\frac{-9}{11}$



Question 3:

Write five rational numbers which are smaller than 2.

Answer 3:

$\frac{1}{3}, \frac{1}{4}, \frac{1}{2}, \frac{-1}{2}, \frac{-1}{5}$ and so on.

Question 4:

Find ten rational numbers between $\frac{-2}{5}$ and $\frac{1}{2}$.

Answer 4:

Given rational numbers $\frac{-2}{5}$ and $\frac{1}{2}$

Here, L.C.M. of 5 and 2 is 10.

$\therefore \quad \frac{-2}{5} \times \frac{2}{2} = \frac{-4}{10}$ and $\frac{1}{2} \times \frac{5}{5} = \frac{5}{10}$

Again, $\frac{-4}{10} \times \frac{2}{2} = \frac{-8}{20}$ and $\frac{5}{10} \times \frac{2}{2} = \frac{10}{20}$

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

Question 5:

Find five rational numbers between:

(i) $\frac{2}{3}$ and $\frac{4}{5}$ (ii) $\frac{-3}{2}$ and $\frac{5}{3}$ (iii) $\frac{1}{4}$ and $\frac{1}{2}$

Answer 5:

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

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

$\therefore \quad \frac{2}{3}\times\frac{5}{5}=\frac{10}{15}$ and $\frac{4}{5}\times\frac{3}{3}=\frac{12}{15}$

Again $\frac{10}{15}\times\frac{4}{4}=\frac{40}{60}$ and $\frac{12}{15}\times\frac{4}{4}=\frac{48}{60}$

$\therefore$ Five rational numbers between $\frac{2}{3}$ and $\frac{4}{5}$ are $\frac{41}{60},\frac{42}{60},\frac{43}{60},\frac{44}{60},\frac{45}{60}$.

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

L.C.M. of 2 and 3 is 6.

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

$\therefore$ Five rational numbers between $\frac{-3}{2}$ and $\frac{5}{3}$ are $\frac{-8}{6},\frac{-7}{6},0,\frac{1}{6},\frac{2}{6}$.

(iii) $\frac{1}{4}$ and $\frac{1}{2}$

L.C.M. of 4 and 2 is 4.

$\therefore \quad \frac{1}{4}\times\frac{1}{1}=\frac{1}{4}$ and $\frac{1}{2}\times\frac{2}{2}=\frac{2}{4}$

Again $\frac{1}{4}\times\frac{8}{8}=\frac{8}{32}$ and $\frac{2}{4}\times\frac{8}{8}=\frac{16}{32}$

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

Question 6:

Write 5 rational numbers greater than -2.

Answer 6:

Five rational numbers greater than -2 are:

$\frac{-3}{2},-1,\frac{-1}{2},0,\frac{1}{2}$ [Other rational numbers may also be possible]

Question 7:

Find ten rational numbers between $\frac{3}{5}$ and $\frac{3}{4}$.

Answer 7:

The given rational numbers $\frac{3}{5}$ and $\frac{3}{4}$

L.C.M. of 5 and 4 is 20.

$\therefore \quad \frac{3}{5}\times\frac{4}{4}=\frac{12}{20}$ and $\frac{3}{4}\times\frac{5}{5}=\frac{15}{20}$

Again $\quad \frac{12}{20}\times\frac{8}{8}=\frac{96}{160}$ and $\frac{15}{20}\times\frac{8}{8}=\frac{120}{160}$

$\therefore$ Five rational numbers between $\frac{3}{5}$ and $\frac{3}{4}$ are:

$$\frac{97}{160},\frac{98}{160},\frac{99}{160},\frac{100}{160},\frac{101}{160},\frac{102}{160},\frac{103}{160},\frac{104}{160},\frac{105}{160},\frac{106}{160}$$

Mathematics

(Chapter – 2) (Linear Equations in One Variable)

(Class – VIII)

Exercise 2.1

Question 1:

Solve the following: $x-2=7$

Answer 1:

$x-2=7$

$\Rightarrow \quad x-2+2 = 7+2$ [Adding 2 both sides]

$\Rightarrow \quad x = 9$

Question 2:

Solve the following: $y+3=10$

Answer 2:

$y+3=10$

$\Rightarrow \quad y+3-3 = 10-3$ [Subtracting 3 both sides]

$\Rightarrow \quad y = 7$

Question 3:

Solve the following: $6=z+2$

Answer 3:

$6=z+2$

$\Rightarrow \quad 6-2=z+2-2$ [Subtracting 2 both sides]

$\Rightarrow \quad 4=z \quad \Rightarrow \quad z=4$

Question 4:

Solve the following: $\frac{3}{7}+x=\frac{17}{7}$

Answer 4:

$\frac{3}{7}+x=\frac{17}{7}$

$\Rightarrow \quad x+\frac{3}{7}-\frac{3}{7}=\frac{17}{7}-\frac{3}{7}$ [Subtracting $\frac{3}{7}$ both sides]

$\Rightarrow \quad x=\frac{17-3}{7}$

$\Rightarrow \quad x=\frac{14}{7} \quad \Rightarrow \quad x=2$

Question 5:

Solve the following: $6x=12$

Answer 5:

$6x=12$

$\Rightarrow \quad \frac{x}{6}=\frac{12}{6}$ [Dividing both sides by 6]

$\Rightarrow \quad x=2$

Question 6:

Solve the following: $\frac{t}{5}=10$

Answer 6:

$\frac{t}{5}=10$

$\Rightarrow \quad \frac{t}{5}\times 5 = 10 \text{ x } 5$ [Multiplying both sides by 5]

$\Rightarrow \quad t = 50$

Question 7:

Solve the following: $\frac{2x}{3}=18$

Answer 7:

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

$\Rightarrow \quad \frac{2x}{3}\times 3=18\times 3$ [Multiplying both sides by 3]

$\Rightarrow \quad 2x=18\times 3$

$\Rightarrow \quad \frac{2x}{2}=\frac{18\times 3}{2}$ [Dividing both sides by 2]

$\Rightarrow \quad x=27$

Question 8:

Solve the following: $1.6=\frac{y}{1.5}$

Answer 8:

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

$\Rightarrow \quad 1.6\times 1.5=\frac{y}{1.5}\times 1.5$ [Multiplying both sides by 1.5]

$\Rightarrow \quad 2.40=y \quad \Rightarrow \quad y=2.40$

Question 9:

Solve the following: $7x-9=16$

Answer 9:

$7x-9=16$

$\Rightarrow \quad 7x-9+9=16+9$ [Adding 9 both sides]

$\Rightarrow \quad 7x=25 \quad \Rightarrow \quad \frac{7x}{7}=\frac{25}{7}$ [Dividing both sides by 7]

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

Question 10:

Solve the following: $14y-8=13$

Answer 10:

$14y-8=13$

$\Rightarrow \quad 14y-8+8=13+8$ [Adding 8 both sides]

$\Rightarrow \quad 14y=21$

$\Rightarrow \quad \frac{14y}{14}=\frac{21}{14}$ [Dividing both sides by 14]

$\Rightarrow \quad y=\frac{3}{2}$

Question 11:

Solve the following: $17+6p=9$

Answer 11:

$17+6p=9$

$\Rightarrow \quad 17+6p-17=9-17$ [Subtracting 17 from both sides]

$\Rightarrow \quad 6p=-8$

$\Rightarrow \quad \frac{6p}{6}=\frac{-8}{6}$ [Dividing both sides by 6]

$\Rightarrow \quad p=\frac{-4}{3}$

Question 12:

Solve the following: $\frac{x}{3}+1=\frac{7}{15}$

Answer 12:

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

$\Rightarrow \quad \frac{x}{3}+1-1=\frac{7}{15}-1$ [Subtracting 1 from both sides]

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

$$\Rightarrow \quad \frac{x}{3} = \frac{-8}{15}$$

$$\Rightarrow \quad \frac{x}{3} \times 3 = \frac{-8}{15} \times 3 \qquad \text{[Multiplying both sides by 3]}$$

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

Exercise 2.2

Question 1:

If you subtract $\frac{1}{2}$ from a number and multiply the result by $\frac{1}{2}$, you get $\frac{1}{8}$. What is the number?

Answer 1:

Let the number be x.

According to the question, $\frac{1}{2}\left(x-\frac{1}{2}\right)=\frac{1}{8}$

$\Rightarrow \quad 2\times\frac{1}{2}\left(x-\frac{1}{2}\right)=\frac{1}{8}\times 2$ [Multiplying both sides by 2]

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

$\Rightarrow \quad x-\frac{1}{2}+\frac{1}{2}=\frac{1}{4}+\frac{1}{2}$ [Adding both sides $\frac{1}{2}$]

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

$\Rightarrow \quad x=\frac{3}{4}$

Hence, the required number is $\frac{3}{4}$.

Question 2:

The perimeter of a rectangular swimming pool is 154 m. Its length is 2 m more than twice its breadth. What are the length and breadth?

Answer 2:

Let the breadth of the pool be x m.

Then, the length of the pool = $(2x+2)$ m

Perimeter = $2(l+b)$

$\Rightarrow \quad 154 = 2(2x+2+x)$

$\Rightarrow \quad \frac{154}{2} = \frac{2(2x+2+x)}{2}$ [Dividing both sides by 2]

$\Rightarrow \quad 77 = 3x+2$

$\Rightarrow \quad 77-2 = 3x+2-2$ [Subtracting 2 from both sides]

$\Rightarrow \quad 75 = 3x$

$\Rightarrow \quad \frac{75}{3} = \frac{3x}{3}$ [Dividing both sides by 3]

$\Rightarrow \quad 25 = x$

$\Rightarrow \quad x = 25 \text{ m}$

Length of the pool = $2x+2 =$ 2 x 25 + 2 = 50 + 2 = 52 m

Breadth of the pool = 25 m

Hence, the length of the pool is 52 m and breadth is 25 m.

Question 3:

The base of an isosceles triangle is $\frac{4}{3}$ cm. The perimeter of the triangle is $4\frac{2}{15}$ cm. What is the length of either of the remaining equal sides?

Answer 3:

Let each of equal sides of an isosceles triangle be x cm.

Perimeter of a triangle = Sum of all three sides

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

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

$\Rightarrow \quad \frac{62}{15}-\frac{4}{3} = \frac{4}{3}-\frac{4}{3}+2x$ [Subtracting $\frac{4}{3}$ from both the sides]

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

$\Rightarrow \quad \frac{42}{15} = 2x$

$\Rightarrow \quad \frac{42}{15\times 2} = \frac{2x}{2}$ [Dividing both sides by 2]

$\Rightarrow \quad \frac{7}{5} = x$

$\Rightarrow \quad x = 1\frac{2}{5}$ cm

Hence, each equal side of an isosceles triangle is $1\frac{2}{5}$ cm.

Question 4:

Sum of two numbers is 95. If one exceeds the other by 15, find the numbers.

Answer 4:

Sum of two number = 95

Let the first number be x, then another number be $x+15$.

According to the question,

$x + x + 15 = 95$

$\Rightarrow \quad 2x + 15 = 95$

$\Rightarrow \quad 2x + 15 - 15 = 95 - 15$ [Subtracting 15 from both sides]

$\Rightarrow \quad 2x = 80$

$\Rightarrow \quad \frac{2x}{2} = \frac{80}{2}$ [Dividing both sides by 2]

$\Rightarrow \quad x = 40$

So, the first number = 40 and another number = 40 + 15 = 55

Hence, the two numbers are 40 and 55.

Question 5:

Two numbers are in the ratio 5:3. If they differ by 18, what are the numbers?

Answer 5:

Let the two numbers be $5x$ and $3x$.

According to question,

$5x - 3x = 18$

$\Rightarrow \quad 2x = 18$

$\Rightarrow \quad \frac{2x}{2} = \frac{18}{2}$ [Dividing both sides by 2]

$\Rightarrow \quad x = 9$

Hence, first number = 5 x 9 = 45 and second number = 3 x 9 = 27.

Question 6:

Three consecutive integers add up to 51. What are these integers?

Answer 6:

Let the three consecutive integers be $x, x+1$ and $x+2$.

According to the question,

$x+x+1+x+2=51$

$\Rightarrow \quad 3x+3=51$

$\Rightarrow \quad 3x+3-3=51-3$ [Subtracting 3 from both sides]

$\Rightarrow \quad 3x=48$

$\Rightarrow \quad \frac{3x}{3}=\frac{48}{3}$ [Dividing both sides by 3]

$\Rightarrow \quad x=16$

Hence, first integer = 16, second integer = 16 + 1 = 17 and third integer = 16 + 2 = 18.

Question 7:

The sum of three consecutive multiples of 8 is 888. Find the multiples.

Answer 7:

Let the three consecutive multiples of 8 be $x, x+8$ and $x+16$.

According to question, $x+x+8+x+16=888$

$\Rightarrow \quad 3x+24=888$

$\Rightarrow \quad 3x+24-24=888-24$ [Subtracting 24 from both sides]

$\Rightarrow \quad 3x=864$

$\Rightarrow \quad \frac{3x}{3}=\frac{864}{3}$ [Dividing both sides by 3]

$\Rightarrow \quad x=288$

Hence, first multiple of 8 = 288, second multiple of 8 = 288 + 8 = 296 and third multiple of 8 = 288 + 16 = 304.

Question 8:

Three consecutive integers are such that when they are taken in increasing order and multiplied by 2, 3 and 4 respectively, they add up to 74. Find these numbers.

Answer 8:

Let the three consecutive integers be $x, x+1$ and $x+2$.

According to the question, $2x+3(x+1)+4(x+2)=74$

$\Rightarrow \quad 2x+3x+3+4x+8=74$

$\Rightarrow \quad 9x+11=74$

$\Rightarrow \quad 9x+11-11=74-11$ [Subtracting 11 from both sides]

$\Rightarrow \quad 9x=63$

$\Rightarrow \quad \frac{9x}{9}=\frac{63}{9}$ [Dividing both sides by 9]

$\Rightarrow \quad x=7$

Hence first integer = 7, second integer = 7 + 1 = 8 and third integer = 7 + 2 = 9.

Question 9:

The ages of Rahul and Haroon are in the ratio 5:7. Four years later the sum of their ages will be 56 years. What are their present ages?

Answer 9:

Let the present ages of Rahul and Haroon be $5x$ years and $7x$ years respectively.

According to condition, $(5x+4)+(7x+4)=56$

$\Rightarrow \quad 12x+8=56$

$\Rightarrow \quad 12x+8-8=56-8$ [Subtracting 8 from both sides]

$\Rightarrow \quad 12x=48$

$\Rightarrow \quad \frac{12x}{12}=\frac{48}{12}$ [Dividing both sides by 12]

$\Rightarrow \quad x=4$

Hence, present age of Rahul = 5 x 4 = 20 years and present age of Haroon = 7 x 4 = 28 years.

Question 10:

The number of boys and girls in a class are in the ratio 7 : 5. The number of boys is 8 more than the number of girls. What is the total class strength?

Answer 10:

Let the number of girls be x.

Then, the number of boys = $x+8$.

According to the question, $\frac{x+8}{x}=\frac{7}{5}$

$\Rightarrow \quad 5(x+8)=7x$

$\Rightarrow \quad 5x+40=7x$

$\Rightarrow \quad 5x-7x=-40$ [Transposing $7x$ to L.H.S. and 40 to R.H.S.]

$\Rightarrow \quad -2x=-40$

$\Rightarrow \quad \frac{-2x}{-2}=\frac{-40}{-2}$ [Dividing both sides by -2]

$\Rightarrow \quad x=20$

Hence the number of girls = 20 and number of boys = 20 + 8 = 28.

Question 11:

Baichung's father is 26 years younger than Baichung's grandfather and 29 years older than Baichung. The sum of the ages of all the three is 135 years. What is the age of each one of them?

Answer 11:

Let Baichung's age be x years, then Baichung's father's age = $(x+29)$ years and Baichung's granddaughter's age = $(x+29+26)=(x+55)$ years.

According to condition, $x+x+29+x+55=135$

$\Rightarrow \quad 3x+84=135$

$\Rightarrow \quad 3x+84-84=135-84$ [Subtracting 84 from both sides]

$\Rightarrow \quad 3x=51$

$\Rightarrow \quad \frac{3x}{3}=\frac{51}{3}$ [Dividing both sides by 3]

$\Rightarrow \quad x=17$ years

Hence, Baichung's age = 17 years, Baichung's father's age = 17 + 29 = 46 years and Baichung's granddaughter's age = 17 + 29 + 26 = 72 years.

Question 12:

Fifteen years from now Ravi's age will be four times his present age. What is Ravi's present age?

Answer 12:

Let Ravi's present age be x years.

After fifteen years, Ravi's age = $4x$ years.

Fifteen years from now, Ravi's age = $(x+15)$ years.

According to question, $4x = x+15$

$\Rightarrow \quad 4x - x = 15$ [Transposing x to L.H.S.]

$\Rightarrow \quad 3x = 15$

$\Rightarrow \quad \frac{3x}{3} = \frac{15}{3}$ [Dividing both sides by 3]

$\Rightarrow \quad x = 5$ years

Hence, Ravi's present age be 5 years.

Question 13:

A rational number is such that when you multiply it by $\frac{5}{2}$ and add $\frac{2}{3}$ to the product, you get $\frac{-7}{12}$. What is the number?

Answer 13:

Let the rational number be x.

According to the question, $\frac{5}{2}x + \frac{2}{3} = \frac{-7}{12}$

$\Rightarrow \quad \frac{5}{2}x + \frac{2}{3} - \frac{2}{3} = \frac{-7}{12} - \frac{2}{3}$ [Subtracting $\frac{2}{3}$ from both sides]

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

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

$\Rightarrow \quad 5x \times 12 = -15 \times 2$

$\Rightarrow \quad 60x = -30$

$\Rightarrow \quad \frac{60x}{60} = \frac{-30}{60}$ [Dividing both sides by 60]

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

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

Question 14:

Lakshmi is a cashier in a bank. She has currency notes of denominations ₹100, ₹50 and ₹10 respectively. The ratio of the number of these notes is 2:3:5. The total cash with Lakshmi is ₹4,00,000. How many notes of each denomination does she have?

Answer 14:

Let number of notes be $2x, 3x$ and $5x$.

According to question, $100 \times 2x + 50 \times 3x + 10 \times 5x = 4,00,000$

$\Rightarrow \quad 200x + 150x + 50x = 4,00,000$

$\Rightarrow \quad 400x = 4,00,000$

$\Rightarrow \quad \frac{400x}{400} = \frac{4,00,000}{400}$ [Dividing both sides by 400]

$\Rightarrow \quad x = 1000$

Hence, number of denominations of ₹100 notes = 2 x 1000 = 2000

Number of denominations of ₹50 notes = 3 x 1000 = 3000

Number of denominations of ₹10 notes = 5 x 1000 = 5000

Therefore, required denominations of notes of ₹100, ₹50 and ₹10 are 2000, 3000 and 5000 respectively.

Question 15:

I have a total of ₹300 in coins of denomination ₹1, ₹2 and ₹5. The number of ₹2 coins is 3 times the number of ₹5 coins. The total number of coins is 160. How many coins of each denomination are with me?

Answer 15:

Total sum of money = ₹300

Let the number of ₹5 coins be x, number of ₹2 coins be $3x$ and number of ₹1 coins be $160 - (x + 3x) = 160 - 4x$.

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

$\Rightarrow \quad 5x+6x+160-4x=300$

$\Rightarrow \quad 7x+160=300$

$\Rightarrow \quad 7x+160-160=300-160$ [Subtracting 160 from both sides]

$\Rightarrow \quad 7x=140$

$\Rightarrow \quad \frac{7x}{7}=\frac{140}{7}$ [Dividing both sides by 7]

$\Rightarrow \quad x=20$

Hence, the number of coins of ₹5 denomination = 20

Number of coins of ₹2 denomination = 3 x 20 = 60

Number of coins of ₹1 denomination = 160 – 4 x 20 = 160 – 80 = 80

Question 16:

The organizers of an essay competition decide that a winner in the competition gets a prize of ₹100 and a participant who does not win, gets a prize of ₹25. The total prize money distributed is ₹3,000. Find the number of participants is 63.

Answer 16:

Total sum of money = ₹3000

Let the number of winners of ₹100 be x.

And those who are not winners = $63-x$

According to the question, $100\times x+25\times(63-x)=3000$

$\Rightarrow \quad 100x+1575-25x=3000$

$\Rightarrow \quad 75x+1575=3000$

$\Rightarrow \quad 7x+1575-1575=3000-1575$ [Subtracting 1575 from both sides]

$\Rightarrow \quad 7x=1425$

$\Rightarrow \quad \frac{7x}{7}=\frac{1425}{7}$ [Dividing both sides by 7]

$\Rightarrow \quad x=19$

Hence the number of winner is 19.

Exercise 2.3

Question 1:

Solve the following equations and check your results: $3x = 2x + 18$

Answer 1:

$3x = 2x + 18$

$\Rightarrow \quad 3x - 2x = 18$

$\Rightarrow \quad x = 18$

To check:

$3x = 2x + 18$

$\Rightarrow \quad 3 \times 18 = 2 \times 18 + 18$

$\Rightarrow \quad 54 = 36 + 18$

$\Rightarrow \quad 54 = 54$

$\Rightarrow \quad$ L.H.S. = R.H.S.

Hence, it is correct.

Question 2:

Solve the following equations and check your results: $5t - 3 = 3t - 5$

Answer 2:

$5t - 3 = 3t - 5$

$\Rightarrow \quad 5t - 3t = -5 + 3$

$\Rightarrow \quad 2t = -2$

$\Rightarrow \quad t = \frac{-2}{2} = -1$

To check:

$5t - 3 = 3t - 5$

$\Rightarrow \quad 5 \times (-1) - 3 = 3 \times (-1) - 5$

$\Rightarrow \quad -5 - 3 = -3 - 5$

$\Rightarrow \quad -8 = -8$

$\Rightarrow \quad$ L.H.S. = R.H.S.

Hence, it is correct.

Question 3:

Solve the following equations and check your results: $5x+9=5+3x$

Answer 3:

$5x+9=5+3x$

$\Rightarrow \quad 5x-3x=5-9$

$\Rightarrow \quad 2x=-4$

$\Rightarrow \quad x=\frac{-4}{2}=-2$

To check:

$5x+9=5+3x$

$\Rightarrow \quad 5\times(-2)+9=5+3\times(-2)$

$\Rightarrow \quad -10+9=5-6$

$\Rightarrow \quad -1=-1$

$\Rightarrow \quad$ L.H.S. = R.H.S.

Hence, it is correct.

Question 4:

Solve the following equations and check your results: $4z+3=6+2z$

Answer 4:

$4z+3=6+2z$

$\Rightarrow \quad 4z-2z=6-3$

$\Rightarrow \quad 2z=3$

$\Rightarrow \quad z=\frac{3}{2}$

To check:

$4z+3=6+2z$

$\Rightarrow \quad 4\times\frac{3}{2}+3=6+2\times\frac{3}{2}$

$\Rightarrow \quad 2\times3+3=6+3$

$\Rightarrow \quad 6+3=9$

$\Rightarrow \quad 9=9$

$\Rightarrow \quad$ L.H.S. = R.H.S.

Hence, it is correct.

Question 5:

Solve the following equations and check your results: $2x-1=14-x$

Answer 5:

$2x-1=14-x$

$\Rightarrow \quad 2x+x=14+1$

$\Rightarrow \quad 3x=15$

$\Rightarrow \quad x=\frac{15}{3}=5$

To check:

$2x-1=14-x$

$\Rightarrow \quad 2\times5-1=14-5$

$\Rightarrow \quad 10-1=9$

$\Rightarrow \quad 9=9$

$\Rightarrow \quad$ L.H.S. = R.H.S.

Hence, it is correct.

Question 6:

Solve the following equations and check your results: $8x+4=3(x-1)+7$

Answer 6:

$8x+4=3(x-1)+7$

$\Rightarrow \quad 8x+4=3x-3+7$

$\Rightarrow \quad 8x-3x=-3+7-4$

$\Rightarrow \quad 5x=0$

$\Rightarrow \quad x=\frac{0}{5}=0$

To check:

$8x+4=3(x-1)+7$

$\Rightarrow \quad 8\times0+4=3(0-1)+7$

$\Rightarrow \quad 0+4=3\times(-1)+7$

$\Rightarrow \quad 4=-3+7$

$\Rightarrow \quad 4=4$

$\Rightarrow \quad$ L.H.S. = R.H.S.

Hence, it is correct.

Question 7:

Solve the following equations and check your results: $x=\frac{4}{5}(x+10)$

Answer 7:

$$x=\frac{4}{5}(x+10)$$
$$\Rightarrow \quad 5x=4(x+10)$$
$$\Rightarrow \quad 5x=4x+40$$
$$\Rightarrow \quad 5x-4x=40$$
$$\Rightarrow \quad x=40$$

To check:

$$x=\frac{4}{5}(x+10)$$
$$\Rightarrow \quad 40=\frac{4}{5}(40+10)$$
$$\Rightarrow \quad 40=\frac{4}{5}\times 50$$
$$\Rightarrow \quad 40=4\times 10$$
$$\Rightarrow \quad 40 = 40$$
$$\Rightarrow \quad \text{L.H.S. = R.H.S.}$$

Hence, it is correct.

Question 8:

Solve the following equations and check your results: $\frac{2x}{3}+1=\frac{7x}{15}+3$

Answer 8:

$$\frac{2x}{3}+1=\frac{7x}{15}+3$$
$$\Rightarrow \quad \frac{2x}{3}-\frac{7x}{15}=3-1$$
$$\Rightarrow \quad \frac{10x-7x}{15}=2$$
$$\Rightarrow \quad 3x=30$$

$$\Rightarrow \qquad x = \frac{30}{3} = 10$$

To check:

$$\frac{2x}{3} + 1 = \frac{7x}{15} + 3$$

$$\Rightarrow \qquad \frac{2\times 10}{3} + 1 = \frac{7\times 10}{15} + 3$$

$$\Rightarrow \qquad \frac{20}{3} + 1 = \frac{14}{3} + 3$$

$$\Rightarrow \qquad \frac{20+3}{3} = \frac{14+9}{3}$$

$$\Rightarrow \qquad \frac{23}{3} = \frac{23}{3}$$

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

Hence, it is correct.

Question 9:

Solve the following equations and check your results: $2y + \frac{5}{3} = \frac{26}{3} - y$

Answer 9:

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

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

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

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

$$\Rightarrow \qquad y = \frac{21}{3\times 3} = \frac{7}{3}$$

To check:

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

$$\Rightarrow \qquad 2\times\frac{7}{3} + \frac{5}{3} = \frac{26}{3} - \frac{7}{3}$$

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

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

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

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

Hence, it is correct.

Question 10:

Solve the following equations and check your results: $3m=5m-\frac{8}{5}$

Answer 10:

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

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

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

$$\Rightarrow \quad m=\frac{-8}{5\times(-2)}$$

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

To check:

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

$$\Rightarrow \quad 3\times\frac{4}{5}=5\times\frac{4}{5}-\frac{8}{5}$$

$$\Rightarrow \quad \frac{12}{5}=4-\frac{8}{5}$$

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

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

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

Hence, it is correct.

Exercise 2.4

Question 1:

Amina thinks of a number and subtracts $\frac{5}{2}$ from it. She multiplies the result by 8. The result now obtained is 3 times the same number she thought of. What is the number?

Answer 1:

Let Amina think a number x.

According to the question, $8\left(x-\frac{5}{2}\right)=3x$

$\Rightarrow \quad 8x-\frac{8\times 5}{2}=3x$

$\Rightarrow \quad 8x-4\times 5=3x$

$\Rightarrow \quad 8x-20=3x$

$\Rightarrow \quad 8x-3x=20$

$\Rightarrow \quad 5x=20$

$\Rightarrow \quad x=\frac{20}{5}=4$

Hence, the number is 4.

Question 2:

A positive number is 5 times another number. If 21 is added to both the numbers, then one of the new numbers becomes twice the other new number. What are the numbers?

Answer 2:

Let another number be x.

Then positive number = $5x$

According to the question, $5x+21=2(x+21)$

$\Rightarrow \quad 5x+21=2x+42$

$\Rightarrow \quad 5x-2x=42-21$

$\Rightarrow \quad 3x=21$

$\Rightarrow \quad x=\frac{21}{3}=7$

Hence another number = 7 and positive number = 5 x 7 =35

Question 3:

Sum of the digits of a two-digit number is 9. When we interchange the digits, it is found that the resulting new number is greater than the original number by 27. What is the two-digit number?

Answer 3:

Let the unit place digit of a two-digit number be x.

Therefore, the tens place digit = $9-x$

$\because$ 2-digit number = 10 x tens place digit + unit place digit

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

According to the question, New number = Original number + 27

$\Rightarrow \quad 10x+(9-x)=10(9-x)+x+27$

$\Rightarrow \quad 10+9-x=90-10x+x+27$

$\Rightarrow \quad 9x+9=117-9x$

$\Rightarrow \quad 9x+9x=117-9$

$\Rightarrow \quad 18x=108$

$\Rightarrow \quad x=\frac{108}{18}=6$

Hence, the 2-digit number = $10(9-x)+x$ = 10 (9 – 6) + 6 = 10 x 3 + 6 = 30 + 6 = 36

Question 4:

One of the two digits of a two-digit number is three times the other digit. If you interchange the digits of this two-digit number and add the resulting number to the original number, you get 88. What is the original number?

Answer 4:

Let the unit place digit of a two-digit number be x.

Therefore, the tens place digit = $3x$

$\because$ 2-digit number = 10 x tens place digit + unit place digit

$\therefore$ Original number = $10\times 3x+x=30x+x = 31x$

According to the question, New number + Original number = 88

$\Rightarrow \quad 10x+3x+31x=88$

$\Rightarrow \quad 44x=88$

$\Rightarrow \quad x=\frac{88}{44}=2$

Hence, the 2-digit number = $31x=31\times 2=62$

Question 5:

Shobo's mother's present age is six times Shobo's present age. Shobo's age five years from now will be one third of his mother's present age. What are their present age?

Answer 5:

Let Shobo's present age be x years.

And Shobo's mother's present age = $6x$ years

According to the question, $x+5=\frac{1}{3}\times 6x$

$\Rightarrow \quad x+5=2x$

$\Rightarrow \quad 2x=x+5$

$\Rightarrow \quad 2x-x=5$

$\Rightarrow \quad x=5$ years.

Hence, Shobo's present age = 5 years and Shobo's mother's present age = 6 x 5 = 30 years

Question 6:

There is a narrow rectangular plot, reserved for a school, in Mahuli village. The length and breadth of the plot are in the ratio 11:4. At the rate ` 100 per meter it will cost the village panchayat ` 75,000 to fence the plot. What are the dimensions of the plot?

Answer 6:

Let the length and breadth of the rectangular plot be $11x$ and $4x$ respectively.

$\therefore \quad$ Perimeter of the plot = $\frac{\text{Total Cost}}{\text{Cost of 1 meter}} = \frac{75000}{100}$ = 750 m

We know that Perimeter of rectangle = 2 (length + breadth)

Therefore, according to the question, $750=2(11x+4x)$

$\Rightarrow \quad 750=2\times 15x$

$\Rightarrow \quad 750=30x$

$\Rightarrow \quad 30x=750$

$\Rightarrow \quad x=\frac{750}{30}=25$

Hence, length of rectangular plot = 11 x 25 = 275 m and breadth of rectangular plot = 4 x 25 = 100 m

Question 7:

Hasan buys two kinds of cloth materials for school uniforms, shirt material that costs him ₹50 per meter and trouser material that costs him ₹90 per meter. For every 2 meters of the trouser material he buys 3 meters of the shirt material. He sells the materials at 12% and 10% respectively. His total sale is ₹36,000. How much trouser material did he buy?

Answer 7:

Let ratio between shirt material and trouser material be $3x : 2x$.

The cost of shirt material = $50 \times 3x = 150x$

The selling price at 12% gain = $\frac{100 + \text{P\%}}{100} \times \text{C.P.} = \frac{100+12}{100} \times 150x$

$= \frac{112}{100} \times 150x = 168x$

The cost of trouser material = $90 \times 2x = 180x$

The selling price at 12% gain = $\frac{100 + \text{P\%}}{100} \times \text{C.P.} = \frac{100+10}{100} \times 180x$

$= \frac{110}{100} \times 180x = 198x$

According to the question, $168x + 198x = 36,600$

$\Rightarrow \quad 366x = 36600$

$\Rightarrow \quad x = \frac{36600}{366} = 100$ meters

Now, trouser material = $2x$ = 2 x 100 = 200 meters

Hence, Hasan bought 200 meters of the trouser material.

Question 8:

Half of a herd of deer are grazing in the field and three fourths of the remaining are playing nearby. The rest 9 are drinking water from the pond. Find the number of deer in the herd.

Answer 8:

Let the total number of deer in the herd be x.

According to question, $x = \frac{x}{2} + \frac{3}{4} \times \left(x - \frac{x}{2} \right) + 9$

$\Rightarrow \quad x = \frac{x}{2} + \frac{3}{4}\left(\frac{2x - x}{2} \right) + 9$

$$\Rightarrow \quad x=\frac{x}{2}+\frac{3}{4}\times\frac{x}{2}+9$$

$$\Rightarrow \quad x=\frac{x}{2}+\frac{3}{8}x+9$$

$$\Rightarrow \quad x-\frac{x}{2}-\frac{3x}{8}=9$$

$$\Rightarrow \quad \frac{8x-4x-3x}{8}=9$$

$$\Rightarrow \quad \frac{x}{8}=9$$

$$\Rightarrow \quad x=9\times 8=72$$

Hence, the total number of deer in the herd is 72.

Question 9:

A grandfather is ten times older than his granddaughter. He is also 54 years older than her. Find their present ages.

Answer 9:

Let present age of granddaughter be x years.

Therefore, Grandfather's age = $10x$ years

According to question, $10x=x+54$

$$\Rightarrow \quad 10x-x=54$$

$$\Rightarrow \quad 9x=54$$

$$\Rightarrow \quad x=\frac{54}{9}=6 \text{ years}$$

Hence, granddaughter's age = 6 years and grandfather's age = 10 x 6 = 60 years.

Question 10:

Aman's age is three times his son's age. Ten years ago he was five times his son's age. Find their present ages.

Answer 10:

Let the present age of Amon's son be x years.

Therefore, Aman's age = $3x$ years

According to question, $3x-10=5(x-10)$

$$\Rightarrow \quad 3x-10=5x-50$$

$$\Rightarrow \quad 3x-5x=-50+10$$

$\Rightarrow \quad -2x = -40$

$\Rightarrow \quad x = \frac{-40}{-2}$ = 20 years

Hence, Aman's son's age = 20 years and Aman's age = 3 x 2 = 60 years

Exercise 2.5

Question 1:

Solve the following linear equation: $\frac{x}{2}-\frac{1}{5}=\frac{x}{3}+\frac{1}{4}$

Answer 1:

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

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

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

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

$$\Rightarrow \quad x=\frac{9\times 6}{20}=\frac{27}{10}$$

To check:

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

$$\Rightarrow \quad \frac{27}{10\times 2}-\frac{1}{5}=\frac{27}{10\times 3}+\frac{1}{4}$$

$$\Rightarrow \quad \frac{27}{20}-\frac{1}{5}=\frac{9}{10}+\frac{1}{4}$$

$$\Rightarrow \quad \frac{27-4}{20}=\frac{18+5}{20}$$

$$\Rightarrow \quad \frac{23}{20}=\frac{23}{20}$$

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

Therefore, it is correct.

Question 2:

Solve the following linear equation: $\frac{n}{2}-\frac{3n}{4}+\frac{5n}{6}=21$

Answer 2:

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

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

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

$$\Rightarrow \quad n=\frac{21\times 12}{7}$$

$$\Rightarrow \quad n=36$$

To check:

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

$$\Rightarrow \quad \frac{36}{2}-\frac{3\times 36}{4}+\frac{5\times 36}{6}=21$$

$$\Rightarrow \quad 18-27+30=21$$

$$\Rightarrow \quad 21 = 21$$

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

Therefore, it is correct.

Question 3:

Solve the following linear equation: $x+7-\frac{8x}{3}=\frac{17}{6}-\frac{5x}{2}$

Answer 3:

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

$$\Rightarrow \quad \frac{x}{1}-\frac{8x}{3}+\frac{5x}{2}=\frac{17}{6}-\frac{7}{1}$$

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

$$\Rightarrow \quad \frac{5x}{6} = \frac{-25}{6}$$

$$\Rightarrow \quad x = \frac{-25 \times 6}{6 \times 5}$$

$$\Rightarrow \quad x = -5$$

To check:

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

$$\Rightarrow \quad -5 + 7 - \frac{8 \times (-5)}{3} = \frac{17}{6} - \frac{5 \times (-5)}{2}$$

$$\Rightarrow \quad 2 + \frac{40}{3} = \frac{17}{6} + \frac{25}{2}$$

$$\Rightarrow \quad \frac{6 + 40}{3} = \frac{17 + 75}{6}$$

$$\Rightarrow \quad \frac{46}{3} = \frac{92}{6}$$

$$\Rightarrow \quad \frac{46}{3} = \frac{46}{3}$$

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

Therefore, it is correct.

Question 4:

Solve the following linear equation: $\frac{x-5}{3} = \frac{x-3}{5}$

Answer 4:

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

$$\Rightarrow \quad 5 \times (x-5) = 3(x-3)$$

$$\Rightarrow \quad 5x - 25 = 3x - 9$$

$$\Rightarrow \quad 5x - 3x = -9 + 25$$

$$\Rightarrow \quad 2x = 16$$

$$\Rightarrow \quad x = \frac{16}{2} = 8$$

To check:

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

$$\Rightarrow \quad \frac{8-5}{3}=\frac{8-3}{5}$$

$$\Rightarrow \quad \frac{3}{3}=\frac{5}{5}$$

$$\Rightarrow \quad 1 = 1$$

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

Therefore, it is correct.

Question 5:

Solve the following linear equation: $\frac{3t-2}{4}-\frac{2t+3}{3}=\frac{2}{3}-t$

Answer 5:

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

$$\Rightarrow \quad \frac{3t-2}{4}-\frac{2t+3}{3}+t=\frac{2}{3}$$

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

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

$$\Rightarrow \quad \frac{13t-18}{12}=\frac{2}{3}$$

$$\Rightarrow \quad 3\times(13t-18)=2\times12$$

$$\Rightarrow \quad 39t-54=24$$

$$\Rightarrow \quad 39t=24+54$$

$$\Rightarrow \quad 39t=78$$

$$\Rightarrow \quad t=\frac{78}{39}=2$$

To check:

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

$$\Rightarrow \quad \frac{3\times2-2}{4}-\frac{2\times2+3}{3}=\frac{2}{3}-2$$

$$\Rightarrow \quad \frac{6-2}{4}-\frac{4+3}{3}=\frac{2-6}{3}$$

$$\Rightarrow \quad \frac{4}{4}-\frac{7}{3}=\frac{-4}{3}$$

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

$$\Rightarrow \quad \frac{3-7}{3}=\frac{-4}{3}$$

$$\Rightarrow \quad \frac{-4}{3}=\frac{-4}{3}$$

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

Therefore, it is correct.

Question 6:

Solve the following linear equation: $m-\frac{m-1}{2}=1-\frac{m-2}{3}$

Answer 6:

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

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

$$\Rightarrow \quad \frac{6m-3(m-1)+2(m-2)}{6}=1$$

$$\Rightarrow \quad \frac{6m-3m+3+2m-4}{6}=1$$

$$\Rightarrow \quad \frac{5m-1}{6}=1$$

$$\Rightarrow \quad 5m-1=6$$

$$\Rightarrow \quad 5m=6+1$$

$$\Rightarrow \quad 5m=7$$

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

To check:

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

$$\Rightarrow \quad \frac{7}{5}-\frac{\frac{7}{5}-1}{2}=1-\frac{\frac{7}{5}-2}{3}$$

$$\Rightarrow \quad \frac{7}{5}-\frac{\frac{7-5}{5}}{2}=1-\frac{\frac{7-10}{5}}{3}$$

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

$$\Rightarrow \quad \frac{7}{5}-\frac{1}{5}=1+\frac{1}{5}$$

$$\Rightarrow \quad \frac{7-1}{5}=\frac{5+1}{5}$$

$$\Rightarrow \quad \frac{6}{5}=\frac{6}{5}$$

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

Therefore, it is correct.

Question 7:

Simplify and solve the following linear equation: $3(t-3)=5(2t+1)$

Answer 7:

$$3(t-3)=5(2t+1)$$

$$\Rightarrow \quad 3t-9=10t+5$$

$$\Rightarrow \quad 3t-10t=5+9$$

$$\Rightarrow \quad -7t=14$$

$$\Rightarrow \quad t=\frac{14}{-7}$$

$$\Rightarrow \quad t=-2$$

To check:

$$3(t-3)=5(2t+1)$$

$$\Rightarrow \quad 3(-2-3)=5\{2\times(-2)+1\}$$

$$\Rightarrow \quad 3\times -5=5(-4+1)$$

$$\Rightarrow \quad -15=5\times(-3)$$

$$\Rightarrow \quad -15=-15$$

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

Therefore, it is correct.

Question 8:

Simplify and solve the following linear equation: $15(y-4)-2(y-9)+5(y+6)=0$

Answer 8:

$$15(y-4)-2(y-9)+5(y+6)=0$$

$$\Rightarrow \quad 15y-60-2y+18+5y+30=0$$

$$\Rightarrow \quad 18y-12=0$$

$$\Rightarrow \quad 18y=12$$

$$\Rightarrow \quad y=\frac{12}{18}$$

$$\Rightarrow \quad y=\frac{2}{3}$$

To check:

$$15(y-4)-2(y-9)+5(y+6)=0$$

$$\Rightarrow \quad 15\left(\frac{2}{3}-4\right)-2\left(\frac{2}{3}-9\right)+5\left(\frac{2}{3}+6\right)=0$$

$$\Rightarrow \quad 15\left(\frac{2-12}{3}\right)-2\left(\frac{2-27}{3}\right)+5\left(\frac{2+18}{3}\right)=0$$

$$\Rightarrow \quad 15\times\frac{-10}{3}-2\times\frac{-25}{3}+5\times\frac{20}{3}=0$$

$$\Rightarrow \quad -50+\frac{50}{3}+\frac{100}{3}=0$$

$$\Rightarrow \quad -50+\frac{50+100}{3}=0$$

$$\Rightarrow \quad -50+\frac{150}{3}=0$$

$$\Rightarrow \quad -50+50=0$$

$$\Rightarrow \quad 0=0$$

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

Therefore, it is correct.

Question 9:

Simplify and solve the following linear equation: $3(5z-7)-2(9z-11)=4(8z-13)-17$

Answer 9:

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

$\Rightarrow \quad 15z-21-18z+22=32z-52-17$

$\Rightarrow \quad -3z+1=32z-69$

$\Rightarrow \quad -3z-32z=-69-1$

$\Rightarrow \quad -35z=-70$

$\Rightarrow \quad z=\frac{-70}{-35}=2$

To check:

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

$\Rightarrow \quad 3(5\times 2-7)-2(9\times 2-11)=4(8\times 2-13)-17$

$\Rightarrow \quad 3(10-7)-2(18-11)=4(16-13)-17$

$\Rightarrow \quad 3\times 3-2\times 7=4\times 3-17$

$\Rightarrow \quad 9-14=12-17$

$\Rightarrow \quad -5=-5$

$\Rightarrow \quad$ L.H.S. = R. H. S.

Therefore, it is correct.

Question 10:

Simplify and solve the following linear equation: $0.25(4f-3)=0.05(10f-9)$

Answer 10:

$0.25(4f-3)=0.05(10f-9)$

$\Rightarrow \quad 1.00f-0.75=0.50f-0.45$

$\Rightarrow \quad 1.00f-0.50f=-0.45+0.75$

$\Rightarrow \quad 0.50f=0.3$

$\Rightarrow \quad f=\frac{0.3}{0.50}$

$\Rightarrow \quad f=0.6$

To check:

$0.25(4f-3)=0.05(10f-9)$

$\Rightarrow \quad 0.25(4\times0.6-3)=0.05(10\times0.6-9)$

$\Rightarrow \quad 0.25(2.4-3)=0.05(6.0-9)$

$\Rightarrow \quad 0.25\times(-0.6)=0.05\times(-3)$

$\Rightarrow \quad -0.150=-0.150$

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

Therefore, it is correct.

Exercise 2.6

Question 1:

Solve the following equation: $\frac{8x-3}{3x}=2$

Answer 1:

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

$$\Rightarrow \quad 8x-3=2\times 3x$$

$$\Rightarrow \quad 8x-3=6x$$

$$\Rightarrow \quad 8x-6x=3$$

$$\Rightarrow \quad 2x=3$$

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

Question 2:

Solve the following equation: $\frac{9x}{7-6x}=15$

Answer 2:

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

$$\Rightarrow \quad 9x=15(7-6x)$$

$$\Rightarrow \quad 9x=105-90x$$

$$\Rightarrow \quad 9x+90x=105$$

$$\Rightarrow \quad 99x=105$$

$$\Rightarrow \quad x=\frac{105}{99}$$

$$\Rightarrow \quad x=\frac{35}{33}$$

Question 3:

Solve the following equation: $\frac{z}{z+15} = \frac{4}{9}$

Answer 3:

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

$$\Rightarrow \quad z \times 9 = 4(z+15)$$

$$\Rightarrow \quad 9z = 4z + 60$$

$$\Rightarrow \quad 9z - 4z = 60$$

$$\Rightarrow \quad 5z = 60$$

$$\Rightarrow \quad z = \frac{60}{5}$$

$$\Rightarrow \quad z = 12$$

Question 4:

Solve the following equation: $\frac{3y+4}{2-6y} = \frac{-2}{5}$

Answer 4:

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

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

$$\Rightarrow \quad 15y + 20 = -4 + 12y$$

$$\Rightarrow \quad 15y - 12y = -4 - 20$$

$$\Rightarrow \quad 3y = -24$$

$$\Rightarrow \quad y = \frac{-24}{3}$$

$$\Rightarrow \quad y = -8$$

Question 5:

Solve the following equation: $\frac{7y+4}{y+2}=\frac{-4}{3}$

Answer 5:

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

$$\Rightarrow \quad 3(7y+4)=-4(y+2)$$

$$\Rightarrow \quad 21y+12=-4y-8$$

$$\Rightarrow \quad 21y+4y=-8-12$$

$$\Rightarrow \quad 25y=-20$$

$$\Rightarrow \quad y=\frac{-20}{25}$$

$$\Rightarrow \quad y=\frac{-4}{5}$$

Question 6:

The ages of Hari and Harry are in the ratio 5:7. Four years from now the ratio of their ages will be 3:4. Find their present ages.

Answer 6:

Let the Ages of Hari and Harry be $5x$ years and $7x$ years.

