THE SQUARE CLASSES

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Maths by:

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KNOWLEDGE AND MOTIVATION

Class- 8th Mathematics solution

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Exercise 1.1 : Solutions of Questions on Page Number : 14

Q1 :

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 :

(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 commutativity of rational numbers)

$$=\left(-\frac{3}{5}\right)\times\left(\frac{2}{3}+\frac{1}{6}\right)+\frac{5}{2} \qquad \text{(Distributivity)}$$

$$=\left(-\frac{3}{5}\right)\times\left(\frac{2\times2+1}{6}\right)+\frac{5}{2}=\left(-\frac{3}{5}\right)\times\left(\frac{5}{6}\right)+\frac{5}{2}$$

$$=\left(-\frac{3}{6}\right)+\frac{5}{2}=\left(\frac{-3+5\times3}{6}\right)=\left(\frac{-3+15}{6}\right)$$

$$=\frac{12}{6}=2$$

(ii)

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

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

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

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

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

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

Q2 :

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 :

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

Additive inverse = $-\frac{2}{8}$

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

Additive inverse = $\frac{5}{9}$

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

Additive inverse = $\frac{-6}{5}$

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

Additive inverse $=\frac{2}{9}$

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

Additive inverse $=\frac{19}{6}$

Q3 :

Verify that - (- *x*) = *x* for.

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

Answer :

(i) $x=\frac{11}{15}$

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

This equality $\frac{11}{15}+\left(-\frac{11}{15}\right)=0$ represents that the additive inverse of $-\frac{11}{15}$ is $\frac{11}{15}$ or it can be said that $-\left(-\frac{11}{15}\right)=\frac{11}{15}$ i.e., - (- *x*) = *x*

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

The additive inverse of $x=-\frac{13}{17}$ is $-x=\frac{13}{17}$ as $-\frac{13}{17}+\frac{13}{17}=0$ This equality $-\frac{13}{17}+\frac{13}{17}=0$ represents that the additive inverse of $\frac{13}{17}$ is - $\frac{13}{17}$ i.e., - (- *x*) = *x*

Q4 :

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 :

(i) - 13

Multiplicative inverse = - $\frac{1}{13}$

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

Multiplicative inverse = $-\frac{19}{13}$

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

Multiplicative inverse = 5

(iv) $-\frac{5}{8}\times-\frac{3}{7}=\frac{15}{56}$

Multiplicative inverse $=\frac{56}{15}$

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

Multiplicative inverse $=\frac{5}{2}$

(vi) - 1

Multiplicative inverse = - 1

Q5 :

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

(i) $\frac{-4}{5}\times1=1\times\frac{-4}{5}=-\frac{4}{5}$

(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 :

(i) $-\frac{4}{5}\times1=1\times-\frac{4}{5}=-\frac{4}{5}$

1 is the multiplicative identity.

(ii) Commutativity (iii)

Multiplicative inverse Q6

:

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

Answer :

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

Q7 :

Tell what property allows you to compute $\frac{1}{3}\times\left(6\times\frac{4}{3}\right)$ as $\left(\frac{1}{3}\times6\right)\times\frac{4}{3}$.

Answer :
Associativity
Q8 :

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

Answer :

If it is the multiplicative inverse, then the product should be 1.

However, here, the product is not 1 as

$$\frac{8}{9}\times\left(-1\frac{1}{8}\right)=\frac{8}{9}\times\left(-\frac{9}{8}\right)=-1\neq1$$

Q9 :

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

Answer :

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

0.3 × $3\frac{1}{3}$ = 0.3 × $\frac{10}{3} = \frac{3}{10} \times \frac{10}{3} = 1$

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

Q10 :

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 :

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

(ii) 1 and -1 are the rational numbers that are equal to their reciprocals.

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

Q11 :

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 :

(i) No

(ii) 1, - 1

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

(iv) *x*

(v) Rational number

(vi) Positive rational number

Exercise 1.2 : Solutions of Questions on Page Number : 20

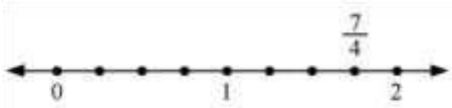
Q1 :

Represent these numbers on the number line.

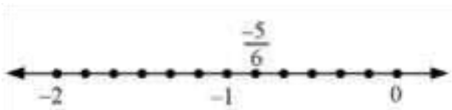
(i) $\frac{7}{4}$ (ii) $\frac{-5}{6}$

Answer :

(i) $\frac{7}{4}$ can be represented on the number line as follows.



(ii) $-\frac{5}{6}$ can be represented on the number line as follows.

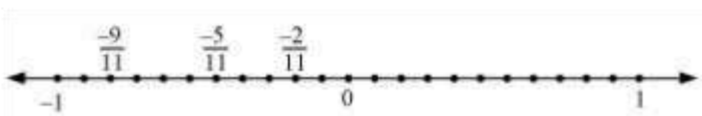


Q2 :

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

Answer :

$\frac{-2}{11}, \frac{-5}{11}, \frac{-9}{11}$ can be represented on the number line as follows.



Q3 :

Write five rational numbers which are smaller than 2.

Answer :

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

Therefore, five rational numbers smaller than 2 are

$\frac{13}{7}, \frac{12}{7}, \frac{11}{7}, \frac{10}{7}, \frac{9}{7}$

Q4 :

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

Answer :

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

Therefore, ten rational numbers between $\frac{-2}{5}$ and $\frac{1}{2}$ are

$-\frac{7}{20}, -\frac{6}{20}, -\frac{5}{20}, -\frac{4}{20}, -\frac{3}{20}, -\frac{2}{20}, -\frac{1}{20}, 0, \frac{1}{20}, \frac{2}{20}$

Q5 :

$\frac{2}{3}$ and $\frac{4}{5}$ Find five rational numbers between
(i)

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

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

Answer :

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

$\frac{2}{3}$ and $\frac{4}{5}$

Therefore, five rational numbers between are

$\frac{31}{45}, \frac{32}{45}, \frac{33}{45}, \frac{34}{45}, \frac{35}{45}$

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

Therefore, five rational numbers between $-\frac{3}{2}$ and $\frac{5}{3}$ are

$-\frac{8}{6}, -\frac{7}{6}, -1, -\frac{5}{6}, -\frac{4}{6}$

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

Therefore, five rational numbers between $\frac{1}{4}$ and $\frac{1}{2}$ are

$\frac{9}{32}, \frac{10}{32}, \frac{11}{32}, \frac{12}{32}, \frac{13}{32}$

Q6 :
Write five rational numbers greater than - 2.

Answer :

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

Therefore, five rational numbers greater than - 2 are

$$-\frac{13}{7}, -\frac{12}{7}, -\frac{11}{7}, -\frac{10}{7}, -\frac{9}{7}$$

Q7 :

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

Answer :

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

Therefore, ten rational numbers between $\frac{3}{5}$ and $\frac{3}{4}$ are

$\frac{49}{80}, \frac{50}{80}, \frac{51}{80}, \frac{52}{80}, \frac{53}{80}, \frac{54}{80}, \frac{55}{80}, \frac{56}{80}, \frac{57}{80}, \frac{58}{80}$

Exercise 2.1 : Solutions of Questions on Page Number : 23

Q1 :

Solve: $x - 2 = 7$

Answer :

x - 2 = 7

Transposing 2 to R.H.S, we obtain

x = 7 + 2 = 9 Q2 :

Solve: $y + 3 = 10$

Answer : *y*

+ 3 = 10

Transposing 3 to R.H.S, we obtain

y = 10 - 3 = 7 Q3 :

Solve: $6 = z + 2$

Answer :

6 = *z* + 2

Transposing 2 to L.H.S, we obtain

6 - 2 = *z* *z*

= 4

Q4 :

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

Answer :

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

Transposing $\frac{3}{7}$ to R.H.S, we obtain

$$x=\frac{17}{7}-\frac{3}{7}=\frac{14}{7}=2$$

Q5 :

Solve: $6x=12$

Answer :

$6x = 12$

Dividing both sides by 6, we obtain

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

$x = 2$

Q6 :

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

Answer :

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

Multiplying both sides by 5, we obtain

$$\frac{t}{5}\times 5 = 10\times 5$$
$$t = 50$$

Q7 :

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

Answer :

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

Multiplying both sides by $\frac{3}{2}$, we obtain

$$\frac{2x}{3}\times\frac{3}{2} = 18\times\frac{3}{2}$$
$$x = 27$$

Q8 :

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

Answer :

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

Multiplying both sides by 1.5, we obtain

$$1.6\times 1.5 = \frac{y}{1.5}\times 1.5$$
$$2.4 = y$$

Q9 :

Solve: $7x-9=16$

Answer :

$7x - 9 = 16$

Transposing 9 to R.H.S, we obtain

$7x = 16 + 9$

$7x = 25$

Dividing both sides by 7, we obtain

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

Q10 :

Solve: $14y-8=13$

Answer :

$14y - 8 = 13$

Transposing 8 to R.H.S, we obtain

$14y = 13 + 8$

$14y = 21$

Dividing both sides by 14, we obtain

$$\frac{14y}{14} = \frac{21}{14}$$
$$y = \frac{3}{2}$$

Q11 :

Solve: $17 + 6p = 9$

Answer :

$17 + 6p = 9$

Transposing 17 to R.H.S, we obtain

$6p = 9 - 17$

$6p = -8$

Dividing both sides by 6, we obtain

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

Q12 :

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

Answer :

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

Transposing 1 to R.H.S, we obtain

$$\frac{x}{3}=\frac{7}{15}-1$$
$$\frac{x}{3}=\frac{7-15}{15}$$
$$\frac{x}{3}=-\frac{8}{15}$$

Multiplying both sides by 3, we obtain

$$\frac{x}{3}\times 3=-\frac{8}{15}\times 3$$
$$x=-\frac{8}{5}$$

Exercise 2.2 : Solutions of Questions on Page Number : 28

Q1 :

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 :

Let the number be *x*. According to the question,

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

On multiplying both sides by 2, we obtain

$$\left(x-\frac{1}{2}\right)\times\frac{1}{2}\times 2=\frac{1}{8}\times 2$$
$$x-\frac{1}{2}=\frac{1}{4}$$

On transposing $\frac{1}{2}$ to R.H.S, we obtain

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

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

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

Q2 :

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 the breadth of the pool?

Answer :

Let the breadth be *x* m. The length will be (2*x* + 2) m.

Perimeter of swimming pool = 2(*l* + *b*) = 154 m

2(2*x* + 2 + *x*) = 154

2(3*x* + 2) = 154

Dividing both sides by 2, we obtain

$$\frac{2(3x+2)}{2} = \frac{154}{2}$$

3*x* + 2 = 77

On transposing 2 to R.H.S, we obtain

3*x* = 77 - 2

3*x* = 75

On dividing both sides by 3, we obtain

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

$x = 25$

$2x + 2 = 2 \times 25 + 2 = 52$

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

Q3 :

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 :

Let the length of equal sides be x cm.

Perimeter = x cm + x cm + Base = $4\frac{2}{15}$ cm

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

On transposing $\frac{4}{3}$ to R.H.S, we obtain

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

$$2x=\frac{62-4\times5}{15}=\frac{62-20}{15}$$

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

On dividing both sides by 2, we obtain

$$\frac{2x}{2}=\frac{42}{15}\times\frac{1}{2}$$

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

Therefore, the length of equal sides is $1\frac{2}{5}$ cm.

Q4 :

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

Answer :

Let one number be x. Therefore, the other number will be x+ 15.

According to the question, $x + x + 15 = 95$

$2x + 15 = 95$

On transposing 15 to R.H.S, we obtain

$2x = 95 - 15$

$2x = 80$

On dividing both sides by 2, we obtain

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

$x = 40$ $x + 15 = 40 +$

$15 = 55$

Hence, the numbers are 40 and 55.

Q5 :

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

Answer :

Let the common ratio between these numbers be x. Therefore, the numbers will be $5x$and $3x$respectively.

Difference between these numbers = 18

$5x - 3x = 18$

$2x = 18$

Dividing both sides by 2,

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

$x = 9$

First number = $5x = 5 \times 9 = 45$

Second number = $3x = 3 \times 9 = 27$

Q6 :

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

Answer :

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

Sum of these numbers = $x + x + 1 + x + 2 = 51$

$3x + 3 = 51$

On transposing 3 to R.H.S, we obtain

$3x = 51 - 3$

$3x = 48$

On dividing both sides by 3, we obtain

$$\frac{3x}{3} = \frac{48}{3}$$

$x = 16 \quad x + 1$

$= 17 \quad x + 2$

$= 18$

Hence, the consecutive integers are 16, 17, and 18.

Q7 :

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

Answer :

Let the three consecutive multiples of 8 be $8x$, $8(x + 1)$, $8(x + 2)$.

Sum of these numbers $= 8x + 8(x + 1) + 8(x + 2) = 888$

$8(x + x + 1 + x + 2) = 888$

$8(3x + 3) = 888$

On dividing both sides by 8, we obtain

$$\frac{8(3x+3)}{8} = \frac{888}{8}$$

$3x + 3 = 111$

On transposing 3 to R.H.S, we obtain

$3x = 111 - 3$

$3x = 108$

On dividing both sides by 3, we obtain

$$\frac{3x}{3} = \frac{108}{3}$$

$x = 36$

First multiple = $8x = 8 \times 36 = 288$

Second multiple = $8(x + 1) = 8 \times (36 + 1) = 8 \times 37 = 296$

Third multiple = $8(x + 2) = 8 \times (36 + 2) = 8 \times 38 = 304$

Hence, the required numbers are 288, 296, and 304.

Q8 :

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 :

Let three consecutiveintegers be x, $x + 1$, $x + 2$. According to the question,

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

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

$9x + 11 = 74$

On transposing 11 to R.H.S, we obtain

$9x = 74 - 11$

$9x = 63$

On dividing both sides by 9, we obtain

$$\frac{9x}{9} = \frac{63}{9}$$

$x = 7$

$x + 1 = 7 + 1 = 8$ $x + 2$

$= 7 + 2 = 9$

Hence, the numbers are 7, 8, and 9.

Q9 :

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 :

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

Therefore, age of Rahul and Haroon will be $5x$years and $7x$years respectively. After 4 years, the age of Rahul and Haroon will be $(5x + 4)$ years and $(7x + 4)$ years respectively.

According to the given question, after 4 years, the sum of the ages of Rahul and Haroon is 56 years.

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

$12x + 8 = 56$

On transposing 8 to R.H.S, we obtain

$12x = 56 - 8$

$12x = 48$

On dividing both sides by 12, we obtain

$$\frac{12x}{12} = \frac{48}{12}$$

$x = 4$

Rahul's age = $5x$years = (5×4) years = 20 years

Haroon's age = $7x$years = (7×4) years = 28 years

Q10 :

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 :

Let the common ratio between the number of boys and numbers of girls be x.

Number of boys = $7x$

Number of girls = $5x$

According to the given question,

Number of boys = Number of girls + 8

$\therefore 7x = 5x + 8$

On transposing $5x$ to L.H.S, we obtain

$7x - 5x = 8$

$2x = 8$

On dividing both sides by 2, we obtain

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

$x = 4$

Number of boys = $7x = 7 \times 4 = 28$

Number of girls = $5x = 5 \times 4 = 20$

Hence, total class strength = 28 + 20 = 48 students

Q11 :

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 :

Let Baichung's father's age be x years. Therefore, Baichung's age and Baichung's grandfather's age will be (x - 29) years and (x + 26) years respectively.

According to the given question, the sum of the ages of these 3 people is 135 years.

$\therefore x + x - 29 + x + 26 = 135$

$3x - 3 = 135$

On transposing 3 to R.H.S, we obtain

$3x = 135 + 3$

$3x = 138$

On dividing both sides by 3, we obtain

$$\frac{3x}{3} = \frac{138}{3}$$

$x = 46$

Baichung's father's age = x years = 46 years

Baichung's age = (x - 29) years = (46 - 29) years = 17 years

Baichung's grandfather's age = (x + 26) years = (46 + 26) years = 72 years

Q12 :

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 :
Let Baichung's father's age be x years. Therefore, Baichung's age and Baichung's grandfather's age will be $(x - 29)$ years and $(x + 26)$ years respectively.

According to the given question, the sum of the ages of these 3 people is 135 years.

$\therefore x + x - 29 + x + 26 = 135$

$3x - 3 = 135$

On transposing 3 to R.H.S, we obtain

$3x = 135 + 3$

$3x = 138$

On dividing both sides by 3, we obtain

$$\frac{3x}{3} = \frac{138}{3}$$

$x = 46$

Baichung's father's age = x years = 46 years

Baichung's age = $(x - 29)$ years = (46 - 29) years = 17 years

Baichung's grandfather's age = $(x + 26)$ years = (46 + 26) years = 72 years

Q13 :

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 :

Let the number be *x*.

According to the given question,

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

On transposing $\frac{2}{3}$

$$\frac{5}{2}x=-\frac{7}{12}-\frac{2}{3}$$
$$\frac{5}{2}x=\frac{-7-(2\times 4)}{12}$$
$$\frac{5}{2}x=-\frac{15}{12}$$

to R.H.S, we obtain

On multiplying both sides by $\frac{2}{5}$, we obtain

$$x=-\frac{15}{12}\times\frac{2}{5}=-\frac{1}{2}$$

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

Q14 :

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

Answer :

Let the common ratio between the numbers of notes of different denominations be x. Therefore, numbers of Rs 100 notes, Rs 50 notes, and Rs 10 notes will be $2x$, $3x$, and $5x$ respectively.

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

Amount of Rs 50 notes = Rs $(50 \times 3x)$= Rs $150x$

Amount of Rs 10 notes = Rs $(10 \times 5x)$ = Rs $50x$
It is given that total amount is Rs 400000.

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

$\Rightarrow 400x = 400000$

On dividing both sides by 400, we obtain

$x = 1000$

Number of Rs 100 notes = $2x = 2 \times 1000 = 2000$

Number of Rs 50 notes = $3x = 3 \times 1000 = 3000$

Number of Rs 10 notes = $5x = 5 \times 1000 = 5000$

Q15 :

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

Answer :

Let the number of Rs 5 coins be x.

Number of Rs 2 coins = 3 × Number of Rs 5 coins = $3x$

Number of Re 1 coins = 160 - (Number of coins of Rs 5 and of Rs 2)

$= 160 - (3x + x) = 160 - 4x$

Amount of Re 1 coins = Rs $[1 \times (160 - 4x)]$ = Rs $(160 - 4x)$

Amount of Rs 2 coins = Rs $(2 \times 3x)$= Rs $6x$

Amount of Rs 5 coins = Rs $(5 \times x)$ = Rs $5x$

It is given that the total amount is Rs 300.

$\therefore 160 - 4x + 6x + 5x = 300$
$160 + 7x = 300$

On transposing 160 to R.H.S, we obtain

$7x = 300 - 160$

$7x = 140$

On dividing both sides by 7, we obtain

$$\frac{7x}{7} = \frac{140}{7}$$

$x = 20$

Number of Re 1 coins $= 160 - 4x = 160 - 4 \times 20 = 160 - 80 = 80$

Number of Rs 2 coins $= 3x = 3 \times 20 = 60$

Number of Rs 5 coins $= x = 20$

Q16 :

The organizers of an essay competition decide that a winner in the competition gets a prize of Rs 100 and a participant who does not win gets a prize of Rs 25. The total prize money distributed is Rs 3000. Find the number of winners, if the total number of participants is 63.

Answer :

Let the number of winners be x. Therefore, the number of participants who did not win will be 63 - x.

Amount given to the winners = Rs ($100 \times x$) = Rs $100x$

Amount given to the participants who did not win = Rs [25(63 - x)]

= Rs (1575 - $25x$)

According to the given question,

$100x + 1575 - 25x = 3000$
On transposing 1575 to R.H.S, we obtain

$75x = 3000 - 1575$

$75x = 1425$

On dividing both sides by 75, we obtain

$$\frac{75x}{75} = \frac{1425}{75}$$

$x = 19$

Hence, number of winners = 19

Exercise 2.3 : Solutions of Questions on Page Number : 30

Q1 :

Solve and check result: $3x = 2x + 18$

Answer :

$3x = 2x + 18$

On transposing $2x$ to L.H.S, we obtain

$3x - 2x = 18$ x

$= 18$

L.H.S = $3x = 3 \times 18 = 54$

R.H.S = $2x + 18 = 2 \times 18 + 18 = 36 + 18 = 54$

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

Hence, the result obtained above is correct.

Q2 :
Solve and check result: $5t - 3 = 3t - 5$

Answer :

$5t - 3 = 3t - 5$

On transposing $3t$ to L.H.S and -3 to R.H.S, we obtain

$5t - 3t = -5 - (-3)$

$2t = -2$

On dividing both sides by 2, we obtain

$t = -1$

L.H.S = $5t - 3 = 5 \times (-1) - 3 = -8$ R.H.S =

$3t - 5 = 3 \times (-1) - 5 = - 3 - 5 = -8$

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

Hence, the result obtained above is correct.

Q3 :

Solve and check result: $5x + 9 = 5 + 3x$

Answer :

$5x + 9 = 5 + 3x$

On transposing $3x$ to L.H.S and 9 to R.H.S, we obtain

$5x - 3x = 5 - 9$

$2x = -4$

On dividing both sides by 2, we obtain

$x = -2$

L.H.S = $5x + 9 = 5 \times (-2) + 9 = -10 + 9 = -1$

R.H.S = $5 + 3x = 5 + 3 \times (-2) = 5 - 6 = -1$

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

Hence, the result obtained above is correct.

Q4 :

Solve and check result: $4z + 3 = 6 + 2z$

Answer :

$4z + 3 = 6 + 2z$

On transposing $2z$ to L.H.S and 3 to R.H.S, we obtain

$4z - 2z = 6 - 3$

$2z = 3$

Dividing both sides by 2, we obtain

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

L.H.S = 4z + 3 = 4 $\left(\frac{3}{2}\right)$ × + 3 = 6 + 3 = 9

R.H.S = 6 + 2z = $\left(\frac{3}{2}\right)$ 6 + 2 × = 6 + 3 = 9

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

Hence, the result obtained above is correct.

Q5 :
Solve and check result: 2x - 1 = 14 - x

Answer :

2x - 1 = 14 - x

Transposing x to L.H.S and 1 to R.H.S, we obtain

2x + x = 14 + 1

3x = 15

Dividing both sides by 3, we obtain

x = 5

L.H.S = 2x - 1 = 2 x (5) - 1 = 10 - 1 = 9

R.H.S = 14 - x = 14 - 5 = 9

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

Hence, the result obtained above is correct.

Q6 :

Solve and check result: $8x + 4 = 3(x - 1) + 7$

Answer :

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

$8x + 4 = 3x - 3 + 7$

Transposing $3x$ to L.H.S and 4 to R.H.S, we obtain

$8x - 3x = - 3 + 7 - 4$

$5x = - 7 + 7$

$x = 0$

L.H.S = $8x + 4 = 8 \times (0) + 4 = 4$ R.H.S = $3(x - 1)$

$+ 7 = 3 (0 - 1) + 7 = - 3 + 7 = 4$

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

Hence, the result obtained above is correct.

Q7 :

Solve and check result: $x = \frac{4}{5}(x + 10)$

Answer :

$x=\frac{4}{5}(x+10)$

Multiplying both sides by 5, we obtain

5*x* = 4(*x* + 10)

5*x* = 4*x* + 40

Transposing 4*x* to L.H.S, we obtain

5*x* - 4*x* = 40 *x*

= 40

L.H.S = *x* = 40

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

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

Hence, the result obtained above is correct.

Q8 :

Solve and check result: $\frac{2x}{3}+1=\frac{7x}{15}+3$

Answer :

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

Transposing $\frac{7x}{15}$

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

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

$$\frac{3x}{15}=2$$

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

to L.H.S and 1 to R.H.S, we obtain

Multiplying both sides by 5, we obtain

x = 10

$\frac{2x}{3}+1$ = $\frac{2\times 10}{3}+1=\frac{2\times 10+1\times 3}{3}=\frac{23}{3}$

L.H.S = R.H.S = $\frac{7x}{15}+3=\frac{7\times 10}{15}+3=\frac{7\times 2}{3}+3=\frac{14}{3}+3=\frac{14+3\times 3}{3}=\frac{23}{3}$

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

Hence, the result obtained above is correct.

Q9 :

Solve and check result: $2y+\frac{5}{3}=\frac{26}{3}-y$

Answer :

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

Transposing *y* to L.H.S and $\frac{5}{3}$ to R.H.S, we obtain

$$2y + y = \frac{26}{3} - \frac{5}{3}$$
$$3y = \frac{21}{3} = 7$$

Dividing both sides by 3, we obtain

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

L.H.S = $2y + \frac{5}{3} = 2 \times \frac{7}{3} + \frac{5}{3} = \frac{14}{3} + \frac{5}{3} = \frac{19}{3}$

R.H.S = $\frac{26}{3} - y = \frac{26}{3} - \frac{7}{3} = \frac{19}{3}$

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

Hence, the result obtained above is correct.

Q10 :

Solve and check result: $3m = 5m - \frac{8}{5}$

Answer :

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

Transposing 5*m* to L.H.S, we obtain

$$3m - 5m = -\frac{8}{5}$$
$$-2m = -\frac{8}{5}$$

Dividing both sides by - 2, we obtain

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

L.H.S = $3m = 3 \times \frac{4}{5} = \frac{12}{5}$

R.H.S = $5m - \frac{8}{5} = 5 \times \frac{4}{5} - \frac{8}{5} = \frac{12}{5}$

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

Hence, the result obtained above is correct.

Exercise 2.4 : Solutions of Questions on Page Number : 31

Q1 :

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 :

Let the number be x.

According to the given question,

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

$8x - 20 = 3x$

Transposing $3x$ to L.H.S and - 20 to R.H.S, we obtain

$8x - 3x = 20$

$5x = 20$

Dividing both sides by 5, we obtain

$x = 4$

Hence, the number is 4.

Q2 :

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 :

Let the numbers be x and $5x$. According to the question,

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

$21 + 5x = 2x + 42$

Transposing $2x$ to L.H.S and 21 to R.H.S, we obtain

$5x - 2x = 42 - 21$

$3x = 21$

Dividing both sides by 3, we obtain

$x = 7$

$5x = 5 \times 7 = 35$

Hence, the numbers are 7 and 35 respectively.

Q3 :

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 :

Let the digits at tens place and ones place be x and $9 - x$ respectively.

Therefore, original number = $10x + (9 - x) = 9x + 9$

On interchanging the digits, the digits at ones place and tens place will be x and $9 - x$ respectively.

Therefore, new number after interchanging the digits = $10(9 - x) + x$

$= 90 - 10x + x$

$= 90 - 9x$

According to the given question,

New number = Original number + 27

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

$90 - 9x = 9x + 36$

Transposing $9x$ to R.H.S and 36 to L.H.S, we obtain

$90 - 36 = 18x$

$54 = 18x$

Dividing both sides by 18, we obtain

$3 = x$ and $9 - x = 6$

Hence, the digits at tens place and ones place of the number are 3 and 6 respectively.
Therefore, the two-digit number is $9x + 9 = 9 \times 3 + 9 = 36$

Q4 :

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

Answer :

Let the digits at tens place and ones place be x and $3x$ respectively.

Therefore, original number = $10x + 3x = 13x$

On interchanging the digits, the digits at ones place and tens place will be x and $3x$ respectively.

Number after interchanging = $10 \times 3x + x = 30x + x = 31x$

According to the given question,

Original number + New number = 88

$13x + 31x = 88$

$44x = 88$

Dividing both sides by 44, we obtain

$x = 2$

Therefore, original number = $13x = 13 \times 2 = 26$

By considering the tens place and ones place as $3x$ and x respectively, the two-digit number obtained is 62.

Therefore, the two-digit number may be 26 or 62.

Q5 :

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 this mother's present age. What are their present ages?

Answer :

Let Shobo's age be x years. Therefore, his mother's age will be $6x$ years.

According to the given question,

$$\text{After 5 years, Shobo's age} = \frac{\text{Shobo's mother's present age}}{3}$$

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

$x + 5 = 2x$

Transposing x to R.H.S, we obtain

$5 = 2x - x$

$5 = x$

$6x = 6 \times 5 = 30$

Therefore, the present ages of Shobo and Shobo's mother will be 5 years and 30 years respectively.

Q6 :

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 Rs 100 per metre it will cost the village panchayat Rs 75, 000 to fence the plot. What are the dimensions of the plot?

Answer :

Let the common ratio between the length and breadth of the rectangular plot be x. Hence, the length and breadth of the rectangular plot will be $11x$ m and $4x$ m respectively.

Perimeter of the plot = 2(Length + Breadth) $= \left[2(11x + 4x)\right] \text{ m} = 30x \text{ m}$

It is given that the cost of fencing the plot at the rate of Rs 100 per metre is Rs 75, 000.

∴ 100 × Perimeter = 75000

100 × 30x = 75000

3000x = 75000

Dividing both sides by 3000, we obtain

x = 25

Length = 11x m = (11 × 25) m = 275 m

Breadth = 4x m = (4 × 25) m = 100 m

Hence, the dimensions of the plot are 275 m and 100 m respectively.

Q7 :

Hasan buys two kinds of cloth materials for school uniforms, shirt material that costs him Rs 50 per metre and trouser material that costs him Rs 90 per metre. For every 2 meters of the trouser material he buys 3 metres of the shirt material. He sells the materials at 12% and 10% profit respectively. His total sale is Rs 36660. How much trouser material did he buy?

Answer :

Let 2x m of trouser material and 3x m of shirt material be bought by him.

Per metre selling price of trouser material = $\text{Rs}\left(90+\frac{90\times12}{100}\right)$ = Rs 100.80

Per metre selling price of shirt material = $\text{Rs}\left(50+\frac{50\times10}{100}\right)$ = Rs 55

Given that, total amount of selling = Rs 36660

100.80 × (2x) + 55 × (3x) = 36660

201.60x + 165x = 36660

$366.60x = 36660$

Dividing both sides by 366.60, we obtain

$x = 100$

Trouser material = $2x$ m = (2×100) m = 200 m

Q8 :

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 :

Let the number of deer be x.

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

$$\begin{aligned}\text{Number of deer playing nearby} &= \frac{3}{4} \times \text{Number of remaining deer} \\ &= \frac{3}{4} \times \left(x - \frac{x}{2}\right) = \frac{3}{4} \times \frac{x}{2} = \frac{3x}{8}\end{aligned}$$

Number of deer drinking water from the pond = 9

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

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

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

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

Multiplying both sides by 8, we obtain
$x = 72$

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

Q9 :

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

Answer :

Let the granddaughter's age be x years. Therefore, grandfather's age will be

$10x$ years.

According to the question,

Grandfather's age = Granddaughter's age + 54 years

$10x = x + 54$

Transposing x to L.H.S, we obtain

$10x - x = 54$

$9x = 54$ $x =$

6

Granddaughter's age = x years = 6 years

Grandfather's age = $10x$ years = (10 x 6) years = 60 years

Q10 :

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 :
Let Aman's son's age be x years. Therefore, Aman's age will be $3x$ years. Ten years ago, their age was $(x - 10)$ years and $(3x - 10)$ years respectively.

According to the question,

10 years ago, Aman's age = 5 x Aman's son's age 10 years ago

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

$3x - 10 = 5x - 50$

Transposing $3x$ to R.H.S and 50 to L.H.S, we obtain

$50 - 10 = 5x - 3x$

$40 = 2x$

Dividing both sides by 2, we obtain

$20 = x$

Aman's son's age = x years = 20 years

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

Exercise 2.5 : Solutions of Questions on Page Number : 33

Q1 :

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

Answer :

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

L.C.M. of the denominators, 2, 3, 4, and 5, is 60.

Multiplying both sides by 60, we obtain

$$60\left(\frac{x}{2}-\frac{1}{5}\right)=60\left(\frac{x}{3}+\frac{1}{4}\right)$$

$\Rightarrow$ 30x - 12 = 20x + 15 (Opening the brackets)

$\Rightarrow$ 30x - 20x = 15 + 12

$\Rightarrow$ 10x = 27

$\Rightarrow x=\frac{27}{10}$

Q2 :

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

Answer :

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

L.C.M. of the denominators, 2, 4, and 6, is 12.

Multiplying both sides by 12, we obtain

6n - 9n + 10n = 252

$\Rightarrow$ 7n = 252

$$\Rightarrow n=\frac{252}{7}$$
$$\Rightarrow n=36$$

Q3 :

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

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

L.C.M. of the denominators, 2, 3, and 6, is 6.

Multiplying both sides by 6, we obtain

$6x + 42 - 16x = 17 - 15x$

$\Rightarrow 6x - 16x + 15x = 17 - 42$

$\Rightarrow 5x = -25$

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

$\Rightarrow x=-5$

Q4 :

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

Answer :

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

L.C.M. of the denominators, 3 and 5, is 15.

Multiplying both sides by 15, we obtain

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

$\Rightarrow$ 5*x* - 25 = 3*x* - 9 (Opening the brackets)

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

$\Rightarrow$ 2*x* = 16

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

$\Rightarrow x = 8$

Q5 :

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

Answer :

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

L.C.M. of the denominators, 3 and 4, is 12.

Multiplying both sides by 12, we obtain

3(3*t* - 2) - 4(2*t* + 3) = 8 - 12*t*

$\Rightarrow$ 9*t* - 6 - 8*t* - 12 = 8 - 12*t* (Opening the brackets)

$\Rightarrow$ 9*t* - 8*t* + 12*t* = 8 + 6 + 12

$\Rightarrow$ 13*t* = 26

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

$\Rightarrow t = 2$

Q6 :

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

Answer :

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

L.C.M. of the denominators, 2 and 3, is 6.

Multiplying both sides by 6, we obtain

$6m - 3(m - 1) = 6 - 2(m - 2)$

$\Rightarrow 6m - 3m + 3 = 6 - 2m + 4$ (Opening the brackets)

$\Rightarrow 6m - 3m + 2m = 6 + 4 - 3$

$\Rightarrow 5m = 7$

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

Q7 :

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

Answer :

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

$\Rightarrow 3t - 9 = 10t + 5$ (Opening the brackets)

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

$\Rightarrow -14 = 7t$

$$\Rightarrow t = \frac{-14}{7}$$
$$\Rightarrow t = -2$$

Q8 :

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

Answer :

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

⇒ 15y - 60 - 2y + 18 + 5y + 30 = 0 (Opening the brackets)

⇒ 18y - 12 = 0

⇒ 18y = 12

⇒ $y = \frac{12}{18} = \frac{2}{3}$

Q9 :

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

Answer :

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

⇒ 15z - 21 - 18z + 22 = 32z - 52 - 17 (Opening the brackets)

⇒ - 3z + 1 = 32z - 69

⇒ - 3z - 32z = - 69 - 1

⇒ - 35z = - 70

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

Q10 :

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

Answer :

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

$\frac{1}{4}(4f - 3) = \frac{1}{20}(10f - 9)$

Multiplying both sides by 20, we obtain

5(4f - 3) = 10f - 9

⇒ 20f - 15 = 10f - 9 (Opening the brackets)

⇒ 20f - 10f = - 9 + 15

⇒ 10f = 6

$\Rightarrow f = \frac{3}{5} = 0.6$

Exercise 2.6 : Solutions of Questions on Page Number : 35

Q1 :

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

Answer :

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

On multiplying both sides by 3x, we obtain

$8x - 3 = 6x$

$\Rightarrow 8x - 6x = 3$
$\Rightarrow 2x = 3$

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

Q2 :

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

Answer :

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

Onmultiplying both sides by 7 - 6x, we obtain

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

$\Rightarrow 9x = 105 - 90x$

$\Rightarrow 9x + 90x = 105$

$\Rightarrow 99x = 105$

$\Rightarrow x=\frac{105}{99}=\frac{35}{33}$

Q3 :

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

Answer :

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

On multiplying both sides by 9(*z* + 15), we obtain

$9z = 4(z + 15)$

$\Rightarrow 9z = 4z + 60$

$\Rightarrow 9z - 4z = 60$

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

$= 12$

Q4 :

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

Answer :

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

On multiplying both sides by 5(2 - 6*y*), we obtain

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

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

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

$\Rightarrow 3y = - 24 \Rightarrow y = - 8$

Q5 :

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

Answer :

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

On multiplying both sides by $3(y + 2)$, we obtain

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

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

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

$\Rightarrow 25y = - 20$

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

Q6 :

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 :

Let the common ratio between their ages be x. Therefore, Hari's age and Harry's age will be $5x$ years and $7x$ years respectively and four years later, their ages will be $(5x + 4)$ years and $(7x + 4)$ years respectively.

According to the situation given in the question,

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

$$\Rightarrow 4(5x+4)=3(7x+4)$$
$$\Rightarrow 20x+16=21x+12$$
$$\Rightarrow 16-12=21x-20x$$
$$\Rightarrow 4=x$$

Hari's age = $5x$ years = (5×4) years = 20 years

Harry's age = $7x$ years = (7×4) years = 28 years

Therefore, Hari's age and Harry's age are 20 years and 28 years respectively.

Q7 :

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 :

Let the numerator of the rational number be x. Therefore, its denominator will

be $x + 8$.

The rational number will be $\frac{x}{x+8}$. According to the question,

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

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

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

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

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

$\Rightarrow$13 = x

Numerator of the rational number = x = 13

Denominator of the rational number = x + 8 = 13 + 8 = 21

Rational number $=\frac{13}{21}$

Understanding Quadrilaterals

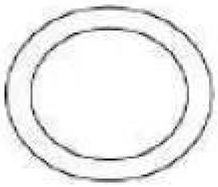
Exercise 3.1

Question 1:

Given here are some figures.


(1)


(2)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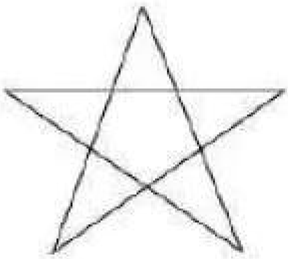
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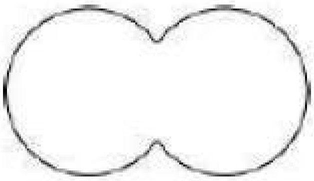
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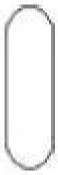
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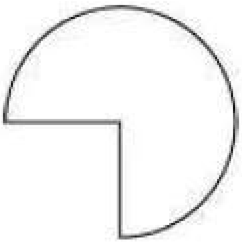
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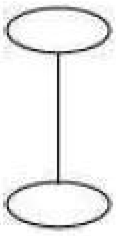

(8)

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:

(a) 1, 2, 5, 6, 7

(b) 1, 2, 5, 6, 7

(c) 1, 2

(d) 2

(e) 1

Question 2:

How many diagonals does each of the following have?

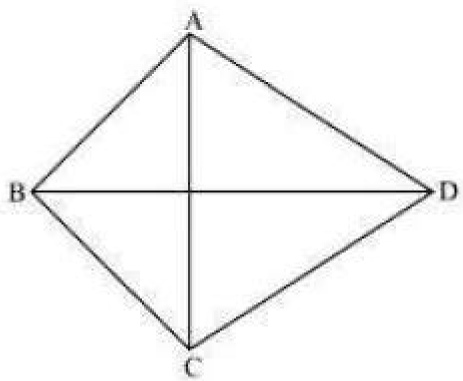
(a) A convex quadrilateral

(b) A regular hexagon

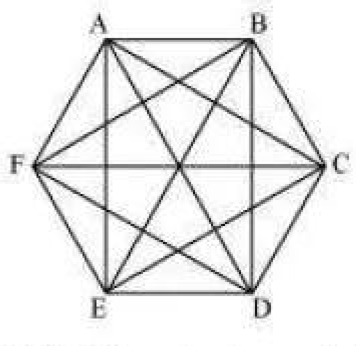
(c) A triangle

Answer:

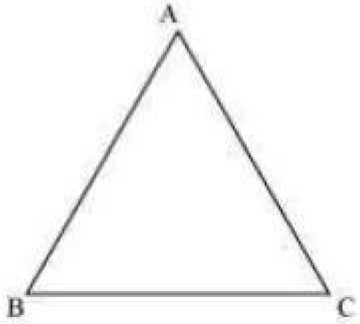
(a) There are 2 diagonals in a convex quadrilateral.



(b) There are 9 diagonals in a regular hexagon.



(c) A triangle does not have any diagonal in it.

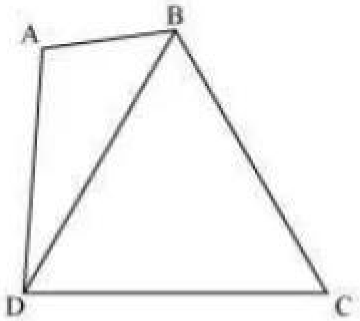


Question 3:

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

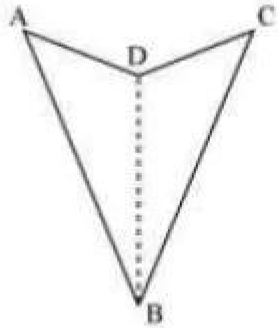
Answer:

The sum of the measures of the angles of a convex quadrilateral is 360° as a convex quadrilateral is made of two triangles.



Here, ABCD is a convex quadrilateral, made of two triangles ΔABD and ΔBCD. Therefore, the sum of all the interior angles of this quadrilateral will be same as the sum of all the interior angles of these two triangles i.e., 180° + 180° = 360°

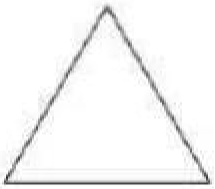
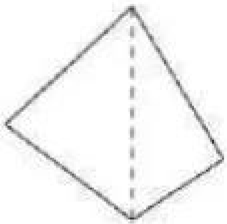
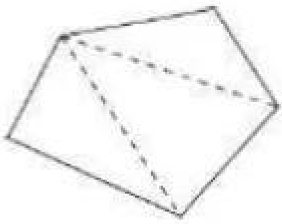
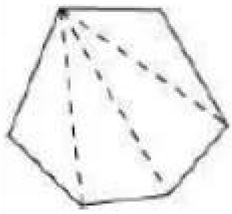
Yes, this property also holds true for a quadrilateral which is not convex. This is because any quadrilateral can be divided into two triangles.



Here again, ABCD is a concave quadrilateral, made of two triangles ΔABD and ΔBCD. Therefore, sum of all the interior angles of this quadrilateral will also be 180° + 180° = 360°

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	180°	2 × 180° = (4 − 2) × 180°	3 × 180° = (5 − 2) × 180°	4 × 180° = (6 − 2) × 180°

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

(a) 7

(b) 8

(c) 10

(d) *n*

Answer:

From the table, it can be observed that the angle sum of a convex polygon of n sides is $(n - 2) \times 180^\circ$. Hence, the angle sum of the convex polygons having number of sides as above will be as follows.

(a) $(7 - 2) \times 180^\circ = 900^\circ$

(b) $(8 - 2) \times 180^\circ = 1080^\circ$

(c) $(10 - 2) \times 180^\circ = 1440^\circ$

(d) $(n - 2) \times 180^\circ$

Question 5:

What is a regular polygon?

State the name of a regular polygon of

(i) 3 sides

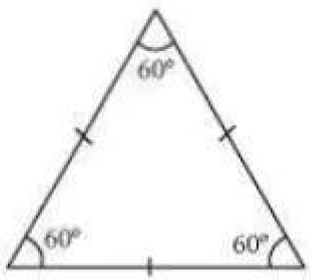
(ii) 4 sides

(iii) 6 sides

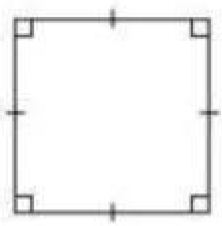
Answer:

A polygon with equal sides and equal angles is called a regular polygon.

