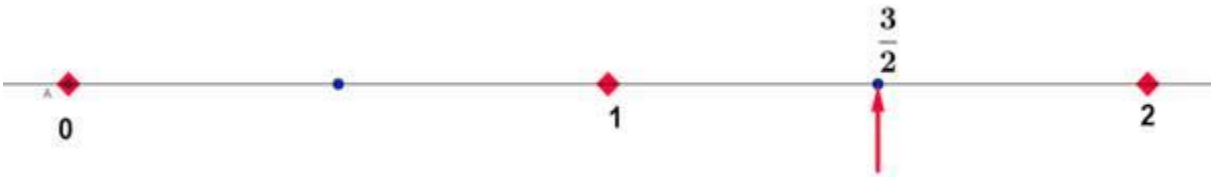
Rational And Irrational Numbers

Practice set 1.1

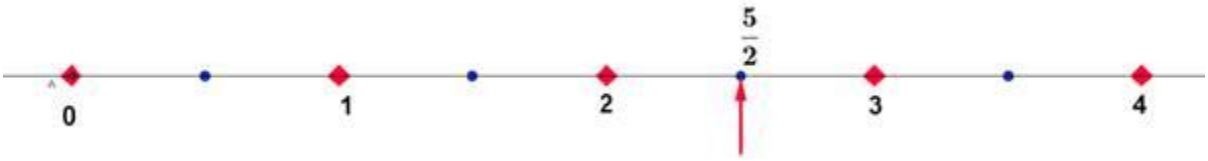
Q. 1. A. Show the following numbers on a number line. Draw a separate number line for each example.

$$\frac{3}{2}, \frac{5}{2}, -\frac{3}{2}$$

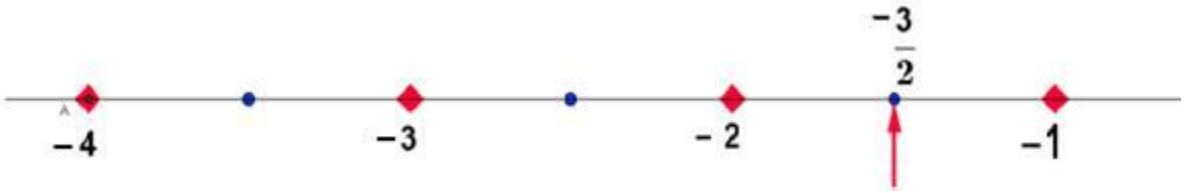
Answer : For $\frac{3}{2}$ the number line will be:



For $\frac{5}{2}$ the number line will be:



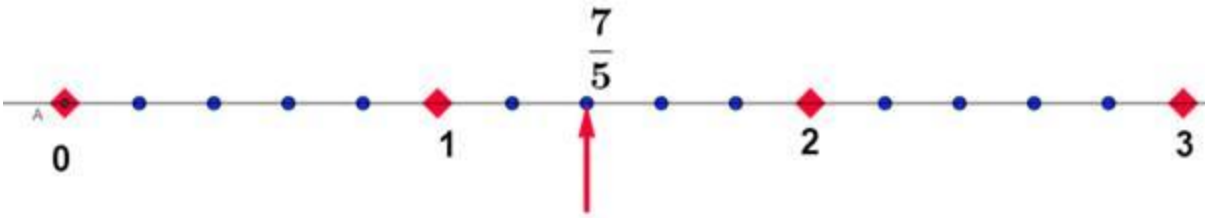
For $\frac{-3}{2}$ the number line will be:



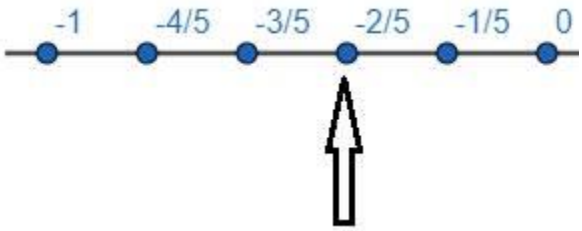
Q. 1. B. Show the following numbers on a number line. Draw a separate number line for each example.

$$\frac{7}{5}, \frac{-2}{5}, \frac{-4}{5}$$

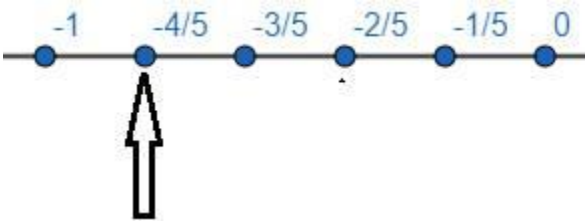
Answer : For $\frac{7}{5}$ the number line will be:



For $\frac{-2}{5}$ the number line will be:



For $\frac{-4}{5}$ the number line will be:



Q. 1. C. Show the following numbers on a number line. Draw a separate number line for each example.

$$\frac{-5}{8}, \frac{11}{8}$$

Answer : For $\frac{-5}{8}$ the number line will be:

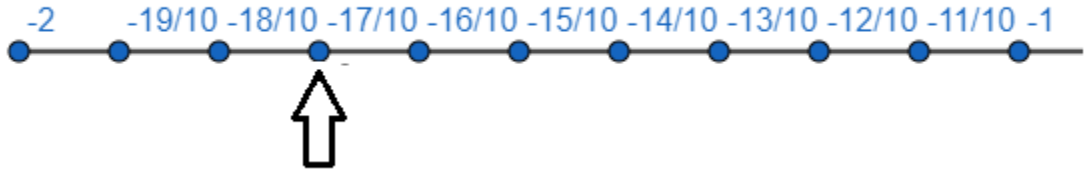
For $\frac{11}{8}$ the number line will be:

Q. 1. D. Show the following numbers on a number line. Draw a separate number line for each example.

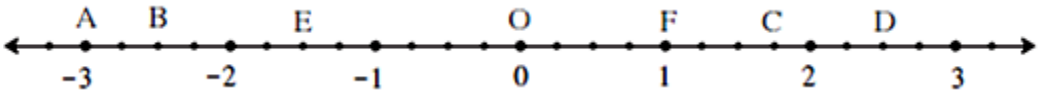
$$\frac{13}{10}, \frac{-17}{10}$$

Answer : For $\frac{13}{10}$ the number line will be:

For $\frac{-17}{10}$ the number line will be:



Q. 2. Observe the number line and answer the questions.



(1) Which number is indicated by point B?