According to question, $\frac{5x+4}{7x+4}=\frac{3}{4}$

$$\Rightarrow \quad 4(5x+4)=3(7x+4)$$

$$\Rightarrow \quad 20x+16=21x+12$$

$$\Rightarrow \quad 20x-21x=12-16$$

$$\Rightarrow \quad -x=-4$$

$$\Rightarrow \quad x=4$$

Hence, the age of Hari = $5x$ = 5 x 4 = 20 years and the age of Harry = $7x$ = 7 x 4 = 28 years.

Question 7:

The denominator of a rational number is greater than its numerator by 8. If the numerator is increased by 17 and the denominator is decreased by 1, the number obtained is $\frac{3}{2}$. Find the rational number.

Answer 7:

Let the numerator of a rational number be x, then the denominator is $x+8$.

Therefore, Rational number = $\frac{x}{x+8}$

According to the question,

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

$$\Rightarrow \quad \frac{x+17}{x+7}=\frac{3}{2}$$

$$\Rightarrow \quad 2(x+17)=3(x+7)$$

$$\Rightarrow \quad 2x+34=3x+21$$

$$\Rightarrow \quad 2x-3x=21-34$$

$$\Rightarrow \quad -x=-13$$

$$\Rightarrow \quad x=13$$

Hence, the required rational number = $\frac{x}{x+8}=\frac{13}{13+8}=\frac{13}{21}$.

Mathematics

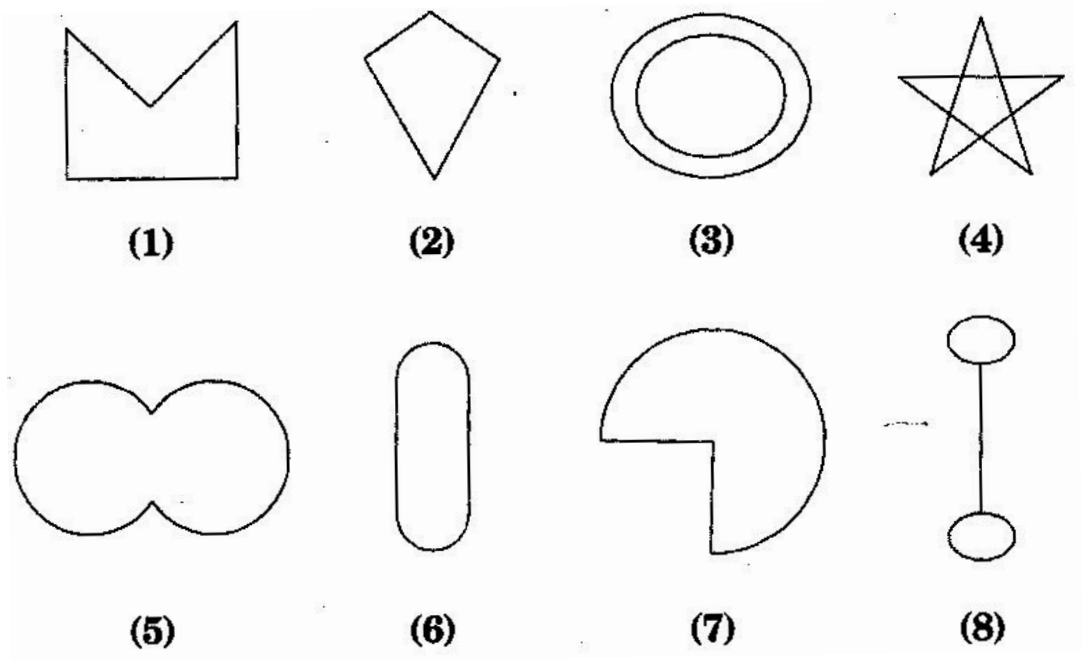
(Chapter – 3) (Understanding Quadrilaterals)

(Class – VIII)

Exercise 3.1

Question 1:

Given here are some figures:



Classify each of them on the basis of the following:

(a) Simple curve

(b) Simple closed curve

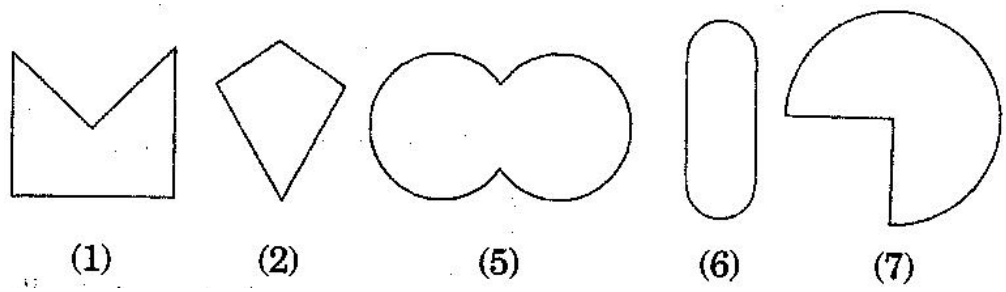
(c) Polygon

(d) Convex polygon

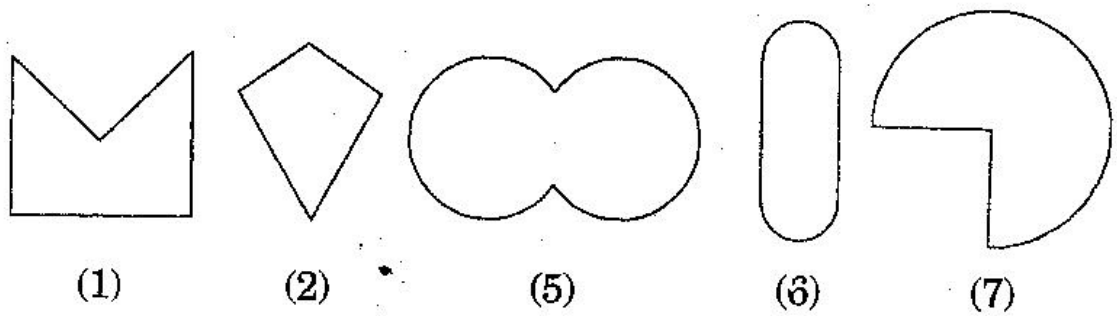
(e) Concave polygon

Answer 1:

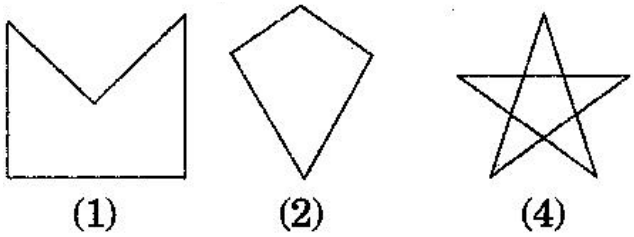
(a) Simple curve



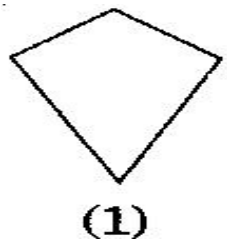
(b) Simple closed curve



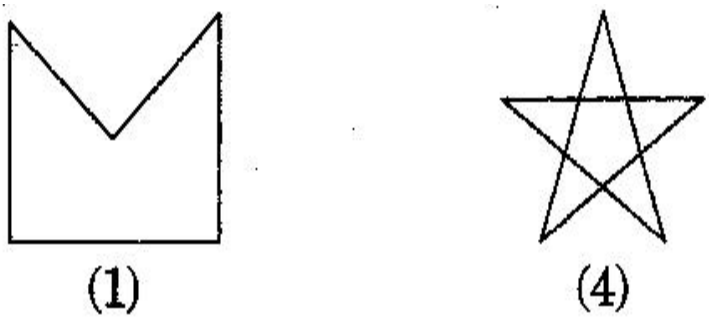
(c) Polygons



(d) Convex polygons



(e) Concave polygon



Question 2:

How many diagonals does each of the following have?

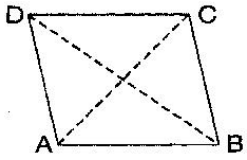
(a) A convex quadrilateral (b) A regular hexagon

(c) A triangle

Answer 2:

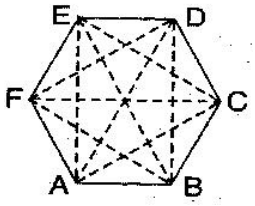
(a) A convex quadrilateral has two diagonals.

Here, AC and BD are two diagonals.



(b) A regular hexagon has 9 diagonals.

Here, diagonals are AD, AE, BD, BE, FC, FB, AC, EC and FD.



(c) A triangle has no diagonal.

Question 3:

What is the sum of the measures of the angles of a convex quadrilateral? Will this property hold if the quadrilateral is not convex? (Make a non-convex quadrilateral and try)

Answer 3:

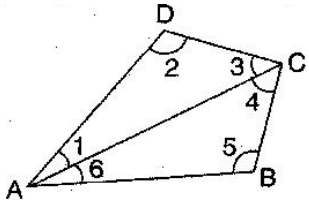
Let ABCD is a convex quadrilateral, then we draw a diagonal AC which divides the quadrilateral in two triangles.

$\angle A + B + \angle C + \angle D = \angle 1 + \angle 6 + \angle 5 + \angle 4 + \angle 3 + \angle 2$

$= (\angle 1 + \angle 2 + \angle 3) + (\angle 4 + \angle 5 + \angle 6)$

$= 180° + 180°$ [By Angle sum property of triangle]

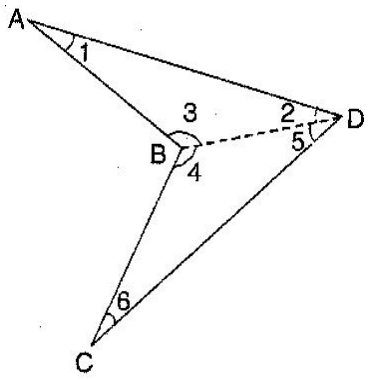
$= 360°$



Hence, the sum of measures of the triangles of a convex quadrilateral is 360°.

Yes, if quadrilateral is not convex then, this property will also be applied.

Let ABCD is a non-convex quadrilateral and join BD, which also divides the quadrilateral in two triangles.



Using angle sum property of triangle,

In ΔABD, $\angle 1 + \angle 2 + \angle 3 = 180°$ .....(i)

In ΔBDC, $\angle 4 + \angle 5 + \angle 6 = 180°$ .....(i)

Adding eq. (i) and (ii),

$\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5 + \angle 6 = 360°$

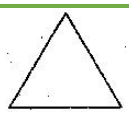
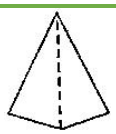
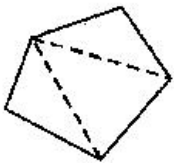
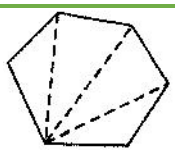
$\Rightarrow \quad \angle 1 + \angle 2 + (\angle 3 + \angle 4) + \angle 5 + \angle 6 = 360°$

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

Hence proved.

Question 4:

Examine the table. (Each figure is divided into triangles and the sum of the angles deduced from that.)

Figure				
Side	3	4	5	6
Angle sum	$1\times180^\circ$ $=(3-2)\times180^\circ$	$2\times180^\circ$ $=(4-2)\times180^\circ$	$3\times180^\circ$ $=(5-2)\times180^\circ$	$4\times180^\circ$ $=(6-2)\times180^\circ$

What can you say about the angle sum of a convex polygon with number of sides?

Answer 4:

(a) When n = 7, then

Angle sum of a polygon = $(n-2)\times180° = (7-2)\times180° = 5\times180° = 900°$

(b) When n = 8, then

Angle sum of a polygon = $(n-2)\times180° = (8-2)\times180° = 6\times180° = 1080°$

(c) When n = 10, then

Angle sum of a polygon = $(n-2)\times180° = (10-2)\times180° = 8\times180° = 1440°$

(d) When n = n, then

Angle sum of a polygon = $(n-2)\times180°$

Question 5:

What is a regular polygon? State the name of a regular polygon of:

(a) 3 sides

(b) 4 sides

(c) 6 sides

Answer 5:

A regular polygon: A polygon having all sides of equal length and the interior angles of equal size is known as regular polygon.

(i) 3 sides

Polygon having three sides is called a ***triangle***.

(ii) 4 sides

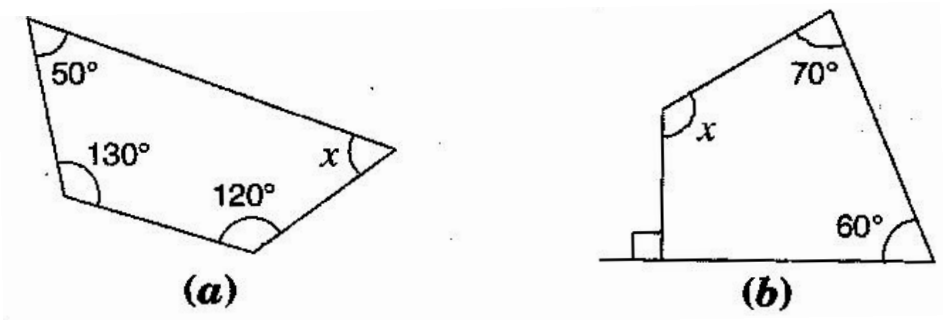
Polygon having four sides is called a ***quadrilateral***.

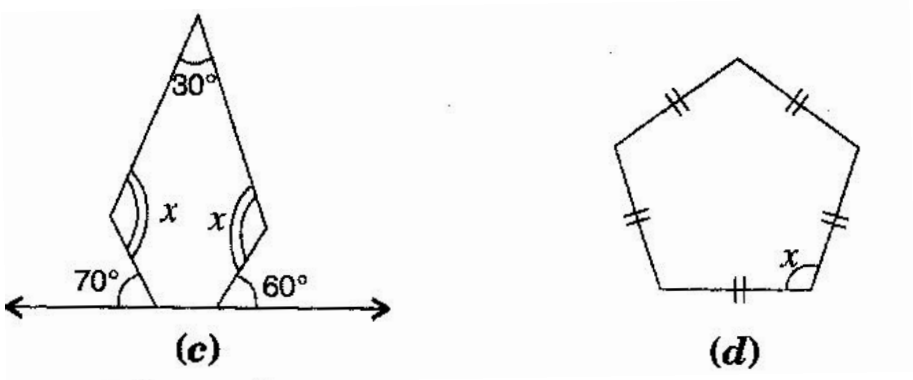
(iii) 6 sides

Polygon having six sides is called a ***hexagon***.

Question 6:

Find the angle measures x in the following figures:

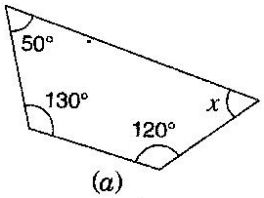




Answer 6:

(a) Using angle sum property of a quadrilateral,

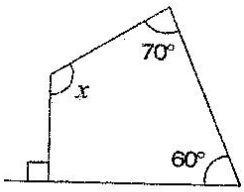
$$50° + 130° + 120° + x = 360°$$
$$\Rightarrow \quad 300° + x = 360°$$
$$\Rightarrow \quad x = 360° - 300°$$
$$\Rightarrow \quad x = 60°$$



(a)

(b) Using angle sum property of a quadrilateral,

$$90° + 60° + 70° + x = 360°$$
$$\Rightarrow \quad 220° + x = 360°$$
$$\Rightarrow \quad x = 360° - 220°$$
$$\Rightarrow \quad x = 140°$$



(b)

(c) First base interior angle $= 180° - 70° = 110°$

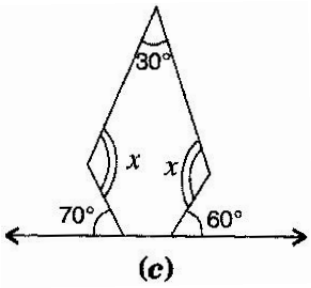
Second base interior angle $= 180° - 60° = 120°$

There are 5 sides, $n = 5$

$\therefore$ Angle sum of a polygon $= (n-2) \times 180°$

$= (5-2) \times 180° = 3 \times 180° = 540°$

$$\therefore \quad 30° + x + 110° + 120° + x = 540°$$
$$\Rightarrow \quad 260° + 2x = 540°$$
$$\Rightarrow \quad 2x = 540° - 260°$$
$$\Rightarrow \quad 2x = 280°$$
$$\Rightarrow \quad x = 140°$$

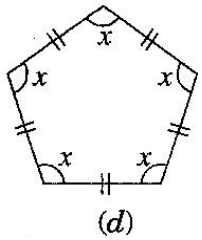


(c)

(d) Angle sum of a polygon $= (n-2) \times 180°$

$= (5-2) \times 180° = 3 \times 180° = 540°$

$$\therefore \quad x + x + x + x + x = 540°$$
$$\Rightarrow \quad 5x = 540°$$
$$\Rightarrow \quad x = 108°$$

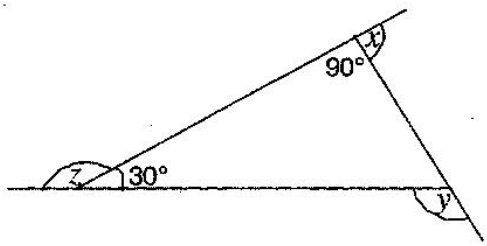


(d)

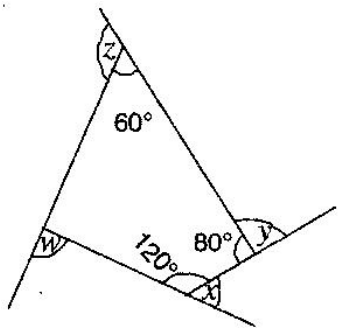
Hence each interior angle is 108°.

Question 7:

(a) Find $x+y+z$



(b) Find $x+y+z+w$



Answer 7:

(a) Since sum of linear pair angles is 180°.

$\therefore \quad 90°+x=180°$

$\Rightarrow \quad x=180°-90°=90°$

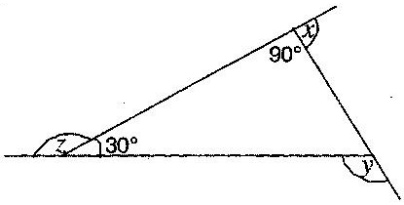
And $\quad z+30°=180°$

$\Rightarrow \quad z=180°-30°=150°$

Also $\quad y=90°+30°=120°$

[Exterior angle property]

$\therefore \quad x+y+x=90°+120°+150°=360°$



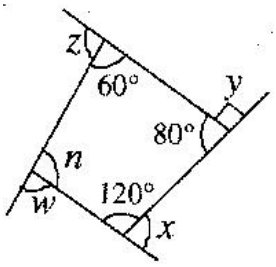
(b) Using angle sum property of a quadrilateral,

$60°+80°+120°+n=360°$

$\Rightarrow \quad 260°+n=360°$

$\Rightarrow \quad n=360°-260°$

$\Rightarrow \quad n=100°$



Since sum of linear pair angles is 180°.

$\therefore \quad w+100=180°$ .....(i)

$x+120°=180°$ .....(ii)

$y+80°=180°$ .....(iii)

$z+60°=180°$ .....(iv)

Adding eq. (i), (ii), (iii) and (iv),

$\Rightarrow \quad x+y+z+w+100°+120°+80°+60°=180°+180°+180°+180°$

$\Rightarrow \quad x+y+z+w+360°=720°$

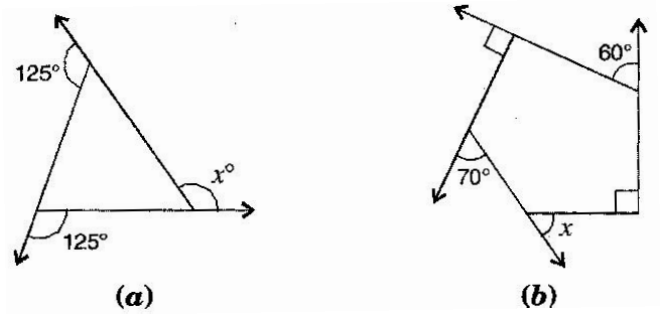
$\Rightarrow \quad x+y+z+w=720°-360°$

$\Rightarrow \quad x+y+z+w=360°$

Exercise 3.2

Question 1:

Find x in the following figures:



Answer 1:

(a) Here, $125° + m = 180°$ [Linear pair]

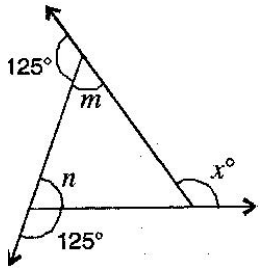
$\Rightarrow \quad m = 180° - 125° = 55°$

and $125° + n = 180°$ [Linear pair]

$\Rightarrow \quad n = 180° - 125° = 55°$

$\because$ Exterior angle $x°$ = Sum of opposite interior angles

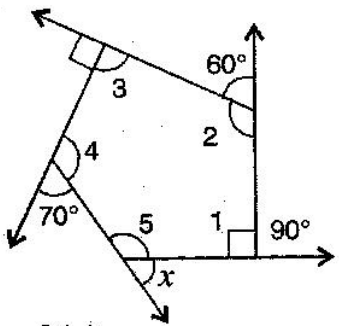
$\therefore \quad x° = 55° + 55° = 110°$



(b) Sum of angles of a pentagon $= (n-2)\times 180°$

$= (5-2)\times 180°$

$= 3\times 180° = 540°$



By linear pairs of angles,

$\angle 1 + 90° = 180°$ .....(i)

$\angle 2 + 60° = 180°$ .....(ii)

$\angle 3 + 90° = 180°$ .....(iii)

$\angle 4 + 70° = 180°$ .....(iv)

$\angle 5 + x = 180°$ .....(v)

Adding eq. (i), (ii), (iii), (iv) and (v),

$x + (\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5) + 310° = 900$

$\Rightarrow \quad x + 540° + 310° = 900°$

$\Rightarrow \quad x + 850° = 900°$

$\Rightarrow \quad x = 900° - 850° = 50°$

Question 2:

Find the measure of each exterior angle of a regular polygon of:

(a) 9 sides (b) 15 sides

Answer 2:

(i) Sum of angles of a regular polygon = $(n-2)\times 180°$

$= (9-2)\times 180° = 7\times 180° = 1260°$

$$\text{Each interior angle} = \frac{\text{Sum of interior angles}}{\text{Number of sides}} = \frac{1260°}{9} = 140°$$

Each exterior angle = $180° - 140° = 40°$

(ii) Sum of exterior angles of a regular polygon = $360°$

$$\text{Each interior angle} = \frac{\text{Sum of interior angles}}{\text{Number of sides}} = \frac{360°}{15} = 24°$$

Question 3:

How many sides does a regular polygon have, if the measure of an exterior angle is $24°$?

Answer 3:

Let number of sides be n.

Sum of exterior angles of a regular polygon = $360°$

$$\text{Number of sides} = \frac{\text{Sum of exterior angles}}{\text{Each interior angle}} = \frac{360°}{24°} = 15$$

Hence, the regular polygon has 15 sides.

Question 4:

How many sides does a regular polygon have if each of its interior angles is $165°$?

Answer 4:

Let number of sides be n.

Exterior angle = $180° - 165° = 15°$

Sum of exterior angles of a regular polygon = $360°$

$$\text{Number of sides} = \frac{\text{Sum of exterior angles}}{\text{Each interior angle}} = \frac{360°}{15°} = 24$$

Hence, the regular polygon has 24 sides.

Question 5:

(a) Is it possible to have a regular polygon with of each exterior angle as $22°$?

(b) Can it be an interior angle of a regular polygon? Why?

Answer 5:

(a) No. (Since 22 is not a divisor of $360°$)

(b) No, (Because each exterior angle is $180° - 22° = 158°,$ which is not a divisor of $360°$)

Question 6:

(a) What is the minimum interior angle possible for a regular polygon? Why?

(b) What is the maximum exterior angle possible for a regular polygon?

Answer 6:

(a) The equilateral triangle being a regular polygon of 3 sides has the least measure of an interior angle of 60°.

$\because$ Sum of all the angles of a triangle = $180°$

$\therefore \quad x + x + x = 180°$

$\Rightarrow \quad 3x = 180°$

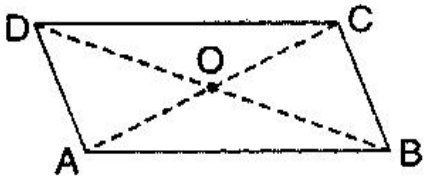
$\Rightarrow \quad x = 60^{\circ}$

(b) By (a), we can observe that the greatest exterior angle is $180° - 60° = 120°$.

Exercise 3.3

Question 1:

Given a parallelogram ABCD. Complete each statement along with the definition or property used.



(i) AD = _____

(ii) $\angle$ DCB = _____

(iii) OC = _____

(iv) $m\angle$DAB + $m\angle$CDA = _____

Answer 1:

(i) AD = BC [Since opposite sides of a parallelogram are equal]

(ii) $\angle$ DCB = $\angle$ DAB [Since opposite angles of a parallelogram are equal]

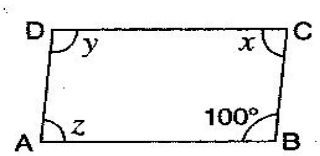
(iii) OC = OA [Since diagonals of a parallelogram bisect each other]

(iv) $m\angle$DAB + $m\angle$CDA = 180°

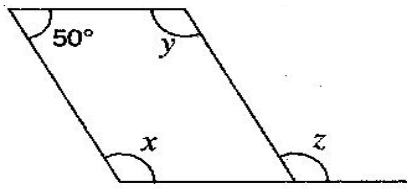
[Adjacent angles in a parallelogram are supplementary]

Question 2:

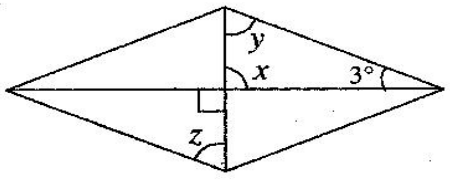
Consider the following parallelograms. Find the values of the unknowns x, y, z.



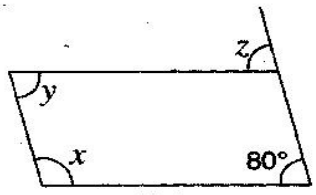
(i)



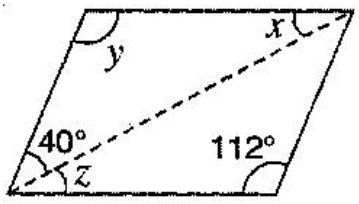
(ii)



(iii)



(iv)



(v)

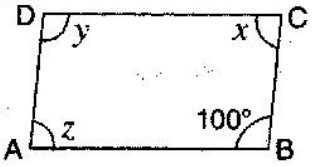
Note: For getting correct answer, read $3^\circ = 30^\circ$ in figure (iii)

Answer 2:

(i) $\angle B + \angle C = 180°$ [Adjacent angles in a parallelogram are supplementary]

$\Rightarrow \quad 100° + x = 180°$

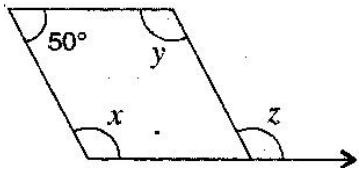
$\Rightarrow \quad x = 180° - 100° = 80°$



and $z = x = 80°$ [Since opposite angles of a parallelogram are equal]

also $y = 100°$ [Since opposite angles of a parallelogram are equal]

(ii) $x + 50° = 180°$ [Adjacent angles in a ||gm are supplementary]

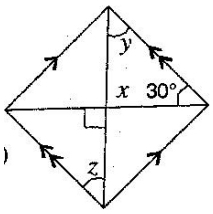


$\Rightarrow \quad x = 180° - 50° = 130°$

$\Rightarrow \quad z = x = 130°$ [Corresponding angles]

(iii) $x = 90^\circ$ [Vertically opposite angles]

$\Rightarrow \quad y + x + 30^\circ = 180^\circ$ [Angle sum property of a triangle]



$\Rightarrow \quad y + 90^\circ + 30^\circ = 180^\circ$

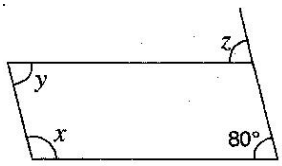
$\Rightarrow \quad y + 120^\circ = 180^\circ$

$\Rightarrow \quad y = 180^\circ - 120^\circ = 60^\circ$

$\Rightarrow \quad z = y = 60^\circ$ [Alternate angles]

(iv) $z = 80°$ [Corresponding angles]

$\Rightarrow \quad x + 80° = 180°$ [Adjacent angles in a ||gm are supplementary]



$\Rightarrow \quad x = 180° - 80° = 100°$

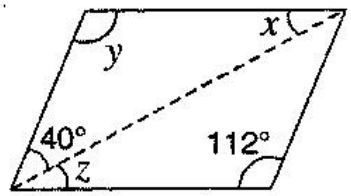
and $y = 80°$ [Opposite angles are equal in a ||gm]

(v) $y = 112°$ [Opposite angles are equal in a ||gm]

$\Rightarrow$ $40° + y + x = 180°$ [Angle sum property of a triangle]

$\Rightarrow$ $40° + 112° + x = 180°$

$\Rightarrow$ $152° + x = 180°$



$\Rightarrow$ $x = 180° - 152° = 28°$

and $z = x = 28°$ [Alternate angles]

Question 3:

Can a quadrilateral ABCD be a parallelogram, if:

(i) $\angle D + \angle B = 180°$?

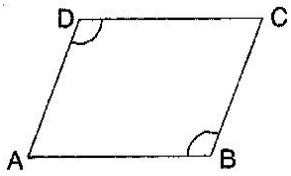
(ii) AB = DC = 8 cm, AD = 4 cm and BC = 4.4 cm?

(iii) $\angle A = 70°$ and $\angle C = 65°$?

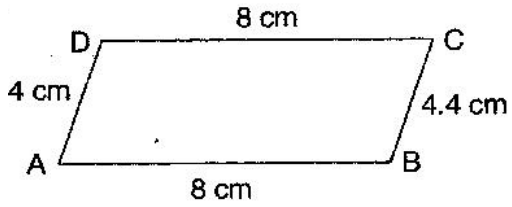
Answer 3:

(i) $\angle D + \angle B = 180°$

It can be, but here, it needs not to be.

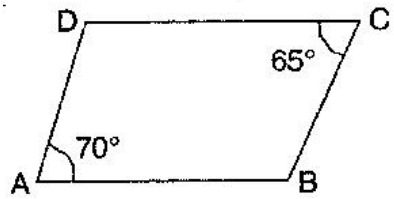


(ii) No, in this case because one pair of opposite sides are equal and another pair of opposite sides are unequal. So, it is not a parallelogram.



(iii) No. $\angle A \neq \angle C$.

Since opposite angles are equal in parallelogram and here opposite angles are not equal in quadrilateral ABCD. Therefore it is not a parallelogram.



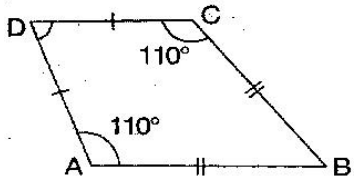
Question 4:

Draw a rough figure of a quadrilateral that is not a parallelogram but has exactly two opposite angles of equal measures.

Answer 4:

ABCD is a quadrilateral in which angles $\angle A = \angle C = 110°$.

Therefore, it could be a kite.



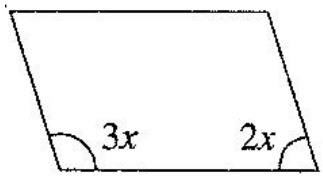
Question 5:

The measure of two adjacent angles of a parallelogram are in the ratio 3:2. Find the measure of each of the angles of the parallelogram.

Answer 5:

Let two adjacent angles be $3x$ and $2x$.

Since the adjacent angles in a parallelogram are supplementary.



$\therefore \quad 3x + 2x = 180°$

$\Rightarrow \quad 5x = 180°$

$\Rightarrow \quad x = \frac{180°}{5} = 36°$

$\therefore$ One angle $= 3x = 3 \times 36° = 108°$

and another angle $= 2x = 2 \times 36° = 72°$

Question 6:

Two adjacent angles of a parallelogram have equal measure. Find the measure of the angles of the parallelogram.

Answer 6:

Let each adjacent angle be x.

Since the adjacent angles in a parallelogram are supplementary.

$\therefore \quad x + x = 180°$

$\Rightarrow \quad 2x = 180°$

$\Rightarrow \quad x = \frac{180°}{2} = 90°$

Hence, each adjacent angle is 90°.

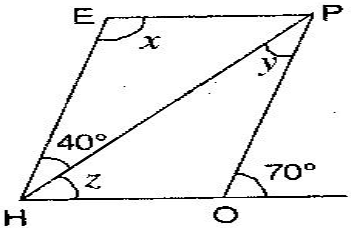
$\therefore \quad x + x + x = 180°$

$\Rightarrow \quad 3x = 180°$

$\Rightarrow \quad x = 60^{\circ}$

Question 7:

The adjacent figure HOPW is a parallelogram. Find the angle measures x, y and z. State the properties you use to find them.



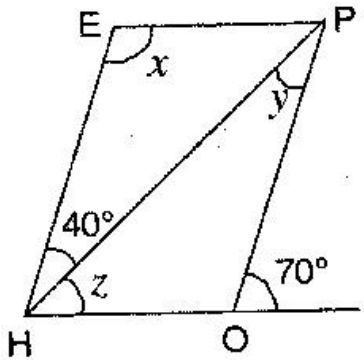
Answer 7:

Here $\angle HOP + 70° = 180°$ [Angles of linear pair]

$\angle HOP = 180° - 70° = 110°$

and $\angle E = \angle HOP$ [Opposite angles of a ||gm are equal]

$\Rightarrow \quad x = 110°$



$\angle PHE = \angle HPO$ [Alternate angles]

$\therefore \quad y = 40°$

Now $\angle EHO = \angle O = 70°$ [Corresponding angles]

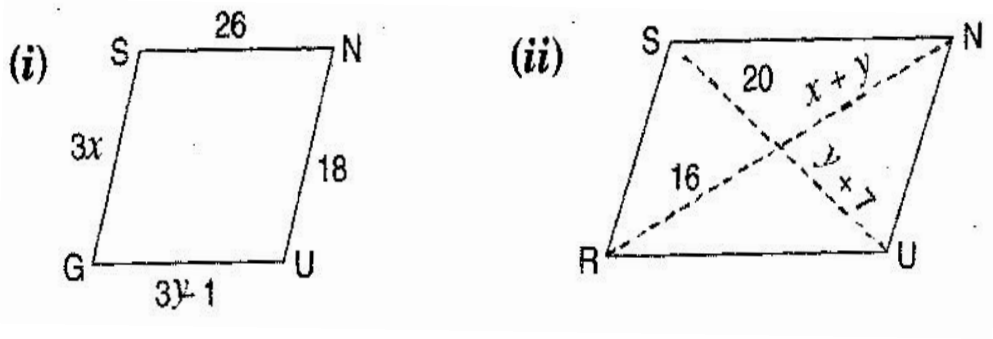
$\Rightarrow \quad 40° + z = 70°$

$\Rightarrow \quad z = 70° - 40° = 30°$

Hence, $x = 110°, y = 40°$ and $z = 30°$

Question 8:

The following figures GUNS and RUNS are parallelograms. Find x and y. (Lengths are in cm)



Answer 8:

(i) In parallelogram GUNS,

GS = UN [Opposite sides of parallelogram are equal]

$\Rightarrow \quad 3x = 18$

$\Rightarrow \quad x = \frac{18}{3} = 6 \text{ cm}$

Also GU = SN [Opposite sides of parallelogram are equal]

$\Rightarrow \quad 3y - 1 = 26$

$\Rightarrow \quad 3y = 26 + 1$

$\Rightarrow \quad 3y = 27$

$\Rightarrow \quad y = \frac{27}{3} = 9 \text{ cm}$

Hence, x = 6 cm and y = 9 cm.

(ii) In parallelogram RUNS,

$y + 7 = 20$ [Diagonals of ||^{gm} bisects each other]

$\Rightarrow \quad y = 20 - 7 = 13 \text{ cm}$

and $x + y = 16$

$\Rightarrow \quad x + 13 = 16$

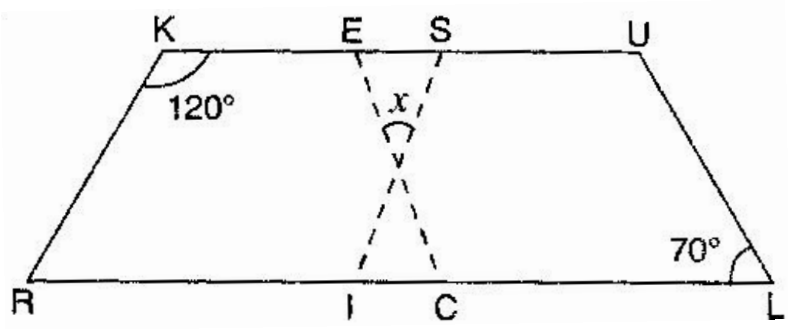
$\Rightarrow \quad x = 16 - 13$

$\Rightarrow \quad x = 3 \text{ cm}$

Hence, $x = 3$ cm and $y = 13$ cm.

Question 9:

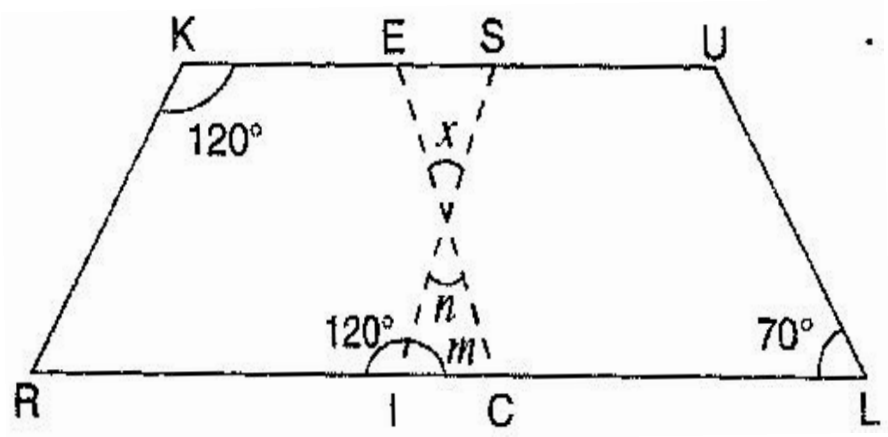
In the figure, both RISK and CLUE are parallelograms. Find the value of x.



Answer 9:

In parallelogram RISK,

$\angle RIS = \angle K = 120°$ [Opposite angles of a ||gm are equal]



$\angle m + 120° = 180°$ [Linear pair]

$\Rightarrow \quad \angle m = 180° - 120° = 60°$

and $\quad \angle ECI = \angle L = 70°$ [Corresponding angles]

$\Rightarrow \quad m + n + \angle ECI = 180°$ [Angle sum property of a triangle]

$\Rightarrow \quad 60° + n + 70° = 180°$

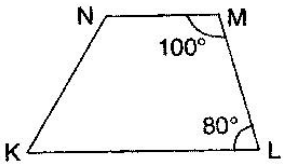
$\Rightarrow \quad 130° + n = 180°$

$\Rightarrow \quad n = 180° - 130° = 50°$

also $\quad x = n = 50°$ [Vertically opposite angles]

Question 10:

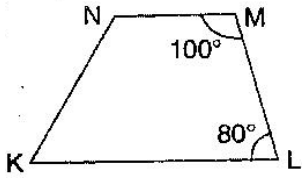
Explain how this figure is a trapezium. Which is its two sides are parallel?



Answer 10:

Here, $\angle M + \angle L = 100° + 80° = 180°$ [Sum of interior opposite angles is $180°$]

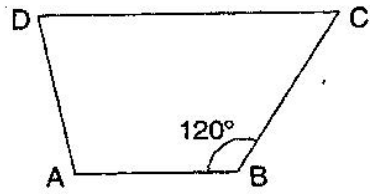
$\therefore$ NM and KL are parallel.



Hence, KLMN is a trapezium.

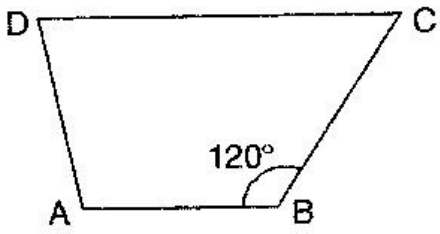
Question 11:

1. Find $m\angle C$ in figure , if $\overline{AB} \parallel \overline{DC}$,



Answer 11:

Here, $\angle B + \angle C = 180°$ [$\because \overline{AB} \parallel \overline{DC}$]

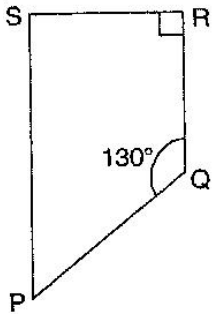


$\therefore$ $120° + m\angle C = 180°$

$\Rightarrow$ $m\angle C = 180° - 120° = 60°$

Question 12:

Find the measure of $\angle P$ and $\angle S$ if $\overline{SP} \parallel \overline{RQ}$ in given figure.
(If you find $m\angle R$ is there more than one method to find $m\angle P$)



Answer 12:

Here, $\angle P + \angle Q = 180°$ [Sum of co-interior angles is $180°$]

$\Rightarrow \quad \angle P + 130° = 180°$

$\Rightarrow \quad \angle P = 180° - 130°$

$\Rightarrow \quad \angle P = 50°$

$\because \quad \angle R = 90°$ [Given]

$\therefore \quad \angle S + 90° = 180°$

$\Rightarrow \quad \angle S = 180° - 90°$

$\Rightarrow \quad \angle S = 90°$

Yes, one more method is there to find $\angle P$.

$\angle S + \angle R + \angle Q + \angle P = 360°$ [Angle sum property of quadrilateral]

$\Rightarrow \quad 90° + 90° + 130° + \angle P = 360°$

$\Rightarrow \quad 310° + \angle P = 360°$

$\Rightarrow \quad \angle P = 360° - 310°$

$\Rightarrow \quad \angle P = 50°$

Exercise 3.4

Question 1:

State whether true or false:

(a) All rectangles are squares.
(b) All rhombuses are parallelograms.
(c) All squares are rhombuses and also rectangles.
(d) All squares are not parallelograms.
(e) All kites are rhombuses.
(f) All rhombuses are kites.
(g) All parallelograms are trapeziums.
(h) All squares are trapeziums.

Answer 1:

(a) False. Since, squares have all sides are equal.
(b) True. Since, in rhombus, opposite angles are equal and diagonals intersect at mid-point.
(c) True. Since, squares have the same property of rhombus but not a rectangle.
(d) False. Since, all squares have the same property of parallelogram.
(e) False. Since, all kites do not have equal sides.
(f) True. Since, all rhombuses have equal sides and diagonals bisect each other.
(g) True. Since, trapezium has only two parallel sides.
(h) True. Since, all squares have also two parallel lines.

Question 2:

Identify all the quadrilaterals that have:

(a) four sides of equal lengths.
(b) four right angles.

Answer 2:

(a) Rhombus and square have sides of equal length.
(b) Square and rectangle have four right angles.

Question 3:

Explain how a square is:

(i) a quadrilateral

(ii) a parallelogram

(iii) a rhombus

(iv) a rectangle

Answer 3:

(i) A square is a quadrilateral, if it has four unequal lengths of sides.

(ii) A square is a parallelogram, since it contains both pairs of opposite sides equal.

(iii) A square is already a rhombus. Since, it has four equal sides and diagonals bisect at 90° to each other.

(iv) A square is a parallelogram, since having each adjacent angle a right angle and opposite sides are equal.

Question 4:

Name the quadrilateral whose diagonals:

(i) bisect each other.

(ii) are perpendicular bisectors of each other.

(iii) are equal.

Answer 4:

(i) If diagonals of a quadrilateral bisect each other then it is a rhombus, parallelogram, rectangle or square.

(ii) If diagonals of a quadrilateral are perpendicular bisector of each other, then it is a rhombus or square.

(iii) If diagonals are equal, then it is a square or rectangle.

Question 5:

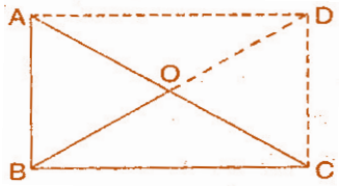
Explain why a rectangle is a convex quadrilateral.

Answer 5:

A rectangle is a convex quadrilateral since its vertex are raised and both of its diagonals lie in its interior.

Question 6:

ABC is a right-angled triangle and O is the mid-point of the side opposite to the right angle. Explain why O is equidistant from A, B and C. (The dotted lines are drawn additionally to help you.)



Answer 6:

Since, two right triangles make a rectangle where O is equidistant point from A, B, C and D because O is the mid-point of the two diagonals of a rectangle.

Since AC and BD are equal diagonals and intersect at mid-point.

So, O is the equidistant from A, B, C and D.

Mathematics

(Chapter – 5) (Data Handling)

(Class – VIII)

Exercise 5.1

Question 1:

For which of these would you use a histogram to show the data:

(a) The number of letters for different areas in a postman's bag.

(b) The height of competitors in an athletics meet.

(c) The number cassettes produced by 5 companies.

(d) The number of passengers boarding trains from 7.00 a.m. to 7.00 p.m. at a station.

Give reason for each.

Answer 1:

Since, Histogram is a graphical representation of data, if data represented in manner of class-interval.

Therefore, for case (b) and (d), we would use a histogram to show the data, because in these cases, data can be divided into class-intervals.

In case (b), a group of competitions having different heights in an athletics meet.

In case (d), the number of passengers boarding trains in an interval of one hour at a station.

Question 2:

The shoppers who come to a departmental store are marked as: man (M), woman (W), boy (B) or girl (G). The following list gives the shoppers who came during the first hour in the morning.

W W W G B W W M G G M M W W W W G B M W B G G M W W M M W W W M W B W G M W W W W G W M M W M W G W M G W M M B G G W.

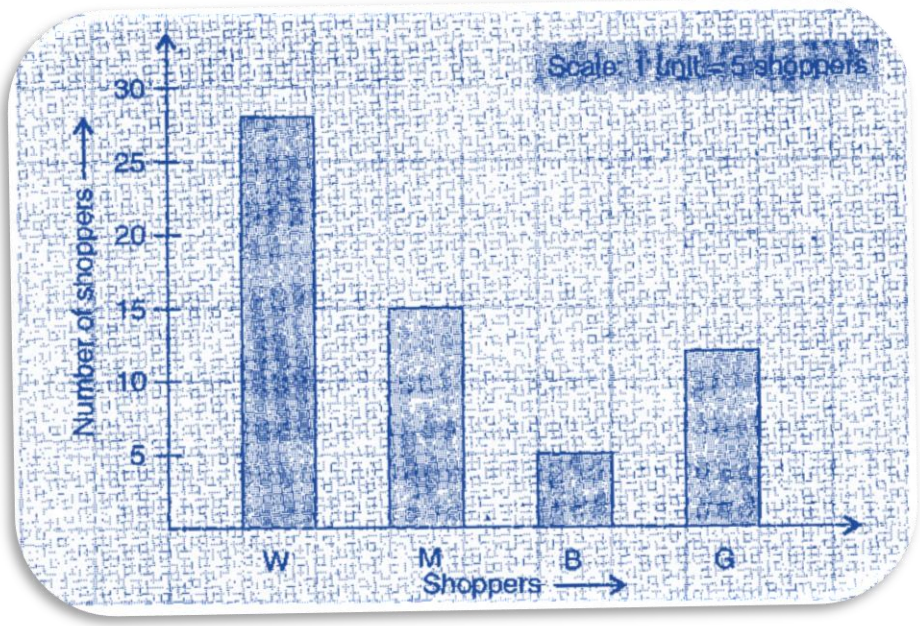
Make a frequency distribution table using tally marks. Draw a bar graph to illustrate it.