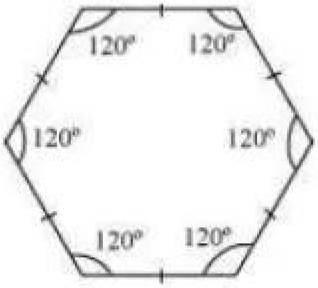
(i) Equilateral Triangle



(ii) Square

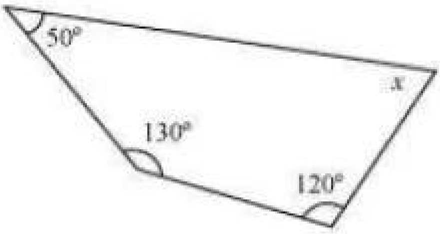


(iii) Regular Hexagon

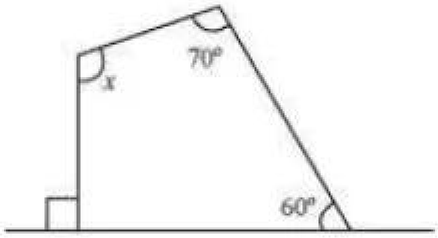


Question 6:

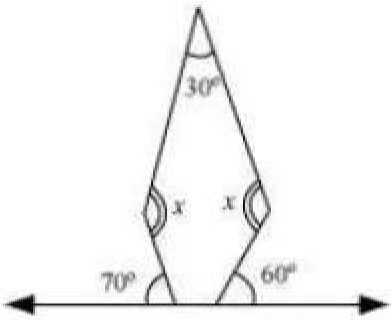
Find the angle measure x in the following figures.



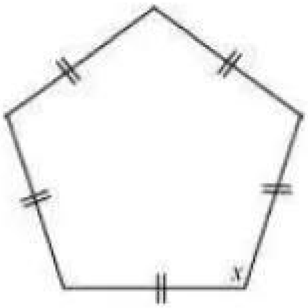
(a)



(b)



(c)



(d)

Answer:

(a)

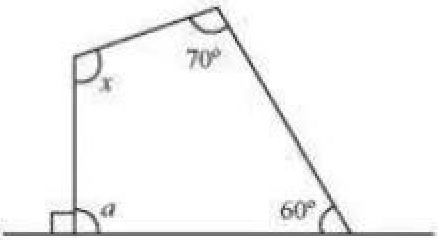
Sum of the measures of all interior angles of a quadrilateral is 360°. Therefore, in the given quadrilateral,

$50° + 130° + 120° + x = 360°$

$300° + x = 360°$

$x = 60°$

(b)



From the figure, it can be concluded that,

$90° + a = 180°$ (Linear pair)

$a = 180° - 90° = 90°$

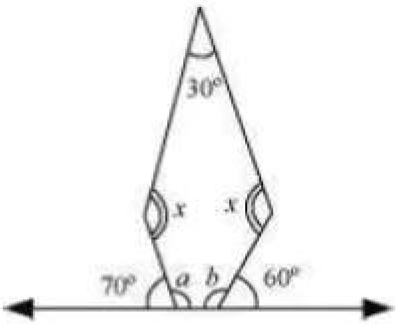
Sum of the measures of all interior angles of a quadrilateral is 360°. Therefore, in the given quadrilateral,

$60° + 70° + x + 90° = 360°$

$220° + x = 360°$

$x = 140°$

(c)



From the figure, it can be concluded that,

$70 + a = 180°$ (Linear pair)

$a = 110°$

$60° + b = 180°$ (Linear pair)

$b = 120°$

Sum of the measures of all interior angles of a pentagon is 540°.

Therefore, in the given pentagon,

$120° + 110° + 30° + x + x = 540°$

$260° + 2x = 540°$

$2x = 280°$

$x = 140°$

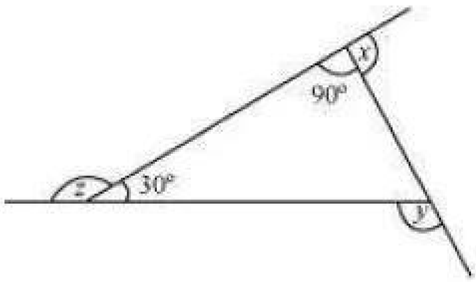
(d)

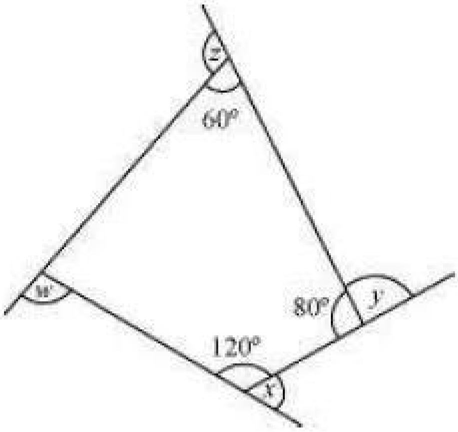
Sum of the measures of all interior angles of a pentagon is 540°.

$5x = 540°$

$x = 108°$

Question 7:





(a) find $x + y + z$

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

Answer:

(a) $x + 90° = 180°$ (Linear pair)

$x = 90°$

$z + 30° = 180°$ (Linear pair)

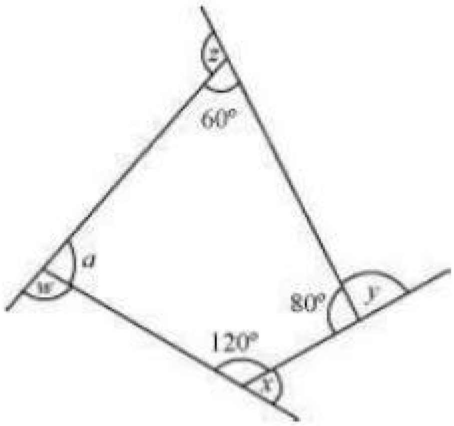
$z = 150°$

$y = 90° + 30°$ (Exterior angle theorem)

$y = 120°$

$x + y + z = 90° + 120° + 150° = 360°$

(b)



Sum of the measures of all interior angles of a quadrilateral is 360°. Therefore, in the given quadrilateral,

$a + 60° + 80° + 120° = 360°$

$a + 260° = 360°$

$a = 100°$

$x + 120° = 180°$ (Linear pair)

$x = 60°$

$y + 80° = 180°$ (Linear pair)

$y = 100°$

$z + 60° = 180°$ (Linear pair)

$z = 120°$

$w + 100° = 180°$ (Linear pair)

$w = 80°$

Sum of the measures of all interior angles $= x + y + z + w$

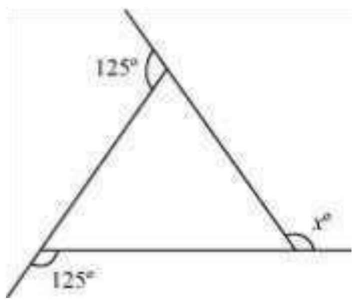
$= 60° + 100° + 120° + 80°$

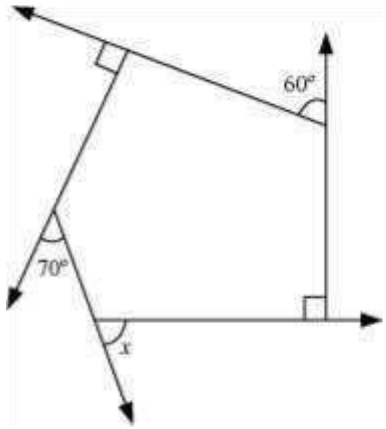
$= 360°$

Exercise 3.2 : Solutions of Questions on Page Number : 44

Q1 :

Find *x* in the following figures.





(a) (b)

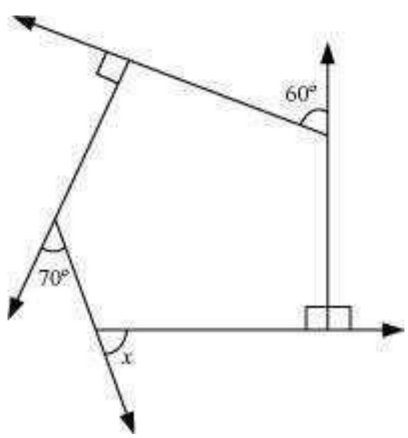
Answer :

We know that the sum of all exterior angles of any polygon is 360º.

(a) $125° + 125° + x = 360°$

$250° + x = 360°$ $x = 110°$

(b)



$60° + 90° + 70° + x + 90° = 360°$

$310° + x = 360°$ x

$= 50°$

Q2 :

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

(i) 9 sides

(ii) 15 sides

Answer :

(i) Sum of all exterior angles of the given polygon = 360 º

Each exterior angle of a regular polygon has the same measure.

Thus, measure of each exterior angle of a regular polygon of 9 sides

$= \frac{360°}{9} = 40°$

(ii) Sum of all exterior angles of the given polygon = 360 º

Each exterior angle of a regular polygon has the same measure.

Thus, measure of each exterior angle of a regular polygon of 15 sides

$= \frac{360°}{15} = 24°$

Q3 :

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

Answer :

Sum of all exterior angles of the given polygon = 360 º
Measure of each exterior angle = 24 º

Thus, number of sides of the regular polygon $= \frac{360^\circ}{24^\circ} = 15$

Q4 :

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

Answer :

Measure of each interior angle = 165°

Measure of each exterior angle = 180° - 165° = 15°

The sum of all exterior angles of any polygon is 360 º.

Thus, number of sides of the polygon $= \frac{360^\circ}{15^\circ} = 24$

Q5 :

(a) Is it possible to have a regular polygon with measure of each exterior angle as 22° (b) Can it be an interior angle of a regular polygon Why

Answer :

The sum of all exterior angles of all polygons is 360º. Also, in a regular polygon, each exterior angle is of the same measure. Hence, if 360º is a perfect multiple of the given exterior angle, then the given polygon will be possible.

(a) Exterior angle = 22°

360º is not a perfect multiple of 22º. Hence, such polygon is not possible.

(b) Interior angle = 22°

Exterior angle = 180° - 22° = 158°
Such a polygon is not possible as 360° is not a perfect multiple of 158°.

Q6 :

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

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

Answer :

Consider a regular polygon having the lowest possible number of sides (i.e., an equilateral triangle). The exterior angle of this triangle will be the maximum exterior angle possible for any regular polygon.

Exterior angle of an equilateral triangle $= \frac{360°}{3} = 120°$

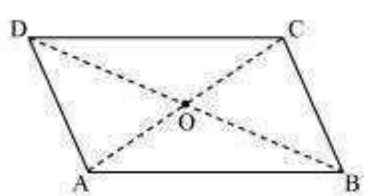
Hence, maximum possible measure of exterior angle for any polygon is 120 º. Also, we know that an exterior angle and an interior angle are always in a linear pair.

Hence, minimum interior angle = 180 º - 120° = 60 º

Exercise 3.3 : Solutions of Questions on Page Number : 50

Q1 :

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



(i) AD = ...

(ii) ∠DCB = ...

(iii) OC = ...
(iv) $m\angle$ DAB + $m\angle$ CDA = ...

Answer :

(i) In a parallelogram, opposite sides are equal in length.

AD = BC

(ii) In a parallelogram, opposite angles are equal in measure.

$\angle$ DCB = $\angle$ DAB

(iii) In a parallelogram, diagonals bisect each other.

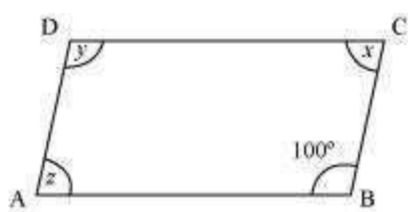
Hence, OC = OA

(iv) In a parallelogram, adjacent angles are supplementary to each other.

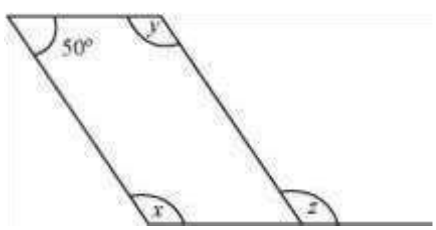
Hence, $m\angle$ DAB +$m\angle$ CDA =180°

Q2 :

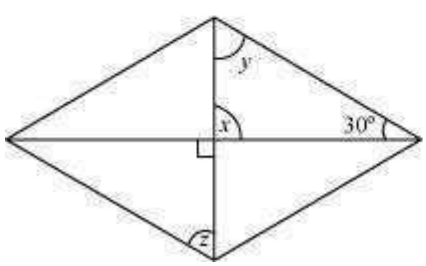
Consider the following parallelograms. Find the values of the unknowns *x*, *y*, *z*.



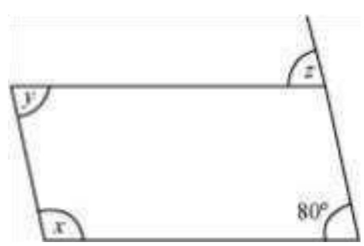
(i)



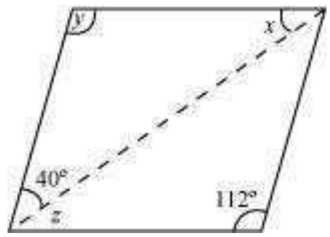
(ii)



(iii)



(iv)



(v)

Answer :

(i) $x + 100° = 180°$ (Adjacent angles are supplementary) $x = 80°$ $z = x = 80°$(Opposite angles are equal) $y = 100°$ (Opposite angles are equal)

(ii) $50° + y = 180°$ (Adjacent angles are supplementary) $y = 130°$ $x = y = 130°$ (Opposite angles are equal) $z = x = 130°$ (Corresponding angles) (iii) $x = 90°$ (Vertically opposite angles) $x + y + 30° = 180°$ (Angle sum property of triangles)

$120° + y = 180°$ $y = 60°$ $z = y = 60°$ (Alternate interior angles) (iv) $z = 80°$ (Corresponding angles) $y = 80°$ (Opposite angles are equal) $x + y = 180°$ (Adjacent angles are supplementary) $x = 180° - 80° = 100°$

(v) $y = 112°$ (Opposite angles are equal) $x + y + 40° = 180°$ (Angle sum property of triangles) $x + 112° +$

$40° = 180°$ $x + 152° = 180°$ $x = 28°$ $z = x = 28°$

(Alternate interior angles)

Q3 :

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 :

(i) For $\angle$D + $\angle$B = 180°, quadrilateral ABCD may or may not be a parallelogram. Along with this condition, the following conditions should also be fulfilled.

The sum of the measures of adjacent angles should be 180º.

Opposite angles should also be of same measures.

(ii) No. Opposite sides AD and BC are of different lengths.

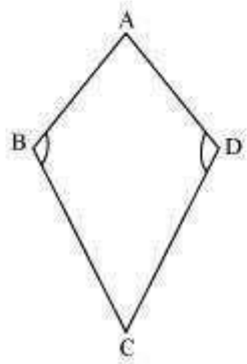
(iii) No. Opposite angles A and C have different measures.

Q4 :

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

Answer :

Here, quadrilateral ABCD (kite) has two of its interior angles, $\angle$B and $\angle$D, of same measures. However, still the quadrilateral ABCD is not a parallelogram as the measures of the remaining pair of opposite angles, $\angle$A and $\angle$C, are not equal.



Q5 :

The measures 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 :

Let the measures of two adjacent angles, ∠A and ∠B, of parallelogram ABCD are in the ratio of 3:2. Let ∠A = $3x$ and ∠B = $2x$

We know that the sum of the measures of adjacent angles is 180 º for a parallelogram.

∠A + ∠B = 180 º

$3x + 2x = 180°$

$5x = 180°$

$$x = \frac{180°}{5} = 36°$$

∠A = ∠C = $3x$ = 108 º (Opposite angles)

∠B = ∠D = $2x$ = 72 º (Opposite angles)
Thus, the measures of the angles of the parallelogram are 108 º, 72 º, 108 º, and 72 º.

Q6 :

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

Answer :

Sum of adjacent angles = 180°

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

$2\angle A = 180^\circ$ ($\angle A = \angle B$)

$\angle A = 90^\circ$

$\angle B = \angle A = 90^\circ$

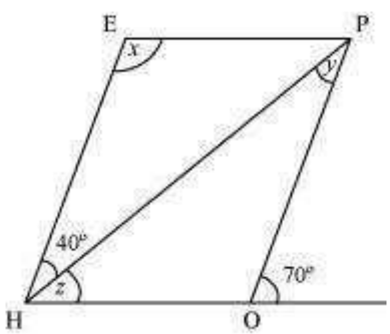
$\angle C = \angle A = 90^\circ$ (Opposite angles)

$\angle D = \angle B = 90^\circ$ (Opposite angles)

Thus, each angle of the parallelogram measures 90º.

Q7 :

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



Answer :

$y = 40^\circ$ (Alternate interior angles)

$70^\circ = z + 40^\circ$ (Corresponding angles)

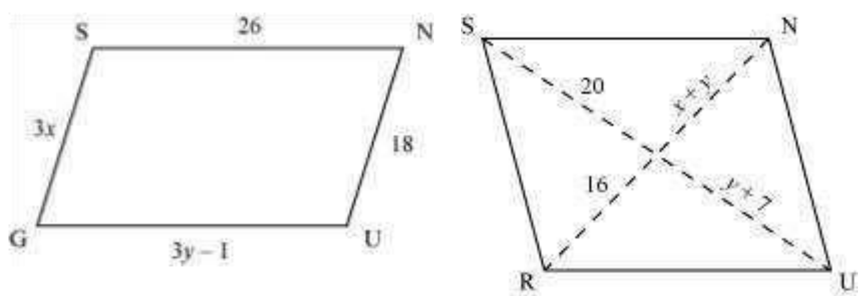
70° - 40° = z z = 30° $x + (z + 40°) = 180°$

(Adjacent pair of angles) x + 70º = 180° x =

110°

Q8 :

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



(i) (ii)

Answer :

(i)We know that the lengths of opposite sides of a parallelogram are equal to each other.

GU = SN

$3y$ - 1 = 26

$3y$ = 27
y = 9

SG = NU

$3x$ = 18 x

= 6

Hence, the measures of x and y are 6 cm and 9 cm respectively. (ii)We

know that the diagonals of a parallelogram bisect each other.

$y + 7 = 20$ y

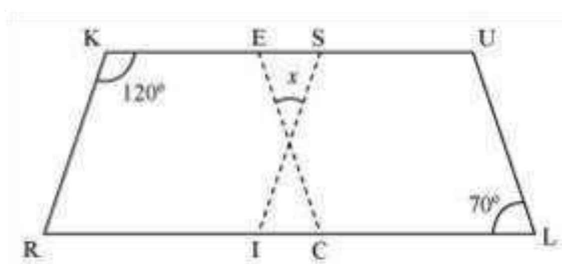
$= 13$ $x + y =$

16 $x + 13 =$

16 $x = 3$

Hence, the measures of x and y are 3 cm and 13 cm respectively.

Q9 :



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

Answer :

Adjacent angles of a parallelogram are supplementary.

In parallelogram RISK, ∠ RKS + ∠ ISK = 180°

120° + ∠ ISK = 180°
∠ ISK = 60°

Also, opposite angles of a parallelogram are equal.

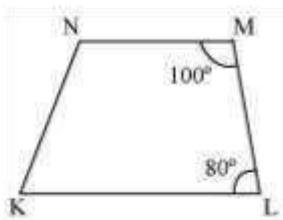
In parallelogram CLUE, ∠ ULC = ∠ CEU = 70°

The sum of the measures of all the interior angles of a triangle is 180º.

$x + 60° + 70° = 180°$ $x = 50°$

Q10 :

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



Answer :

If a transversal line is intersecting two given lines such that the sum of the measures of the angles on the same side of transversal is 180º, then the given two lines will be parallel to each other.

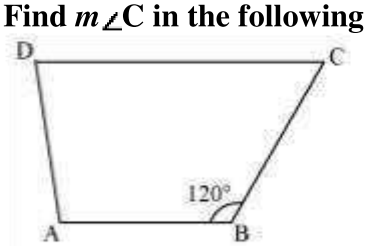
Here, $\angle$ NML + $\angle$ MLK = 180°

Hence,NM||LK

As quadrilateral KLMN has a pair of parallel lines, therefore, it is a trapezium.

Q11 :

Find *m*$\angle$C in the following figure if $\overline{AB} \parallel \overline{DC}$



Answer :

Given that, $\overline{AB} \parallel \overline{DC}$

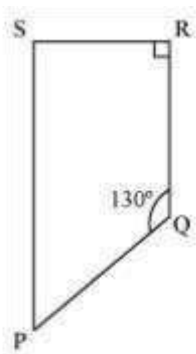
$\angle B + \angle C = 180°$ (Angles on the same side of transversal)

$120° + \angle C = 180°$

$\angle C = 60°$

Q12 :

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



Answer :

$\angle P + \angle Q = 180°$ (Angles on the same side of transversal)

$\angle P + 130° = 180°$

$\angle P = 50°$
$\angle R + \angle S = 180°$ (Angles on the same side of transversal)

$90° + \angle R = 180°$

$\angle S = 90°$

Yes. There is one more method to find the measure of $m\angle P$.

$m\angle R$ and $m\angle Q$ are given. After finding $m\angle S$, the angle sum property of a quadrilateral can be applied to find $m\angle P$.

Exercise 3.4 : Solutions of Questions on Page Number : 55

Q1 :

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 :

(a) False. All squares are rectangles but all rectangles are not squares.

(b) True. Opposite sides of a rhombus are equal and parallel to each other.

(c) True. All squares are rhombuses as all sides of a square are of equal lengths. All squares are also rectangles as each internal angle measures 90°.

(d) False. All squares are parallelograms as opposite sides are equal and parallel.

(e) False. A kite does not have all sides of the same length.

(f) True. A rhombus also has two distinct consecutive pairs of sides of equal length.

(g) True. All parallelograms have a pair of parallel sides.

(h) True. All squares have a pair of parallel sides.

Q2 :

Identify all the quadrilaterals that have

(a) four sides of equal length

(b) four right angles

Answer :

(a) Rhombus and Square are the quadrilaterals that have 4 sides of equal length.

(b) Square and rectangle are the quadrilaterals that have 4 right angles.

Q3 :

Explain how a square is.

(i) a quadrilateral

(ii) a parallelogram

(iii) a rhombus

(iv) a rectangle

Answer :

(i) A square is a quadrilateral since it has four sides.

(ii) A square is a parallelogram since its opposite sides are parallel to each other. (iii) A square is a rhombus since its four sides are of the same length.

(iv) A square is a rectangle since each interior angle measures 90°.

Q4 :

Name the quadrilaterals whose diagonals.

(i) bisect each other

(ii) are perpendicular bisectors of each other

(iii) are equal

Answer :

(i) The diagonals of a parallelogram, rhombus, square, and rectangle bisect each other.

(ii) The diagonals of a rhombus and square act as perpendicular bisectors.

(iii) The diagonals of a rectangle and square are equal.

Q5 :

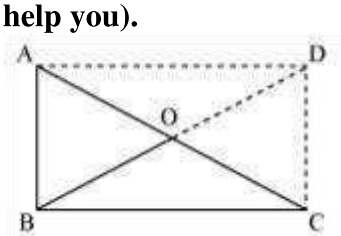
Explain why a rectangle is a convex quadrilateral.

Answer :

In a rectangle, there are two diagonals, both lying in the interior of the rectangle. Hence, it is a convex quadrilateral.

Q6 :

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 :

Draw lines AD and DC such that AD||BC, AB||DC

AD = BC, AB = DC

ABCD is a rectangle as opposite sides are equal and parallel to each other and all the interior angles are of 90º.

In a rectangle, diagonals are of equal length and also these bisect each other.

Hence, AO = OC = BO = OD

Thus, O is equidistant from A, B, and C.

Exercise 4.1 : Solutions of Questions on Page Number : 60

Q1 :

Construct the following quadrilaterals.

(i) Quadrilateral ABCD

AB = 4.5 cm

BC = 5.5 cm

CD = 4 cm

AD = 6 cm

AC = 7 cm

(ii) Quadrilateral JUMP

JU = 3.5 cm

UM = 4 cm

MP = 5 cm

PJ = 4.5 cm

PU = 6.5 cm

(iii) Parallelogram MORE

OR = 6 cm

RE = 4.5 cm

EO = 7.5 cm

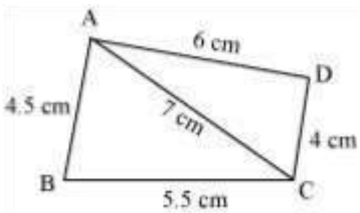
(iv) Rhombus BEST

BE = 4.5 cm

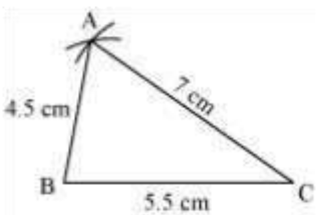
ET = 6 cm

Answer :

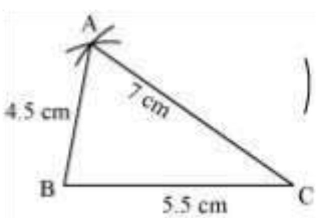
(i) Firstly, a rough sketch of this quadrilateral can be drawn as follows.



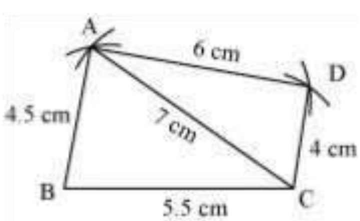
(1) ΔABC can be constructed by using the given measurements as follows.



(2) Vertex D is 6 cm away from vertex A. Therefore, while taking A as centre, draw an arc of radius 6 cm.

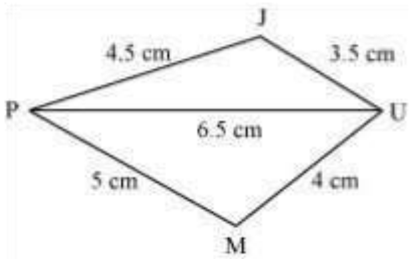


(3) Taking C as centre, draw an arc of radius 4 cm, cutting the previous arc at point D. Join D to A and C.

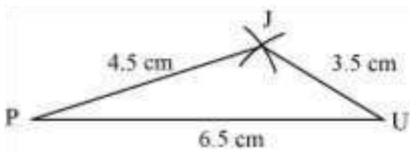


ABCD is the required quadrilateral.

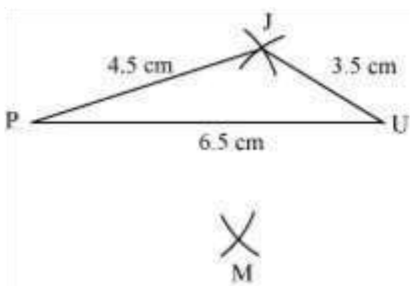
(ii)Firstly, a rough sketch of this quadrilateral can be drawn as follows.



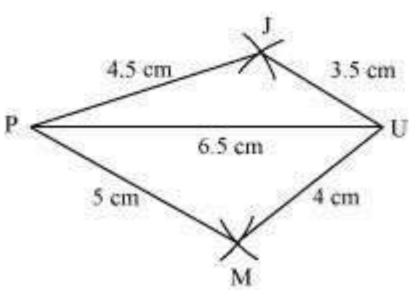
(1) Δ JUP can be constructed by using the given measurements as follows.



(2) Vertex M is 5 cm away from vertex P and 4 cm away from vertex U. Taking P and U as centres, draw arcs of radii 5 cm and 4 cm respectively. Let the point of intersection be M.



(3) Join M to P and U.

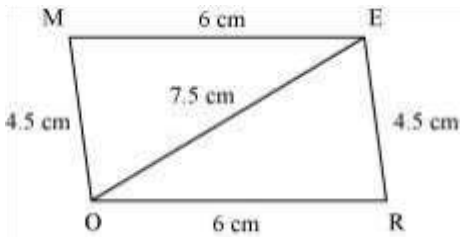


JUMP is the required quadrilateral.

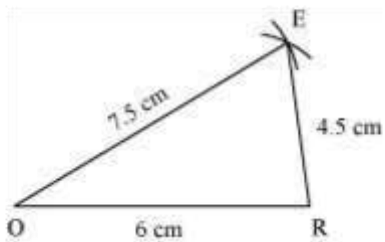
(iii)We know that opposite sides of a parallelogram are equal in length and also these are parallel to each other.

Hence, ME = OR, MO = ER

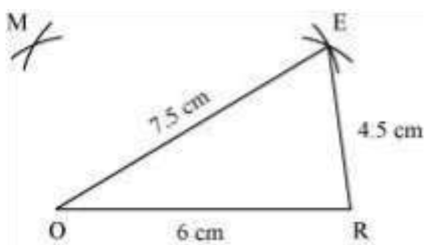
A rough sketch of this parallelogram can be drawn as follows.



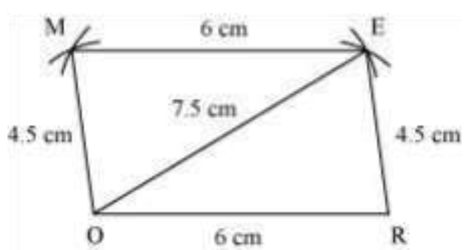
(1) Δ EOR can be constructed by using the given measurements as follows.



(2) Vertex M is 4.5 cm away from vertex O and 6 cm away from vertex E. Therefore, while taking O and E as centres, draw arcs of 4.5 cm radius and 6 cm radius respectively. These will intersect each other at point M.



(3) Join M to O and E.

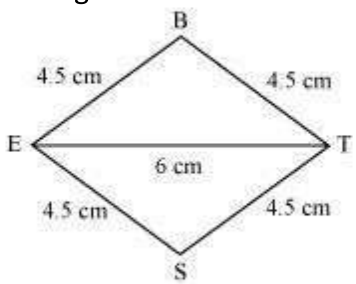


MORE is the required parallelogram.

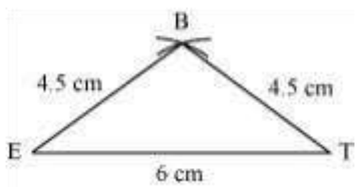
(iv)We know that all sides of a rhombus are of the same measure.

Hence, BE = ES = ST = TB

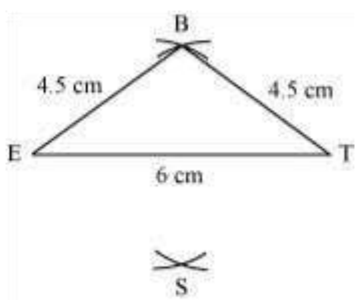
A rough sketch of this rhombus can be drawn as follows.



(1) Δ BET can be constructed by using the given measurements as follows.



(2) Vertex S is 4.5 cm away from vertex E and also from vertex T. Therefore, while taking E and T as centres, draw arcs of 4.5 cm radius, which will be intersecting each other at point S.



Exercise 4.2 : Solutions of Questions on Page Number : 62

Q1 :

Construct the following quadrilaterals.

(i) Quadrilateral LIFT

LI = 4 cm

IF = 3 cm

TL = 2.5 cm

LF = 4.5 cm

IT = 4 cm

(ii) Quadrilateral GOLD

OL = 7.5 cm

GL = 6 cm

GD = 6 cm

LD = 5 cm

OD = 10 cm

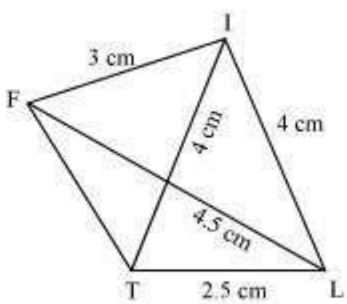
(iii) Rhombus BEND

BN = 5.6 cm

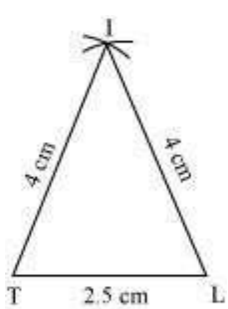
DE = 6.5 cm

Answer :

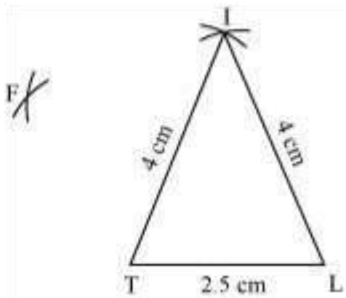
(i) A rough sketch of this quadrilateral can be drawn as follows.



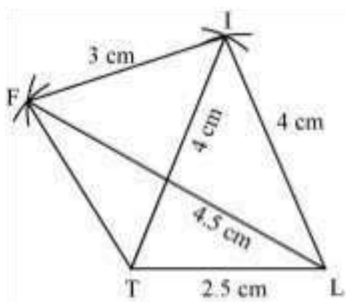
(1) Δ ITL can be constructed by using the given measurements as follows.



(2) Vertex F is 4.5 cm away from vertex L and 3 cm away from vertex I. Therefore, while taking L and I as centres, draw arcs of 4.5 cm radius and 3 cm radius respectively, which will be intersecting each other at point F.

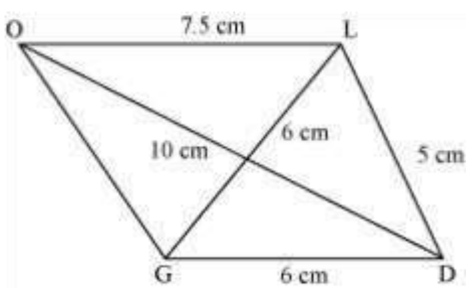


(3) Join F to T and F to I.

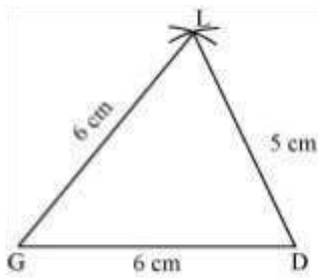


LIFT is the required quadrilateral.

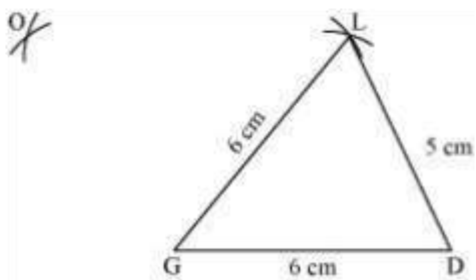
(ii)A rough sketch of this quadrilateral can be drawn as follows.



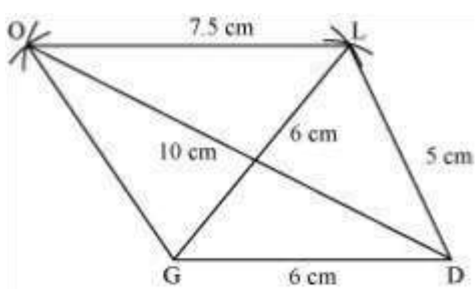
(1) Δ GDL can be constructed by using the given measurements as follows.



(2) Vertex O is 10 cm away from vertex D and 7.5 cm away from vertex L. Therefore, while taking D and L as centres, draw arcs of 10 cm radius and 7.5 cm radius respectively. These will intersect each other at point O.



(3) Join O to G and L.

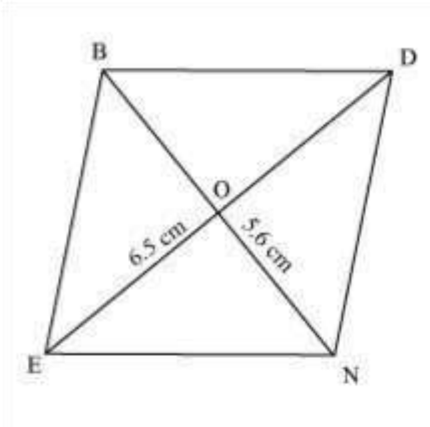


GOLD is the required quadrilateral.

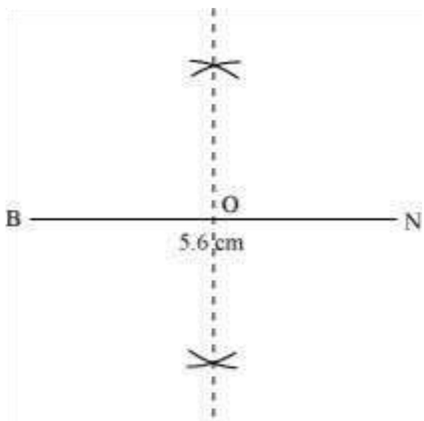
(iii) We know that the diagonals of a rhombus always bisect each other at 90º. Let us assume that these are intersecting each other at point O in this rhombus.

Hence, EO = OD = 3.25 cm

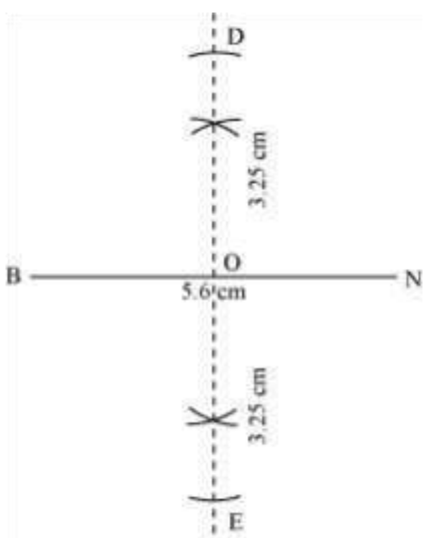
A rough sketch of this rhombus can be drawn as follows.



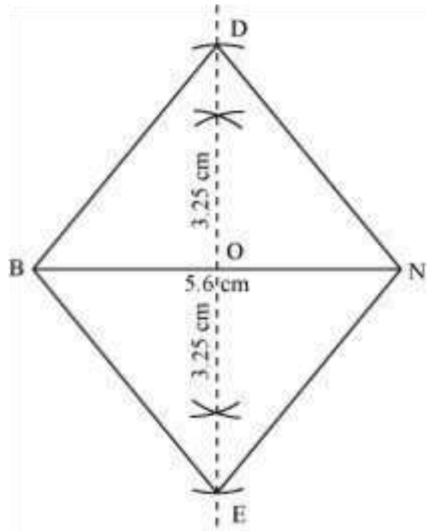
(1) Draw a line segment BN of 5.6 cm and also draw its perpendicular bisector. Let it intersect the line segment BN at point O.



(2) Taking O as centre, draw arcs of 3.25 cm radius to intersect the perpendicular bisector at point D and E.



(3) Join points D and E to points B and N.



BEND is the required quadrilateral.

Exercise 4.3 : Solutions of Questions on Page Number : 64

Q1 :

Construct the following quadrilaterals.

(i) Quadrilateral MORE

MO = 6 cm

OR = 4.5 cm

∠M = 60°

∠O = 105°

∠R = 105°

(ii) Quadrilateral PLAN

PL = 4 cm

LA = 6.5 cm

∠P = 90°

∠ A = 110°
∠ N = 85°

(iii) Parallelogram HEAR

HE = 5 cm

EA = 6 cm

∠ R = 85°

(iv) Rectangle OKAY

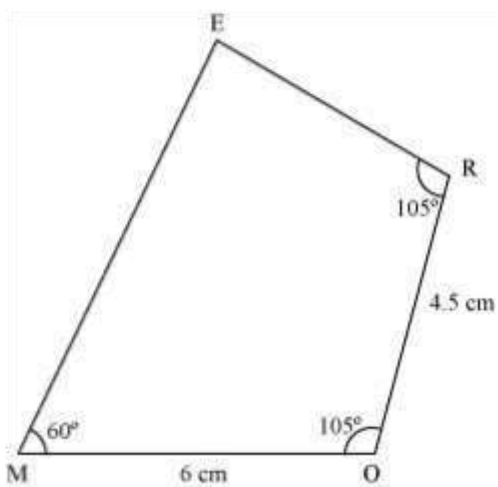
OK = 7 cm

KA = 5 cm

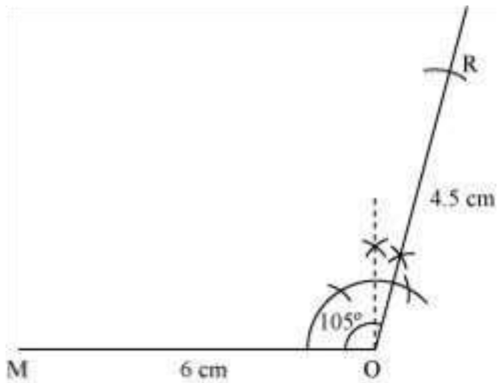
Answer :

(i)

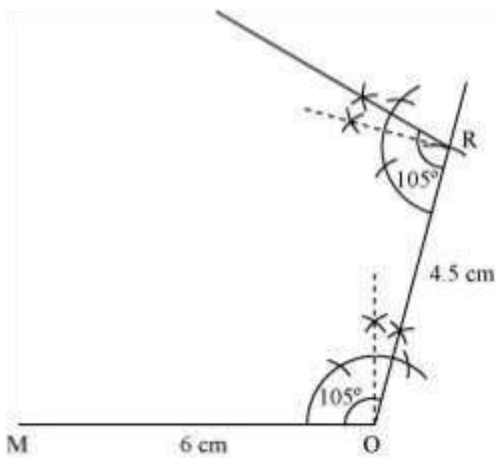
(1) A rough sketch of this quadrilateral can be drawn as follows.



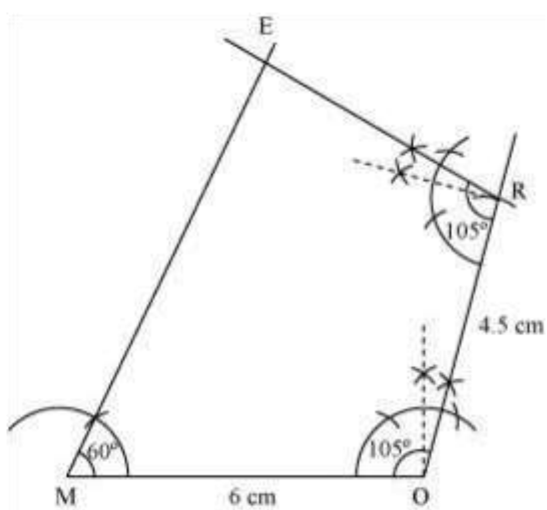
(2) Draw a line segment MO of 6 cm and an angle of 105º at point O. As vertex R is 4.5 cm away from the vertex O, cut a line segment OR of 4.5 cm from this ray.



(3) Again, draw an angle of 105º at point R.



(4) Draw an angle of 60º at point M. Let this ray meet the previously drawn ray from R at point E.



MORE is the required quadrilateral.

(ii)

(1)The sum of the angles of a quadrilateral is 360°.

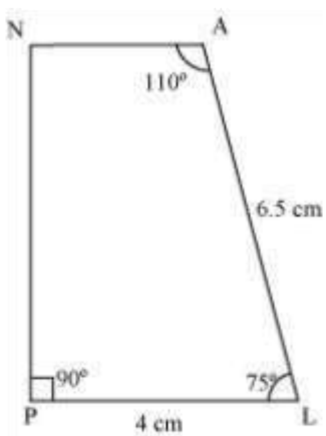
In quadrilateral PLAN, $\angle P + \angle L + \angle A + \angle N = 360°$

$90° + \angle L + 110° + 85° = 360°$

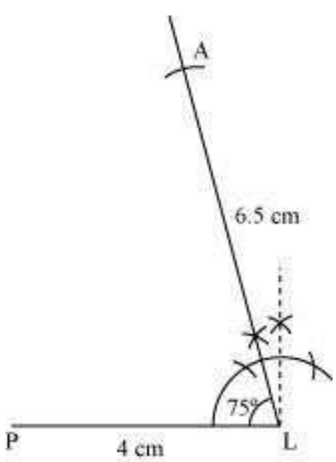
$285° + \angle L = 360°$

$\angle L = 360° - 285° = 75°$

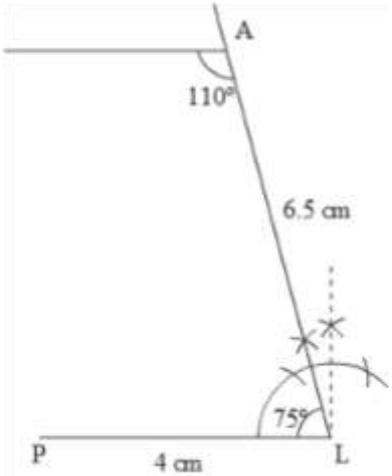
(2) A rough sketch of this quadrilateral is as follows.



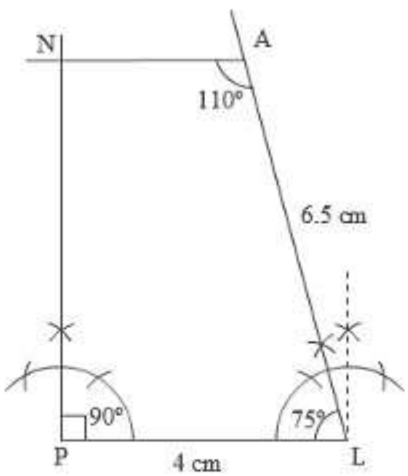
(3) Draw a line segment PL of 4 cm and draw an angle of 75º at point L. As vertex A is 6.5 cm away from vertex L, cut a line segment LA of 6.5 cm from this ray.