(2) Which point indicates the number $1\frac{3}{4}$ **?**

(3) State whether the statement, 'the point D denotes the number 5/2, is true or false.

Answer : As each part between integers divided into 4 parts on the number line hence each part equals $\frac{1}{4}$.

(1) Which number is indicated by point B?

Now point B is 10 places to left i.e. in the negative side of number line hence point **B is** $\frac{-10}{4}$.

(2) Which point indicates the number $1\frac{3}{4}$?

Now $1\frac{3}{4}$ can also be written as $\frac{7}{4}$, Which means seven places to right i.e. **Point C.**

(3) State whether the statement, 'the point D denotes the number 5/2, is true or false.

Now point D is 10 places away from zero i.e. it is $\frac{10}{4}$ which can also be written as $\frac{5}{2}$**.**

Hence the above statement is true.

Practice set 1.2

Q. 1. A. Compare the following numbers.

-7, -2

Answer : Now if there are two numbers, a and b such that a>b then

-a<-b.

Therefore, as 7>2

Hence **-7<-2.**

Q. 1. B. Compare the following numbers.

0, -9/5

Answer : As -9/5 is a negative quantity, it will be always less than zero.

0>-9/5.

Q. 1. C. Compare the following numbers.

8/7, 0

Answer : As 8/7 is a positive quantity, it will always be greater than zero.

0<8/7.

Q. 1. D. Compare the following numbers.

$$\frac{-5}{4}, \frac{1}{4}$$

Answer : As the denominator is same, we just need to check which number in the numerator is greater.

∴ As -5 < 1

$$\frac{-5}{4} < \frac{1}{4}$$

Q. 1. E. Compare the following numbers.

$$\frac{40}{29}, \frac{141}{29}$$

Answer : As the denominator is same, we just need to check which number in the numerator is greater.

∴ As 40 < 141

$$\frac{40}{29} < \frac{141}{29}$$

Q. 1. F. Compare the following numbers.

$$-\frac{17}{20}, \frac{-13}{20}$$

Answer : Now if there are two numbers, a and b such that a>b then

-a<-b.

Therefore, as 17>13

Hence -17<-13.

Also, As the denominator is same, we just need to check which number in the numerator is greater.

∴ As -17 < -13

$$\frac{-17}{20} < \frac{-13}{20}$$

Q. 1. G. Compare the following numbers.

$$\frac{15}{12}, \frac{7}{16}$$

Answer :

$$\frac{15}{12} = \frac{15 \times 4}{12 \times 4} = \frac{60}{48} \frac{7}{16} = \frac{7 \times 3}{16 \times 3} = \frac{21}{48}$$

As we have made denominator equal we now just need to check whose numerator is greater.

Therefore, as 60>21.

$$\frac{60}{48} > \frac{21}{48}$$

Hence, $\frac{15}{12} > \frac{7}{16}$

Q. 1. H. Compare the following numbers.

$$\frac{-25}{8}, \frac{-9}{4}$$

Answer : $\frac{-9}{4} = \frac{-9 \times 2}{4 \times 2} = \frac{-18}{8}$

As we have made denominator equal we now just need to check whose numerator is greater.

Therefore, as -25<-18.

Hence $\frac{-25}{18} < \frac{-9}{4}$.

Q. 1. I. Compare the following numbers.

$$\frac{12}{15}, \frac{3}{5}$$

Answer :

$$\frac{3}{5} = \frac{3 \times 3}{5 \times 3} = \frac{9}{15}$$

As we have made denominator equal we now just need to check whose numerator is greater.

Therefore, as 12 >9.

$$\frac{12}{15} > \frac{9}{15}$$

Hence, $\frac{12}{15} > \frac{3}{5}$

Q. 1. J. Compare the following numbers.

$$\frac{-7}{11}, \frac{-3}{4}$$

Answer :

$$\frac{-7}{11} = \frac{-7 \times 4}{11 \times 4} = \frac{-28}{44} \frac{-3}{4} = \frac{-3 \times 11}{4 \times 11} = \frac{-33}{44}$$

As we have made denominator equal we now just need to check whose numerator is greater.

Therefore, as -28>-33.

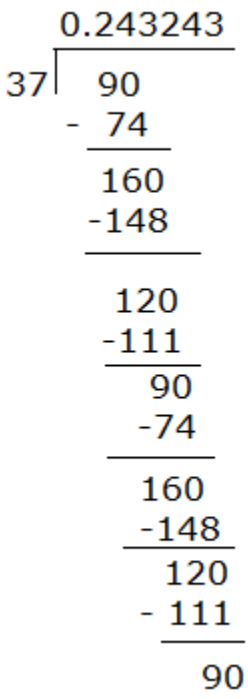
Hence $\frac{-7}{11} > \frac{-3}{4}$.

Practice set 1.3

Q. 1. A. Write the following rational numbers in decimal form.

9/37

Answer :



We divide now 9 by 37 what we write down as 9/37 and we get 0.24324324324324…….