Answer 2:

The frequency distribution table is as follows:

Shopper	Tally Marks	Number of shoppers
W	𝍸 𝍸 𝍸 𝍸 𝍸 III	28
M	𝍸 𝍸 𝍸	15
B	𝍸	5
G	𝍸 𝍸 II	12
	Total	60

The illustration of data by bar-graph is as follows:



Question 3:

The weekly wages (in ₹) of 30 workers in a factory are:

830, 835, 890, 810, 835, 836, 869, 845, 898, 890, 820, 860, 832, 833, 855, 845, 804, 808, 812, 840, 885, 835, 835, 836, 878, 840, 868, 890, 806, 840.

Using tally marks, make a frequency table with intervals as 800 – 810, 810 – 820 and so on.

Answer 3:

The representation of data by frequency distribution table using tally marks is as follows:

Class Intervals	Tally Marks	Frequency
800–810	III	3
810–820	II	2
820–830	I	1
830–840	𝍸 IIII	9
840–850	𝍸	5
850–860	I	1
860–870	III	3
870–880	I	1
880–890	I	1
890–900	IIII	4
	Total	30

Question 4:

Draw a histogram for the frequency table made for the data in Question 3 and answer the following questions.

(i) Which group has the maximum number of workers?

(ii) How many workers earn ₹ 850 and more?

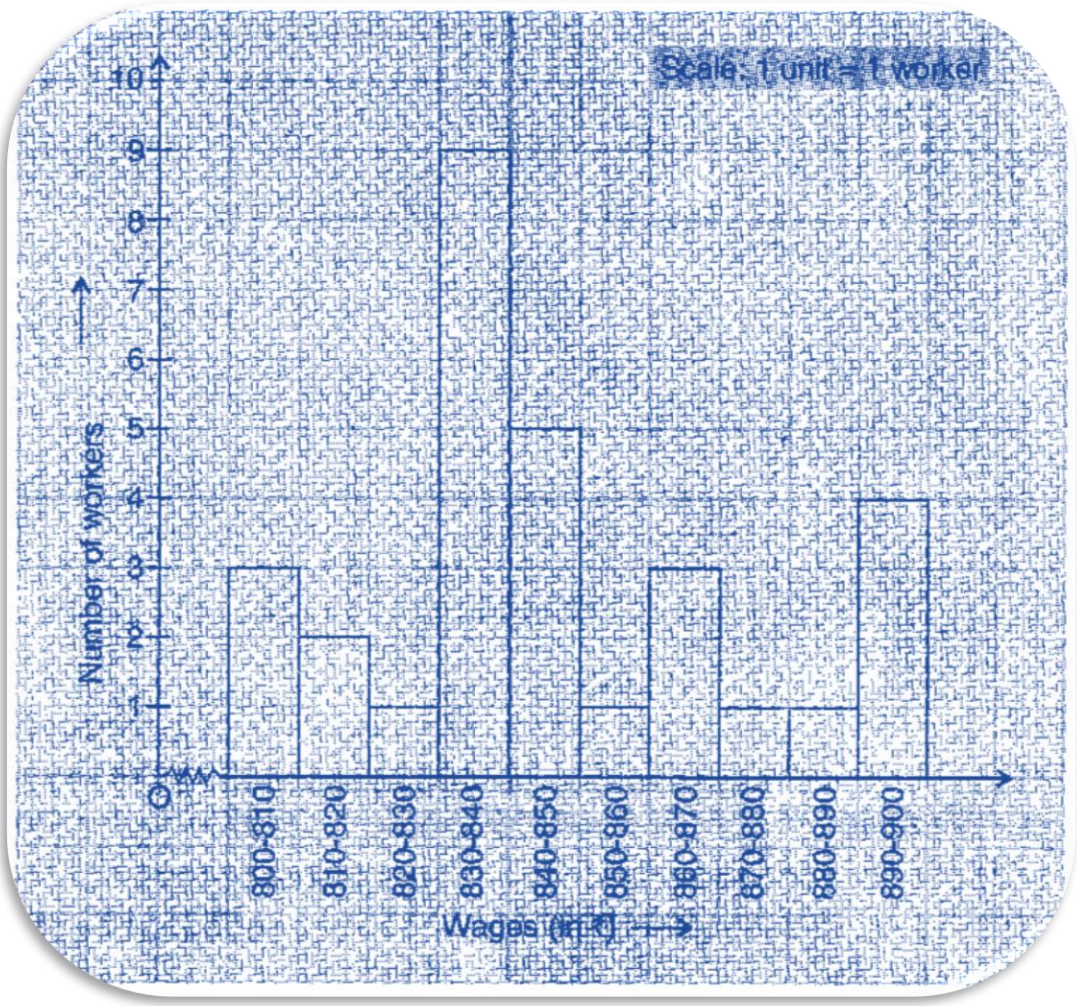
(iii) How many workers earn less than ₹ 850?

Answer 4:

(i) 830 – 840 group has the maximum number of workers.

(ii) 10 workers can earn more than ₹ 850.

(iii) 20 workers earn less than ₹ 850.



Question 5:

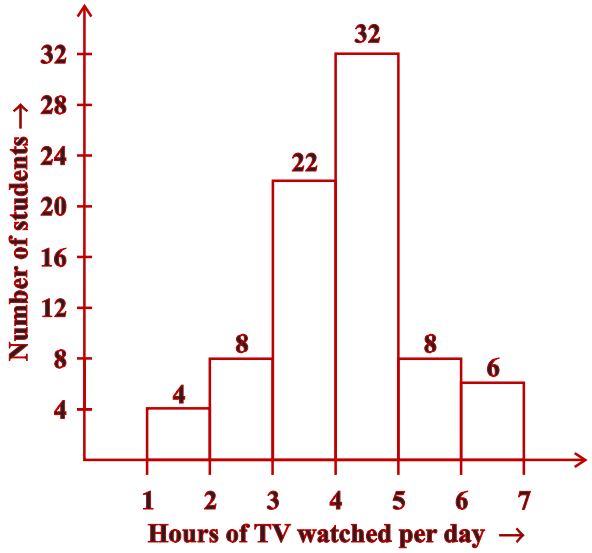
The number of hours for which students of a particular class watched television during holidays is shown through the given graph.

Answer the following:

(i) For how many hours did the maximum number of students watch T.V.?

(ii) How many students watched TV for less than 4 hours?

(iii) How many students spent more than 5 hours in watching TV?



Answer 5:

(i) The maximum number of students watched T.V. for 4 – 5 hours.

(ii) 34 students watched T.V. for less than 4 hours.

(iii) 14 students spent more than 5 hours in watching T.V.

Exercise 5.2

Question 1:

A survey was made to find the type of music that a certain group of young people liked in a city.

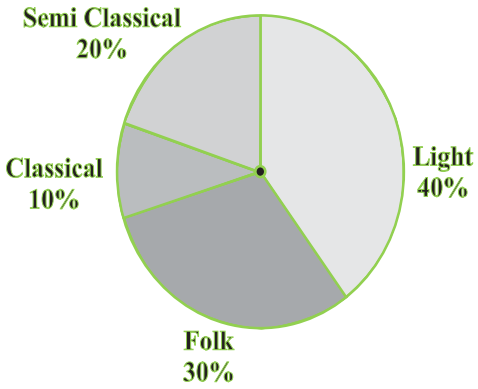
Adjoining pie chart shows the findings of this survey.

From this pie chart, answer the following:

(i) If 20 people liked classical music, how many young people were surveyed?

(ii) Which type of music is liked by the maximum number of people?

(iii) If a cassette company were to make 1000 CD's, how many of each type would they make?



Answer 1:

(i) 10% represents 100 people.

Therefore 20% represents = $\frac{100\times 20}{10}$ = 200 people

Hence, 200 people were surveyed.

(ii) Light music is liked by the maximum number of people.

(iii) CD's of classical music = $\frac{10\times 1000}{100}$ = 100

CD's of semi-classical music = $\frac{20\times 1000}{100}$ = 200

CD's of light music = $\frac{40\times 1000}{100}$ = 400

CD's of folk music = $\frac{30\times 1000}{100}$ = 300

Question 2:

A group of 360 people were asked to vote for their favourite season from the three seasons rainy, winter and summer.

(i) Which season got the most votes?

(ii) Find the central angle of each sector.

(iii) Draw a pie chart to show this information.

Season	No. of votes
Summer	90
Rainy	120
Winter	150

Answer 2:

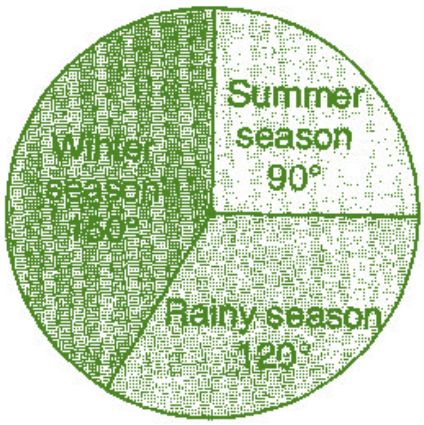
(i) Winter season got the most votes.

(ii) Central angle of summer season = $\frac{90^\circ \times 360^\circ}{360^\circ} = 90^\circ$

Central angle of rainy season = $\frac{120^\circ \times 360^\circ}{360^\circ} = 120^\circ$

Central angle of winter season = $\frac{150^\circ \times 360^\circ}{360^\circ} = 150^\circ$

(iii)



Question 3:

Draw a pie chart showing the following information. The table shows the colours preferred by a group of people.

Colours	Number of people
Blue	18
Green	9
Red	6
Yellow	3
Total	36

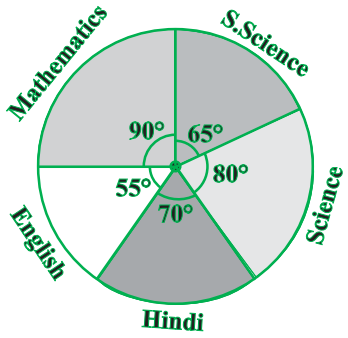
Answer 3:

Here, central angle = 360° and total number of people = 36

Colours	No. of people	In fraction	Central angles
Blue	18	$\frac{18}{36}=\frac{1}{2}$	$\frac{1}{2}\times 360^\circ = 180^\circ$
Green	9	$\frac{9}{36}=\frac{1}{4}$	$\frac{1}{4}\times 360^\circ = 90^\circ$
Red	6	$\frac{6}{36}=\frac{1}{6}$	$\frac{1}{6}\times 360^\circ = 60^\circ$
Yellow	3	$\frac{3}{36}=\frac{1}{12}$	$\frac{1}{12}\times 360^\circ = 30^\circ$

Question 4:

The adjoining pie chart gives the marks scored in an examination by a student in Hindi, English, Mathematics, Social Science and Science. If the total marks obtained by the students were 540, answer the following questions:



(i) In which subject did the student score 105 marks?
(Hint: for 540 marks, the central angle = 360°. So, for 105 marks, what is the central angle?)

(ii) How many more marks were obtained by the student in Mathematics than in Hindi?

(iii) Examine whether the sum of the marks obtained in Social Science and Mathematics is more than that in Science and Hindi.

(Hint: Just study the central angles)

Answer 4:

Subject	Central Angle	Marks obtained
Mathematics	90°	$\frac{90^\circ}{360^\circ}\times 540 = 135$
Social Science	65°	$\frac{65^\circ}{360^\circ}\times 540 = 97.5$
Science	80°	$\frac{80^\circ}{360^\circ}\times 540 = 120$
Hindi	70°	$\frac{70^\circ}{360^\circ}\times 540 = 105$
English	55°	$\frac{55^\circ}{360^\circ}\times 540 = 82.5$

(i) The student scored 105 marks in Hindi.

(ii) Marks obtained in Mathematics = 135

Marks obtained in Hindi = 105

Difference = 135 – 105 = 30

Thus, 30 more marks were obtained by the student in Mathematics than in Hindi.

(iii) The sum of marks in Social Science and Mathematics = 97.5 + 135 = 232.5

The sum of marks in Science and Hindi = 120 + 105 = 225

Yes, the sum of the marks in Social Science and Mathematics is more than that in Science and Hindi.

Question 5:

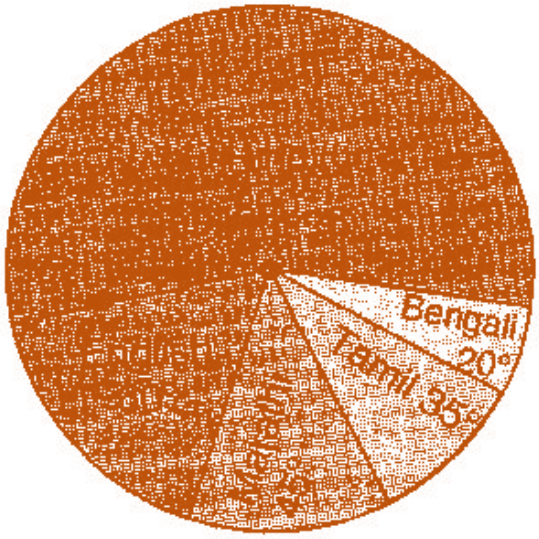
The number of students in a hostel, speaking different languages is given below. Display the data in a pie chart.

Language	Hindi	English	Marathi	Tamil	Bengali	Total
No. of students	40	12	9	7	4	72

Answer 5:

Language	No. of students	In fraction	Central Angle
Hindi	40	$\frac{40}{72}=\frac{5}{9}$	$\frac{5}{9}\times 360^\circ = 200^\circ$
English	12	$\frac{12}{72}=\frac{1}{6}$	$\frac{1}{6}\times 360^\circ = 60^\circ$
Marathi	9	$\frac{9}{72}=\frac{1}{8}$	$\frac{1}{8}\times 360^\circ = 45^\circ$
Tamil	7	$\frac{7}{72}=\frac{7}{72}$	$\frac{7}{72}\times 360^\circ = 35^\circ$
Bengali	4	$\frac{4}{72}=\frac{1}{18}$	$\frac{1}{18}\times 360^\circ = 20^\circ$
Total	72		

Pie chart at above given data is as follows:

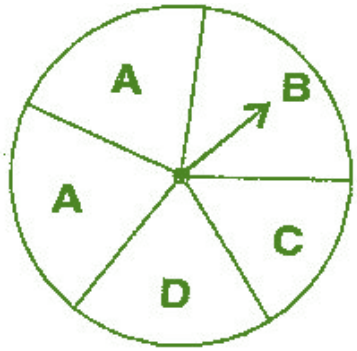


Exercise 5.3

Question 1:

List the outcomes you can see in these experiments.

(a) Spinning a wheel



(b) Tossing two coins together

Answer 1:

(a) There are four letters A, B, C and D in a spinning wheel. So there are 4 outcomes.

(b) When two coins are tossed together. There are four possible outcomes HH, HT, TH, TT.

(Here HT means head on first coin and tail on second coin and so on.)

Question 2:

When a die is thrown, list the outcomes of an event of getting:

(i) (a) a prime number (b) not a prime number

(ii) (a) a number greater than 5 (b) a number not greater than 5

Answer 2:

(i) (a) Outcomes of event of getting a prime number are 2, 3 and 5.

(b) Outcomes of event of not getting a prime number are 1, 4 and 6.

(ii) (a) Outcomes of event of getting a number greater than 5 is 6.

(b) Outcomes of event of not getting a number greater than 5 are 1, 2, 3, 4 and 5.

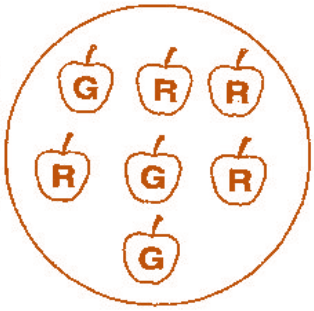
Question 3:

Find the:

(a) Probability of the pointer stopping on D in (Question 1 (a)).

(b) Probability of getting an ace from a well shuffled deck of 52 playing cards.

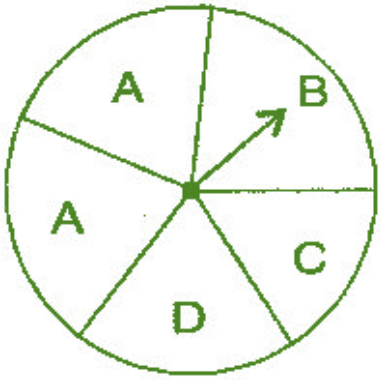
(c) Probability of getting a red apple. (See figure below)



Answer 3:

(a) In a spinning wheel, there are five pointers A, A, B, C, D. So there are five outcomes. Pointer stops at D which is one outcome.

So the probability of the pointer stopping on D = $\frac{1}{5}$



(b) There are 4 aces in a deck of 52 playing cards. So, there are four events of getting an ace.

So, probability of getting an ace = $\frac{4}{42} = \frac{1}{4}$

(c) Total number of apples = 7

Number of red apples = 4

Probability of getting red apple = $\frac{4}{7}$

Question 4:

Numbers 1 to 10 are written on ten separate slips (one number on one slip), kept in a box and mixed well. One slip is chosen from the box without looking into it. What is the probability of:

(i) getting a number 6.

(ii) getting a number less than 6.

(iii) getting a number greater than 6.

(iv) getting a 1-digit number.

Answer 4:

(i) Outcome of getting a number 6 from ten separate slips is one.

Therefore, probability of getting a number 6 = $\frac{1}{10}$

(ii) Numbers less than 6 are 1, 2, 3, 4 and 5 which are five. So there are 5 outcomes.

Therefore, probability of getting a number less than 6 = $\frac{5}{10} = \frac{1}{2}$

(iii) Number greater than 6 out of ten that are 7, 8, 9, 10. So there are 4 possible outcomes.

Therefore, probability of getting a number greater than 6 = $\frac{4}{10} = \frac{2}{5}$

(iv) One digit numbers are 1, 2, 3, 4, 5, 6, 7, 8, 9 out of ten.

Therefore, probability of getting a 1-digit number = $\frac{9}{10}$

Question 5:

If you have a spinning wheel with 3 green sectors, 1 blue sector and 1 red sector, what is the probability of getting a green sector? What is the probability of getting a none-blue sector?

Answer 5:

There are five sectors. Three sectors are green out of five sectors.

Therefore, probability of getting a green sector = $\frac{3}{5}$

There is one blue sector out of five sectors.

Non-blue sectors = 5 – 1 = 4 sectors

Therefore, probability of getting a non-blue sector = $\frac{4}{5}$

Question 6:

Find the probability of the events given in Question 2.

Answer 6:

When a die is thrown, there are total six outcomes, i.e., 1, 2, 3, 4, 5 and 6.

(i) (a) 2, 3, 5 are prime numbers. So there are 3 outcomes out of 6.

Therefore, probability of getting a prime number = $\frac{3}{6}=\frac{1}{2}$

(b) 1, 4, 6 are not the prime numbers. So there are 3 outcomes out of 6.

Therefore, probability of getting a prime number = $\frac{3}{6}=\frac{1}{2}$

(ii) (a) Only 6 is greater than 5. So there is one outcome out of 6.

Therefore, probability of getting a number greater than 5 = $\frac{1}{6}$

(b) Numbers not greater than 5 are 1, 2, 3, 4 and 5. So there are 5 outcomes out of 6.

Therefore, probability of not getting a number greater than 5 = $\frac{5}{6}$

Exercise 6.1

Question 1:

What will be the unit digit of the squares of the following numbers?

(i)	81	(ii)	272
(iii)	799	(iv)	3853
(v)	1234	(vi)	26387
(vii)	52698	(viii)	99880
(ix)	12796	(x)	55555

Answer 1:

(i) The number 81 contains its unit's place digit 1. So, square of 1 is 1.
Hence, unit's digit of square of 81 is 1.

(ii) The number 272 contains its unit's place digit 2. So, square of 2 is 4.
Hence, unit's digit of square of 272 is 4.

(iii) The number 799 contains its unit's place digit 9. So, square of 9 is 81.
Hence, unit's digit of square of 799 is 1.

(iv) The number 3853 contains its unit's place digit 3. So, square of 3 is 9.
Hence, unit's digit of square of 3853 is 9.

(v) The number 1234 contains its unit's place digit 4. So, square of 4 is 16.
Hence, unit's digit of square of 1234 is 6.

(vi) The number 26387 contains its unit's place digit 7. So, square of 7 is 49.
Hence, unit's digit of square of 26387 is 9.

(vii) The number 52698 contains its unit's place digit 8. So, square of 8 is 64.
Hence, unit's digit of square of 52698 is 4.

(viii) The number 99880 contains its unit's place digit 0. So, square of 0 is 0.
Hence, unit's digit of square of 99880 is 0.

(ix) The number 12796 contains its unit's place digit 6. So, square of 6 is 36.
Hence, unit's digit of square of 12796 is 6.

(x) The number 55555 contains its unit's place digit 5. So, square of 5 is 25.
Hence, unit's digit of square of 55555 is 5.

Question 2:

The following numbers are obviously not perfect squares. Give reasons.

(i)	1057	(ii)	23453
(iii)	7928	(iv)	222222
(v)	64000	(vi)	89722
(vii)	222000	(viii)	505050

Answer 2:

(i) Since, perfect square numbers contain their unit's place digit 1, 4, 5, 6, 9 and even numbers of 0.
Therefore 1057 is not a perfect square because its unit's place digit is 7.

(ii) Since, perfect square numbers contain their unit's place digit 0, 1, 4, 5, 6, 9 and even number of 0. Therefore 23453 is not a perfect square because its unit's place digit is 3.

(iii) Since, perfect square numbers contain their unit's place digit 0, 1, 4, 5, 6, 9 and even number of 0. Therefore 7928 is not a perfect square because its unit's place digit is 8.

(iv) Since, perfect square numbers contain their unit's place digit 0, 1, 4, 5, 6, 9 and even number of 0. Therefore 222222 is not a perfect square because its unit's place digit is 2.

(v) Since, perfect square numbers contain their unit's place digit 0, 1, 4, 5, 6, 9 and even number of 0. Therefore 64000 is not a perfect square because its unit's place digit is single 0.

(vi) Since, perfect square numbers contain their unit's place digit 0, 1, 4, 5, 6, 9 and even number of 0. Therefore 89722 is not a perfect square because its unit's place digit is 2.

(vii) Since, perfect square numbers contain their unit's place digit 0, 1, 4, 5, 6, 9 and even number of 0. Therefore 222000 is not a perfect square because its unit's place digit is triple 0.

(viii) Since, perfect square numbers contain their unit's place digit 0, 1, 4, 5, 6, 9 and even number of 0. Therefore 505050 is not a perfect square because its unit's place digit is 0.

Question 3:

The squares of which of the following would be odd number:

(i) 431
(ii) 2826
(iii) 7779
(iv) 82004

Answer 3:

(i) 431 – Unit's digit of given number is 1 and square of 1 is 1. Therefore, square of 431 would be an odd number.

(ii) 2826 – Unit's digit of given number is 6 and square of 6 is 36. Therefore, square of 2826 would not be an odd number.

(iii) 7779 – Unit's digit of given number is 9 and square of 9 is 81. Therefore, square of 7779 would be an odd number.

(iv) 82004 – Unit's digit of given number is 4 and square of 4 is 16. Therefore, square of 82004 would not be an odd number.

Question 4:

Observe the following pattern and find the missing digits:

11^2 = 121
101^2 = 10201
1001^2 = 1002001
100001^2 = 1…….2…….1
10000002 = 1……

Answer 4:

11^2 = 121
101^2 = 10201
1001^2 = 1002001
100001^2 = 10000200001
1000000^2 = 100000020000001

Question 5:

Observe the following pattern and supply the missing numbers:

$11^2 = 121$
$101^2 = 10201$
$10101^2 = 102030201$
$1010101^2 =$ ……
……$^2 = 10203040504030201$

Answer 5:

$11^2 = 121$
$101^2 = 10201$
$10101^2 = 102030201$
$1010101^2 = 1020304030201$
$101010101^2 = 10203040504030201$

Question 6:

Using the given pattern, find the missing numbers:

$1^2 + 2^2 + 2^2 = 3^2$
$2^2 + 3^2 + 6^2 = 7^2$
$3^2 + 4^2 + 12^2 = 13^2$
$4^2 + 5^2 + \_^2 = 21^2$
$5^2 + \_^2 + 30^2 = 31^2$
$6^2 + 7^2 + \_^2 = \_^2$

Answer 6:

$1^2 + 2^2 + 2^2 = 3^2$
$2^2 + 3^2 + 6^2 = 7^2$
$3^2 + 4^2 + 12^2 = 13^2$
$4^2 + 5^2 + 20^2 = 21^2$
$5^2 + 6^2 + 30^2 = 31^2$
$6^2 + 7^2 + 42^2 = 43^2$

Question 7:

Without adding, find the sum:

(i) 1 + 3 + 5 + 7 + 9

(ii) 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19

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

Answer 7:

(i) Here, there are five odd numbers. Therefore square of 5 is 25.

$\therefore$ $1 + 3 + 5 + 7 + 9 = 5^2 = 25$

(ii) Here, there are ten odd numbers. Therefore square of 10 is 100.

$\therefore$ $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 = 10^2 = 100$

(iii) Here, there are twelve odd numbers. Therefore square of 12 is 144.

$\therefore$ $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21 + 23 = 12^2 = 144$

Question 8:

(i) Express 49 as the sum of 7 odd numbers.

(ii) Express 121 as the sum of 11 odd numbers.

Answer 8:

(i) 49 is the square of 7. Therefore it is the sum of 7 odd numbers.

49 = 1 + 3 + 5 + 7 + 9 + 11 + 13

(ii) 121 is the square of 11. Therefore it is the sum of 11 odd numbers

121 = 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21

Question 9:

How many numbers lie between squares of the following numbers:

(i) 12 and 13

(ii) 25 and 26

(iii) 99 and 100

Answer 9:

(i) Since, non-perfect square numbers between n^2 and $(n+1)^2$ are $2n$.

Here, n = 12

Therefore, non-perfect square numbers between 12 and 13 = $2n$ = 2 x 12 = 24

(ii) Since, non-perfect square numbers between n^2 and $(n+1)^2$ are $2n$.

Here, n = 25

Therefore, non-perfect square numbers between 25 and 26 = $2n$ = 2 x 25 = 50

(iii) Since, non-perfect square numbers between n^2 and $(n+1)^2$ are $2n$.

Here, n = 99

Therefore, non-perfect square numbers between 99 and 100 = $2n$ = 2 x 99 = 198

Exercise 6.2

Question 1:

Find the squares of the following numbers:

(i) 32

(ii) 35

(iii) 86

(iv) 93

(v) 71

(vi) 46

Answer 1:

(i) $(32)^2 = (30+2)^2 = (30)^2 + 2\times 30\times 2 + (2)^2 \quad \left[\because (a+b)^2 = a^2 + 2ab + b^2\right]$

= 900 + 120 + 4 = 1024

(ii) $(35)^2 = (30+5)^2 = (30)^2 + 2\times 30\times 5 + (5)^2 \quad \left[\because (a+b)^2 = a^2 + 2ab + b^2\right]$

= 900 + 300 + 25 = 1225

(iii) $(86)^2 = (80+6)^2 = (80)^2 + 2\times 80\times 6 + (6)^2 \quad \left[\because (a+b)^2 = a^2 + 2ab + b^2\right]$

= 1600 + 960 + 36 = 7386

(iv) $(93)^2 = (90+3)^2 = (90)^2 + 2\times 90\times 3 + (3)^2 \quad \left[\because (a+b)^2 = a^2 + 2ab + b^2\right]$

= 8100 + 540 + 9 = 8649

(v) $(71)^2 = (70+1)^2 = (70)^2 + 2\times 70\times 1 + (1)^2 \quad \left[\because (a+b)^2 = a^2 + 2ab + b^2\right]$

= 4900 + 140 + 1 = 5041

(vi) $(46)^2 = (40+6)^2 = (40)^2 + 2\times 40\times 6 + (6)^2 \quad \left[\because (a+b)^2 = a^2 + 2ab + b^2\right]$

= 1600 + 480 + 36 = 2116

Question 2:

Write a Pythagoras triplet whose one member is:

(i) 6
(ii) 14
(iii) 16
(iv) 18

Answer 2:

(i) There are three numbers $2m, m^2-1$ and m^2+1 in a Pythagorean Triplet.

Here, $2m=6 \quad \Rightarrow \quad m=\frac{6}{2}=3$

Therefore,

Second number $\left(m^2-1\right)=(3)^2-1=9-1=8$

Third number $m^2+1=(3)^2+1=9+1=10$

Hence, Pythagorean triplet is (6, 8, 10).

(ii) There are three numbers $2m, m^2-1$ and m^2+1 in a Pythagorean Triplet.

Here, $2m=14 \quad \Rightarrow \quad m=\frac{14}{2}=7$

Therefore,

Second number $\left(m^2-1\right)=(7)^2-1=49-1=48$

Third number $m^2+1=(7)^2+1=49+1=50$

Hence, Pythagorean triplet is (14, 48, 50).

(iii) There are three numbers $2m, m^2-1$ and m^2+1 in a Pythagorean Triplet.

Here, $2m=16 \quad \Rightarrow \quad m=\frac{16}{2}=8$

Therefore,

Second number $\left(m^2-1\right)=(8)^2-1=64-1=63$

Third number $m^2+1=(8)^2+1=64+1=65$

Hence, Pythagorean triplet is (16, 63, 65).

(iv) There are three numbers $2m, m^2-1$ and m^2+1 in a Pythagorean Triplet.

Here, $2m=18 \quad \Rightarrow \quad m=\frac{18}{2}=9$

Therefore,

Second number $\left(m^2-1\right)=(9)^2-1=81-1=80$

Third number $m^2+1=(9)^2+1=81+1=82$

Hence, Pythagorean triplet is (18, 80, 82).

Exercise 6.3

Question 1:

What could be the possible 'one's' digits of the square root of each of the following numbers:

(i) 9801
(ii) 99856
(iii) 998001
(iv) 657666025

Answer 1:

Since, Unit's digits of square of numbers are 0, 1, 4, 5, 6 and 9. Therefore, the possible unit's digits of the given numbers are:

(i) 1 (ii) 6 (iii) 1 (iv) 5

Question 2:

Without doing any calculation, find the numbers which are surely not perfect squares:

(i) 153
(ii) 257
(iii) 408
(iv) 441

Answer 2:

Since, all perfect square numbers contain their unit's place digits 0, 1, 4, 5, 6 and 9.

(i) But given number 153 has its unit digit 3. So it is not a perfect square number.
(ii) Given number 257 has its unit digit 7. So it is not a perfect square number.
(iii) Given number 408 has its unit digit 8. So it is not a perfect square number.
(iv) Given number 441 has its unit digit 1. So it would be a perfect square number

Question 3:

Find the square roots of 100 and 169 by the method of repeated subtraction.

Answer 3:

By successive subtracting odd natural numbers from 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		

This successive subtraction is completed in 10 steps.

Therefore $\sqrt{100} = 10$

By successive subtracting odd natural numbers from 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			

This successive subtraction is completed in 13 steps.

Therefore $\sqrt{169} = 13$

Question 4:

Find the square roots of the following numbers by the Prime Factorization method:

(i)	729	(ii)	400
(iii)	1764	(iv)	4096
(v)	7744	(vi)	9604
(vii)	5929	(viii)	9216
(ix)	529	(x)	8100

Answer 4:

(i) 729

$\sqrt{729} = \sqrt{3\times3\times3\times3\times3\times3}$

= 3 x 3 x 3

= 27

3	729
3	243
3	81
3	27
3	9
3	3
	1

(ii) 400

$\sqrt{400} = \sqrt{2\times2\times2\times2\times5\times5}$

= 2 x 2 x 5

= 20

2	400
2	200
2	100
2	50
5	25
5	5
	1

(iii) 1764

$\sqrt{1764} = \sqrt{2\times2\times3\times3\times7\times7}$

= 2 x 3 x 7

= 42

2	1764
2	882
3	441
3	147
7	49
7	7
	1

(iv) 4096

$\sqrt{4096} = \sqrt{2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2}$

= 2 x 2 x 2 x 2 x 2 x 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

(v) 7744

$\sqrt{7744} = \sqrt{2\times2\times2\times2\times2\times2\times11\times11}$

= 2 x 2 x 2 x 11

= 88

2	**7744**
2	3872
2	1936
2	968
2	484
2	242
11	121
11	11
	1

(vi) 9604

$\sqrt{9604} = \sqrt{2\times2\times7\times7\times7\times7}$

= 2 x 7 x 7

= 98

2	**9604**
2	4802
7	2401
7	343
7	49
7	7
	1

(vii) 5929

$\sqrt{5929} = \sqrt{7\times7\times11\times11}$

= 7 x 11

= 77

7	**5929**
7	847
11	121
11	11
	1

(viii) 9216

$\sqrt{9216} = \sqrt{2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times3\times3}$

= 2 x 2 x 2 x 2 x 2 x 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

(ix) 529

$\sqrt{529} = \sqrt{23 \times 23}$

= 23

23	529
23	23
	1

(x) 8100

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

= 2 x 3 x 3 x 5

= 90

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

Question 5:

For each of the following numbers, find the smallest whole number by which it should be multiplied so as to get a perfect square number. Also, find the square root of the square number so obtained:

(i) 252 (ii) 180

(iii) 1008 (iv) 2028

(v) 1458 (vi) 768

Answer 5:

(i) 252 = 2 x 2 x 3 x 3 x 7

Here, prime factor 7 has no pair. Therefore 252 must be multiplied by 7 to make it a perfect square.

∴ 252 x 7 = 1764

And $\sqrt{1764}$ = 2 x 3 x 7 = 42

2	252
2	126
3	63
3	21
7	7
	1

(ii) $180 = 2 \times 2 \times 3 \times 3 \times 5$

Here, prime factor 5 has no pair. Therefore 180 must be multiplied by 5 to make it a perfect square.

$\therefore$ $180 \times 5 = 900$

And $\sqrt{900} = 2 \times 3 \times 5 = 30$

2	**180**
2	90
3	45
3	15
5	5
	1

(iii) $1008 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 7$

Here, prime factor 7 has no pair. Therefore 1008 must be multiplied by 7 to make it a perfect square.

$\therefore$ $1008 \times 7 = 7056$

And $\sqrt{7056} = 2 \times 2 \times 3 \times 7 = 84$

2	**1008**
2	504
2	252
2	126
3	63
3	21
7	7
	1

(iv) $2028 = 2 \times 2 \times 3 \times 13 \times 13$

Here, prime factor 3 has no pair. Therefore 2028 must be multiplied by 3 to make it a perfect square.

$\therefore$ $2028 \times 3 = 6084$

And $\sqrt{6084} = 2 \times 2 \times 3 \times 3 \times 13 \times 13 = 78$

2	**2028**
2	1014
3	507
13	169
13	13
	1

(v) 1458 = 2 x 3 x 3 x 3 x 3 x 3

Here, prime factor 2 has no pair. Therefore 1458 must be multiplied by 2 to make it a perfect square.

∴ 1458 x 2 = 2916

And $\sqrt{2916}$ = 2 x 3 x 3 x 3 = 54

2	**1458**
3	729
3	243
3	81
3	27
3	9
3	3
	1

(vi) 768 = 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2 x 3

Here, prime factor 3 has no pair. Therefore 768 must be multiplied by 3 to make it a perfect square.

∴ 768 x 3 = 2304

And $\sqrt{2304}$ = 2 x 2 x 2 x 2 x 3 = 48

2	**768**
2	384
2	192
2	96
2	48
2	24
2	12
2	6
3	3
	1

Question 6:

For each of the following numbers, find the smallest whole number by which it should be divided so as to get a perfect square. Also, find the square root of the square number so obtained:

(i) 252 (ii) 2925

(iii) 396 (iv) 2645

(v) 2800 (vi) 1620

Answer 6:

(i) $252 = 2 \times 2 \times 3 \times 3 \times 7$

Here, prime factor 7 has no pair. Therefore 252 must be divided by 7 to make it a perfect square.

$\therefore \quad 252 \div 7 = 36$

And $\sqrt{36} = 2 \times 3 = 6$

2	**252**
2	126
3	63
3	21
7	7
	1

(ii) $2925 = 3 \times 3 \times 5 \times 5 \times 13$

Here, prime factor 13 has no pair. Therefore 2925 must be divided by 13 to make it a perfect square.

$\therefore \quad 2925 \div 13 = 225$

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

3	**2925**
3	975
5	325
5	65
13	13
	1

(iii) $396 = 2 \times 2 \times 3 \times 3 \times 11$

Here, prime factor 11 has no pair. Therefore 396 must be divided by 11 to make it a perfect square.

$\therefore \quad 396 \div 11 = 36$

And $\sqrt{36} = 2 \times 3 = 6$

2	**396**
2	198
3	99
3	33
11	11
	1

(iv) $2645 = 5 \times 23 \times 23$

Here, prime factor 5 has no pair. Therefore 2645 must be divided by 5 to make it a perfect square.

$\therefore \quad 2645 \div 5 = 529$

And $\sqrt{529} = 23 \times 23 = 23$

5	**2645**
23	529
23	23
	1

(v) $2800 = 2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 7$

Here, prime factor 7 has no pair. Therefore 2800 must be divided by 7 to make it a perfect square.

$\therefore \quad 2800 \div 7 = 400$

And $\sqrt{400} = 2 \times 2 \times 5 = 20$

2	**2800**
2	1400
2	700
2	350
5	175
5	35
7	7
	1

(vi) $1620 = 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 5$

Here, prime factor 5 has no pair. Therefore 1620 must be divided by 5 to make it a perfect square.

$\therefore \quad 1620 \div 5 = 324$

And $\sqrt{324} = 2 \times 3 \times 3 = 18$

2	**1620**
2	810
3	405
3	135
3	45
3	15
5	5
	1

Question 7:

The students of Class VIII of a school donated ` 2401 in all, for Prime Minister's National Relief Fund. Each student donated as many rupees as the number of students in the class. Find the number of students in the class.

Answer 7:

Here, Donated money = ` 2401

Let the number of students be x.

Therefore donated money = $x \times x$

According to question,

$x^2 = 2401$

$\Rightarrow \quad x = \sqrt{2401} = \sqrt{7 \times 7 \times 7 \times 7}$

$\Rightarrow \quad x = 7 \times 7 = 49$

7	**2401**
7	343
7	49
7	7
	1

Hence, the number of students is 49.

Question 8:

2025 plants are to be planted in a garden in such a way that each row contains as many plants as the number of rows. Find the number of rows and the number of plants in each row.

Answer 8:

Here, Number of plants = 2025

Let the number of rows of planted plants be x.

And each row contains number of plants = x

According to question,

$x^2 = 2025$

$\Rightarrow \quad x = \sqrt{2025} = \sqrt{3\times3\times3\times3\times5\times5}$

$\Rightarrow \quad x = 3 \times 3 \times 5 = 45$

Hence, each row contains 45 plants.

3	**2025**
3	675
3	225
3	75
5	25
5	5
	1

Question 9:

Find the smallest square number that is divisible by each of the numbers 4, 9 and 10.

Answer 9:

L.C.M. of 4, 9 and 10 is 180.

Prime factors of 180 = 2 x 2 x 3 x 3 x 5

Here, prime factor 5 has no pair. Therefore 180 must be multiplied by 5 to make it a perfect square.

$\therefore \quad 180 \times 5 = 900$

Hence, the smallest square number which is divisible by 4, 9 and 10 is 900.

2	**180**
2	90
3	45
3	15
5	5
	1

Question 10:

Find the smallest square number that is divisible by each of the numbers 8, 15 and 20.

Answer 10:

L.C.M. of 8, 15 and 20 is 120.

Prime factors of 120 = 2 x 2 x 2 x 3 x 5

Here, prime factor 2, 3 and 5 has no pair. Therefore 120 must be multiplied by

2 x 3 x 5 to make it a perfect square.

$\therefore \quad 120 \times 2 \times 3 \times 5 = 3600$

Hence, the smallest square number which is divisible by 8, 15 and 20 is 3600.

2	**120**
2	60
3	30
3	15
5	5
	1

Exercise 6.4

Question 1:

Find the square roots of each of the following numbers by Division method:

(i) 2304
(ii) 4489
(iii) 3481
(iv) 529
(v) 3249
(vi) 1369
(vii) 5776
(viii) 7921
(ix) 576
(x) 1024
(xi) 3136
(xii) 900

Answer 1:

(i) 2304

Hence, the square root of 2304 is 48.

	48
4	$\overline{23}\ \overline{04}$ − 16
88	704 − 704
	0

(ii) 4489

Hence, the square root of 4489 is 67.

	67
6	$\overline{44}\ \overline{89}$ − 36
127	889 − 889
	0

(iii) 3481

Hence, the square root of 3481 is 59.

	59
5	$\overline{34}\ \overline{81}$ − 25
109	981 − 981
	0

(iv) 529

Hence, the square root of 529 is 23.

	23
2	$\overline{5}\ \overline{29}$ $-\ 4$
43	129 -129
	0

(v) 3249

Hence, the square root of 3249 is 57.

	57
5	$\overline{32}\ \overline{49}$ $-\ 25$
107	749 $-\ 749$
	0

(vi) 1369

Hence, the square root of 1369 is 37.

	37
3	$\overline{13}\ \overline{69}$ $-\ 9$
67	469 $-\ 469$
	0

(vii) 5776

Hence, the square root of 5776 is 76.

	76
7	$\overline{57}\ \overline{76}$ $-\ 49$
146	876 $-\ 876$
	0

(viii) 7921

Hence, the square root of 7921 is 89.

	89
8	$\overline{79}\ \overline{21}$ $-\ 64$
169	1521 $-\ 1521$
	0

(ix) 576

Hence, the square root of 576 is 24.

	24
2	$\overline{5}\ \overline{76}$ $-\ 4$
44	176 -176
	0

(x) 1024

Hence, the square root of 1024 is 32.

	32
3	$\overline{10}\ \overline{24}$ $-\ 9$
62	124 $-\ 124$
	0

(xi) 3136

Hence, the square root of 3136 is 56.

	56
5	$\overline{31}\ \overline{36}$ $-\ 25$
106	636 $-\ 636$
	0

(xii) 900

Hence, the square root of 900 is 30.

	30
3	$\overline{9}\ \overline{00}$ $-\ 9$
00	000 $-\ 000$
	0

Question 2:

Find the number of digits in the square root of each of the following numbers (without any calculation):

(i) 64 (ii) 144
(iii) 4489 (iv) 27225
(v) 390625

Answer 2:

(i) Here, 64 contains two digits which is even.

Therefore, number of digits in square root = $\frac{n}{2}=\frac{2}{2}=1$

(ii) Here, 144 contains three digits which is odd.

Therefore, number of digits in square root = $\frac{n+1}{2}=\frac{3+1}{2}=\frac{4}{2}=2$

(iv) Here, 4489 contains four digits which is even.

Therefore, number of digits in square root = $\frac{n}{2}=\frac{4}{2}=2$

(v) Here, 390625 contains six digits which is even.

Therefore, number of digits in square root = $\frac{n}{2}=\frac{6}{2}=3$

Question 3:

Find the square root of the following decimal numbers:

(i) 2.56 (ii) 7.29
(iii) 51.84 (iv) 42.25
(v) 31.36

Answer 3:

(i) 2.56

Hence, the square root of 2.56 is 1.6.

	1.6
1	$\overline{2}\,.\,\overline{56}$
	$-\ 1$
26	156
	$-\ 156$
	0

(ii) 7.29

Hence, the square root of 7.29 is 2.7.

	2.7
2	$\overline{7}\,.\,\overline{29}$
	$-\ 4$
47	329
	$-\ 329$
	0

(iii) 51.84

Hence, the square root of 51.84 is 7.2.

	7.2
7	$\overline{51}\,.\,\overline{84}$
	$-\ 49$
142	284
	$-\ 284$
	0

(iv) 42.25

Hence, the square root of 42.25 is 6.5.

	6.5
6	$\overline{42}$. $\overline{25}$ − 36
125	625 − 625
	0

(v) 31.36

Hence, the square root of 31.36 is 5.6.

	5.6
5	$\overline{31}$. $\overline{36}$ − 25
106	636 − 636
	0

Question 4:

Find the least number which must be subtracted from each of the following numbers so as to get a perfect square. Also, find the square root of the perfect square so obtained:

(i) 402 (ii) 1989
(iii) 3250 (iv) 825
(v) 4000

Answer 4:

(i) 402

We know that, if we subtract the remainder from the number, we get a perfect square.

Here, we get remainder 2. Therefore 2 must be subtracted from 402 to get a perfect square.

∴ 402 – 2 = 400

	20
2	$\overline{4}$ $\overline{02}$ − 4
40	02 − 00
	2

Hence, the square root of 400 is 20.

	20
2	$\overline{4}\ \overline{00}$ – 4
00	00 – 00
	0

(ii) 1989

We know that, if we subtract the remainder from the number, we get a perfect square.

Here, we get remainder 53. Therefore 53 must be subtracted from 1989 to get a perfect square.

∴ 1989 – 53 = 1936

Hence, the square root of 1936 is 44.

	44
4	$\overline{19}\ \overline{89}$ – 16
84	389 – 336
	53

	44
4	$\overline{19}\ \overline{36}$ – 16
84	336 – 336
	0

(iii) 3250

We know that, if we subtract the remainder from the number, we get a perfect square.

Here, we get remainder 1. Therefore 1 must be subtracted from 3250 to get a perfect square.

∴ 3250 – 1 = 3249

	57
5	$\overline{32}\ \overline{50}$ – 25
107	750 – 749
	1

Hence, the square root of 3249 is 57.

	57
5	$\overline{32}\ \overline{49}$ − 25
107	749 − 749
	0

(iv) 825

We know that, if we subtract the remainder from the number, we get a perfect square.

Here, we get remainder 41. Therefore 41 must be subtracted from 825 to get a perfect square.

∴ 825 – 41 = 784

Hence, the square root of 784 is 28.

	28
2	$\overline{8}\ \overline{25}$ − 4
48	425 − 384
	41

	28
2	$\overline{7}\ \overline{84}$ − 4
48	384 − 384
	0

(v) 4000

We know that, if we subtract the remainder from the number, we get a perfect square.