(4) Again draw an angle of 110º at point A.



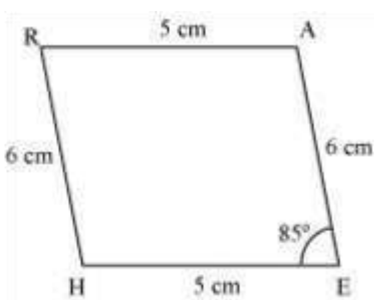
(5) Draw an angle of 90º at point P. This ray will meet the previously drawn ray from A at point N.



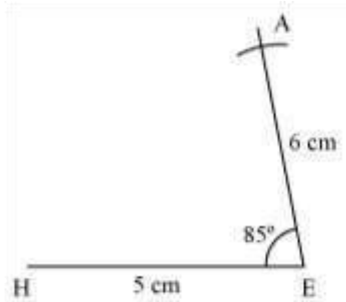
PLAN is the required quadrilateral.

(iii)

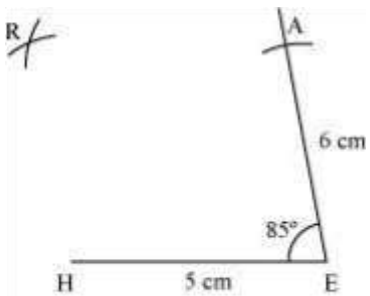
(1)Firstly, a rough sketch of this quadrilateral is as follows.



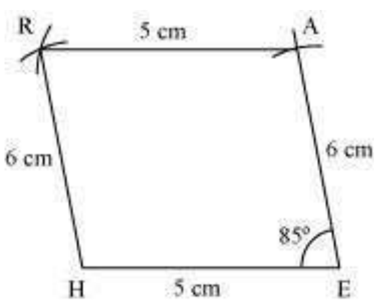
(2) Draw a line segment HE of 5 cm and an angle of 85º at point E. As vertex A is 6 cm away from vertex E, cut a line segment EA of 6 cm from this ray.



(3) Vertex R is 6 cm and 5 cm away from vertex H and A respectively. By taking radius as 6 cm and 5 cm, draw arcs from point H and A respectively. These will be intersecting each other at point R.



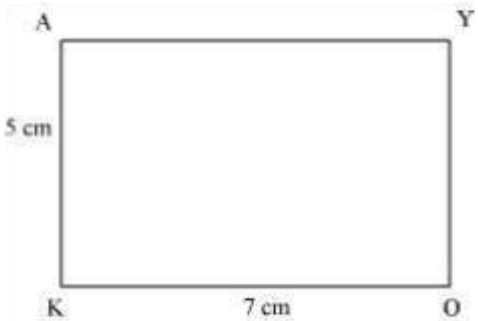
4. Join R to H and A.



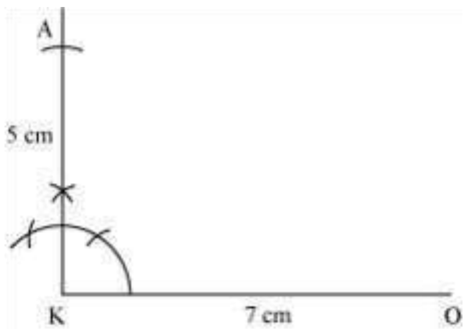
HEAR is the required quadrilateral.

(iv)

(1) A rough sketch of this quadrilateral is drawn as follows.



(2) Draw a line segment OK of 7 cm and an angle of 90º at point K. As vertex A is 5 cm away from vertex K, cut a line segment KA of 5 cm from this ray.



(3) Vertex Y is 5 cm and 7 cm away from vertex O a

Exercise 4.4 : Solutions of Questions on Page Number : 67

Q1 :

Construct the following quadrilaterals,

(i) Quadrilateral DEAR

DE = 4 cm

EA = 5 cm

AR = 4.5 cm

∠E = 60°

∠A = 90°

(ii) Quadrilateral TRUE

TR = 3.5 cm
RU = 3 cm

UE = 4 cm

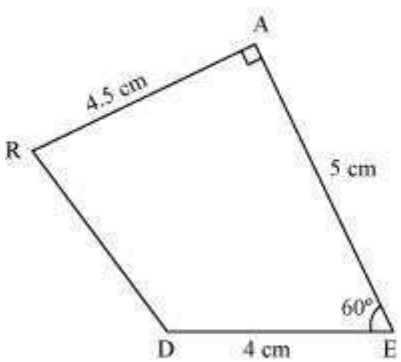
∠R = 75°

∠U = 120°

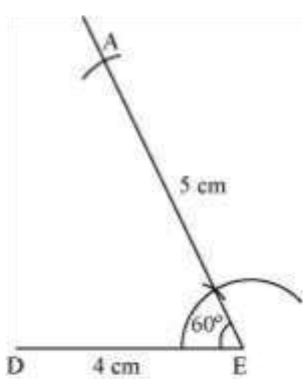
Answer :

(i)

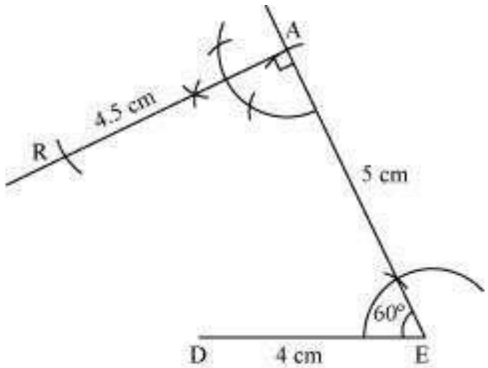
(1) A rough sketch of this quadrilateral can be drawn as follows.



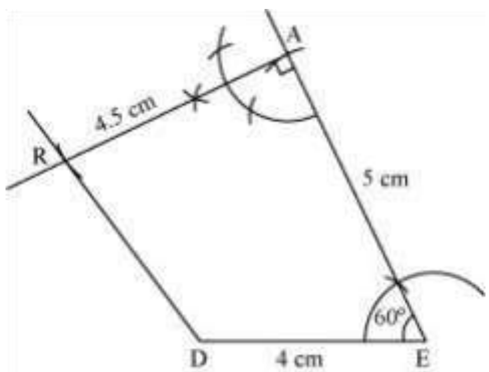
(2) Draw a line segment DE of 4 cm and an angle of 60º at point E. As vertex A is 5 cm away from vertex E, cut a line segment EA of 5 cm from this ray.



(3) Again draw an angle of 90º at point A. As vertex R is 4.5 cm away from vertex A, cut a line segment RA of 4.5 cm from this ray.



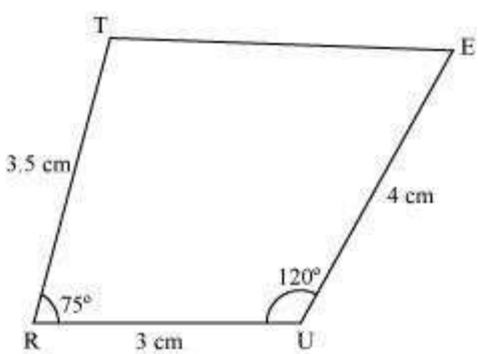
(4) Join D to R.



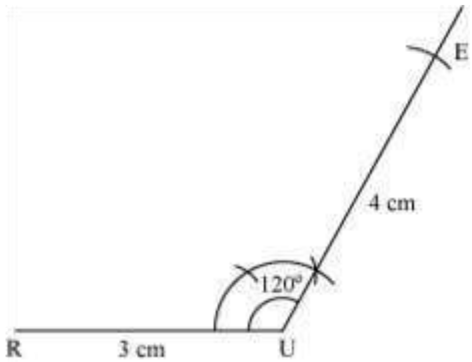
DEAR is the required quadrilateral.

(ii)

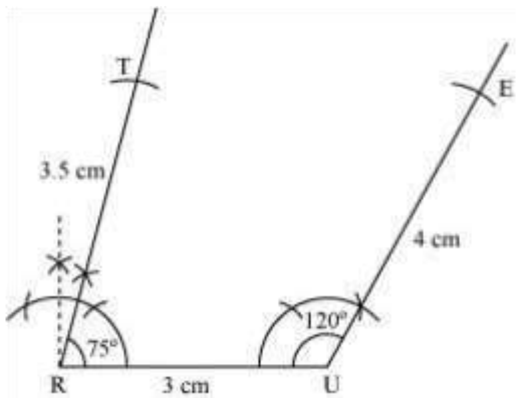
(1) A rough sketch of this quadrilateral can be drawn as follows.



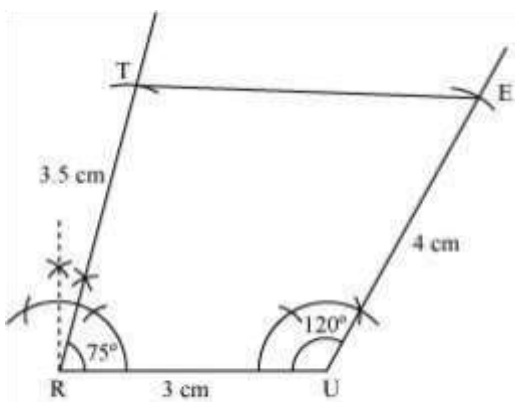
(2) Draw a line segment RU of 3 cm and an angle of 120º at point U. As vertex E is 4 cm away from vertex U, cut a line segment UE of 4 cm from this ray.



(3) Next, draw an angle of 75º at point R. As vertex T is 3.5 cm away from vertex R, cut a line segment RT of 3.5 cm from this ray.



(4) Join T to E.



TRUE is the required quadrilateral.

Exercise 4.5 : Solutions of Questions on Page Number : 68

Q1 :

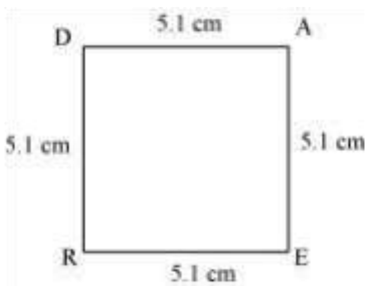
Draw the following:

The square READ with RE = 5.1 cm

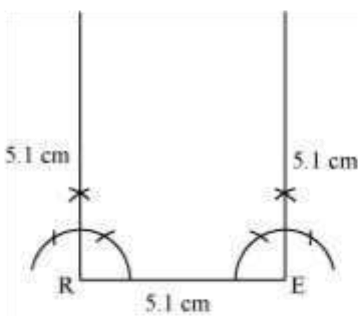
Answer :

All the sides of a square are of the same measure and also all the interior angles of a square are of 90º measure. Therefore, the given square READ can be drawn as follows.

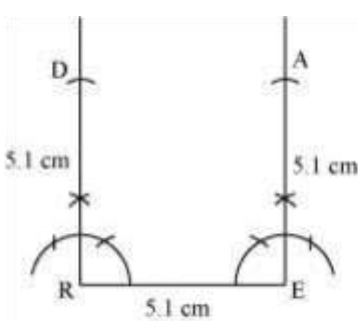
(1) A rough sketch of this square READ can be drawn as follows.



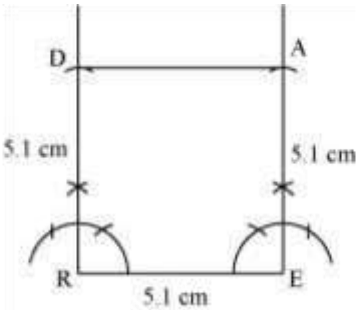
(2) Draw a line segment RE of 5.1 cm and an angle of 90º at point R and E.



(3) As vertex A and D are 5.1 cm away from vertex E and R respectively, cut line segments EA and RD, each of 5.1 cm from these rays.



(4) Join D to A.



READ is the required square.

Q2 :

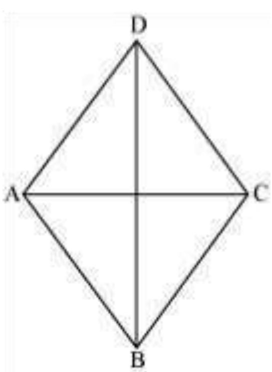
Draw the following:

A rhombus whose diagonals are 5.2 cm and 6.4 cm long.

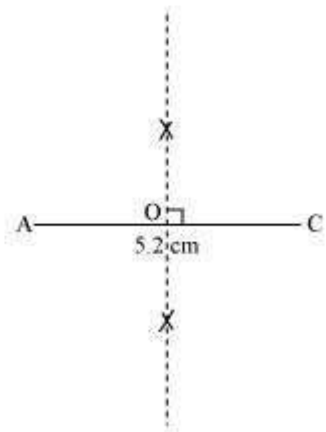
Answer :

In a rhombus, diagonals bisect each other at 90 º. Therefore, the given rhombus ABCD can be drawn as follows.

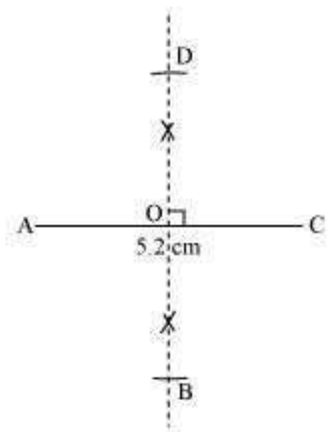
(1) A rough sketch of this rhombus ABCD is as follows.



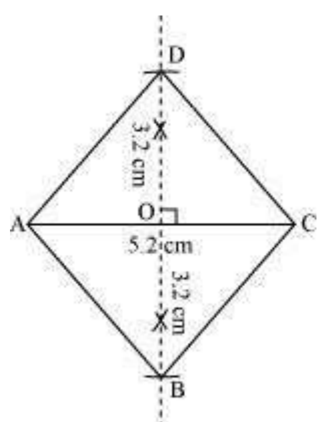
(2) Draw a line segment AC of 5.2 cm and draw its perpendicular bisector. Let it intersect the line segment AC at point O.



(3) Draw arcs of $\frac{6.4\text{ cm}}{2} = 3.2\text{ cm}$ on both sides of this perpendicular bisector. Let the arcs intersect the perpendicular bisector at point B and D.



(4) Join points B and D with points A and C.



ABCD is the required rhombus.

Q3 :

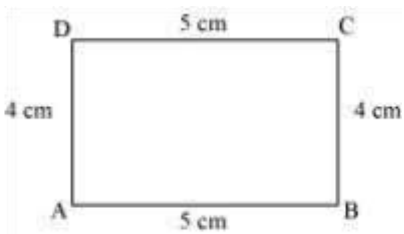
Draw the following:

A rectangle with adjacent sides of length 5 cm and 4 cm.

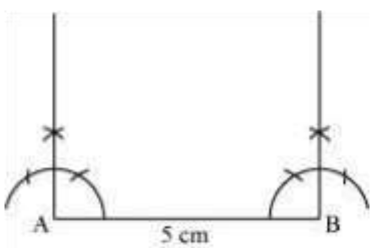
Answer :

Opposite sides of a rectangle have their lengths of same measure and also, all the interior angles of a rectangle are of 90º measure. The given rectangle ABCD may be drawn as follows.

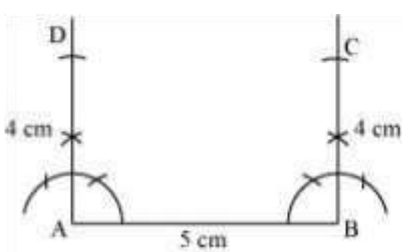
(1) A rough sketch of this rectangle ABCD can be drawn as follows.



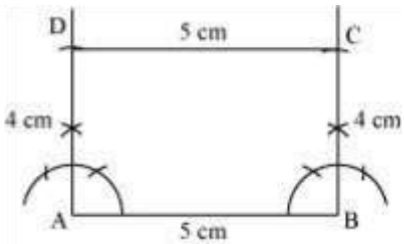
(2) Draw a line segment AB of 5 cm and an angle of 90º at point A and B.



(3) As vertex C and D are 4 cm away from vertex B and A respectively, cut line segments AD and BC, each of 4 cm, from these rays.



(4) Join D to C.



ABCD is the required rectangle.

Q4 :

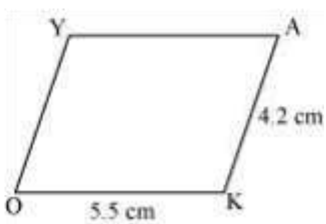
Draw the following:

A parallelogram OKAY where OK = 5.5 cm and KA = 4.2 cm.

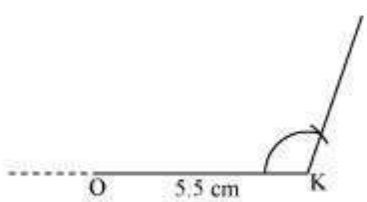
Answer :

Opposite sides of a parallelogram are equal and parallel to each other. The given parallelogram OKAY can be drawn as follows.

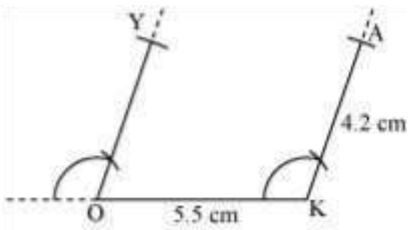
(1) A rough sketch of this parallelogram OKAY is drawn as follows.



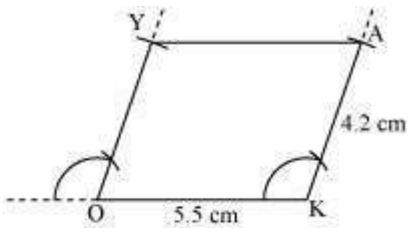
(2) Draw a line segment OK of 5.5 cm and a ray at point K at a convenient angle.



(3) Draw a ray at point O parallel to the ray at K. As the vertices, A and Y, are 4.2 cm away from the vertices K and O respectively, cut line segments KA and OY, each of 4.2 cm, from these rays.



(4) Join Y to A.



OKAY is the required parallelogram.

Exercise 5.1 : Solutions of Questions on Page Number : 76

Q1 :

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 of 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 reasons for each.

Answer :

In case of the data given in alternative (b) and (d), we will use histogram as we can divide the given data in class intervals. In case of alternatives (a) and (c), we do not know about the number of letters of different areas and the number of cassettes produced by the given companies. We do not have any approximate idea about it. Therefore, we cannot define class intervals for this data and thus, we will not use a histogram.

Q2 :

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 W M W G W M G W M M B G G W

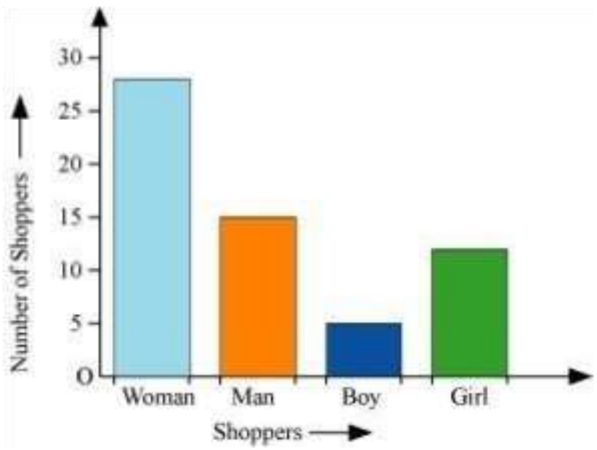
Make a frequency distribution table using tally marks. Draw a bar graph to illustrate it.

Answer :

By observing the data given above, we can make a frequency distribution table as follows.

Shopper	Tally marks	Number
W	卌 卌 卌 卌 卌 |||	28
M	卌 卌 卌	15
B	卌	5
G	卌 卌 ||	12

The bar graph of this data can be drawn as follows.



Q3 :

The weekly wages (in Rs) 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 :

A frequency distribution table by using tally marks for the above data is as follows.

Interval	Tally marks	Frequency

<table>
<tr><td>800 - 810</td><td>|||</td><td>3</td></tr>
<tr><td>810 - 820</td><td>||</td><td>2</td></tr>
<tr><td>820 - 830</td><td>|</td><td>1</td></tr>
<tr><td>830 - 840</td><td>𝍸||||</td><td>9</td></tr>
<tr><td>840 - 850</td><td>𝍸</td><td>5</td></tr>
<tr><td>850 - 860</td><td>|</td><td>1</td></tr>
<tr><td>860 - 870</td><td>|||</td><td>3</td></tr>
<tr><td>870 - 880</td><td>|</td><td>1</td></tr>
<tr><td>880 - 890</td><td>|</td><td>1</td></tr>
</table>

Q4 :

Draw a histogram for the frequency table made for the data in Question 3 and answer the following questions.

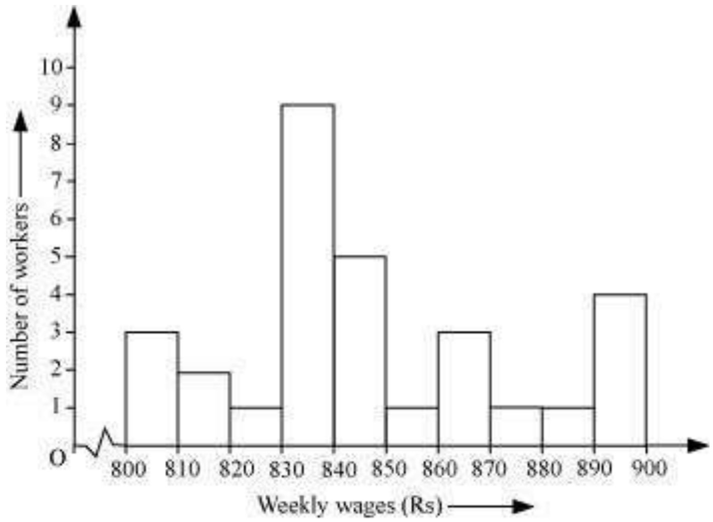
(i) Which group has the maximum number of workers

(ii) How many workers earn Rs 850 and more

(iii) How many workers earn less than Rs 850

Answer :

A histogram for the above frequency distribution table is as follows.



(i) 830 - 840 is the group which has the maximum number of workers.

(ii) The workers who earn more than Rs 850 are the number of workers who fall in the group of 850 - 860 or 860 - 870 or 870 - 880 or 880 - 890. Hence, the total number of workers earning more than 850 will be the sum of the numbers of all these workers i.e., 1 + 3 + 1 + 1 + 4 = 10

(iii) The workers who earn less than Rs 850 are the number of workers who fall in the group of 800 - 810 or 810 - 820 or 820 - 830 or 830 - 840 or 840 - 850. Hence, the total number of workers earning less than 850 will be the sum of the numbers of all these workers i.e., 3 + 2 + 1 + 9 + 5 = 20

Q5 :

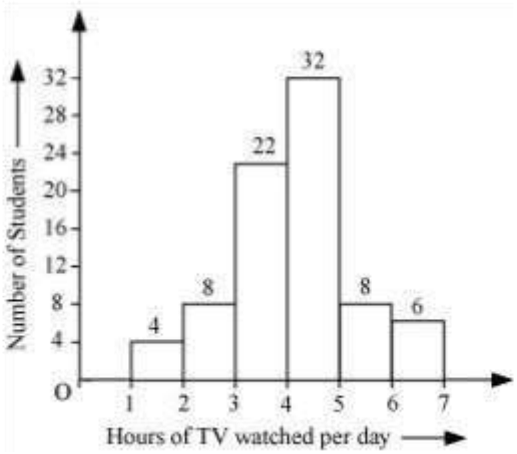
The number of hours for which students of a particular class watched television during holidays is shown through the given graph.

Answer the following

(i) For how many hours did the maximum number of students watch TV

(ii) How many students watched TV for less than 4 hours

(iii) How many students spent more than 5 hours in watching TV



Answer :

(i) From the graph, it can be observed that the maximum number of students (i.e., 32) watched TV for 4 - 5 hours.

(ii) The students who watched TV for less than 4 hours are the students who watched TV for 1 - 2 hours or 2 - 3 hours or 3 - 4 hours.

Hence, total number of students = 4 + 8 + 22 = 34

(iii) The students who watched TV for more than 5 hours are the students who watched TV for 5 - 6 hours or 6 - 7 hours.

Hence, total number of students = 8 + 6 = 14

Exercise 5.2 : Solutions of Questions on Page Number : 82

Q1 :

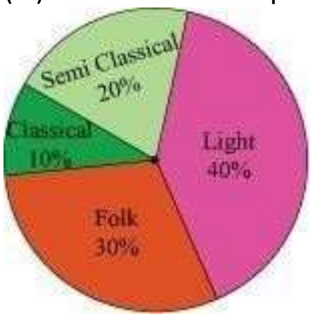
A survey was made to find the type of music that a certain group of young people liked in a city. Adjoining pie chart shows the findings of this survey.

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 :

(i) Number of people who like classical music = 10%

This 10% represents 20 people.

100 % represents = $\frac{20\times100}{10}=200$ people

Therefore, 200 young people were surveyed.

(ii) From the pie chart, it can be easily observed that the light music is represented by the maximum part of the pie chart (i.e., 40 %). Hence, most of the people like light music. (iii) Number of CD's of classical music = 10% of 1000

$$=\frac{10}{100}\times1000$$
$$=100$$

Number of CD's of semi-classical music = 20% of 1000

$$=\frac{20}{100}\times1000$$
$$=200$$

Number of CD's of folk music = 30% of 1000

$$=\frac{30}{100}\times1000$$
$$=300$$

Number of cassettes of light music = 40% of 1000

$$= \frac{40}{100} \times 1000$$
$$= 400$$

Q2 :

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	Number of votes
Summer	90
Rainy	120
Winter	150

Answer :

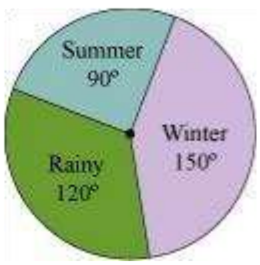
(i) Winter

(ii) Total number of votes = 90 + 120 + 150 = 360

Season	Number of votes	In fraction	Central angle
Summer	90	$\frac{90}{360}$	$\frac{90}{360} \times 360^\circ = 90^\circ$

Rainy	120	$\frac{120}{360}$	$\frac{120}{360}\times 360^{o}=120^{o}$
Winter	150	$\frac{150}{360}$	$\frac{150}{360}\times 360^{o}=150^{o}$

(iii) A pie chart can be drawn for the above data as follows.



Q3 :

Draw a pie chart showing the following information. The table shows the colours preferred by a group of people.

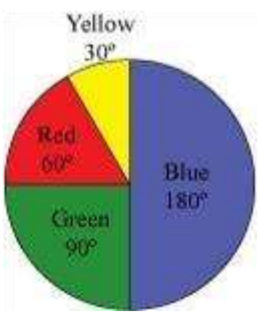
Colours	Number of people
Blue	18
Green	9
Red	6
Yellow	3
Total	36

Answer :

The central angle for each colour can be calculated as follows.

Colours	Number of people	In fraction	Central angle
Blue	18	$\frac{18}{36}$	$\frac{18}{36}\times 360^{\circ}=180^{\circ}$
Green	9	$\frac{9}{36}$	$\frac{9}{36}\times 360^{\circ}=90^{\circ}$
Red	6	$\frac{6}{36}$	$\frac{6}{36}\times 360^{\circ}=60^{\circ}$
Yellow	3	$\frac{3}{36}$	$\frac{3}{36}\times 360^{\circ}=30^{\circ}$

The pie chart of the above data is as follows.



Q4 :

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.

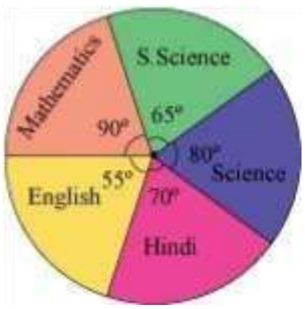
(i) In which subject did the student score 105 marks

(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 :

(i) Total marks obtained by the student are 540. Hence, 540 marks represent 360 º. The central angle for 105 marks has to be calculated.

Central angle for 105 marks = $\frac{105}{540} \times 360° = 70°$

Hindi is the subject having its central angle as 70 º.

Therefore, the student scored 105 marks in Hindi.

(ii) Difference between the central angles of Mathematics and Hindi

= 90 º - 70 º = 20 º

Marks for 20 º central angle = $\frac{20°}{360°} \times 540 = 30$

There is a difference of 30 marks between the score obtained in Mathematics and Hindi.

Therefore, 30 more marks were obtained by the student in Mathematics than in Hindi.

(iii) Sum of central angles of Social Science and Mathematics

= 90° + 65° = 155°

Sum of central angles of Science and Hindi = 80° + 70° = 150°

The sum of the central angles for Social Science and Mathematics is more than that of Science and Hindi. Therefore, the student scored more in Social Science and Mathematics than in Science and Hindi.

Q5 :

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
Number of students	40	12	9	7	4	72

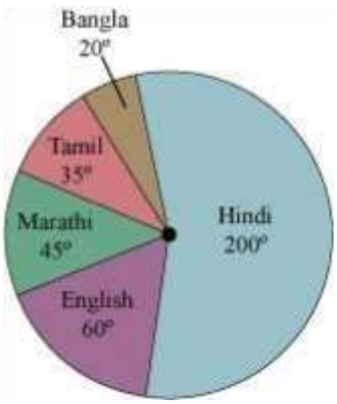
Answer :

The central angle for each subject can be calculated as follows.

Language	Number of students	In fraction	Central angle
Hindi	40	$\frac{40}{72}$	$\frac{40}{72} \times 360^{\circ} = 200^{\circ}$
English	12	$\frac{12}{72}$	$\frac{12}{72} \times 360^{\circ} = 60^{\circ}$
Marathi	9	$\frac{9}{72}$	$\frac{9}{72} \times 360^{\circ} = 45^{\circ}$
Tamil	7	$\frac{7}{72}$	$\frac{7}{72} \times 360^{\circ} = 35^{\circ}$

Bengali	4	$\frac{4}{72}$	$\frac{4}{72} \times 360º = 20º$

A pie chart of the above data is as follows.

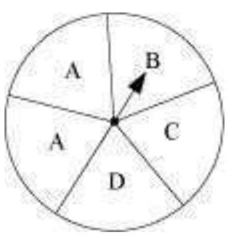


Exercise 5.3 : Solutions of Questions on Page Number : 87

Q1 :

List the outcomes you can see in these experiments.

(a) Spinning a wheel



(b) Tossing two coins together

Answer :

(a) On spinning the given wheel, the possible outcomes are A, B, C, D.

(b) By tossing two coins together, the possible outcomes are HT, TH, HH, TT where H and T represents Head and Tail of the coins respectively.

Q2 :

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 :

When a dice is thrown, the possible outcomes are 1, 2, 3, 4, 5, and 6.

(i) (a) Out of these outcomes, 2, 3, 5 are prime numbers. Hence, these are the outcomes of an event of getting a prime number on the face of a dice.

(b) Out of these outcomes, 1, 4, 6 are not prime numbers. Hence, these are the outcomes of an event of not getting a prime number on the face of a dice.

(ii) (a) Out of these outcomes, a number greater than 5 is possible when 6 comes on the face of the dice.

(b) Out of these outcomes, a number not greater than 5 is possible when the number on the face of the dice is any one of the outcomes 1, 2, 3, 4, 5.

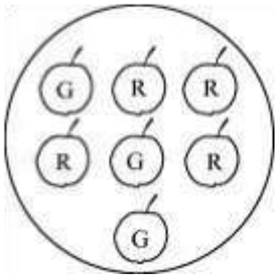
Q3 :

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 :

(i) The pointer can stop at one of the following regions.

A, A, B, C, D

Out of these 5 cases, it is possible only in 1 case that the pointer will stop at region D.

Therefore, probability that the pointer will stop at region D = $\frac{1}{5}$

(ii) There are 52 cards in a deck of cards and there are 4 ace cards in 1 deck of cards.

Probability of getting an ace card = $\frac{4}{52}=\frac{1}{13}$

(iii) There are a total of 7 apples, out of which, 4 are red and 3 are green.

Probability of getting a red apple = $\frac{4}{7}$

Q4 :

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 :

(i) There are 10 slips in the box. However, 6 is written only on 1 slip.

Probability of getting a number 6 = $\frac{1}{10}$

(ii) The numbers less than 6 are 1, 2, 3, 4, 5.

Probability of getting a number less than 6 = $\frac{5}{10} = \frac{1}{2}$

(iii) The numbers greater than 6 are 7, 8, 9, 10.

Probability of getting a number greater than 6 = $\frac{4}{10} = \frac{2}{5}$

(iv) There are 9 numbers which are single digit numbers.

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

Probability of getting a single digit number = $\frac{9}{10}$

Q5 :

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 non blue sector

Answer :

Total sectors = 3 + 1 + 1 = 5

There are 5 sectors and we can get a green sector in three cases.

Probability of getting a green sector = $\frac{3}{5}$

We will get a non blue sector when we will get either a green sector or a red sector. Hence, 4 cases of such type are possible in which we will get a non blue sector.

Probability of getting a non blue sector = $\frac{4}{5}$

Q6 :

Find the probabilities of the events given in Question 2.

Answer :

(i) (a) Out of 6 possible outcomes, a prime number can be obtained in three cases. Therefore,

probability of getting a prime number = $\frac{3}{6} = \frac{1}{2}$

(b) Out of 6 possible outcomes, a prime number may not be obtained in three cases.

Therefore, probability of getting not a prime number = $\frac{3}{6} = \frac{1}{2}$

(ii) (a) Out of 6 possible outcomes, a number greater than 5 can be obtained in only 1 case.

Therefore, probability of getting a number greater than 5 = $\frac{1}{6}$

(b) Out of 6 possible outcomes, a number not greater than 5 can be obtained in 5 cases.

Therefore, probability of getting a number not greater than 5 = $\frac{5}{6}$

Exercise 6.1 : Solutions of Questions on Page Number : 96

Q1 :

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 :

We know that if a number has its unit's place digit as *a*, then its square will end with the unit digit of the multiplication *a* x *a*.

(i) 81

Since the given number has its unit's place digit as 1, its square will end with the unit digit of the multiplication (1 x 1 = 1) i.e., 1.

(ii) 272

Since the given number has its unit's place digit as 2, its square will end with the unit digit of the multiplication (2 x 2 = 4) i.e., 4.

(iii) 799

Since the given number has its unit's place digit as 9, its square will end with the unit digit of the multiplication (9 x 9 = 81) i.e., 1.

(iv) 3853

Since the given number has its unit's place digit as 3, its square will end with the unit digit of the multiplication (3 x 3 = 9) i.e., 9.

(v) 1234

Since the given number has its unit's place digit as 4, its square will end with the unit digit of the multiplication (4 x 4 = 16) i.e., 6.

(vi) 26387

Since the given number has its unit's place digit as 7, its square will end with the unit digit of the multiplication (7 x 7 = 49) i.e., 9.

(vii) 52698

Since the given number has its unit's place digit as 8, its square will end with the unit digit of the multiplication (8 x 8 = 64) i.e., 4. (viii) 99880

Since the given number has its unit's place digit as 0, its square will have two zeroes at the end. Therefore, the unit digit of the square of the given number is 0.

(xi) 12796

Since the given number has its unit's place digit as 6, its square will end with the unit digit of the multiplication (6 x 6 = 36) i.e., 6.

(x) 55555

Since the given number has its unit's place digit as 5, its square will end with the unit digit of the multiplication (5 x 5 = 25) i.e., 5.

Q2 :

The following numbers are obviously not perfect squares. Give reason.

(i) 1057 (ii) 23453

(iii) 7928 (iv) 222222

(v) 64000 (vi) 89722

(vii) 222000 (viii) 505050

Answer :

The square of numbers may end with any one of the digits 0, 1, 5, 6, or 9. Also, a perfect square has even number of zeroes at the end of it.

(i) 1057 has its unit place digit as 7. Therefore, it cannot be a perfect square.

(ii) 23453 has its unit place digit as 3. Therefore, it cannot be a perfect square.

(iii) 7928 has its unit place digit as 8. Therefore, it cannot be a perfect square.

(iv) 222222 has its unit place digit as 2. Therefore, it cannot be a perfect square.

(v) 64000 has three zeros at the end of it. However, since a perfect square cannot end with odd number of zeroes, it is not a perfect square.

(vi) 89722 has its unit place digit as 2. Therefore, it cannot be a perfect square.

(vii) 222000 has three zeroes at the end of it. However, since a perfect square cannot end with odd number of zeroes, it is not a perfect square.

(viii) 505050 has one zero at the end of it. However, since a perfect square cannot end with odd number of zeroes, it is not a perfect square.

Q3 :

The squares of which of the following would be odd numbers?

(i) 431 (ii) 2826

(iii) 7779 (iv) 82004

Answer :

The square of an odd number is odd and the square of an even number is even. Here, 431 and 7779 are odd numbers.

Thus, the square of 431 and 7779 will be an odd number.

Q4 :

Observe the following pattern and find the missing digits.
$11^2 = 121$

$101^2 = 10201$

$1001^2 = 1002001$

$100001^2 = 1…2…1$

$10000001^2 = …$

Answer :

In the given pattern, it can be observed that the squares of the given numbers have the same number of zeroes before and after the digit 2 as it was in the original number. Therefore,

$100001^2 = 10000200001$

$10000001^2 = 100000020000001$

Q5 :

Observe the following pattern and supply the missing number.

$11^2 = 121$

$101^2 = 10201$

$10101^2 = 102030201$

$1010101^2 = …$

$…^2 = 10203040504030201$

Answer :

By following the given pattern, we obtain

$1010101^2 = 1020304030201$

$101010101^2 = 10203040504030201$

Q6 :

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 :

From the given pattern, it can be observed that,

(i) The third number is the product of the first two numbers.

(ii) The fourth number can be obtained by adding 1 to the third number.

Thus, the missing numbers in the pattern will be as follows.

$4^2 + 5^2 + \underline{20^2} = 21^2$

$5^2 + \underline{6^2} + 30^2 = 31^2$

$6^2 + 7^2 + \underline{42^2} = \underline{43^2}$

Q7 :

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 :

We know that the sum of first *n* odd natural numbers is n^2.

(i) Here, we have to find the sum of first five odd natural numbers.

Therefore, 1 + 3 + 5 + 7 + 9 = $(5)^2$ = 25

(ii) Here, we have to find the sum of first ten odd natural numbers.

Therefore, 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 = $(10)^2$ = 100

(iii) Here, we have to find the sum of first twelve odd natural numbers.

Therefore, 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 +17 + 19 + 21 + 23 = $(12)^2$ = 144

Q8 :

(i) Express 49 as the sum of 7 odd numbers.

(ii) Express 121 as the sum of 11odd numbers.

Answer :

We know that the sum of first *n* odd natural numbers is n^2.

(i) $49 = (7)^2$

Therefore, 49 is the sum of first 7 odd natural numbers.

$49 = 1 + 3 + 5 + 7 + 9 + 11 + 13$

(ii) $121 = (11)^2$

Therefore, 121 is the sum of first 11 odd natural numbers.
$121 = 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21$

Q9 :

How many numbers lie between squares of the following numbers?

(i) 12 and 13 (ii) 25 and 26 (iii) 99 and 100

Answer :

We know that there will be $2n$ numbers in between the squares of the numbers n and $(n + 1)$.

(i) Between 12^2 and 13^2, there will be 2 x 12 = 24 numbers

(ii) Between 25^2 and 26^2, there will be 2 x 25 = 50 numbers

(iii) Between 99^2 and 100^2, there will be 2 x 99 = 198 numbers

Exercise 6.2 : Solutions of Questions on Page Number : 98

Q1 :

Find the square of the following numbers

(i) 32 (ii) 35

(iii) 86 (iv) 93

(v) 71 (vi) 46

Answer :

(i) $32^2 = (30 + 2)^2$

$= 30 (30 + 2) + 2 (30 + 2)$

$= 30^2 + 30 \times 2 + 2 \times 30 + 2^2$

$= 900 + 60 + 60 + 4$
$= 1024$

(ii) The number 35 has 5 in its unit's place. Therefore,

$35^2 = (3) (3 + 1)$ hundreds $+ 25$

$= (3 \times 4)$ hundreds $+ 25$

$= 1200 + 25 = 1225$

(iii) $86^2 = (80 + 6)^2$

$= 80 (80 + 6) + 6 (80 + 6)$

$= 80^2 + 80 \times 6 + 6 \times 80 + 6^2$

$= 6400 + 480 + 480 + 36$

$= 7396$

(iv) $93^2 = (90 + 3)^2$

$= 90 (90 + 3) + 3 (90 + 3)$

$= 90^2 + 90 \times 3 + 3 \times 90 + 3^2$

$= 8100 + 270 + 270 + 9$

$= 8649$

(v) $71^2 = (70 + 1)^2$

$= 70 (70 + 1) + 1 (70 + 1)$

$= 70^2 + 70 \times 1 + 1 \times 70 + 1^2$

$= 4900 + 70 + 70 + 1$

$= 5041$

(vi) $46^2 = (40 + 6)^2$

$= 40 (40 + 6) + 6 (40 + 6)$

$= 40^2 + 40 \times 6 + 6 \times 40 + 6^2$
$= 1600 + 240 + 240 + 36$

$= 2116$

Q2 :

Write a Pythagorean triplet whose one member is

(i) 6 (ii) 14

(iii) 16 (iv) 18

Answer :

For any natural number $m > 1$, $2m$, $m^2 - 1$, $m^2 + 1$ forms a Pythagorean triplet.

(i) If we take $m^2 + 1 = 6$, then $m^2 = 5$

The value of m will not be an integer.

If we take $m^2 - 1 = 6$, then $m^2 = 7$

Again the value of m is not an integer.

Let $2m = 6$ $m = 3$

Therefore, the Pythagorean triplets are 2×3, $3^2 - 1$, $3^2 + 1$ or 6, 8, and 10.

(ii) If we take $m^2 + 1 = 14$, then $m^2 = 13$

The value of m will not be an integer.

If we take $m^2 - 1 = 14$, then $m^2 = 15$

Again the value of m is not an integer.

Let $2m = 14$ $m = 7$

Thus, $m^2 - 1 = 49 - 1 = 48$ and $m^2 + 1 = 49 + 1 = 50$

Therefore, the required triplet is 14, 48, and 50.

(iii) If we take $m^2 + 1 = 16$, then $m^2 = 15$

The value of m will not be an integer.

If we take $m^2 - 1= 16$, then $m^2 = 17$

Again the value of m is not an integer.

Let $2m = 16$ $m = 8$

Thus, $m^2 - 1 = 64 - 1 = 63$ and $m^2 + 1 = 64 + 1 = 65$

Therefore, the Pythagorean triplet is 16, 63, and 65.

(iv) If we take $m^2 + 1 = 18$, $m^2 = 17$

The value of m will not be an integer.

If we take m^2 - 1 = 18, then m^2 = 19

Again the value of m is not an integer.

Let 2m =18 m = 9

Thus, m^2 - 1 = 81 - 1 = 80 and m^2 + 1 = 81 + 1 = 82

Therefore, the Pythagorean triplet is 18, 80, and 82.

Exercise 6.3 : Solutions of Questions on Page Number : 102

Q1 :

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 :

(i) If the number ends with 1, then the one's digit of the square root of that number may be 1 or 9. Therefore, one's digit of the square root of 9801 is either 1 or 9.

(ii) If the number ends with 6, then the one's digit of the square root of that number may be 4 or 6. Therefore, one's digit of the square root of 99856 is either 4 or 6.

(iii) If the number ends with 1, then the one's digit of the square root of that number may be 1 or 9. Therefore, one's digit of the square root of 998001 is either 1 or 9.

(iv) If the number ends with 5, then the one's digit of the square root of that number will be 5. Therefore, the one's digit of the square root of 657666025 is 5.

Q2 :

Without doing any calculation, find the numbers which are surely not perfect squares.

(i) 153 (ii) 257

(iii) 408 (iv) 441

Answer :

The perfect squares of a number can end with any of the digits 0, 1, 4, 5, 6, or 9 at unit's place. Also, a perfect square will end with even number of zeroes, if any.

(i) Since the number 153 has its unit's place digit as 3, it is not a perfect square.

(ii) Since the number 257 has its unit's place digit as 7, it is not a perfect square.

(iii) Since the number 408 has its unit's place digit as 8, it is not a perfect square.

(iv) Since the number 441 has its unit's place digit as 1, it is a perfect square.