Here we can see 243 in being repeated again and again so we can 243 is in recursion

$$\therefore \frac{9}{37} = 0.243243 = \overline{0.243}$$

Note: “A important note in every example except 4 we get solution recursive that is because when we divide it the remainder never becomes zero as in example 4 and remember the numbers which are repeated again and again should be given $\overline{(\ )}$ symbol above them.”

Q. 1. B. Write the following rational numbers in decimal form.

18/42

Answer :

```
   0.42857142
42| 180
  - 168
  -----
    120
  -  84
  -----
     360
   - 336
   -----
     240
   - 210
   -----
      300
    -294
    ----
       60
      -42
      ---
       180
      -168
      ----
       120
     -  84
     -----
       360
```

$\frac{18}{42}$ = 0.428571428571428571…

So, as we can see 428751 repeats itself so we can write it as $0.\overline{428571}$

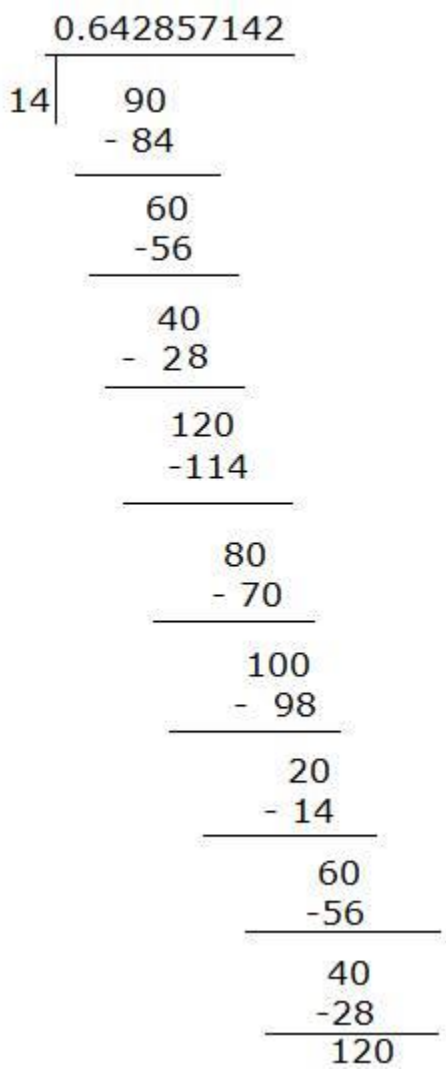
$$\therefore \frac{18}{42} = \frac{3}{7} = 0.42857142857142857\ldots = 0.\overline{428571}$$

Note: “A important note in every example except 4 we get solution recursive that is because when we divide it the remainder never becomes zero as in example 4 and remember the numbers which are repeated again and again should be given $\overline{(\ )}$ symbol above them.”

Q. 1. C. Write the following rational numbers in decimal form.

9/14

Answer :



$\frac{9}{14}$ Cannot be further reduced so we have to divide it and we get 0.64285714285714… . As we can see 428571 is recursive so we can write it as $0.\overline{6428571}$. It is important to note that 6 is not recurring so there is no $\overline{(\ )}$ symbol above it.

$\therefore \frac{9}{14} = 0.\overline{6428571}$.

Note: “A important note in every example except 4 we get solution recursive that is because when we divide it the remainder never becomes zero as in example 4 and

remember the numbers which are repeated again and again should be given $\overline{(\ )}$ symbol above them."

Q. 1. D. Write the following rational numbers in decimal form.

-103/5

Answer :

$$
\begin{array}{r}
20.6 \\
5\overline{)\ 103} \\
-\ 10 \\
\hline
03 \\
-00 \\
\hline
30 \\
-\ 30 \\
\hline
00
\end{array}
$$

The above solution is for $\frac{103}{5}$ when we multiply the quotient by negative (-) sign. We get the solution for $\frac{-\ 103}{5}$.

$\therefore \frac{-103}{5} = -20.6$

Note: "A important note in every example except 4 we get solution recursive that is because when we divide it the remainder never becomes zero as in example 4 and remember the numbers which are repeated again and again should be given $\overline{(\ )}$ symbol above them."

Q. 1. E. Write the following rational numbers in decimal form.

-11/13

Answer :

```
    0.84615384
13 | 110
     - 104
     ------
       60
      -52
      ----
       80
      - 78
      ----
       20
      -13
      ----
       70
      -65
      ----
       50
      -39
      ----
      110
     -104
     ----
       60
      -52
      ----
       80
```

We get 0.8461538461538… . As we can see 846153 is recursive so we can write it as $0.\overline{8461538}$

$\therefore \frac{-11}{13} = 0.\overline{8461538}$

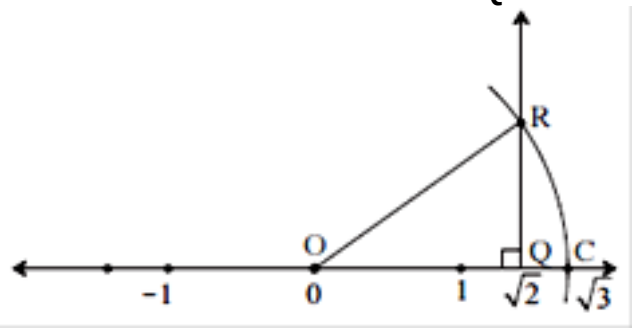
Note: “A important note in every example except 4 we get solution recursive that is because when we divide it the remainder never becomes zero as in example 4 and remember the numbers which are repeated again and again should be given $\overline{(\ )}$ symbol above them.”

Practice set 1.4

Q. 1. The number √2 is shown on a number line. Steps are given to show √3 on the number line using √2. Fill in the boxes properly and complete the activity.

Activity :

● The point Q on the number line shows the number.....
● A line perpendicular to the number line is drawn through the point Q.
Point R is at unit distance from Q on the line.