Here, we get remainder 31. Therefore 31 must be subtracted from 4000 to get a perfect square.

∴ 4000 – 31 = 3969

	63
6	$\overline{40}\ \overline{00}$ − 36
123	400 − 369
	31

Hence, the square root of 3969 is 63.

	63
6	$\overline{39}\ \overline{69}$ − 36
123	369 − 369
	0

Question 5:

Find the least number which must be added to each of the following numbers so as to get a perfect square. Also, find the square root of the perfect square so obtained:

(i) 525 (ii) 1750
(iii) 252 (iv) 1825
(v) 6412

Answer 5:

(i) 525

Since remainder is 41. Therefore $22^2 < 525$
Next perfect square number $23^2 = 529$
Hence, number to be added = 529 − 525 = 4
∴ 525 + 4 = 529
Hence, the square root of 529 is 23.

	22
2	$\overline{5}\ \overline{25}$ − 4
42	125 − 84
	41

(ii) 1750

Since remainder is 69. Therefore $41^2 < 1750$
Next perfect square number $42^2 = 1764$
Hence, number to be added = 1764 − 1750 = 14
∴ 1750 + 14 = 1764
Hence, the square root of 1764 is 42.

	41
4	$\overline{17}\ \overline{50}$ − 16
81	150 − 81
	69

(iii) 252

Since remainder is 27. Therefore $15^2 < 252$

Next perfect square number $16^2 = 256$

Hence, number to be added = 256 – 252 = 4

$\therefore$ 252 + 4 = 256

Hence, the square root of 256 is 16.

	15
1	$\overline{2}\ \overline{52}$ – 1
25	152 –125
	27

(iv) 1825

Since remainder is 61. Therefore $42^2 < 1825$

Next perfect square number $43^2 = 1849$

Hence, number to be added = 1849 – 1825 = 24

$\therefore$ 1825 + 24 = 1849

Hence, the square root of 1849 is 43.

	42
4	$\overline{18}\ \overline{25}$ – 16
82	225 –164
	61

(v) 6412

Since remainder is 12. Therefore $80^2 < 6412$

Next perfect square number $81^2 = 6561$

Hence, number to be added = 6561 – 6412 = 149

$\therefore$ 6412 + 149 = 6561

Hence, the square root of 6561 is 81.

	80
8	$\overline{64}\ \overline{12}$ – 64
160	0012 – 0000
	12

Question 6:

Find the length of the side of a square whose area is 441 m^2?

Answer 6:

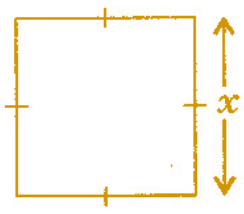
Let the length of side of a square be x meter.

Area of square = $(\text{side})^2 = x^2$

According to question, $x^2 = 441$

$\Rightarrow$ $x = \sqrt{441} = \sqrt{3\times3\times7\times7} = 3 \times 7$

$\Rightarrow$ $x = 21$ m



Hence, the length of side of a square is 21 m.

Question 7:

In a right triangle ABC, $\angle B = 90^\circ$.

(i) If AB = 6 cm, BC = 8 cm, find AC.

(ii) If AC = 13 cm, BC = 5 cm, find AB.

Answer 7:

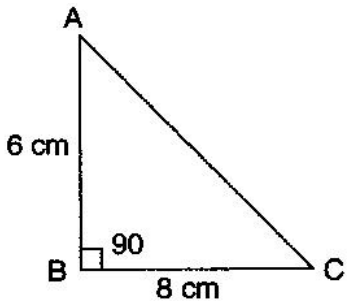
(i) Using Pythagoras theorem,

$AC^2 = AB^2 + BC^2$

$\Rightarrow AC^2 = (6)^2 + (8)^2$

$\Rightarrow AC^2 = 36 + 84 = 100$

$\Rightarrow AC = 10$ cm



(ii) Using Pythagoras theorem,

$AC^2 = AB^2 + BC^2$

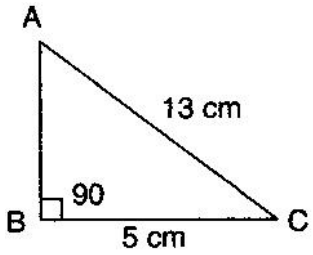
$\Rightarrow (13)^2 = AB^2 + (5)^2$

$\Rightarrow 169 = AB^2 + 25$

$\Rightarrow AB^2 = 169 - 25$

$\Rightarrow AB^2 = 144$

$\Rightarrow AB = 12$ cm



Question 8:

A gardener has 1000 plants. He wants to plant these in such a way that the number of rows and number of columns remain same. Find the minimum number of plants he needs more for this.

Answer 8:

Here, plants = 1000

Since remainder is 39. Therefore $31^2 < 1000$

Next perfect square number $32^2 = 1024$

Hence, number to be added = 1024 – 1000 = 24

$\therefore$ 1000 + 24 = 1024

Hence, the gardener required 24 more plants.

	31
3	$\overline{10}\ \overline{00}$ − 9
61	100 − 61
	39

Question 9:

There are 500 children in a school. For a P.T. drill they have to stand in such a manner that the number of rows is equal to number of columns. How many children would be left out in this arrangement?

Answer 9:

Here, Number of children = 500

By getting the square root of this number, we get,

	22
2	$\bar{5}\ \overline{00}$ $-\ 4$
42	100 $-\ 84$
	16

In each row, the number of children is 22.

And left out children are 16.

Exercise 7.1

Question 1:

Which of the following numbers are not perfect cubes:

(i) 216 (ii) 128

(iii) 1000 (iv) 100

(v) 46656

Answer 1:

(i) 216

Prime factors of 216 = 2 x 2 x 2 x 3 x 3 x 3

Here all factors are in groups of 3's (in triplets)

Therefore, 216 is a perfect cube number.

2	**216**
2	108
2	54
3	27
3	9
3	3
	1

(ii) 128

Prime factors of 128 = 2 x 2 x 2 x 2 x 2 x 2 x 2

Here one factor 2 does not appear in a 3's group.

Therefore, 128 is not a perfect cube.

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

(iii) 1000

Prime factors of 1000 = 2 x 2 x 2 x 3 x 3 x 3
Here all factors appear in 3's group.
Therefore, 1000 is a perfect cube.

2	**1000**
2	500
2	250
5	125
5	25
5	5
	1

(iv) 100

Prime factors of 100 = 2 x 2 x 5 x 5
Here all factors do not appear in 3's group.
Therefore, 100 is not a perfect cube.

2	**100**
2	50
5	25
5	5
	1

(v) 46656

Prime factors of 46656 = 2 x 2 x 2 x 2 x 2 x 2 x 3 x 3 x 3 x 3 x 3 x 3
Here all factors appear in 3's group.
Therefore, 46656 is a perfect cube.

2	**46656**
2	23328
2	11664
2	5832
2	2916
2	1458
3	729
3	243
3	81
3	27
3	9
3	3
	1

Question 2:

Find the smallest number by which each of the following numbers must be multiplied to obtain a perfect cube:

(i) 243 (ii) 256

(iii) 72 (iv) 675

(v) 100

Answer 2:

(i) 243

Prime factors of 243 = 3 x 3 x 3 x 3 x 3

Here 3 does not appear in 3's group.

Therefore, 243 must be multiplied by 3 to make it a perfect cube.

3	**243**
3	81
3	27
3	9
3	3
	1

(ii) 256

Prime factors of 256 = 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2

Here one factor 2 is required to make a 3's group.

Therefore, 256 must be multiplied by 2 to make it a perfect cube.

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

(iii) 72

Prime factors of 72 = 2 x 2 x 2 x 3 x 3

Here 3 does not appear in 3's group.

Therefore, 72 must be multiplied by 3 to make it a perfect cube.

2	**72**
2	36
2	18
3	9
3	3
	1

(iv) 675

Prime factors of 675 = 3 x 3 x 3 x 5 x 5
Here factor 5 does not appear in 3's group.
Therefore 675 must be multiplied by 3 to make it a perfect cube.

3	**675**
3	225
3	75
5	25
5	5
	1

(v) 100

Prime factors of 100 = 2 x 2 x 5 x 5
Here factor 2 and 5 both do not appear in 3's group.
Therefore 100 must be multiplied by 2 x 5 = 10 to make it a perfect cube.

2	**100**
2	50
5	25
5	5
	1

Question 3:

Find the smallest number by which each of the following numbers must be divided to obtain a perfect cube:

(i) 81 (ii) 128
(iii) 135 (iv) 192
(v) 704

Answer 3:

(i) 81

Prime factors of 81 = 3 x 3 x 3 x 3
Here one factor 3 is not grouped in triplets.
Therefore 81 must be divided by 3 to make it a perfect cube.

3	**81**
3	27
3	9
3	3
	1

(ii) 128

Prime factors of 128 = 2 x 2 x 2 x 2 x 2 x 2 x 2

Here one factor 2 does not appear in a 3's group.

Therefore, 128 must be divided by 2 to make it a perfect cube.

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

(iii) 135

Prime factors of 135 = 3 x 3 x 3 x 5

Here one factor 5 does not appear in a triplet.

Therefore, 135 must be divided by 5 to make it a perfect cube.

3	**135**
3	45
3	15
5	5
	1

(iv) 192

Prime factors of 192 = 2 x 2 x 2 x 2 x 2 x 2 x 3

Here one factor 3 does not appear in a triplet.

Therefore, 192 must be divided by 3 to make it a perfect cube.

2	**192**
2	96
2	48
2	24
2	12
2	6
3	3
	1

(v) 704

Prime factors of 704 = 2 x 2 x 2 x 2 x 2 x 2 x 11

Here one factor 11 does not appear in a triplet.

Therefore, 704 must be divided by 11 to make it a perfect cube.

2	**704**
2	352
2	176
2	88
2	44
2	22
2	11
	1

Question 4:

Parikshit makes a cuboid of plasticine of sides 5 cm, 2 cm, 5 cm. How many such cuboids will he need to form a cube?

Answer 4:

Given numbers = 5 x 2 x 5

Since, Factors of 5 and 2 both are not in group of three.

Therefore, the number must be multiplied by 2 x 2 x 5 = 20 to make it a perfect cube.

Hence he needs 20 cuboids.

Exercise 7.2

Question 1:

Find the cube root of each of the following numbers by prime factorization method:

(i)	64	(ii)	512
(iii)	10648	(iv)	27000
(v)	15625	(vi)	13824
(vii)	110592	(viii)	46656
(ix)	175616	(x)	91125

Answer 1:

(i) 64

$\sqrt[3]{64} = \sqrt[3]{2\times2\times2\times2\times2\times2}$

$\sqrt[3]{64}$ = 2 x 2

= 4

2	**64**
2	32
2	16
2	8
2	4
2	2
	1

(ii) 512

$\sqrt[3]{512} = \sqrt[3]{2\times2\times2\times2\times2\times2\times2\times2\times2}$

= 2 x 2 x 2

= 8

2	**512**
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

(iii) 10648

$\sqrt[3]{10648} = \sqrt[3]{2\times2\times2\times11\times11\times11}$

= 2 x 11

= 22

2	**10648**
2	5324
2	2662
11	1331
11	121
11	11
	1

(iv) 27000

$\sqrt[3]{27000} = \sqrt[3]{2\times2\times2\times3\times3\times3\times5\times5\times5}$

= 2 x 3 x 5

= 30

2	**27000**
2	13500
2	6750
3	3375
3	1125
3	375
5	125
5	25
5	5
	1

(v) 15625

$\sqrt[3]{15625} = \sqrt[3]{5\times5\times5\times5\times5\times5}$

= 5 x 5

= 25

5	**15625**
5	3125
5	625
5	125
5	25
5	5
	1

(vi) 13824

$\sqrt[3]{13824} = \sqrt[3]{2\times2\times2\times2\times2\times2\times2\times2\times2\times3\times3\times3}$

= 2 x 2 x 2 x 3

= 24

2	**13824**
2	6912
2	3456
2	1728
2	864
2	432
2	216
2	108
2	54
3	27
3	9
3	3
	1

(vii) 110592

$\sqrt[3]{110592} = \sqrt[3]{2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times3\times3\times3}$

= 2 x 2 x 2 x 2 x 3

= 48

2	**110592**
2	55296
2	27648
2	13824
2	6912
2	3456
2	1728
2	864
2	432
2	216
2	108

2	54
3	27
3	9
3	3
	1

(viii) 46656

$$\sqrt[3]{46656} = \sqrt[3]{2\times2\times2\times2\times2\times2\times3\times3\times3\times3\times3\times3}$$

= 2 x 2 x 3 x 3

= 36

2	**46656**
2	23328
2	11664
2	5832
2	2916
2	1458
3	729
3	243
3	81
3	27
3	9
3	3
	1

(ix) 175616

$$\sqrt[3]{175616} = \sqrt[3]{2\times2\times2\times2\times2\times2\times2\times2\times2\times7\times7\times7}$$

= 2 x 2 x 2 x 7

= 56

2	**175616**
2	87808
2	43904
2	21952
2	10976

2	5488
2	2744
2	1372
2	686
7	343
7	49
7	7
	1

(x) 91125

$\sqrt[3]{91125} = \sqrt[3]{3\times3\times3\times3\times3\times3\times5\times5\times5}$

= 3 x 3 x 5

= 45

3	**91125**
3	30375
3	10125
3	3375
3	1125
3	375
5	125
5	25
5	5
	1

Question 2:

State true or false:

(i) Cube of any odd number is even.

(ii) A perfect cube does not end with two zeroes.

(iii) If square of a number ends with 5, then its cube ends with 25.

(iv) There is no perfect cube which ends with 8.

(v) The cube of a two digit number may be a three digit number.

(vi) The cube of a two digit number may have seven or more digits.

(vii) The cube of a single digit number may be a single digit number.

Answer 2:

(i) False

Since, $1^3 = 1, 3^3 = 27, 5^3 = 125, \ldots\ldots\ldots$ are all odd.

(ii) True

Since, a perfect cube ends with three zeroes.

e.g. $10^3 = 1000, 20^3 = 8000, 30^3 = 27000, \ldots\ldots$ so on

(iii) False

Since, $5^2 = 25, 5^3 = 125, 15^2 = 225, 15^3 = 3375$ (Did not end with 25)

(iv) False

Since $12^3 = 1728$ [Ends with 8]

And $22^3 = 10648$ [Ends with 8]

(v) False

Since $10^3 = 1000$ [Four digit number]

And $11^3 = 1331$ [Four digit number]

(vi) False

Since $99^3 = 970299$ [Six digit number]

(vii) True

$1^3 = 1$ [Single digit number]

$2^3 = 8$ [Single digit number]

Question 3:

You are told that 1,331 is a perfect cube. Can you guess with factorization what is its cube root? Similarly guess the cube roots of 4913, 12167, 32768.

Answer 3:

We know that $10^3 = 1000$ and Possible cube of $11^3 = 1331$

Since, cube of unit's digit $1^3 = 1$

Therefore, cube root of 1331 is 11.

4913

We know that $7^3 = 343$

Next number comes with 7 as unit place $17^3 = 4913$

Hence, cube root of 4913 is 17.

12167

We know that 3^3 = 27

Here in cube, ones digit is 7

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 is 23.

32768

We know that 2^3 = 8

Here in cube, ones digit is 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 is 32.

Exercise 8.1

Question 1:

Find the ratio of the following:

(a) Speed of a cycle 15 km per hour to the speed of scooter 30 km per hour.

(b) 50 m to 10 km

(c) 50 paise to ₹ 5

Answer 1:

(a) Speed of cycle = 15 km/hr

Speed of scooter = 30 km/hr

Hence ratio of speed of cycle to that of scooter = 15 : 30

$$= \frac{15}{30} = \frac{1}{2} = 1 : 2$$

(b) ∵ 1 km = 1000 m

∴ 10 km = 10 x 1000 = 10000 m

$$\therefore \text{Ratio} = \frac{5 \text{ m}}{10000 \text{ m}} = \frac{1}{2000} = 1 : 2000$$

(c) ∵ ₹ 1 = 100 paise

∴ ₹ 5 = 5 x 100 = 500 paise

$$\text{Hence Ratio} = \frac{50 \text{ paise}}{500 \text{ paise}} = \frac{1}{10} = 1 : 10$$

Question 2:

Convert the following ratios to percentages:

(a) 3 : 4 (b) 2 : 3

Answer 2:

(a) Percentage of $3 : 4 = \frac{3}{4} \times 100\ \% = 75\%$

(b) Percentage of $2 : 3 = \frac{2}{3} \times 100\ \% = 66\frac{2}{3}\%$

Question 3:

72% of 25 students are good in mathematics. How many are not good in mathematics?

Answer 3:

Total number of students = 25

Number of good students in mathematics = 72% of 25

$= \frac{72}{100} \times 25 = 18$

Number of students not good in mathematics = 25 – 18 = 7

Hence percentage of students not good in mathematics = $\frac{7}{25} \times 100 = 28\%$

Question 4:

A football team won 10 matches out of the total number of matches they played. If their win percentage was 40, then how many matches did they play in all?

Answer 4:

Let total number of matches be x

According to question,

40% of total matches = 10

$\Rightarrow$ 40% of x = 10

$\Rightarrow \frac{40}{100} \times x = 10$

$\Rightarrow x = \frac{10 \times 100}{40} = 25$

Hence total number of matches are 25.

Question 5:

If Chameli had ₹ 600 left after spending 75% of her money, how much did she have in the beginning?

Answer 5:

Let her money in the beginning be ₹ x.

According to question,

$x - 75\% \text{ of } x = 600$

$$\Rightarrow \quad x - \frac{75}{100} \times x = 600$$

$$\Rightarrow \quad x - \frac{3}{4}x = 600$$

$$\Rightarrow \quad x\left(1 - \frac{3}{4}\right) = 600$$

$$\Rightarrow \quad x\left(\frac{4-3}{4}\right) = 600$$

$$\Rightarrow \quad x = 600 \text{ x } 4 = ₹\ 2400$$

Hence the money in the beginning was ₹ 2,400.

Question 6:

If 60% people in a city like cricket, 30% like football and the remaining like other games, then what percent of the people like other games? If the total number of people are 50 lakh, find the exact number who like each type of game.

Answer 6:

Number of people who like cricket = 60%

Number of people who like football = 30%

Number of people who like other games = 100% – (60% + 30%) = 10%

Now Number of people who like cricket = 60% of 50,00,000

$$= \frac{60}{100} \times 50,00,000 = 30,00,000$$

And Number of people who like football = 30% of 50,00,000

$$= \frac{30}{100} \times 50,00,000 = 15,00,000$$

$\therefore$ Number of people who like other games = 10% of 50,00,000

$$= \frac{10}{100} \times 50,00,000 = 5,00,000$$

Hence, number of people who like other games are 5 lakh.

Exercise 8.2

Question 1:

A man got 10% increase in his salary. If his new salary is ₹ 1,54,000, find his original salary.

Answer 1:

Let original salary be ₹ 100.

Therefore New salary i.e., 10% increase = 100 + 10 = ₹ 110

$\because$ New salary is ₹ 110, when original salary = ₹ 100

$\therefore$ New salary is ₹ 1, when original salary = $\frac{100}{110}$

$\therefore$ New salary is ₹ 1,54,000, when original salary = $\frac{100}{110} \times 154000$ = ₹ 1,40,000

Hence original salary is ₹ 1,40,000.

Question 2:

On Sunday 845 people went to the Zoo. On Monday only 169 people went. What is the percent decrease in the people visiting the Zoo on Monday?

Answer 2:

On Sunday, people went to the Zoo = 845

On Monday, people went to the Zoo = 169

Number of decrease in the people = 845 – 169 = 676

Decrease percent = $\frac{676}{845} \times 100$ = 80%

Hence decrease in the people visiting the Zoo is 80%.

Question 3:

A shopkeeper buys 80 articles for ₹ 2,400 and sells them for a profit of 16%. Find the selling price of one article.

Answer 3:

No. of articles = 80

Cost Price of articles = ₹ 2,400

And Profit = 16%

∵ Cost price of articles is ₹ 100, then selling price = 100 + 16 = ₹ 116

∴ Cost price of articles is ₹ 1, then selling price = $\frac{116}{100}$

∴ Cost price of articles is ₹ 2400, then selling price = $\frac{116}{100} \times 2400$ = ₹ 2784

Hence, Selling Price of 80 articles = ₹ 2784

Therefore Selling Price of 1 article = $\frac{2784}{80}$ = ₹ 34.80

Question 4:

The cost of an article was ₹ 15,500, ₹ 450 were spent on its repairs. If it sold for a profit of 15%, find the selling price of the article.

Answer 4:

Here, C.P. = ₹ 15,500 and Repair cost = ₹ 450

Therefore Total Cost Price = 15500 + 450 = ₹ 15,950

Let C.P be ₹ 100, then S.P. = 100 + 15 = ₹ 115

∵ When C.P. is ₹ 100, then S.P. = ₹ 115

∴ When C.P. is ₹ 1, then S.P. = $\frac{115}{100}$

∴ When C.P. is ₹ 15950, then S.P. = $\frac{115}{100} \times 15950$ = ₹ 18,342.50

Question 5:

A VCR and TV were bought for ₹ 8,000 each. The shopkeeper made a loss of 4% on the VCR and a profit of 8% on the TV. Find the gain or loss percent on the whole transaction.

Answer 5:

Cost price of VCR = ₹ 8000 and Cost price of TV = ₹ 8000

Total Cost Price of both articles = ₹ 8000 + ₹ 8000 = ₹ 16,000

Now VCR is sold at 4% loss.

Let C.P. of each article be ₹ 100, then S.P. of VCR = 100 – 4 = ₹ 96

$\because$ When C.P. is ₹ 100, then S.P. = ₹ 96

$\therefore$ When C.P. is ₹ 1, then S.P. = $\frac{96}{100}$

$\therefore$ When C.P. is ₹ 8000, then S.P. = $\frac{96}{100} \times 8000$ = ₹ 7,680

And TV is sold at 8% profit, then S.P. of TV = 100 + 8 = ₹ 108

$\because$ When C.P. is ₹ 100, then S.P. = ₹ 108

$\therefore$ When C.P. is ₹ 1, then S.P. = $\frac{108}{100}$

$\therefore$ When C.P. is ₹ 8000, then S.P. = $\frac{108}{100} \times 8000$ = ₹ 8,640

Then, Total S.P. = ₹ 7,680 + ₹ 8,640 = ₹ 16,320

Since S.P. > C.P.,

Therefore Profit = S.P. – C.P. = 16320 – 16000 = ₹ 320

And Profit% = $\frac{\text{Profit}}{\text{Cost Price}} \times 100 = \frac{320}{16000} \times 100 = 2\%$

Question 6:

During a sale, a shop offered a discount of 10% on the marked prices of all the items. What would a customer have to pay for a pair of jeans marked at ₹ 1450 and two shirts marked at ₹ 850 each?

Answer 6:

Rate of discount on all items = 10%

Marked Price of a pair of jeans = ₹ 1450 and Marked Price of a shirt = ₹ 850

Discount on a pair of jeans = $\frac{\text{Rate} \times \text{M.P.}}{100} = \frac{10 \times 1450}{100}$ = ₹ 145

$\therefore$ S.P. of a pair of jeans = ₹ 1450 – ₹ 145 = ₹ 1305

Marked Price of two shirts = 2 x 850 = ₹ 1700

Discount on two shirts = $\frac{\text{Rate} \times \text{M.P.}}{100} = \frac{10 \times 1700}{100}$ = ₹ 170

$\therefore$ S.P. of two shirts = ₹ 1700 – ₹ 170 = ₹ 1530

Therefore, the customer had to pay = 1305 + 1530 = ₹ 2,835

Question 7:

A milkman sold two of his buffaloes for ₹ 20,000 each. On one he made a gain of 5% and on the other a loss of 10%. Find his overall gain or loss. (Hint: Find CP of each)

Answer 7:

S.P. of each buffalo = ₹ 20,000

S.P. of two buffaloes = ₹ 20,000 x 2 = ₹ 40,000

One buffalo is sold at 5% gain.

Let C.P. be ₹ 100, then S.P. = 100 + 5 = ₹105

$\because$ When S.P. is ₹ 105, then C.P. = ₹ 100

$\therefore$ When S.P. is ₹ 1, then C.P. = $\frac{100}{105}$

$\therefore$ When S.P. is ₹ 20,000, then C.P. = $\frac{100}{105} \times 20000$ = ₹ 19,047.62

Another buffalo is sold at 10% loss.

Let C.P. be ₹ 100, then S.P. = 100 – 10 = ₹ 90

$\because$ When S.P. is ₹ 90, then C.P. = ₹ 100

$\therefore$ When S.P. is ₹ 1, then C.P. = $\frac{100}{90}$

$\therefore$ When S.P. is ₹ 20,000, then C.P. = $\frac{100}{90} \times 20000$ = ₹ 22,222.22

Total C.P. = ₹ 19,047.62 + ₹ 22,222.22 = ₹ 41,269.84

Since C.P. > S.P.

Therefore here it is loss.

Loss = C.P. – S.P. = ₹ 41,269.84 – ₹ 40,000.00 = ₹ 1,269.84

Question 8:

The price of a TV is ₹ 13,000. The sales tax charged on it is at the rate of 12%. Find the amount that Vinod will have to pay if he buys it.

Answer 8:

C.P. = ₹ 13,000 and S.T. rate = 12%

Let C.P. be ₹ 100, then S.P. for purchaser = 100 + 12 = ₹ 112

∵ When C.P. is ₹ 100, then S.P. = ₹ 112

∴ When C.P. is ₹ 1, then S.P. = $\frac{112}{100}$

∴ When C.P. is ₹ 13,000, then S.P. = $\frac{112}{100} \times 13000$ = ₹ 14,560

Question 9:

Arun bought a pair of skates at a sale where the discount given was 20%. If the amount he pays is ₹1,600, find the marked price.

Answer 9:

S.P. = ₹1,600 and Rate of discount = 20%

Let M.P. be ₹ 100, then S.P. for customer = 100 – 20 = ₹ 80

∵ When S.P. is ₹ 80, then M.P. = ₹ 100

∴ When S.P. is ₹1, then M.P. = $\frac{100}{80}$

∴ When S.P. is ₹1600, then M.P. = $\frac{100}{80} \times 1600$ = ₹ 2,000

Question 10:

I purchased a hair-dryer for ₹ 5,400 including 8% VAT. Find the price before VAT was added.

Answer 10:

C.P. = ₹ 5,400 and Rate of VAT = 8%

Let C.P. without VAT is ₹100, then price including VAT = 100 + 8 = ₹ 108

∵ When price including VAT is ₹ 108, then original price = ₹ 100

$\therefore$ When price including VAT is ₹ 1, then original price = $\frac{100}{108}$

$\therefore$ When price including VAT is ₹ 5400,

then original price = $\frac{100}{108} \times 5400$ = ₹ 5000

Exercise 8.3

Question 1:

Calculate the amount and compound interest on:

(a) ₹ 10,800 for 3 years at $12\frac{1}{2}\%$ per annum compounded annually.

(b) ₹ 18,000 for $2\frac{1}{2}$ years at 10% per annum compounded annually.

(c) ₹ 62,500 for $1\frac{1}{2}$ years at 8% per annum compounded annually.

(d) ₹ 8,000 for 1 years at 9% per annum compounded half yearly. (You could the year by year calculation using S.I. formula to verify).

(e) ₹ 10,000 for 1 years at 8% per annum compounded half yearly.

Answer 1:

(a) Here,

Principal (P) = ₹ 10800, Time (n) = 3 years,

Rate of interest (R) = $12\frac{1}{2}\% = \frac{25}{2}\%$

Amount (A) = $P\left(1+\frac{R}{100}\right)^n$

$= 10800\left(1+\frac{25}{2\times 100}\right)^3$

$= 10800\left(1+\frac{1}{2\times 4}\right)^3$

$= 10800\left(1+\frac{1}{8}\right)^3$

$= 10800\left(\frac{9}{8}\right)^3$

$= 10800\times\frac{9}{8}\times\frac{9}{8}\times\frac{9}{8}$

= ₹ 15,377.34

Compound Interest (C.I.) = A – P = ₹ 10800 – ₹15377.34 = ₹4,577.34

(b) Here,

Principal (P) = ₹ 18,000, Time $(n) = 2\frac{1}{2}$ years, Rate of interest (R) = 10% p.a.

Amount (A) = $P\left(1+\frac{R}{100}\right)^n$

$= 18000\left(1+\frac{10}{100}\right)^2$

$= 18000\left(1+\frac{1}{10}\right)^2$

$= 18000\left(\frac{11}{10}\right)^2$

$= 18000\times\frac{11}{10}\times\frac{11}{10}$

= ₹ 21,780

Interest for $\frac{1}{2}$ years on ₹ 21,780 at rate of 10% = $\frac{1}{2}\times\frac{21780\times10\times1}{100}$ = ₹ 1,089

Total amount for $2\frac{1}{2}$ years = ₹ 21,780 + ₹ 1089 = ₹ 22,869

Compound Interest (C.I.) = A – P = ₹ 22869 – ₹ 18000 = ₹ 4,869

(c) Here,

Principal (P) = ₹ 62500, Time $(n) = 1\frac{1}{2} = \frac{3}{2}$ years = 3 half-years (compounded half yearly)

Rate of interest (R) = 8% = 4% (compounded half yearly)

Amount (A) = $P\left(1+\frac{R}{100}\right)^n$

$= 62500\left(1+\frac{4}{100}\right)^2 = 62500\left(1+\frac{1}{25}\right)^3$

$= 62500\left(\frac{26}{25}\right)^3$

$= 62500\times\frac{26}{25}\times\frac{26}{25}\times\frac{26}{25}$ = ₹ 70,304

Compound Interest (C.I.) = A – P = ₹ 70304 – ₹ 62500 = ₹ 7,804

(d) Here,

Principal (P) = ₹ 8000, Time (n) = 1 years = 2 half-years(compounded half yearly)

Rate of interest (R) = 9% = $\frac{9}{2}$% (compounded half yearly)

Amount (A) = $P\left(1+\frac{R}{100}\right)^n$

$= 8000\left(1+\frac{9}{2\times100}\right)^2$

$= 8000\left(1+\frac{9}{200}\right)^2$

$= 8000\left(\frac{209}{200}\right)^2$

$= 8000\times\frac{209}{200}\times\frac{209}{200}$

= ₹ 8,736.20

Compound Interest (C.I.) = A – P = ₹ 8736.20 – ₹ 8000 = ₹ 736.20

(e) Here,

Principal (P) = ₹ 10,000, Time (n) = 1 years = 2 half-years (compounded half yearly)

Rate of interest (R) = 8% = 4% (compounded half yearly)

Amount (A) = $P\left(1+\frac{R}{100}\right)^n$

$= 10000\left(1+\frac{4}{100}\right)^2$

$= 10000\left(1+\frac{1}{25}\right)^2$

$= 10000\left(\frac{26}{25}\right)^2$

$= 10000\times\frac{26}{25}\times\frac{26}{25}$ = ₹ 10,816

Compound Interest (C.I.) = A – P = ₹ 10,816 – ₹ 10,000 = ₹ 816

Question 2:

Kamala borrowed ₹ 26,400 from a Bank to buy a scooter at a rate of 15% p.a. compounded yearly. What amount will she pay at the end of 2 years and 4 months to clear the loan?

(**Hint**: Find A for 2 years with interest is compounded yearly and then find SI on the 2nd year amount for $\frac{4}{12}$ years).

Answer 2:

Here,

Principal (P) = ₹ 26,400, Time (n) = 2 years 4 months, Rate of interest (R) = 15% p.a.

Amount for 2 years (A) = $P\left(1+\frac{R}{100}\right)^n$

$= 26400\left(1+\frac{15}{100}\right)^2$

$= 26400\left(1+\frac{3}{20}\right)^2$

$= 26400\left(\frac{23}{20}\right)^2$

$= 26400\times\frac{23}{20}\times\frac{23}{20}$

= ₹ 34,914

Interest for 4 months = $\frac{4}{12}=\frac{1}{3}$ years at the rate of 15%

$=\frac{1}{3}\times\frac{34914\times15\times1}{100}$ = ₹ 1745.70

$\therefore$ Total amount = ₹ 34,914 + ₹ 1,745.70

= ₹ 36,659.70

Question 3:

Fabina borrows ₹ 12,500 per annum for 3 years at simple interest and Radha borrows the same amount for the same time period at 10% per annnum, compounded annually. Who pays more interest and by how much?

Answer 3:

Here,

Principal (P) = ₹ 12,500, Time (T) = 3 years, Rate of interest (R) = 12% p.a.

Simple Interest for Fabina = $\frac{P \times R \times T}{100} = \frac{12500 \times 12 \times 3}{100}$ = ₹ 4,500

Amount for Radha, P = ₹ 12,500, R = 10% and n = 3 years

Amount (A) $= P\left(1+\frac{R}{100}\right)^n$

$= 12500\left(1+\frac{10}{100}\right)^3$

$= 12500\left(1+\frac{1}{10}\right)^3$

$= 12500\left(\frac{11}{10}\right)^3$

$= 12500 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10}$

= ₹ 16,637.50

$\therefore$ C.I. for Radha = A – P = ₹ 16,637.50 – ₹ 12,500 = ₹ 4,137.50

Here, Fabina pays more interest = ₹ 4,500 – ₹ 4,137.50 = ₹ 362.50

Question 4:

I borrows ₹ 12,000 from Jamshed at 6% per annum simple interest for 2 years. Had I borrowed this sum at 6% per annum compound interest, what extra amount would I have to pay?

Answer 4:

Here,

Principal (P) = ₹12,000, Time (T) = 2 years, Rate of interest (R) = 6% p.a.

Simple Interest = $\frac{P \times R \times T}{100} = \frac{12000 \times 6 \times 2}{100}$ = ₹ 1,440

Had he borrowed this sum at 6% p.a., then

Compound Interest $= P\left(1+\frac{R}{100}\right)^n - P$

$= 12000\left(1+\frac{6}{100}\right)^2 - 12000$

$= 12000\left(1+\frac{3}{50}\right)^2 - 12000$

$= 12000\left(\frac{53}{50}\right)^2 - 12000$

$= 12000 \times \frac{53}{50} \times \frac{53}{50} - 12000$

= ₹ 13,483.20 – ₹ 12,000

= ₹ 1,483.20

Difference in both interests = ₹ 1,483.20 – ₹ 1,440.00 = ₹ 43.20

Question 5:

Vasudevan invested ₹ 60,000 at an interest rate of 12% per annum compounded half yearly. What amount would he get:

(i) after 6 months?

(ii) after 1 year?

Answer 5:

Here, Principal (P) = ₹ 60,000,

Time (n) = 6 months = 1 half-year (compounded half yearly)

Rate of interest (R) = 12% = 6% (compounded half yearly)

Amount (A) = $P\left(1+\frac{R}{100}\right)^n$

$$= 60000\left(1+\frac{6}{100}\right)^{1}$$

$$= 60000\left(1+\frac{3}{50}\right)^{1}$$

$$= 60000\left(\frac{53}{50}\right)^{1}$$

$$= 60000\times\frac{53}{50} = ₹\ 63{,}600$$

After 6 months Vasudevan would get amount ₹ 63,600.

(ii) Here, Principal (P) = ₹ 60,000,

Time (n) = 1 year = 2 half-years (compounded half yearly)

Rate of interest (R) = 12% = 6% (compounded half yearly)

Amount (A) $= P\left(1+\frac{R}{100}\right)^{n}$

$$= 60000\left(1+\frac{6}{100}\right)^{2}$$

$$= 60000\left(1+\frac{3}{50}\right)^{2}$$

$$= 60000\left(\frac{53}{50}\right)^{2}$$

$$= 60000\times\frac{53}{50}\times\frac{53}{50} = ₹\ 67{,}416$$

After 1 year Vasudevan would get amount ₹ 67,416.

Question 6:

Arif took a loan of ₹ 80,000 from a bank. If the rate of interest is 10% per annum, find the difference in amounts he would be paying after $1\frac{1}{2}$ years if the interest is:

(i) compounded annually.

(ii) compounded half yearly.

Answer 6:

(i) Here,

Principal (P) = ₹ 80,000, Time $(n) = 1\frac{1}{2}$ years, Rate of interest (R) = 10%

Amount for 1 year (A) $= P\left(1+\frac{R}{100}\right)^n$

$= 80000\left(1+\frac{10}{100}\right)^1$

$= 80000\left(1+\frac{1}{10}\right)^1$

$= 80000\left(\frac{11}{10}\right)^1$

= ₹ 88,000

Interest for $\frac{1}{2}$ year = $\frac{88000\times10\times1}{100\times2}$ = ₹ 4,400

Total amount = ₹ 88,000 + ₹ 4,400 = ₹ 92,400

(ii) Here, Principal (P) = ₹ 80,000,

Time $(n) = 1\frac{1}{2}$ year = 3 half-years (compounded half yearly)

Rate of interest (R) = 10% = 5% (compounded half yearly)

Amount (A) $= P\left(1+\frac{R}{100}\right)^n$

$= 80000\left(1+\frac{5}{100}\right)^3$

$= 80000\left(1+\frac{1}{20}\right)^3$

$= 80000\left(\frac{21}{20}\right)^3$

$= 80000\times\frac{21}{20}\times\frac{21}{20}\times\frac{21}{20}$ = ₹ 92,610

Difference in amounts = ₹ 92,610 – ₹ 92,400 = ₹ 210

Question 7:

Maria invested ₹ 8,000 in a business. She would be paid interest at 5% per annum compounded annually. Find:

(i) The amount credited against her name at the end of the second year.

(ii) The interest for the third year.

Answer 7:

(i) Here,

Principal (P) = ₹ 8000, Rate of Interest (R) = 5%, Time (n) = 2 years

$$\text{Amount (A)} = P\left(1+\frac{R}{100}\right)^n$$

$$= 8000\left(1+\frac{5}{100}\right)^2$$

$$= 8000\left(1+\frac{1}{20}\right)^2$$

$$= 8000\left(\frac{21}{20}\right)^2$$

$$= 8000\times\frac{21}{20}\times\frac{21}{20} = ₹\ 8{,}820$$

(ii) Here,

Principal (P) = ₹ 8000, Rate of Interest (R) = 5%, Time (n) = 3 years

$$\text{Amount (A)} = P\left(1+\frac{R}{100}\right)^n$$

$$= 8000\left(1+\frac{5}{100}\right)^3$$

$$= 8000\left(1+\frac{1}{20}\right)^3$$

$$= 8000\left(\frac{21}{20}\right)^3$$

$$= 8000\times\frac{21}{20}\times\frac{21}{20}\times\frac{21}{20} = ₹\ 9{,}261$$

Interest for 3rd year = A – P = ₹ 9,261 – ₹ 8,820 = ₹ 441

Question 8:

Find the amount and the compound interest on ₹ 10,000 for $1\frac{1}{2}$ years at 10% per annum, compounded half yearly.
Would this interest be more than the interest he would get if it was compounded annually?

Answer 8:

Here,
Principal (P) = ₹ 10000, Rate of Interest (R) = 10% = 5% (compounded half yearly)
Time (n) = $1\frac{1}{2}$ years = 3 half-years (compounded half yearly)

Amount (A) $= P\left(1+\frac{R}{100}\right)^{n}$

$= 10000\left(1+\frac{5}{100}\right)^{3}$

$= 10000\left(1+\frac{1}{20}\right)^{3}$

$= 10000\left(\frac{21}{20}\right)^{3}$

$= 10000\times\frac{21}{20}\times\frac{21}{20}\times\frac{21}{20}$ = ₹ 11,576.25

Compound Interest (C.I.) = A – P = ₹ 11,576.25 – ₹ 10,000 = ₹ 1,576.25

If it is compounded annually, then

Here, Principal (P) = ₹ 10000, Rate of Interest (R) = 10%, Time (n) = $1\frac{1}{2}$ years

Amount (A) for 1 year $= P\left(1+\frac{R}{100}\right)^{n}$

$= 10000\left(1+\frac{10}{100}\right)^{1}$

$= 10000\left(1+\frac{1}{10}\right)^{1}$

$= 10000\left(\frac{11}{10}\right)^{1}$

$= 10000 \times \frac{11}{10} = ₹\ 11{,}000$

Interest for $\frac{1}{2}$ year $= \frac{11000 \times 1 \times 10}{2 \times 100} = ₹\ 550$

$\therefore$ Total amount = ₹ 11,000 + ₹ 550 = ₹ 11,550

Now, C.I. = A – P = ₹ 11,550 – ₹ 10,000 = ₹ 1,550

Yes, interest ₹ 1,576.25 is more than ₹ 1,550.

Question 9:

Find the amount which Ram will get on ₹ 4,096, if he gave it for 18 months at $12\frac{1}{2}\%$ per annum, interest being compounded half yearly.

Answer 9:

Here, Principal (P) = ₹ 4096,

Rate of Interest (R) = $12\frac{1}{2} = \frac{25}{2}\% = \frac{25}{4}\%$ (compounded half yearly)

Time (n) = 18 months = $1\frac{1}{2}$ years = 3 half-years (compounded half yearly)

Amount (A) $= P\left(1 + \frac{R}{100}\right)^n$

$= 4096\left(1 + \frac{25}{4 \times 100}\right)^3$

$= 4096\left(1 + \frac{1}{4 \times 4}\right)^3$

$= 4096\left(\frac{17}{16}\right)^3$

$= 4096 \times \frac{17}{16} \times \frac{17}{16} \times \frac{17}{16}$

$= ₹\ 4{,}913$

Question 10:

The population of a place increased to 54,000 in 2003 at a rate of 5% per annum.

(i) Find the population in 2001.

(ii) What would be its population in 2005?

Answer 10:

(i) Here, $A_{2003} = 54{,}000$, $R = 5\%$, $n = 2$ years

Population would be less in 2001 than 2003 in two years.

Here population is increasing.

$$\therefore \quad A_{2003} = P_{2001}\left(1+\frac{R}{100}\right)^n$$

$$\Rightarrow \quad 54000 = P_{2001}\left(1+\frac{5}{100}\right)^2$$

$$\Rightarrow \quad 54000 = P_{2001}\left(1+\frac{1}{20}\right)^2$$

$$\Rightarrow \quad 54000 = P_{2001}\left(\frac{21}{20}\right)^2$$

$$\Rightarrow \quad 54000 = P_{2001}\times\frac{21}{20}\times\frac{21}{20}$$

$$\Rightarrow \quad P_{2001} = \frac{54000\times 20\times 20}{21\times 21}$$

$$\Rightarrow \quad P_{2001} = 48{,}980 \text{ (approx.)}$$

(ii) According to question, population is increasing.

Therefore population in 2005,

$$A_{2005} = P\left(1+\frac{R}{100}\right)^n$$

$$= 54000\left(1+\frac{5}{100}\right)^2$$

$$= 54000\left(1+\frac{1}{20}\right)^2$$

$$= 54000\left(\frac{21}{20}\right)^2$$

$$= 54000\times\frac{21}{20}\times\frac{21}{20} = 59{,}535$$

Hence population in 2005 would be 59,535.

Question 11:

In a laboratory, the count of bacteria in a certain experiment was increasing at the rate of 2.5% per hour. Find the bacteria at the end of 2 hours if the count was initially 5,06,000.

Answer 11:

Here, Principal (P) = 5,06,000, Rate of Interest (R) = 2.5%, Time (n) = 2 hours

After 2 hours, number of bacteria,

$$\text{Amount (A)} = P\left(1+\frac{R}{100}\right)^n$$

$$= 506000\left(1+\frac{2.5}{100}\right)^2$$

$$= 506000\left(1+\frac{25}{1000}\right)^2$$

$$= 506000\left(1+\frac{1}{40}\right)^2$$

$$= 506000\left(\frac{41}{40}\right)^2$$

$$= 506000\times\frac{41}{40}\times\frac{41}{40} = 5,31,616.25$$

Hence, number of bacteria after two hours are 531616 (approx.).

Question 12:

A scooter was bought at ₹ 42,000. Its value depreciated at the rate of 8% per annum. Find its value after one year.

Answer 12:

Here, Principal (P) = ₹ 42,000, Rate of Interest (R) = 8%, Time (n) = 1 years

$$\text{Amount (A)} = P\left(1-\frac{R}{100}\right)^n$$

$$= 42000\left(1-\frac{8}{100}\right)^1$$

$$= 42000\left(1+\frac{2}{25}\right)^1$$

$$= 42000\left(\frac{27}{25}\right)^1$$

$$= 42000\times\frac{27}{25} = ₹\ 38{,}640$$

Hence, the value of scooter after one year is ₹ 38,640.

Exercise 9.1

Question 1:

Identify the terms, their coefficients for each of the following expressions:

(i) $5xyz^2 - 3zy$ (ii) $1 + x + x^2$

(iii) $4x^2y^2 - 4x^2y^2z^2 + z^2$ (iv) $3 - pq + qr - rp$

(v) $\frac{x}{2} + \frac{y}{2} - xy$ (vi) $0.3a - 0.6ab + 0.5b$

Answer 1:

(i) Terms: $5xyz^2$ and $-3zy$

Coefficient in $5xyz^2$ is 5 and in $-3zy$ is -3.

(ii) Terms: $1, x$ and x^2.

Coefficient of x and coefficient of x^2 is 1.

(iii) Terms: $4x^2y^2, -4x^2y^2z^2$ and z^2.

Coefficient in $4x^2y^2$ is 4, coefficient of $-4x^2y^2z^2$ is -4 and coefficient of z^2 is 1.

(iv) Terms: $3, -pq, qr$ and $-rp$

Coefficient of $-pq$ is -1, coefficient of qr is 1 and coefficient of $-rp$ is -1.

(v) Terms: $\frac{x}{2}, \frac{y}{2}$ and $-xy$

Coefficient of $\frac{x}{2}$ is $\frac{1}{2}$, coefficient of $\frac{y}{2}$ is $\frac{1}{2}$ and coefficient of $-xy$ is -1.

(vi) Terms: $0.3a, -0.6ab$ and $0.5b$

Coefficient of $0.3a$ is 0.3, coefficient of $-0.6ab$ is -0.6 and coefficient of $0.5b$ is 0.5.

Question 2:

Classify the following polynomials as monomials, binomials, trinomials. Which polynomials do not fit in any of these three categories:

$x + y$, 1000, $x + x^2 + x^3 + x^4$, $7 + y + 5x$, $2y - 3y^2$, $2y - 3y^2 + 4y^3$, $5x - 4y + 3xy$, $4z - 15^{\ 2}$, , pqr, $p^2q + pq^2$, $2p + 2q$

Answer 2:

(i) Since $x+y$ contains two terms. Therefore it is binomial.

(ii) Since 1000 contains one terms. Therefore it is monomial.

(iii) Since $x+x^2+x^3+x^4$ contains four terms. Therefore it is a polynomial and it does not fit in above three categories.

(iv) Since $7+y+5x$ contains three terms. Therefore it is trinomial.