Q3 :

Find the square roots of 100 and 169 by the method of repeated subtraction.

Answer :

We know that the sum of the first n odd natural numbers is n^2.

Consider $\sqrt{100}$.

(i) 100 - 1 = 99 (ii) 99 - 3 = 96 (iii) 96 - 5 = 91

(iv) 91 - 7 = 84 (v) 84 - 9 = 75 (vi) 75 - 11= 64

(vii) 64 - 13 = 51 (viii) 51 - 15 = 36 (ix) 36 - 17 = 19

(x) 19 - 19 = 0

We have subtracted successive odd numbers starting from 1 to 100, and obtained 0 at 10^{th} step.

Therefore, $\sqrt{100} = 10$

The square root of 169 can be obtained by the method of repeated subtraction as follows.

(i) 169 - 1 = 168 (ii) 168 - 3 = 165 (iii) 165 - 5 = 160

(iv) 160 - 7 = 153 (v) 153 - 9 = 144 (vi) 144 - 11 = 133

(vii) 133 - 13 = 120 (viii) 120 - 15 = 105 (ix) 105 - 17 = 88

(x) 88 - 19 = 69 (xi) 69 - 21 = 48 (xii) 48 - 23 = 25

(xiii)25 - 25 = 0

We have subtracted successive odd numbers starting from 1 to 169, and obtained 0 at 13th step.

Therefore, $\sqrt{169} = 13$

Q4 :
Find the square roots of the following numbers by the Prime Factorisation Method.

(i) 729 (ii) 400

(iii) 1764 (iv) 4096

(v) 7744 (vi) 9604

(vii) 5929 (viii) 9216

(ix) 529 (x) 8100

Answer :

(i) 729 can be factorised as follows.

3	729
3	243
3	81
3	27
3	9
3	3
	1

729 = $\underline{3 \times 3} \times \underline{3 \times 3} \times \underline{3 \times 3}$

$\therefore \sqrt{729} = 3 \times 3 \times 3$ = 27

(ii) 400 can be factorised as follows.

2	400
2	200
2	100
2	50
5	25
5	5
	1

400 = $\underline{2 \times 2} \times \underline{2 \times 2} \times \underline{5 \times 5}$

$\therefore \sqrt{400} = 2 \times 2 \times 5$ = 20

(iii) 1764 can be factorised as follows.

2	1764
2	882
3	441
3	147
7	49
7	7
	1

1764 = 2 × 2 × 3 × 3 × 7 × 7

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

(iv) 4096 can be factorised as follows.

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

4096 = 2 Ãƒ

Q5 :

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 :

(i)252 can be factorised as follows.

2	252
2	126
3	63
3	21
7	7
	1

252 = $\underline{2 \times 2} \times \underline{3 \times 3} \times 7$

Here, prime factor 7 does not have its pair.

If 7 gets a pair, then the number will become a perfect square. Therefore, 252 has to be multiplied with 7 to obtain a perfect square.

$252 \times 7 = \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{7 \times 7}$

Therefore, 252 × 7 = 1764 is a perfect square.

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

(ii)180 can be factorised as follows.

2	180
2	90
3	45
3	15
5	5
	1

$180 = \underline{2 \times 2} \times \underline{3 \times 3} \times 5$

Here, prime factor 5 does not have its pair. If 5 gets a pair, then the number will become a perfect square. Therefore, 180 has to be multiplied with 5 to obtain a perfect square.

$180 \times 5 = 900 = \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{5 \times 5}$

Therefore, 180 × 5 = 900 is a perfect square.

$\therefore \sqrt{900} = 2 \times 3 \times 5 = 30$

(iii)1008 can be factorised as follows.

2	1008
2	504
2	252
2	126
3	63
3	21
7	7
	1

1008 = $\underline{2 \times 2} \times \underline{2 \times 2} \times \underline{3 \times 3} \times 7$

Here, prime factor 7 does not have its pair. If 7 gets a pair, then the number will become a perfect square. Therefore, 1008 can be multiplied with 7 to obtain a perfect square.

1008 × 7 = 7056 = $\underline{2 \times 2} \times \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{7 \times 7}$

Therefore, 1008 × 7 = 7056 is a perfect square.

∴ $\sqrt{7056} = 2 \times 2 \times 3 \times 7$ = 84

(iv) 2028 can be factorised as follows.

2	2028
2	1014

Q6 :

For each of the following numbers, find the smallest whole number by which it should be divided so as to get a perfect square number. Also find the square root of the square number so obtained.

(i) 252 (ii) 2925

(iii) 396 (iv) 2645

(v) 2800 (vi) 1620

Answer :

(i) 252 can be factorised as follows.

2	252
2	126
3	63
3	21
7	7
	1

$252 = \underline{2\times2}\times\underline{3\times3}\times7$

Here, prime factor 7 does not have its pair.

If we divide this number by 7, then the number will become a perfect square. Therefore, 252 has to be divided by 7 to obtain a perfect square.

252 ÃƒÂ·7 = 36 is a perfect square.

$36 = \underline{2\times2}\times\underline{3\times3}$

$\therefore \sqrt{36} = 2\times3 = 6$

(ii) 2925 can be factorised as follows.

3	2925
3	975
5	325
5	65
13	13
	1

$$2925 = \underline{3\times3}\times\underline{5\times5}\times13$$

Here, prime factor 13 does not have its pair.

If we divide this number by 13, then the number will become a perfect square. Therefore, 2925 has to be divided by 13 to obtain a perfect square.

2925 ÃƒÂ·13 = 225 is a perfect square.

$$225 = \underline{3\times3}\times\underline{5\times5}$$
$$\therefore \sqrt{225} = 3\times5 = 15$$

(iii)396 can be factorised as follows.

2	396
2	198
3	99
3	33
11	11
	1

$396 = \underline{2 \times 2} \times \underline{3 \times 3} \times 11$

Here, prime factor 11 does not have its pair.

If we divide this number by 11, then the number will become a perfect square. Therefore, 396 has to be divided by 11 to obtain a perfect square.
396 ÃƒÂ·11 = 36 is a perfect square.

$36 = \underline{2 \times 2} \times \underline{3 \times 3}$

$\therefore \sqrt{36} = 2 \times 3 = 6$

(iv) 2645 can be factorised as follows.

5	2645

Q7 :

The students of Class VIII of a school donated Rs 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 :

It is given that each student donated as many rupees as the number of students of the class. Number of students in the class will be the square root of the amount donated by the students of the class.

The total amount of donation is Rs 2401.

Number of students in the class = $\sqrt{2401}$

$2401 = \underline{7 \times 7} \times \underline{7 \times 7}$

$\therefore \sqrt{2401} = 7 \times 7 = 49$

Hence, the number of students in the class is 49.

Q8 :

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 :

It is given that in the garden, each row contains as many plants as the number of rows.

Hence,

Number of rows = Number of plants in each row

Total number of plants = Number of rows × Number of plants in each row

Number of rows × Number of plants in each row = 2025

(Number of rows)^2 = 2025

$\text{Number of rows} = \sqrt{2025}$

$2025 = \underline{5 \times 5} \times \underline{3 \times 3} \times \underline{3 \times 3}$

$\therefore \sqrt{2025} = 5 \times 3 \times 3 = 45$

Thus, the number of rows and the number of plants in each row is 45.

Q9 :

Find the smallest square number that is divisible by each of the numbers 4, 9, and 10.

Answer :

The number that will be perfectly divisible by each one of 4, 9, and 10 is their LCM. The LCM of these numbers is as follows.

2	4, 9, 10
2	2, 9, 5
3	1, 9, 5
3	1, 3, 5
5	1, 1, 5
	1, 1, 1

LCM of 4, 9, 10 = $\underline{2 \times 2} \times \underline{3 \times 3} \times 5$ =180

Here, prime factor 5 does not have its pair. Therefore, 180 is not a perfect square. If we multiply 180 with 5, then the number will become a perfect square. Therefore, 180 should be multiplied with 5 to obtain a perfect square.

Hence, the required square number is 180 × 5 = 900

Q10 :

Find the smallest square number that is divisible by each of the numbers 8, 15,

and 20.

Answer :

The number that is perfectly divisible by each of the numbers 8, 15, and 20 is their LCM.

2	8, 15, 20
2	4, 15, 10
2	2, 15, 5

3	1, 15, 5
5	1, 5, 5
	1, 1, 1

LCM of 8, 15, and 20 = $\underline{2 \times 2} \times 2 \times 3 \times 5 = 120$

Here, prime factors 2, 3, and 5 do not have their respective pairs. Therefore, 120 is not a perfect square.
Therefore, 120 should be multiplied by 2 × 3 × 5, i.e. 30, to obtain a perfect square.

Hence, the required square number is 120 × 2 × 3 × 5 = 3600

Exercise 6.4 : Solutions of Questions on Page Number : 107

Q1 :

Find the square root 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 :

(i) The square root of 2304 can be calculated as follows.

	48
4	$\overline{23}\,\overline{04}$ -16
88	704 704
	0

$\therefore \sqrt{2304} = 48$

(ii) The square root of 4489 can be calculated as follows.

	67
6	$\overline{44}\,\overline{89}$ -36
127	889 889
	0

$\therefore \sqrt{4489} = 67$

(iii) The square root of 3481 can be calculated as follows.

	59
5	$\overline{34}\,\overline{81}$ -25

109	981 981
	0

Therefore, $\sqrt{3481} = 59$

(iv) The square root of 529 can be calculated as follows.

	23
2	$\overline{5}\,\overline{29}$ -4
43	129 129
	0

$\therefore \sqrt{529} = 23$

(v) The square root of 3249 can be calculated as follows.

	57
5	$\overline{32}\,\overline{49}$ -25
107	749 749
	0

$\therefore$

Q2 :

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 :

(i) By placing bars, we obtain

$$64 = \overline{64}$$

Since there is only one bar, the square root of 64 will have only one digit in it.
(ii) By placing bars, we obtain

$$144 = \overline{1}\,\overline{44}$$

Since there are two bars, the square root of 144 will have 2 digits in it.

(iii) By placing bars, we obtain

$$4489 = \overline{44}\,\overline{89}$$

Since there are two bars, the square root of 4489 will have 2 digits in it.

(iv) By placing bars, we obtain

$$27225 = \overline{2}\,\overline{72}\,\overline{25}$$

Since there are three bars, the square root of 27225 will have three digits in it.

(v) By placing the bars, we obtain

$390625 = \overline{39}\,\overline{06}\,\overline{25}$

Since there are three bars, the square root of 390625 will have 3 digits in it.

Q3 :

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 :

(i) The square root of 2.56 can be calculated as follows.

	1. 6
1	$\overline{2}.\overline{56}$ -1
26	156 156
	0

$\therefore \sqrt{2.56} = 1.6$

(ii) The square root of 7.29 can be calculated as follows.

	2. 7
2	$\overline{7}.\overline{29}$ -4
47	329 329
	0

$\therefore \sqrt{7.29} = 2.7$

(iii) The square root of 51.84 can be calculated as follows.

	7.2
7	$\overline{51}.\overline{84}$ -49
142	284 284
	0

$\therefore \sqrt{51.84} = 7.2$

(iv) The square root of 42.25 can be calculated as follows.

	6.5
6	$\overline{42}.\overline{25}$ -36

125	625 625
	0

∴ $\sqrt{42.25} = 6.5$

(v) The square root of 31.36 can be calculated as follows.

	5.6
5	$\overline{31}.\overline{36}$ -25
106	636 636
	0

∴

Q4 :

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 :

(i) The square root of 402 can be calculated by long division method as follows.

	20
2	$\overline{4}\,\overline{02}$ -4
40	02 00
	2

The remainder is 2. It represents that the square of 20 is less than 402 by 2. Therefore, a perfect square will be obtained by subtracting 2 from the given number 402.

Therefore, required perfect square = 402 - 2 = 400

And, $\sqrt{400} = 20$

(ii) The square root of 1989 can be calculated by long division method as follows.

	44
4	$\overline{19}\,\overline{89}$ -16
84	389 336
	53

The remainder is 53. It represents that the square of 44 is less than 1989 by 53. Therefore, a perfect square will be obtained by subtracting 53 from the given number 1989.

Therefore, required perfect square = 1989 - 53 = 1936

And, $\sqrt{1936} = 44$

(iii) The square root of 3250 can be calculated by long division method as follows.

	57
5	$\overline{32}\,\overline{50}$ -25
107	750 749
	1

The remainder is 1. It represents that the square of 57 is less than 3250 by 1. Therefore, a perfect square can be obtained by subtracting 1 from the given number 3250.

Therefore, required perfect square = 3250 - 1 = 3249

And, $\sqrt{3249} = 57$

(iv) The square root of 825 can be calculated by long division method as follows.

	28
2	$\overline{8}\,\overline{25}$ -4

48	425 384
	41

The remainder is 41. It represents that the square of 28 is less than 825 by 41. Therefore, a perfect square can be calculated by subtracting

Q5 :

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 :

(i) The square root of 525 can be calculated by long division method as follows.

	22
2	$\overline{5}\,\overline{25}$ -4
42	125 84

	41

The remainder is 41.

It represents that the square of 22 is less than 525.

Next number is 23 and $23^2 = 529$

Hence, number to be added to 525 = $23^2 - 525 = 529 - 525 = 4$

The required perfect square is 529 and $\sqrt{529} = 23$

(ii) The square root of 1750 can be calculated by long division method as follows.

	41
4	$\overline{17}\,\overline{50}$ -16
81	150 81
	69

The remainder is 69.

It represents that the square of 41 is less than 1750.

The next number is 42 and $42^2 = 1764$

Hence, number to be added to 1750 = $42^2 - 1750 = 1764 - 1750 = 14$

The required perfect square is 1764 and $\sqrt{1764} = 42$

(iii) The square root of 252 can be calculated by long division method as follows.

	15
1	$\overline{2}\,\overline{52}$ -1
25	152 125
	27

The remainder is 27. It represents that the square of 15 is less than 252.

The next number is 16 and $16^2 = 256$

Hence, number to be added to 252 = 16^2 - 252 = 256 - 252 = 4

The required perfect square is 256 and $\sqrt{256} = 16$

(iv) The square root of 1825 can be calculated by long division method as follows.

	42
4	$\overline{18}\,\overline{25}$ -16
82	225 164
	61

The remainder is 61. It represents that the square of 42

Q6 :

Find the length of the side of a square whose area is 441 m^2.

Answer :

Let the length of the side of the square be x m.

Area of square = $(x)^2 = 441\ m^2$

$x = \sqrt{441}$

The square root of 441 can be calculated as follows.

	21
2	$\overline{4}\,\overline{41}$ -4
41	041 41
	0

$\therefore\ x = 21$ m

Hence, the length of the side of the square is 21 m.

Q7 :

In a right triangle ABC, ∠B = 90°.

(a) If AB = 6 cm, BC = 8 cm, find AC

(b) If AC = 13 cm, BC = 5 cm, find AB

Answer :

(a) ΔABC is right-angled at B.

Therefore, by applying Pythagoras theorem, we obtain

$AC^2 = AB^2 + BC^2$

$AC^2 = (6\text{ cm})^2 + (8\text{ cm})^2$

$AC^2 = (36 + 64)\text{ cm}^2 = 100\text{ cm}^2$

AC= $\left(\sqrt{100}\right)\text{ cm} = \left(\sqrt{10\times10}\right)\text{ cm}$

AC = 10 cm

(b) ΔABC is right-angled at B.

Therefore, by applying Pythagoras theorem, we obtain

$AC^2 = AB^2 + BC^2$
$(13\text{ cm})^2 = (AB)^2 + (5\text{ cm})^2$

$AB^2 = (13\text{ cm})^2 - (5\text{ cm})^2 = (169 - 25)\text{ cm}^2 = 144\text{ cm}^2$

AB= $\left(\sqrt{144}\right)\text{ cm} = \left(\sqrt{12\times12}\right)\text{ cm}$

AB = 12 cm

Q8 :

A gardener has 1000 plants. He wants to plant these in such a way that the number of rows and the number of columns remain same. Find the minimum number of plants he needs more for this.

Answer :

It is given that the gardener has 1000 plants. The number of rows and the number of columns is the same.

We have to find the number of more plants that should be there, so that when the gardener plants them, the number of rows and columns are same.

That is, the number which should be added to 1000 to make it a perfect square has to be calculated.

The square root of 1000 can be calculated by long division method as follows.

	31
3	$\overline{10}\,\overline{00}$ -9
61	100 61
	39

The remainder is 39. It represents that the square of 31 is less than 1000.

The next number is 32 and $32^2 = 1024$

Hence, number to be added to 1000 to make it a perfect square

$= 32^2 - 1000 = 1024 - 1000 = 24$

Thus, the required number of plants is 24.

Q9 :

These 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 :

It is given that there are 500 children in the school. They have to stand for a P.T. drill such that the number of rows is equal to the number of columns.

The number of children who will be left out in this arrangement has to be calculated. That is, the number which should be subtracted from 500 to make it a perfect square has to be calculated.

The square root of 500 can be calculated by long division method as follows.

	22
2	$\overline{5}\,\overline{00}$ -4
42	100 84
	16

The remainder is 16.
It shows that the square of 22 is less than 500 by 16. Therefore, if we subtract 16 from 500, we will obtain a perfect square.

Required perfect square = 500 - 16 = 484

Thus, the number of children who will be left out is 16.

Class –VIII Mathematics (Ex. 7.1)

Answers

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

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

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

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.

Class –VIII Mathematics (Ex. 7.2)

Answers

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

2. (i) False

Since, $1^3 = 1, 3^3 = 27, 5^3 = 125, \ldots\ldots\ldots\ldots$ 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]

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 : Solutions of Questions on Page Number : 119

Q1 :

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) 5 m to 10 km

(c) 50 paise to Rs 5

Answer :

(a) Ratio of the speed of cycle to the speed of scooter $= \frac{15}{30} = 1:2$

(b) Since 1 km = 1000 m,

Required ratio $= \frac{5\text{ m}}{10\text{ km}} = \frac{5\text{ m}}{10 \times 1000\text{ m}} = 1:2000$

(c) Since Re 1 = 100 paise,

Required ratio $= \frac{50\text{ paise}}{\text{Rs } 5} = \frac{50\text{ paise}}{500\text{ paise}} = 1:10$

Q2 :

Convert the following ratios to percentages.

(a) 3:4 (b) 2:3

Answer :

(a) $3:4 = \frac{3}{4} = \frac{3}{4} \times \frac{100}{100} = \frac{3}{4} \times 100\% = 75\%$

(b) $2:3=\frac{2}{3}=\frac{2}{3}\times\frac{100}{100}=\frac{2}{3}\times100\%=\frac{200}{3}\%$

$=\left(\frac{66\times3+2}{3}\right)\%=66\frac{2}{3}\%$

Q3 :

72% of 25 students are good in mathematics. How many are not good in mathematics?

Answer :

It is given that 72% of 25 students are good in mathematics.

Therefore,

Percentage of students who are not good in mathematics = (100 - 72)%

= 28%

∴Number of students who are not good in mathematics = $\frac{28}{100}\times25$

= 7

Thus, 7 students are not good in mathematics.

Q4 :

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 :

Let the total number of matches played by the team be *x*.

It is given that the team won 10 matches and the winning percentage of the team was 40%. Therefore,

$$\frac{40}{100} \times x = 10$$
$$x = 10 \times \frac{100}{40}$$
$$x = 25$$

Thus, the team played 25 matches.

Q5 :

If Chameli had Rs 600 left after spending 75% of her money, how much did she have in the beginning?

Answer :

Let the amount of money which Chameli had in the beginning be *x*.

It is given that after spending 75% of Rs *x*, she was left with Rs 600.

Therefore,

(100 - 75)% of *x* = Rs 600

Or, 25 % of *x* = Rs 600

$$\frac{25}{100} \times x = \text{Rs } 600$$
$$x = \text{Rs } \left(600 \times \frac{100}{25}\right) = \text{Rs } 2400$$

Thus, she had Rs 2400 in the beginning.

Q6 :

If 60% people in city like cricket, 30% like football and the remaining like other games, then what per cent 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 :

Percentage of people who like other games = (100 - 60 - 30)%

= (100 - 90)% = 10 %

Total number of people = 50 lakh

Therefore, number of people $= \left(\frac{60}{100} \times 50\right)$ lakh who like cricket = 30 lakh

$= \left(\frac{30}{100} \times 50\right)$ lakh = 15 lakh

Number of people who like football

$= \left(\frac{10}{100} \times 50\right)$ lakh

Number of people who like other games = 5 lakh

Exercise 8.2 : Solutions of Questions on Page Number : 125

Q1 :

A man got a 10% increase in his salary. If his new salary is Rs 1,54,000, find his original salary.

Answer :

Let the original salary be *x*. It is given that the new salary is Rs 1,54,000.

Original salary + Increment = New salary

However, it is given that the increment is 10% of the original salary.

Therefore,

$$x+\frac{10}{100}\times x=154000$$
$$\frac{110x}{100}=154000$$
$$x=\left(154000\times\frac{100}{110}\right)$$
$$x=140000$$

Thus, the original salary was Rs 1,40,000.

Q2 :

On Sunday 845 people went to the Zoo. On Monday only 169 people went. What is the per cent decrease in the people visiting the zoo on Monday?

Answer :

It is given that on Sunday, 845 people went to the zoo and on Monday, 169 people went.

Decrease in the number of people = 845 - 169 = 676

Percentage decrease = $\left(\frac{\text{Decrease in the number of people }\times 100}{\text{Number of people who went to zoo on sunday}}\right)\%$

$$=\left(\frac{676}{845}\times 100\right)\%$$
$$=80\%$$

Q3 :

A shopkeeper buys 80 articles for Rs 2,400 and sells them for a profit of 16%. Find the selling price of one article.

Answer :

It is given that the shopkeeper buys 80 articles for Rs 2,400.

Cost of one article = $\text{Rs } \frac{2400}{80} = \text{Rs } 30$

Profit percent = 16

$$\text{Profit Percent} = \frac{\text{Profit}}{\text{C.P.}} \times 100$$

$$16 = \frac{\text{Profit}}{\text{Rs } 30} \times 100$$
$$\text{Profit } = \text{Rs } \left(\frac{16 \times 30}{100}\right) = \text{Rs } 4.80$$

Selling price of one article = C.P. + Profit = Rs (30 + 4.80) = Rs 34.80

Q4 :

The cost of an article was Rs 15,500. Rs 450 were spent on its repairs. If it is sold for a profit of 15%, find the selling price of the article.

Answer :

Total cost of an article = Cost + Overhead expenses

= Rs 15500 + Rs 450

= Rs 15950

$$\text{Profit } \% = \frac{\text{Profit}}{\text{C.P.}} \times 100$$

$$15 = \frac{\text{Profit}}{\text{Rs } 15950} \times 100$$
$$\text{Profit} = \text{Rs } \left(\frac{15950 \times 15}{100}\right) = \text{Rs } 2392.50$$

∴Selling price of the article = C.P. + Profit = Rs (15950 + 2392.50)

= Rs 18342.50

Q5 :

A VCR and TV were bought for Rs 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 :

C.P. of a VCR = Rs 8000

The shopkeeper made a loss of 4 % on VCR.

This means if C.P. is Rs 100, then S.P. is Rs 96.

When C.P. is Rs 8000, S.P. = $\text{Rs}\left(\frac{96}{100}\times 8000\right)$ = Rs 7680

C.P. of a TV = Rs 8000

The shopkeeper made a profit of 8 % on TV.

This means that if C.P. is Rs 100, then S.P. is Rs 108.

When C.P. is Rs 8000, S.P. = $\text{Rs}\left(\frac{108}{100}\times 8000\right)$ = Rs 8640

Total S.P. = Rs 7680 + Rs 8640 = Rs 16320

Total C.P. = Rs 8000 + Rs 8000 = Rs 16000

Since total S.P.> total C.P., there was a profit.

Profit = Rs 16320 - Rs 16000 = Rs 320

$$\text{Profit }\% = \frac{\text{Profit}}{\text{C.P.}} \times 100$$
$$= \frac{320}{16000} \times 100 = 2\%$$

Therefore, the shopkeeper had a gain of 2% on the whole transaction.

Q6 :

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 Rs 1450 and two shirts marked at Rs 850 each?

Answer :

Total marked price = Rs (1,450 + 2 × 850) = Rs (1,450 +1,700) = Rs 3,150

Given that, discount % = 10%

Discount = $\text{Rs}\left(\frac{10}{100} \times 3150\right) = \text{Rs } 315$

Also, Discount = Marked price - Sale price

Rs 315 = Rs 3150 - Sale price

∴ Sale price = Rs (3150 - 315) = Rs 2835

Thus, the customer will have to pay Rs 2,835.

Q7 :

A milkman sold two of his buffaloes for Rs 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 :

S.P. of each buffalo = Rs 20000

The milkman made a gain of 5% while selling one buffalo.

This means if C.P. is Rs 100, then S.P. is Rs 105.

C.P. of one buffalo = $\text{Rs}\left(20000\times\frac{100}{105}\right)$ = Rs 19,047.62

Also, the second buffalo was sold at a loss of 10%.

This means if C.P. is Rs 100, then S.P. is Rs 90.

$\therefore$C.P. of other buffalo = $\text{Rs}\left(20000\times\frac{100}{90}\right)$ = Rs 22222.22

Total C.P. = Rs 19047.62 + Rs 22222.22 = Rs 41269.84

Total S.P. = Rs 20000 + Rs 20000 = Rs 40000

Loss = Rs 41269.84 - Rs 40000 = Rs 1269.84

Thus, the overall loss of milkman was Rs 1,269.84.

Q8 :

The price of a TV is Rs 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 :

On Rs 100, the tax to be paid = Rs 12

On Rs 13000, the tax to be paid will be $=\text{Rs}\left(\frac{12}{100}\times13000\right)$

= Rs 1560

Required amount = Cost + Sales Tax = Rs 13000 + Rs 1560

= Rs 14560

Thus, Vinod will have to pay Rs 14,560 for the T.V.

Q9 :

Arun bought a pair of skates at a sale where the discount given was 20%. If the amount he pays is Rs 1,600, find the marked price.

Answer :

Let the marked price be *x*.

$$\text{Discount percent} = \frac{\text{Discount}}{\text{Marked price}} \times 100$$

$$20 = \frac{\text{Discount}}{x} \times 100$$

$$\text{Discount} = \frac{20}{100} \times x = \frac{1}{5}x$$

Also,

Discount = Marked price - Sale price

$$\frac{1}{5}x = x - \text{Rs } 1600$$

$$x - \frac{1}{5}x = \text{Rs } 1600$$

$$\frac{4}{5}x = \text{Rs } 1600$$

$$x = \text{Rs } \left(1600 \times \frac{5}{4}\right) = \text{Rs } 2000$$

Thus, the marked price was Rs 2000.

Q10 :

I purchased a hair-dryer for Rs 5,400 including 8% VAT. Find the price before VAT was added.

Answer :

The price includes VAT.
Thus, 8% VAT means that if the price without VAT is Rs 100, then price including VAT will be Rs 108.

When price including VAT is Rs 108, original price = Rs 100

$$\text{When price including VAT is Rs 5400, original price } = \text{Rs}\left(\frac{100}{108}\times 5400\right)$$
$$= \text{Rs } 5000$$

Thus, the price of the hair-dryer before the addition of VAT was Rs 5,000.

Q11 :

I purchased a hair-dryer for Rs 5,400 including 8% VAT. Find the price before VAT was added.

Answer :

The price includes VAT.

Thus, 8% VAT means that if the price without VAT is Rs 100, then price including VAT will be Rs 108.

When price including VAT is Rs 108, original price = Rs 100

$$\text{When price including VAT is Rs 5400, original price } = \text{Rs}\left(\frac{100}{108}\times 5400\right)$$
$$= \text{Rs } 5000$$

Thus, the price of the hair-dryer before the addition of VAT was Rs 5,000.

Exercise 8.3 : Solutions of Questions on Page Number : 133

Q1 :

Calculate the amount and compound interest on

(a) Rs 10800 for 3 years at $12\frac{1}{2}\%$ per annum compounded annually.

(b) Rs 18000 $2\frac{1}{2}$ for years at 10% per annum compounded annually.

(c) Rs 62500 $1\frac{1}{2}$ for years at 8% per annum compounded half yearly. (d) Rs 8000 for 1 year at 9% per annum compound half yearly. (You could use the year by year calculation using SI formula to verify)

(e) Rs 10000 for 1 year at 8% per annum compounded half yearly.

Answer :

(a) Principal (P) = Rs 10, 800

Rate (R) = $12\frac{1}{2}\%$ = $\frac{25}{2}$ % (annual)

Number of years (*n*) = 3

Amount, A = $P\left(1+\frac{R}{100}\right)^{n}$

$$= \text{Rs}\left[10800\left(1+\frac{25}{200}\right)^{3}\right]$$
$$= \text{Rs}\left[10800\left(\frac{225}{200}\right)^{3}\right]$$
$$= \text{Rs}\left(10800\times\frac{225}{200}\times\frac{225}{200}\times\frac{225}{200}\right)$$
$$= \text{Rs } 15377.34375$$
$$= \text{Rs } 15377.34 \qquad (\text{approximately})$$

C.I. = A - P = Rs (15377.34 - 10800) = Rs 4,577.34

(b) Principal (P) = Rs 18,000

Rate (R) = 10% annual

Number of years (n) = $2\frac{1}{2}$ years

The amount for 2 years and 6 months can be calculated by first calculating the amount for 2 years using the compound interest formula, and then calculating the simple interest for 6 months on the amount obtained at the end of 2 years.

Firstly, the amount for 2 years has to be calculated.

$$A = \text{Rs}\left[18000\left(1+\frac{1}{10}\right)^{2}\right] = \text{Rs}\left(18000\times\frac{11}{10}\times\frac{11}{10}\right) = \text{Rs } 21780$$

By taking Rs 21780 as principal, the S.I.for the next $\frac{1}{2}$ year will be calculated.

$$\text{S.I.} = \text{Rs}\left(\frac{21780\times\frac{1}{2}\times10}{100}\right) = \text{Rs } 1089$$

∴ Interest for the first 2 years = Rs (21780 - 18000) = Rs 3780

And interest for the next $\frac{1}{2}$ year = Rs 1089

∴ Total C.I. = Rs 3780 + Rs 1089 = Rs 4,869

A = P + C.I. = Rs 18000 + Rs 4869 = Rs 22,869

(c) Principal (P) = Rs 62,500

Rate = 8% per annum or 4% per half year

Number of years = $1\frac{1}{2}$

There will be 3 half years in $1\frac{1}{2}$ years.

$$\begin{aligned} A = P\left(1+\frac{R}{100}\right)^n &= \text{Rs}\left[62500\left(1+\frac{4}{100}\right)^3\right] \\ &= \text{Rs}\left(62500\times\frac{26}{25}\times\frac{26}{25}\times\frac{26}{25}\right) \\ &= \text{Rs } 70304 \end{aligned}$$

C.I. = A - P = Rs 70304 - Rs 62500 = Rs 7,804

(d) Principal (P) = Rs 8000

Rate of interest = 9% per annum or $\frac{9}{2}$ % per half year

Number of years = 1 year

There will be 2 half years in 1 year.

$$A = P\left(1+\frac{R}{100}\right)^n$$

$$= \text{Rs}\left[8000\left(1+\frac{9}{200}\right)^2\right]$$

$$= \text{Rs}\left[8000\left(\frac{209}{200}\right)^2\right] = \text{Rs } 8,736.20$$

C.I. = A - P = Rs 8736.20 - Rs 8000 = Rs 736.20

(e) Principal (P) = Rs 10,000

Rate = 8% per annum or 4% per half year

Number of years = 1 year

There are 2 half years in 1 year.

$$A = P\left(1+\frac{R}{100}\right)^n$$

$$= \text{Rs}\left[10000\left(1+\frac{4}{100}\right)^2\right] = \text{Rs}\left[10000\left(1+\frac{1}{25}\right)^2\right]$$

$$= \text{Rs}\left(10000\times\frac{26}{25}\times\frac{26}{25}\right) = \text{Rs } 10,816$$

C.I. = A - P = Rs 10816 - Rs 10000 = Rs 816

Q2 :

Kamala borrowed Rs 26400 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 2^{nd} year

amount for $\frac{4}{12}$ years.)

Answer :

Principal (P) = Rs 26,400

Rate (R) = 15% per annum

Number of years (n) = $2\frac{4}{12}$ years

The amount for 2 years and 4 months can be calculated by first calculating the amount for 2 years using the compound interest formula, and then calculating the simple interest for 4 months on the amount obtained at the end of 2 years.

Firstly, the amount for 2 years has to be calculated.

$$A = \text{Rs}\left[26400\left(1+\frac{15}{100}\right)^2\right] = \text{Rs}\left[26400\left(1+\frac{3}{20}\right)^2\right]$$
$$= \text{Rs}\left(26400\times\frac{23}{20}\times\frac{23}{20}\right) = \text{Rs } 34,914$$

By taking Rs 34,914 as principal, the S.I. for the next $\frac{1}{3}$ years will be calculated.

$$\text{S.I.} = \text{Rs}\left(\frac{34914\times\frac{1}{3}\times 15}{100}\right) = \text{Rs } 1,745.70$$

Interest for the first two years = Rs (34914 - 26400) = Rs 8,514

And interest for the next $\frac{1}{3}$ year = Rs 1,745.70

Total C.I. = Rs (8514 + Rs 1745.70) = Rs 10,259.70

Amount = P + C.I. = Rs 26400 + Rs 10259.70 = Rs 36,659.70

Q3 :

Fabina borrows Rs 12,500 at 12% per annum for 3 years at simple interest and Radha borrows the same amount for the same time period at 10% per annum, compounded annually. Who pays more interest and by how much?

Answer :

Interest paid by Fabina = $\frac{P \times R \times T}{100}$

$$= \text{Rs}\left(\frac{12500 \times 12 \times 3}{100}\right) = \text{Rs } 4,500$$

Amount paid by Radha at the end of 3 years = A = $P\left(1+\frac{R}{100}\right)^n$

$$A = \text{Rs}\left[12500\left(1+\frac{10}{100}\right)^3\right]$$
$$= \text{Rs}\left(12500 \times \frac{110}{100} \times \frac{110}{100} \times \frac{110}{100}\right) = \text{Rs } 16,637.50$$

C.I. = A - P = Rs 16637.50 - Rs 12500 = Rs 4,137.50

The interest paid by Fabina is Rs 4,500 and by Radha is Rs 4,137.50.

Thus, Fabina pays more interest.

Rs 4500 - Rs 4137.50 = Rs 362.50

Hence, Fabina will have to pay Rs 362.50 more.

Q4 :

I borrowed Rs 12000 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 :

P = Rs 12000

R = 6% per annum

T = 2 years

$$\text{S.I.} = \frac{P \times R \times T}{100} = \text{Rs}\left(\frac{12000 \times 6 \times 2}{100}\right) = \text{Rs } 1,440$$

To find the compound interest, the amount (A) has to be calculated.

$$A = P\left(1 + \frac{R}{100}\right)^n = \text{Rs}\left[12000\left(1 + \frac{6}{100}\right)^2\right]$$
$$= \text{Rs}\left[12000\left(1 + \frac{3}{50}\right)^2\right] = \text{Rs}\left(12000 \times \frac{53}{50} \times \frac{53}{50}\right)$$
$$= \text{Rs } 13,483.20$$

∴ C.I. = A - P = Rs 13483.20 - Rs 12000 = Rs 1,483.20

C.I. - S.I. = Rs 1,483.20 - Rs 1,440 = Rs 43.20

Thus, the extra amount to be paid is Rs 43.20.

Q5 :

Vasudevan invested Rs 60000 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 :

(i) P = Rs 60,000

Rate = 12% per annum = 6% per half year

n = 6 months = 1 half year

$$A = P\left(1+\frac{R}{100}\right)^n$$
$$= \text{Rs}\left[60000\left(1+\frac{6}{100}\right)^1\right] = \text{Rs}\left(60000\times\frac{106}{100}\right) = \text{Rs } 63,600$$

(ii) There are 2 half years in 1

year. n = 2

$$A = \text{Rs}\left[60000\left(1+\frac{6}{100}\right)^2\right] = \text{Rs}\left(60000\times\frac{106}{100}\times\frac{106}{100}\right) = \text{Rs } 67,416$$

Q6 :

Arif took a loan of Rs 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 :

(i) P = Rs 80,000

R = 10% per annum

$n = 1\frac{1}{2}$ years

The amount for 1 year and 6 months can be calculated by first calculating the amount for 1 year using the compound interest formula, and then calculating the simple interest for 6 months on the amount obtained at the end of 1 year.

Firstly, the amount for 1 year has to be calculated.

$$A = \text{Rs}\left[80000\left(1+\frac{10}{100}\right)^{1}\right]$$
$$= \text{Rs}\left[80000\left(1+\frac{1}{10}\right)\right] = \text{Rs}\left(80000\times\frac{11}{10}\right) = \text{Rs } 88,000$$

By taking Rs 88,000 as principal, the SI for the next $\frac{1}{2}$ year will be calculated.

$$\text{S.I.} = \frac{P\times R\times T}{100} = \text{Rs}\left(\frac{88000\times 10\times\frac{1}{2}}{100}\right) = \text{Rs } 4,400$$

Interest for the first year = Rs 88000 - Rs 80000 = Rs 8,000

And interest for the next $\frac{1}{2}$ year = Rs 4,400

Total C.I. = Rs 8000 + Rs 4,400 = Rs 1,2400

A = P + C.I. = Rs (80000 + 12400) = Rs 92,400

(ii) The interest is compounded half yearly.

Rate = 10% per annum = 5% per half year

There will be three half years in $1\frac{1}{2}$ years.

$$A = \text{Rs}\left[80000\left(1+\frac{5}{100}\right)^3\right] = \text{Rs}\left[80000\left(1+\frac{1}{20}\right)^3\right]$$
$$= \text{Rs}\left(80000\times\frac{21}{20}\times\frac{21}{20}\times\frac{21}{20}\right) = \text{Rs } 92,610$$

Difference between the amounts = Rs 92,610 - Rs 92,400 = Rs 210

Q7 :

Maria invested Rs 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 3^{rd} year.

Answer :

(i) P = Rs 8,000

R = 5% per annum

n = 2 years

$$A = \text{Rs}\left[8000\left(1+\frac{5}{100}\right)^2\right] = \text{Rs}\left(8000\left(1+\frac{1}{20}\right)^2\right)$$
$$= \text{Rs}\left(8000\times\frac{21}{20}\times\frac{21}{20}\right) = \text{Rs } 8,820$$

(ii) The interest for the next one year, i.e. the third year, has to be calculated.

By taking Rs 8,820 as principal, the S.I. for the next year will be calculated.

$$\text{S.I.} = \text{Rs}\left(\frac{8820\times5\times1}{100}\right) = \text{Rs } 441$$

Q8 :

Find the amount and the compound interest on Rs 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 :

P = Rs 10,000

Rate = 10% per annum = 5% per half year

n = $1\frac{1}{2}$ years

There will be 3 half years in $1\frac{1}{2}$ years.

$$\begin{aligned}\text{A} &= \text{Rs}\left[10000\left(1+\frac{5}{100}\right)^3\right] = \text{Rs}\left[10000\left(1+\frac{1}{20}\right)^3\right]\\ &= \text{Rs}\left(10000\times\frac{21}{20}\times\frac{21}{20}\times\frac{21}{20}\right) = \text{Rs } 11,576.25\end{aligned}$$

C.I. = A - P

= Rs 11576.25 - Rs 10000 = Rs 1,576.25

The amount for 1 year and 6 months can be calculated by first calculating the amount for 1 year using the compound interest formula, and then calculating the simple interest for 6 months on the amount obtained at the end of 1 year.

The amount for the first year has to be calculated first.

$$A = \text{Rs}\left[10000\left(1+\frac{10}{100}\right)^1\right] = \text{Rs}\left[10000\left(1+\frac{1}{10}\right)\right]$$
$$= \text{Rs}\left(10000\times\frac{11}{10}\right) = \text{Rs } 11,000$$

By taking Rs 11,000 as the principal, the S.I. for the next $\frac{1}{2}$ year will be calculated.

$$\text{S.I.} = \text{Rs}\left(\frac{11000\times 10\times\frac{1}{2}}{100}\right) = \text{Rs } 550$$

∴ Interest for the first year = Rs 11000 - Rs 10000 = Rs 1,000

∴ Total compound interest = Rs 1000 + Rs 550 = Rs 1,550

Therefore, the interest would be more when compounded half yearly than the interest when compounded annually.

Q9 :

Find the amount which Ram will get on Rs 4,096, he gave it for 18 months at $12\frac{1}{2}\%$ per annum, interest being compounded half yearly.

Answer :

P = Rs 4,096

R = $12\frac{1}{2}\%$ per annum = $\frac{25}{4}\%$ per half year

n = 18 months

There will be 3 half years in 18 months.

Therefore,

$$A = \text{Rs}\left[4096\left(1+\frac{25}{400}\right)^3\right] = \text{Rs}\left[4096\left(1+\frac{1}{16}\right)^3\right]$$

$$= \text{Rs}\left(4096\times\frac{17}{16}\times\frac{17}{16}\times\frac{17}{16}\right) = \text{Rs } 4,913$$

Thus, the required amount is Rs 4,913.

Q10 :

The population of a place increased to 54000 in 2003 at a rate of 5% per annum

(i) find the population in 2001

(ii) what would be its population in 2005?

Answer :

(i) It is given that, population in the year 2003 = 54,000

Therefore,

54000 = $\left(1+\frac{5}{100}\right)^2$ (Population in 2001)

Population in 2001 $= 54000\times\frac{20}{21}\times\frac{20}{21}$ = 48979.59

Thus, the population in the year 2001 was approximately 48,980.

(ii) Population in 2005 = $54000\left(1+\frac{5}{100}\right)^2$

$$= 54000\left(1+\frac{1}{20}\right)^2 = 54000\times\frac{21}{20}\times\frac{21}{20} = 59,535$$

Thus, the population in the year 2005 would be 59,535.

Q11 :

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 :

The initial count of bacteria is given as 5,06,000.

Bacteria at the end of 2 hours = $506000\left(1+\frac{2.5}{100}\right)^2$

$$= 506000\left(1+\frac{1}{40}\right)^2 = 506000 \times \frac{41}{40} \times \frac{41}{40}$$
$$= 531616.25 = 5,31,616 \text{ (approx.)}$$

Thus, the count of bacteria at the end of 2 hours will be 5,31,616 (approx.).

Q12 :

A scooter was bought at Rs 42,000. Its value depreciated at the rate of 8% per annum. Find its value after one year.

Answer :

Principal = Cost price of the scooter = Rs 42,000

Depreciation = 8% of Rs 42,000 per year

$$= \text{Rs}\left(\frac{42000 \times 8 \times 1}{100}\right)$$
$$= \text{Rs } 3,360$$

Value after 1 year = Rs 42000 - Rs 3360 = Rs 38,640

Exercise 9.1 : Solutions of Questions on Page Number : 140

Q1 :

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 :

The terms and the respective coefficients of the given expressions are as follows.

-	Terms	Coefficients
(i)	$5xyz^2$ $- 3zy$	5 - 3
(ii)	1 x x^2	1 1 1

(iii)	$4x^2y^2$ $-4x^2y^2z^2$ z^2	4 - 4 1
(iv)	3	3
	$-pq$ qr $-rp$	- 1 1 - 1
(v)	$\frac{x}{2}$ $\frac{y}{2}$ $-xy$	$\frac{1}{2}$ $\frac{1}{2}$ - 1
(vi)	$0.3a$ $-0.6ab$ $0.5b$	0.3 - 0.6 0.5

Q2 :

Classify the following polynomials as monomials, binomials, trinomials. Which polynomials do not fit in any of these three categories?

$x + y$, 1000, $x + x^2 + x^3 + x^4$, $7 + y + 5x$, $2y - 3y^2$, $2y - 3y^2 + 4y^3$, $5x - 4y + 3xy$, $4z - 15z^2$, $ab + bc + cd + da$, pqr, $p^2q + pq^2$, $2p + 2q$

Answer :

The given expressions are classified as

Monomials: 1000, pqr

Binomials: $x + y$, $2y - 3y^2$, $4z - 15z^2$, $p^2q + pq^2$, $2p + 2q$

Trinomials: $7 + y + 5x$, $2y - 3y^2 + 4y^3$, $5x - 4y + 3xy$

Polynomials that do not fit in any of these categories are

$x+ x^2+ x^3+ x^4$, $ab + bc + cd + da$

Q3 :

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 :

The given expressions written in separate rows, with like terms one below the other and then the addition of these expressions are as follows.