- Right angled △ORQ is obtained by drawing seg OR.
- l(OQ) = √2, l(QR) = 1

∴ by Pythagoras theorem,

$[l(OR)]^2 = [l(OQ)]^2 + [l(QR)]^2$

$= \square^2 + \square^2 = \square + \square$

$= \square$ ∴ l(OR) = $\square$

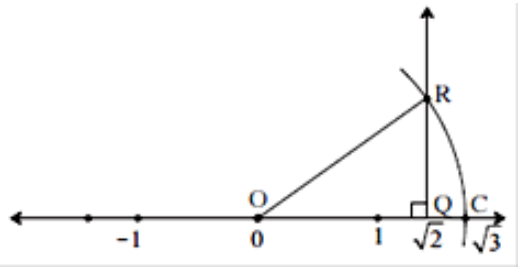
Draw an arc with center O and radius OR. Mark the point of intersection of the line and the arc as C. The point C shows the number √3.

Answer : Activity :

● The point Q on the number line shows the number ...$\sqrt{2}$... .

● A line perpendicular to the number line is drawn through the point Q.

Point R is at unit distance from Q on the line. (Here unit distance means 1 cm or any other unit that you choose earlier)



● Right angled ΔORQ is obtained by drawing seg OR.

● l(OQ) = √2, l(QR) = 1

∴ By Pythagoras theorem,

$[l(OR)]^2 = [l(OQ)]^2 + [l(QR)]^2$

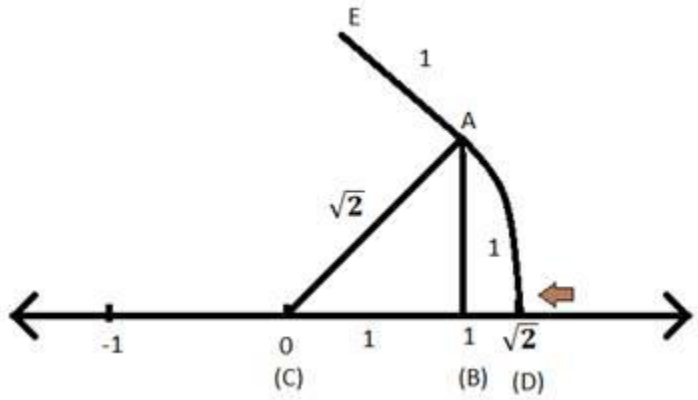
$= \left(\sqrt{2}\right)^2 + (1)^2 = 2 + 1$

$= 3 \therefore l(OR) = \sqrt{3}$

The solution for drawing $\sqrt{3}$:

To represent √3 on the number line, first of all, we have to represent √2 on the number line. The procedure for the representation of √2 will be same as shown in the activity. So, let's start from there only. The steps further followed will be as:

Step I: Now we need to construct a line which is perpendicular to line AB from point A such that this new line has unity length and let's name the new line as AE.



Step II: Now join (C) and (E). The length of line CE could be found out by using Pythagoras theorem in right angled triangle EAC. So;

$AE^2 + AC^2 = EC^2$

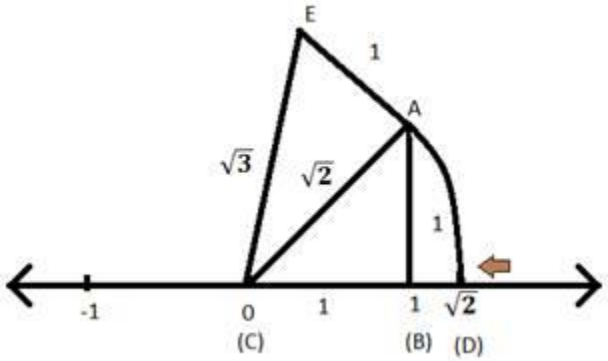
$\Rightarrow EC^2 = 1^2 + (\sqrt{2})^2$

$\Rightarrow EC^2 = 1 + 2$

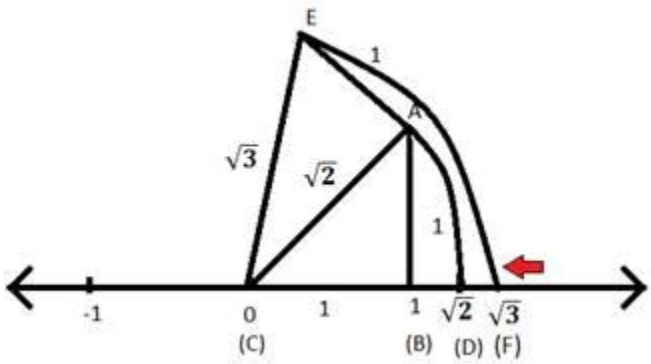
$\Rightarrow EC^2 = 3$

$\Rightarrow EC = \sqrt{3}$

So the length of EC line is found to be √3 units.



Step III: Now, with (C) as center and EC as the radius of circle cut an arc on the number line and mark the point as F. Since, OE is the radius of the arc, hence OF will also be the radius of the arc and will have the same length as that of OE. So, OF **=** √3 units. Hence, F will represent √3 on the number line.



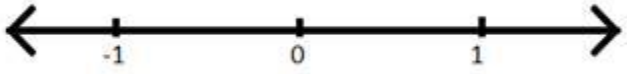
Similarly, we can represent any rational number on the number line. The positive rational numbers will be represented on the right of (C) and the negative rational numbers will be on the left of (C). If m is a rational number greater than the rational number y then on the number line the point representing x will be on the right of the point represents.

Q. 2. Represent √5 on the number line.

Answer : Steps involved are as follows:

Step I: Draw a number line and mark the center point as zero.

Step II: Mark right side of the zero as (1) and the left side as (-1).