(v) Since $2y-3y^2$ contains two terms. Therefore it is binomial.

(vi) Since $2y-3y^2+4y^3$ contains three terms. Therefore it is trinomial.

(vii) Since $5x-4y+3xy$ contains three terms. Therefore it is trinomial.

(viii) Since $4x-15z^2$ contains two terms. Therefore it is binomial.

(ix) Since $ab+bc+cd+da$ contains four terms. Therefore it is a polynomial and it does not fit in above three categories.

(x) Since pqr contains one terms. Therefore it is monomial.

(xi) Since p^2q+pq^2 contains two terms. Therefore it is binomial.

(xii) Since $2p+2q$ contains two terms. Therefore it is binomial.

Question 3:

Add the following:

(i) $ab-bc, bc-ca, ca-ab$

(ii) $a-b+ab, b-c+bc, c-a+ac$

(iii) $2p^2q^2-3pq+4, 5+7pq-3p^2q^2$

(iv) $l^2+m^2, m^2+n^2, n^2+l^2+2lm+2mn+2nl$

Answer 3:

(i) $ab-bc, bc-ca, ca-ab$

$$\begin{array}{l} ab-bc \\ \quad +bc-ca \\ -ab \quad +ca \\ \hline \boxed{0+0+0} \end{array}$$

Hence the sum is 0.

(ii) $a-b+ab, b-c+bc, c-a+ac$

$$\begin{array}{l} a-b-ab \\ \quad +b \quad -c+bc \\ -a \quad +c \quad +ac \\ \hline \boxed{0+0+ab+0+bc+ac} \end{array}$$

Hence the sum is $ab+bc+ac$.

(iii) $2p^2q^2-3pq+4, 5+7pq-3p^2q^2$

$$\begin{array}{r} 2p^2q^2-3pq+4 \\ -3p^2q^2+7pq+5 \\ \hline \boxed{-p^2q^2+4pq+9} \end{array}$$

Hence the sum is $-p^2q^2+4pq+9$.

(iv) $l^2+m^2, m^2+n^2, n^2+l^2, 2lm+2mn+2nl$

$$\begin{array}{r} l^2+m^2 \\ +\quad m^2+n^2 \\ +l^2\quad +n^2 \\ +\qquad 2lm+2mn+2nl \\ \hline \boxed{2l^2+2m^2+2n^2+2lm+2mn+2nl} \end{array}$$

Hence the sum is $2\left(l^2+m^2+n^2+lm+mn+nl\right)$

Question 4:

(a) Subtract $4a-7ab+3b+12$ from $12a-9ab+5b-3$.

(b) Subtract $3xy+5yz-7zx$ from $5xy-2yz-2zx+10xyz$.

(c) Subtract $4p^2q-3pq+5pq^2-8p+7q-10$ from $18-3p-11q+5pq-2pq^2+5p^2q$.

Answer 4:

(a)

$$\begin{array}{r} 12a-9ab+5b-3 \\ 4a-7ab+3b+12 \\ (-)\quad (+)\quad (-)(-) \\ \hline \boxed{8a-2ab+2b-15} \end{array}$$

(b)

$$\begin{array}{r} 5xy-2yz-2zx+10xyz \\ 3xy+5yz-7zx \\ (-)\quad (-)\quad (+) \\ \hline \boxed{2xy-7yz+5zx+10xyz} \end{array}$$

(c)

$$\begin{array}{r} 5p^2q-2pq^2+5pq-11q-3p+18 \\ 4p^2q+5pq^2-3pq+7q\ -8p-10 \\ (-)\quad (-)\quad (+)\quad (-)\ (+)\ (+) \\ \hline \boxed{p^2q-7pq^2+8pq-18q+5p+28} \end{array}$$

Exercise 9.2

Question 1:

Find the product of the following pairs of monomials:

(i) $4, 7p$ (ii) $-4p, 7p$ (iii) $-4p, 7pq$

(iv) $4p^3, -3p$ (iv) $4p, 0$

Answer 1:

(i) $4 \times 7p = 4 \times 7 \times p = 28p$

(ii) $-4p \times 7p = (-4 \times 7) \times (p \times p) = -28p^2$

(iii) $-4p \times 7pq = (-4 \times 7)(p \times pq) = -28p^2q$

(iv) $4p^3 \times -3p = (4 \times -3)(p^3 \times p) = -12p^4$

(v) $4p \times 0 = (4 \times 0)(p) = 0$

Question 2:

Find the areas of rectangles with the following pairs of monomials as their lengths and breadths respectively:

(p, q); $(10m, 5n)$; $(20x^2, 5y^2)$; $(4x, 3x^2)$; $(3mn, 4np)$

Answer 2:

(i) Area of rectangle = length x breadth
= $p \times q = pq$ sq. units

(ii) Area of rectangle = length x breadth
= $10m \times 5n = (10 \times 5)(m \times n) = 50mn$ sq. units

(iii) Area of rectangle = length x breadth
= $20x^2 \times 5y^2 = (20 \times 5)(x^2 \times y^2) = 100x^2y^2$ sq. units

(iv) Area of rectangle = length x breadth
= $4x \times 3x^2 = (4 \times 3)(x \times x^2) = 12x^3$ sq. units

(v) Area of rectangle = length x breadth
= $3mn \times 4np = (3 \times 4)(mn \times np) = 12mn^2p$ sq. units

Question 3:

Complete the table of products:

First monomial ⟶ Second monomial ↓	$2x$	$-5y$	$3x^2$	$-4xy$	$7x^2y$	$-9x^2y^2$
$2x$	$4x^2$	.....	.....	.....	.....	.....
$-5y$	.....	.....	$-15x^2y$	.....	.....	.....
$3x^2$	.....	.....	.....	.....	.....	.....
$-4xy$	.....	.....	.....	.....	.....	.....
$7x^2y$	.....	.....	.....	.....	.....	.....
$-9x^2y^2$	.....	.....	.....	.....	.....	.....

Answer 3:

First monomial ⟶ Second monomial ↓	$2x$	$-5y$	$3x^2$	$-4xy$	$7x^2y$	$-9x^2y^2$
$2x$	$4x^2$	$-10xy$	$6x^3$	$-8x^2y$	$14x^3y$	$-18x^3y^2$
$-5y$	$-10xy$	$25y^2$	$-15x^2y$	$20xy^2$	$-35x^2y^2$	$45x^2y^3$
$3x^2$	$6x^3$	$-15x^2y$	$9x^4$	$-12x^3y$	$21x^4y$	$-27x^4y^2$
$-4xy$	$8x^2y$	$20xy^2$	$-12x^3y$	$16x^2y^2$	$-28x^3y^2$	$36x^3y^3$
$7x^2y$	$14x^3y$	$-35x^2y^2$	$21x^4y$	$-28x^3y^2$	$49x^4y^2$	$-63x^4y^3$
$-9x^2y^2$	$-18x^3y^2$	$45x^2y^3$	$-27x^4y^2$	$36x^3y^3$	$-63x^4y^3$	$81x^4y^4$

Question 4:

Obtain the volume of rectangular boxes with the following length, breadth and height respectively:

(i) $5a, 3a^2 7a^4$ (ii) $2p, 4q, 8r$

(iii) $xy, 2x^2y, 2xy^2$ (iv) $a, 2b, 3c$

Answer 4:

(i) Volume of rectangular box = length x breadth x height

$= 5a \times 3a^2 \times 7a^4 = (5 \times 3 \times 7)(a \times a^2 \times a^4)$

$= 105a^7$ cubic units

(ii) Volume of rectangular box = length x breadth x height

$= 2p \times 4q \times 8r = (2 \times 4 \times 8)(p \times q \times r)$

$= 64pqr$ cubic units

(iii) Volume of rectangular box = length x breadth x height

$= xy \times 2x^2y \times 2xy^2 = (1 \times 2 \times 2)(x \times x^2 \times x \times y \times y \times y^2)$

$= 4x^4y^4$ cubic units

(iv) Volume of rectangular box = length x breadth x height

$= a \times 2b \times 3c = (1 \times 2 \times 3)(a \times b \times c) = 6abc$ cubic units

Question 5:

Obtain the product of:

(i) xy, yz, zx

(ii) $a, -a^2, a^3$

(iii) $2, 4y, 8y^2, 16y^3$

(iv) $a, 2b, 3c, 6abc$

(v) $m, -mn, mnp$

Answer 5:

(i) $xy \times yz \times zx = x \times x \times y \times y \times z \times z = x^2y^2z^2$

(ii) $a \times (-a^2) \times a^3 = (-1)(a \times a^2 \times a^3) = -a^6$

(iii) $2 \times 4y \times 8y^2 \times 16y^3 = (2 \times 4 \times 8 \times 16)(y \times y^2 \times y^3) = 1024y^6$

(iv) $a \times 2b \times 3c \times 6abc = (1 \times 2 \times 3 \times 6)(a \times b \times c \times abc) = 36a^2b^2c^2$

(v) $m \times -mn \times mnp = (1)(m \times m \times m \times n \times n \times p) = -m^3n^2p$

Exercise 9.3

Question 1:

Carry out the multiplication of the expressions in each of the following pairs:

(i) $4p, q+r$ (ii) $ab, a-b$

(iii) $a+b, 7a^2b^2$ (iv) $a^2-9, 4a$

(v) $pq+qr+rp, 0$

Answer 1:

(i) $4p\times(q+r) = 4p\times q + 4p\times r$

$= 4pq + 4pr$

(ii) $ab\times(a-b) = ab\times a - ab\times b$

$= a^2b - ab^2$

(iii) $(a+b)\times 7a^2b^2 = a\times 7a^2b^2 + b\times 7a^2b^2$

$= 7a^3b^2 + 7a^2b^3$

(iv) $(a^2-9)\times 4a = a^2\times 4a - 4a\times 9$

$= 4a^3 - 36a$

(v) $(pq+qr+rp)\times 0 = pq\times 0 + qr\times 0 + rp\times 0$

$= 0 + 0 + 0 = 0$

Question 2:

Complete the table:

	First expression	Second expression	Product
(i)	a	$b+c+d$	.....
(ii)	$x+y-5$	$5xy$	.....
(iii)	p	$6p^2-7p+5$	.....
(iv)	$4p^2q^2$	p^2-q^2	.....
(v)	$a+b+c$	abc	.....

Answer 2:

	First expression	Second expression	Product
(i)	a	$b+c+d$	$a(b+c+d)$ $= a\times b+a\times c+a\times d$ $= ab+ac+ad$
(ii)	$x+y-5$	$5xy$	$5xy(x+y-5)$ $= 5xy\times x+5xy\times y-5xy\times 5$ $= 5x^2y+5xy^2-25xy$
(iii)	p	$6p^2-7p+5$	$p(6p^2-7p+5)$ $= p\times 6p^2-p\times 7p+p\times 5$ $= 6p^3-7p^2+5p$
(iv)	$4p^2q^2$	p^2-q^2	$4p^2q^2(p^2-q^2)$ $= 4p^2q^2\times p^2-4p^2q^2\times q^2$ $= 4p^4q^2-4p^2q^4$
(v)	$a+b+c$	abc	$abc(a+b+c)$ $= abc\times a+abc\times b+abc\times c$ $= a^2bc+ab^2c+abc^2$

Question 3:

Find the product:

(i) $\left(a^2\right)\times\left(2a^{22}\right)\times\left(4a^{26}\right)$

(ii) $\left(\frac{2}{3}xy\right)\times\left(\frac{-9}{10}x^2y^2\right)$

(iii) $\left(\frac{-10}{3}pq^3\right)\times\left(\frac{6}{5}p^3q\right)$

(iv) $x\times x^2\times x^3\times x^4$

Answer 3:

(i) $\left(a^2\right)\times\left(2a^{22}\right)\times\left(4a^{26}\right)=(2\times4)\left(a^2\times a^{22}\times a^{26}\right)$

$= 8\times a^{2+22+26}=8a^{50}$

(ii) $\left(\frac{2}{3}xy\right)\times\left(\frac{-9}{10}x^2y^2\right)=\left(\frac{2}{3}\times\frac{-9}{10}\right)\left(x\times x^2\times y\times y^2\right)$

$=\frac{-3}{5}x^3y^3$

(iii) $\left(\frac{-10}{3}pq^3\right)\left(\frac{6}{5}p^3q\right)=\left(\frac{-10}{3}\times\frac{6}{5}\right)\left(p\times p^3\times q^3\times q\right)$

$=-4p^4q^4$

(iv) $x\times x^2\times x^3\times x^4=x^{1+2+3+4}=x^{10}$

Question 4:

(a) Simplify: $3x\left(4x-5\right)+3$ and find values for (i) $x=3$ (ii) $x=\frac{1}{2}$.

(b) Simplify: $a\left(a^2+a+1\right)+5$ and find its value for (i) $a=0$ (ii) $a=1$ (iii) $a=-1$.

Answer 4:

(a) $3x\left(4x-5\right)+3=3x\times4x-3x\times5+3=12x^2-15x+3$

(i) For $x=3$, $12x^2+15x+3=12\left(3\right)^2-15\times3+3$

$= 12 \text{ x } 9 - 45 + 3 = 108 - 45 + 3 = 66$

(ii) For $x=\frac{1}{2}$, $12x^2-15x+3=12\left(\frac{1}{2}\right)^2-15\times\frac{1}{2}+3=12\times\frac{1}{4}-\frac{15}{2}+3$

$=6-\frac{15}{2}=\frac{12-15}{2}=\frac{-3}{2}$

(b) $a\left(a^2+a+1\right)+5=a\times a^2+a\times a+a\times1+5=a^3+a^2+a+5$

(i) For $a=0$, $a^3+a^2+a+5=\left(0\right)^3+\left(0\right)^2+\left(0\right)+5$

$= 0 + 0 + 0 + 5 = 5$

(ii) For $a=1$, $a^3+a^2+a+5=\left(1\right)^3+\left(1\right)^2+\left(1\right)+5$

$= 1 + 1 + 1 + 5 = 8$

(iii) For $a=-1$, $a^3+a^2+a+5 = (-1)^3+(-1)^2+(-1)+5$

$= -1+1-1+5 = -2+6 = 4$

Question 5:

(a) Add: $p(p-q), q(q-r)$ and $r(r-p)$.

(b) Add: $2x(z-x-y)$ and $2y(z-y-zx)$.

(c) Subtract: $3l(l-4m+5n)$ from $4l(10n-3m+2l)$.

(d) Subtract: $3a(a+b+c)-2b(a-b+c)$ from $4c(-a+b+c)$.

Answer 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) $2x(z-x-y)+2y(z-y-x) = 2xz-2x^2-2xy+2yz-2y^2-2xy$

$= 2xz-2xy-2xy+2yz-2x^2-2y^2$

$= -2x^2-2y^2-4xy+2yz+2zx$

(c) $4l(10n-3m+2l)-3l(l-4m+5n) = 40ln-12lm+8l^2-3l^2+12lm-15ln$

$= 8l^2-3l^2-12lm+12lm+40ln-15ln$

$= 5l^2+25ln$

(d) $4c(-a+b+c)-[3a(a+b+c)-2b(a-b+c)]$

$= -4ac+4bc+4c^2-[3a^2+3ab+3ac-2ab+2b^2-2bc]$

$= -4ac+4bc+4c^2-[3a^2+2b^2+3ab-2bc+3ac-2ab]$

$= -4ac+4bc+4c^2-[3a^2+2b^2+ab+3ac-2bc]$

$= -4ac+4bc+4c^2-3a^2-2b^2-ab-3ac+2bc$

$= -3a^2-2b^2+4c^2-ab+4bc+2bc-4ac-3ac$

$= -3a^2-2b^2+4c^2-ab+6bc-7ac$

Exercise 9.4

Question 1:

Multiply the binomials:

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

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

(iii) $(2.5l-0.5m)$ and $(2.5l+0.5m)$

(iv) $(a+3b)$ and $(x+5)$

(v) $(2pq+3q^2)$ and $(3pq-2q^2)$

(vi) $\left(\frac{3}{4}a^2+3b^2\right)$ and $4\left(a^2-\frac{2}{3}b^2\right)$

Answer 1:

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

$= 2x\times4x-2x\times3+5\times4x-5\times3$

$= 8x^2-6x+20x-15$

$= 8x^2+14x-15$

(ii) $(y-8)\times(3y-4)=y(3y-4)-8(3y-4)$

$= y\times3y-y\times4-8\times3y-8\times-4$

$= 3y^2-4y-24y+12$

$= 3y^2-28y+12$

(iii) $(2.5l-0.5m)\times(2.5l+0.5m)=2.5l\times(2.5l+0.5m)-0.5m\times(2.5l+0.5m)$

$= 2.5l\times2.5l+0.5l\times0.5m-0.5m\times2.5l-0.5m\times0.5m$

$= 6.25l^2+1.25lm-1.25lm-0.25m^2$

$= 6.25l^2-0.25m^2$

(iv) $(a+3b)\times(x+5)=a(x+5)+3b(x+5)$

$= a\times x+a\times5+3b\times x+3b\times5$

$= ax+5a+3bx+15b$

(v) $(2pq+3q^2)(3pq-2q^2) = 2pq\times(3pq-2q^2)+3q^2(3pq-2q^2)$

$= 2pq\times3pq-2pq\times2q^2+3q^2\times3pq-3q^2\times2q^2$

$= 6p^2q^2-4pq^3+9pq^3-6q^4$

$= 6p^2q^2+5pq^3-6q^4$

(vi) $\left(\frac{3}{4}a^2+3b^2\right)\times 4\left(a^2-\frac{2}{3}b^2\right)=\left(\frac{3}{4}a^2+3b^2\right)\times\left(4a^2-\frac{8}{3}b^2\right)$

$=\frac{3}{4}a^2\times\left(4a^2-\frac{8}{3}b^2\right)+3b^2\times\left(4a^2-\frac{8}{3}b^2\right)$

$=\frac{3}{4}a^2\times 4a^2-\frac{3}{4}a^2\times\frac{8}{3}b^2+3b^2\times 4a^2-3b^2\times\frac{8}{3}b^2$

$=3a^4-2a^2b^2+12a^2b^2-8b^4$

$=3a^4+10a^2b^2-8b^4$

Question 2:

Find the product:

(i) $(5-2x)(3+x)$ (ii) $(x+7y)(7x-y)$

(iii) $(a^2+b)(a+b^2)$ (iv) $(p^2-q^2)(2p+q)$

Answer 2:

(i) $(5-2x)(3+x)=5\times(3+x)-2x(3+x)=5\times 3+5\times x-2x\times 3-2x\times x$

$=15+5x-6x-2x^2=15-x-2x^2$

(ii) $(x+7y)(7x-y)=x(7x-y)+7y\times(7x-y)$

$=x\times 7x-x\times y+7y\times 7x-7y\times y$

$=7x^2-xy+49xy-7y^2$

$=7x^2+48xy-7y^2$

(iii) $(a^2+b)(a+b^2)=a^2\times(a+b^2)+b\times(a+b^2)$

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

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

(iv) $(p^2-q^2)(2p+q)=p^2\times(2p+q)-q^2(2p+q)$

$=p^2\times 2p+p^2\times q-q^2\times 2p-q^2\times q$

$=2p^3+p^2q-2pq^2-q^3$

Question 3:

Simplify:

(i) $(x^2-5)(x+5)+25$

(ii) $(a^2+5)(b^2+3)+5$

(iii) $(t+s^2)(t^2-s)$

(iv) $(a+b)(c-d)+(a-b)(c+d)+2(ac+bd)$

(v) $(x+y)(2x+y)+(x+2y)(x-y)$

(vi) $(x+y)(x^2-xy+y^2)$

(vii) $(1.5x-4y)(1.5x+4y+3)-4.5x+12y$

(viii) $(a+b+c)(a+b-c)$

Answer 3:

(i) $(x^2-5)(x+5)+25 = x^2(x+5)-5(x+5)+25$

$= x^2\times x + x^2\times 5 - 5\times x - 5\times 5 + 25$

$= x^3 + 5x^2 - 5x - 25 + 25$

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

(ii) $(a^2+5)(b^3+3)+5 = a^2(b^3+3)+5(b^3+3)+5$

$= a^2\times b^3 + a^2\times 3 + 5\times b^3 + 5\times 3 + 5$

$= a^2b^3 + 3a^2 + 5b^3 + 15 + 5$

$= a^2b^3 + 3a^2 + 5b^3 + 20$

(iii) $(t+s^2)(t^2-s) = t(t^2-s)+s^2(t^2-s)$

$= t\times t^2 - t\times s + s^2\times t^2 - s^2\times s$

$= t^3 - st + s^2t^2 - s^3$

(iv) $(a+b)(c-d)+(a-b)(c+d)+2(ac+bd)$

$= a(c-d)+b(c-d)+a(c+d)-b(c+d)+2ac+2bd$

$= ac-ad+bc-bd+ac+ad-bc-bd+2ac+2bd$

$= ac+ac-ad+ad+bc-bc-bd-bd+2ac+2bd$

$= 2ac-2bd+2ac+2bd$

$= 4ac$

(v) $(x+y)(2x+y)+(x+2y)(x-y)=x(2x+y)+y(2x+y)+x(x-y)+2y(x-y)$

$= 2x^2+xy+2xy+y^2+x^2-xy+2xy-2y^2$

$= 2x^2+x^2+xy+2xy-xy+2xy+y^2-2y^2$

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

(vi) $(x+y)(x^2-xy+y^2)=x(x^2-xy+y^2)+y(x^2-xy+y^2)$

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

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

$= x^3+y^3$

(vii) $(1.5x-4y)(1.5x+4y+3)-4.5x+12y$

$=1.5x(1.5x+4y+3)-4y(1.5x+4y+3)-4.5x+12y$

$= 2.25x^2+6.0xy+4.5x-6.0xy-16y^2-12y-4.5x+12y$

$= 2.25x^2+6.0xy-6.0xy+4.5x-4.5x-16y^2-12y+12y$

$= 2.25x^2-16y^2$

(viii) $(a+b+c)(a+b-c)=a(a+b-c)+b(a+b-c)+c(a+b-c)$

$= a^2+ab-ac+ab+b^2-bc+ac+bc-c^2$

$= a^2+ab+ab-ac+ac-bc+bc+b^2-c^2$

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

Exercise 9.5

Question 1:

Use a suitable identity to get each of the following products:

(i) $(x+3)(x+3)$

(ii) $(2y+5)(2y+5)$

(iii) $(2a-7)(2a-7)$

(iv) $\left(3a-\frac{1}{2}\right)\left(3a-\frac{1}{2}\right)$

(v) $(1.1m-0.4)(1.1m+0.4)$

(vi) $\left(a^2+b^2\right)\left(-a^2+b^2\right)$

(vii) $(6x-7)(6x+7)$

(viii) $(-a+c)(-a+c)$

(ix) $\left(\frac{x}{2}+\frac{3y}{4}\right)\left(\frac{x}{2}+\frac{3y}{4}\right)$

(x) $(7a-9b)(7a-9b)$

Answer 1:

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

$=(x)^2+2\times x\times 3+(3)^2$ [Using identity $(a+b)^2=a^2+2ab+b^2$]

$= x^2+6x+9$

(ii) $(2y+5)(2y+5)=(2y+5)^2$

$= (2y)^2+2\times 2y\times 5+(5)^2$ [Using identity $(a+b)^2=a^2+2ab+b^2$]

$= 4y^2+20y+25$

(iii) $(2a-7)(2a-7)=(2a-7)^2$

$= (2a)^2-2\times 2a\times 7+(7)^2$ [Using identity $(a-b)^2=a^2-2ab+b^2$]

$= 4a^2-28a+49$

(iv) $\left(3a-\frac{1}{2}\right)\left(3a-\frac{1}{2}\right)=\left(3a-\frac{1}{2}\right)^2$

$= (3a)^2-2\times 3a\times\frac{1}{2}+\left(\frac{1}{2}\right)^2$ [Using identity $(a-b)^2=a^2-2ab+b^2$]

$= 9a^2-3a+\frac{1}{4}$

(v) $(1.1m-0.4)(1.1m+0.4)=(1.1m)^2-(0.4)^2$

Using identity $(a-b)(a+b)=a^2-b^2$]

$= 1.21m^2 - 0.16$

(vi) $(a^2+b^2)(-a^2+b^2) = (b^2+a^2)(b^2-a^2)$

$= (b^2)^2 - (a^2)^2$

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

$= b^4 - a^4$

(vii) $(6x-7)(6x+7) = (6x)^2 - (7)^2$ [Using identity $(a-b)(a+b) = a^2 - b^2$]

$= 36x^2 - 49$

(viii) $(-a+c)(-a+c) = (c-a)(c-a) = (c-a)^2$

$= (c)^2 - 2 \times c \times a + (a)^2$

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

$= c^2 - 2ca + a^2$

(ix) $\left(\frac{x}{2}+\frac{3y}{4}\right)\left(\frac{x}{2}+\frac{3y}{4}\right) = \left(\frac{x}{2}+\frac{3y}{4}\right)^2$

$= \left(\frac{x}{2}\right)^2 + 2 \times \frac{x}{2} \times \frac{3y}{4} + \left(\frac{3y}{4}\right)^2$

[Using identity $(a+b)^2 = a^2 + 2ab + b^2$]

$= \frac{x^2}{4} + \frac{3}{4}xy + \frac{9}{16}y^2$

(x) $(7a-9b)(7a-9b) = (7a-9b)^2$

$= (7a)^2 - 2 \times 7a \times 9b + (9b)^2$

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

$= 49a^2 - 126ab + 81b^2$

Question 2:

Use the identity $(x+a)(x+b)=x^2+(a+b)x+ab$ to find the following products:

(i) $(x+3)(x+7)$ (ii) $(4x+5)(4x+1)$

(iii) $(4x-5)(4x-1)$ (iv) $(4x+5)(4x-1)$

(v) $(2x+5y)(2x+3y)$ (vi) $(2a^2+9)(2a^2+5)$

(vii) $(xyz-4)(xyz-2)$

Answer 2:

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

[Using identity $(x+a)(x+b)=x^2+(a+b)x+ab$]

$= x^2+10x+21$

(ii) $(4x+5)(4x+1)=(4x)^2+(5+1)4x+5\times 1$

[Using identity $(x+a)(x+b)=x^2+(a+b)x+ab$]

$= 16x^2+6\times 4x+5=16x^2+24x+5$

(iii) $(4x-5)(4x-1) = (4x)^2+(-5-1)4x+(-5)\times(-1)$

[Using identity $(x+a)(x+b)=x^2+(a+b)x+ab$]

$= 16x^2+(-6)\times 4x+5=16x^2-24x+5$

(iv) $(4x+5)(4x-1)=(4x)^2+\{5\times(-1)\}\times 4x+5\times(-1)$

[Using identity $(x+a)(x+b)=x^2+(a+b)x+ab$]

$= 16x^2+(5-1)\times 4x-5$

$= 16x^2+4\times 4x-5$

$= 16x^2+16x-5$

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

[Using identity $(x+a)(x+b)=x^2+(a+b)x+ab$]

$= 4x^2+8y\times 2x+15y^2$

$= 4x^2+16xy+15y^2$

(vi) $(2a^2+9)(2a^2+5)=(2a^2)^2+(9+5)\times 2a^2+9\times 5$

[Using identity $(x+a)(x+b)=x^2+(a+b)x+ab$]

$= 4a^4+14\times 2a^2+45$

$= 4a^4+28a^2+45$

(vii) $(xyz-4)(xyz-2)=(xyz)^2+(-4-2)\times xyz+(-4)\times(-2)$

[Using identity $(x+a)(x+b)=x^2+(a+b)x+ab$]

$= x^2y^2z^2-6xyz+8$

Question 3:

Find the following squares by using identities:

(i) $(b-7)^2$ (ii) $(xy+3z)^2$ (iii) $(6x^2-5y)^2$

(iv) $\left(\frac{2}{3}m+\frac{3}{2}n\right)^2$ (v) $(0.4p-0.5q)^2$ (vi) $(2xy+5y)^2$

Answer 3:

(i) $(b-7)^2=(b)^2-2\times b\times 7+(7)^2$ [Using identity $(a-b)^2=a^2-2ab+b^2$]

$= b^2-14b+49$

(ii) $(xy+3z)^2=(xy)^2+2\times xy\times 3z+(3z)^2$ [Using identity $(a+b)^2=a^2+2ab+b^2$]

$= x^2y^2+6xyz+9z^2$

(iii) $(6x^2-5y)^2=(6x^2)^2-2\times 6x^2\times 5y+(5y)^2$

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

$= 36x^4-60x^2y+25y^2$

(iv) $\left(\frac{2}{3}m+\frac{3}{2}n\right)^2=\left(\frac{2}{3}m\right)^2+2\times\frac{2}{3}m\times\frac{3}{2}n+\left(\frac{3}{2}n\right)^2$

[Using identity $(a+b)^2=a^2+2ab+b^2$]

$= \frac{4}{9}m^2 + 2mn + \frac{9}{4}n^2$

(v) $(0.4p - 0.5q)^2 = (0.4p)^2 - 2 \times 0.4p \times 0.5q + (0.5q)^2$

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

$= 0.16p^2 - 0.40pq + 0.25q^2$

(vi) $(2xy + 5y)^2 = (2xy)^2 + 2 \times 2xy \times 5y + (5y)^2$

[Using identity $(a+b)^2 = a^2 + 2ab + b^2$]

$= 4x^2y^2 + 20xy^2 + 25y^2$

Question 4:

Simplify:

(i) $(a^2 - b^2)^2$

(ii) $(2x+5)^2 - (2x-5)^2$

(iii) $(7m - 8n)^2 + (7m + 8n)^2$

(iv) $(4m + 5n)^2 + (5m + 4n)^2$

(v) $(2.5p - 1.5q)^2 - (1.5p - 2.5q)^2$

(vi) $(ab + bc)^2 - 2ab^2c$

(vii) $(m^2 - n^2m)^2 + 2m^3n^2$

Answer 4:

(i) $(a^2 - b^2)^2 = (a^2)^2 - 2 \times a^2 \times b^2 + (b^2)^2$ [Using identity $(a-b)^2 = a^2 - 2ab + b^2$]

$= a^4 - 2a^2b^2 + b^4$

(ii) $(2x+5)^2 - (2x-5)^2 = (2x)^2 + 2 \times 2x \times 5 + (5)^2 - \left[(2x)^2 - 2 \times 2x \times 5 + (5)^2\right]$

[Using identities $(a+b)^2 = a^2 + 2ab + b^2$ and $(a-b)^2 = a^2 - 2ab + b^2$]

$= 4x^2 + 20x + 25 - \left[4x^2 - 20x + 25\right]$

$= 4x^2 + 20x + 25 - 4x^2 + 20x - 25$

$= 40x$

(iii)

$(7m-8n)^2 + (7m+8n)^2 = (7m)^2 - 2\times 7m\times 8n + (8n)^2 + \left[(7m)^2 + 2\times 7m\times 8n + (8n)^2\right]$

[Using identities $(a+b)^2 = a^2 + 2ab + b^2$ and $(a-b)^2 = a^2 - 2ab + b^2$]

$= 49m^2 - 112mn + 64n^2 + \left[49m^2 + 112mn + 64n^2\right]$

$= 49m^2 - 112mn + 64n^2 + 49m^2 + 112mn + 64n^2$

$= 98m^2 + 128n^2$

(iv) $(4m+5n)^2 + (5m+4n)^2 = (4m)^2 + 2\times 4m\times 5n + (5n)^2 + (5m)^2 + 2\times 5m\times 4n + (4n)^2$

[Using identity $(a+b)^2 = a^2 + 2ab + b^2$]

$= 16m^2 + 40mn + 25n^2 + 25m^2 + 40mn + 16n^2$

$= 16m^2 + 25m^2 + 40mn + 40mn + 25n^2 + 16n^2$

$= 41m^2 + 80mn + 41n^2$

(v) $(2.5p-1.5q)^2 - (1.5p-2.5q)^2$

$= (2.5p)^2 - 2\times 2.5p\times 1.5q + (1.5q)^2 - \left[(1.5p)^2 - 2\times 1.5p\times 2.5q + (2.5q)^2\right]$

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

$= 6.25p^2 - 7.50pq + 2.25q^2 - \left[2.25p^2 - 7.50pq + 6.25q^2\right]$

$= 6.25p^2 - 7.50pq + 2.25q^2 - 2.25p^2 + 7.50pq - 6.25q^2$

$= 4p^2 - 4q^2$

(vi) $(ab+bc)^2 - 2ab^2c = (ab)^2 + 2\times ab\times bc + (bc)^2 - 2ab^2c$

[Using identity $(a+b)^2 = a^2 + 2ab + b^2$]

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

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

(vii) $\left(m^2-n^2m\right)^2+2m^3n^2 = \left(m^2\right)^2-2\times m^2\times n^2m+\left(n^2m\right)^2+2m^3n^2$

[Using identity $\left(a-b\right)^2=a^2-2ab+b^2$]

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

$= m^4+n^4m^2$

Question 5:

Show that:

(i) $\left(3x+7\right)^2-84x=\left(3x-7\right)^2$

(ii) $\left(9p-5q\right)^2+180pq=\left(9p+5q\right)^2$

(iii) $\left(\frac{4}{3}m-\frac{3}{4}n\right)^2+2mn=\frac{16}{9}m^2+\frac{9}{16}n^2$

(iv) $\left(4pq+3q\right)^2-\left(4pq-3q\right)^2=48pq^2$

(v) $\left(a-b\right)\left(a+b\right)+\left(b-c\right)\left(b+c\right)+\left(c-a\right)\left(c+a\right)=0$

Answer 5:

(i) L.H.S. $= \left(3x+7\right)^2-84x=\left(3x\right)^2+2\times3x\times7+\left(7\right)^2-84x$

[Using identity $\left(a+b\right)^2=a^2+2ab+b^2$]

$= 9x^2+42x+49-84x$

$= 9x^2-42x+49$

$= \left(3x-7\right)^2$ [$\because$ $\left(a-b\right)^2=a^2-2ab+b^2$]

$=$ R.H.S.

(ii) L.H.S. $= \left(9p-5q\right)^2+180pq=\left(9p\right)^2-2\times9p\times5q+\left(5q\right)^2+180pq$

[Using identity $\left(a-b\right)^2=a^2-2ab+b^2$]

$= 81p^2-90pq+25q^2+180pq$

$= 81p^2+90pq+25q^2$

$= \left(9p+5q\right)^2$ [$\because$ $\left(a+b\right)^2=a^2+2ab+b^2$]

(iii) $\text{L.H.S.} = \left(\frac{4}{3}m-\frac{3}{4}n\right)^2+2mn=\left(\frac{4}{3}m\right)^2-2\times\frac{4}{3}m\times\frac{3}{4}n+\left(\frac{3}{4}n\right)^2+2mn$

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

$=\frac{16}{9}m^2-2mn+\frac{9}{16}n^2+2mn$

$=\frac{16}{9}m^2+\frac{9}{16}n^2$

= R.H.S.

(iv) $\text{L.H.S.} = (4pq+3q)^2-(4pq-3q)^2$

$=(4pq)^2+2\times4pq\times3q+(3q)^2-\left[(4pq)^2-2\times4pq\times3q+(3q)^2\right]$

[Using identities $(a+b)^2=a^2+2ab+b^2$ and $(a-b)^2=a^2-2ab+b^2$]

$=16p^2q^2+24pq^2+9q^2-\left[16p^2q^2-24pq^2+9q^2\right]$

$=16p^2q^2+24pq^2+9q^2-16p^2q^2+24pq^2-9q^2$

$=48pq^2$

= R.H.S.

(v) $\text{L.H.S.} = (a-b)(a+b)+(b-c)(b+c)+(c-a)(c+a)$

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

= 0

= R.H.S.

Question 6:

Using identities, evaluate:

(i)	71^2	(ii)	99^2	(iii)	102^2
(iv)	998^2	(v)	5.2^2	(vi)	297×303
(vii)	78×82	(viii)	8.9^2	(ix)	1.05×9.5

Answer 6:

(i) $71^2 = (70+1)^2 = (70)^2 + 2\times 70\times 1 + (1)^2$

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

= 4900 + 140 + 1 = 5041

(ii) $99^2 = (100-1)^2 = (100)^2 - 2\times 100\times 1 + (1)^2$

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

= 10000 – 200 + 1 = 9801

(iii) $102^2 = (100+2)^2 = (100)^2 + 2\times 100\times 2 + (2)^2$

[Using identity $(a+b)^2 = a^2 + 2ab + b^2$]

= 10000 + 400 + 4 = 10404

(iv) $998^2 = (1000-2)^2 = (1000)^2 - 2\times 1000\times 2 + (2)^2$

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

= 1000000 – 4000 + 4 = 996004

(v) $5.2^2 = (5+0.2)^2 = (5)^2 + 2\times 5\times 0.2 + (0.2)^2$

[Using identity $(a+b)^2 = a^2 + 2ab + b^2$]

= 25 + 2.0 + 0.04 = 27.04

(vi) 297 x 303 = (300 – 3) x (300 + 3) = $(300)^2 - (3)^2$

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

= 90000 – 9 = 89991

(vii) 78 x 82 = (80 – 2) x (80 + 2) = $(80)^2 - (2)^2$

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

= 6400 – 4 = 6396

(viii) $8.9^2 = (8+0.9)^2 = (8)^2 + 2\times 8\times 0.9 + (0.9)^2$

[Using identity $(a+b)^2 = a^2 + 2ab + b^2$]

= 64 + 14.4 + 0.81 = 79.21

(ix) 1.05 x 9.5 = (10 + 0.5) x (10 – 0.5) = $(10)^2 - (0.5)^2$

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

Question 7:

Using $a^2 - b^2 = (a+b)(a-b)$, find

(i) $51^2 - 49^2$ (ii) $(1.02)^2 - (0.98)^2$

(iii) $153^2 - 147^2$ (iv) $12.1^2 - 7.9^2$

Answer 7:

(i) $51^2 - 49^2 = (51+49)(51-49)$

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

= 100 x 2 = 200

(ii) $(1.02)^2 - (0.98)^2 = (1.02+0.98)(1.02-0.98)$

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

= 2.00 x 0.04 = 0.08

(iii) $153^2 - 147^2 = (153+147)(153-147)$

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

= 300 x 6 = 1800

(iv) $12.1^2 - 7.9^2 = (12.1+7.9)(12.1-7.9)$

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

= 20.0 x 4.2 = 84.0 = 84

Question 8:

Using $(x+a)(x+b) = x^2 + (a+b)x + ab$, find

(i) 103 x 104
(ii) 5.1 x 5.2
(iii) 103 x 98
(iv) 9.7 x 9.8

Answer 8:

(i) 103 x 104 = (100 + 3) x (100 + 4) = $(100)^2 + (3+4)\times 100 + 3\times 4$

[Using identity $(x+a)(x+b) = x^2 + (a+b)x + ab$]

= 10000 + 7 x 100 + 12
= 10000 + 700 + 12 = 10712

(ii) 5.1 x 5.2 = (5 + 0.1) x (5 + 0.2) = $(5)^2 + (0.1+0.2)\times 5 + 0.1\times 0.2$

[Using identity $(x+a)(x+b) = x^2 + (a+b)x + ab$]

= 25 + 0.3 x 5 + 0.02
= 25 + 1.5 + 0.02 = 26.52

(iii) 103 x 98 = (100 + 3) x (100 – 2) = $(100)^2 + (3-2)\times 100 + 3\times(-2)$

[Using identity $(x+a)(x+b) = x^2 + (a+b)x + ab$]

= 10000 + (3 – 2) x 100 – 6
= 10000 + 100 – 6 = 10094

(iv) 9.7 x 9.8 = (10 – 0.3) x (10 – 0.2)

= $(10)^2 + \{(-0.3)+(-0.2)\}\times 10 + (-0.3)\times(-0.2)$

[Using identity $(x+a)(x+b) = x^2 + (a+b)x + ab$]

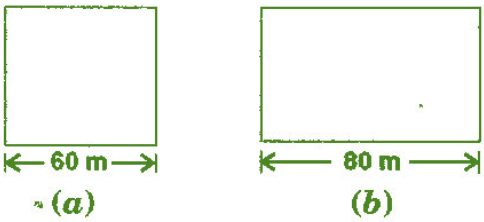
= $100 + \{-0.3-0.2\}\times 10 + 0.06$

= 100 – 0.5 x 10 + 0.06
= 100 – 5 + 0.06 = 95.06

Exercise 11.1

Question 1:

A square and a rectangular field with measurements as given in the figure have the same perimeter. Which field has a larger area?



Answer 1:

Given: The side of a square = 60 m

And the length of rectangular field = 80 m

According to question,

Perimeter of rectangular field = Perimeter of square field

$\Rightarrow \quad 2(l+b)$ = 4 x side

$\Rightarrow \quad 2(80+b)=4\times 60$

$\Rightarrow \quad 160+2b=240$

$\Rightarrow \quad 2b=240-160$

$\Rightarrow \quad 2b=80$

$\Rightarrow \quad b=40$ m

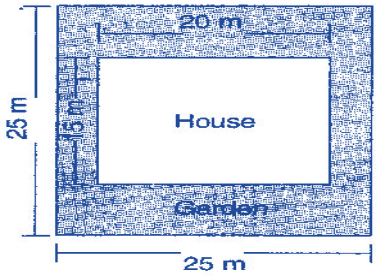
Now Area of Square field = $(\text{Side})^2$ = $(60)^2$ = 3600 m^2

And Area of Rectangular field = length x breadth = 80 x 40 = 3200 m^2

Hence, area of square field is larger.

Question 2:

Mrs. Kaushik has a square plot with the measurement as shown in the figure. She wants to construct a house in the middle of the plot. A garden is developed around the house. Find the total cost of developing a garden around the house at the rate of ₹ 55 per m^2.

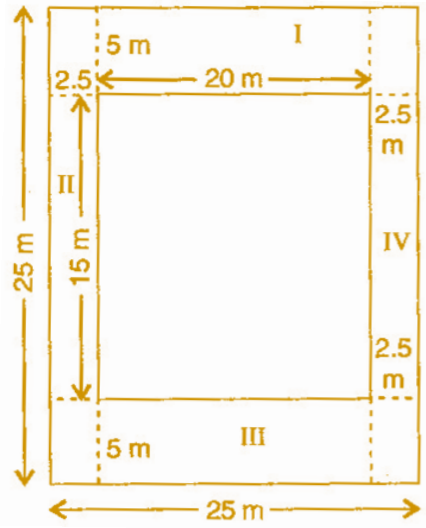


Answer 2:

Side of a square plot = 25 m

$\therefore$ Area of square plot = $(\text{Side})^2 = (25)^2 = 625\ m^2$

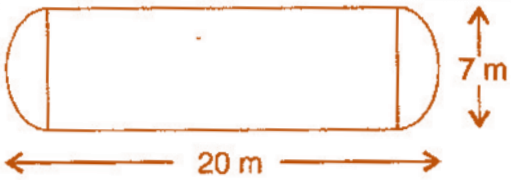
Length of the house = 20 m and
Breadth of the house = 15 m



$\therefore$ Area of the house = length x breadth = 20 x 15 = 300 m^2
Area of garden = Area of square plot – Area of house
= 625 – 300 = 325 m^2
$\because$ Cost of developing the garden per sq. m = ₹ 55
$\therefore$ Cost of developing the garden 325 sq. m = ₹ 55 x 325
= ₹ 17,875
Hence total cost of developing a garden around is ₹ 17,875.

Question 3:

The shape of a garden is rectangular in the middle and semi-circular at the ends as shown in the diagram. Find the area and the perimeter of this garden [Length of rectangle is 20 – (3.5 + 3.5 meters]



Answer 3:

Given: Total length = 20 m

Diameter of semi circle = 7 m

$\therefore$ Radius of semi circle = $\frac{7}{2}$ = 3.5 m

Length of rectangular field = 20 – (3.5 + 3.5) = 20 – 7 = 13 m

Breadth of the rectangular field = 7 m

$\therefore$ Area of rectangular field = $l \times b$ = 13 x 7 = 91 m^2

Area of two semi circles = $2 \times \frac{1}{2} \pi r^2 = 2 \times \frac{1}{2} \times \frac{22}{7} \times 3.5 \times 3.5$ = 38.5 m^2

Area of garden = 91 + 38.5 = 129.5 m^2

Now Perimeter of two semi circles = $2 \times \pi r = 2 \times \frac{22}{7} \times 3.5$ = 22 m

And Perimeter of garden = 22 + 13 + 13 = 48 m

Question 4:

A flooring tile has the shape of a parallelogram whose base is 24 cm and the corresponding height is 10 cm. How many such tiles are required to cover a floor of area 1080 m^2? [If required you can split the tiles in whatever way you want to fill up the corners]

Answer 4:

Given: Base of flooring tile = 24 cm = 0.24 m

Corresponding height of a flooring tile = 10 cm = 0.10 m

Now Area of flooring tile = Base x Altitude = 0.24 x 0.10 = 0.024 m^2

$\therefore$ Number of tiles required to cover the floor = $\frac{\text{Area of floor}}{\text{Area of one tile}}$

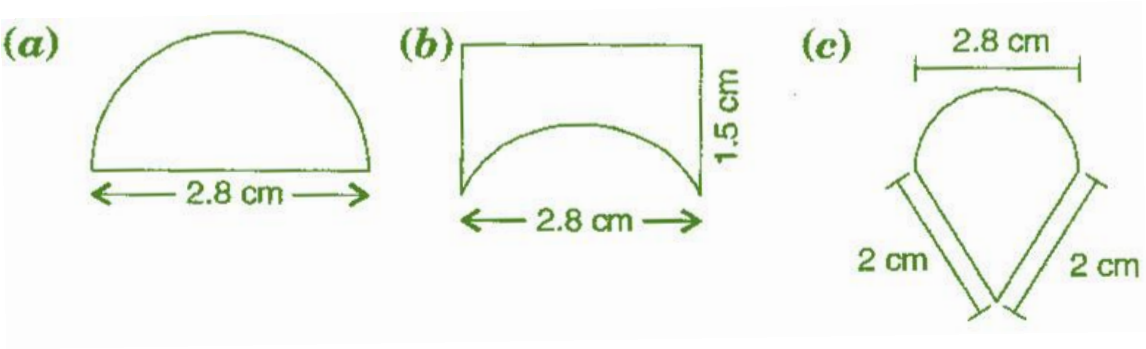
$= \frac{1080}{0.024}$

= 45000 tiles

Hence 45000 tiles are required to cover the floor.

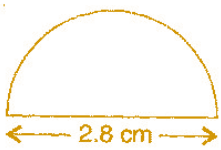
Question 5:

An ant is moving around a few food pieces of different shapes scattered on the floor. For which food-piece would the ant have to take a longer round? Remember, circumference of a circle can be obtained by using the expression $c = 2\pi r$, where r is the radius of the circle.