(i)

$$\begin{array}{lccc} & ab & -bc & \\ + & & bc & -ca \\ + & -ab & & +ca \\ \hline & & 0 & \end{array}$$

Thus, the sum of the given expressions is 0.

(ii)

$$\begin{array}{lllllll} & a & -b & +ab & & & \\ + & & b & & -c & +bc & \\ + & -a & & & c & & +ac \\ \hline & & & ab & & +bc & +ac \end{array}$$

Thus, the sum of the given expressions is $ab + bc + ac$.

(iii)

$$\begin{array}{llll} & 2p^2q^2 & -3pq & +4 \\ + & -3p^2q^2 & +7pq & +5 \\ \hline & -p^2q^2 & +4pq & +9 \end{array}$$

Thus, the sum of the given expressions is $- p^2q^2 + 4pq + 9$.

(iv)

$$\begin{array}{lllllll} & l^2 & +m^2 & & & & \\ + & & m^2 & +n^2 & & & \\ + & l^2 & & +n^2 & & & \\ + & & & & 2lm & +2mn & +2nl \\ \hline & 2l^2 & +2m^2 & +2n^2 & +2lm & +2mn & +2nl \end{array}$$

Thus, the sum of the given expressions is $2(l^2 + m^2 + n^2 + lm + mn + nl)$.

Q4 :

(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 :

The given expressions in separate rows, with like terms one below the other and then the subtraction of these expressions is as follows.

(a)

$$\begin{array}{rrrr} 12a & -\,9ab & +\,5b & -\,3 \\ 4a & -\,7ab & +\,3b & +\,12 \\ (-) & (+) & (-) & (-) \\ \hline 8a & -\,2ab & +\,2b & -\,15 \end{array}$$

(b)

$$\begin{array}{rrrr} 5xy & -\,2yz & -\,2zx & +\,10xyz \\ 3xy & +\,5yz & -\,7zx & \\ (-) & (-) & (+) & \\ \hline 2xy & -\,7yz & +\,5zx & +\,10xyz \end{array}$$

(c)

$$\begin{array}{rrrrrr} 18 & -\,3p & -\,11q & +\,5pq & -\,2pq^2 & +\,5p^2q \\ -10 & -\,8p & +\,7q & -\,3pq & +\,5pq^2 & +\,4p^2q \\ (+) & (+) & (-) & (+) & (-) & (-) \\ \hline 28 & +\,5p & -\,18q & +\,8pq & -\,7pq^2 & +\,p^2q \end{array}$$

Exercise 9.2 : Solutions of Questions on Page Number : 143

Q1 :

Find the product of the following pairs of monomials.

(i) 4, 7*p* (ii) - 4*p*, 7*p* (iii) - 4*p*, 7*pq*

(iv) $4p^3$, - 3*p* (v) 4*p*, 0

Answer :

The product will be as follows.

(i) $4 \times 7p = 4 \times 7 \times p = 28p$

(ii) $-4p \times 7p = -4 \times p \times 7 \times p = (-4 \times 7) \times (p \times p) = -28\,p^2$

(iii) $-4p \times 7pq = -4 \times p \times 7 \times p \times q = (-4 \times 7) \times (p \times p \times q) = -28p^2q$

(iv) $4p^3 \times -3p = 4 \times (-3) \times p \times p \times p \times p = -12\,p^4$

(v) $4p \times 0 = 4 \times p \times 0 = 0$

Q2 :
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 :

We know that,

Area of rectangle = Length x Breadth

Area of 1st rectangle = $p \times q = pq$

Area of 2nd rectangle = $10m \times 5n = 10 \times 5 \times m \times n = 50\,mn$

Area of 3rd rectangle = $20x^2 \times 5y^2 = 20 \times 5 \times x^2 \times y^2 = 100\,x^2y^2$

Area of 4th rectangle = $4x \times 3x^2 = 4 \times 3 \times x \times x^2 = 12x^3$

Area of 5th rectangle = $3mn \times 4np = 3 \times 4 \times m \times n \times n \times p = 12mn^2p$

Q3 :

Complete the table of products.

First monomial → / Second monomial ↓	$2x$	$-5y$	$3x^2$	$-4xy$	$7x^2y$	$-9x^2y^2$
$2x$	$4x^2$	…	…	…	…	…
$-5y$	…	…	$-15x^2y$	…	…	…
$3x^2$	…	…	…	…	…	…
-4						

Answer :

The table can be completed as follows.

First monomial → / Second monomial ↓	$2x$	$-5y$	$3x^2$	$-4xy$	$7x^2y$	$-9x^2y^2$
$2x$	$4x^2$	$-10xy$	$6x^3$	$-8x^2y$	$14x^3y$	$-18x^3y^2$
$-5y$	$-10xy$	$25y^2$	$-15x^2y$	$20xy^2$	$-35x^2y^2$	$45x^2y^3$
$3x^2$	$6x^3$	$-15x^2y$	$9x^4$	$-12x^3y$	$21x^4y$	$-27x^4y^2$
$-4xy$	$-8x^2y$	$20xy^2$	$-12x^3y$	$16x^2y^2$	$-28x^3y^2$	$36x^3y^3$
$7x^2y$	$14x^3y$	$-35x^2y^2$	$21x^4y$	$-28x^3y^2$	$49x^4y^2$	$-63x^4y^3$
$-9x^2y^2$	$-18x^3y^2$	$45x^2y^3$	$-27x^4y^2$	$36x^3y^3$	$-63x^4y^3$	$81x^4y^4$

Q4 :

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 :

We know that,

Volume = Length x Breadth x Height

(i) Volume = $5a \times 3a^2 \times 7a^4 = 5 \times 3 \times 7 \times a \times a^2 \times a^4 = 105\, a^7$

(ii) Volume = $2p \times 4q \times 8r = 2 \times 4 \times 8 \times p \times q \times r = 64pqr$

(iii) Volume = $xy \times 2x^2y \times 2xy^2 = 2 \times 2 \times xy \times x^2y \times xy^2 = 4x^4y^4$

(iv) Volume = $a \times 2b \times 3c = 2 \times 3 \times a \times b \times c = 6abc$

Q5 :
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 :

(i) $xy \times yz \times zx = x^2y^2z^2$

(ii) $a \times (-a^2) \times a^3 = -a^6$

(iii) $2 \times 4y \times 8y^2 \times 16y^3 = 2 \times 4 \times 8 \times 16 \times y \times y^2 \times y^3 = 1024\, y^6$

(iv) $a \times 2b \times 3c \times 6abc = 2 \times 3 \times 6 \times a \times b \times c \times abc = 36a^2b^2c^2$

(v) $m \times (-\, mn) \times mnp = -\, m^3n^2p$

Exercise 9.3 : Solutions of Questions on Page Number : 146

Q1 :

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 :

(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) $(a + b) \times (7a^2\, b^2) = (a \times 7a^2b^2) + (b \times 7a^2b^2) = 7a^3b^2 + 7a^2b^3$

(iv) $(a^2 - 9) \times (4a) = (a^2 \times 4a) + (-\, 9) \times (4a) = 4a^3 - 36a$

(v) $(pq + qr + rp) \times 0 = (pq \times 0) + (qr \times 0) + (rp \times 0) = 0$

Q2 :

Complete the table

---	First expression	Second Expression	Product
(i)	a	$b + c + d$	-
(ii)	$x + y - 5$	$5\, xy$	-

(iii)	p	$6p^2 - 7p + 5$	-
(iv)	$4p^2q^2$	$p^2 - q^2$	-
(v)	$a + b + c$	abc	-

Answer :

The table can be completed as follows.

-	First expression	Second Expression	Product
(i)	a	$b + c + d$	$ab + ac + ad$
(ii)	$x + y - 5$	$5\ xy$	$5x^2y + 5xy^2 - 25xy$
(iii)	p	$6p^2 - 7p + 5$	$6p^3 - 7p^2 + 5p$
(iv)	$4p^2q^2$	$p^2 - q^2$	$4p^4q^2 - 4p^2q^4$
(v)	$a + b + c$	abc	$a^2bc + ab^2c + abc^2$

Q3 :

Find the product.

(i) $(a^2) \times (2a^{22}) \times (4a^{26})$

(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 :

(i) $(a^2) \times (2a^{22}) \times (4a^{26}) = 2 \times 4 \times a^2 \times a^{22} \times a^{26} = 8a^{50}$

(ii) $\left(\frac{2}{3}xy\right)\times\left(\frac{-9}{10}x^2y^2\right)=\left(\frac{2}{3}\right)\times\left(\frac{-9}{10}\right)\times x\times y\times x^2\times y^2=\frac{-3}{5}x^3y^3$

(iii) $\left(\frac{-10}{3}pq^3\right)\times\left(\frac{6}{5}p^3q\right)=\left(\frac{-10}{3}\right)\times\left(\frac{6}{5}\right)\times pq^3\times p^3q=-4p^4q^4$

(iv) $x \times x^2 \times x^3 \times x^4 = x^{10}$

Q4 :

(a) Simplify $3x(4x - 5) + 3$ and find its values for (i) $x = 3$, (ii) $x=\frac{1}{2}$.

(b) $a(a^2 + a + 1) + 5$ and find its values for (i) $a = 0$, (ii) $a = 1$, (iii) $a = -1$.

Answer :

(a) $3x(4x - 5) + 3 = 12x^2 - 15x + 3$

(i) For $x = 3$, $12x^2 - 15x + 3 = 12(3)^2 - 15(3) + 3$

$= 108 - 45 + 3$

$= 66$

(ii) For $x=\frac{1}{2}, 12x^2-15x+3=12\left(\frac{1}{2}\right)^2-15\left(\frac{1}{2}\right)+3$

$$=12\times\frac{1}{4}-\frac{15}{2}+3$$
$$=3-\frac{15}{2}+3=6-\frac{15}{2}$$
$$=\frac{12-15}{2}=\frac{-3}{2}$$

(b) $a(a^2 + a + 1) + 5 = a^3 + a^2 + a + 5$

(i) For $a = 0$, $a^3 + a^2 + a + 5 = 0 + 0 + 0 + 5 = 5$

(ii) For $a = 1$, $a^3 + a^2 + a + 5 = (1)^3 + (1)^2 + 1 + 5$

$= 1 + 1 + 1 + 5 = 8$

(iii) For $a = -1$, $a^3 + a^2 + a + 5 = (-1)^3 + (-1)^2 + (-1) + 5$

$= -1 + 1 - 1 + 5 = 4$

Q5 :

(a) Add: $p(p - q)$, $q(q - r)$ and $r(r - p)$

(b) Add: $2x(z - x - y)$ and $2y(z - y - x)$

(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 :

(a) First expression $= p(p - q) = p^2 - pq$

Second expression $= q(q - r) = q^2 - qr$

Third expression $= r(r - p) = r^2 - pr$

Adding the three expressions, we obtain

$$\begin{array}{llll} & p^2 - pq & & \\ + & & q^2 - qr & \\ + & & & r^2 - pq \\ \hline & \multicolumn{3}{l}{p^2 - pq + q^2 - qr + r^2 - pq} \end{array}$$

Therefore, the sum of the given expressions is $p^2 + q^2 + r^2 - pq - qr - rp$.

(b) First expression $= 2x(z - x - y) = 2xz - 2x^2 - 2xy$

Second expression $= 2y(z - y - x) = 2yz - 2y^2 - 2yx$

Adding the two expressions, we obtain

$$\begin{array}{lll} & 2xz - 2x^2 - 2xy & \\ + & \quad -2yx + 2yz - 2y^2 & \\ \hline & 2xz - 2x^2 - 4xy + 2yz - 2y^2 & \end{array}$$

Therefore, the sum of the given expressions is $-2x^2 - 2y^2 - 4xy + 2yz + 2zx$.

(c) $3l(l - 4m + 5n) = 3l^2 - 12lm + 15ln$

$4l(10n - 3m + 2l) = 40ln - 12lm + 8l^2$

Subtracting these expressions, we obtain

$$\begin{array}{lll} 40ln & -12lm & +8l^2 \\ 15ln & -12lm & +3l^2 \\ (-) & (+) & (-) \\ \hline +25ln & & +5l^2 \end{array}$$

Therefore, the result is $5l^2 + 25ln$.

(d) $3a(a + b + c) - 2b(a - b + c) = 3a^2 + 3ab + 3ac - 2ba + 2b^2 - 2bc$

$= 3a^2 + 2b^2 + ab + 3ac - 2bc$

$4c(-a + b + c) = -4ac + 4bc + 4c^2$

Subtracting these expressions, we obtain

$$\begin{array}{llllll} -4ac & +4bc & +4c^2 & & & \\ 3ac & -2bc & & +3a^2 & +2b^2 & +ab \\ (-) & (+) & & (-) & (-) & (-) \\ \hline -7ac & +6bc & +4c^2 & -3a^2 & -2b^2 & -ab \end{array}$$

Therefore, the result is $-3a^2 - 2b^2 + 4c^2 - ab + 6bc - 7ac$.

Exercise 9.4 : Solutions of Questions on Page Number : 148

Q1 :

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 :

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

$= 8x^2 - 6x + 20x - 15$

$= 8x^2 + 14x - 15$ (By adding like terms)

(ii) $(y - 8) \times (3y - 4) = y \times (3y - 4) - 8 \times (3y - 4)$

$= 3y^2 - 4y - 24y + 32$

$= 3y^2 - 28y + 32$ (By adding like terms)

(iii) $(2.5l - 0.5m) \times (2.5l + 0.5m) = 2.5l \times (2.5l + 0.5m) - 0.5m\ (2.5l + 0.5m)$

$= 6.25l^2 + 1.25lm - 1.25lm - 0.25m^2$

$= 6.25l^2 - 0.25m^2$

(iv) $(a + 3b) \times (x + 5) = a \times (x + 5) + 3b \times (x + 5)$

$= ax + 5a + 3bx + 15b$

(v) $(2pq + 3q^2) \times (3pq - 2q^2) = 2pq \times (3pq - 2q^2) + 3q^2 \times (3pq - 2q^2)$

$= 6p^2q^2 - 4pq^3 + 9pq^3 - 6q^4$

$= 6p^2q^2 + 5pq^3 - 6q^4$

(vi) $\left(\frac{3}{4}a^2+3b^2\right)\times\left[4\left(a^2-\frac{2}{3}b^2\right)\right]=\left(\frac{3}{4}a^2+3b^2\right)\times\left(4a^2-\frac{8}{3}b^2\right)$

$$=\frac{3}{4}a^2\times\left(4a^2-\frac{8}{3}b^2\right)+3b^2\times\left(4a^2-\frac{8}{3}b^2\right)$$
$$=3a^4-2a^2b^2+12b^2a^2-8b^4$$
$$=3a^4+10a^2b^2-8b^4$$

Q2 :

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 :

(i) $(5 - 2x)(3 + x) = 5(3 + x) - 2x(3 + x)$

$= 15 + 5x - 6x - 2x^2$

$= 15 - x - 2x^2$

(ii) $(x + 7y)(7x - y) = x(7x - y) + 7y(7x - y)$

$= 7x^2 - xy + 49xy - 7y^2$

$= 7x^2 + 48xy - 7y^2$

(iii) $(a^2 + b)(a + b^2) = a^2(a + b^2) + b(a + b^2)$

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

(iv) $(p^2 - q^2)(2p + q) = p^2(2p + q) - q^2(2p + q)$

$= 2p^3 + p^2q - 2pq^2 - q^3$

Q3 :

Simplify.

(i) $(x^2 - 5)(x + 5) + 25$

(ii) $(a^2 + 5)(b^3 + 3) + 5$

(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 :

(i) $(x^2 - 5)(x + 5) + 25$

$= x^2(x + 5) - 5(x + 5) + 25$

$= x^3 + 5x^2 - 5x - 25 + 25$

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

(ii) $(a^2 + 5)(b^3 + 3) + 5$

$= a^2(b^3 + 3) + 5(b^3 + 3) + 5$
$= a^2b^3 + 3a^2 + 5b^3 + 15 + 5$

$=a^2b^3 + 3a^2 + 5b^3 + 20$

(iii) $(t + s^2)(t^2 - s)$

$= t\ (t^2 - s) + s^2\ (t^2 - s)$

$= t^3 - st + s^2t^2 - s^3$

(iv) $(a + b)\ (c - d) + (a - b)\ (c + d) + 2\ (ac + bd)$

$= a\ (c - d) + b\ (c - d) + a\ (c + d) - b\ (c + d) + 2\ (ac + bd)$

$= ac - ad + bc - bd + ac + ad - bc - bd + 2ac + 2bd$

$= (ac + ac + 2ac) + (ad - ad) + (bc - bc) + (2bd - bd - bd)$

$= 4ac$

(v) $(x + y)\ (2x + y) + (x + 2y)\ (x - y)$

$= x\ (2x + y) + y\ (2x + y) + x\ (x - y) + 2y\ (x - y)$

$= 2x^2 + xy + 2xy + y^2 + x^2 - xy + 2xy - 2y^2$

$= (2x^2 + x^2) + (y^2 - 2y^2) + (xy + 2xy - xy + 2xy)$

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

(vi) $(x + y)\ (x^2 - xy + y^2)$

$= x\ (x^2 - xy + y^2) + y\ (x^2 - xy + y^2)$

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

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

$= x^3 + y^3$

(vii) $(1.5x - 4y)\ (1.5x + 4y + 3) - 4.5x + 12y$

$= 1.5x\ (1.5x + 4y + 3) - 4y\ (1.5x + 4y + 3) - 4.5x + 12y$

$= 2.25\ x^2 + 6xy + 4.5x - 6xy - 16y^2 - 12y - 4.5x + 12y$ $= 2.25\ x^2 + (6xy - 6xy) + (4.5x - 4.5x) - 16y^2 + (12y - 12y)$

$= 2.25x^2 - 16y^2$

(viii) $(a + b + c)(a + b - c)$

$= a(a + b - c) + b(a + b - c) + c(a + b - c)$

$= a^2 + ab - ac + ab + b^2 - bc + ca + bc - c^2$

$= a^2 + b^2 - c^2 + (ab + ab) + (bc - bc) + (ca - ca)$

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

Exercise 9.5 : Solutions of Questions on Page Number : 151

Q1 :

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

(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 :

The products will be as follows.

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

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

$= x^2 + 6x + 9$

(ii) $(2y + 5)(2y + 5) = (2y + 5)^2$

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

$= 4y^2 + 20y + 25$

(iii) $(2a - 7)(2a - 7) = (2a - 7)^2$

$= (2a)^2 - 2(2a)(7) + (7)^2$ $[(a - b)^2 = a^2 - 2ab + b^2]$

$= 4a^2 - 28a + 49$

(iv) $\left(3a-\frac{1}{2}\right)\left(3a-\frac{1}{2}\right)=\left(3a-\frac{1}{2}\right)^2$

$= (3a)^2 - 2(3a)\left(\frac{1}{2}\right)+\left(\frac{1}{2}\right)^2$ $[(a - b)^2 = a^2 - 2ab + b^2]$

$= 9a^2 - 3a + \frac{1}{4}$

(v) $(1.1m - 0.4)(1.1m + 0.4)$

$= (1.1m)^2 - (0.4)^2$ $[(a + b)(a - b) = a^2 - b^2]$

$= 1.21m^2 - 0.16$

(vi) $(a^2 + b^2)(-a^2 + b^2) = (b^2 + a^2)(b^2 - a^2)$

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

$= b^4 - a^4$

(vii) $(6x - 7)(6x + 7) = (6x)^2 - (7)^2$ $[(a + b)(a - b) = a^2 - b^2]$

$= 36x^2 - 49$

(viii) $(-a + c)(-a + c) = (-a + c)^2$

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

$= a^2 - 2ac + c^2$

(ix) $\left(\frac{x}{2}+\frac{3y}{4}\right)\left(\frac{x}{2}+\frac{3y}{4}\right)=\left(\frac{x}{2}+\frac{3y}{4}\right)^2$

$=\left(\frac{x}{2}\right)^2+2\left(\frac{x}{2}\right)\left(\frac{3y}{4}\right)+\left(\frac{3y}{4}\right)^2$ $[(a + b)^2 = a^2 + 2ab + b^2]$

$=\frac{x^2}{4}+\frac{3xy}{4}+\frac{9y^2}{16}$

(x) $(7a - 9b)(7a - 9b) = (7a - 9b)^2$

$= (7a)^2 - 2(7a)(9b) + (9b)^2$ $[(a - b)^2 = a^2 - 2ab + b^2]$

$= 49a^2 - 126ab + 81b^2$

Q2 :

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 :

The products will be as follows.

(i) $(x + 3)(x + 7) = x^2 + (3 + 7)x + (3)(7)$

$= x^2 + 10x + 21$

(ii) $(4x + 5)(4x + 1) = (4x)^2 + (5 + 1)(4x) + (5)(1)$

$= 16x^2 + 24x + 5$

(iii) $(4x-5)(4x-1) = (4x)^2 + [(-5)+(-1)](4x) + (-5)(-1)$

$= 16x^2 - 24x + 5$

(iv) $(4x+5)(4x-1) = (4x)^2 + [(5)+(-1)](4x) + (5)(-1)$

$= 16x^2 + 16x - 5$

(v) $(2x + 5y)(2x + 3y) = (2x)^2 + (5y + 3y)(2x) + (5y)(3y)$

$= 4x^2 + 16xy + 15y^2$

(vi) $(2a^2 + 9)(2a^2 + 5) = (2a^2)^2 + (9 + 5)(2a^2) + (9)(5)$

$= 4a^4 + 28a^2 + 45$

(vii) $(xyz - 4)(xyz - 2)$

$= (xyz)^2 + [(-4)+(-2)](xyz) + (-4)(-2)$

$= x^2y^2z^2 - 6xyz + 8$

Q3 :

Find the following squares by suing the 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 :

(i) $(b - 7)^2 = (b)^2 - 2(b)(7) + (7)^2$ $[(a - b)^2 = a^2 - 2ab + b^2]$

$= b^2 - 14b + 49$

(ii) $(xy + 3z)^2 = (xy)^2 + 2(xy)(3z) + (3z)^2$ $[(a + b)^2 = a^2 + 2ab + b^2]$ $= x^2y^2 + 6xyz + 9z^2$

(iii) $(6x^2 - 5y)^2 = (6x^2)^2 - 2(6x^2)(5y) + (5y)^2$ $[(a - b)^2 = a^2 - 2ab + b^2]$

$= 36x^4 - 60x^2y + 25y^2$

(iv) $\left(\frac{2}{3}m+\frac{3}{2}n\right)^2 = \left(\frac{2}{3}m\right)^2 + 2\left(\frac{2}{3}m\right)\left(\frac{3}{2}n\right) + \left(\frac{3}{2}n\right)^2$ $[(a + b)^2 = a^2 + 2ab + b^2]$

$= \frac{4}{9}m^2 + 2mn + \frac{9}{4}n^2$

(v) $(0.4p - 0.5q)^2 = (0.4p)^2 - 2(0.4p)(0.5q) + (0.5q)^2$

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

$= 0.16p^2 - 0.4pq + 0.25q^2$

(vi) $(2xy + 5y)^2 = (2xy)^2 + 2(2xy)(5y) + (5y)^2$

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

$= 4x^2y^2 + 20xy^2 + 25y^2$

Q4 :

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 :

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

$= a^4 - 2a^2b^2 + b^4$

(ii) $(2x + 5)^2 - (2x - 5)^2 = (2x)^2 + 2(2x)(5) + (5)^2 - [(2x)^2 - 2(2x)(5) + (5)^2]$

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

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

$= 4x^2 + 20x + 25 - [4x^2 - 20x + 25]$

$= 4x^2 + 20x + 25 - 4x^2 + 20x - 25 = 40x$

(iii) $(7m - 8n)^2 + (7m + 8n)^2$

$= (7m)^2 - 2(7m)(8n) + (8n)^2 + (7m)^2 + 2(7m)(8n) + (8n)^2$

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

$= 49m^2 - 112mn + 64n^2 + 49m^2 + 112mn + 64n^2$

$= 98m^2 + 128n^2$

(iv) $(4m + 5n)^2 + (5m + 4n)^2$

$= (4m)^2 + 2(4m)(5n) + (5n)^2 + (5m)^2 + 2(5m)(4n) + (4n)^2$

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

$= 16m^2 + 40mn + 25n^2 + 25m^2 + 40mn + 16n^2$

$= 41m^2 + 80mn + 41n^2$

(v) $(2.5p - 1.5q)^2 - (1.5p - 2.5q)^2$

$= (2.5p)^2 - 2(2.5p)(1.5q) + (1.5q)^2 - [(1.5p)^2 - 2(1.5p)(2.5q) + (2.5q)^2]$

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

$= 6.25p^2 - 7.5pq + 2.25q^2 - [2.25p^2 - 7.5pq + 6.25q^2]$

$= 6.25p^2 - 7.5pq + 2.25q^2 - 2.25p^2 + 7.5pq - 6.25q^2]$

$= 4p^2 - 4q^2$

(vi) $(ab + bc)^2 - 2ab^2c$

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

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

(vii) $(m^2 - n^2m)^2 + 2m^3n^2$

$= (m^2)^2 - 2(m^2)(n^2m) + (n^2m)^2 + 2m^3n^2$ $[(a - b)^2 = a^2 - 2ab + b^2]$

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

$= m^4 + n^4m^2$

Q5 :

Show that

(i) $(3x + 7)^2 - 84x = (3x - 7)^2$ (ii) $(9p - 5q)^2 + 180pq = (9p + 5q)^2$

(iii) $\left(\frac{4}{3}m - \frac{3}{4}n\right)^2 + 2mn = \frac{16}{9}m^2 + \frac{9}{16}n^2$

(iv) $(4pq + 3q)^2 - (4pq - 3q)^2 = 48pq^2$

(v) $(a - b)(a + b) + (b - c)(b + c) + (c - a)(c + a) = 0$

Answer :

(i) L.H.S = $(3x + 7)^2 - 84x$

$= (3x)^2 + 2(3x)(7) + (7)^2 - 84x$

$= 9x^2 + 42x + 49 - 84x$

$= 9x^2 - 42x + 49$

R.H.S = $(3x - 7)^2 = (3x)^2 - 2(3x)(7) + (7)^2$

$= 9x^2 - 42x + 49$

L.H.S = R.H.S

(ii) L.H.S = $(9p - 5q)^2 + 180pq$

$= (9p)^2 - 2(9p)(5q) + (5q)^2 - 180pq$

$= 81p^2 - 90pq + 25q^2 + 180pq$

$= 81p^2 + 90pq + 25q^2$

R.H.S = $(9p + 5q)^2$

$= (9p)^2 + 2(9p)(5q) + (5q)^2$

$= 81p^2 + 90pq + 25q^2$

L.H.S = R.H.S

(iii) L.H.S = $\left(\frac{4}{3}m - \frac{3}{4}n\right)^2 + 2mn$

$$= \left(\frac{4}{3}m\right)^2 - 2\left(\frac{4}{3}m\right)\left(\frac{3}{4}n\right) + \left(\frac{3}{4}n\right)^2 + 2mn$$
$$= \frac{16}{9}m^2 - 2mn + \frac{9}{16}n^2 + 2mn$$
$$= \frac{16}{9}m^2 + \frac{9}{16}n^2 = \text{R.H.S.}$$

(iv) L.H.S = $(4pq + 3q)^2 - (4pq - 3q)^2$

$= (4pq)^2 + 2(4pq)(3q) + (3q)^2 - [(4pq)^2 - 2(4pq)(3q) + (3q)^2]$

$= 16p^2q^2 + 24pq^2 + 9q^2 - [16p^2q^2 - 24pq^2 + 9q^2]$

$= 16p^2q^2 + 24pq^2 + 9q^2 - 16p^2q^2 + 24pq^2 - 9q^2$

$= 48pq^2$ = R.H.S

(v) L.H.S = $(a - b)(a + b) + (b - c)(b + c) + (c - a)(c + a)$

$= (a^2 - b^2) + (b^2 - c^2) + (c^2 - a^2) = 0$ = R.H.S.

Q6 :
Using identities, evaluate.

(i) 71^2 (ii) 99^2 (iii) 102^2 (iv) 998^2

(v) $(5.2)^2$ (vi) 297 x 303 (vii) 78 x 82

(viii) 8.9^2 (ix) 1.05 x 9.5

Answer :

(i) $71^2 = (70 + 1)^2$

$= (70)^2 + 2(70)(1) + (1)^2$ $[(a + b)^2 = a^2 + 2ab + b^2]$

= 4900 + 140 + 1 = 5041

(ii) $99^2 = (100 - 1)^2$

$= (100)^2 - 2(100)(1) + (1)^2$ $[(a - b)^2 = a^2 - 2ab + b^2]$

= 10000 - 200 + 1 = 9801

(iii) $102^2 = (100 + 2)^2$

$= (100)^2 + 2(100)(2) + (2)^2$ $[(a + b)^2 = a^2 + 2ab + b^2]$

$= 10000 + 400 + 4 = 10404$

(iv) $998^2 = (1000 - 2)^2$

$= (1000)^2 - 2(1000)(2) + (2)^2$ $[(a - b)^2 = a^2 - 2ab + b^2]$

$= 1000000 - 4000 + 4 = 996004$

(v) $(5.2)^2 = (5.0 + 0.2)^2$

$= (5.0)^2 + 2(5.0)(0.2) + (0.2)^2$ $[(a + b)^2 = a^2 + 2ab + b^2]$

$= 25 + 2 + 0.04 = 27.04$

(vi) $297 \times 303 = (300 - 3) \times (300 + 3)$

$= (300)^2 - (3)^2$ $[(a + b)(a - b) = a^2 - b^2]$
$= 90000 - 9 = 89991$

(vii) $78 \times 82 = (80 - 2)(80 + 2)$

$= (80)^2 - (2)^2$ $[(a + b)(a - b) = a^2 - b^2]$

$= 6400 - 4 = 6396$

(viii) $8.9^2 = (9.0 - 0.1)^2$

$= (9.0)^2 - 2(9.0)(0.1) + (0.1)^2$ $[(a - b)^2 = a^2 - 2ab + b^2]$

$= 81 - 1.8 + 0.01 = 79.21$

(ix) $1.05 \times 9.5 = 1.05 \times 0.95 \times 10$

$= (1 + 0.05)(1 - 0.05) \times 10$

$= [(1)^2 - (0.05)^2] \times 10$

$= [1 - 0.0025] \times 10$ $[(a + b)(a - b) = a^2 - b^2]$

$= 0.9975 \times 10 = 9.975$

Q7 :

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 :

(i) $51^2 - 49^2 = (51 + 49)(51 - 49)$

$= (100)(2) = 200$

(ii) $(1.02)^2 - (0.98)^2 = (1.02 + 0.98)(1.02 - 0.98)$

$= (2)(0.04) = 0.08$

(iii) $153^2 - 147^2 = (153 + 147)(153 - 147) = (300)(6) = 1800$

(iv) $12.1^2 - 7.9^2 = (12.1 + 7.9)(12.1 - 7.9)$

$= (20.0)(4.2) = 84$

Q8 :

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 :

(i) $103 \times 104 = (100 + 3)(100 + 4)$

$= (100)^2 + (3 + 4) (100) + (3) (4) =$

$10000 + 700 + 12 = 10712$

(ii) $5.1 \times 5.2 = (5 + 0.1) (5 + 0.2)$

$= (5)^2 + (0.1 + 0.2) (5) + (0.1) (0.2)$

$= 25 + 1.5 + 0.02 = 26.52$

(iii) $103 \times 98 = (100 + 3) (100 - 2)$

$= (100)^2 + [3 + (- 2)] (100) + (3) (- 2)$

$= 10000 + 100 - 6$

$= 10094$

(iv) $9.7 \times 9.8 = (10 - 0.3) (10 - 0.2)$

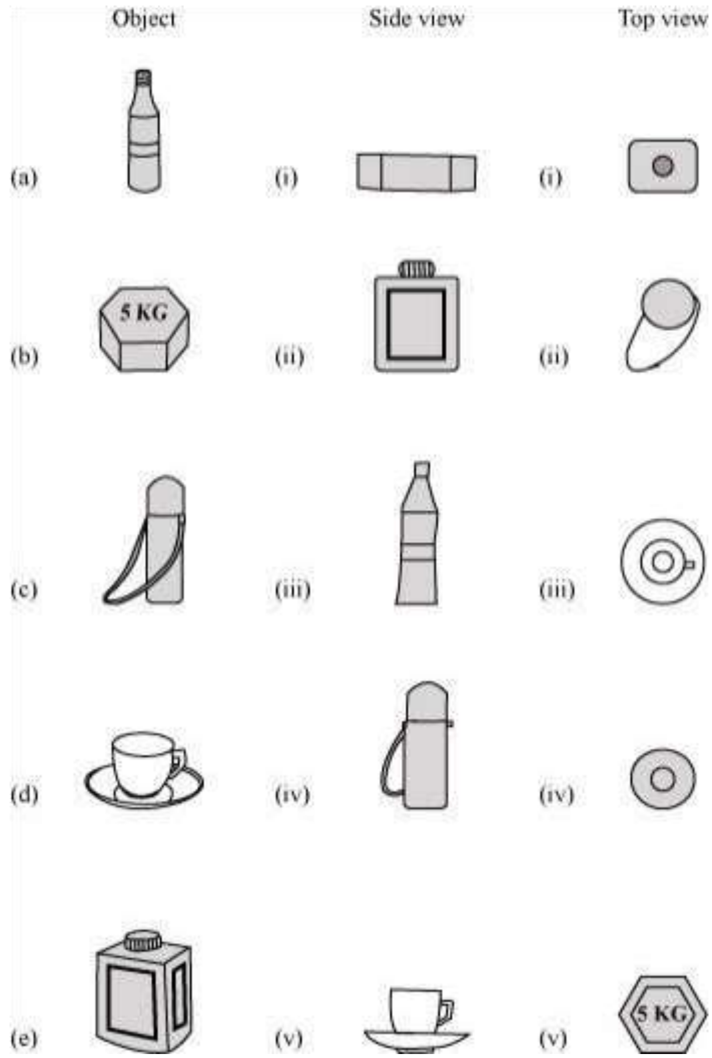
$= (10)^2 + [(- 0.3) + (- 0.2)] (10) + (- 0.3) (- 0.2)$

$= 100 + (- 0.5)10 + 0.06 = 100.06 - 5 = 95.06$

Exercise 10.1 : Solutions of Questions on Page Number : 157

Q1 :

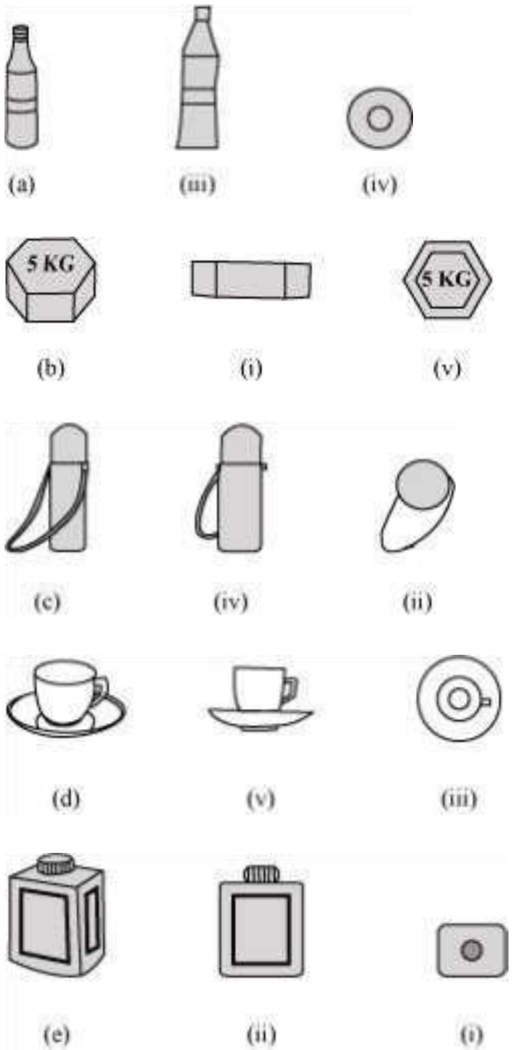
For each of the given solid, the two views are given. Match for each solid the corresponding top and front views.



Answer :

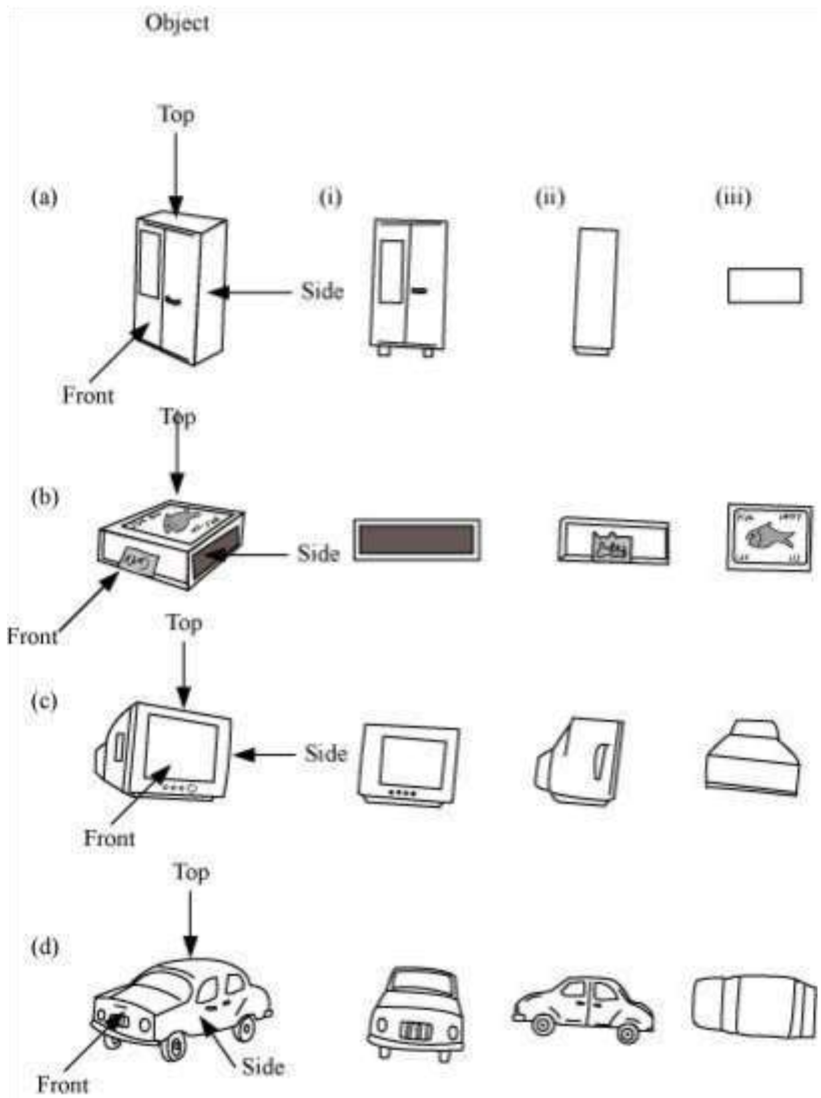
The given solids, matched to their respective side view and top view, are as follows.

Object Side view Top view



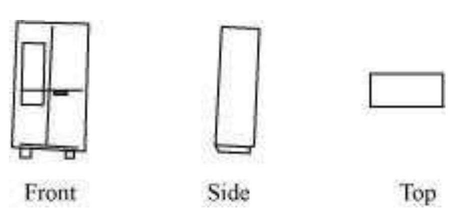
Q2 :

For each of the given solid, the three views are given. Identify for each solid the corresponding top, front and side views.



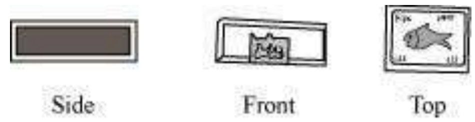
Answer :

(a)



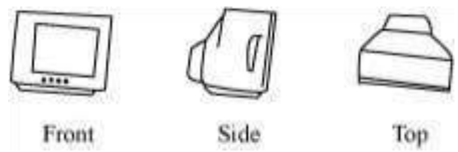
(i) Front (ii) Side (iii) Top

(b)



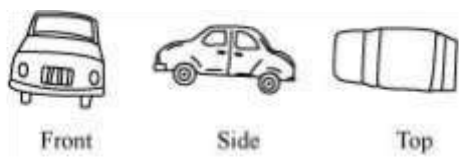
(i) Side (ii) Front (iii) Top

(c)



(i) Front (ii) Side (iii) Top

(d)

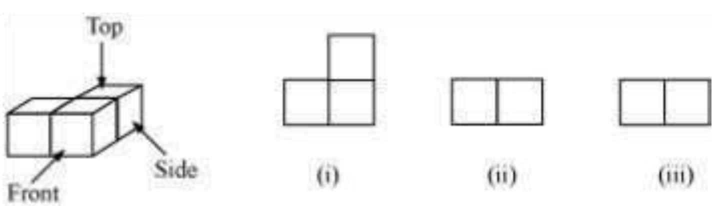


(i) Front (ii) Side (iii) Top

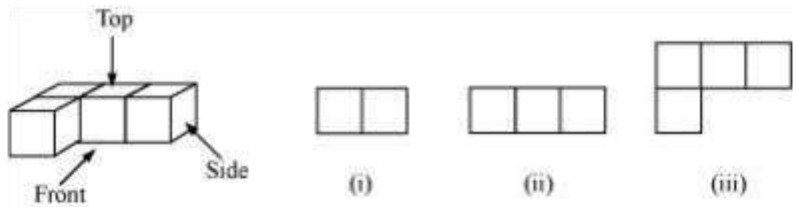
Q3 :

For each given solid, identify the top view, front view and side view.