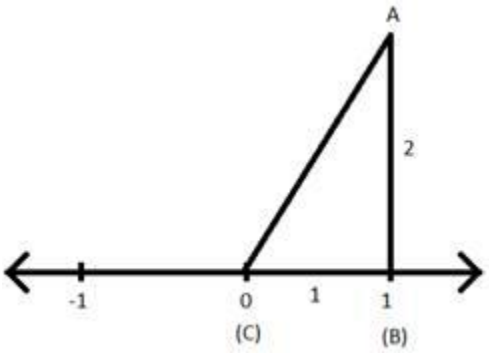
Step III: We won't be considering (-1) for our purpose.

Step IV: With 2 units as length draw a line from (1) such that it is perpendicular to the line.

Step V: Now join the point (0) and the end of the new line of 2 units length.

Step VI: A right-angled triangle is constructed.

Step VII: Now let us name the triangle as ABC such that AB is the height (perpendicular), BC is the base of triangle and AC is the hypotenuse of the right-angled ΔABC.



Step VIII: Now the length of the hypotenuse, i.e., AC can be found by applying Pythagoras theorem to the triangle ABC.

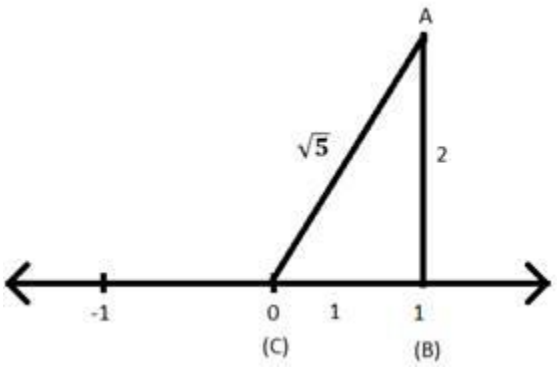
$AC^2 = AB^2 + BC^2$

$\Rightarrow AC^2 = 2^2 + 1^2$

$\Rightarrow AC^2 = 4 + 1$

$\Rightarrow AC^2 = 5$

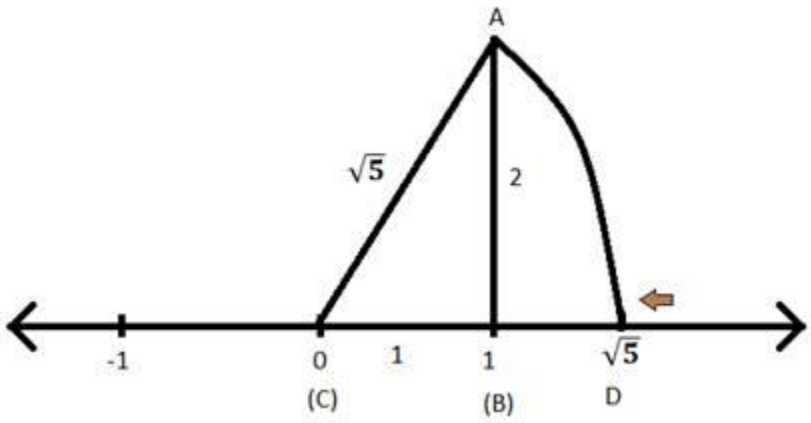
$\Rightarrow AC = \sqrt{5}$



Step IX: Now with AC as radius and C as the center cut an arc on the same number line and name the point as D.

Step X: Since AC is the radius of the arc and hence, the CD will also be the radius of the arc whose length is √5.

Step XI: Hence, D is the representation of√5 on the number line.



Q. 3. Show the number √7 on the number line.

Answer : Draw a number line l and mark the points O,A and B such that OA **=** OB **=** 1. Draw BC perpendicular to number line such that BC **=** 1 units. Join OC

In Right ΔOBC,

OC^2 **=** OB^2 **+** BC^2

= $(2)^2$ **+** $(1)^2$

= 5

OC = $\sqrt{5}$

Taking O as center and C and C as radius, draw an arc which cuts l in D.

Hence, OC = OD = $\sqrt{5}$

Now, draw DE perpendicular number line l such that DE = 1 Units. Join OE.

In Right ΔODE,

$OE^2 = OD^2 + DE^2$

$= (\sqrt{5})^2 + (1)^2$

$= 5 + 1$

$= 6$

$\therefore OE = \sqrt{6}$

Taking O as center and OE as radius, draw an arc which cuts l in F.

$\therefore OE = OF = \sqrt{6}$

Now, Draw GF perpendicular l such that GH = 1 units. Join OG.

In right ΔOGF,

$OG^2 = OF^2 + GF^2$

$= (\sqrt{6})^2 + (1)^2$

$= 6 + 1$

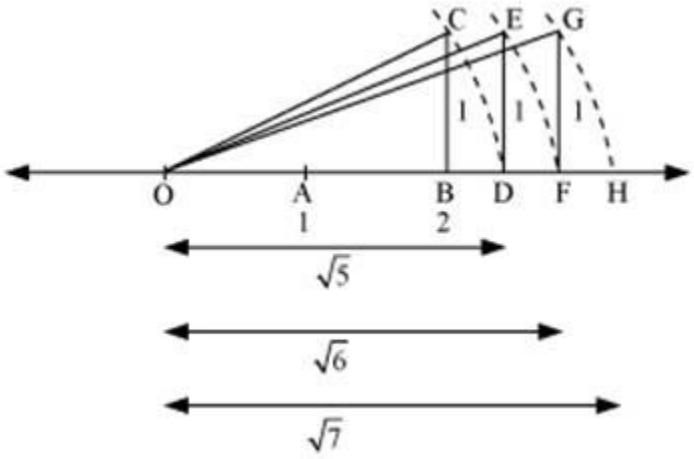
$= 7$

OG = $\sqrt{7}$

Taking O as center and OG as radius, Draw an arc which cuts l in H.