Answer 5:

(a) Radius = $\frac{\text{Diameter}}{2} = \frac{2.8}{2}$ = 1.4 cm



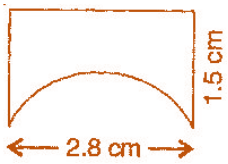
Circumference of semi circle = $\pi r = \frac{22}{7} \times 1.4$ = 4.4 cm

Total distance covered by the ant = Circumference of semi circle + Diameter

= 4.4 + 2.8 = 7.2 cm

(b) Diameter of semi circle = 2.8 cm

$\therefore$ Radius = $\frac{\text{Diameter}}{2} = \frac{2.8}{2}$ = 1.4 cm



Circumference of semi circle = $\pi r = \frac{22}{7} \times 1.4$ = 4.4 cm

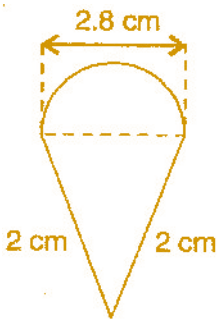
Total distance covered by the ant = 1.5 + 2.8 + 1.5 + 4.4 = 10.2 cm

(c) Diameter of semi circle = 2.8 cm

$\therefore$ Radius = $\frac{\text{Diameter}}{2} = \frac{2.8}{2}$ = 1.4 cm

Circumference of semi circle = $\pi r = \frac{22}{7} \times 1.4$ = 4.4 cm

Total distance covered by the ant = 2 + 2 + 4.4 = 8.4 cm

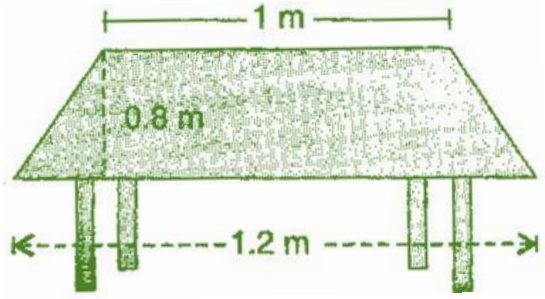


Hence for figure (b) food piece, the ant would take a longer round.

Exercise 11.2

Question 1:

The shape of the top surface of a table is a trapezium. Find its area if its parallel sides are 1 m and 1.2 m and perpendicular distance between them is 0.8 m.



Answer 1:

Here one parallel side of the trapezium (a) = 1 m

And second side (b) = 1.2 m and height (h) = 0.8 m

$\therefore$ Area of top surface of the table = $\frac{1}{2}(a+b)\times h$

$= \frac{1}{2}\times(1+1.2)\times 0.8$

$= \frac{1}{2}\times 2.2\times 0.8 = 0.88$ m^2

Hence, the surface area of the table is 0.88 m^2.

Question 2:

The area of a trapezium is 34 cm^2 and the length of one of the parallel sides is 10 cm and its height is 4 cm. Find the length of the other parallel side.

Answer 2:

Let the length of the other parallel side be b.

Length of one parallel side (a) = 10 am and height (h) = 4 cm

Area of trapezium = $\frac{1}{2}(a+b)\times h$

$\Rightarrow \quad 34 = \frac{1}{2}(10+b)\times 4$

$\Rightarrow \quad 34 = (10+b)\times 2$

$\Rightarrow \quad 34 = 20 + 2b$

$\Rightarrow \quad 34 - 20 = 2b$

$\Rightarrow \quad 14 = 2b$

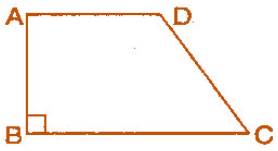
$\Rightarrow \quad 7 = b$

$\Rightarrow \quad b = 7$

Hence, the another required parallel side is 7 cm.

Question 3:

Length of the fence of a trapezium shaped field ABCD is 120 m. If BC = 48 m, CD = 17 m and AD = 40 m, find the area of this field. Side AB is perpendicular to the parallel sides AD and BC.



Answer 3:

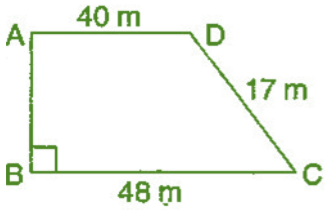
Given: BC = 48 m, CD = 17 m, AD = 40 m and perimeter = 120 m

$\because$ Perimeter of trapezium ABCD = AB + BC + CD + DA

$\Rightarrow$ 120 = AB + 48 + 17 + 40

$\Rightarrow$ 120 = AB = 105

$\Rightarrow$ AB = 120 – 105 = 15 m



Now Area of the field = $\frac{1}{2} \times (\text{BC} + \text{AD}) \times \text{AB}$

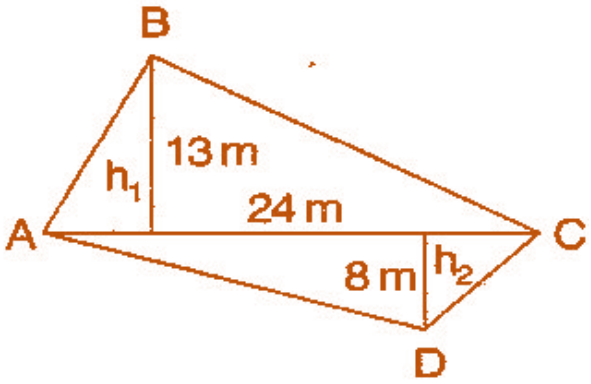
$= \frac{1}{2} \times (48 + 40) \times 15 = \frac{1}{2} \times 88 \times 15$

$= 660 \text{ m}^2$

Hence, area of the field ABCD is 660 m^2.

Question 4:

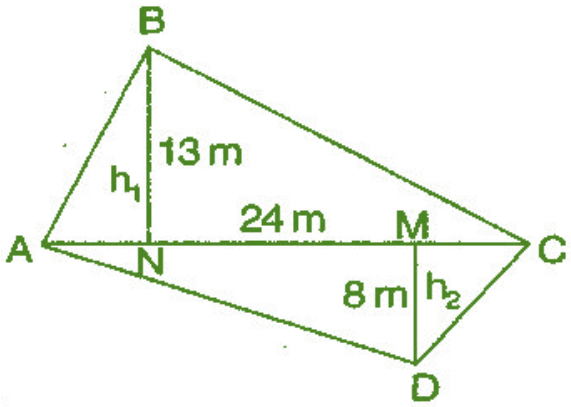
The diagonal of a quadrilateral shaped field is 24 m and the perpendiculars dropped on it from the remaining opposite vertices are 8 m and 13 m. Find the area of the field.



Answer 4:

Here h_1 = 13 m, h_2 = 8 m and AC = 24 m

Area of quadrilateral ABCD = Area of ΔABC + Area of ΔADC



$$= \frac{1}{2} b \times h_1 + \frac{1}{2} b \times h_2$$

$$= \frac{1}{2} b (h_1 + h_2)$$

$$= \frac{1}{2} \times 24 \times (13+8) = \frac{1}{2} \times 24 \times 21 = 252 \text{ m}^2$$

Hence, required area of the field is 252 m^2.

Question 5:

The diagonals of a rhombus are 7.5 cm and 12 cm. Find its area.

Answer 5:

Given: d_1 =7.5 cm and d_2 = 12 cm

We know that,

$$\text{Area of rhombus} = \frac{1}{2} \times d_1 d_2 = \frac{1}{2} \times 7.5 \times 12 = 45 \text{ cm}^2$$

Hence, area of rhombus is 45 cm^2.

Question 6:

Find the area of a rhombus whose side is 6 cm and whose altitude is 4 cm. If one of the diagonals is 8 cm long, find the length of the other diagonal.

Answer 6:

Since rhombus is also a kind of parallelogram.

$\therefore$ Area of rhombus = Base x Altitude

= 6 x 4 = 24 cm^2

Also Area of rhombus = $\frac{1}{2} d_1 d_2$

$\Rightarrow$ $24 = \frac{1}{2} \times 8 \times d_2$

$\Rightarrow$ $24 = 4d_2$

$\Rightarrow$ $d_2 = \frac{24}{4}$ = 6 cm

Hence, the length of the other diagonal is 6 cm.

Question 7:

The floor of a building consists of 3000 tiles which are rhombus shaped and each of its diagonals are 45 cm and 30 cm in length. Find the total cost of polishing the floor, if the cost per m^2 is ₹ 4.

Answer 7:

Here, d_1 = 45 cm and d_2 = 30 cm

$\because$ Area of one tile = $\frac{1}{2} d_1 d_2 = \frac{1}{2} \times 45 \times 30 = 675 \text{ cm}^2$

$\therefore$ Area of 3000 tiles = 675 x 3000 = 2025000 cm^2

$= \frac{2025000}{10000} = 202.50$ m2 $\quad \left[\because\ 1\ m^2 = 10000\ cm^2\right]$

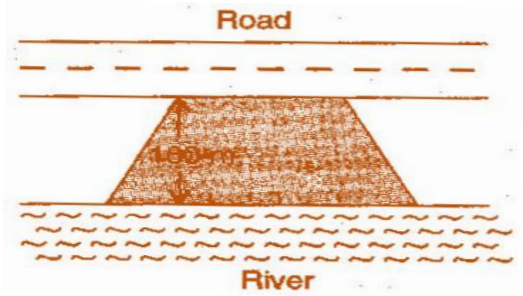
$\because$ Cost of polishing the floor per sq. meter = ₹ 4

$\therefore$ Cost of polishing the floor per 202.50 sq. meter = 4 x 202.50 = ₹ 810

Hence, the total cost of polishing the floor is ₹ 810.

Question 8:

Mohan wants to buy a trapezium shaped field. Its side along the river is parallel to and twice the side along the road. If the area of this field is 10500 m^2 and the perpendicular distance between the two parallel sides is 100 m, find the length of the side along the river.



Answer 8:

Given: Perpendicular distance (h) = 100 m

Area of the trapezium shaped field = 10500 m^2

Let side along the road be x m and side along the river = $2x$ m

$\therefore$ Area of the trapezium field = $\frac{1}{2}(a+b)\times h$

$\Rightarrow$ $10500 = \frac{1}{2}(x+2x)\times 100$

$\Rightarrow$ $10500 = 3x\times 50$

$\Rightarrow$ $3x = \frac{10500}{50}$

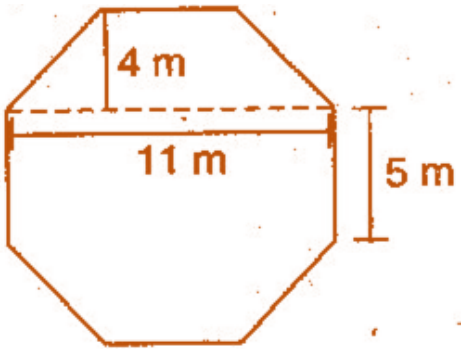
$\Rightarrow$ $x = \frac{10500}{50\times 3}$

$\Rightarrow$ $x = 70$ m

Hence, the side along the river = $2x$ = 2 x 70 = 140 m.

Question 9:

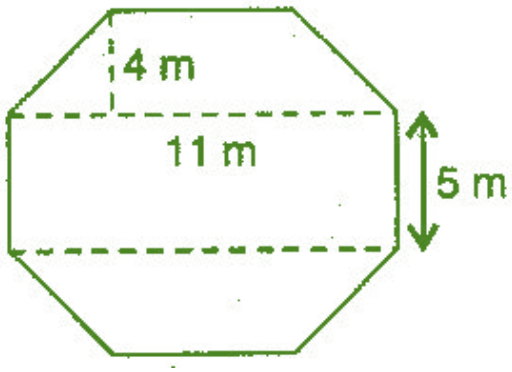
Top surface of a raised platform is in the shape of a regular octagon as shown in the figure. Find the area of the octagonal surface.



Answer 9:

Given: Octagon having eight equal sides, each 5 m.

Construction: Divided the octagon in 3 figures, two trapeziums whose parallel and perpendicular sides are 11 m and 4 m respectively and third figure is rectangle having length and breadth 11 m and 5 m respectively.



Now Area of two trapeziums = $2 \times \frac{1}{2}(a+b)\times h$

$= 2 \times \frac{1}{2}(11+5)\times 4 = 4 \times 16 = 64\ m^2$

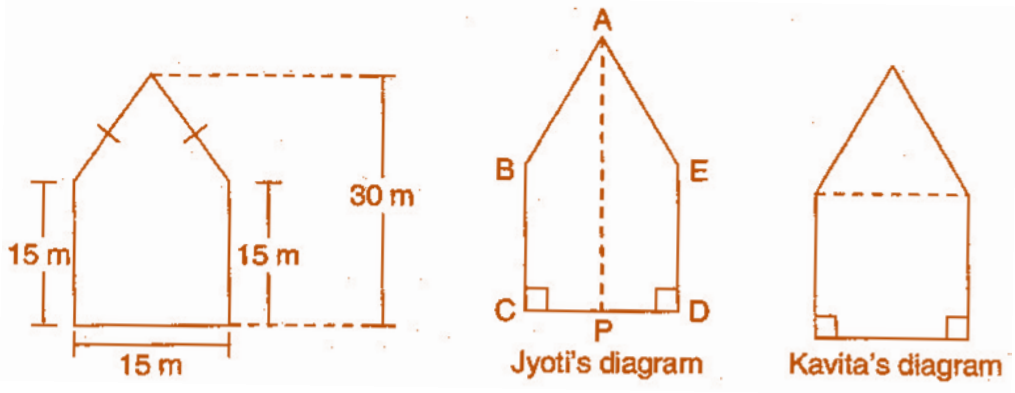
And Area of rectangle = length x breadth

$= 11 \times 5 = 55\ m^2$

$\therefore$ Total area of octagon = $64 + 55 = 119\ m^2$

Question 10:

There is a pentagonal shaped park as shown in the figure.
For finding its area Jyoti and Kavita divided it in two different ways.



Find the area of this park using both ways. Can you suggest some other way of finding its area?

Answer 10:

First way : By Jyoti's diagram,

Area of pentagon = Area of trapezium ABCP + Area of trapezium AEDP

$$= \frac{1}{2} (AP + BC) \times CP + \frac{1}{2} (ED + AP) \times DP$$

$$= \frac{1}{2} (30 + 15) \times CP + \frac{1}{2} (15 + 30) \times DP$$

$$= \frac{1}{2} (30 + 15) (CP + DP)$$

$$= \frac{1}{2} \times 45 \times CD$$

$$= \frac{1}{2} \times 45 \times 15 = 337.5 \text{ m}^2$$

Second way : By Kavita's diagram

Here, a perpendicular AM drawn to BE.

AM = 30 – 15 = 15 m

Area of pentagon = Area of ΔABE + Area of square BCDE

$$= \frac{1}{2} \times 15 \times 15 + 15 \times 15$$

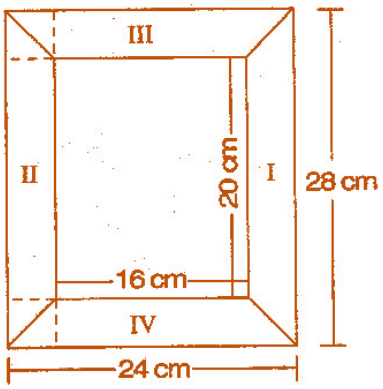
$$= 112.5 + 225.0$$

$$= 337.5 \text{ m}^2$$

Hence, total area of pentagon shaped park = 337.5 m^2.

Question 11:

Diagram of the adjacent picture frame has outer dimensions = 24 cm x 28 cm and inner dimensions 16 cm x 20 cm. Find the area of each section of the frame, if the width of each section is same.



Answer 11:

Here two of given figures (I) and (II) are similar in dimensions.
And also figures (III) and (IV) are similar in dimensions.

$\therefore$ Area of figure (I) = Area of trapezium = $\frac{1}{2}(a+b)\times h$

$= \frac{1}{2}(28+20)\times 4$

$= \frac{1}{2}\times 48\times 4 = 96 \text{ cm}^2$

Also Area of figure (II) = 96 cm^2

Now Area of figure (III) = Area of trapezium = $\frac{1}{2}(a+b)\times h$

$= \frac{1}{2}(24+16)\times 4$

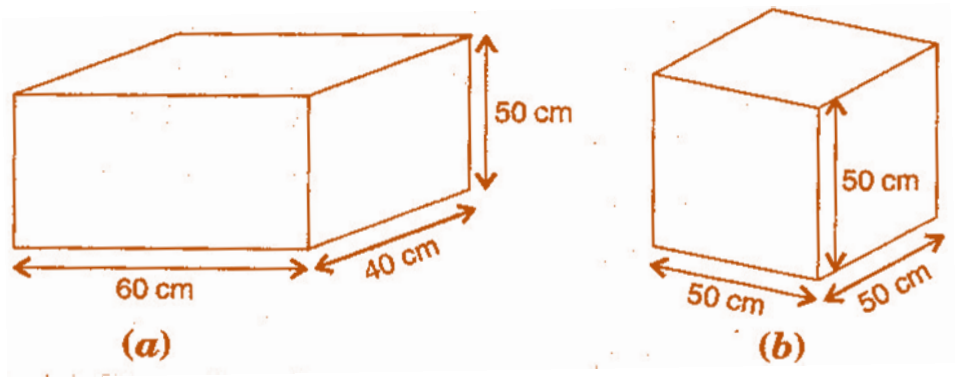
$= \frac{1}{2}\times 40\times 4 = 80 \text{ cm}^2$

Also Area of figure (IV) = 80 cm^2

Exercise 11.3

Question 1:

There are two cuboidal boxes as shown in the adjoining figure. Which box requires the lesser amount of material to make?



Answer 1:

(a) Given: Length of cuboidal box (l) = 60 cm

Breadth of cuboidal box (b) = 40 cm

Height of cuboidal box (h) = 50 cm

$\therefore$ Total surface area of cuboidal box = $2(lb+bh+hl)$

= 2 (60 x 40 + 40 x 50 + 50 x 60)

= 2 (2400 + 2000 + 3000)

= 2 x 7400 = 14800 cm^2

(b) Given: Length of cuboidal box (l) = 50 cm

Breadth of cuboidal box (b) = 50 cm

Height of cuboidal box (h) = 50 cm

$\therefore$ Total surface area of cuboidal box = $2(lb+bh+hl)$

= 2 (50 x 50 + 50 x 50 + 50 x 50)

= 2 (2500 + 2500 + 2500)

= 2 x 7500 = 15000 cm^2

Hence, the cuboidal box (a) requires the lesser amount of material to make, since surface area of box (a) is less than that of box (b).

Question 2:

A suitcase with measures 80 cm x 48 cm x 24 cm is to be covered with a tarpaulin cloth. How many meters of tarpaulin of width 96 cm is required to cover 100 such suitcases?

Answer 2:

Given: Length of suitcase box (l) = 80 cm,

Breadth of suitcase box (b) = 48 cm

And Height of cuboidal box (h) = 24 cm

$\therefore$ Total surface area of suitcase box = $2(lb+bh+hl)$

= 2 (80 x 48 + 48 x 24 + 24 x 80)

= 2 (3840 + 1152 + 1920)

= 2 x 6912 = 13824 cm^2

Area of Tarpaulin cloth = Surface area of suitcase

$\Rightarrow \quad l \times b = 13824$

$\Rightarrow \quad l \times 96 = 13824$

$\Rightarrow \quad l = \frac{13824}{96}$ = 144 cm

Required tarpaulin for 100 suitcases = 144 x 100 = 14400 cm = 144 m

Hence, the tarpaulin cloth required to cover 100 suitcases is 144 m.

Question 3:

Find the side of a cube whose surface area id 600 cm^2.

Answer 3:

Here Surface area of cube = 600 cm^2

$\Rightarrow \quad 6l^2 = 600$

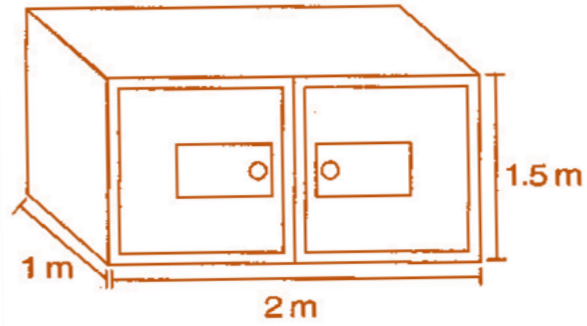
$\Rightarrow \quad l^2 = 100$

$\Rightarrow \quad l$ = 10 cm

Hence the side of cube is 10 cm

Question 4:

Rukshar painted the outside of the cabinet of measure 1 m x 2 m x 1.5 m. How much surface area did she cover if she painted all except the bottom of the cabinet?



Answer 4:

Here,

Length of cabinet (l) = 2 m,

Breadth of cabinet (b) = 1 m

And Height of cabinet (h) = 1.5 m

$\therefore$ Surface area of cabinet = $lb+2(bh+hl)$

= 2 x 1 + 2 (1 x 1.5 + 1.5 x 2)

= 2 + 2 (1.5 + 3.0)

= 2 + 9.0

= 11 m^2

Hence, the required surface area of cabinet is 11 m^2.

Question 5:

Daniel is paining the walls and ceiling of a cuboidal hall with length, breadth and height of 15 m, 10 m and 7 m respectively. From each can of paint 100 m^2 of area is painted. How many cans of paint will she need to paint the room?

Answer 5:

Here,

Length of wall (l) = 15 m,

Breadth of wall (b) = 10 m

And Height of wall (h) = 7 m

$\therefore$ Total Surface area of classroom = $lb + 2(bh + hl)$

= 15 x 10 + 2 (10 x 7 + 7 x 15)

= 150 + 2 (70 + 105)

= 150 + 350

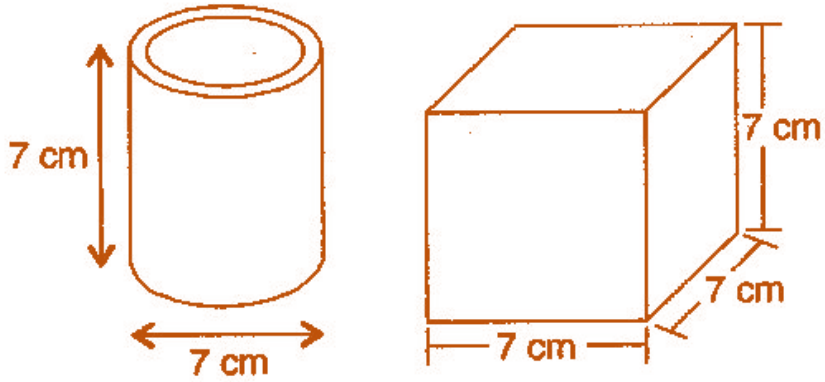
= 500 m^2

Now Required number of cans = $\frac{\text{Area of hall}}{\text{Area of one can}} = \frac{500}{100}$ = 5 cans

Hence, 5 cans are required to paint the room.

Question 6:

Describe how the two figures below are alike and how they are different. Which box has larger lateral surface area?



Answer 6:

Given: Diameter of cylinder = 7 cm

$\therefore$ Radius of cylinder (r) = $\frac{7}{2}$ cm

And Height of cylinder (h) = 7 cm

Lateral surface area of cylinder = $2\pi rh = 2 \times \frac{22}{7} \times \frac{7}{2} \times 7$

= 154 cm^2

Now lateral surface area of cube = $4l^2 = 4 \times (7)^2$ = 4 x 49 = 196 cm^2

Hence, the cube has larger lateral surface area.

Question 7:

A closed cylindrical tank of radius 7 m and height 3 m is made from a sheet of metal. How much sheet of metal is required?

Answer 7:

Given: Radius of cylindrical tank (r) = 7 m

Height of cylindrical tank (h) = 3 m

Total surface area of cylindrical tank = $2\pi r(h+r)$

$= 2\times\frac{22}{7}\times 7(3+7)$

= 44 x 10 = 440 m^2

Hence, 440 m^2 metal sheet is required.

Question 8:

The lateral surface area of a hollow cylinder is 4224 cm^2. It is cut along its height and formed a rectangular sheet of width 33 cm. Find the perimeter of rectangular sheet?

Answer 8:

Given: Lateral surface area of hollow cylinder = 4224 cm^2

And Height of hollow cylinder = 33 cm

Curved surface area of hollow cylinder = $2\pi rh$

$\Rightarrow \quad 4224 = 2\times\frac{22}{7}\times r\times 33$

$\Rightarrow \quad r = \frac{4224\times 7}{2\times 22\times 33} = \frac{64\times 7}{22}$ cm

Now Length of rectangular sheet = $2\pi r$

$\Rightarrow \quad l = 2\times\frac{22}{7}\times\frac{64\times 7}{22}$ = 128 cm

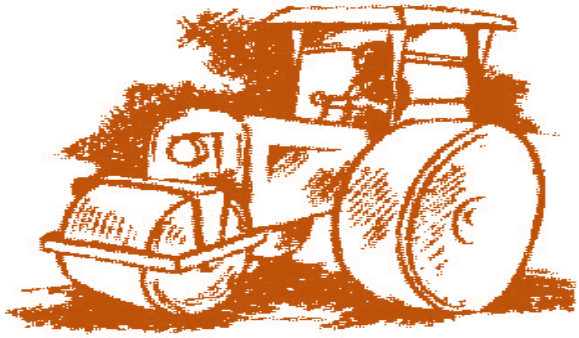
Perimeter of rectangular sheet = $2(l+b)$

= 2 (128 + 33) = 2 x 161 = 322 cm

Hence, the perimeter of rectangular sheet is 322 cm.

Question 9:

A road roller takes 750 complete revolutions to move once over to level a road. Find the area of the road if the diameter of a road roller is 84 cm and length 1 m.



Answer 9:

Given: Diameter of road roller = 84 cm

$\therefore$ Radius of road roller $(r) = \frac{d}{2} = \frac{84}{2}$ = 42 cm

Length of road roller (h) = 1 m = 100 cm

Curved surface area of road roller = $2\pi rh = 2\frac{22}{7} \times 42 \times 100$ = 26400 cm^2

$\therefore$ Area covered by road roller in 750 revolutions = 26400 x 750

= 1,98,00,000 cm^2

= 1980 m^2

[$\because$ 1 m^2 = 10,000 cm^2]

Hence, the area of the road is 1980 m^2.

Question 10:

A company packages its milk powder in cylindrical container whose base has a diameter of 14 cm and height 20 cm. Company places a label around the surface of the container (as shown in figure). If the label is placed 2 cm from top and bottom, what is the area of the label?

Answer 10:

Given: Diameter of cylindrical container = 14 cm

$\therefore$ Radius of cylindrical container $(r) = \frac{d}{2} = \frac{14}{2}$ = 7 cm

Height of cylindrical container = 20 cm

Height of the label (h) = 20 – 2 – 2 = 16 cm

Curved surface area of label = $2\pi rh = 2\frac{22}{7} \times 7 \times 16$ = 704 cm^2

Hence, the area of the label of 704 cm^2.

Exercise 11.4

Question 1:

Given a cylindrical tank, in which situation will you find surface are and in which situation volume.

(a) To find how much it can hold.
(b) Number of cement bags required to plaster it.
(c) To find the number of smaller tanks that can be filled with water from it.

Answer 1:

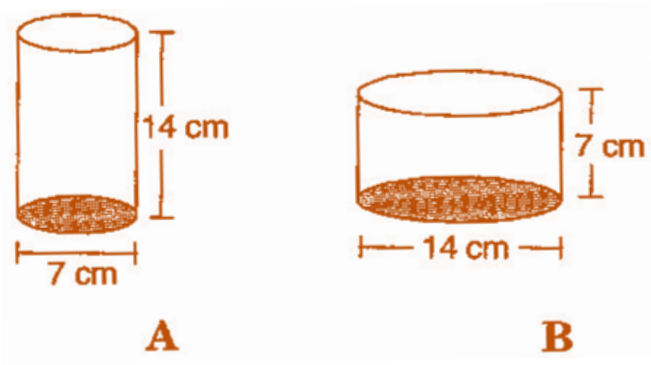
We find area when a region covered by a boundary, such as outer and inner surface area of a cylinder, a cone, a sphere and surface of wall or floor.

When the amount of space occupied by an object such as water, milk, coffee, tea, etc., then we have to find out volume of the object.

(a) Volume (b) Surface are (c) Volume

Question 2:

Diameter of cylinder A is 7 cm and the height is 14 cm. Diameter of cylinder B is 14 cm and height is 7 cm. Without doing any calculations can you suggest whose volume is greater? Verify it by finding the volume of both the cylinders. Check whether the cylinder with greater volume also has greater surface area.



Answer 2:

Yes, we can say that volume of cylinder B is greater, since radius of cylinder B is greater than that of cylinder A (and square of radius gives more value than previous).

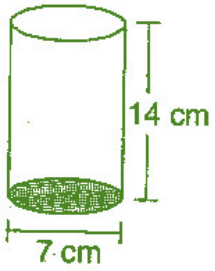
Diameter of cylinder A = 7 cm

$\Rightarrow$ Radius of cylinder A = $\frac{7}{2}$ cm

And Height of cylinder A = 14 cm

$\therefore$ Volume of cylinder A = $\pi r^2 h = \frac{22}{7}\times\frac{7}{2}\times\frac{7}{2}\times 14$

= 539 cm^3



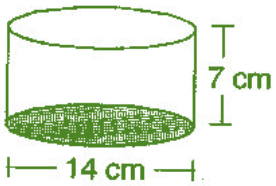
Now Diameter of cylinder B = 14 cm

$\Rightarrow$ Radius of cylinder B = $\frac{14}{2}$ = 7 cm

And Height of cylinder B = 7 cm

$\therefore$ Volume of cylinder A = $\pi r^2 h = \frac{22}{7}\times 7\times 7\times 7$

= 1078 cm^3



Total surface area of cylinder A = $\pi r(2h+r)$ [$\because$ It is open from top]

$= \frac{22}{7}\times\frac{7}{2}\left(2\times 14+\frac{7}{2}\right) = 11\times\left(28+\frac{7}{2}\right)$

$= 11\times\frac{63}{2}$ = 346.5 cm^2

Total surface area of cylinder B = $\pi r(2h+r)$ [$\because$ It is open from top]

= $\frac{22}{7}$ x 7 (2 x 7 + 7)

= 22 x (14 + 7) = 22 x 21 = 462 cm^2

Yes, cylinder with greater volume also has greater surface area.

Question 3:

Find the height of a cuboid whose base area is 180 cm^2 and volume is 900 cm^3?

Answer 3:

Given: Base area of cuboid = 180 cm^2 and Volume of cuboid = 900 cm^3

We know that,

Volume of cuboid = $l \times b \times h$

$\Rightarrow$ $900 = 180 \times h$ $\quad [\because$ Base area $= l \times b = 180 (\text{given})]$

$\Rightarrow$ $h = \frac{900}{180} = 5$ m

Hence, the height of cuboid is 5 m.

Question 4:

A cuboid is of dimensions 60 cm x 54 cm x 30 cm. How many small cubes with side 6 cm can be placed in the given cuboid?

Answer 4:

Given: Length of cuboid (l) = 60 cm,

Breadth of cuboid (b) = 54 cm and

Height of cuboid (h) = 30 cm

We know that, Volume of cuboid = $l \times b \times h$ = 60 x 54 x 30 cm^3

And Volume of cube = $(\text{Side})^3$ = 6 x 6 x 6 cm^3

$\therefore$ Number of small cubes = $\frac{\text{Volume of cuboid}}{\text{Volume of cube}} = \frac{60 \times 54 \times 30}{6 \times 6 \times 6} = 450$

Hence, the required cubes are 450.

Question 5:

Find the height of the cylinder whose volume if 1.54 m3 and diameter of the base is 140 cm.

Answer 5:

Given: Volume of cylinder = 1.54 m^3 and Diameter of cylinder = 140 cm

$\therefore$ Radius (r) = $\frac{d}{2} = \frac{140}{2}$ = 70 cm

Volume of cylinder = $\pi r^2 h$

$\Rightarrow \quad 1.54 = \frac{22}{7} \times 0.7 \times 0.7 \times h$

$\Rightarrow \quad h = \frac{1.54 \times 7}{22 \times 0.7 \times 0.7}$

$\Rightarrow \quad h = \frac{154 \times 7 \times 10 \times 10}{22 \times 7 \times 7 \times 100} = 1$ m

Hence, the height of the cylinder is 1 m.

Question 6:

A milk tank is in the form of cylinder whose radius is 1.5 m and length is 7 m. Find the quantity of milk in liters that can be stored in the tank.

Answer 6:

Given: Radius of cylindrical tank (r) = 1.5 m

And Height of cylindrical tank (h) = 7 m

Volume of cylindrical tank = $\pi r^2 h$

$= \frac{22}{7} \times 1.5 \times 1.5 \times 7$

= 49.5 cm^3

= 49.5 x 1000 liters [$\because$ 1 m^3 = 1000 liters]

= 49500 liters

Hence, the required quantity of milk is 49500 liters.

Question 7:

If each edge of a cube is doubled,

(i) how many times will its surface area increase?

(ii) how many times will its volume increase?

Answer 7:

(i) Let the edge of cube be l.

Since, Surface area of the cube (A) = $6l^2$

When edge of cube is doubled, then

Surface area of the cube (A')= $6(2l)^2 = 6\times 4l^2 = 4\times 6l^2$

$$A' = 4 \text{ x } A$$

Hence, the surface area will increase four times.

(ii) Volume of cube (V) = l^3

When edge of cube is doubled, then

Volume of cube (V')= $(2l)^3 = 8l^3$

$$V' = 8 \text{ x } V$$

Hence, the volume will increase 8 times.

Question 8:

Water is pouring into a cuboidal reservoir at the rate of 60 liters per minute. If the volume of reservoir is 108 m^3, find the number of hours it will take to fill the reservoir.

Answer 8:

Given: volume of reservoir = 108 m^3

Rate of pouring water into cuboidal reservoir = 60 liters/minute

$$= \frac{60}{1000} \text{ m}^3\text{/minute} \quad \left[\because 1l = \frac{1}{1000}\text{m}^3\right]$$

$$= \frac{60\times 60}{1000} \text{ m}^3\text{/hour}$$

$\because$ $\frac{60\times 60}{1000}$ m^3 water filled in reservoir will take = 1 hour

$\therefore$ 1 m^3 water filled in reservoir will take = $\frac{1000}{60\times 60}$ hours

$\therefore$ 108 m^3 water filled in reservoir will take = $\frac{108\times 1000}{60\times 60}$ hours = 30 hours

It will take 30 hours to fill the reservoir.

Exercise 12.1

Question 1:

Evaluate:

(i) 3^{-2} (ii) $(-4)^{-2}$ (iii) $\left(\frac{1}{2}\right)^{-5}$

Answer 1:

(i) $3^{-2} = \frac{1}{3^2}$ $\left[\because\ a^{-m} = \frac{1}{a^m}\right]$

$= \frac{1}{9}$

(ii) $(-4)^{-2} = \frac{1}{(-4)^2}$ $\left[\because\ a^{-m} = \frac{1}{a^m}\right]$

$= \frac{1}{16}$

(iii) $\left(\frac{1}{2}\right)^{-5} = \left(\frac{2}{1}\right)^{5}$ $\left[\because\ a^{-m} = \frac{1}{a^m}\right]$

$= (2)^5 = 32$

Question 2:

Simplify and express the result in power notation with positive exponent:

(i) $(-4)^5 \div (-4)^8$ (ii) $\left(\frac{1}{2^3}\right)^2$ (iii) $(-3)^4 \times \left(\frac{5}{3}\right)^4$

(iv) $\left(3^{-7} \div 3^{-10}\right) \times 3^{-5}$ (v) $2^{-3} \times (-7)^{-3}$

Answer 2:

(i) $(-4)^5 \div (-4)^8 = (-4)^{5-8}$ $\left[\because\ a^m \div a^n = a^{m-n}\right]$

$= (-4)^{-3} = \frac{1}{(-4)^3}$ $\left[\because\ a^{-m} = \frac{1}{a^m}\right]$

(ii) $\left(\frac{1}{2^3}\right)^2 = \frac{1^2}{\left(2^3\right)^2}$ $\left[\because\ \left(\frac{a}{b}\right)^m = \frac{a^m}{a^n}\right]$

$= \frac{1}{2^{3\times 2}} = \frac{1}{2^6}$ $\left[\because \left(a^m\right)^n = a^{m\times n}\right]$

(iii) $(-3)^4 \times \left(\frac{5}{3}\right)^4 = (-3)^4 \times \frac{5^4}{3^4}$ $\left[\because \left(\frac{a}{b}\right)^m = \frac{a^m}{a^n}\right]$

$= \left\{(-1)^4 \times 3^4\right\} \times \frac{5^4}{3^4}$ $\left[\because (ab)^m = a^m b^m\right]$

$= 3^{4-4} \times 5^4$ $\left[\because a^m \div a^n = a^{m-n}\right]$

$= 3^0 \times 5^4 = 5^4$ $\left[\because a^0 = 1\right]$

(iv) $\left(3^{-7} \div 3^{-10}\right) \times 3^{-5} = 3^{-7-(-10)} \times 3^{-5}$ $\left[\because a^m \div a^n = a^{m-n}\right]$

$= 3^{-7+10} \times 3^{-5} = 3^3 \times 3^{-5} = 3^{3+(-5)}$ $\left[\because a^m \times a^n = a^{m+n}\right]$

$= 3^{-2} = \frac{1}{3^2}$ $\left[\because a^{-m} = \frac{1}{a^m}\right]$

(v) $2^{-3} \times (-7)^{-3} = \frac{1}{2^3} \times \frac{1}{(-7)^3}$ $\left[\because a^{-m} = \frac{1}{a^m}\right]$

$= \frac{1}{\{2\times(-7)\}^3} = \frac{1}{(-14)^3}$ $\left[\because (ab)^m = a^m b^m\right]$

Question 3:

Find the value of:

(i) $\left(3^0 + 4^{-1}\right) \times 2^2$ (ii) $\left(2^{-1} \times 4^{-1}\right) \div 2^{-2}$ (iii) $\left(\frac{1}{2}\right)^{-2} + \left(\frac{1}{3}\right)^{-2} + \left(\frac{1}{4}\right)^{-2}$

(iv) $\left(3^{-1} + 4^{-1} + 5^{-1}\right)^0$ (v) $\left\{\left(\frac{-2}{3}\right)^{-2}\right\}^2$

Answer 3:

(i) $\left(3^0+4^{-1}\right)\times 2^2 = \left(1+\frac{1}{4}\right)\times 2^2$ $\left[\because\ a^{-m}=\frac{1}{a^m}\right]$

$= \left(\frac{4+1}{4}\right)\times 2^2 = \frac{5}{4}\times 2^2 = \frac{5}{2^2}\times 2^2$

$= 5\times 2^{2-2}$ $\left[\because\ a^m\div a^n = a^{m-n}\right]$

$= 5\times 2^0 = 5\times 1 = 5$ $\left[\because\ a^0=1\right]$

(ii) $\left(2^{-1}\times 4^{-1}\right)\div 2^{-2} = \left(\frac{1}{2^1}\times\frac{1}{4^1}\right)\div 2^{-2}$ $\left[\because\ a^{-m}=\frac{1}{a^m}\right]$

$= \left(\frac{1}{2}\times\frac{1}{2^2}\right)\div 2^{-2} = \frac{1}{2^3}\div 2^{-2}$ $\left[\because\ a^m\times a^n = a^{m+n}\right]$

$= 2^{-3}\div 2^{-2} = 2^{-3-(-2)} = 2^{-3+2} = 2^{-1}$ $\left[\because\ a^m\div a^n = a^{m-n}\right]$

$= \frac{1}{2}$ $\left[\because\ a^{-m}=\frac{1}{a^m}\right]$

(iii) $\left(\frac{1}{2}\right)^{-2}+\left(\frac{1}{3}\right)^{-2}+\left(\frac{1}{4}\right)^{-2} = \left(2^{-1}\right)^{-2}+\left(3^{-1}\right)^{-2}+\left(4^{-1}\right)^{-2}$ $\left[\because\ a^{-m}=\frac{1}{a^m}\right]$

$= 2^{-1\times(-2)}+3^{-1\times(-2)}+4^{-1\times(-2)}$ $\left[\because\ \left(a^m\right)^n = a^{m\times n}\right]$

$= 2^2+3^2+4^2 = 4+9+16 = 29$

(iv) $\left(3^{-1}+4^{-1}+5^{-1}\right)^0 = \left(\frac{1}{3}+\frac{1}{4}+\frac{1}{5}\right)^0$ $\left[\because\ a^{-m}=\frac{1}{a^m}\right]$

$= \left(\frac{20+15+12}{60}\right)^0 = \left(\frac{47}{60}\right)^0 = 1$ $\left[\because\ a^0=1\right]$

(v) $\left\{\left(\frac{-2}{3}\right)^{-2}\right\}^2 = \left(\frac{-2}{3}\right)^{-2\times 2}$ $\left[\because\ \left(a^m\right)^n = a^{m\times n}\right]$

$= \left(\frac{-2}{3}\right)^{-4} = \left(\frac{-3}{2}\right)^4$ $\left[\because\ a^{-m}=\frac{1}{a^m}\right]$

$= \frac{81}{16}$

Question 4:

Evaluate:

(i) $\dfrac{8^{-1}\times 5^{3}}{2^{-4}}$ (ii) $\left(5^{-1}\times 2^{-1}\right)\times 6^{-1}$

Answer 4:

(i) $\dfrac{8^{-1}\times 5^{3}}{2^{-4}}=\dfrac{\left(2^{3}\right)^{-1}\times 5^{3}}{2^{-4}}=\dfrac{2^{-3}\times 5^{3}}{2^{-4}}$ $\left[\because \left(a^{m}\right)^{n}=a^{m\times n}\right]$

$= 2^{-3-(-4)}\times 5^{3}=2^{-3+4}\times 5^{3}$ $\left[\because a^{m}\div a^{n}=a^{m-n}\right]$

$= 2\times 125=250$

(ii) $\left(5^{-1}\times 2^{-1}\right)\times 6^{-1}=\left(\dfrac{1}{5}\times\dfrac{1}{2}\right)\times\dfrac{1}{6}$ $\left[\because a^{-m}=\dfrac{1}{a^{m}}\right]$

$=\dfrac{1}{10}\times\dfrac{1}{6}=\dfrac{1}{60}$

Question 5:

Find the value of m for which $5^{m}\div 5^{-3}=5^{5}$.

Answer 5:

$5^{m}\div 5^{-3}=5^{5}$

$\Rightarrow$ $5^{m-(-3)}=5^{5}$ $\left[\because a^{m}\div a^{n}=a^{m-n}\right]$

$\Rightarrow$ $5^{m+3}=5^{5}$

Comparing exponents both sides, we get

$\Rightarrow$ $m+3=5$

$\Rightarrow$ $m=5-3$

$\Rightarrow$ $m=2$

Question 6:

Evaluate:

(i) $\left\{\left(\frac{1}{3}\right)^{-1}-\left(\frac{1}{4}\right)^{-1}\right\}^{-1}$ (ii) $\left(\frac{5}{8}\right)^{-7}\times\left(\frac{8}{5}\right)^{-4}$

Answer 6:

(i) $\left\{\left(\frac{1}{3}\right)^{-1}-\left(\frac{1}{4}\right)^{-1}\right\}=\left\{\left(\frac{3}{1}\right)^{1}-\left(\frac{4}{1}\right)^{1}\right\}$ $\left[\because\ a^{-m}=\frac{1}{a^m}\right]$

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

(ii) $\left(\frac{5}{8}\right)^{-7}\times\left(\frac{8}{5}\right)^{-4}=\frac{5^{-7}}{8^{-7}}\times\frac{8^{-4}}{5^{-4}}$ $\left[\because\ \left(\frac{a}{b}\right)^m=\frac{a^m}{b^m}\right]$

$=5^{-7-(-4)}\times 8^{-4-(-7)}$ $\left[\because\ a^m\div a^n=a^{m-n}\right]$

$=5^{-7+4}\times 8^{-4+7}=5^{-3}\times 8^3=\frac{8^3}{5^3}$ $\left[\because\ a^{-m}=\frac{1}{a^m}\right]$

$=\frac{512}{125}$

Question 7:

Simplify:

(i) $\frac{25\times t^{-4}}{5^{-3}\times 10\times t^{-8}}\quad (t\neq 0)$ (ii) $\frac{3^{-5}\times 10^{-5}\times 125}{5^{-7}\times 6^{-5}}$

Answer 7:

(i) $\frac{25\times t^{-4}}{5^{-3}\times 10\times t^{-8}}=\frac{5^2\times t^{-4}}{5^{-3}\times 5\times 2\times t^{-8}}=\frac{5^{2-(-3)-1}\times t^{-4-(-8)}}{2}$ $\left[\because\ a^m\div a^n=a^{m-n}\right]$

$=\frac{5^{2+3-1}\times t^{-4+8}}{2}=\frac{5^4\times t^4}{2}=\frac{625}{2}t^4$

(ii) $\dfrac{3^{-5}\times10^{-5}\times125}{5^{-7}\times6^{-5}}=\dfrac{3^{-5}\times(2\times5)^{-5}\times5^{3}}{5^{-7}\times(2\times3)^{-5}}=\dfrac{3^{-5}\times2^{-5}\times5^{-5}\times5^{3}}{5^{-7}\times2^{-5}\times3^{-5}}$ $\left[\because\ (ab)^m=a^mb^m\right]$

$= \dfrac{3^{-5}\times2^{-5}\times5^{-5+3}}{5^{-7}\times2^{-5}\times3^{-5}}=\dfrac{3^{-5}\times2^{-5}\times5^{-2}}{5^{-7}\times2^{-5}\times3^{-5}}$ $\left[\because\ a^m\times a^n=a^{m+n}\right]$

$= 3^{-5-(-5)}\times2^{-5-(-5)}\times5^{-2-(-7)}$ $\left[\because\ a^m\div a^n=a^{m-n}\right]$

$= 3^{-5+5}\times2^{-5+5}\times5^{-2+7} = 3^0\times2^0\times5^5$

$= 1 \text{ x } 1 \text{ x } 3125$ $\left[\because\ a^0=1\right]$

$= 3125$

Exercise 12.2

Question 1:

Express the following numbers in standard form:

(i) 0.0000000000085 (ii) 0.00000000000942

(iii) 6020000000000000 (iv) 0.00000000837

(v) 31860000000

Answer 1:

(i) $0.0000000000085 = 0.0000000000085 \times \frac{10^{12}}{10^{12}} = 8.5\times10^{-12}$

(ii) $0.00000000000942 = 0.00000000000942 \times \frac{10^{12}}{10^{12}} = 9.42\times10^{-12}$

(iii) $6020000000000000 = 6020000000000000 \times \frac{10^{15}}{10^{15}} = 6.02\times10^{15}$

(iv) $0.00000000837 = 0.00000000837 \times \frac{10^{9}}{10^{9}} = 8.37\times10^{-9}$

(v) $31860000000 = 31860000000 \times \frac{10^{10}}{10^{10}} = 3.186\times10^{10}$

Question 2:

Express the following numbers in usual form:

(i) 3.02×10^{-6} (ii) 4.5×10^{4} (iii) 3×10^{-8}

(iv) 1.0001×10^{9} (v) 5.8×10^{12} (vi) 3.61492×10^{6}

Answer 2:

(i) $3.02\times10^{-6} = \frac{3.02}{10^{6}} = 0.00000302$

(ii) $4.5\times10^{4} = 4.5 \times 10000 = 45000$

(iii) $3\times10^{-8} = \frac{3}{10^{8}} = 0.00000003$

(iv) $1.0001\times10^{9} = 1000100000$

(v) $5.8\times10^{12} = 5.8 \times 1000000000000 = 5800000000000$

(vi) $3.61492\times10^{6} = 3.61492 \times 1000000 = 3614920$

Question 3:

Express the number appearing in the following statements in standard form:

(i) 1 micron is equal to $\frac{1}{1000000}$ m.