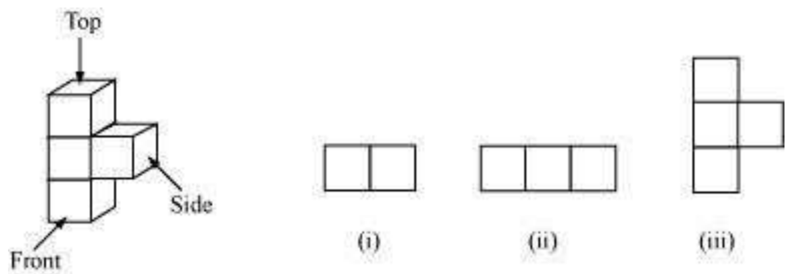
(a)



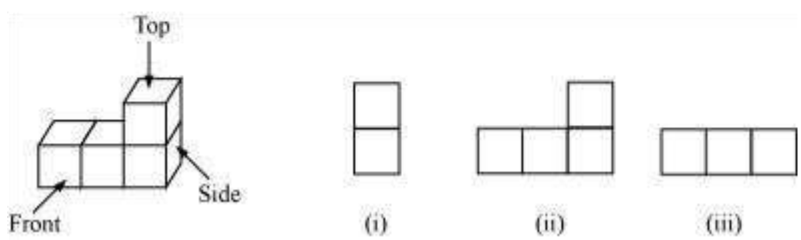
(b)


Top
Front
Side
(i)
(ii)
(iii)

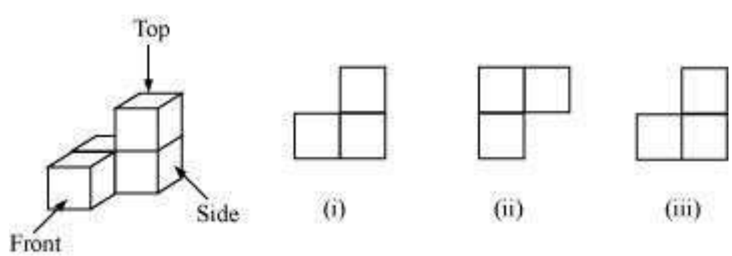
(c)


Top
Side
Front
(i)
(ii)
(iii)

(d)

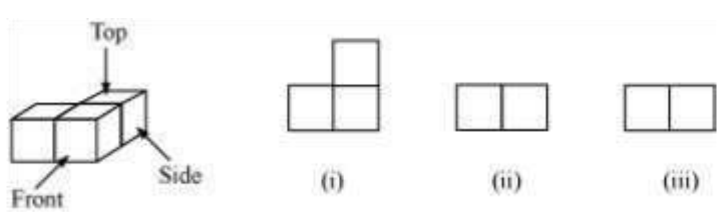

Top
Side
Front
(i)
(ii)
(iii)

(e)


Top
Side
Front
(i)
(ii)
(iii)

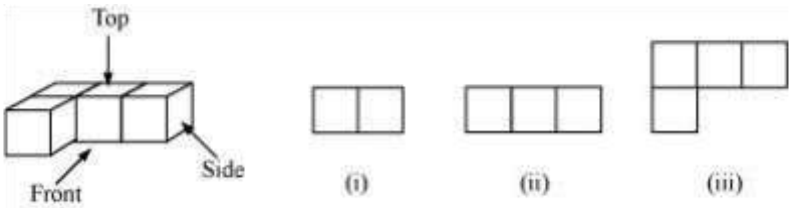
Answer :

(a)


Top
Side
Front
(i)
(ii)
(iii)

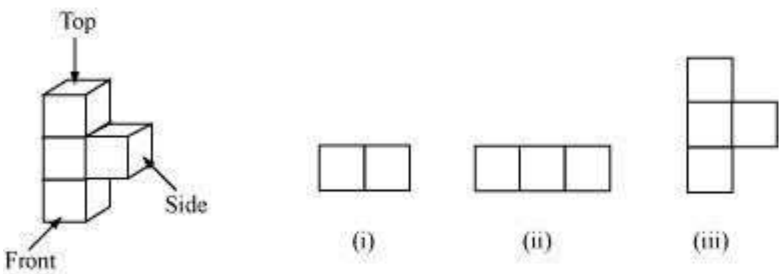
(i) Top (ii) Front/Side (iii) Side/Front

(b)



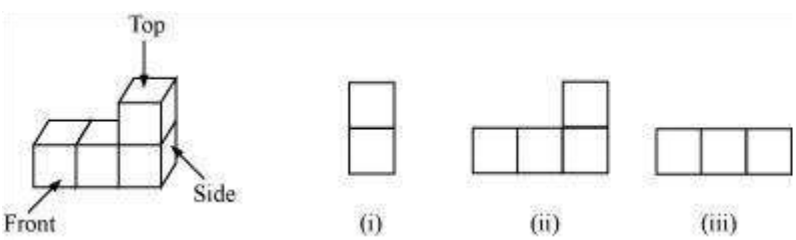
(i) Side (ii) Front (iii) Top

(c)



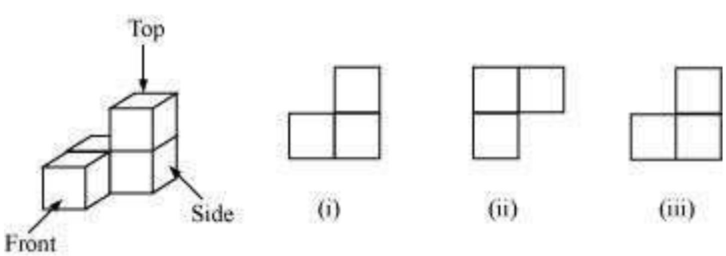
(i) Top (ii) Side (iii) Front

(d)



(i) Side (ii) Front (iii) Top

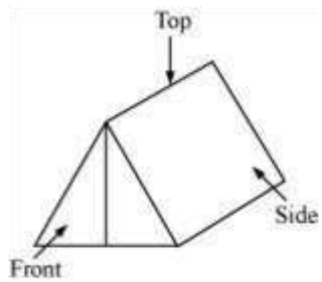
(e)

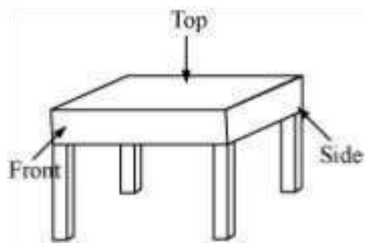


(i) Front/Side (ii) Top (iii) Side/Front

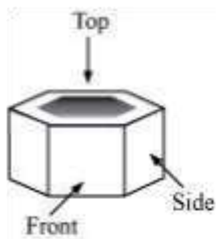
Q4 :

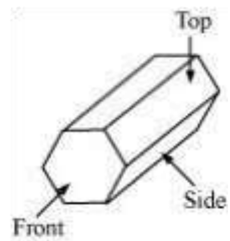
Draw the front view, side view and top view of the given objects.



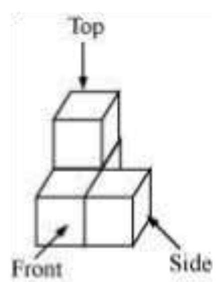


(a) A military tent (b) A table





(c) A nut (d) A hexagonal block

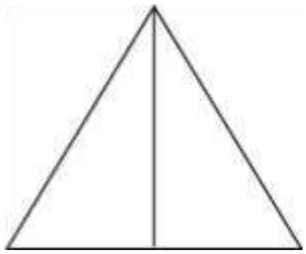
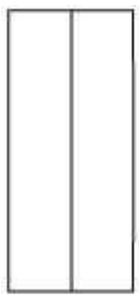


(e) A dice (f) A solid

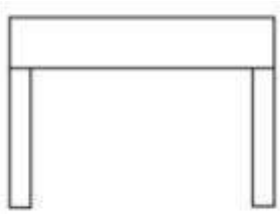
Answer :

(a)

A military tent

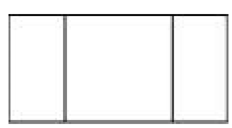
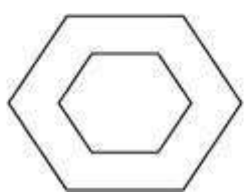
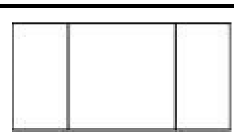
Front View	
Top View	
Side View	

(b)

A table	
Front View	

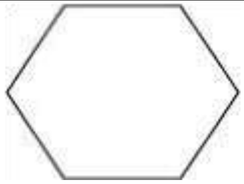
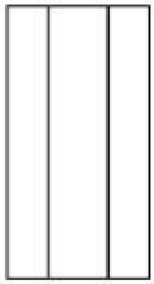
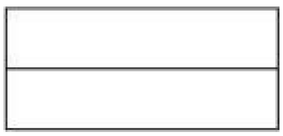
Top View	
Side View	

(c)

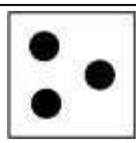
A nut	
Front View	
Top View	
Side View	

(d)

A hexagonal block

Front View	
Top View	
Side View	

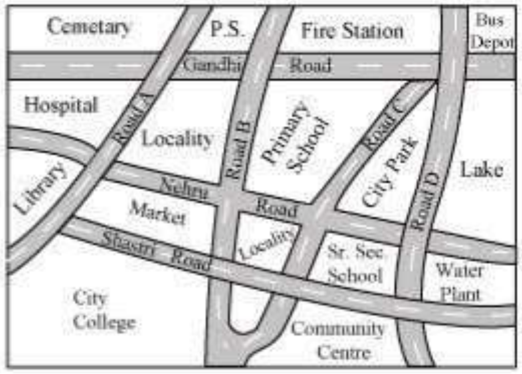
(e)

A dice	
Front View	

Exercise 10.2 : Solutions of Questions on Page Number : 163

Q1 :

Look at the given map of a city.



Answer the following.

(a) Colour the map as follows: Blue - water plant, red - fire station, orange - library, yellow - schools, green - park, pink - college, purple - hospital, brown - cemetery.

(b) Mark a green 'X' at the intersection of Road 'C' and Nehru Road, Green 'Y' at the intersection of Gandhi Road and Road A.

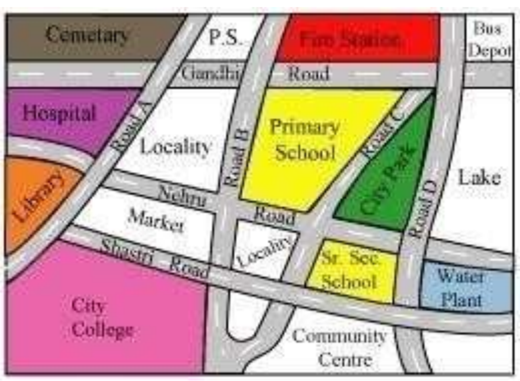
(c) In red, draw a short street route from library to the bus depot.

(d) Which is further east, the city park or the market?

(e) Which is further south, the Primary School or the Sr. Secondary School?

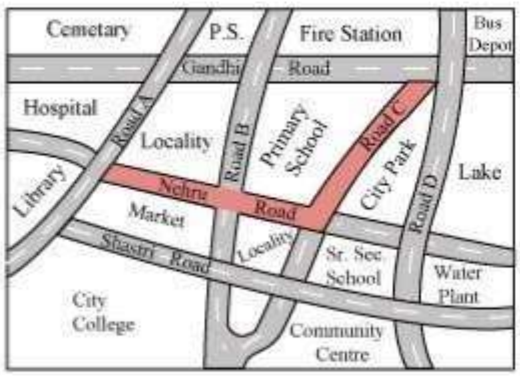
Answer :

(a) The given map coloured in the required way is as follows.



(b)The marks can be put at the given points as follows.

(c) The shortest route from the library to bus depot is represented by red colour.



(d) Between the Market and the City Park, the City Park is further east.

(e) Between the Primary School and the Sr. Secondary School, the Sr. Secondary School is further south.

Exercise 10.3 : Solutions of Questions on Page Number : 166

Q1 :

Can a polyhedron have for its faces

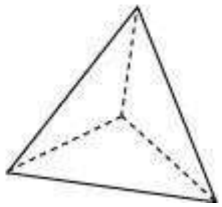
(i) 3 triangles? (ii) 4 triangles?

(iii) a square and four triangles?

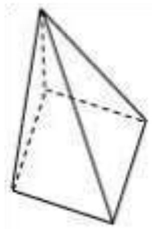
Answer :

(i) No, such a polyhedron is not possible. A polyhedron has minimum 4 faces.

(ii) Yes, a triangular pyramid has 4 triangular faces.



(iii) Yes, a square pyramid has a square face and 4 triangular faces.



Q2 :

Is it possible to have a polyhedron with any given number of faces? (Hint: Think of a pyramid).

Answer :

A polyhedron has a minimum of 4 faces.

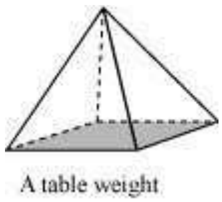
Q3 :

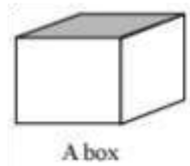
Which are prisms among the following?

A nail

Unsharpened pencil

(i) (ii)





(iii) (iv)

Answer :

(i) It is not a polyhedron as it has a curved surface. Therefore, it will not be a prism also.

(ii) It is a prism.
(iii) It is not a prism. It is a pyramid.

(iv) It is a prism.

Q4 :

(i) How are prisms and cylinders alike?

(ii) How are pyramids and cones alike?

Answer :

(i) A cylinder can be thought of as a circular prism i.e., a prism that has a circle as its base.

(ii) A cone can be thought of as a circular pyramid i.e., a pyramid that has a circle as its base.

Q5 :

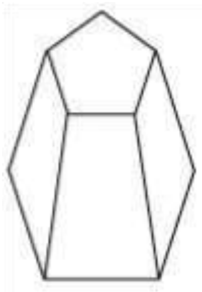
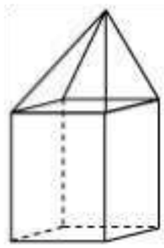
Is a square prism same as a cube? Explain.

Answer :

A square prism has a square as its base. However, its height is not necessarily same as the side of the square. Thus, a square prism can also be a cuboid.

Q6 :

Verify Euler's formula for these solids.

(i) (ii)

Answer :

(i) Number of faces = F = 7

Number of vertices = V = 10

Number of edges = E = 15 We have, F + V -

E = 7 + 10 - 15 = 17 - 15 = 2

Hence, Euler's formula is verified.

(ii) Number of faces = F = 9

Number of vertices = V = 9

Number of edges = E = 16 F + V -

E = 9 + 9 - 16 = 18 - 16 = 2

Hence, Euler's formula is verified.

Q7 :

Using Euler's formula, find the unknown.

Faces	?	5	20
Vertices	6	?	12
Edges	12	9	?

Answer :

By Euler's formula, we have

F + V - E = 2

(i) F + 6 - 12 = 2

F - 6 = 2

F = 8

(ii) 5 + V - 9 = 2

V - 4 = 2

V = 6

(iii) 20 + 12 - E = 2

32 - E = 2

E = 30

Thus, the table can be completed as

Faces	8	5	20
Vertices	6	6	12
Edges	12	9	30

Q8 :

Can a polyhedron have 10 faces, 20 edges and 15 vertices?

Answer :

Number of faces = F = 10

Number of edges = E = 20

Number of vertices = V = 15

Any polyhedron satisfies Euler's Formula, according to which, $F + V - E = 2$

For the given polygon,

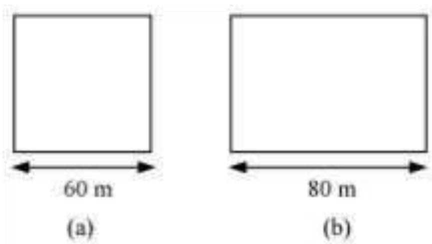
$F + V - E = 10 + 15 - 20 = 25 - 20 = 5 \neq 2$

Since Euler's formula is not satisfied, such a polyhedron is not possible.

Exercise 11.1 : Solutions of Questions on Page Number : 171

Q1 :

A square and a rectangular field with measurements as given in the figure have the same perimeter. Which field has a larger area



Answer :

Perimeter of square = 4 (Side of the square) = 4 (60 m) = 240 m

Perimeter of rectangle = 2 (Length + Breadth)

= 2 (80 m + Breadth)

= 160 m + 2 × Breadth

It is given that the perimeter of the square and the rectangle are the same.

160 m + 2 × Breadth = 240 m

Breadth of the rectangle = $\left(\frac{80}{2}\right)$ m = 40 m

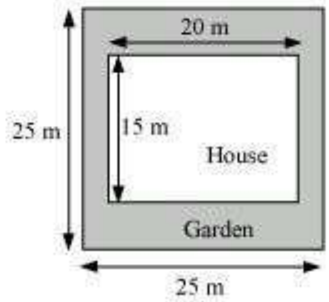
Area of square = (Side)^2 = (60 m)^2 = 3600 m^2

Area of rectangle = Length × Breadth = (80 × 40) m^2 = 3200 m^2

Thus, the area of the square field is larger than the area of the rectangular field.

Q2 :

Mrs. Kaushik has a square plot with the measurement as shown in the following 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 Rs 55 per m^2.



Answer :

Area of the square plot = $(25 \text{ m})^2 = 625 \text{ m}^2$

Area of the house = $(15 \text{ m}) \times (20 \text{ m}) = 300 \text{ m}^2$

Area of the remaining portion = Area of square plot - Area of the house

$= 625 \text{ m}^2 - 300 \text{ m}^2 = 325 \text{ m}^2$

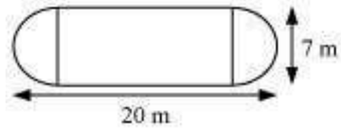
The cost of developing the garden around the house is Rs 55 per m^2.

Total cost of developing the garden of area 325 m^2 = Rs (55 x 325)

= Rs 17,875

Q3 :

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 the garden [Length of rectangle is 20 - (3.5 + 3.5) metres]

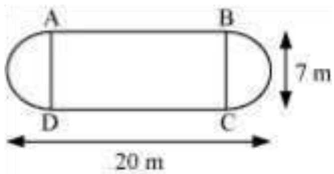


Answer :

Length of the rectangle = [20 - (3.5 + 3.5)] metres = 13 m

Circumference of 1 semi-circular part = πr $= \left(\frac{22}{7} \times 3.5\right)$ m $= 11$ m

Circumference of both semi-circular parts = (2 × 11) m = 22 m



Perimeter of the garden = AB + Length of both semi-circular regions BC and

DA + CD

= 13 m + 22 m + 13 m = 48 m

Area of the garden = Area of rectangle + 2 × Area of two semi-circular regions

$$= \left[(13 \times 7) + 2 \times \frac{1}{2} \times \frac{22}{7} \times (3.5)^2\right] \text{ m}^2$$
$$= (91 + 38.5) \text{ m}^2$$
$$= 129.5 \text{ m}^2$$

Q4 :

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 :

Area of parallelogram = Base × Height

Hence, area of one tile = 24 cm × 10 cm = 240 cm^2

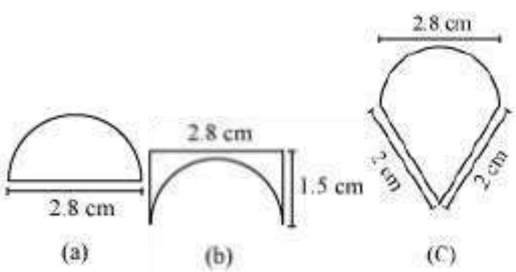
Required number of tiles = $\dfrac{\text{Area of the floor}}{\text{Area of each tile}}$

$$= \frac{1080 \text{ m}^2}{240 \text{ cm}^2} = \frac{(1080 \times 10000) \text{ cm}^2}{240 \text{ cm}^2} \qquad (\because 1 \text{ m} = 100 \text{ cm})$$ = 45000 tiles

Thus, 45000 tiles are required to cover a floor of area 1080 m^2.

Q5 :

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*Ãâ,¬r*, where *r* is the radius of the circle.



Answer :

(a)Radius (r) of semi-circular part = $\left(\dfrac{2.8}{2}\right) \text{ cm} = 1.4 \text{ cm}$

Perimeter of the given figure = 2.8 cm + πr

$$= 2.8 \text{ cm} + \left(\frac{22}{7} \times 1.4\right) \text{ cm}$$
$$= 2.8 \text{ cm} + 4.4 \text{ cm}$$
$$= 7.2 \text{ cm}$$

(b)Radius (r) of semi-circular part = $\left(\dfrac{2.8}{2}\right) \text{ cm} = 1.4 \text{ cm}$

Perimeter of the given figure = 1.5 cm + 2.8 cm + 1.5 cm +π (1.4 cm)

$$= 5.8 \text{ cm} + \frac{22}{7}(1.4 \text{ cm})$$
$$= 5.8 \text{ cm} + 4.4 \text{ cm}$$
$$= 10.2 \text{ cm}$$

(c)Radius (*r*) of semi-circular part = $\left(\frac{2.8}{2}\right) \text{ cm} = 1.4 \text{ cm}$

Perimeter of the figure(c) = 2 cm + π*r* + 2 cm

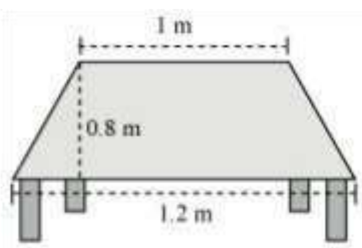
$$= 4 \text{ cm} + \frac{22}{7} \times (1.4 \text{ cm})$$
$$= 4 \text{ cm} + 4.4 \text{ cm}$$
$$= 8.4 \text{cm}$$

Thus, the ant will have to take a longer round for the food-piece (b), because the perimeter of the figure given in alternative (b) is the greatest among all.

Exercise 11.2 : Solutions of Questions on Page Number : 177

Q1 :

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.



E

Answer :

Area of trapezium = $\frac{1}{2}$ (Sum of parallel sides) × (Distances between parallel sides)

$$= \left[\frac{1}{2}(1+1.2)(0.8)\right] \text{ m}^2 = 0.88 \text{ m}^2$$

Q2 :

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 :

It is given that,area of trapezium = 34 cm^2 and height = 4 cm
Let the length of one parallel side be *a*. We know that,

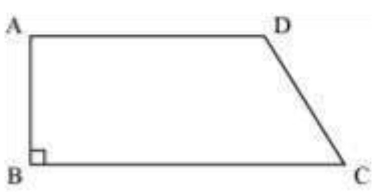
Area of trapezium = $\frac{1}{2}$ (Sum of parallel sides) × (Distances between parallel sides)

$$34\text{ cm}^2 = \frac{1}{2}(10\text{ cm} + a)\times(4\text{ cm})$$
$$34\text{ cm} = 2(10\text{ cm} + a)$$
$$17\text{ cm} = 10\text{ cm} + a$$
$$a = 17\text{ cm} - 10\text{ cm} = 7\text{ cm}$$

Thus, the length of the other parallel side is 7 cm.

Q3 :

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 :

Length of the fence of trapezium ABCD = AB + BC + CD + DA

120 m = AB + 48 m + 17 m + 40 m

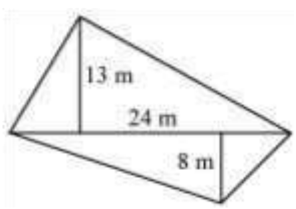
AB = 120 m - 105 m = 15 m

Area of the field ABCD $= \frac{1}{2}(AD + BC) \times AB$

$$= \left[\frac{1}{2}(40+48)\times(15)\right] \text{ m}^2$$
$$= \left(\frac{1}{2}\times 88\times 15\right) \text{ m}^2$$
$$= 660 \text{ m}^2$$

Q4 :

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 :

It is given that,

Length of the diagonal, d = 24 m

Length of the perpendiculars, h_1 and h_2, from the opposite vertices to the diagonal are h_1 = 8 m and h_2 = 13 m

Area of the quadrilateral $= \frac{1}{2} d(h_1 + h_2)$

$= \frac{1}{2}(24\text{m}) \times (13\text{m} + 8\text{cm})$

$= \frac{1}{2}(24\text{m})(21\text{m})$
$= 252\,\text{m}^2$

Thus, the area of the field is 252 m^2.

Q5 :

The diagonals of a rhombus are 7.5 cm and 12 cm. Find its area.

Answer :

Area of rhombus = $\frac{1}{2}$ (Product of its diagonals)

Therefore, area of the given rhombus

= $\frac{1}{2} \times 7.5\,\text{cm} \times 12\,\text{cm}$

= 45 cm^2

Q6 :

Find the area of a rhombus whose side is 6 cm and whose altitude is 4 cm. If one of its diagonals is 8 cm long, find the length of the other diagonal.

Answer :

Let the length of the other diagonal of the rhombus be *x*.

A rhombus is a special case of a parallelogram.

The area of a parallelogram is given by the product of its base and height.

Thus, area of the given rhombus = Base × Height = 6 cm × 4 cm = 24 cm^2

Also, area of rhombus = $\frac{1}{2}$ (Product of its diagonals)

$$\Rightarrow 24 \text{ cm}^2 = \frac{1}{2}(8 \text{ cm} \times x)$$
$$\Rightarrow x = \left(\frac{24 \times 2}{8}\right) \text{ cm} = 6 \text{ cm}$$

Thus, the length of the other diagonal of the rhombus is 6 cm.

Q7 :

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 Rs 4.

Answer :

Area of rhombus = $\frac{1}{2}$ (Product of its diagonals)

Area of each tile

$$= \left(\frac{1}{2} \times 45 \times 30\right) \text{ cm}^2$$

= 675 cm^2

Area of 3000 tiles = (675 × 3000) cm^2 = 2025000 cm^2 = 202.5 m^2

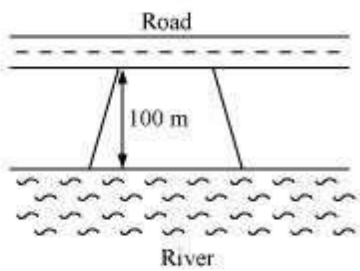
The cost of polishing is Rs 4 per m^2.

Cost of polishing 202.5 m^2 area = Rs (4 × 202.5) = Rs 810

Thus, the cost of polishing the floor is Rs 810.

Q8 :

Mohan wants to buy a trapezium shaped field. Its side along the river is parallel to and twice the side along the road. It 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 :

Let the length of the field along the road be *l* m. Hence, the length of the field along the river will be 2*l* m.

Area of trapezium = $\frac{1}{2}$ (Sum of parallel sides) (Distance between the parallel sides)

$$\Rightarrow 10500 \text{ m}^2 = \frac{1}{2}(l + 2l) \times (100 \text{ m})$$

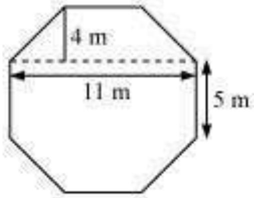
$$3l = \left(\frac{2 \times 10500}{100}\right) \text{ m} = 210 \text{ m}$$

$$l = 70 \text{ m}$$

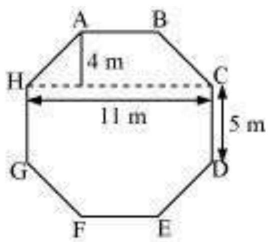
Thus, length of the field along the river = (2 × 70) m = 140 m

Q9 :

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 :



Side of regular octagon = 5 cm

Area of trapezium ABCH = Area of trapezium DEFG

$$\text{Area of trapezium ABCH} = \left[\frac{1}{2}(4)(11+5)\right] \text{ m}^2 = \left(\frac{1}{2}\times 4\times 16\right) \text{ m}^2 = 32 \text{ m}^2$$

Area of rectangle HGDC = 11 × 5 = 55 m^2

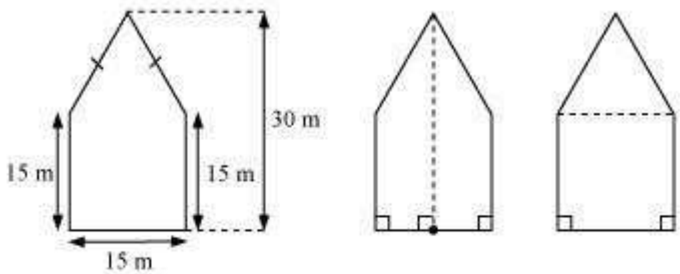
Area of octagon = Area of trapezium ABCH + Area of trapezium DEFG

+ Area of rectangle HGDC
= 32 m^2 + 32 m^2 + 55 m^2 = 119 m^2

Q10 :

There is a pentagonal shaped park as shown in the figure.

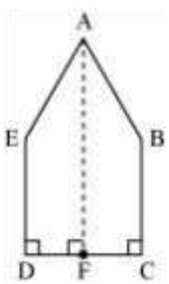
For finding its area Jyoti and Kavita divided it in two different ways.



Find the area of this park using both ways. Can you suggest some other way of finding its area

Answer :

Jyoti's way of finding area is as follows.

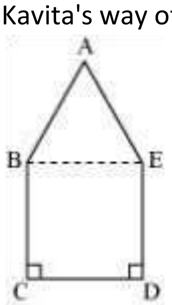


Area of pentagon = 2 (Area of trapezium ABCF)

$$= \left[2 \times \frac{1}{2}(15+30)\left(\frac{15}{2}\right)\right] \text{m}^2$$

= 337.5 m^2

Kavita's way of finding area is as follows.



Area of pentagon = Area of ΔABE + Area of square BCDE

$$= \left[\frac{1}{2} \times 15 \times (30 - 15) + (15)^2\right] \text{ m}^2$$

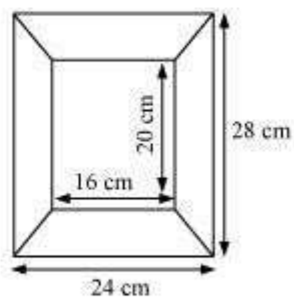
$$= \left(\frac{1}{2} \times 15 \times 15 + 225\right) \text{ m}^2$$

$$= (112.5 + 225) \text{ m}^2$$

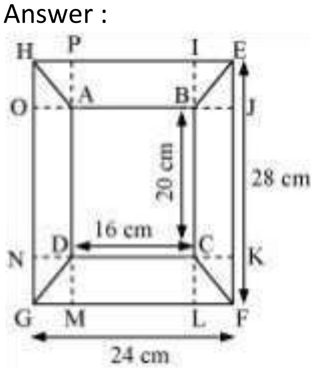
$$= 337.5 \text{ m}^2$$

Q11 :

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 :



Given that, the width of each section is same. Therefore,

IB = BJ = CK = CL = DM = DN = AO = AP

IL = IB + BC + CL

28 = IB + 20 + CL

IB + CL = 28 cm - 20 cm = 8 cm

IB = CL = 4 cm

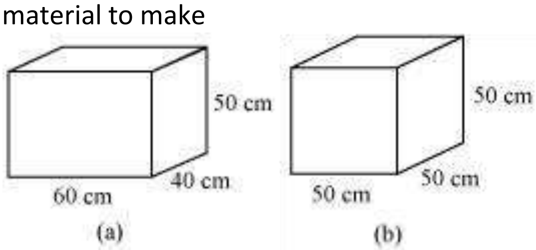
Hence, IB = BJ = CK = CL = DM = DN = AO = AP = 4 cm
Area of section BEFC = Area of section DGHA

$$= \left[\frac{1}{2}(20+28)(4)\right] \text{ cm}^2 = 96 \text{ cm}^2$$

Area of section ABEH = Area of section CDGF
⇒Area of section ABEH = Area of section CDGF
= [12(16+24)(4)]=80

Exercise 11.3 : Solutions of Questions on Page Number : 186
Q1 :

There are two cuboidal boxes as shown in the adjoining figure. Which box requires the lesser amount of material to make



Answer :

We know that,

Total surface area of the cuboid = 2 (*lh* + *bh* + *lb*)

Total surface area of the cube = 6 $(l)^2$

Total surface area of cuboid (a) = [2{(60) (40) + (40) (50) + (50) (60)}] cm^2

= [2(2400 + 2000 + 3000)] cm^2

= (2 x 7400) cm^2

= 14800 cm^2

Total surface area of cube (b) = 6 (50 cm)^2 = 15000 cm^2

Thus, the cuboidal box (a) will require lesser amount of material.

Q2 :

A suitcase with measures 80 cm x 48 cm x 24 cm is to be covered with a tarpaulin cloth. How many metres of tarpaulin of width 96 cm is required to cover 100 such suitcases

Answer :

Total surface area of suitcase = 2[(80) (48) + (48) (24) + (24) (80)]

= 2[3840 + 1152 + 1920]

= 13824 cm^2

Total surface area of 100 suitcases = (13824 × 100) cm^2 = 1382400 cm^2

Required tarpaulin = Length × Breadth
1382400 cm^2 = Length × 96 cm

Length = $\left(\frac{1382400}{96}\right)$ cm = 14400 cm = 144 m

Thus, 144 m of tarpaulin is required to cover 100 suitcases.

Q3 :

Find the side of a cube whose surface area is 600 cm^2.

Answer :

Given that, surface area of cube = 600 cm^2

Let the length of each side of cube be *l*.

Surface area of cube = 6 (Side)^2

600 cm^2 = 6l^2

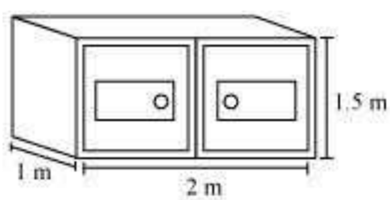
l^2= 100 cm^2 l

= 10 cm

Thus, the side of the cube is 10 cm.

Q4 :

Rukhsar 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 :
Length (l) of the cabinet = 2 m

Breadth (b) of the cabinet = 1 m

Height (h) of the cabinet = 1.5 m

Area of the cabinet that was painted = 2h (l + b) + lb

= [2 x 1.5 x (2 + 1) + (2) (1)] m^2

= [3(3) + 2] m^2

= (9 + 2) m^2

= 11 m^2

Q5 :

Daniel is painting 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 :

Given that,

Length (l) = 15 m, breadth (b) = 10 m, height (h) = 7 m

Area of the hall to be painted = Area of the wall + Area of the ceiling

$= 2h(l + b) + lb$

$= [2(7)(15 + 10) + 15 \times 10]\ m^2$

$= [14(25) + 150]\ m^2$

$= 500\ m^2$

It is given that 100 m^2 area can be painted from each can.

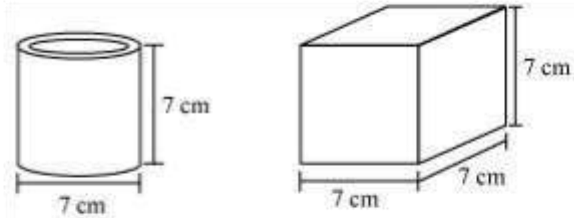
Number of cans required to paint an area of 500 m^2

$= \frac{500}{100} = 5$

Hence, 5 cans are required to paint the walls and the ceiling of the cuboidal hall.

Q6 :

Describe how the two figures at the right are alike and how they are different. Which box has larger lateral surface area



Answer :

Similarity between both the figures is that both have the same heights.

The difference between the two figures is that one is a cylinder and the other is a cube.

Lateral surface area of the cube = $4l^2$ = 4 (7 cm)^2 = 196 cm^2

Lateral surface area of the cylinder = $2\pi rh$ $=\left(2\times\frac{22}{7}\times\frac{7}{2}\times 7\right)$ cm^2 = 154 cm^2

Hence, the cube has larger lateral surface area.

Q7 :

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 :

Total surface area of cylinder = $2\pi r\,(r + h)$

$=\left[2\times\frac{22}{7}\times 7(7+3)\right]$ m^2

= 440 m^2

Thus, 440 m^2 sheet of metal is required.

Q8 :

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 :

A hollow cylinder is cut along its height to form a rectangular sheet.

Area of cylinder = Area of rectangular sheet 4224
cm^2 = 33 cm × Length

$$\text{Length} = \frac{4224\ \text{cm}^2}{33\ \text{cm}} = 128\ \text{cm}$$

Thus, the length of the rectangular sheet is 128 cm.

Perimeter of the rectangular sheet = 2 (Length + Width)

= [2 (128 + 33)] cm

= (2 × 161) cm

= 322 cm

Q9 :

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 is 1 m.

Answer :
In one revolution, the roller will cover an area equal to its lateral surface area.

Thus, in 1 revolution, area of the road covered = $2\pi rh$

$$= 2 \times \frac{22}{7} \times 42\ \text{cm} \times 1\ \text{m}$$
$$= 2 \times \frac{22}{7} \times \frac{42}{100}\ \text{m} \times 1\ \text{m}$$
$$= \frac{264}{100}\ \text{m}^2$$

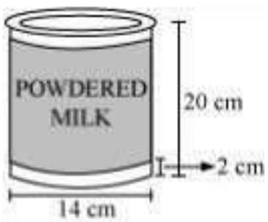
In 750 revolutions, area of the road covered

$$= \left(750 \times \frac{264}{100}\right)\ \text{m}^2$$

= 1980 m^2

Q10 :

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 the figure). If the label is placed 2 cm from top and bottom, what is the area of the label.



Answer :

Height of the label = 20 cm - 2 cm - 2 cm = 16 cm

Radius of the label $= \left(\frac{14}{2}\right)$ cm = 7 cm

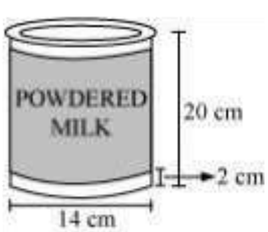
Label is in the form of a cylinder having its radius and height as 7 cm and 16 cm.

Area of the label = 2π (Radius) (Height)

$$= \left(2 \times \frac{22}{7} \times 7 \times 16\right) \text{ cm}^2 = 704 \text{ cm}^2$$

Q11 :

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 the figure). If the label is placed 2 cm from top and bottom, what is the area of the label.



Answer :

Height of the label = 20 cm - 2 cm - 2 cm = 16 cm

Radius of the label $= \left(\frac{14}{2}\right) \text{ cm} = 7 \text{ cm}$

Label is in the form of a cylinder having its radius and height as 7 cm and 16 cm.

Area of the label = 2π (Radius) (Height)

$$= \left(2 \times \frac{22}{7} \times 7 \times 16\right) \text{ cm}^2 = 704 \text{ cm}^2$$

Exercise 11.4 : Solutions of Questions on Page Number : 191

Q1 :

Given a cylindrical tank, in which situation will you find surface area 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 :

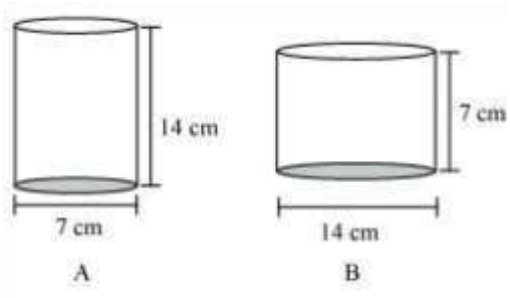
(a) In this situation, we will find the volume.

(b) In this situation, we will find the surface area.

(c) In this situation, we will find the volume.

Q2 :

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 :

The heights and diameters of these cylinders A and B are interchanged.

We know that,

Volume of cylinder $= \pi r^2 h$

If measures of *r* and *h* are same, then the cylinder with greater radius will have greater area.

Radius of cylinder $\frac{7}{2}$ cm A =

Radius of cylinder $\left(\frac{14}{2}\right)$ B = cm = 7 cm

As the radius of cylinder B is greater, therefore, the volume of cylinder B will be greater.
Let us verify it by calculating the volume of both the cylinders.

Volume of cylinder A$= \pi r^2 h$

$$= \left(\frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 14\right) \text{ cm}^3$$
$$= 539 \text{ cm}^3$$

Volume of cylinder B$= \pi r^2 h$

$$= \left(\frac{22}{7} \times 7 \times 7 \times 7\right) \text{ cm}^3$$
$$= 1078 \text{ cm}^3$$

Volume of cylinder B is greater.

Surface area of cylinder A $= 2\pi r(r+h)$

$$= \left[2 \times \frac{22}{7} \times \frac{7}{2}\left(\frac{7}{2} + 14\right)\right] \text{ cm}^2$$
$$= \left[22 \times \left(\frac{7+28}{2}\right)\right] \text{ cm}^2$$
$$= \left(22 \times \frac{35}{2}\right) \text{ cm}^2$$
$$= 385 \text{ cm}^2$$

Surface area of cylinder B $= 2\pi r(r+h)$

$$= \left[2 \times \frac{22}{7} \times 7 \times (7+7)\right] \text{ cm}^2$$
$$= (44 \times 14) \text{ cm}^2$$
$$= 616 \text{ cm}^2$$

Thus, the surface area of cylinder B is also greater than the surface area of cylinder A.

Q3 :
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 :

Volume of cuboid = 60 cm × 54 cm × 30 cm = 97200 cm^3

Side of the cube = 6 cm

Volume of the cube = $(6)^3$ cm^3 = 216 cm^3

Required number of cubes = $\frac{\text{Volume of the cuboid}}{\text{Volume of the cube}}$

$$=\frac{97200}{216}=450$$

Thus, 450 cubes can be placed in the given cuboid.

Q4 :

Find the height of the cylinder whose volume is 1.54 m^3 and diameter of the base is 140 cm

Answer :

Diameter of the base = 140 cm

Radius (r) of the base $=\left(\frac{140}{2}\right)\text{ cm}=70\text{ cm}=\frac{70}{100}\text{m}$

Volume of cylinder $=\pi r^2 h$

$$1.54\text{ m}^3=\frac{22}{7}\times\frac{70}{100}\text{ m}\times\frac{70}{100}\text{ m}\times h$$

$$h=\left(\frac{1.54\times 100}{22\times 7}\right)\text{ m}=1\text{ m}$$

Thus, the height of the cylinder is 1 m.

Q5 :

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 litres that can be stored in the tank

Answer :

Radius of cylinder = 1.5 m

Length of cylinder = 7 m

Volume of cylinder $= \pi r^2 h$

$$= \left(\frac{22}{7}\times 1.5\times 1.5\times 7\right)\ \mathrm{m}^3$$
$$= 49.5\ \mathrm{m}^3$$

$1\mathrm{m}^3 = 1000$ L

Required quantity = (49.5 × 1000) L = 49500 L

Therefore, 49500 L of milk can be stored in the tank.

Q6 :

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 :

(i) Let initially the edge of the cube be l.

Initial surface area = $6l^2$

If each edge of the cube is doubled, then it becomes $2l$.

New surface area = $6(2l)^2 = 24l^2 = 4 \times 6l^2$
Clearly, the surface area will be increased by 4 times.

(ii) Initial volume of the cube = l^3

When each edge of the cube is doubled, it becomes $2l$.

New volume = $(2l)^3 = 8l^3 = 8 \times l^3$

Clearly, the volume of the cube will be increased by 8 times.

Q7 :

Water is pouring into a cubiodal reservoir at the rate of 60 litres per minute. If the volume of reservoir is 108 m^3, find the number of hours it will take to fill the reservoir.

Answer :

Volume of cuboidal reservoir = 108 m^3 = (108 × 1000) L = 108000 L

It is given that water is being poured at the rate of 60 L per minute.

That is, (60 × 60) L = 3600 L per hour

Required number of hours $= \frac{108000}{3600}$ = 30 hours

Thus, it will take 30 hours to fill the reservoir.

Exercise 12.1 : Solutions of Questions on Page Number : 197

Q1 :

Evaluate

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

Answer :

(i) $3^{-2} = \frac{1}{3^2} = \frac{1}{9}$ $\left(a^{-m} = \frac{1}{a^m}\right)$

(ii) $(-4)^{-2} = \frac{1}{(-4)^2} = \frac{1}{16}$ $\left(a^{-m} = \frac{1}{a^m}\right)$

(iii) $\left(\frac{1}{2}\right)^{-5} = \frac{1}{(2)^{-5}} = (2)^5 = 2\times2\times2\times2\times2 = 32$

Q2 :

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 :

(i) $(-4)^{5}$ ÃƒÂ· $(-4)^{8} = (-4)^{5-8}$ (a^{m} ÃƒÂ· $a^{n} = a^{m-n}$)
$= (-4)^{-3}$

$$= \frac{1}{(-4)^{3}} \qquad \left(a^{-m} = \frac{1}{a^{m}}\right)$$

(ii) $$\left(\frac{1}{2^{3}}\right)^{2} = \frac{1}{\left(2^{3}\right)^{2}} = \frac{1}{2^{6}} \qquad \left(\left(a^{m}\right)^{n} = a^{mn}\right)$$

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

$$= (-1)^{4} \times 3^{4} \times \frac{5^{4}}{3^{4}} \qquad \left[(ab)^{m} = a^{m} \times b^{m}\right]$$
$$= (-1)^{4} \times 5^{4}$$
$$= 5^{4} \qquad \left[(-1)^{4} = 1\right]$$

(iv) (3_{-7} ÃƒÂ· 3_{-10}) × 3_{-5} = ($3_{-7-(-10)}$) × 3_{-5} (a_{m} ÃƒÂ· $a_{n} = a_{m-n}$)

$= 3_{3} \times 3_{-5}$

$= 3_{3+(-5)}$ ($a_{m} \times a_{n} = a_{m+n}$)

$= 3_{-2}$

$$= \frac{1}{3^{2}} \qquad \left(a^{-m} = \frac{1}{a^{m}}\right)$$

(v) $2^{-3} \times (-7)^{-3} = \frac{1}{2^{3}} \times \frac{1}{(-7)^{3}} \qquad \left(a^{-m} = \frac{1}{a^{m}}\right)$

$$= \frac{1}{\left[2 \times (-7)\right]^{3}} \qquad \left[a^{m} \times b^{m} = (ab)^{m}\right]$$
$$= \frac{1}{(-14)^{3}}$$

Q3 :

Find the value of.