Hence,

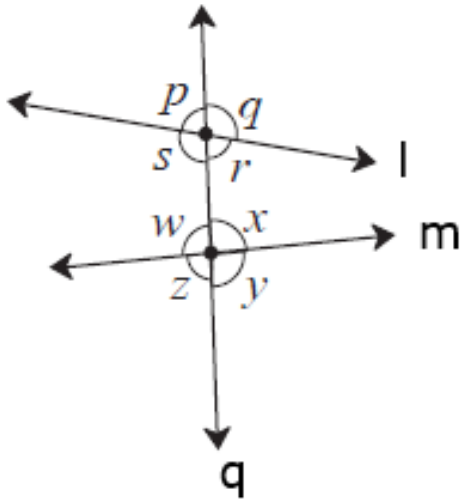
OG = OH = $\sqrt{7}$



Parallel Lines And Transversals

Practice set 2.1

Q. 1. In the adjoining figure, each angle is shown by a letter. Fill in the boxes with the help of the figure.



Corresponding angles.
(1) ∠p and [ ] (2) ∠q and [ ]
(3) ∠r and [ ] (4) ∠ s and [ ]
Interior alternate angles.
(5) ∠s and [ ] (6) ∠w and [ ]

Answer : • Given: Line q is transversal is to line m and line l.

• To find corresponding angles of

1) ∠ p

2) ∠ q

3) ∠ r

4) ∠ s

• Explanation:

If we go by the definition, the definition of corresponding angels tells us, if the arms on the transversal of a pair of angles are in the same direction and the other arms are on the same side of the transversal, then it is called a pair of corresponding angles.

So, now in the above given figure we have say, line q making transversal to line m and line l.

1) For ∠p, ∠w is the angle which is in the same side and same direction of transversal so ∠w is the corresponding angle to ∠p.

2) For ∠q, ∠x is the angle which is in the same side and same direction of transversal so ∠x is the corresponding angle to ∠q.

3) For ∠r, ∠y is the angle which is in the same side and same direction of transversal so ∠r is the corresponding angle to ∠y.

4) For ∠s, ∠z is the angle which is in the same side and same direction of transversal so ∠s is the corresponding angle to ∠z.

Now for Interior Alternate angles

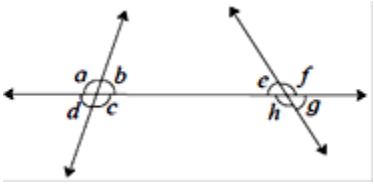
Pairs of angles which are on the opposite sides of transversal and their arms on the transversal show opposite directions is called a pair of alternate angles.

When these angels are in the inner side they are called Interior alternate angels.

5) For ∠s the angel which is in the inner side as well as on the opposite side of transversal and it's arm show opposite direction is ∠x. So ∠s and ∠x form pair of Interior Alternate angel.

6) For ∠w the angel which is in the inner side as well as on the opposite side of transversal and it's arm show opposite direction is ∠r. So ∠w and ∠r form pair of Interior Alternate angel.

Q. 2. Observe the angles shown in the figure and write the following pair of angles.



(1) Interior alternate angles
(2) Corresponding angles
(3) Interior angles

Answer : • Given: Line q is transversal is to line m and line l.

• To find: (1) Interior alternate angles

(2) Corresponding angles

(3) Interior angles

(1) Now for Interior Alternate angles

Pairs of angles which are on the opposite sides of transversal and their arms on the transversal show opposite directions is called a pair of alternate angles.

When these angels are in the inner side they are called Interior alternate angels.

1) For ∠b the angle which is in the inner side as well as on the opposite side of transversal and it's arm show opposite direction is ∠h. So ∠b and ∠h form pair of Interior Alternate angel.

2) For ∠c the angel which is in the inner side as well as on the opposite side of transversal and it's arm show opposite direction is ∠e. So ∠c and ∠e form pair of Interior Alternate angel.

(2) Corresponding angles

If we go by the definition, the definition of corresponding angels tells us, if the arms on the transversal of a pair of angles are in the same direction and the other arms are on the same side of the transversal, then it is called a pair of corresponding angles.

So, now in the above given figure we have say, line q making transversal to line m and line l.

1) For ∠a, ∠e is the angle which is in the same side and same direction of transversal so ∠a is the corresponding angle to ∠e.

2) For ∠b, ∠f is the angle which is in the same side and same direction of transversal so ∠b is the corresponding angle to ∠f.

3) For ∠d, ∠h is the angle which is in the same side and same direction of transversal so ∠d is the corresponding angle to ∠h.

4) For ∠c, ∠g is the angle which is in the same side and same direction of transversal so ∠c is the corresponding angle to ∠g.

(3) Interior angles

A pair of angles which are on the same side of the transversal and inside the given lines is called a pair of interior angles.

So, we get only two such pairs of angels.

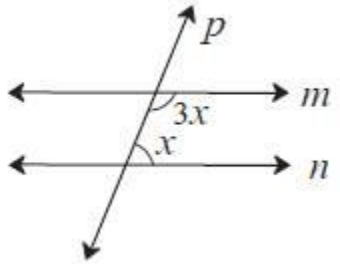
1) ∠b has ∠e on the same side of transversal and inside the given line. So ∠b and ∠e form pair of interior angels.

2) ∠c has ∠h on the same side of transversal and inside the given line. So ∠c and ∠h form pair of interior angels.

Practice set 2.2

Q. 1. A. Choose the correct alternative.

In the adjoining figure, if line *m* || line *n* and line *p* is a transversal then find *x*.



A. 135°

B. 90°
C. 45°
D. 40°

Answer : • Given: Line *m* || line *n* and line *p* is a transversal

• To find: The value of x.

Now in the given figure we have 3x and x. 3x and x form a pair of interior angle.