(ii) Charge of an electron is 0.000,000,000,000,000,000,16 coulomb.

(iii) Size of a bacteria is 0.0000005 m.

(iv) Size of a plant cell is 0.00001275 m.

(v) Thickness if a thick paper is 0.07 mm.

Answer 3:

(i) 1 micron = $\frac{1}{1000000} = \frac{1}{10^6} = 1\times10^{-6}$ m

(ii) Charge of an electron is 0.00000000000000000016 coulombs.

= 0.00000000000000000016 x $\frac{10^{19}}{10^{19}}$ = 1.6×10^{-19} coulomb

(iii) Size of bacteria = 0.0000005 = $\frac{5}{10000000}$ = $\frac{5}{10^7} = 5\times10^{-7}$ m

(iv) Size of a plant cell is 0.00001275 m = 0.00001275 x $\frac{10^5}{10^5}$ = 1.275×10^{-5} m

(v) Thickness of a thick paper = 0.07 mm = $\frac{7}{100}$ mm = $\frac{7}{10^2} = 7\times10^{-2}$ mm

Question 4:

In a stack there are 5 books each of thickness 20 mm and 5 paper sheets each of thickness 0.016 mm. What is the total thickness of the stack?

Answer 4:

Thickness of one book = 20 mm

Thickness of 5 books = 20 x 5 = 100 mm

Thickness of one paper = 0.016 mm

Thickness of 5 papers = 0.016 x 5 = 0.08 mm

Total thickness of a stack = 100 + 0.08

= 100.08 mm = 100.08 x $\frac{10^2}{10^2} = 1.0008\times10^2$ mm

Exercise 13.1

Question 1:

Following are the car parking charges near a railway station up to:

4 hours	₹60
8 hours	₹100
12 hours	₹140
24 hours	₹180

Check if the parking charges are in direct proportion to the parking time.

Answer 1:

Charges per hour:

$$C_1 = \frac{60}{4} = ₹15$$

$$C_2 = \frac{100}{8} = ₹12.50$$

$$C_3 = \frac{140}{12} = ₹11.67$$

$$C_4 = \frac{180}{24} = ₹7.50$$

Here, the charges per hour are not same, i.e., $C_1 \neq C_2 \neq C_3 \neq C_4$

Therefore, the parking charges are not in direct proportion to the parking time.

Question 2:

A mixture of paint is prepared by mixing 1 part of red pigments with 8 parts of base. In the following table, find the parts of base that need to be added.

Parts of red pigment	**1**	**4**	**7**	**12**	**20**
Parts of base	8	----	----	----	----

Answer 2:

Let the ratio of parts of red pigment and parts of base be $\frac{a}{b}$.

Here $a_1 = 1, b_1 = 8$ $\Rightarrow$ $\frac{a_1}{b_1} = \frac{1}{8} = k$ (say)

When $a_2 = 4, b_2 = ?$

$$k = \frac{a_2}{b_2} \qquad \Rightarrow \qquad b_2 = \frac{a_2}{k} = \frac{4}{\frac{1}{8}} = 4 \times 8 = 32$$

When $a_3 = 7, b_3 = ?$

$$k = \frac{a_3}{b_3} \qquad \Rightarrow \qquad b_3 = \frac{a_3}{k} = \frac{7}{\frac{1}{8}} = 7 \times 8 = 56$$

When $a_4 = 12, b_4 = ?$

$$k = \frac{a_4}{b_4} \qquad \Rightarrow \qquad b_4 = \frac{a_4}{k} = \frac{12}{\frac{1}{8}} = 12 \times 8 = 96$$

When $a_5 = 20, b_5 = ?$

$$k = \frac{a_5}{b_5} \qquad \Rightarrow \qquad b_5 = \frac{a_5}{k} = \frac{20}{\frac{1}{8}} = 20 \times 8 = 160$$

Parts of red pigment	**1**	**4**	**7**	**12**	**20**
Parts of base	8	32	56	96	160

Question 3:

In Question 2 above, if 1 part of a red pigment requires 75 mL of base, how much red pigment should we mix with 1800 mL of base?

Answer 3:

Let the parts of red pigment mix with 1800 mL base be x.

Parts of red pigment	**1**	x
Parts of base	75	1800

Since it is in direct proportion.

$$\therefore \qquad \frac{1}{75} = \frac{x}{1800}$$

$$\Rightarrow \qquad 75 \times x = 1 \times 1800$$

$$\Rightarrow \qquad x = \frac{1 \times 1800}{75} = 24 \text{ parts}$$

Hence, with base 1800 mL, 24 parts red pigment should be mixed.

Question 4:

A machine in a soft drink factory fills 840 bottles in six hours. How many bottles will it fill in five hours?

Answer 4:

Let the number of bottles filled in five hours be x.

Hours	**1**	x
Bottles	75	1800

Here ratio of hours and bottles are in direct proportion.

$$\therefore \qquad \frac{6}{840} = \frac{5}{x}$$

$$\Rightarrow \qquad 6 \times x = 5 \times 840$$

$$\Rightarrow \qquad x = \frac{5 \times 840}{6} = 700 \text{ bottles}$$

Hence, machine will fill 700 bottles in five hours.

Question 5:

A photograph of a bacteria enlarged 50,000 times attains a length of 5 cm as shown in the diagram. What is the *actual* length of the bacteria? If the photograph is enlarged 20,000 times only, what would be its enlarged length?

Answer 5:

Let enlarged length of bacteria be x.

Actual length of bacteria = $\frac{5}{50000} = \frac{1}{10000}$ cm = 10^{-4} cm

Length	**5**	x
Enlarged length	50,000	20,000

Here length and enlarged length of bacteria are in direct proportion.

$$\therefore \quad \frac{5}{50000} = \frac{x}{20000}$$

$$\Rightarrow \quad x \times 50000 = 5 \times 20000$$

$$\Rightarrow \quad x = \frac{5 \times 20000}{50000} = 2 \text{ cm}$$

Hence, the enlarged length of bacteria is 2 cm.

Question 6:

In a model of a ship, the mast is 9 cm high, while the mast of the actual ship is 12 m high. If the length if the ship is 28 m, how long is the model ship?

Answer 6:

Let the length of model ship be x.

Length of actual ship (in m)	**12**	**28**
Length of model ship (in cm)	9	x

Here length of mast and actual length of ship are in direct proportion.

$$\therefore \quad \frac{12}{9} = \frac{28}{x}$$

$$\Rightarrow \quad x \times 12 = 28 \times 9$$

$$\Rightarrow \quad x = \frac{28 \times 9}{12} = 21 \text{ cm}$$

Hence, the length of the model ship is 21 cm.

Question 7:

Suppose 2 kg of sugar contains 9 x 10^6 crystals. How many sugar crystals are there in (i) 5 kg of sugar? (ii) 1.2 kg of sugar?

Answer 7:

(i) Let sugar crystals be x.

Weight of sugar (in kg)	**2**	**5**
No. of crystals	9×10^6	x

Here weight of sugar and number of crystals are in direct proportion.

$$\therefore \quad \frac{2}{9\times10^6}=\frac{5}{x}$$

$$\Rightarrow \quad x\times2=5\times9\times10^6$$

$$\Rightarrow \quad x=\frac{5\times9\times10^6}{2}$$

$$= 22.5\times10^6=2.25\times10^7$$

Hence, the number of sugar crystals is 2.25×10^7.

(ii) Let sugar crystals be x.

Weight of sugar (in kg)	**2**	**1.2**
No. of crystals	9×10^6	x

Here weight of sugar and number of crystals are in direct proportion.

$$\therefore \quad \frac{2}{9\times10^6}=\frac{1.2}{x}$$

$$\Rightarrow \quad x\times2=1.2\times9\times10^6$$

$$\Rightarrow \quad x=\frac{1.2\times9\times10^6}{2}$$

$$= 0.6\times9\times10^6=5.4\times10^6$$

Hence, the number of sugar crystals is 5.4×10^6.

Question 8:

Rashmi has a road map with a scale of 1 cm representing 18 km. She drives on a road for 72 km. What would be her distance covered in the map?

Answer 8:

Let distance covered in the map be x.

Actual distance (in km)	**18**	**72**
Distance covered in map (in cm)	1	x

Here actual distance and distance covered in the map are in direct proportion.

$$\therefore \quad \frac{18}{1} = \frac{72}{x}$$

$$\Rightarrow \quad x \times 18 = 72 \times 1$$

$$\Rightarrow \quad x = \frac{72 \times 1}{18} = 4 \text{ cm}$$

Hence, the distance covered in the map is 4 cm.

Question 9:

A 5 m 60 cm high vertical pole casts a shadow 3 m 20 cm long. Find at the same time (i) the length of the shadow cast by another pole 10 m 50 cm high (ii) the height of a pole which casts a shadow 5 m long.

Answer 9:

Here height of the pole and length of the shadow are in direct proportion.

And 1 m = 100 cm

5 m 60 cm = 5 x 100 + 60 = 560 cm

3 m 20 cm = 3 x 100 + 20 = 320 cm

10 m 50 cm = 10 x 100 + 50 = 1050 cm

5 m = 5 x 100 = 500 cm

(i). Let the length of the shadow of another pole be x.

Height of pole (in cm)	**560**	**1050**
Length of shadow (in cm)	320	x

$$\therefore \quad \frac{560}{320} = \frac{1050}{x}$$

$$\Rightarrow \quad x \times 560 = 1050 \times 320$$

$$\Rightarrow \quad x = \frac{1050 \times 320}{560}$$

= 600 cm = 6 m

Hence, the length of the shadow of another pole is 6 m.

(ii). Let the height of the pole be x.

Height of pole (in cm)	**560**	x
Length of shadow (in cm)	320	500

$$\therefore \quad \frac{560}{320} = \frac{x}{500}$$

$$\Rightarrow \quad x \times 320 = 560 \times 500$$

$$\Rightarrow \quad x = \frac{560 \times 500}{320}$$

= 875 cm = 8 m 75 cm

Hence, the height of the pole is 8 m 75 cm.

Question 10:

A loaded truck travels 14 km in 25 minutes. If the speed remains the same, how far can it travel in 5 hours?

Answer 10:

Let distance covered in 5 hours be x km.

$\because$ 1 hour = 60 minutes

$\therefore$ 5 hours = 5 x 60 = 300 minutes

Distance (in km)	**14**	x
Time (in minutes)	25	300

Here distance covered and time in direct proportion.

$$\therefore \quad \frac{14}{25} = \frac{x}{300}$$

$\Rightarrow \quad x \times 25 = 14 \times 300$

$\Rightarrow \quad x = \frac{14 \times 300}{25} = 168 \text{ km}$

Hence, the distance covered in 5 hours is 168 km.

Exercise 13.2

Question 1:

Which of the following are in inverse proportion:

(i) The number of workers on a job and the time to complete the job.

(ii) The time taken for a journey and the distance travelled in a uniform speed.

(iii) Area of cultivated land and the crop harvested.

(iv) The time taken for a fixed journey and the speed of the vehicle.

(v) The population of a country and the area of land per person.

Answer 1:

(i) The number of workers and the time to complete the job is in inverse proportion because less workers will take more time to complete a work and more workers will take less time to complete the same work.

(ii) Time and distance covered in direct proportion.

(iii) It is a direct proportion because more are of cultivated land will yield more crops.

(iv) Time and speed are inverse proportion because if time is less, speed is more.

(v) It is a inverse proportion. If the population of a country increases, the area of land per person decreases.

Question 2:

In a Television game show, the prize money of ₹1,00,000 is to be divided equally amongst the winners. Complete the following table and find whether the prize money given to an individual winner is directly or inversely proportional to the number of winners:

No. of winners	**1**	**2**	**4**	**5**	**8**	**10**	**20**
Prize for each winner (in ₹)	1,00,000	50,000	----	----	----	----	----

Answer 2:

Here number of winners and prize money are in inverse proportion because winners are increasing, prize money is decreasing.

When the number of winners are 4, each winner will get = $\frac{100000}{4}$ = ₹25,000

When the number of winners are 5, each winner will get = $\frac{100000}{5}$ = ₹20,000

When the number of winners are 8, each winner will get = $\frac{100000}{8}$ = ₹12,500

When the number of winners are 10, each winner will get = $\frac{100000}{10}$ = ₹10,000

When the number of winners are 20, each winner will get = $\frac{100000}{20}$ = ₹5,000

Question 3:

Rehman is making a wheel using spokes. He wants to fix equal spokes in such a way that the angles between any pair of consecutive spokes are equal. Help him by completing the following table:

No. of spokes	**4**	**6**	**8**	**10**	**12**
Angle between a pair of consecutive spokes	90°	60°	----	----	----

(i) Are the number of spokes and the angles formed between the pairs of consecutive spokes in inverse proportion?

(ii) Calculate the angle between a pair of consecutive spokes on a wheel with 15 spokes.

(iii) How many spokes would be needed, if the angle between a pair of consecutive spokes is 40° ?

Answer 3:

Here the number of spokes are increasing and the angle between a pair of consecutive spokes is decreasing. So, it is a inverse proportion and angle at the centre of a circle is 360°.

When the number of spokes is 8,

then angle between a pair of consecutive spokes = $\frac{360^\circ}{8} = 45^\circ$

When the number of spokes is 10,

then angle between a pair of consecutive spokes= $\frac{360^\circ}{10} = 36^\circ$

When the number of spokes is 12,

then angle between a pair of consecutive spokes= $\frac{360^\circ}{12} = 30^\circ$

No. of spokes	**4**	**6**	**8**	**10**	**12**
Angle between a pair of consecutive spokes	90°	60°	45°	36°	30°

(i) Yes, the number of spokes and the angles formed between a pair of consecutive spokes is in inverse proportion.

(ii) When the number of spokes is 15, then angle between a pair of consecutive spokes = $\frac{360^\circ}{15} = 24^\circ$.

(iii) The number of spokes would be needed = $\frac{360^\circ}{40^\circ} = 9$

Question 4:

If a box of sweets is divided among 24 children, they will get 5 sweets each. How many would each get, if the number of the children is reduced by 4?

Answer 4:

$\because$ Each child gets = 5 sweets

$\therefore$ 24 children will get 24 x 5 = 120 sweets

Total number of sweets = 120

If the number of children is reduced by 4, then children left = 24 – 4 = 20

Now each child will get sweets = $\frac{120}{20}$ = 6 sweets

Question 5:

A farmer has enough food to feed 20 animals in his cattle for 6 days. How long would the food last if there were 10 more animals in his cattle?

Answer 5:

Let the number of days be x.

Total number of animals = 20 + 10 = 30

Animals	**20**	**30**
Days	6	x

Here, the number of animals and the number of days are in inverse proportion.

$$\therefore \quad \frac{20}{30} = \frac{x}{6}$$

$$\Rightarrow \quad 30 \times x = 20 \times 6$$

$$\Rightarrow \quad x = \frac{20 \times 6}{30} = 4$$

Hence, the food will last for four days.

Question 6:

A contractor estimates that 3 persons could rewire Jasminder's house in 4 days. If, he uses 4 persons instead of three, how long should they take to complete the job?

Answer 6:

Let time taken to complete the job be x.

Persons	**3**	**4**
Days	4	x

Here the number of persons and the number of days are in inverse proportion.

$$\therefore \quad \frac{3}{4} = \frac{x}{4}$$

$$\Rightarrow \quad 4 \times x = 3 \times 4$$

$\Rightarrow \quad x = \frac{3 \times 4}{4}$ = 3 days

Hence, they will complete the job in 3 days.

Question 7:

A batch of bottles was packed in 25 boxes with 12 bottles in each box. If the same batch is packed using 20 bottles in each box, how many boxes would be filled?

Answer 7:

Let the number of boxes be x.

No. of bottles in each box	**12**	**20**
Boxes	25	x

Here the number of bottles and the number of boxes are in inverse proportion.

$\therefore \quad \frac{12}{20} = \frac{x}{25}$

$\Rightarrow \quad x \times 20 = 12 \times 25$

$\Rightarrow \quad x = \frac{12 \times 25}{20}$ = 15

Hence, 15 boxes would be filled.

Question 8:

A factory requires 42 machines to produce a given number of articles in 63 days. How many machines would be required to produce the same number of articles in 54 days?

Answer 8:

Let the number of machines required be x.

Days	**63**	**54**
Machines	42	x

Here, the number of machines and the number of days are in inverse proportion.

$$\therefore \quad \frac{63}{54} = \frac{x}{42}$$
$$\Rightarrow \quad x \times 54 = 63 \times 42$$
$$\Rightarrow \quad x = \frac{63 \times 42}{54} = 49$$

Hence, 49 machines would be required.

Question 9:

A car takes 2 hours to reach a destination by travelling at the speed of 60 km/hr. How long will it take when the car travels at the speed of 80 km/hr?

Answer 9:

Let the number of hours be x.

Speed (in km/hr)	**60**	**80**
Time (in hours)	2	x

Here, the speed of car and time are in inverse proportion.

$$\therefore \quad \frac{60}{80} = \frac{x}{2}$$
$$\Rightarrow \quad x \times 80 = 60 \times 2$$
$$\Rightarrow \quad x = \frac{60 \times 2}{80} = \frac{3}{2} = 1\frac{1}{2} \text{ hrs.}$$

Hence, the car will take $1\frac{1}{2}$ hours to reach its destination.

Question 10:

Two persons could fit new windows in a house in 3 days.

(i) One of the persons fell ill before the work started. How long would the job take now?

(ii) How many persons would be needed to fit the windows in one day?

Answer 10:

(i) Let the number of days be x.

Persons	**2**	**1**
Days	3	x

Here, the number of persons and the number of days are in inverse proportion.

$$\therefore \quad \frac{2}{1} = \frac{x}{3}$$

$$\Rightarrow \quad x \times 1 = 2 \times 3$$

$$\Rightarrow \quad x = \frac{2 \times 3}{1} = 6 \text{ days}$$

(ii) Let the number of persons be x.

Persons	**2**	x
Days	3	1

Here, the number of persons and the number of days are in inverse proportion.

$$\therefore \quad \frac{2}{x} = \frac{1}{3}$$

$$\Rightarrow \quad x \times 1 = 2 \times 3$$

$$\Rightarrow \quad x = \frac{2 \times 3}{1} = 6 \text{ persons}$$

Question 11:

A school has 8 periods a day each of 45 minutes duration. How long would each period be, if the school has 9 periods a day, assuming the number of school hours to be the same?

Answer 11:

Let the duration of each period be x.

Period	**8**	**9**
Duration of period (in minutes)	45	x

Here the number of periods and the duration of periods are in inverse proportion.

$$\therefore \quad \frac{8}{9} = \frac{x}{45}$$

$$\Rightarrow \quad x \times 9 = 8 \times 45$$

$$\Rightarrow \quad x = \frac{8 \times 45}{9} = 40 \text{ minutes}$$

Hence, the duration of each period would be 40 minutes.

Exercise 14.1

Question 1:

Find the common factors of the given terms.

(i) $12x, 36$

(ii) $2y, 22xy$

(iii) $14pq, 28p^2q^2$

(iv) $2x, 3x^2, 4$

(v) $6abc, 24ab^2, 12a^2b$

(vi) $16x^3, -4x^2, 32x$

(vii) $10pq, 20qr, 30rp$

(viii) $3x^2y^3, 10x^3y^2, 6x^2y^2z$

Answer 1:

(i) $12x = 2 \times 2 \times 3 \times x$

$36 = 2 \times 2 \times 3 \times 3$

Hence, the common factors are 2, 2 and 3 = 2 x 2 x 3 = 12

(ii) $2y = 2 \times y$

$22xy = 2 \times 11 \times x \times y$

Hence, the common factors are 2 and $y = 2 \times y = 2y$

(iii) $14pq = 2 \times 7 \times p \times q$

$28p^2q^2 = 2 \times 2 \times 7 \times p \times p \times q \times q$

Hence, the common factors are $2 \times 7 \times p \times q = 14pq$

(iv) $2x = 2 \times x \times 1$

$3x^2 = 3 \times x \times x \times 1$

$4 = 2 \times 2 \times 1$

Hence, the common factor is 1.

(v) $6abc = 2 \times 3 \times a \times b \times c$

$24ab^2 = 2 \times 2 \times 2 \times 3 \times a \times b \times b$

$12a^2b = 2 \times 2 \times 3 \times a \times a \times b$

Hence, the common factors are $2 \times 3 \times a \times b = 6ab$

(vi) $16x^3 = 2 \times 2 \times 2 \times 2 \times x \times x \times x$

$-4x^2 = (-1) \times 2 \times 2 \times x \times x$

$32x = 2 \times 2 \times 2 \times 2 \times 2 \times x$

Hence, the common factors are $2 \times 2 \times x = 4x$

(vii) $10pq = 2\times5\times p\times q$

$20qr = 2\times2\times5\times q\times r$

$30rp = 2\times3\times5\times r\times p$

Hence, the common factors are $2\times5=10$

(viii) $3x^2y^3 = 3\times x\times x\times y\times y\times y$

$10x^3y^2 = 2\times5\times x\times x\times x\times y\times y$

$6x^2y^2z = 2\times3\times x\times x\times y\times y\times z$

Hence, the common factors are $x\times x\times y\times y = x^2y^2$

Question 2:

Factorize the following expressions.

(i) $7x-42$ (ii) $6p-12q$

(iii) $7a^2+14a$ (iv) $-16z+20z^3$

(v) $20l^2m+30alm$ (vi) $5x^2y-15xy^2$

(vii) $10a^2-15b^2+20c^2$ (viii) $-4a^2+4ab-4ca$

(ix) $x^2yz+xy^2z+xyz^2$ (x) ax^2y+bxy^2+cxyz

Answer 2:

(i) $7x-42 = 7\times x-2\times3\times7$

Taking common factors from each term,

$= 7(x-2\times3)$

$= 7(x-6)$

(ii) $6p-12q = 2\times3\times p-2\times2\times3\times q$

Taking common factors from each term,

$= 2\times3(p-2q)$

$= 6(p-2q)$

(iii) $7a^2+14a = 7\times a\times a+2\times7\times a$

Taking common factors from each term,

$= 7\times a(a+2)$

$= 7a(a+2)$

(iv) $-16z+20z^3=(-1)\times 2\times 2\times 2\times 2\times z+2\times 2\times 5\times z\times z\times z$

Taking common factors from each term,

$= 2\times 2\times z(-2\times 2+5\times z\times z)$

$= 4z(-4+5z^2)$

(v) $20l^2m+30alm=2\times 2\times 5\times l\times l\times m+2\times 3\times 5\times a\times l\times m$

Taking common factors from each term,

$= 2\times 5\times l\times m(2\times l+3\times a)$

$= 10lm(2l+3a)$

(vi) $5x^2y-15xy^2=5\times x\times x\times y+3\times 5\times x\times y\times y$

Taking common factors from each term,

$= 5\times x\times y(x-3y)$

$= 5xy(x-3y)$

(vii) $10a^2-15b^2+20c^2=2\times 5\times a\times a-3\times 5\times b\times b+2\times 2\times 5\times c\times c$

Taking common factors from each term,

$= 5(2\times a\times a-3\times b\times b+2\times 2\times c\times c)$

$= 5(2a^2-3b^2+4c^2)$

(viii) $-4a^2+4ab-4ca=(-1)\times 2\times 2\times a\times a+2\times 2\times a\times b-2\times 2\times c\times a$

Taking common factors from each term,

$= 2\times 2\times a(-a+b-c)$

$= 4a(-a+b+c)$

(ix) $x^2yz+xy^2z+xyz^2=x\times x\times y\times z+x\times y\times y\times z+x\times y\times z\times z$

Taking common factors from each term,

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

$= xyz(x+y+z)$

(x) $ax^2y+bxy^2+cxyz=a\times x\times x\times y+b\times x\times y\times y+c\times x\times y\times z$

Taking common factors from each term,

$= x\times y(a\times x+b\times y+c\times z)$

$= xy(ax+by+cz)$

Question 3:

Factorize:

(i) $x^2+xy+8x+8y$ (ii) $15xy-6x+5y-2$

(iii) $ax+bx-ay-by$ (iv) $15pq+15+9q+25p$

(v) $z-7+7xy-xyz$

Answer 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) $ax+bx-ay-by=(ax+bx)-(ay+by)$

$=x(a+b)-y(a+b)$

$=(a+b)(x-y)$

(iv) $15pq+15+9q+25p=15pq+25p+9q+15$

$=5p(3q+5)+3(3q+5)$

$=(3q+5)(5p+3)$

(v) $z-7+7xy-xyz=7xy-7-xyz+z$

$=7(xy-1)-z(xy-1)$

$=(xy-1)(7-z)=(-1)(1-xy)(-1)(z-7)$

$=(1-xy)(z-7)$

Exercise 14.2

Question 1:

Factorize the following expressions:

(i) $a^2+8a+16$ (ii) $p^2-10p+25$

(iii) $25m^2+30m+9$ (iv) $49y^2+84yz+36z^2$

(v) $4x^2-8x+4$ (vi) $121b^2-88bc+16c^2$

(vii) $(l+m)^2-4lm$ [Hint: Expand $(l+m)^2$ first]

(viii) $a^4+2a^2b^2+b^4$

Answer 1:

(i) $a^2+8a+16=a^2+(4+4)a+4\times4$

Using identity $x^2+(a+b)x+ab=(x+a)(x+b)$,

Here $x=a, a=4$ and $b=4$

$a^2+8a+16 = (a+4)(a+4)=(a+4)^2$

(ii) $p^2-10p+25=p^2+(-5-5)p+(-5)(-5)$

Using identity $x^2+(a+b)x+ab=(x+a)(x+b)$,

Here $x=p, a=-5$ and $b=-5$

$p^2-10p+25=(p-5)(p-5)=(p-5)^2$

(iii) $25m^2+30m+9=(5m)^2+2\times5m\times3+(3)^2$

Using identity $a^2+2ab+b^2=(a+b)^2$, here $a=5m, b=3$

$25m^2+30m+9=(5m+3)^2$

(iv) $49y^2+84yz+36z^2=(7y)^2+2\times7y\times6z+(6z)^2$

Using identity $a^2+2ab+b^2=(a+b)^2$, here $a=7y, b=6z$

$49y^2+84yz+36z^2=(7y+6z)^2$

(v) $4x^2-8x+4=(2x)^2-2\times 2x\times 2+(2)^2$

Using identity $a^2-2ab+b^2=(a-b)^2$, here $a=2x, b=2$

$4x^2-8x+4=(2x-2)^2=(2)^2(x-1)^2=4(x-1)^2$

(vi) $121b^2-88bc+16c^2=(11b)^2-2\times 11b\times 4c+(4c)^2$

Using identity $a^2-2ab+b^2=(a-b)^2$, here $a=11b, b=4c$

$121b^2-88bc+16c^2=(11b-4c)^2$

(vii) $(l+m)^2-4lm = l^2+2\times l\times m+m^2-4lm$ $\quad[\because\ (a+b)^2=a^2+2ab+b^2]$

$= l^2+2lm+m^2-4lm$

$= l^2-2lm+m^2$

$= (l-m)^2$ $\quad[\because\ (a-b)^2=a^2-2ab+b^2]$

(viii) $a^4+2a^2b^2+b^4=(a^2)^2+2\times a^2\times b^2+(b^2)^2$

$= (a^2+b^2)^2$ $\quad[\because\ (a+b)^2=a^2+2ab+b^2]$

Question 2:

Factorize:

(i) $4p^2-9q^2$ (ii) $63a^2-112b^2$

(iii) $49x^2-36$ (iv) $16x^5-144x^2$

(v) $(l+m)^2-(l-m)^2$ (vi) $9x^2y^2-16$

(vii) $(x^2-2xy+y^2)-z^2$ (viii) $25a^2-4b^2+28bc-49c^2$

Answer 2:

(i) $4p^2-9q^2=(2p)^2-(3q)^2$

$= (2p-3q)(2p+3q)$ $\quad[\because\ a^2-b^2=(a-b)(a+b)]$

(ii) $63a^2-112b^2=7(9a^2-16b^2)=7[(3a)^2-(4b)^2]$

$= 7(3a-4b)(3a+4b)$ $\quad[\because\ a^2-b^2=(a-b)(a+b)]$

(iii) $49x^2-36 = (7x)^2-(6)^2$

$= (7x-6)(7x+6)$ $\left[\because\ a^2-b^2=(a-b)(a+b)\right]$

(iv) $16x^5-144x^3 = 16x^3(x^2-9)$

$= 16x^3\left[(x)^2-(3)^2\right]$

$= 16x^3(x-3)(x+3)$ $\left[\because\ a^2-b^2=(a-b)(a+b)\right]$

(v) $(l+m)^2-(l-m)^2 = \left[(l+m)+(l-m)\right]\left[(l+m)-(l-m)\right]$

$\left[\because\ a^2-b^2=(a-b)(a+b)\right]$

$= (l+m+l-m)(l+m-l+m)$

$= (2m)(2l) = 4lm$

(vi) $9x^2y^2-16 = (3xy)^2-(4)^2$

$= (3xy-4)(3xy+4)$ $\left[\because\ a^2-b^2=(a-b)(a+b)\right]$

(vii) $(x^2-2xy+y^2)-z^2 = (x-y)^2-z^2$

$\left[\because\ (a-b)^2=a^2-2ab+b^2\right]$

$= (x-y-z)(x-y+z)$ $\left[\because\ a^2-b^2=(a-b)(a+b)\right]$

(viii) $25a^2-4b^2+28bc-49c^2 = 25a^2-(4b^2-28bc+49c^2)$

$= 25a^2-\left[(2b)^2-2\times 2b\times 7c+(7c)^2\right]$

$= 25a^2-(2b-7c)^2$ $\left[\because\ (a-b)^2=a^2-2ab+b^2\right]$

$= (5a)^2-(2b-7c)^2$

$= \left[5a-(2b-7c)\right]\left[5a+(2b-7c)\right]$ $\left[\because\ a^2-b^2=(a-b)(a+b)\right]$

$= (5a-2b+7c)(5a+2b-7c)$

Question 3:

Factorize the expressions:

(i) ax^2+bx (ii) $7p^2+21q^2$

(iii) $2x^3+2xy^2+2xz^2$ (iv) $am^2+bm^2+bn^2+an^2$

(v) $(lm+l)+m+1$ (vi) $y(y+z)+9(y+z)$

(vii) $5y^2-20y-8z+2yz$ (viii) $10ab+4a+5b+2$

(ix) $6xy-4y+6-9x$

Answer 3:

(i) $ax^2+bx = x(ax+b)$

(ii) $7p^2+21q^2 = 7(p^2+3q^2)$

(iii) $2x^3+2xy^2+2xz^2 = 2x(x^2+y^2+z^2)$

(iv) $am^2+bm^2+bn^2+an^2 = m^2(a+b)+n^2(a+b)$

$= (a+b)(m^2+n^2)$

(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) $6xy-4y+6-9x = 6xy-9x-4y+6$

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

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

Question 4:

Factorize:

(i) a^4-b^4 (ii) p^4-81

(iii) $x^4-(y+z)^4$ (iv) $x^4-(x-z)^4$

(v) $a^4-2a^2b^2+b^4$

Answer 4:

(i) $a^4-b^4=\left(a^2\right)^2-\left(b^2\right)^2$

$=\left(a^2-b^2\right)\left(a^2+b^2\right)$ $\left[\because\ a^2-b^2-(a-b)(a+b)\right]$

$=(a-b)(a+b)\left(a^2+b^2\right)$ $\left[\because\ a^2-b^2-(a-b)(a+b)\right]$

(ii) $p^4-81=\left(p^2\right)^2-(9)^2$

$=\left(p^2-9\right)\left(p^2+9\right)$ $\left[\because\ a^2-b^2-(a-b)(a+b)\right]$

$=\left(p^2-3^2\right)\left(p^2+9\right)$

$=(p-3)(p+3)\left(p^2+9\right)$ $\left[\because\ a^2-b^2-(a-b)(a+b)\right]$

(iii) $x^4-(y+z)^4=\left(x^2\right)^2-\left[(y+z)^2\right]^2$

$=\left[x^2-(y+z)^2\right]\left[x^2+(y+z)^2\right]$ $\left[\because\ a^2-b^2-(a-b)(a+b)\right]$

$=\left[x-(y+z)\right]\left[x+(y+z)\right]\left[x^2+(y+z)^2\right]$ $\left[\because\ a^2-b^2-(a-b)(a+b)\right]$

$=(x-y+z)(x+y+z)\left[x^2+(y+z)^2\right]$

(iv) $x^4-(x-z)^4=\left(x^2\right)^2-\left[(x-z)^2\right]^2$

$=\left[x^2-(x-z)^2\right]\left[x^2+(x-z)^2\right]$ $\left[\because\ a^2-b^2-(a-b)(a+b)\right]$

$=\left[x-(x-z)\right]\left[x+(x+z)\right]\left[x^2+(x-z)^2\right]$ $\left[\because\ a^2-b^2-(a-b)(a+b)\right]$

$=(x-x+z)(x+x+z)\left(x^2+x^2-2xz+z^2\right)$ $\left[\because\ (a-b)^2=a^2-2ab+b^2\right]$

$=x(2x+z)\left(2x^2-2xz+z^2\right)$

(v) $a^4-2a^2b^2+b^4 = \left(a^2\right)^2-2a^2b^2+\left(b^2\right)^2$

$= \left(a^2-b^2\right)^2$ $\left[\because \ (a-b)^2 = a^2-2ab+b^2\right]$

$= \left[(a-b)(a+b)\right]^2$ $\left[\because \ a^2-b^2-(a-b)(a+b)\right]$

$= (a-b)^2(a+b)^2$ $\left[\because \ (xy)^m = x^m.y^m\right]$

Question 5:

Factorize the following expressions:

(i) p^2+6p+8 (ii) $q^2-10q+21$

(iii) $p^2+6p-16$

Answer 5:

(i) $p^2+6p+8 = p^2+(4+2)p+4\times 2$

$= p^2+4p+2p+4\times 2$

$= p(p+4)+2(p+4)$

$= (p+4)(p+2)$

(ii) $q^2-10q+21 = q^2-(7+3)q+7\times 3$

$= q^2-7q-3q+7\times 3$

$= q(q-7)-3(q-7)$

$= (q-7)(q-3)$

(iii) $p^2+6p-16 = p^2+(8-2)p-8\times 2$

$= p^2+8p-2p-8\times 2$

$= p(p+8)-2(p+8)$

$= (p+8)(p-2)$

Exercise 14.3

Question 1:

Carry out the following divisions:

(i) $28x^4 \div 56x$ (ii) $-36y^3 \div 9y^2$

(iii) $66pq^2r^3 \div 11qr^2$ (iv) $34x^3y^3z^3 \div 51xy^2z^3$

(v) $12a^8b^8 \div \left(-6a^6b^4\right)$

Answer 1:

(i) $28x^4 \div 56x = \frac{28x^4}{56x} = \frac{28}{56} \times \frac{x^4}{x}$

$= \frac{1}{2}x^3$ $\left[\because\ x^m \div x^n = x^{m-n}\right]$

(ii) $-36y^3 \div 9y^2 = \frac{-36y^3}{9y^2} = \frac{-36}{9} \times \frac{y^3}{y^2}$

$= -4y$ $\left[\because\ x^m \div x^n = x^{m-n}\right]$

(iii) $66pq^2r^3 \div 11qr^2 = \frac{66pq^2r^3}{11qr^2} = \frac{66}{11} \times \frac{pq^2r^3}{qr^2}$

$= 6pqr$ $\left[\because\ x^m \div x^n = x^{m-n}\right]$

(iv) $34x^3y^3z^3 \div 51xy^2z^3 = \frac{34x^3y^3z^3}{51xy^2z^3} = \frac{34}{51} \times \frac{x^3y^3z^3}{xy^2z^3}$

$= \frac{2}{3}x^2y$ $\left[\because\ x^m \div x^n = x^{m-n}\right]$

(v) $12a^8b^8 \div \left(-6a^6b^4\right) = \frac{12a^8b^8}{-6a^6b^4} = \frac{12}{-6} \times \frac{a^8b^8}{a^6b^4}$

$= -2a^2b^4$ $\left[\because\ x^m \div x^n = x^{m-n}\right]$

Question 2:

Divide the given polynomial by the given monomial:

(i) $\left(5x^2-6x\right)\div 3x$ (ii) $\left(3y^8-4y^6+5y^4\right)\div y^4$

(iii) $8\left(x^3y^2z^2+x^2y^3z^2+x^2y^2z^3\right)\div 4x^2y^2z^2$

(iv) $\left(x^3+2x^2+3x\right)\div 2x$ (v) $\left(p^3q^6-p^6q^3\right)\div p^3q^3$

Answer 2:

(i) $\left(5x^2-6x\right)\div 3x=\dfrac{5x^2-6x}{3x}$

$=\dfrac{5x^2}{3x}-\dfrac{6x}{3x}=\dfrac{5}{3}x-2=\dfrac{1}{3}(5x-6)$

(ii) $\left(3y^8-4y^6+5y^4\right)\div y^4=\dfrac{3y^8-4y^6+5y^4}{y^4}$

$=\dfrac{3y^8}{y^4}-\dfrac{4y^6}{y^4}+\dfrac{5y^4}{y^4}=3y^4-4y^2+5$

(iii) $8\left(x^3y^2z^2+x^2y^3z^2+x^2y^2z^3\right)\div 4x^2y^2z^2=\dfrac{8\left(x^3y^2z^2+x^2y^3z^2+x^2y^2z^3\right)}{4x^2y^2z^2}$

$=\dfrac{8x^3y^2z^2}{4x^2y^2z^2}+\dfrac{8x^2y^3z^2}{4x^2y^2z^2}+\dfrac{8x^2y^2z^3}{4x^2y^2z^2}=2x+2y+2z$

$=2\left(x+y+z\right)$

(iv) $\left(x^3+2x^2+3x\right)\div 2x=\dfrac{x^3+2x^2+3x}{2x}$

$=\dfrac{x^3}{2x}+\dfrac{2x^2}{2x}+\dfrac{3x}{2x}=\dfrac{x^2}{2}+\dfrac{2x}{2}+\dfrac{3}{2}=\dfrac{1}{2}\left(x^2+2x+3\right)$

(v) $\left(p^3q^6-p^6q^3\right)\div p^3q^3=\dfrac{p^3q^6-p^6q^3}{p^3q^3}$

$=\dfrac{p^3q^6}{p^3q^3}-\dfrac{p^6q^3}{p^3q^3}=q^3-p^3$

Question 3:

Work out the following divisions:

(i) $(10x-25)\div 5$ (ii) $(10x-25)\div(2x-5)$

(iii) $10y(6y+21)\div 5(2y+7)$ (iv) $9x^2y^2(3z-24)\div 27xy(z-8)$

(v) $96abc(3a-12)(5b-30)\div 144(a-4)(b-6)$

Answer 3:

(i) $(10x-25)\div 5=\dfrac{10x-25}{5}$

$=\dfrac{5(2x-5)}{5}=2x-5$

(ii) $(10x-25)\div(2x-5)=\dfrac{10x-25}{(2x-5)}$

$=\dfrac{5(2x-5)}{(2x-5)}=5$

(iii) $10y(6y+21)\div 5(2y+7)=\dfrac{10y(6y+21)}{5(2y+7)}$

$=\dfrac{2\times 5\times y\times 3(2y+7)}{5(2y+7)}=2\times y\times 3=6y$

(iv) $9x^2y^2(3z-24)\div 27xy(z-8)=\dfrac{9x^2y^2(3z-24)}{27xy(z-8)}$

$=\dfrac{9}{27}\times\dfrac{xy\times xy\times 3(z-8)}{xy(z-8)}=xy$

(v) $96abc(3a-12)(5b-30)\div 144(a-4)(b-6)=\dfrac{96abc(3a-12)(5b-30)}{144(a-4)(b-6)}$

$=\dfrac{12\times 4\times 2\times abc\times 3(a-4)\times 5(b-6)}{12\times 4\times 3(a-4)(b-6)}=10abc$

Question 4:

Divide as directed:

(i) $5(2x+1)(3x+5)\div(2x+1)$

(ii) $26xy(x+5)(y-4)\div 13x(y-4)$

(iii) $52pqr(p+q)(q+r)(r+p)\div 104pq(q+r)(r+p)$

(iv) $20(y+4)(y^2+5y+3)\div 5(y+4)$

(v) $x(x+1)(x+2)(x+3)\div x(x+1)$

Answer 4:

(i) $5(2x+1)(3x+5)\div(2x+1)=\dfrac{5(2x+1)(3x+5)}{(2x+1)}$

$= 5(3x+5)$

(ii) $26xy(x+5)(y-4)\div 13x(y-4)=\dfrac{26xy(x+5)(y-4)}{13x(y-4)}$

$=\dfrac{13\times 2\times xy(x+5)(y-4)}{13x(y-4)} = 2y(x+5)$

(iii)

$52pqr(p+q)(q+r)(r+p)\div 104pq(q+r)(r+p)=\dfrac{52pqr(p+q)(q+r)(r+p)}{104pq(q+r)(r+p)}$

$=\dfrac{52pqr(p+q)(q+r)(r+p)}{52\times 2\times pq(q+r)(r+p)} = \dfrac{1}{2}r(p+q)$

(iv) $20(y+4)(y^2+5y+3)\div 5(y+4)=\dfrac{20(y+4)(y^2+5y+3)}{5(y+4)}$

$= 4(y^2+5y+3)$

(v) $x(x+1)(x+2)(x+3)\div x(x+1)=\dfrac{x(x+1)(x+2)(x+3)}{x(x+1)}$

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

Question 5:

Factorize the expressions and divide them as directed:

(i) $\left(y^2+7y+10\right)\div\left(y+5\right)$

(ii) $\left(m^2-14m-32\right)\div\left(m+2\right)$

(iii) $\left(5p^2-25p+20\right)\div\left(p-1\right)$

(iv) $4yz\left(z^2+6z-16\right)\div 2y\left(z+8\right)$

(v) $5pq\left(p^2-q^2\right)\div 2p\left(p+q\right)$

(vi) $12xy\left(9x^2-16y^2\right)\div 4xy\left(3x+4y\right)$

(vii) $39y^3\left(50y^2-98\right)\div 26y^2\left(5y+7\right)$

Answer 5:

(i) $\left(y^2+7y+10\right)\div\left(y+5\right)=\dfrac{y^2+7y+10}{\left(y+5\right)}$

$=\dfrac{y^2+\left(2+5\right)y+2\times 5}{\left(y+5\right)}=\dfrac{y^2+2y+5y+2\times 5}{\left(y+5\right)}$

$=\dfrac{\left(y+2\right)\left(y+5\right)}{\left(y+5\right)}\qquad\left[\because x^2+\left(a+b\right)x+ab=\left(x+a\right)\left(x+b\right)\right]$

$=y+2$

(ii) $\left(m^2-14m+32\right)\div\left(m+2\right)=\dfrac{m^2-14m+32}{\left(m+2\right)}$

$=\dfrac{m^2+\left(-16+2\right)m+\left(-16\right)\times 2}{\left(m+2\right)}$

$=\dfrac{\left(m-16\right)\left(m+2\right)}{\left(m+2\right)}\qquad\left[\because x^2+\left(a+b\right)x+ab=\left(x+a\right)\left(x+b\right)\right]$

$=\left(m+2\right)$

(iii) $\left(5p^2-25p+20\right)\div\left(p-1\right)=\dfrac{5p^2-25p+20}{\left(p-1\right)}$

$=\dfrac{5p^2-20p-5p+20}{\left(p-1\right)}$

$$= \frac{5p(p-4)-5(p-4)}{(p-1)}$$

$$= \frac{(5p-5)(p-4)}{(p-1)} = \frac{5(p-1)(p-4)}{(p-1)}$$

$$= 5(p-4)$$

(iv) $$4yz\left(z^2+6z-16\right) \div 2y(z+8) = \frac{4yz\left(z^2+6z-16\right)}{2y(z+8)}$$

$$= \frac{4yz\left[z^2+(8-2)z+8\times(-2)\right]}{2y(z+8)}$$

$$= \frac{4yz(z-2)(z+8)}{2y(z+8)} \qquad \left[\because x^2+(a+b)x+ab=(x+a)(x+b)\right]$$

$$= 2z(z-2)$$

(v) $$5pq\left(p^2-q^2\right) \div 2p(p+q) = \frac{5pq\left(p^2-q^2\right)}{2p(p+q)}$$

$$= \frac{5pq(p-q)(p+q)}{2p(p+q)} \qquad \left[\because \ a^2-b^2=(a-b)(a+b)\right]$$

$$= \frac{5}{2}q(p-q)$$

(vi) $$12xy\left(9x^2-16y^2\right) \div 4xy(3x+4y) = \frac{12xy\left(9x^2-16y^2\right)}{4xy(3x+4y)}$$

$$= \frac{12xy\left[(3x)^2-(4y)^2\right]}{4xy(3x+4y)}$$

$$= \frac{12xy(3x-4y)(3x+4y)}{4xy(3x+4y)} \qquad \left[\because \ a^2-b^2=(a-b)(a+b)\right]$$

$$= 3(3x-4y)$$

(vii) $39y^3\left(50y^2-98\right)\div 26y^2\left(5y+7\right)=\dfrac{39y^3\left(50y^2-98\right)}{26y^2\left(5y+7\right)}$

$$= \frac{39y^3\times 2\left(25y^2-49\right)}{26y^2\left(5y+7\right)}$$

$$= \frac{39y^2\times 2\left[\left(5y\right)^2-\left(7\right)^2\right]}{26y^2\left(5y+7\right)}$$

$$= \frac{39y^2\times 2\left(5y-7\right)\left(5y+7\right)}{26y^2\left(5y+7\right)} \qquad \left[\because\ a^2-b^2=\left(a-b\right)\left(a+b\right)\right]$$

$$= 3y\left(5y-7\right)$$

Exercise 14.4

Question 1:

Find and correct the errors in the following mathematical statement: $4(x-5)=4x-5$

Answer 1:

L.H.S. = $4(x-5)=4x-20 \neq$ R.H.S.