(i) $(3^0 + 4^{-1}) \times 2^2$ (ii) $(2^{-1} \times 4^{-1})$ ÃƒÂ·2^{-2}

$$\left(\frac{1}{2}\right)^{-2}+\left(\frac{1}{3}\right)^{-2}+\left(\frac{1}{4}\right)^{-2}$$

((v) $\left\{\left(\frac{-2}{3}\right)^{-2}\right\}^2$ iii) (iv) $(3^{-1} + 4^{-1} + 5^{-1})^0$

Answer :

(i) $(3^0+4^{-1})\times 2^2 = \left(1+\frac{1}{4}\right)\times 2^2$ $\left(a^0 = 1 \text{ and } a^{-m} = \frac{1}{a^m}\right)$

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

(ii) $(2^{-1} \times 4^{-1})$ ÃƒÂ· $2^{-2} = [2^{-1} \times \{(2)^2\}^{-1}]$ ÃƒÂ· 2^{-2}

$= (2^{-1} \times 2^{-2})$ ÃƒÂ· 2^{-2} $\left(\left(a^m\right)^n = a^{mn}\right)$

$= 2^{-1+(-2)}$ ÃƒÂ· 2^{-2} $(a^m \times a^n = a^{m+n})$

$= 2^{-3}$ ÃƒÂ· 2^{-2}

$= 2^{-3-(-2)}$ (a^m ÃƒÂ· $a^n = a^{m-n}$)

$= 2^{-3+2} = 2^{-1}$

$= \frac{1}{2}$ $\left(a^{-m} = \frac{1}{a^m}\right)$

(iii) $\left(\frac{1}{2}\right)^{-2} + \left(\frac{1}{3}\right)^{-2} + \left(\frac{1}{4}\right)^{-2} = \left(\frac{2}{1}\right)^2 + \left(\frac{3}{1}\right)^2 + \left(\frac{4}{1}\right)^2$ $\left(\therefore a^{-m} = \frac{1}{a^m}\right)$

$= 2^2 + 3^2 + 4^2 = 4 + 9 + 16 = 29$

(iv) $(3^{-1} + 4^{-1} + 5^{-1})^0$ $= \left(\frac{1}{3} + \frac{1}{4} + \frac{1}{5}\right)^0$ $\left(a^{-m} = \frac{1}{a^m}\right)$

= 1 ($a^0 = 1$)

(v) $\left\{\left(\frac{-2}{3}\right)^{-2}\right\}^2 = \left\{\left(\frac{3}{-2}\right)^2\right\}^2$ $\left(a^{-m} = \frac{1}{a^m}\right)$

$= \left\{\frac{3^2}{(-2)^2}\right\}^2$ $\left[\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}\right]$

$= \left(\frac{9}{4}\right)^2 = \frac{81}{16}$

Q4 :

Evaluate (i) $\frac{8^{-1} \times 5^3}{2^{-4}}$ (ii) $\left(5^{-1} \times 2^{-1}\right) \times 6^{-1}$

Answer :

(i) $\dfrac{8^{-1}\times 5^3}{2^{-4}} = \dfrac{2^4 \times 5^3}{8^1}$ $\left(a^{-m} = \dfrac{1}{a^m}\right)$

$= \dfrac{2^4 \times 5^3}{2^3} = 2^{4-3} \times 5^3$ $\left(a^m \div a^n = a^{m-n}\right)$

$= 2 \times 125 = 250$

(ii) $(5^{-1} \times 2^{-1}) \times 6^{-1} = \left(\dfrac{1}{5} \times \dfrac{1}{2}\right) \times \dfrac{1}{6}$ $\left(a^{-m} = \dfrac{1}{a^m}\right)$

$= \dfrac{1}{10} \times \dfrac{1}{6} = \dfrac{1}{60}$

Q5 :

Find the value of *m* for which 5^m ÃƒÂ·$5^{-3} = 5^5$.

Answer :

5^m ÃƒÂ· $5^{-3} = 5^5$

$5^{m - (-3)} = 5^5$ (a^m ÃƒÂ· $a^n = a^{m-n}$)

$5^{m+3} = 5^5$

Since the powers have same bases on both sides, their respective exponents must be equal.

$m + 3 = 5$

$m = 5 - 3$ *m*

= 2

Q6 :

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 :

(i) $\left\{\left(\frac{1}{3}\right)^{-1}-\left(\frac{1}{4}\right)^{-1}\right\}^{-1}=\left\{\left(\frac{3}{1}\right)^{1}-\left(\frac{4}{1}\right)^{1}\right\}^{-1}$ $\qquad \left(a^{-m}=\frac{1}{a^{m}}\right)$

$=\{3-4\}^{-1}=(-1)^{-1}=\frac{1}{-1}=-1$

(ii) $\left(\frac{5}{8}\right)^{-7}\times\left(\frac{8}{5}\right)^{-4}=\frac{5^{-7}}{8^{-7}}\times\frac{8^{-4}}{5^{-4}}$ $\qquad \left[\left(\frac{a}{b}\right)^{m}=\frac{a^{m}}{b^{m}}\right]$

$=\frac{8^{7}}{5^{7}}\times\frac{5^{4}}{8^{4}}$ $\qquad \left(a^{-m}=\frac{1}{a^{m}}\right)$

$=\frac{8^{7-4}}{5^{7-4}}$ $\qquad \left(a^{m}\div a^{n}=a^{m-n}\right)$

$=\frac{8^{3}}{5^{3}}=\frac{512}{125}$

Q7 :

Simplify. (i) $\frac{25\times t^{-4}}{5^{-3}\times 10\times t^{-8}}\left(t\neq 0\right)$ (ii) $\frac{3^{-5}\times 10^{-5}\times 125}{5^{-7}\times 6^{-5}}$

Answer :

(i) $\dfrac{25\times t^{-4}}{5^{-3}\times 10\times t^{-8}}=\dfrac{5^2\times t^{-4}}{5^{-3}\times 5\times 2\times t^{-8}}$

$$=\frac{5^2\times t^{-4}}{5^{-3+1}\times 2\times t^{-8}} \qquad \left(a^m\times a^n=a^{m+n}\right)$$
$$=\frac{5^2\times t^{-4}}{5^{-2}\times 2\times t^{-8}}$$
$$=\frac{5^{2-(-2)}t^{-4-(-8)}}{2} \qquad \left(a^m\div a^n=a^{m-n}\right)$$
$$=\frac{5^4t^4}{2}=\frac{625\,t^4}{2}$$

(ii) $\dfrac{3^{-5}\times 10^{-5}\times 125}{5^{-7}\times 6^{-5}}=\dfrac{3^{-5}\times(2\times 5)^{-5}\times 5^3}{5^{-7}\times(2\times 3)^{-5}}$

$$=\frac{3^{-5}\times 2^{-5}\times 5^{-5}\times 5^3}{5^{-7}\times 2^{-5}\times 3^{-5}} \qquad \left[(a\times b)^m=a^m\times b^m\right]$$
$$=3^{-5-(-5)}\times 2^{-5-(-5)}\times 5^{-5+3-(-7)} \qquad \left(a^m\div a^n=a^{m-n}\right)$$
$$=3^0\times 2^0\times 5^5 \qquad \left(a^0=1\right)$$
$$=5^5$$

Exercise 12.2 : Solutions of Questions on Page Number : 200

Q1 :

Express the following numbers in standard form.

(i) 0.0000000000085 (ii) 0.00000000000942

(iii) 6020000000000000 (iv) 0.00000000837

(v) 31860000000

Answer :

(i) 0.0000000000085 = 8.5×10^{-12}

(ii) $0.00000000000942 = 9.42 \times 10^{-12}$

(iii) $6020000000000000 = 6.02 \times 10^{15}$

(iv) $0.00000000837 = 8.37 \times 10^{-9}$

(v) $31860000000 = 3.186 \times 10^{10}$

Q2 :

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 :

(i) $3.02 \times 10^{-6} = 0.00000302$

(ii) $4.5 \times 10^{4} = 45000$
(iii) $3 \times 10^{-8} = 0.00000003$

(iv) $1.0001 \times 10^{9} = 1000100000$

(v) $5.8 \times 10^{12} = 5800000000000$

(vi) $3.61492 \times 10^{6} = 3614920$

Q3 :

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 of a thick paper is 0.07 mm

Answer :

(i) $\frac{1}{1000000} = 1 \times 10^{-6}$

(ii) 0.000, 000, 000, 000, 000, 000, 16 = 1.6×10^{-19}

(iii) 0.0000005 = 5×10^{-7}

(iv) 0.00001275 = 1.275×10^{-5}

(v) 0.07 = 7×10^{-2}

Q4 :

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 :

Thickness of each book = 20 mm

Hence, thickness of 5 books = (5 x 20) mm = 100 mm

Thickness of each paper sheet = 0.016 mm

Hence, thickness of 5 paper sheets = (5 x 0.016) mm = 0.080 mm

Total thickness of the stack = Thickness of 5 books + Thickness of 5 paper sheets

= (100 + 0.080) mm

= 100.08 mm

= 1.0008×10^2 mm

Exercise 13.1 : Solutions of Questions on Page Number : 208

Q1 :

Following are the car parking charges near a railway station up to

4 hours Rs 60

8 hours Rs 100

12 hours Rs 140

24 hours Rs 180

Check if the parking charges are in direct proportion to the parking time.

Answer :

A table of the given information is formed as

Number of hours	4	8	12	24
Parking charges (in Rs)	60	100	140	180

The ratio of parking charges to the respective number of hours (Rs/ hour) can be calculated as

$$\frac{60}{4} = 15, \quad \frac{100}{8} = \frac{25}{2}, \quad \frac{140}{12} = \frac{35}{3}, \quad \frac{180}{24} = \frac{15}{2}$$

As each ratio is not same, therefore, the parking charges are not in a direct proportion to the parking time.

Q2 :

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 :

The given mixture of paint is prepared by mixing 1 part of red pigments with 8 parts of base. For more parts of red pigments, the parts of the base will also be more. Therefore, the parts of red pigments and the parts of base are in direct proportion. The given information in the form of a table is as follows.

Parts of red pigment	1	4	7	12	20
Parts of base	8	x_1	x_2	x_3	x_4

According to direct proportion,

$$\frac{x_1}{4}=\frac{8}{1} \Rightarrow x_1 = 4\times 8 = 32$$

$$\frac{x_2}{7}=\frac{8}{1} \Rightarrow x_2 = 7\times 8 = 56$$

$$\frac{x_3}{12}=\frac{8}{1} \Rightarrow x_3 = 8\times 12 = 96$$

$$\frac{x_4}{20}=\frac{8}{1} \Rightarrow x_4 = 8\times 20 = 160$$

The table can be drawn as follows.

Parts of red pigment	1	4	7	12	20
Parts of base	8	32	56	96	160

Q3 :

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 :

Let the parts of red pigment required to mix with 1800 mL of base be *x*.
The given information in the form of a table is as follows.

Parts of red pigment	1	*x*
Parts of base (in mL)	75	1800

The parts of red pigment and the parts of base are in direct proportion.

Therefore, we obtain

$$\frac{1}{75} = \frac{x}{1800}$$
$$\Rightarrow x = \frac{1 \times 1800}{75}$$
$$\Rightarrow x = 24$$

Thus, 24 parts of red pigments should be mixed with 1800 mL of base.

Q4 :

A machine in a soft drink factory fills 840 bottles in six hours. How many bottles will it fill in five hours?

Answer :

Let the number of bottles filled by the machine in five hours be *x*.

The given information in the form of a table is as follows.

Number of bottles	840	*x*
Time taken (in hours)	6	5

The number of bottles and the time taken to fill these bottles are in direct proportion.
Therefore, we obtain

$$\frac{840}{6} = \frac{x}{5}$$

$$x = \frac{840 \times 5}{6} = 700$$

Thus, 700 bottles will be filled in 5 hours.

Q5 :

A photograph of a bacteria enlarged 50,000 times attains a length of 5 cm. What is the actual length of the bacteria? If the photograph is enlarged 20,000 times only, what would be its enlarged length?

Answer :

Let the actual length of bacteria be *x* cm and the enlarged length of bacteria be *y* cm, if the photograph is enlarged for 20,000 times.

The given information in the form of a table is as follows.

Length of bacteria (in cm)	5	*x*	*y*
Number of times photograph of Bacteria was enlarged	50000	1	20000

The number of times the photograph of bacteria was enlarged and the length of bacteria are in direct proportion.

Therefore, we obtain

$$\frac{5}{50,000} = \frac{x}{1}$$

$$\Rightarrow x = \frac{1}{10000} = 10^{-4}$$

Hence, the actual length of bacteria is 10^{-4} cm.

Let the length of bacteria when the photograph of bacteria is enlarged 20, 000 times be *y*.

$$\frac{5}{50,000}=\frac{y}{20,000}$$
$$y=\frac{20,000\times 5}{50,000}=2$$

Hence, the enlarged length of bacteria is 2 cm.

Q6 :

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 of the ship is 28 m, how long is the model ship?

Answer :

Let the length of the mast of the model ship be *x* cm.

The given information in the form of a table is as follows:

-	Height of mast	Length of ship
Model ship	9 cm	*x*
Actual ship	12 m	28 m

We know that the dimensions of the actual ship and the model ship are directly proportional to each other.

Therefore, we obtain:

$$\frac{12}{9}=\frac{28}{x}$$
$$x=\frac{28\times 9}{12}=21$$

Thus, the length of the model ship is 21 cm.

Q7 :
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 :

(i) Let the number of sugar crystals in 5 kg of sugar be *x*.

The given information in the form of a table is as follows.

Amount of sugar (in kg)	2	5
Number of crystals	9×10^6	x

The amount of sugar and the number of crystals it contains are directly proportional to each other. Therefore, we obtain

$$\frac{2}{9\times10^6} = \frac{5}{x}$$

$$x = \frac{5\times9\times10^6}{2} = 2.25\times10^7$$

Hence, the number of sugar crystals is 2.25×10^7.

(ii) Let the number of sugar crystals in 1.2 kg of sugar be *y*. The given information in the form of a table is as follows.

Amount of sugar (in kg)	2	1.2
Number of crystals	9×10^6	y

$$\frac{2}{9\times10^6} = \frac{1.2}{y}$$

$$y = \frac{1.2\times9\times10^6}{2} = 5.4\times10^6$$

Hence, the number of sugar crystals is 5.4×10^6.

Q8 :
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 :

Let the distance represented on the map be *x* cm.

The given information in the form of a table is as follows.

Distance covered on road in (in km)	18	72
Distance represented on map (in cm)	1	*x*

The distances covered on road and represented on map are directly proportional to each other. Therefore, we obtain

$$\frac{18}{1} = \frac{72}{x}$$
$$\Rightarrow x = \frac{72}{18} = 4$$

Hence, the distance represented on the map is 4 cm.

Q9 :

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 :

(i) Let the length of the shadow of the other pole be *x* m.

1 m = 100 cm

The given information in the form of a table is as follows.

Height of pole (in m)	5.60	10.50
Length of shadow (in m)	3.20	x

More the height of an object, more will be the length of its shadow.

Thus, the height of an object and length of its shadow are directly proportional to each other. Therefore, we obtain

$$\frac{5.60}{3.20} = \frac{10.50}{x}$$

$$\Rightarrow x = \frac{10.50 \times 3.20}{5.60} = 6$$

Hence, the length of the shadow will be 6 m.

(ii) Let the height of the pole be y m.

The given information in the form of a table is as follows.

Height of pole (in m)	5.60	y
Length of shadow (in m)	3.20	5

The height of the pole and the length of the shadow are directly proportional to each other. Therefore,

$$\frac{5.60}{3.20} = \frac{y}{5}$$

$$y = \frac{5 \times 5.60}{3.20} = 8.75$$

Thus, the height of the pole is 8.75 m or 8 m 75 cm.

Q10 :

A loaded truck travels 14 km in 25 minutes. If the speed remains the same, how far can it travel in 5 hours?

Answer :

Let the distance travelled by the truck in 5 hours be *x* km.

We know, 1 hour = 60 minutes

∴ 5 hours = (5 × 60) minutes = 300 minutes

The given information in the form of a table is as follows.

Distance travelled (in km)	14	*x*
Time (in min)	25	300

The distance travelled by the truck and the time taken by the truck are directly proportional to each other. Therefore,

$$\frac{14}{25} = \frac{x}{300}$$

$$x = \frac{14 \times 300}{25} = 168$$

Hence, the distance travelled by the truck is 168 km.

Exercise 13.2 : Solutions of Questions on Page Number : 213

Q1 :

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 :

(i) These are in inverse proportion because if there are more workers, then it will take lesser time to complete that job.

(ii) No, these are not in inverse proportion because in more time, we may cover more distance with a uniform speed.

(iii) No, these are not in inverse proportion because in more area, more quantity of crop may be harvested.

(iv) These are in inverse proportion because with more speed, we may complete a certain distance in a lesser time.

(v) These are in inverse proportion because if the population is increasing, then the area of the land per person will be decreasing accordingly.

Q2 :

In a Television game show, the prize money of Rs 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?

Number of winners	1	2	4	5	8	10	20
Prize for each winner (in Rs)	100000	50000	…	…	…	…	…

Answer :

A table of the given information is as follows.

Number of winners	1	2	4	5	8	10	20
Prize for each winner (in Rs)	100000	50000	x_1	x_2	x_3	x_4	x_5

From the table, we obtain

1 × 100000 = 2 × 50000 = 100000

Thus, the number of winners and the amount given to each winner are inversely proportional to each other. Therefore,

$1 \times 100000 = 4 \times x_1$

$$x_1 = \frac{100000}{4} = 25000$$

$1 \times 100000 = 5 \times x_2$

$$x_2 = \frac{100000}{5} = 20000$$

$1 \times 100000 = 8 \times x_3$

$$x_3 = \frac{100000}{8} = 12500$$

$1 \times 100000 = 10 \times x_4$

$$x_4 = \frac{100000}{10} = 10000$$

$1 \times 100000 = 20 \times x_5$

$$x_5 = \frac{100000}{20} = 5000$$

Q3 :

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.

Number 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 :

A table of the given information is as follows.

Number of spokes	4	6	8	10	12
Angle between a pair of consecutive spokes	90°	60°	x_1	x_2	x_3

From the given table, we obtain

4 × 90° = 360° = 6 × 60°

Thus, the number of spokes and the angle between a pair of consecutive spokes are inversely proportional to each other. Therefore,

4 × 90° = x_1 × 8

$$x_1 = \frac{4 \times 90^\circ}{8} = 45^\circ$$

Similarly, $x_2 = \frac{4 \times 90^\circ}{10} = 36^\circ$ and $x_3 = \frac{4 \times 90^\circ}{12} = 30^\circ$

Thus, the following table is obtained.

Number 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 the pairs of consecutive spokes are in inverse proportion.

(ii)Let the angle between a pair of consecutive spokes on a wheel with 15 spokes be *x*.

Therefore, 4 × 90° = 15 × *x*

$$x = \frac{4 \times 90^\circ}{15} = 24^\circ$$

Hence, the angle between a pair of consecutive spokes of a wheel, which has 15 spokes in it, is 24°.

(iii) Let the number of spokes in a wheel, which has 40 º angles between a pair of consecutive spokes, be *y*. Therefore,

$4 \times 90° = y \times 40°$

$$y = \frac{4 \times 90}{40} = 9$$

Hence, the number of spokes in such a wheel is 9.

Q4 :

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 :

Number of remaining children = 24 - 4 = 20

Let the number of sweets which each of the 20 students will get, be *x*.

The following table is obtained.

Number of students	24	20
Number of sweets	5	*x*

If the number of students is lesser, then each student will get more number of sweets.

Since this is a case of inverse proportion,

$24 \times 5 = 20 \times x$

$$x = \frac{24 \times 5}{20} = 6$$

Hence, each student will get 6 sweets.

Q5 :

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 :

Let the number of days that the food will last if there were 10 more animals in the cattle be x. The following table is obtained.

Number of animals	20	20 + 10 = 30
Number of days	6	x

More the number of animals, lesser will be the number of days for which the food will last.

Hence, the number of days the food will last and the number of animals are inversely proportional to each other.

Therefore,

$20 \times 6 = 30 \times x$

$$x = \frac{20 \times 6}{30} = 4$$

Thus, the food will last for 4 days.

Q6 :

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 :

Let the number of days required by 4 persons to complete the job be x.
The following table is obtained.

Number of days	4	x
Number of persons	3	4

If the number of persons is more, then it will take lesser time to complete the job.

Hence, the number of days and the number of persons required to complete the job are inversely proportional to each other.

Therefore,

$4 \times 3 = x \times 4$

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

Thus, the number of days required to complete the job is 3.

Q7 :

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 :

Let the number of boxes filled, by using 20 bottles in each box, be x.

The following table is obtained.

Number of bottles	12	20
Number of boxes	25	x

More the number of bottles, lesser will be the number of boxes.

Hence, the number of bottles and the number of boxes required to pack these are inversely proportional to each other.
Therefore,

$12 \times 25 = 20 \times x$

$$x = \frac{12 \times 25}{20} = 15$$

Hence, the number of boxes required to pack these bottles is 15.

Q8 :

A factory required 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 :

Let the number of machines required to produce articles in 54 days be *x*. The following table is obtained.

Number of machines	42	*x*
Number of days	63	54

More the number of machines, lesser will be the number of days that it will take to produce the given number of articles. Thus, this is a case of inverse proportion. Therefore,

$42 \times 63 = 54 \times x$

$$x = \frac{42 \times 63}{54} = 49$$

Hence, the required number of machines to produce the given number of articles in 54 days is 49.

Q9 :

A car takes 2 hours to reach a destination by travelling at the speed of 60 km/h. how long will it take when the car travels at the speed of 80 km/h?

Answer :

Let the time taken by the car to reach the destination, while travelling with a speed of 80 km/hr, be *x* hours.

The following table is obtained.

Speed (in km/hr)	60	80
Time taken (in hours)	2	*x*

More the speed of the car, lesser will be the time taken by it to reach the destination.

Hence, the speed of the car and the time taken by the car are inversely proportional to each other. Therefore,

60 × 2 = 80× *x*

$$x = \frac{60 \times 2}{80} = \frac{3}{2} = 1\frac{1}{2}$$

The time required by the car to reach the given destination is $1\frac{1}{2}$ hours.

Q10 :

Two persons could fit new windows in 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 :

(i) Let the number of days required by 1 man to fit all the windows be *x*. The following table is obtained.

Number of persons	2	1

Number of days	3	x

Lesser the number of persons, more will be the number of days required to fit all the windows. Hence, this is a case of inverse proportion. Therefore,

$2 \times 3 = 1 \times x$ x

$= 6$

Hence, the number of days taken by 1 man to fit all the windows is 6.

(ii) Let the number of persons required to fit all the windows in one day be y. The following table is formed.

Number of persons	2	Y
Number of days	3	1

Lesser the number of days, more will be the number of persons required to fit all the windows. Hence, this is a case of inverse proportion. Therefore,

$2 \times 3 = y \times 1$ y

$= 6$

Hence, 6 persons are required to fit all the windows in one day.

Q11 :

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 :

Let the duration of each period, when there are 9 periods a day in the school, be x minutes. The following table is obtained.

Duration of each period (in minutes)	45	*x*
Number of periods	8	9

If there is more number of periods a day in the school, then the duration of each period will be lesser. Hence, this is a case of inverse proportion. Therefore

$45 \times 8 = x \times 9$

$$x = \frac{45 \times 8}{9} = 40$$

Hence, in this case, the duration of each period will be 40 minutes.

Exercise 14.1 : Solutions of Questions on Page Number : 220

Q1 :

Find the common factors of the 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 :

(i) $12x = 2 \times 2 \times 3 \times x$

$36 = 2 \times 2 \times 3 \times 3$

The common factors are 2, 2, 3.

And, $2 \times 2 \times 3 = 12$

(ii) $2y = 2 \times y$

$22xy = 2 \times 11 \times x \times y$

The common factors are 2, y.

And, $2 \times y = 2y$

(iii) $14pq = 2 \times 7 \times p \times q$

$28p^2q^2 = 2 \times 2 \times 7 \times p \times p \times q \times q$
The common factors are 2, 7, p, q.

And, $2 \times 7 \times p \times q = 14pq$

(iv) $2x = 2 \times x$

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

$4 = 2 \times 2$

The common factor is 1.

(v) $6abc = 2 \times 3 \times a \times b \times c$

$24ab^2 = 2 \times 2 \times 2 \times 3 \times a \times b \times b$

$12a^2b = 2 \times 2 \times 3 \times a \times a \times b$

The common factors are 2, 3, a, b.

And, $2 \times 3 \times a \times b = 6ab$

(vi) $16x^3 = 2 \times 2 \times 2 \times 2 \times x \times x \times x$

$-4x^2 = -1 \times 2 \times 2 \times x \times x$

$32x = 2 \times 2 \times 2 \times 2 \times 2 \times x$

The common factors are 2, 2, x.

And, $2 \times 2 \times x = 4x$

(vii) $10pq = 2 \times 5 \times p \times q$

$20qr = 2 \times 2 \times 5 \times q \times r$

$30rp = 2 \times 3 \times 5 \times r \times p$

The common factors are 2, 5.

And, $2 \times 5 = 10$

(viii) $3x^2y^3 = 3 \times x \times x \times y \times y \times y$

$10x^3y^2 = 2 \times 5 \times x \times x \times x \times y \times y$ $6x^2y^2z = 2 \times 3 \times x \times x \times y \times y \times z$

The common factors are x, x, y, y.

And, $x \times x \times y \times y = x^2y^2$

Q2 :

Factorise the following expressions

(i) $7x - 42$

(ii) $6p - 12q$

(iii) $7a^2 + 14a$

(iv) $-16z + 20z^3$

(v) $20l^2m + 30\,alm$

(vi) $5x^2y - 15xy^2$

(vii) $10a^2 - 15b^2 + 20c^2$

(viii) $-4a^2 + 4ab - 4\,ca$

(ix) $x^2yz + xy^2z + xyz^2$

(x) $ax^2y + bxy^2 + cxyz$

Answer :

(i) $7x = 7 \times x$

$42 = 2 \times 3 \times 7$

The common factor is 7.

$\therefore 7x - 42 = (7 \times x) - (2 \times 3 \times 7) = 7(x - 6)$ (ii) $6p = 2 \times 3 \times p$

$12q = 2 \times 2 \times 3 \times q$

The common factors are 2 and 3.

$\therefore 6p - 12q = (2 \times 3 \times p) - (2 \times 2 \times 3 \times q)$

$= 2 \times 3 [p - (2 \times q)]$

$= 6(p - 2q)$

(iii) $7a^2 = 7 \times a \times a$

$14a = 2 \times 7 \times a$

The common factors are 7 and a.

$\therefore 7a^2 + 14a = (7 \times a \times a) + (2 \times 7 \times a)$

$= 7 \times a [a + 2] = 7a(a + 2)$

(iv) $16z = 2 \times 2 \times 2 \times 2 \times z$

$20z^3 = 2 \times 2 \times 5 \times z \times z \times z$

The common factors are 2, 2, and z.

$\therefore -16z + 20z^3 = -(2 \times 2 \times 2 \times 2 \times z) + (2 \times 2 \times 5 \times z \times z \times z)$

$= (2 \times 2 \times z)[-(2 \times 2) + (5 \times z \times z)]$

$= 4z(-4 + 5z^2)$

(v) $20l^2m = 2 \times 2 \times 5 \times l \times l \times m$

$30alm = 2 \times 3 \times 5 \times a \times l \times m$

The common factors are 2, 5, l, and m.

$\therefore 20l^2m + 30alm = (2 \times 2 \times 5 \times l \times l \times m) + (2 \times 3 \times 5 \times a \times l \times m)$

$= (2 \times 5 \times l \times m) [(2 \times l) + (3 \times a)]$

$= 10lm (2l + 3a)$

(vi) $5x^2y = 5 \times x \times x \times y$

$15xy^2 = 3 \times 5 \times x \times y \times y$

The common factors are 5, x, and y.

$\therefore 5x^2y - 15xy^2 = (5 \times x \times x \times y) - (3 \times 5 \times x \times y \times y)$

$= 5 \times x \times y [x - (3 \times y)]$

$= 5xy (x - 3y)$

(vii) $10a^2 = 2 \times 5 \times a \times a$

$15b^2 = 3 \times 5 \times b \times b$

$20c^2 = 2 \times 2 \times 5 \times c \times c$

The common factor is 5.

$10a^2 - 15b^2 + 20c^2 = (2 \times 5 \times a \times a) - (3 \times 5 \times b \times b) + (2 \times 2 \times 5 \times c \times c)$

$= 5 [(2 \times a \times a) - (3 \times b \times b) + (2 \times 2 \times c \times c)]$

$= 5 (2a^2 - 3b^2 + 4c^2)$

(viii) $4a^2 = 2 \times 2 \times a \times a$

$4ab = 2 \times 2 \times a \times b$

$4ca = 2 \times 2 \times c \times a$

The common factors are 2, 2, and a.

$\therefore -4a^2 + 4ab - 4ca = -(2 \times 2 \times a \times a) + (2 \times 2 \times a \times b) - (2 \times 2 \times c \times a)$

$= 2 \times 2 \times a\,[-(a) + b - c]$

$= 4a\,(-a + b - c)$ (ix)

$x^2yz = x \times x \times y \times z$

$xy^2z = x \times y \times y \times z$

$xyz^2 = x \times y \times z \times z$

The common factors

are x, y, and z.

$\therefore x^2yz + xy^2z + xyz^2 = (x \times x \times y \times z) + (x \times y \times y \times z) + (x \times y \times z \times z)$

$= x \times y \times z\,[x + y + z]$

$= xyz\,(x + y + z)$ (x)

$ax^2y = a \times x \times x \times y$

$bxy^2 = b \times x \times y \times y$

$cxyz = c \times x \times y \times z$

The common factors are x and y.

a

Q3 :

Factorise

(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 :

(i) $x^2 + xy + 8x + 8y = x \times x + x \times y + 8 \times x + 8 \times y$

$= x (x + y) + 8 (x + y)$

$= (x + y) (x + 8)$

(ii) $15xy - 6x + 5y - 2 = 3 \times 5 \times x \times y - 3 \times 2 \times x + 5 \times y - 2$
$= 3x (5y - 2) + 1 (5y - 2)$

$= (5y - 2) (3x + 1)$

(iii) $ax + bx - ay - by = a \times x + b \times x - a \times y - b \times y$

$= x (a + b) - y (a + b)$

$= (a + b) (x - y)$

(iv) $15pq + 15 + 9q + 25p = 15pq + 9q + 25p + 15$

$= 3 \times 5 \times p \times q + 3 \times 3 \times q + 5 \times 5 \times p + 3 \times 5$

$= 3q (5p + 3) + 5 (5p + 3)$

$= (5p + 3) (3q + 5)$

(v) $z - 7 + 7xy - xyz = z - x \times y \times z - 7 + 7 \times x \times y$

$= z (1 - xy) - 7 (1 - xy)$

$= (1 - xy) (z - 7)$

Exercise 14.2 : Solutions of Questions on Page Number : 223

Q1 :

Factorise 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 :

(i) $a^2 + 8a + 16 = (a)^2 + 2 \times a \times 4 + (4)^2$

$= (a + 4)^2$ $[(x + y)^2 = x^2 + 2xy + y^2]$

(ii) $p^2 - 10p + 25 = (p)^2 - 2 \times p \times 5 + (5)^2$

$= (p - 5)^2$ $[(a - b)^2 = a^2 - 2ab + b^2]$

(iii) $25m^2 + 30m + 9 = (5m)^2 + 2 \times 5m \times 3 + (3)^2$

$= (5m + 3)^2$ $[(a + b)^2 = a^2 + 2ab + b^2]$

(iv) $49y^2 + 84yz + 36z^2 = (7y)^2 + 2 \times (7y) \times (6z) + (6z)^2$

$= (7y + 6z)^2$ $[(a + b)^2 = a^2 + 2ab + b^2]$

(v) $4x^2 - 8x + 4 = (2x)^2 - 2\,(2x)\,(2) + (2)^2$

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

$= [(2)\,(x - 1)]^2 = 4(x - 1)^2$

(vi) $121b^2 - 88bc + 16c^2 = (11b)^2 - 2\,(11b)\,(4c) + (4c)^2$

$= (11b - 4c)^2$ $[(a - b)^2 = a^2 - 2ab + b^2]$

(vii) $(l + m)^2 - 4lm = l^2 + 2lm + m^2 - 4lm$

$= l^2 - 2lm + m^2$

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

(viii) $a^4 + 2a^2b^2 + b^4 = (a^2)^2 + 2\,(a^2)\,(b^2) + (b^2)^2$

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

Q2 :
Factorise

(i) $4p^2 - 9q^2$

(ii) $63a^2 - 112b^2$

(iii) $49x^2 - 36$

(iv) $16x^5 - 144x^3$

(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 :

(i) $4p^2 - 9q^2 = (2p)^2 - (3q)^2$

$= (2p + 3q)(2p - 3q)$ $[a^2 - b^2 = (a - b)(a + b)]$

(ii) $63a^2 - 112b^2 = 7(9a^2 - 16b^2)$

$= 7[(3a)^2 - (4b)^2]$

$= 7(3a + 4b)(3a - 4b)$ $[a^2 - b^2 = (a - b)(a + b)]$

(iii) $49x^2 - 36 = (7x)^2 - (6)^2$

$= (7x - 6)(7x + 6)$ $[a^2 - b^2 = (a - b)(a + b)]$

(iv) $16x^5 - 144x^3 = 16x^3(x^2 - 9)$

$= 16\,x^3\,[(x)^2 - (3)^2]$

$= 16\,x^3(x - 3)(x + 3)$ $[a^2 - b^2 = (a - b)(a + b)]$

(v) $(l + m)^2 - (l - m)^2 = [(l + m) - (l - m)]\,[(l + m) + (l - m)]$

[Using identity $a^2 - b^2 = (a - b)(a + b)$]
$= (l + m - l + m)(l + m + l - m)$

$= 2m \times 2l$

$= 4ml$

$= 4lm$

(vi) $9x^2y^2 - 16 = (3xy)^2 - (4)^2$

$= (3xy - 4)(3xy + 4)$ $[a^2 - b^2 = (a - b)(a + b)]$

(vii) $(x^2 - 2xy + y^2) - z^2 = (x - y)^2 - (z)^2$ $[(a - b)^2 = a^2 - 2ab + b^2]$

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

(viii) $25a^2 - 4b^2 + 28bc - 49c^2 = 25a^2 - (4b^2 - 28bc + 49c^2)$

$= (5a)^2 - [(2b)^2 - 2 \times 2b \times 7c + (7c)^2]$

$= (5a)^2 - [(2b - 7c)^2]$

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

$= [5a + (2b - 7c)] [5a - (2b - 7c)]$

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

$= (5a + 2b - 7c)(5a - 2b + 7c)$

Q3 :

Factorise 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 :

(i) $ax^2 + bx = a \times x \times x + b \times x = x(ax + b)$

(ii) $7p^2 + 21q^2 = 7 \times p \times p + 3 \times 7 \times q \times q = 7(p^2 + 3q^2)$

(iii) $2x^3 + 2xy^2 + 2xz^2 = 2x(x^2 + y^2 + z^2)$

(iv) $am^2 + bm^2 + bn^2 + an^2 = am^2 + bm^2 + an^2 + bn^2$

$= m^2(a + b) + n^2(a + b)$

$= (a + b)(m^2 + n^2)$

(v) $(lm + l) + m + 1 = lm + m + l + 1$

$= m(l + 1) + 1(l + 1)$

$= (l + 1)(m + 1)$

(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) $10ab + 4a + 5b + 2 = 10ab + 5b + 4a + 2$

$= 5b(2a + 1) + 2(2a + 1)$

$= (2a + 1)(5b + 2)$

(ix) $6xy - 4y + 6 - 9x = 6xy - 9x - 4y + 6$

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

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

Q4 :

Factorise

(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 :

(i) $a^4 - b^4 = (a^2)^2 - (b^2)^2$

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

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

(ii) $p^4 - 81 = (p^2)^2 - (9)^2$

$= (p^2 - 9)(p^2 + 9)$

$= [(p)^2 - (3)^2](p^2 + 9)$

$= (p - 3)(p + 3)(p^2 + 9)$

(iii) $x^4 - (y + z)^4 = (x^2)^2 - [(y + z)^2]^2$

$= [x^2 - (y + z)^2][x^2 + (y + z)^2]$

$= [x - (y + z)][x + (y + z)][x^2 + (y + z)^2]$

$= (x - y - z)(x + y + z)[x^2 + (y + z)^2]$

(iv) $x^4 - (x - z)^4 = (x^2)^2 - [(x - z)^2]^2$

$= [x^2 - (x - z)^2][x^2 + (x - z)^2]$

$= [x - (x - z)][x + (x - z)][x^2 + (x - z)^2]$

$= z(2x - z)\ [x^2 + x^2 - 2xz + z^2]$

$= z(2x - z)\ (2x^2 - 2xz + z^2)$

(v) $a^4 - 2a^2b^2 + b^4 = (a^2)^2 - 2\ (a^2)\ (b^2) + (b^2)^2$

$= (a^2 - b^2)^2$

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

$= (a - b)^2\ (a + b)^2$

Q5 :

Factorise the following expressions

(i) $p^2 + 6p + 8$

(ii) $q^2 - 10q + 21$

(iii) $p^2 + 6p - 16$

Answer :

(i) $p^2 + 6p + 8$

It can be observed that, $8 = 4 \times 2$ and $4 + 2 = 6$ $\therefore$

$p^2 + 6p + 8 = p^2 + 2p + 4p + 8$

$= p(p + 2) + 4(p + 2)$

$= (p + 2)\ (p + 4)$

(ii) $q^2 - 10q + 21$

It can be observed that, $21 = (-7) \times (-3)$ and $(-7) + (-3) = -10$ ∴

$q^2 - 10q + 21 = q^2 - 7q - 3q + 21$

$= q(q - 7) - 3(q - 7)$

$= (q - 7)(q - 3)$

(iii) $p^2 + 6p - 16$

It can be observed that, $16 = (-2) \times 8$ and $8 + (-2) = 6$

$p^2 + 6p - 16 = p^2 + 8p - 2p - 16$

$= p(p + 8) - 2(p + 8)$

$= (p + 8)(p - 2)$

Exercise 14.3 : Solutions of Questions on Page Number : 227

Q1 :

Carry out the following divisions.

(i) $28x^4$ ÃƒÂ· $56x$

(ii) $-36y^3$ ÃƒÂ· $9y^2$

(iii) $66pq^2r^3$ ÃƒÂ· $11qr^2$

(iv) $34x^3y^3z^3$ ÃƒÂ· $51xy^2z^3$

(v) $12a^8b^8$ ÃƒÂ· $(-6a^6b^4)$

Answer :

(i) $28x^4 = 2 \times 2 \times 7 \times x \times x \times x \times x$

$56x = 2 \times 2 \times 2 \times 7 \times x$

$$28x^4 \div 56x = \frac{2 \times 2 \times 7 \times x \times x \times x \times x}{2 \times 2 \times 2 \times 7 \times x} = \frac{x^3}{2} = \frac{1}{2}x^3$$

(ii) $36y^3 = 2 \times 2 \times 3 \times 3 \times y \times y \times y$

$9y^2 = 3 \times 3 \times y \times y$

$$-36y^3 \div 9y^2 = \frac{-2 \times 2 \times 3 \times 3 \times y \times y \times y}{3 \times 3 \times y \times y} = -4y$$

(iii) $66\,pq^2\,r^3 = 2 \times 3 \times 11 \times p \times q \times q \times r \times r \times r$

$11qr^2 = 11 \times q \times r \times r$

$$66pq^2r^3 \div 11qr^2 = \frac{2 \times 3 \times 11 \times p \times q \times q \times r \times r \times r}{11 \times q \times r \times r} = 6pqr$$

(iv) $34\,x^3y^3z^3 = 2 \times 17 \times x \times x \times x \times y \times y \times y \times z \times z \times z$

$51\,xy^2z^3 = 3 \times 17 \times x \times y \times y \times z \times z \times z$

$$34\,x^3y^3z^3 \div 51\,xy^2z^3 = \frac{2 \times 17 \times x \times x \times x \times y \times y \times y \times z \times z \times z}{3 \times 17 \times x \times y \times y \times z \times z \times z}$$
$$= \frac{2}{3}x^2y$$

(v) $12a^8b^8 = 2 \times 2 \times 3 \times a^8 \times b^8$

$6a^6b^4 = 2 \times 3 \times a^6 \times b^4$

$$12a^8b^8 \div \left(-6a^6b^4\right) = \frac{2 \times 2 \times 3 \times a^8 \times b^8}{-2 \times 3 \times a^6 \times b^4} = -2a^2b^4$$

Q2 :

Divide the given polynomial by the given monomial.

(i) $(5x^2 - 6x)$ ÃƒÂ· $3x$

(ii) $(3y^8 - 4y^6 + 5y^4)$ ÃƒÂ· y^4

(iii) $8(x^3y^2z^2 + x^2y^3z^2 + x^2y^2z^3)$ ÃƒÂ· $4x^2y^2z^2$

(iv) $(x^3 + 2x^2 + 3x)$ ÃƒÂ· $2x$

(v) $(p^3q^6 - p^6q^3)$ ÃƒÂ· p^3q^3

Answer :

(i) $5x^2 - 6x = x(5x - 6)$

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

(ii) $3y^8 - 4y^6 + 5y^4 = y^4(3y^4 - 4y^2 + 5)$

$$\left(3\mathrm{y}^8-4\mathrm{y}^6+5\mathrm{y}^4\right)\div \mathrm{y}^4=\frac{y^4\left(3y^4-4y^2+5\right)}{y^4}=3y^4-4y^2+5$$

(iii) $8(x^3y^2z^2 + x^2y^3z^2 + x^2y^2z^3) = 8x^2y^2z^2(x + y + z)$

$$8\left(x^3y^2z^2+x^2y^3z^2+x^2y^2z^3\right)\div 4x^2y^2z^2=\frac{8x^2y^2z^2\left(x+y+z\right)}{4x^2y^2z^2}=2\left(x+y+z\right)$$

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

$$\left(x^3+2x^2+3x\right)\div 2x=\frac{x\left(x^2+2x+3\right)}{2x}=\frac{1}{2}\left(x^2+2x+3\right)$$

(v) $p^3q^6 - p^6q^3 = p^3q^3(q^3 - p^3)$

$$(p^3q^6-p^6q^3)\div p^3q^3=\frac{p^3q^3\left(q^3-p^3\right)}{p^3q^3}=q^3-p^3$$

Q3 :

Work out the following divisions.

(i) $(10x - 25)$ ÃƒÂ· 5

(ii) $(10x - 25)$ ÃƒÂ· $(2x - 5)$

(iii) $10y(6y + 21)$ ÃƒÂ· $5(2y + 7)$
(iv) $9x^2y^2(3z - 24)$ ÃƒÂ· $27xy(z - 8)$

(v) $96abc(3a - 12)(5b - 30)$ ÃƒÂ· $144(a - 4)(b - 6)$

Answer :

(i) $$(10x-25)\div 5 = \frac{2\times5\times x-5\times5}{5}=\frac{5(2x-5)}{5}=2x-5$$

(ii) $$(10x-25)\div(2x-5)=\frac{2\times5\times x-5\times5}{(2x-5)}=\frac{5(2x-5)}{2x-5}=5$$

(iii) $$10y(6y+21)\div5(2y+7)=\frac{2\times5\times y[2\times3\times y+3\times7]}{5(2y+7)}$$

$$=\frac{2\times5\times y\times3(2y+7)}{5(2y+7)}=6y$$

(iv) $$9x^2y^2(3z-24)\div27xy(z-8)=\frac{9x^2y^2[3\times z-2\times2\times2\times3]}{27xy(z-8)}$$

$$=\frac{xy\times3(z-8)}{3(z-8)}=xy$$

(v) 96 $abc(3a - 12)(5b - 30)$ ÃƒÂ· 144 $(a - 4)(b - 6)$

$$=\frac{96abc(3\times a-3\times4)(5\times b-2\times3\times5)}{144(a-4)(b-6)}$$
$$=\frac{2abc\times3(a-4)\times5(b-6)}{3(a-4)(b-6)}=10abc$$

Q4 :

Divide as directed.

(i) $5(2x + 1)(3x + 5)$ ÃƒÂ· $(2x + 1)$
(ii) $26xy(x + 5)(y - 4)$ ÃƒÂ· $13x(y - 4)$

(iii) $52pqr(p + q)(q + r)(r + p)$ ÃƒÂ· $104pq(q + r)(r + p)$

(iv) $20(y + 4)(y^2 + 5y + 3)$ ÃƒÂ· $5(y + 4)$

(v) $x(x + 1)(x + 2)(x + 3)$ ÃƒÂ· $x(x + 1)$

Answer :

(i) $5(2x+1)(3x+5)\div(2x+1)=\frac{5(2x+1)(3x+1)}{(2x+1)}$ $= 5(3x + 1)$

(ii) $26xy(x+5)(y-4)\div 13x(y-4)=\frac{2\times 13\times xy(x+5)(y-4)}{13x(y-4)}$ $= 2y(x + 5)$

(iii) $52pqr(p + q)(q + r)(r + p)$ ÃƒÂ· $104pq(q + r)(r + p)$

$$=\frac{2\times 2\times 13\times p\times q\times r\times(p+q)\times(q+r)\times(r+p)}{2\times 2\times 2\times 13\times p\times q\times(q+r)\times(r+p)}$$
$$=\frac{1}{2}r(p+q)$$

(iv) $20(y + 4)(y^2 + 5y + 3) = 2 \times 2 \times 5 \times (y + 4)(y^2 + 5y + 3)$

$$20(y+4)(y^2+5y+3)\div 5(y+4)=\frac{2\times 2\times 5\times(y+4)\times(y^2+5y+3)}{5\times(y+4)}$$
$$=4(y^2+5y+3)$$

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

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

Q5 :

Factorise the expressions and divide them as directed.