Now by the property of interior angels we know that, each pair of interior angles formed by two parallel lines and their transversal is of supplementary angles i.e. 180°.

∴ x + 3x = 180(∵ Property of interior angles.)

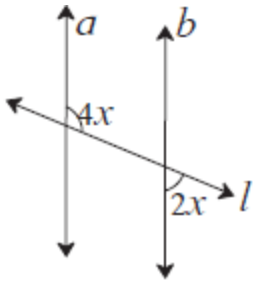
⇒ 4x = 180

⇒ $x = \frac{180}{4} = 45°$

∴ The value of x is 45°.

Q. 1. B. Choose the correct alternative.

In the adjoining figure, if line *a* || line *b* and line *l* is a transversal then find *x*.



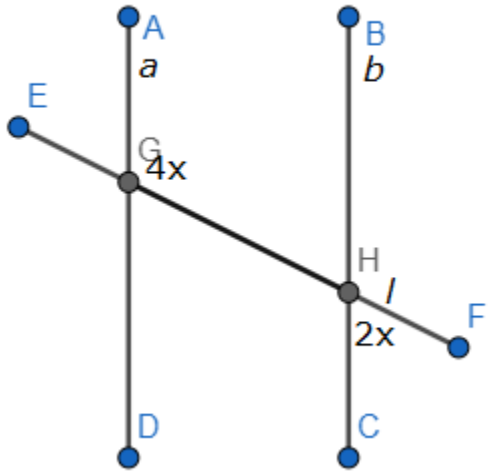
A. 90°

B. 60°
C. 45°
D. 30°

Answer : • Given: Line *a* || line *b* and line *l* is a transversal

• To find: Value of x.

Now from the figure we can see



∠GHB=∠CHF (∵ opposite angles are same)

⇒ ∠GHB=2x

∠AGB+∠BHG=180° (∵ (∵ Property of interior angles.)

∴ 4x+2x=180°

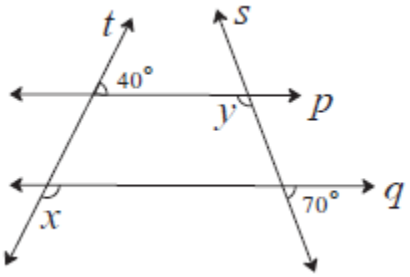
⇒ 6x=180°

$\Rightarrow x = \frac{180}{60} = 30°$

∴ The value of x is 30°

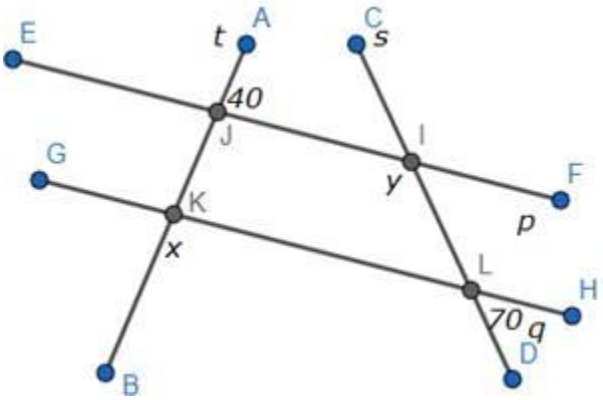
Option (D)

Q. 2. In the adjoining figure line *p* || line *q*. Line *t* and line *s* are transversals. Find the measure of ∠x and ∠y using the measures of angles given in the figure.



Answer : • Given: Line *p* || line *q*, line *t* and line *s* are transversals.

• To find: The measure of ∠x and ∠y.



Here we can see

∠KLD=∠HLD (∵ Opposite angles are equal)

⇒ ∠ KLD=70°

∠KLI+∠JIL=180° (∵ (∵ Property of interior angles.)

∴ 70+Y=180°

⇒ Y=110°

∴ The value of y is 110°

Also,

∠ BKL+∠ JKL =180° (Linear pair)

⇒ x +∠JKL = 180°

∴ ∠ JKL= 180-x…(1)

∠ KJI+∠ AJI =180° (Linear pair)

⇒ 40+∠KJI = 180°

∴ ∠ KJI= 140°…(2)

Now,

∠KJI + ∠JKL = 180° (∵ Property of interior angles.)

140 + 180 – x = 180 (From 1 and 2)

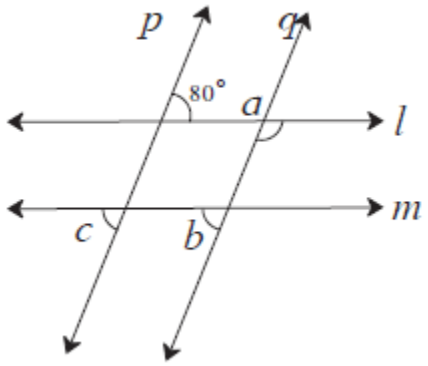
⇒ –x = 180 – 180 – 140

⇒ -x= 1 – 140°

∴ x = 140°

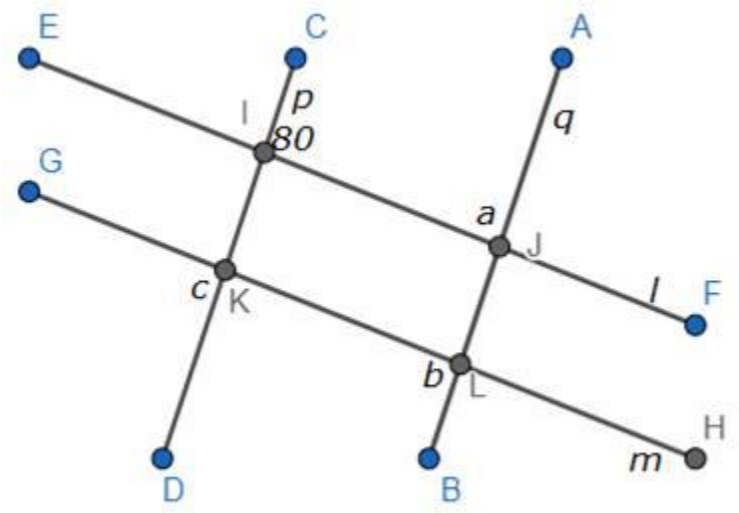
∴ The value of x is 140°.