Hence, the correct mathematical statements is $4(x-5)=4x-20.$

Question 2:

Find and correct the errors in the following mathematical statement: $x(3x+2)=3x^2+2$

Answer 2:

L.H.S. = $x(3x+2)=3x^2+2x \neq$ R.H.S.

Hence, the correct mathematical statements is $x(3x+2)=3x^2+2x.$

Question 3:

Find and correct the errors in the following mathematical statement: $2x+3y=5xy$

Answer 3:

L.H.S. = $2x+3y \neq$ R.H.S.

Hence, the correct mathematical statements is $2x+3y=2x+3y.$

Question 4:

Find and correct the errors in the following mathematical statement: $x+2x+3x=5x$

Answer 4:

L.H.S. = $x+2x+3x=6x \neq$ R.H.S.

Hence, the correct mathematical statements is $x+2x+3x=6x.$

Question 5:

Find and correct the errors in the following mathematical statement: $5y+2y+y-7y=0$

Answer 5:

L.H.S. = $5y+2y+y-7y=8y-7y=y\neq$ R.H.S.

Hence, the correct mathematical statements is $5y+2y+y-7y=y$.

Question 6:

Find and correct the errors in the following mathematical statement: $3x+2x=5x^2$

Answer 6:

L.H.S. = $3x+2x=5x\neq$ R.H.S.

Hence, the correct mathematical statements is $3x+2x=5x$.

Question 7:

Find and correct the errors in the following mathematical statement:

$(2x)^2+4(2x)+7=2x^2+8x+7$

Answer 7:

L.H.S. = $(2x)^2+4(2x)+7=4x^2+8x+7\neq$ R.H.S.

Hence, the correct mathematical statements is $(2x)^2+4(2x)+7=4x^2+8x+7$.

Question 8:

Find and correct the errors in the following mathematical statement:

$(2x)^2+5x=4x+5x=9x$

Answer 8:

L.H.S. = $(2x)^2+5x=4x^2+5x\neq$ R.H.S.

Hence, the correct mathematical statements is $(2x)^2+5x=4x^2+5x$.

Question 9:

Find and correct the errors in the following mathematical statement:

$(3x+2)^2 = 3x^2 + 6x + 4$

Answer 9:

L.H.S. = $(3x+2)^2 = (3x)^2 + 2\times 3x \times 2 + (2)^2 = 9x^2 + 12x + 4 \neq$ R.H.S.

Hence, the correct mathematical statements is $(3x+2)^2 = 9x^2 + 12x + 4.$

Question 10:

Find and correct the errors in the following mathematical statements:

Substituting $x = -3$ in:

(a) $x^2 + 5x + 4$ gives $(-3)^2 + 5(-3) + 4 = 9 + 2 + 4 = 15$

(b) $x^2 - 5x + 4$ gives $(-3)^2 - 5(-3) + 4 = 9 - 15 + 4 = -2$

(c) $x^2 + 5x$ gives $(-3)^2 + 5(-3) = -9 - 15 = -24$

Answer 10:

(a) L.H.S. = $x^2 + 5x + 4$

Putting $x = -3$ in given expression,

= $(-3)^2 + 5(-3) + 4 = 9 - 15 + 4 = -2 \neq$ R.H.S.

Hence, $x^2 + 5x + 4$ gives $(-3)^2 + 5(-3) + 4 = 9 - 15 + 4 = -2.$

(b) L.H.S. = $x^2 - 5x + 4$

Putting $x = -3$ in given expression,

= $(-3)^2 - 5(-3) + 4 = 9 + 15 + 4 = 28 \neq$ R.H.S.

Hence, $x^2 - 5x + 4$ gives $(-3)^2 - 5(-3) + 4 = 9 + 15 + 4 = 28.$

(c) L.H.S. = $x^2 + 5x$

Putting $x = -3$ in given expression,

= $(-3)^2 + 5(-3) = 9 - 15 = -6 \neq$ R.H.S.

Hence, $x^2 + 5x$ gives $(-3)^2 + 5(-3) = 9 - 15 = -6.$

Question 11:

Find and correct the errors in the following mathematical statement: $(y-3)^2 = y^2 - 9$

Answer 11:

L.H.S. = $(y-3)^2 = y^2 - 2\times y\times 3 + (3)^2$ $\left[\because (a-b)^2 = a^2 - 2ab + b^2\right]$

$= y^2 - 6y + 9 \neq$ R.H.S.

Hence, the correct statements is $(y-3)^2 = y^2 - 6y + 9$.

Question 12:

Find and correct the errors in the following mathematical statement: $(z+5)^2 = z^2 + 25$

Answer 12:

L.H.S. = $(z+5)^2 = z^2 + 2\times z\times 5 + (5)^2$ $\left[\because (a+b)^2 = a^2 + 2ab + b^2\right]$

$= z^2 + 10z + 25$

Hence, the correct statement is $(z+5)^2 = z^2 + 10z + 25$.

Question 13:

Find and correct the errors in the following mathematical statement:

$(2a+3b)(a-b) = 2a^2 - 3b^2$

Answer 13:

L.H.S. = $(2a+3b)(a-b) = 2a(a-b) + 3b(a-b)$

$= 2a^2 - 2ab + 3ab - 3b^2 = 2a^2 + ab - 3b^2 \neq$ R.H.S.

Hence, the correct statement is $(2a+3b)(a-b) = 2a^2 + ab - 3b^2$.

Question 14:

Find and correct the errors in the following mathematical statement:

$(a+b)(a+2) = a^2 + 8$

Answer14:

L.H.S. = $(a+4)(a+2) = a(a+2)+4(a+2)$

$= a^2+2a+4a+8 = a^2+6a+8 \neq$ R.H.S.

Hence, the correct statement is $(a+4)(a+2) = a^2+6a+8.$

Question 15:

Find and correct the errors in the following mathematical statement:

$(a-4)(a-2) = a^2-8$

Answer 15:

L.H.S. = $(a-4)(a-2) = a(a-2)-4(a-2)$

$= a^2-2a-4a+8 = a^2-6a+8 \neq$ R.H.S.

Hence, the correct statement is $(a-4)(a-2) = a^2-6a+8.$

Question 16:

Find and correct the errors in the following mathematical statement: $\frac{3x^2}{3x^2} = 0$

Answer 16:

L.H.S. = $\frac{3x^2}{3x^2} = \frac{1}{1} = 1 \neq$ R.H.S.

Hence, the correct statement is $\frac{3x^2}{3x^2} = 1.$

Question 17:

Find and correct the errors in the following mathematical statement: $\frac{3x^2+1}{3x^2} = 1+1 = 2$

Answer 17:

$$\text{L.H.S.} = \frac{3x^2+1}{3x^2} = \frac{3x^2}{3x^2} + \frac{1}{3x^2}$$

$$= 1 + \frac{1}{3x^2} \neq \text{R.H.S.}$$

Hence, the correct statement is $\frac{3x^2+1}{3x^2} = 1 + \frac{1}{3x^2}$.

Question 18:

Find and correct the errors in the following mathematical statement: $\frac{3x}{3x+2} = \frac{1}{2}$

Answer 18:

$$\text{L.H.S.} = \frac{3x}{3x+2} \neq \text{R.H.S.}$$

Hence, the correct statement is $\frac{3x}{3x+2} = \frac{3x}{3x+2}$.

Question 19:

Find and correct the errors in the following mathematical statement: $\frac{3}{4x+3} = \frac{1}{4x}$

Answer 19:

$$\text{L.H.S.} = \frac{3}{4x+3} \neq \text{R.H.S.}$$

Hence, the correct statement is $\frac{3}{4x+3} = \frac{3}{4x+3}$.

Question 20:

Find and correct the errors in the following mathematical statement: $\frac{4x+5}{4x} = 5$

Answer 20:

$$\text{L.H.S.} = \frac{4x+5}{4x} = \frac{4x}{4x} + \frac{5}{4x} = 1 + \frac{5}{4x} \neq \text{R.H.S.}$$

Hence, the correct statement is $\frac{4x+5}{4x} = 1 + \frac{5}{4x}$.

Question 21:

Find and correct the errors in the following mathematical statement: $\frac{7x+5}{5} = 7x$

Answer 21:

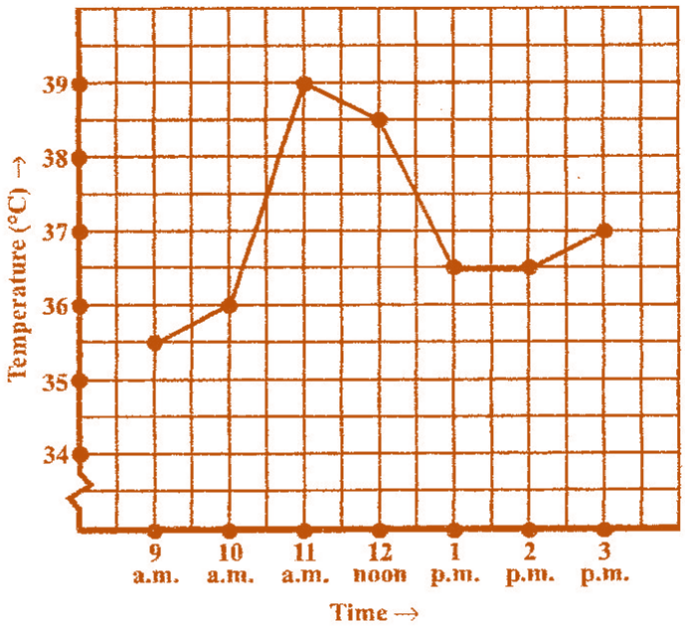
$$\text{L.H.S.} = \frac{7x+5}{5} = \frac{7x}{5} + \frac{5}{5} = \frac{7x}{5} + 1 \neq \text{R.H.S.}$$

Hence, the correct statement is $\frac{7x+5}{5} = \frac{7x}{5} + 1$.

Exercise 15.1

Question 1:

The following graph shows the temperature of a patient in a hospital, recorded every hour:



(a) What was the patient's temperature at 1 p.m.?

(b) When was the patient's temperature 38.5° C?

(c) The patient's temperature was the same two times during the period given. What were these two times?

(d) What was the temperature at 1.30 p.m.? How did you arrive at your answer?

(e) During which periods did the patients' temperature showed an upward trend?

Answer 1:

(a) The patient's temperature was 36.5^{o} C at 1 p.m.

(b) The patient's temperature was 38.5^{o} C at 12 noon.

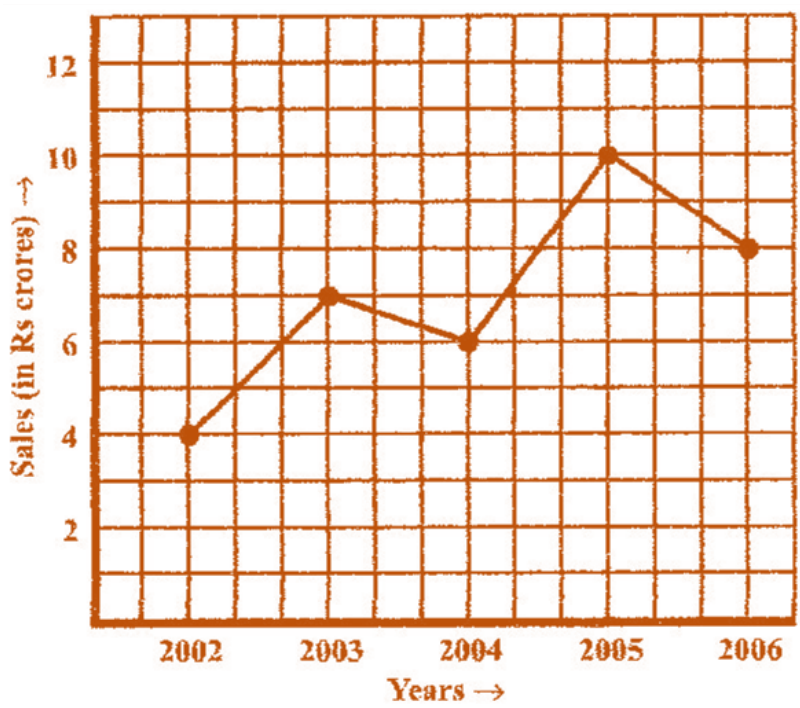
(c) The patient's temperature was same at 1 p.m. and 2 p.m.

(d) The temperature at 1.30 p.m. is 36.5^{o} C. The point between 1 p.m. and 2 p.m., $x-$ axis is equidistant from the two points showing 1 p.m. and 2 p.m. So it represents 1.30 p.m. Similarly the point on $y-$axis, between 36^{o} C and 37^{o} C will represent 36.5^{o} C.

(e) The patient's temperature showed an upward trend from 9 a.m. to 11 a.m.

Question 2:

The following line graph shows the yearly sales figures for a manufacturing company.



(a) What were the sales in (i) 2002 (ii) 2006?

(b) What were the sales in (i) 2003 (ii) 2005?

(c) Compute the difference between the sales in 2002 and 2006.

(d) In which year was there the greatest difference between the sales as compared to its previous year?

Answer 2:

(a) The sales in:

(i) 2002 was ₹ 4 crores and (ii) 2006 was ₹ 8 crores.

(b) The sales in:

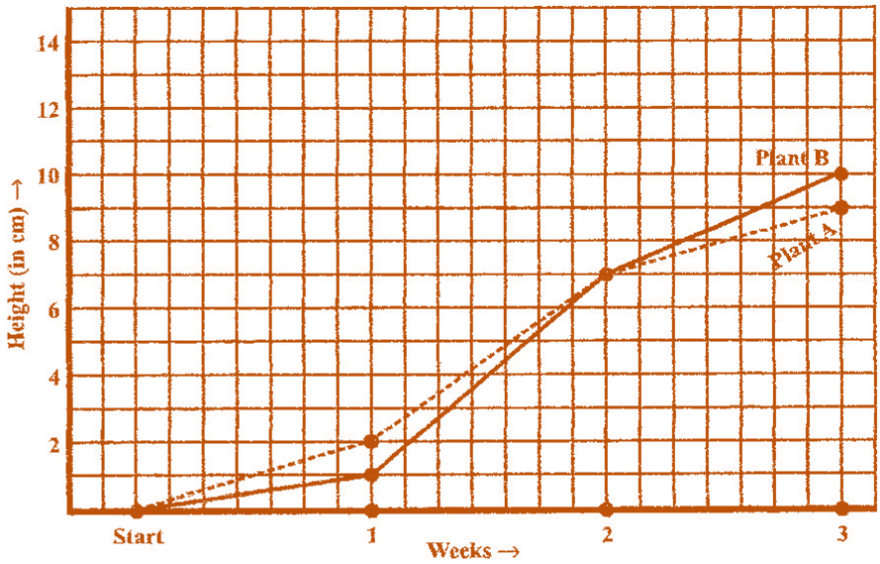
(i) 2003 was ₹ 7 crores and (ii) 2005 was ₹10 crores.

(c) The difference of sales in 2002 and 2006 = ₹8 crores – ₹4 crores = ₹ 4 crores

(d) In the year 2005, there was the greatest difference between the sales as compared to its previous year, which is (₹10 crores – ₹ 6 crores) = ₹4 crores.

Question 3:

For an experiment in Botany, two different plants, plant A and plant B were grown under similar laboratory conditions. Their heights were measured at the end of each week for 3 weeks. The results are shown by the following graph.



(a) How high was Plant A after (i) 2 weeks (ii) 3 weeks?

(b) How high was Plant B after (i) 2 weeks (ii) 3 weeks?

(c) How much did Plant A grow during the 3rd week?

(d) How much did Plant B grow from the end of the 2nd week to the end of the 3rd week?

(e) During which week did Plant A grow most?

(f) During which week did Plant B grow least?

(g) Were the two plants of the same height during any week shown here? Specify.

Answer 3:

(a) (i) The plant A was 7 cm high after 2 weeks and
(ii) after 3 weeks it was 9 cm high.

(b) (i) Plant B was also 7 cm high after 2 weeks and
(ii) after 3 weeks it was 10 cm high.

(c) Plant A grew = 9 cm – 7 cm = 2 cm during 3^{rd} week.

(d) Plant B grew during end of the 2^{nd} week to the end of the 3^{rd} week = 10 cm – 7 cm = 3 cm.

(e) Plant A grew the highest during second week.

(f) Plant B grew the least during first week.

(g) At the end of the second week, plant A and B were of the same height.

Question 4:

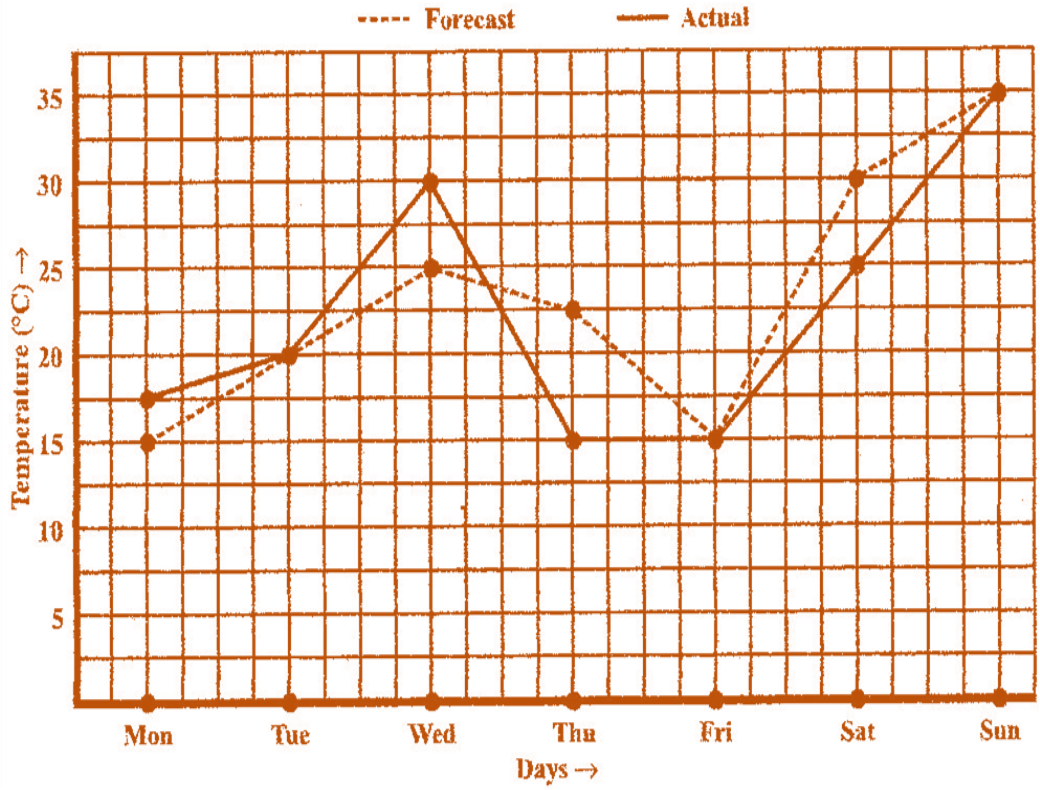
The following graph shows the temperature forecast and the actual temperature for each day of a week.

(a) On which days was the forecast temperature the same as the actual temperature?

(b) What was the maximum forecast temperature during the week?

(c) What was the minimum actual temperature during the week?

(d) On which day did the actual temperature differ the most from the forecast temperature?



Answer 4:

(a) On Tuesday, Friday and Sunday, the forecast temperature was same as the actual temperature.

(b) The maximum forecast temperature was 35^{o} C.

(c) The minimum actual temperature was 15^{o} C.

(d) The actual temperature differed the most from the forecast temperature on Thursday.

Question 5:

Use the tables below to draw linear graphs.

(a) The number of days a hill side city received snow in different years.

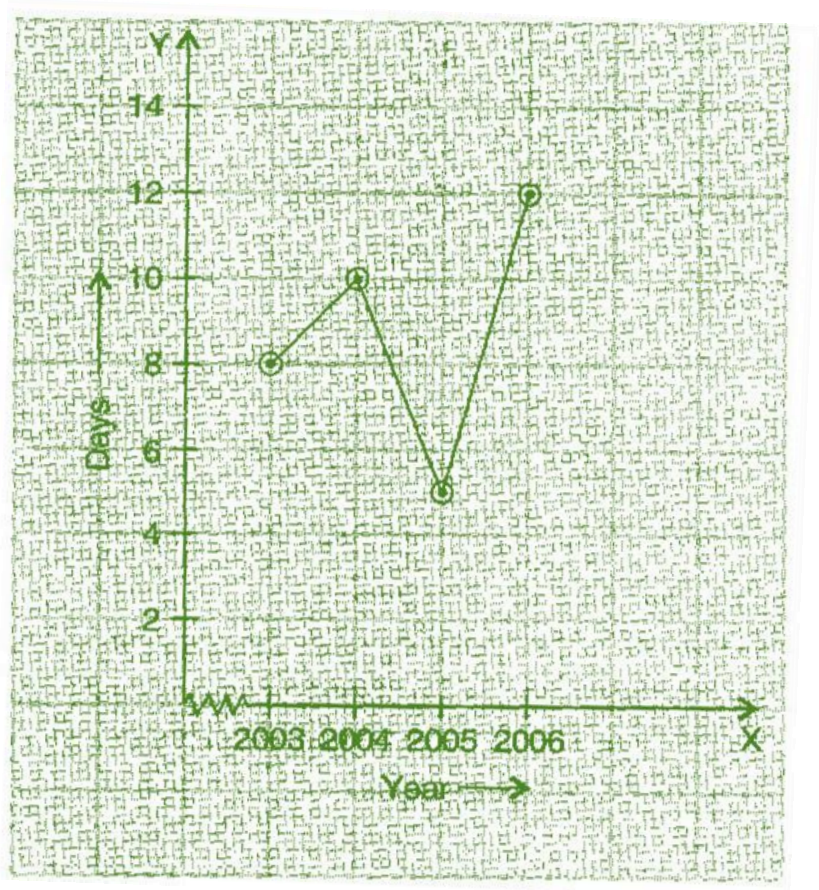
Year	2003	2004	2005	2006
Days	8	10	5	12

(b) Population (in thousands) of men and women in a village in different years.

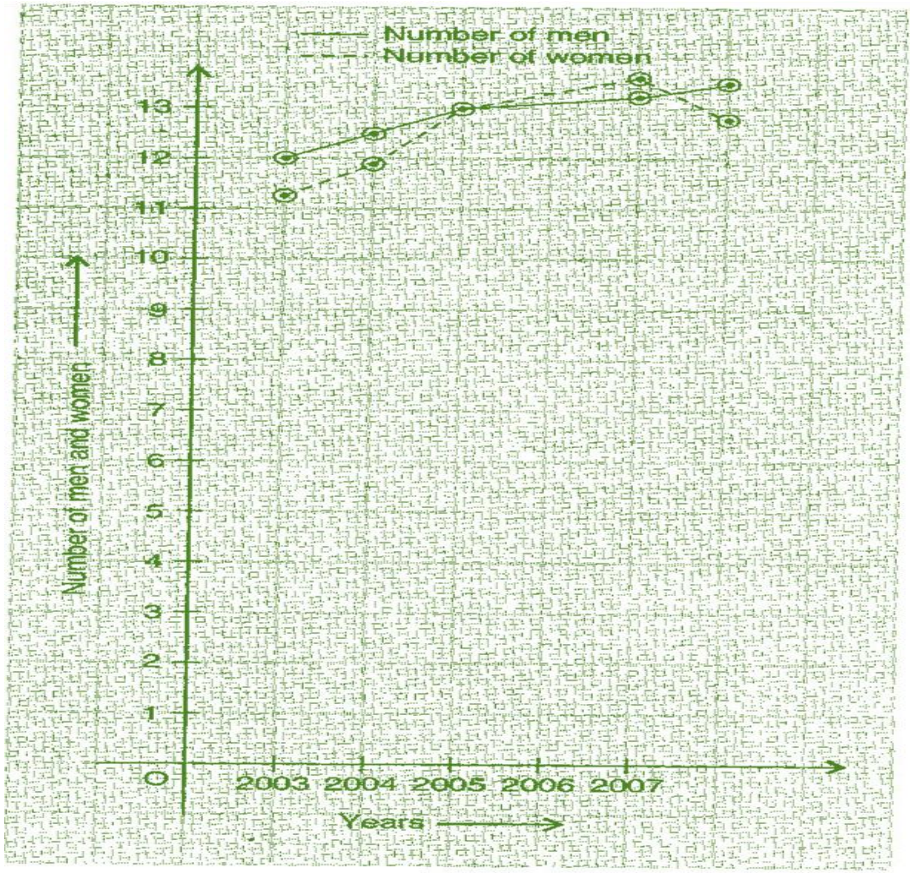
Year	2003	2004	2005	2006	2007
No. of Men	12	12.5	13	13.2	13.5
No. of Women	11.3	11.9	13	13.6	12.8

Answer 5:

(a)

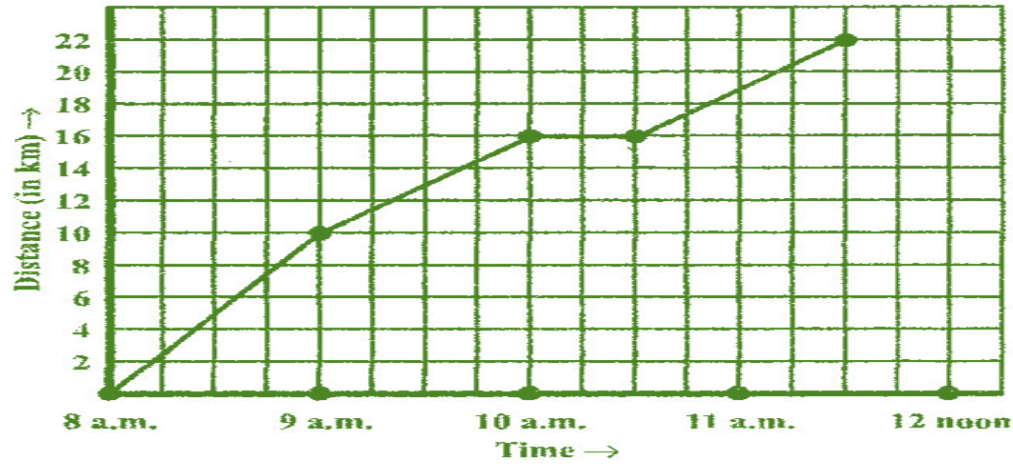


(b)



Question 6:

A courier-person cycles from a town to a neighbouring suburban area to deliver a parcel to a merchant. His distance from the town at different times is shown by the following graph.



(a) What is the scale taken for the time axis?
(b) How much time did the person take for the travel?
(c) How far is the place of the merchant from the town?
(d) Did the person stop on his way? Explain.
(e) During which period did he ride fastest?

Answer 6:

(a) 4 units = 1 hour.

(b) The person took $3\frac{1}{2}$ hours for the travel.

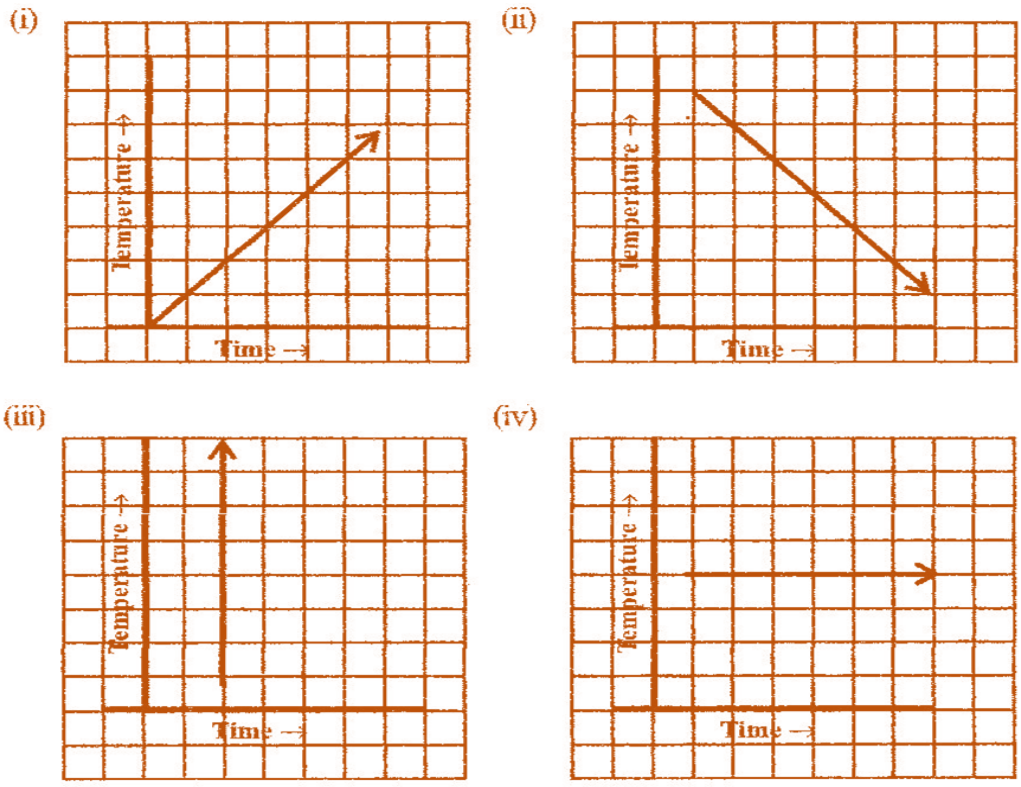
(c) It was 22 km far from the town.

(d) Yes, this has been indicated by the horizontal part of the graph. He stayed from 10 am to 10.30 am.

(e) He rode the fastest between 8 am and 9 am.

Question 7:

Can there be a time-temperature graph as follows? Justify your answer.



Answer 7:

(i) It is showing the increase in temperature.

(ii) It is showing the decrease in temperature.

(iii) The graph figure (iii) is not possible since temperature is increasing very rapidly which is not possible.

(iv) It is showing constant temperature.

Exercise 15.2

Question 1:

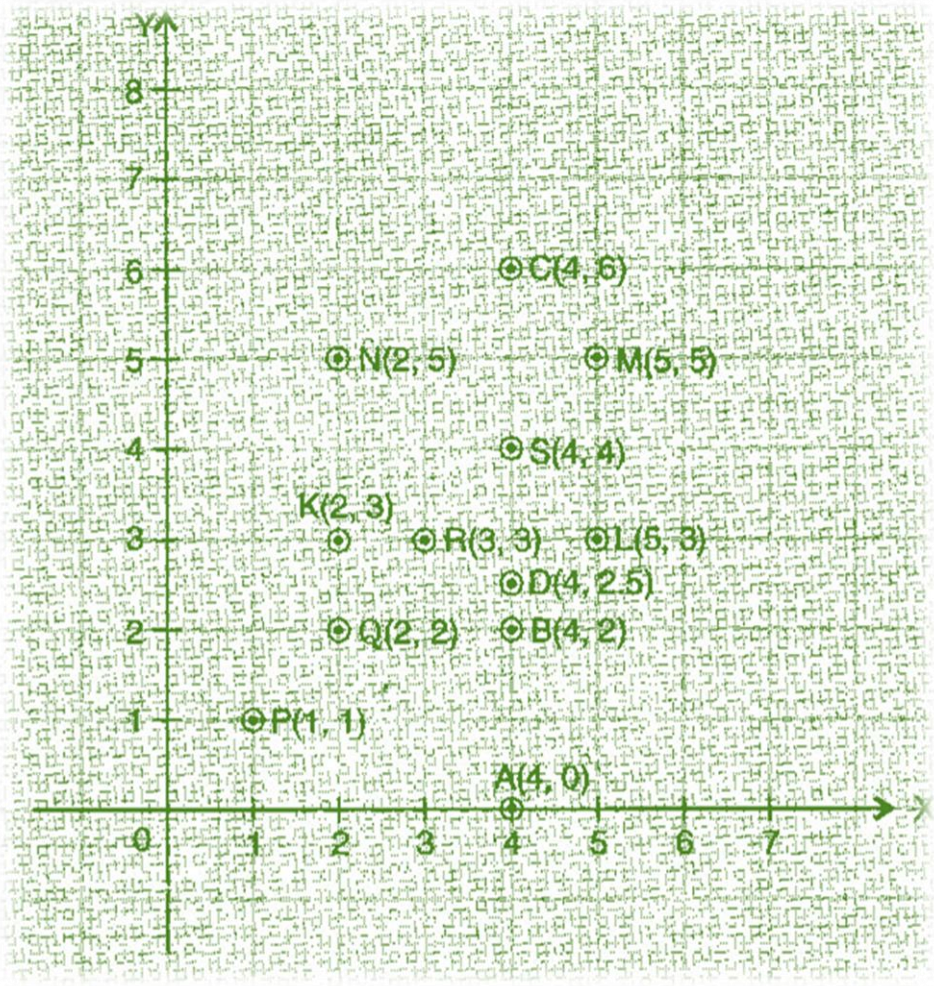
Plot the following points on a graph sheet. Verify if they lie on a line

(a) A(4, 0), B(4, 2), C(4, 6), D(4, 2.5)

(b) P(1, 1), Q(2, 2), R(3, 3), S(4, 4)

(c) K(2, 3), L(5, 3), M(5, 5), N(2, 5)

Answer 1:



(a) All points A, B, C and D lie on a vertical line.

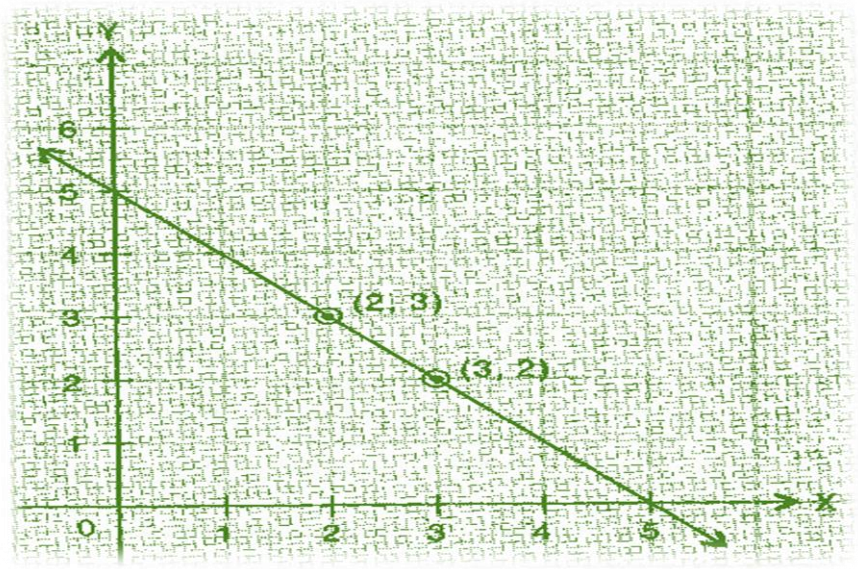
(b) P, Q, R and S points also make a line. It verifies that these points lie on a line.

(c) These points do not lie in a straight line.

Question 2:

Draw the line passing through (2, 3) and (3, 2). Find the coordinates of the points at which this line meets the x-axis and y-axis.

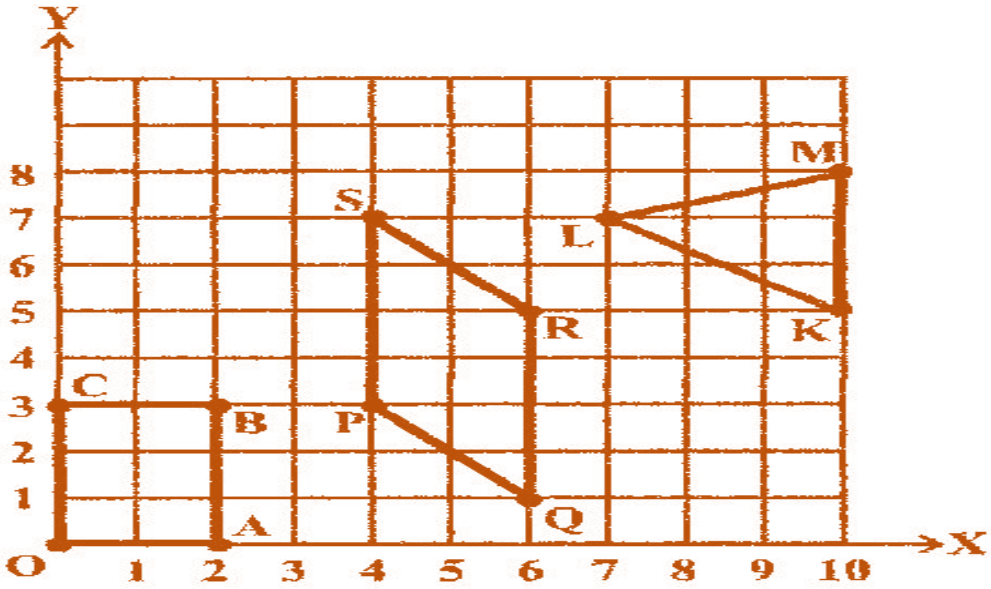
Answer 2:



The coordinates of the points at which this line meets the $x-$axis at (5, 0) and $y-$axis at (0, 5).

Question 3:

Write the coordinates of the vertices of each of these adjoining figures.



Answer 3:

Vertices of figure OABC
O (0, 0), A (2, 0), B (2, 3) and C (0, 3)

Vertices of figure PQRS
P (4, 3), Q (6, 1), R (6, 5) and S (4, 7)

Vertices of figure LMK
L (7, 7), M (10, 8) and K (10, 5)

Question 4:

State whether True or False. Correct that are false.

(i) A point whose x coordinate is zero and y-coordinate is non-zero will lie on the y-axis.

(ii) A point whose y coordinate is zero and x-coordinate is 5 will lie on y-axis.

(iii) The coordinates of the origin are (0, 0).

Answer 4:

(i) True (ii) False, it will lie on $x-$ axis. (iii) True

Exercise 15.3

Question 1:

Draw the graphs for the following tables of values, with suitable scales on the axes.

(a) Cost of apples

No. of apples	**1**	**2**	**3**	**4**	**5**
Cost (in ₹)	5	10	15	20	25

(b) Distance travelled by a car

Time (in hours)	**6 a.m.**	**7 a.m.**	**8 a.m.**	**9 a.m.**
Distance (in km)	40	80	120	160

(i) How much distance did the car cover during the period 7.30 a.m. to 8 a.m?

(ii) What was the time when the car had covered a distance of 100 km since it's start?

(c) Interest on deposits for a year.

Deposit (in Rs.)	**1000**	**2000**	**3000**	**4000**	**5000**
Simple Interest (in ₹)	80	160	240	320	400

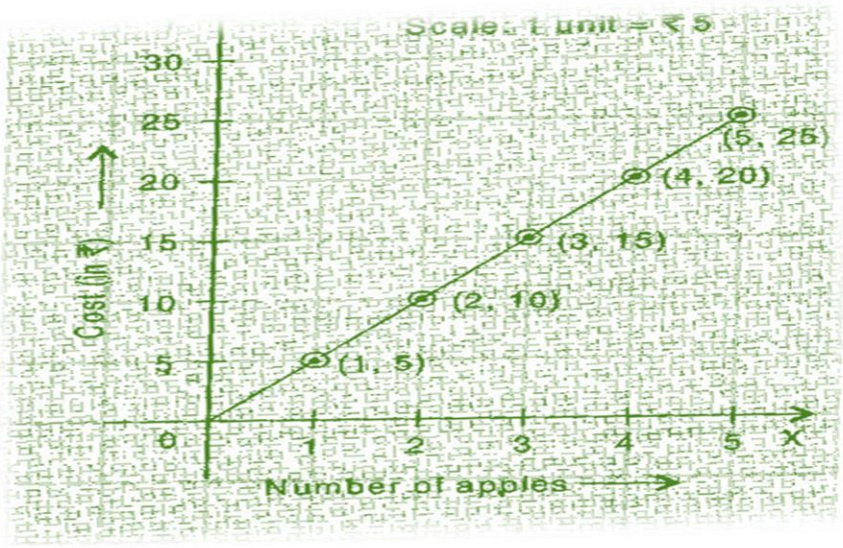
(i) Does the graph pass through the origin?

(ii) Use the graph to find the interest on ₹ 2500 for a year.

(iii) To get an interest of ₹ 280 per year, how much money should be deposited?

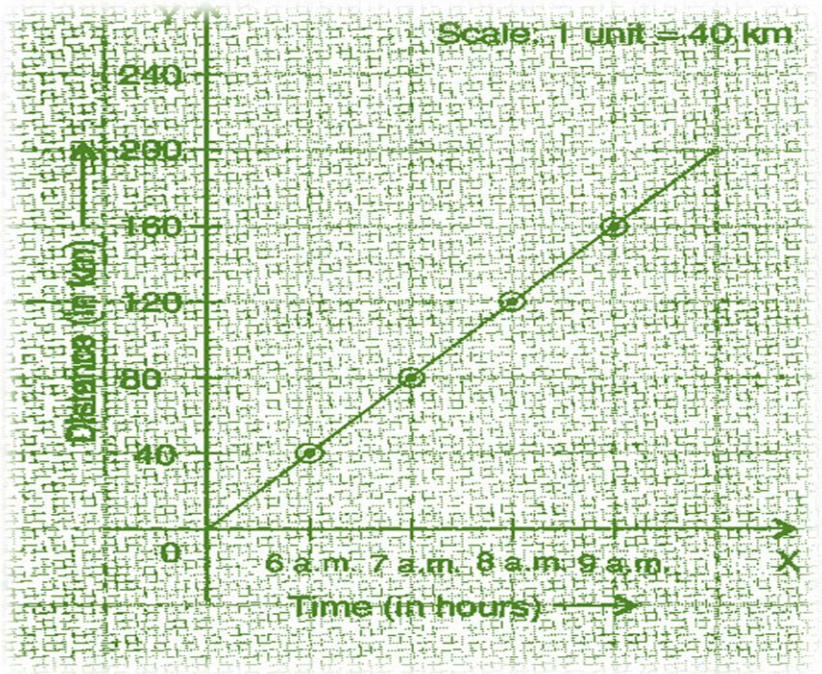
Answer 1:

(a)



(b) (i) The car covered 20 km distance.

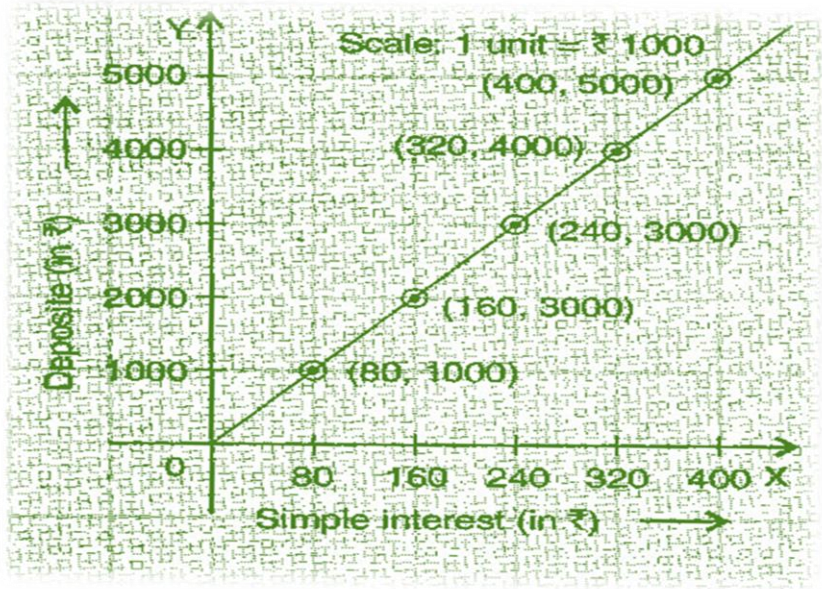
(ii) It was 7.30 am, when it covered 100 km distance.



(c) (i) Yes, the graph passes through the origin.

(ii) Interest on ₹ 2500 is ₹ 200 for a year.

(iii) ₹3500 should be deposited for interest of ₹ 280.



Question 2:

Draw a graph for the following.

(i)

Side of Square(in cm)	**2**	**3**	**3.5**	**5**	**6**
Perimeter(in cm)	8	12	14	20	24

Is it a linear graph?

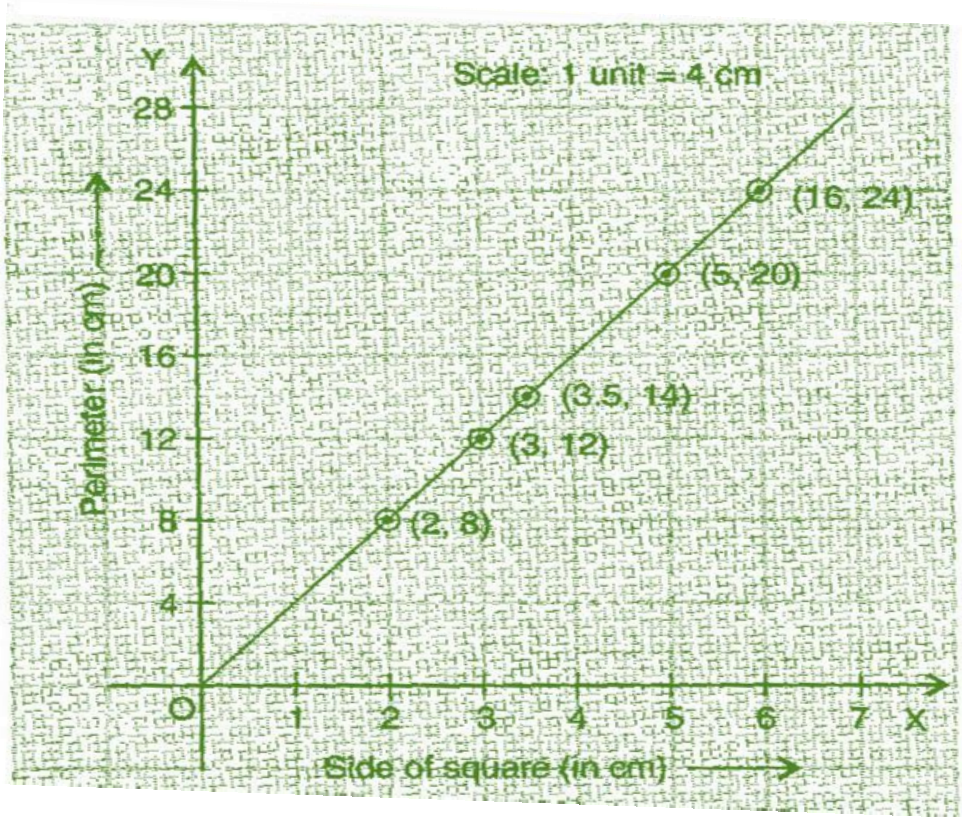
(ii)

Side of Square(in cm)	**2**	**3**	**4**	**5**	**6**
Area (in cm^2)	4	9	16	25	36

Is it a linear graph?

Answer 2:

(i) Yes, it is a linear graph.



(ii) No, it is not a linear graph because the graph does not provide a straight line.