(i) ($y^2 + 7y + 10$) ÃƒÂ· ($y + 5$)

(ii) ($m^2 - 14m - 32$) ÃƒÂ· ($m + 2$)

(iii) ($5p^2 - 25p + 20$) ÃƒÂ· ($p - 1$)

(iv) $4yz(z^2 + 6z - 16)$ ÃƒÂ· $2y(z + 8)$

(v) $5pq(p^2 - q^2)$ ÃƒÂ· $2p(p + q)$

(vi) $12xy(9x^2 - 16y^2)$ ÃƒÂ· $4xy(3x + 4y)$

(vii) $39y^3(50y^2 - 98)$ ÃƒÂ· $26y^2(5y + 7)$

Answer :

(i) $(y^2 + 7y + 10) = y^2 + 2y + 5y + 10$

$= y(y + 2) + 5(y + 2)$

$= (y + 2)(y + 5)$

$$\left(y^2 + 7y + 10\right) \div (y + 5) = \frac{(y + 5)(y + 2)}{(y + 5)} = y + 2$$

(ii) $m^2 - 14m - 32 = m^2 + 2m - 16m - 32$

$= m(m + 2) - 16(m + 2)$

$= (m + 2)(m - 16)$

$$\left(m^2-14m-32\right)\div(m+2)=\frac{(m+2)(m-16)}{(m+2)}=m-16$$

(iii) $5p^2 - 25p + 20 = 5(p^2 - 5p + 4)$

$= 5[p^2 - p - 4p + 4]$

$= 5[p(p - 1) - 4(p - 1)]$

$= 5(p - 1)(p - 4)$

$$\left(5p^2-25p+20\right)\div(p-1)=\frac{5(p-1)(p-4)}{(p-1)}=5(p-4)$$

(iv) $4yz(z^2 + 6z - 16) = 4yz\,[z^2 - 2z + 8z - 16]$

$= 4yz\,[z(z - 2) + 8(z - 2)]$

$= 4yz(z - 2)(z + 8)$

$$4yz\left(z^2+6z-16\right)\div 2y(z+8)=\frac{4yz(z-2)(z+8)}{2y(z+8)}=2z(z-2)$$

(v) $5pq(p^2 - q^2) = 5pq\,(p - q)(p + q)$

$$5pq\left(p^2-q^2\right)\div 2p(p+q)=\frac{5pq(p-q)(p+q)}{2p(p+q)}=\frac{5}{2}q(p-q)$$

(vi) $12xy(9x^2 - 16y^2) = 12xy[(3x)^2 - (4y)^2] = 12xy(3x - 4y)(3x + 4y)$

$$\begin{aligned}12xy\left(9x^2-16y^2\right)\div 4xy(3x+4y)&=\frac{2\times2\times3\times x\times y\times(3x-4y)\times(3x+4y)}{2\times2\times x\times y\times(3x+4y)}\\&=3(3x-4y)\end{aligned}$$

(vii) $39y^3(50y^2 - 98) = 3 \times 13 \times y \times y \times y \times 2[(25y^2 - 49)]$

$= 3 \times 13 \times 2 \times y \times y \times y \times [(5y)^2 - (7)^2]$

$= 3 \times 13 \times 2 \times y \times y \times y\,(5y - 7)(5y + 7)$

$26y^2(5y + 7) = 2 \times 13 \times y \times y \times (5y + 7)$

$39y^3(50y^2 - 98)$ ÃƒÂ·$26y^2$ $(5y + 7)$

$$= \frac{39y^3 \times 2(25y^2 - 49)}{26y^2(5y+7)}$$

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

$$= 3y(5y-7)$$

Exercise 14.4 : Solutions of Questions on Page Number : 228

Q1 :

Find and correct the errors in the statement: $4(x - 5) = 4x - 5$

Answer :

L.H.S. = $4(x - 5) = 4 \times x - 4 \times 5 = 4x - 20 \neq$ R.H.S.

The correct statement is $4(x - 5) = 4x - 20$

Q2 :

Find and correct the errors in the statement: $x(3x + 2) = 3x^2 + 2$

Answer :

L.H.S. = $x(3x + 2) = x \times 3x + x \times 2 = 3x^2 + 2x \neq$ R.H.S.

The correct statement is $x(3x + 2) = 3x^2 + 2x$

Q3 :

Find and correct the errors in the statement: $2x + 3y = 5xy$

Answer :

L.H.S = $2x + 3y \neq$ R.H.S.

The correct statement is $2x + 3y = 2x + 3y$

Q4 :

Find and correct the errors in the statement: $x + 2x + 3x = 5x$ Answer :

L.H.S = $x + 2x + 3x = 1x + 2x + 3x = x(1 + 2 + 3) = 6x \neq$ R.H.S.

The correct statement is $x + 2x + 3x = 6x$

Q5 :

Find and correct the errors in the statement: $5y + 2y + y - 7y = 0$

Answer :

L.H.S. = $5y + 2y + y - 7y = 8y - 7y = y \neq$ R.H.S

The correct statement is $5y + 2y + y - 7y = y$

Q6 :

Find and correct the errors in the statement: $3x + 2x = 5x^2$

Answer :

L.H.S. = $3x + 2x = 5x \neq$ R.H.S

The correct statement is $3x + 2x = 5x$

Q7 :

Find and correct the errors in the statement: $(2x)^2 + 4(2x) + 7 = 2x^2 + 8x + 7$

Answer :

L.H.S $= (2x)^2 + 4(2x) + 7 = 4x^2 + 8x + 7 \neq$ R.H.S

The correct statement is $(2x)^2 + 4(2x) + 7 = 4x^2 + 8x + 7$

Q8 :

Find and correct the errors in the statement: $(2x)^2 + 5x = 4x + 5x = 9x$

Answer :

L.H.S $= (2x)^2 + 5x = 4x^2 + 5x \neq$ R.H.S.

The correct statement is $(2x)^2 + 5x = 4x^2 + 5x$

Q9 :

Find and correct the errors in the statement: $(3x + 2)^2 = 3x^2 + 6x + 4$

Answer :

L.H.S. $= (3x + 2)^2 = (3x)^2 + 2(3x)(2) + (2)^2$ $[(a + b)^2 = a^2 + 2ab + b^2]$

$= 9x^2 + 12x + 4 \neq$ R.H.S

The correct statement is $(3x + 2)^2 = 9x^2 + 12x + 4$

Q10 :

Find and correct the errors in the statement: $(y - 3)^2 = y^2 - 9$

Answer :

L.H.S = $(y - 3)^2 = (y)^2 - 2(y)(3) + (3)^2$ $[(a - b)^2 = a^2 - 2ab + b^2]$

$= y^2 - 6y + 9 \neq$ R.H.S

The correct statement is $(y - 3)^2 = y^2 - 6y + 9$

Q11 :

Find and correct the errors in the statement: $(z + 5)^2 = z^2 + 25$

Answer :

L.H.S = $(z + 5)^2 = (z)^2 + 2(z)(5) + (5)^2$ $[(a + b)^2 = a^2 + 2ab + b^2]$

$= z^2 + 10z + 25 \neq$ R.H.S

The correct statement is $(z + 5)^2 = z^2 + 10z + 25$

Q12 :

Find and correct the errors in the statement: $(2a + 3b)(a - b) = 2a^2 - 3b^2$

Answer :

L.H.S. = $(2a + 3b)(a - b) = 2a \times a + 3b \times a - 2a \times b - 3b \times b$

$= 2a^2 + 3ab - 2ab - 3b^2 = 2a^2 + ab - 3b^2 \neq$ R.H.S.

The correct statement is $(2a + 3b)(a - b) = 2a^2 + ab - 3b^2$

Q13 :

Find and correct the errors in the statement: $(a + 4)(a + 2) = a^2 + 8$

Answer :

L.H.S. = $(a + 4)(a + 2) = (a)^2 + (4 + 2)(a) + 4 \times 2$

$= a^2 + 6a + 8 \neq$ R.H.S

The correct statement is $(a + 4)(a + 2) = a^2 + 6a + 8$

Q14 :

Find and correct the errors in the statement: $(a - 4)(a - 2) = a^2 - 8$

Answer :

L.H.S. = $(a - 4)(a - 2) = (a)^2 + [(-4) + (-2)](a) + (-4)(-2)$

$= a^2 - 6a + 8 \neq$ R.H.S.

The correct statement is $(a - 4)(a - 2) = a^2 - 6a + 8$

Q15 :

Find and correct the errors in the statement: $\frac{3x^2}{3x^2} = 0$

Answer :

L.H.S = $\frac{3x^2}{3x^2} = \frac{3 \times x \times x}{3 \times x \times x} = 1 \neq \text{R.H.S.}$

The correct statement is $\frac{3x^2}{3x^2} = 1$

Q16 :

Find and correct the errors in the statement: $\frac{3x^2 + 1}{3x^2} = 1 + 1 = 2$

Answer :

$$\frac{3x^2 + 1}{3x^2} = \frac{3x^2}{3x^2} + \frac{1}{3x^2} = 1 + \frac{1}{3x^2} \neq \text{R.H.S.}$$

The correct statement is $\frac{3x^2 + 1}{3x^2} = 1 + \frac{1}{3x^2}$

Q17 :

Find and correct the errors in the statement: $\frac{3x}{3x + 2} = \frac{1}{2}$

Answer :

L.H.S = $\frac{3x}{3x+2} \neq$ R.H.S.

The correct statement is $\frac{3x}{3x+2} = \frac{3x}{3x+2}$

Q18 :

Find and correct the errors in the statement: $\frac{3}{4x+3} = \frac{1}{4x}$

Answer :

L.H.S. = $\frac{3}{4x+3}$ ≠ R.H.S.

The correct statement is $\frac{3}{4x+3} = \frac{3}{4x+3}$

Q19 :

Find and correct the errors in the statement: $\frac{4x+5}{4x} = 5$

Answer :

L.H.S. = $\frac{4x+5}{4x} = \frac{4x}{4x} + \frac{5}{4x} = 1 + \frac{5}{4x} \neq$ R.H.S

The correct statement is $\frac{4x+5}{4x} = 1 + \frac{5}{4x}$

Q20 :

Find and correct the errors in the statement: $\frac{7x+5}{5} = 7x$

Answer :

L.H.S. = $\frac{7x+5}{5} = \frac{7x}{5} + \frac{5}{5} = \frac{7x}{5} + 1 \neq \text{R.H.S.}$

The correct statement is $\frac{7x+5}{5} = \frac{7x}{5} + 1$

Exercise 15.1 : Solutions of Questions on Page Number : 236

Q1 :

The following graph shows the temperature of a patient in a hospital, recorded every hour.

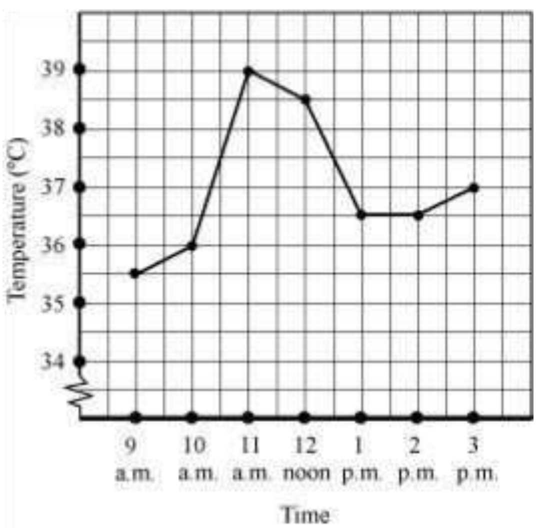
(a) What was the patient's temperature at 1 p.m.?

(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 patient's temperature show an upward trend?



Answer :

(a) At 1 p.m., the patient's temperature was 36.5°C.

(b) The patient's temperature was 38.5°C at 12 noon.

(c) The patient's temperature was same at 1 p.m. and 2 p.m.

(d) The graph between the times 1 p.m. and 2 p.m. is parallel to the *x*-axis. The temperature at 1 p.m. and 2 p.m. is 36.5°C. So, the temperature at 1:30 p.m. is 36.5°C.

(e) During the following periods, the patient's temperature showed an upward trend.
9 a.m. to 10 a.m., 10 a.m. to 11 a.m., 2 p.m. to 3 p.m.

Q2 :

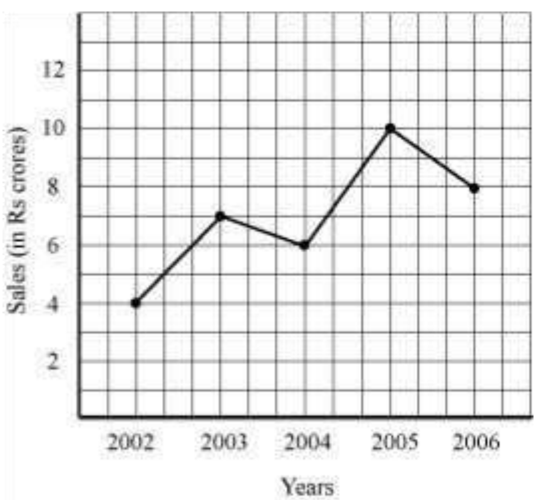
The following line graph shows the yearly sales figure for a manufacturing company.

(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 :

(a)

(i) In 2002, the sales were Rs 4 crores.

(ii) In 2006, the sales were Rs 8 crores.

(b)

(i) In 2003, the sales were Rs 7 crores.

(ii) In 2005, the sales were Rs 10 crores.
(c)

(i) In 2002, the sales were Rs 4 crores and in 2006, the sales were Rs 8 crores.

Difference between the sales in 2002 and 2006

= Rs (8 - 4) crores = Rs 4 crores

(d) Difference between the sales of the year 2006 and 2005

= Rs (10 - 8) crores = Rs 2 crores

Difference between the sales of the year 2005 and 2004

= Rs (10 - 6) crores = Rs 4 crores

Difference between the sales of the year 2004 and 2003

= Rs (7 - 6) crore = Rs 1 crore

Difference between the sales of the year 2003 and 2002

= Rs (7 - 4) crores = Rs 3 crores

Hence, the difference was the maximum in the year 2005 as compared to its previous year 2004.

Q3 :

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) 3weeks?

(b) How high was Plant B after (i) 2 weeks (ii) 3weeks?

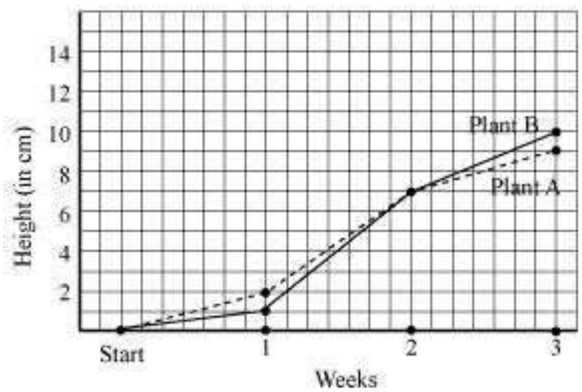
(c) How much did Plant A grow during the 3rd week?

(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 :

(a)

(i) After 2 weeks, the height of plant A was 7 cm.

(ii) After 3 weeks, the height of plant A was 9 cm.

(b)

(i) After 2 weeks, the height of plant B was 7 cm.

(ii) After 3 weeks, the height of plant B was 10 cm.

(c) Growth of plant A during 3rd week = 9 cm - 7 cm = 2 cm

(d) Growth of plant B from the end of the 2nd week to the end of the 3rd week

= 10 cm - 7 cm = 3 cm

(e) Growth of plant A during 1st week = 2 cm - 0 cm = 2 cm

Growth of plant A during 2nd week = 7 cm - 2 cm = 5 cm

Growth of plant A during 3rd week = 9 cm - 7 cm = 2 cm

Therefore, plant A grew the most, i.e. 5 cm, during the 2nd week.

(f) Growth of plant B during 1st week = 1 cm - 0 cm = 1 cm
Growth of plant B during 2nd week = 7 cm - 1 cm = 6 cm

Growth of plant B during 3rd week = 10 cm - 7 cm = 3 cm

Therefore, plant B grew the least, i.e. 1 cm, during the 1st week.

(g) At the end of the 2nd week, the heights of both plants were same.

Q4 :

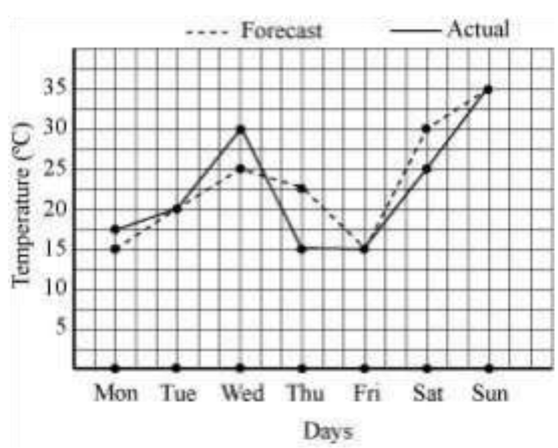
The following graph shows the temperature forecast and the actual temperature for each day of a week.

(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 :

(a) The forecast temperature was same as the actual temperature on Tuesday, Friday, and Sunday.

(b) The maximum forecast temperature during the week was 35°C.

(c) The minimum actual temperature during the week was 15°C.
(d) The actual temperature differs the most from the forecast temperature on Thursday.

Q5 :

Use the tables below to draw linear graphs.

(a) The number of days a hill side city received snow in different years.

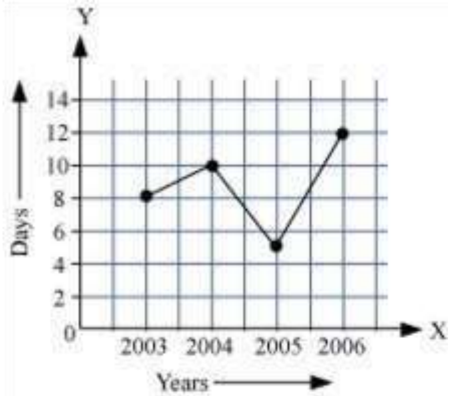
Year	2003	2004	2005	2006
Days	8	10	5	12

(b) Population (in thousands) of men and women in a village in different years.

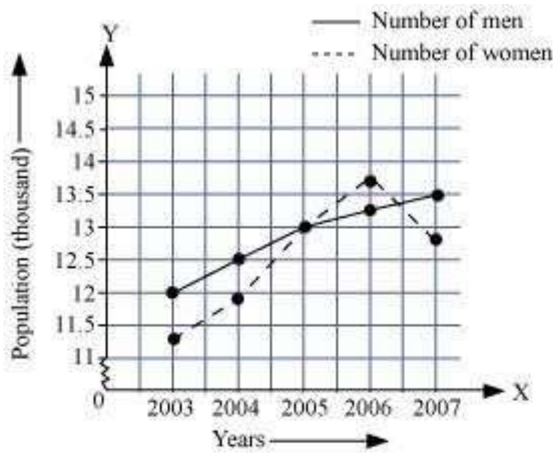
Year	2003	2004	2005	2006	2007
Number of men	12	12.5	13	13.2	13.5
Number of women	11.3	11.9	13	13.6	12.8

Answer :

(a) By taking the years on x-axis and the number of days on y-axis and taking scale as 1 unit = 2 days on y-axis and 2 unit = 1 year on x-axis, the linear graph of the given information can be drawn as follows.

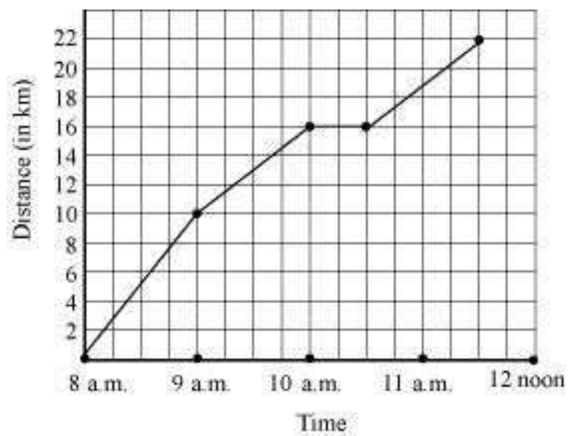


(b) By taking the years on *x*-axis and population on *y*-axis and scale as 1 unit = 0.5 thousand on *y*axis and 2 unit = 1 year on *x*-axis, the linear graph of the given information can be drawn as follows.



Q6 :

A courier-person cycles from a town to a neighboring 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 :
(a) Scale taken for the time axis is 4 units = 1 hour (b) The

person travelled during the time 8 a.m. - 11:30 a.m.

Therefore, the person took $3\frac{1}{2}$ hours to travel.

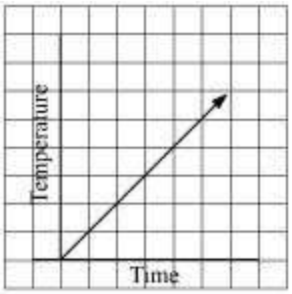
(c) The merchant is 22 km far from the town.

(d) Yes, the person stopped on his way from 10 a.m. to 10: 30 a.m. This is indicated by the horizontal part of the graph.

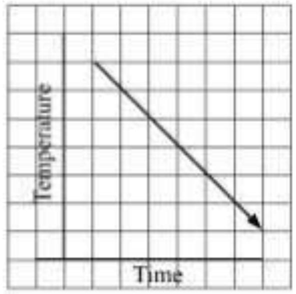
(e) From the graph, it can be observed that during 8 a.m. to 9 a.m., the person travelled the maximum distance. Thus, the person's ride was the fastest between 8 a.m. and 9 a.m.

Q7 :

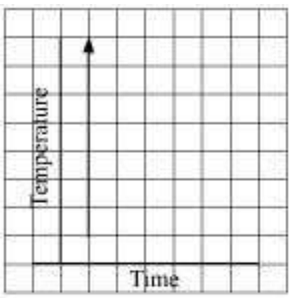
Can there be a time temperature graph as follows? Justify you're answer:



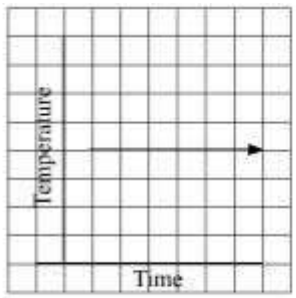
(i)



(ii)



(iii)



(iv)

Answer :

(i) This can be a time-temperature graph, as the temperature can increase with the increase in time.

(ii) This can be a time-temperature graph, as the temperature can decrease with the decrease in time.

(iii) This cannot be a time-temperature graph since different temperatures at the same time are not possible.

(iv) This can be a time-temperature graph, as same temperature at different times is possible.

Exercise 15.2 : Solutions of Questions on Page Number : 243

Q1 :

Plot the following points on a graph sheet. Verify if they lie on a line

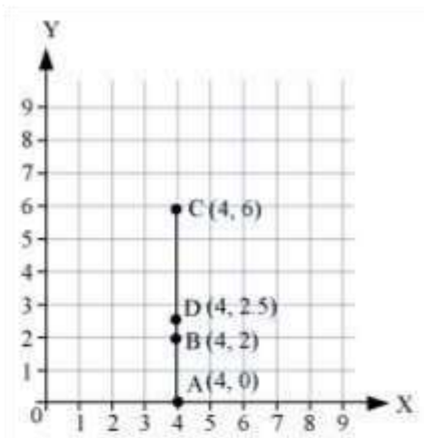
(a) A(4, 0), B(4, 2), C(4, 6), D(4, 2.5)

(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)

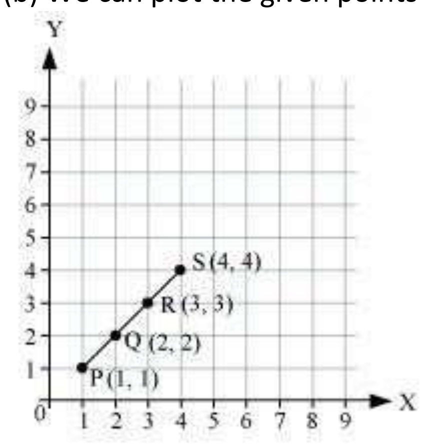
Answer :

(a) We can plot the given points and join the consecutive points on a graph paper as follows.



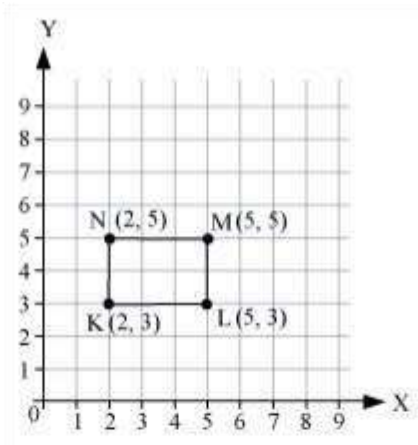
From the graph, it can be observed that the points A, B, C, and D lie on the same line.

(b) We can plot the given points and join the consecutive points on a graph paper as follows.



Hence, points P, Q, R, and S lie on the same line.

(c) We can plot the given points and join the consecutive points on a graph paper as follows.

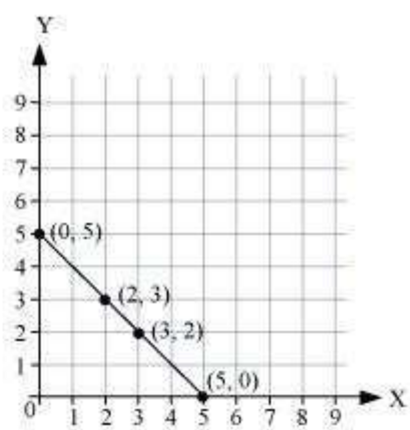


Hence, points K, L, M, and N are not lying on the same line.

Q2 :

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.

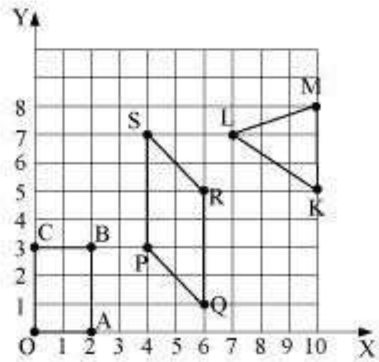
Answer :



From the graph, it can be observed that the line joining the points (2, 3) and (3, 2) meets the *x*axis at the point (5, 0) and the *y*-axis at the point (0, 5).

Q3 :

Write the coordinates of the vertices of each of these adjoining figures.



Answer :

The coordinates of the vertices in the given figure are as follows.

O (0, 0), A (2, 0), B (2, 3), C (0, 3)

P (4, 3), Q (6, 1), R (6, 5), S (4, 7)

K (10, 5), L (7, 7), M (10, 8)

Q4 :

State whether True or False. Correct those 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 :

(i) True

(ii) False

The point whose *y*-coordinate is zero and *x*-coordinate is 5 will lie on *x*-axis.

(iii) True

Exercise 15.3 : Solutions of Questions on Page Number : 247

Q1 :

Draw the graphs for the following tables of values, with suitable scales on the axes.

(a) Cost of apples

Number of apples	1	2	3	4	5
Cost (in Rs)	5	10	15	20	25

(b) Distance travelled by a car

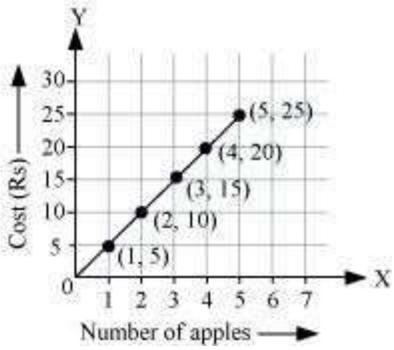
Time (in hours)	6 a.m.	7 a.m.	8 a.m.	9 a.m.
Distance (in km)	40	80	120	160

(i) How much distance did the car cover during the period 7.30 a.m. to 8 a.m.?

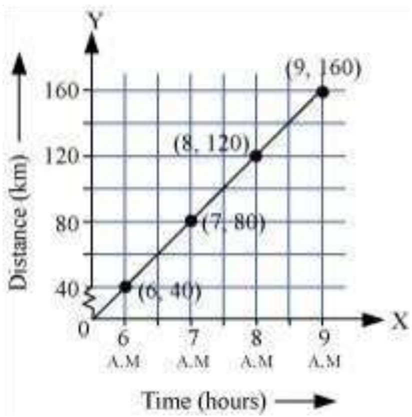
(ii) What was the time when the car had covered a distance of 100 km since its start? (c) Interest on deposits for a year:

Answer :

(a) Taking a suitable scale (for *x*-axis, 1 unit = 1 apple and for *y*-axis, 1 unit = Rs 5), we can mark the number of apples on *x*-axis and the cost of apples on *y*-axis. A graph of the given data is as follows.



(b) Taking a suitable scale (for *x*-axis, 2 units = 1 hour and for *y*-axis, 2 units = 40 km), we can represent the time on *x*-axis and the distance covered by the car on *y*-axis. A graph of the given data is as follows.

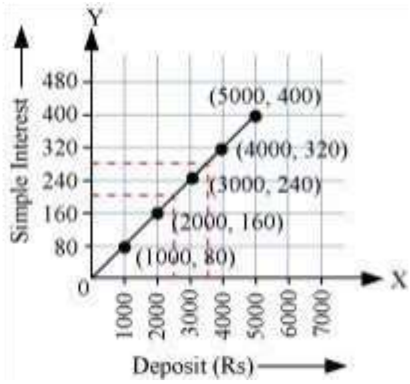


(i) During the period 7:30 a.m. to 8 a.m., the car covered a distance of 20 km.

(ii) The car covered a distance of 100 km at 7:30 a.m. since its start.

(c) Taking a suitable scale,
For *x*-axis, 1 unit = Rs 1000 and for *y*-axis, 1 unit = Rs 80

We can represent the deposit on *x*-axis and the interest earned on that deposit on *y*-axis. A graph of the given data is obtained as follows.



From the graph, the following points can be observed.

(i) Yes. The graph passes through the origin.

(ii) The interest earned in a year on a deposit of Rs 2500 is Rs 200.

(iii) To get an interest of Rs 280 per year, Rs 3500 should be deposited.

Q2 :

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

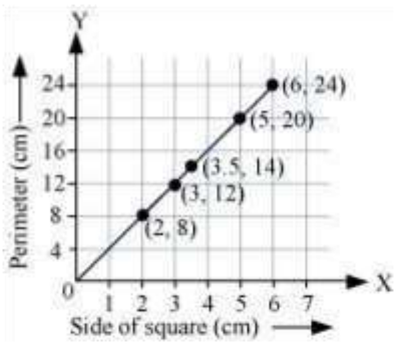
Is it a linear graph?

Answer :

(i) Choosing a suitable scale,

For *x*-axis, 1 unit = 1 cm and for *y*-axis, 1 unit = 4 cm

We can represent the side of a square on *x*-axis and the perimeter of that square on *y*-axis. A graph of the given data is drawn as follows.

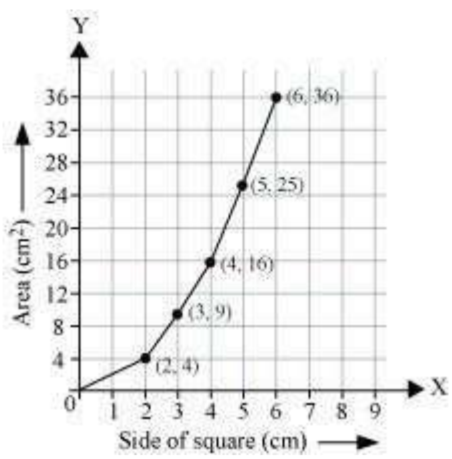


It is a linear graph.

(ii)Choosing a suitable scale,

For *x*-axis, 1 unit = 1 cm and for *y*-axis, 1 unit = 4 cm^2

We can represent the side of a square on the *x*-axis and the area of that square on *y*-axis. A graph of the given data is as follows.



It is not a linear graph.

Exercise 16.1 : Solutions of Questions on Page Number : 255

Q1 :

Find the values of the letters in the following and give reasons for the steps involved.

$$\begin{array}{r} 3\ A \\ +\ 2\ 5 \\ \hline B\ 2 \\ \hline \end{array}$$

Answer :

The addition of A and 5 is giving 2 i.e., a number whose ones digit is 2. This is possible only when digit A is 7. In that case, the addition of A (7) and 5 will give 12 and thus, 1 will be the carry for the next step. In the next step,

1 + 3 + 2 = 6

Therefore, the addition is as follows.

$$\begin{array}{r} 3\ \ 7 \\ +\ 2\ \ 5 \\ \hline 6\ \ 2 \\ \hline \end{array}$$

Clearly, B is 6.

Hence, A and B are 7 and 6 respectively.

Q2 :

Find the values of the letters in the following and give reasons for the steps involved.

$$\begin{array}{r} 4\ A \\ +\ 9\ 8 \\ \hline C\ B\ 3 \\ \hline \end{array}$$

Answer :

The addition of A and 8 is giving 3 i.e., a number whose ones digit is 3. This is possible only when digit A is 5. In that case, the addition of A and 8 will give 13 and thus, 1 will be the carry for the next step. In the next step,

1 + 4 + 9 = 14

Therefore, the addition is as follows.

$$\begin{array}{r} 4\ 5 \\ +\ 9\ 8 \\ \hline 14\ 3 \\ \hline \end{array}$$

Clearly, B and C are 4 and 1 respectively.

Hence, A, B, and C are 5, 4, and 1 respectively.

Q3 :

Find the value of the letter in the following and give reasons for the steps involved.

$$\begin{array}{r} 1\ A \\ \times\ A \\ \hline 9\ A \\ \hline \end{array}$$

Answer :

The multiplication of A with A itself gives a number whose ones digit is A again. This happens only when A = 1, 5, or 6.

If A = 1, then the multiplication will be 11 × 1 = 11. However, here the tens digit is given as 9. Therefore, A = 1 is not possible. Similarly, if A = 5, then the multiplication will be 15 × 5 = 75. Thus, A = 5 is also not possible.

If we take A = 6, then 16 × 6 = 96. Therefore, A should be 6.

The multiplication is as follows.

$$\begin{array}{r} 16 \\ \times\ \ 6 \\ \hline 96 \\ \hline \end{array}$$

Hence, the value of A is 6.

Q4 :

Find the values of the letters in the following and give reasons for the steps involved.

$$\begin{array}{rcc} & A & B \\ + & 3 & 7 \\ \hline & 6 & A \\ \hline \end{array}$$

Answer :

The addition of A and 3 is giving 6. There can be two cases.

(1) First step is not producing a carry

In that case, A comes to be 3 as 3 + 3 = 6. Considering the first step in which the addition of B and 7 is giving A (i.e., 3), B should be a number such that the units digit of this addition comes to be 3. It is possible only when B = 6. In this case, A = 6 + 7 = 13. However, A is a single digit number. Hence, it is not possible.

(2) First step is producing a carry

In that case, A comes to be 2 as 1 + 2 + 3 = 6. Considering the first step in which the addition of B and 7 is giving A (i.e., 2), B should be a number such that the units digit of this addition comes to be 2. It is possible only when B = 5 and 5 + 7 = 12.

$$\begin{array}{rcc} & 2 & 5 \\ + & 3 & 7 \\ \hline & 6 & 2 \\ \hline \end{array}$$

Hence, the values of A and B are 2 and 5 respectively.

Q5 :

Find the values of the letters in the following and give reasons for the steps involved.

$$\begin{array}{r} A\ B \\ \times\ \ 3 \\ \hline C\ A\ B \\ \hline \end{array}$$

Answer :

The multiplication of 3 and B gives a number whose ones digit is B again.

Hence, B must be 0 or 5.

Let B is 5.

Multiplication of first step = 3 × 5 = 15

1 will be a carry for the next step.

We have, 3 × A + 1 = CA

This is not possible for any value of A.

Hence, B must be 0 only. If B = 0, then there will be no carry for the next step.

We should obtain, 3 × A = CA

That is, the one's digit of 3 × A should be A. This is possible when A = 5 or 0.

However, A cannot be 0 as AB is a two-digit number.

Therefore, A must be 5 only. The multiplication is as follows.

$$\begin{array}{r} 50 \\ \times\quad 3 \\ \hline 150 \\ \hline \end{array}$$

Hence, the values of A, B, and C are 5, 0, and 1 respectively.

Q6 :

Find the values of the letters in the following and give reasons for the steps involved.

$$\begin{array}{r} A\ B \\ \times\ 5 \\ \hline C\ A\ B \\ \hline \end{array}$$

Answer :

The multiplication of B and 5 is giving a number whose ones digit is B again. This is possible when B = 5 or B = 0 only.

In case of B = 5, the product, B × 5 = 5 × 5 = 25

2 will be a carry for the next step.

We have, 5 × A + 2 = CA, which is possible for A = 2 or 7

The multiplication is as follows.

$$\begin{array}{r} 25 \\ \times\ 5 \\ \hline 125 \\ \hline \end{array} \quad \begin{array}{r} 75 \\ \times\ 5 \\ \hline 375 \\ \hline \end{array}$$

If B = 0,

B × 5 = B $\Rightarrow$ 0 × 5 = 0

There will not be any carry in this step.

In the next step, 5 × A = CA

It can happen only when A = 5 or A = 0

However, A cannot be 0 as AB is a two-digit number.

Hence, A can be 5 only. The multiplication is as follows.

$$\begin{array}{r} 50 \\ \times\ 5 \\ \hline 250 \\ \hline \end{array}$$

Hence, there are 3 possible values of A, B, and C.

(i) 5, 0, and 2 respectively

(ii) 2, 5, and 1 respectively

(iii) 7, 5, and 3 respectively

Q7 :

Find the values of the letters in the following and give reasons for the steps involved.

$$\begin{array}{r} A\ B \\ \times\ 6 \\ \hline B\ B\ B \\ \hline \end{array}$$

Answer :

The multiplication of 6 and B gives a number whose one's digit is B again.

It is possible only when B = 0, 2, 4, 6, or 8

If B = 0, then the product will be 0. Therefore, this value of B is not possible.

If B = 2, then B × 6 = 12 and 1 will be a carry for the next step.

6A + 1 = BB = 22 $\Rightarrow$ 6A = 21 and hence, any integer value of A is not possible.

If B = 6, then B × 6 = 36 and 3 will be a carry for the next step.

6A + 3 = BB = 66 $\Rightarrow$ 6A = 63 and hence, any integer value of A is not possible.

If B = 8, then B × 6 = 48 and 4 will be a carry for the next step.

6A + 4 = BB = 88 ⇛ 6A = 84 and hence, A = 14. However, A is a single digit number. Therefore, this value of A is not possible.
If B = 4, then B × 6 = 24 and 2 will be a carry for the next step.

6A + 2 = BB = 44 ⇛ 6A = 42 and hence, A = 7 The

multiplication is as follows.

$$\begin{array}{r} 7\,4 \\ \times \quad 6 \\ \hline 4\,4\,4 \\ \hline \end{array}$$

Hence, the values of A and B are 7 and 4 respectively.

Q8 :

Find the values of the letters in the following and give reasons for the steps involved.

$$\begin{array}{r} A\ 1 \\ +\ 1\ B \\ \hline B\ 0 \\ \hline \end{array}$$

Answer :

The addition of 1 and B is giving 0 i.e., a number whose ones digits is 0. This is possible only when digit B is 9. In that case, the addition of 1 and B will give 10 and thus, 1 will be the carry for the next step. In the next step,

1 + A + 1 = B

Clearly, A is 7 as 1 + 7 + 1 = 9 = B

Therefore, the addition is as follows.

$$\begin{array}{r} 7\ 1 \\ +\ 1\ 9 \\ \hline 9\ 0 \\ \hline \end{array}$$

Hence, the values of A and B are 7 and 9 respectively.

Q9 :

Find the values of the letters in the following and give reasons for the steps involved.

$$\begin{array}{r} 2\ A\ B \\ +A\ B\ 1 \\ \hline B\ 1\ 8 \\ \hline \end{array}$$

Answer :

The addition of B and 1 is giving 8 i.e., a number whose ones digits is 8. This is possible only when digit B is 7. In that case, the addition of B and 1 will give 8. In the next step, A + B = 1

Clearly, A is 4.

4 + 7 = 11 and 1 will be a carry for the next step. In the next step,

1 + 2 + A = B

1 + 2 + 4 = 7

Therefore, the addition is as follows.

$$\begin{array}{r} 2\,4\,7 \\ +\ 4\ 7\,1 \\ \hline 7\ 1\,8 \\ \hline \end{array}$$

Hence, the values of A and B are 4 and 7 respectively.

Q10 :

Find the values of the letters in the following and give reasons for the steps involved.

$$\begin{array}{r} 1\ 2\ A \\ +6\ A\ B \\ \hline A\ 0\ 9 \\ \hline \end{array}$$

Answer :

The addition of A and B is giving 9 i.e., a number whose ones digits is 9. The sum can be 9 only as the sum of two single digit numbers cannot be 19. Therefore, there will not be any carry in this step.

In the next step, 2 + A = 0

It is possible only when A = 8

2 + 8 = 10 and 1 will be the carry for the next step.

1 + 1 + 6 = A

Clearly, A is 8. We know that the addition of A and B is giving 9. As A is 8, therefore, B is 1.

Therefore, the addition is as follows.

$$\begin{array}{r} 128 \\ +\ 681 \\ \hline 809 \\ \hline \end{array}$$

Hence, the values of A and B are 8 and 1 respectively.

Exercise 16.2 : Solutions of Questions on Page Number : 260

Q1 :

If 21*y*5 is a multiple of 9, where *y* is a digit, what is the value of *y*?

Answer :

If a number is a multiple of 9, then the sum of its digits will be divisible by 9.

Sum of digits of 21y5 = 2 + 1 + y + 5 = 8 + y

Hence, 8 + y should be a multiple of 9.

This is possible when 8 + y is any one of these numbers 0, 9, 18, 27, and so on …

However, since y is a single digit number, this sum can be 9 only. Therefore, y should be 1 only.

Q2 :

If 31z5 is a multiple of 9, where z is a digit, what is the value of z?

You will find that there are two answers for the last problem. Why is this so?

Answer :

If a number is a multiple of 9, then the sum of its digits will be divisible by 9.

Sum of digits of 31z5 = 3 + 1 + z + 5 = 9 + z

Hence, 9 + z should be a multiple of 9.

This is possible when 9 + z is any one of these numbers 0, 9, 18, 27, and so on …

However, since z is a single digit number, this sum can be either 9 or 18. Therefore, z should be either 0 or 9.

Q3 :

If 24x is a multiple of 3, where x is a digit, what is the value of x?

(Since 24x is a multiple of 3, its sum of digits 6 + x is a multiple of 3; so 6 + x is one of these numbers: 0, 3, 6, 9, 12, 15, 18…. But since x is a digit, it can only be that 6 + x = 6 or 9 or 12 or 15. Therefore, x = 0 or 3 or 6 or 9. Thus, x can have any of four different values)

Answer :

Since 24x is a multiple of 3, the sum of its digits is a multiple of 3.

Sum of digits of 24x = 2 + 4 + x = 6 + x

Hence, 6 + x is a multiple of 3.

This is possible when 6 + x is any one of these numbers 0, 3, 6, 9, and so on …

Since x is a single digit number, the sum of the digits can be 6 or 9 or 12 or 15 and thus, the value of x comes to 0 or 3 or 6 or 9 respectively.
Thus, x can have its value as any of the four different values 0, 3, 6, or 9.

Q4 :

If 31z5 is a multiple of 3, where z is a digit, what might be the values of z?

Answer :

Since 31z5 is a multiple of 3, the sum of its digits will be a multiple of 3.

That is, 3 + 1 + z + 5 = 9 + z is a multiple of 3.

This is possible when 9 + z is any one of 0, 3, 6, 9, 12, 15, 18, and so on …

Since z is a single digit number, the value of 9 + z can only be 9 or 12 or 15 or 18 and thus, the value of x comes to 0 or 3 or 6 or 9 respectively.

Thus, z can have its value as any one of the four different values 0, 3, 6, or 9.