Q. 3. In the adjoining figure. line *p* || line *q*. line *l* || line *m*. Find measures of ∠*a*, ∠*b*, and ∠*c*, using the measures of given angles. Justify your answers.



Answer : • Given: Line *p* || line *q*, line *l* || line *m.*

• To find: The measure of ∠a, ∠b and ∠c.



Now in this figure

∠CIJ+∠AJI=180° (∵ Exterior angles are supplementary)

⇒ 80° + a =180°

⇒ a = 100°

Also,

∠AJI+∠IJL=180° (Linear pair)

⇒100° +∠IJL=180°

∴ ∠IJL=80°

∠BLK=∠LJI=b(corresponding angles are equal)

∴ b=80°

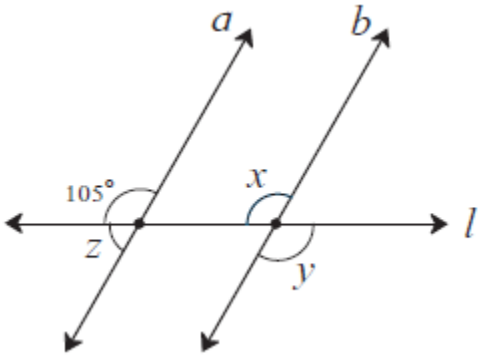
∠EIK=∠CIJ=80° (Opposite angles are equal)

∠GKD=∠EIK=c(corresponding angles are equal)

∴ c=80°

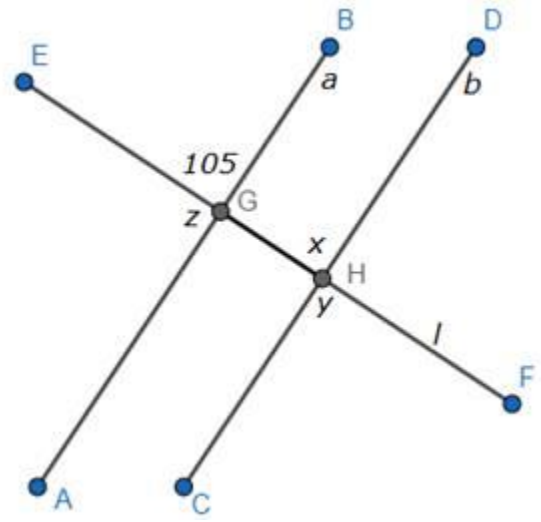
∴ Values of a,b and c are 100° , 80° ,80° respectively.

Q. 4. In the adjoining figure, line *a* || line *b*. line *l* is a transversal. Find the measures of ∠*x*, ∠*y*, ∠*z* using the given information.



Answer : • Given: Line *a* || line *b*, line *l* is transversal.

• To find: The measure of ∠x, ∠y and ∠z.



In, the figure above

∠AGE=z

Also,

∠AGE+∠EGB=180° (Linear pair)

Z + 105 = 180°

z = 75°

∠GHD = x

∠EGB = ∠GHD (corresponding angles are equal)

∴ x = 105°

∠DHF = y

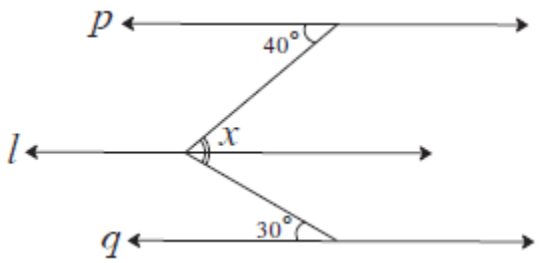
Also

∠DHF=∠GHD (Opposite angles are equal)

∠DHF = 105°

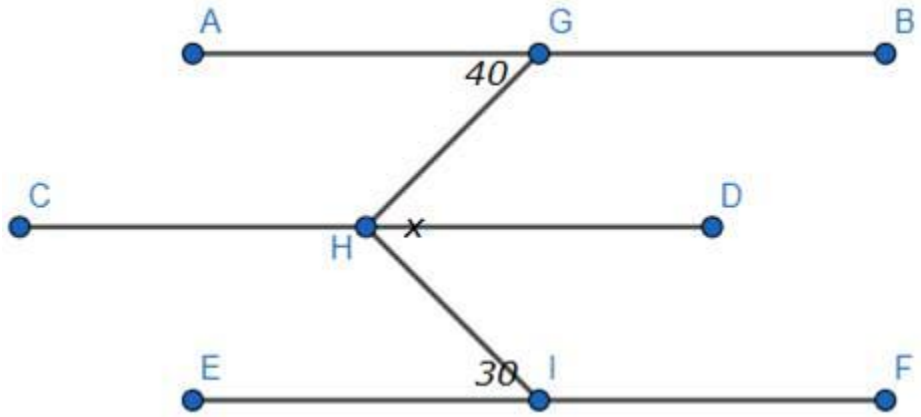
∴ Values of x, y and z are 105°,105°,75° respectively.

Q. 5. In the adjoining figure, line *p* || line *l* || line *q*. Find ∠x with the help of the measures given in the figure.



Answer : • Given: line *p* || line *l* || line *q.*

• To find: Value x



Now, In the above figure ∠GHD = x

Also,

∠GHD =∠GHD + ∠IHD

∠AGH=∠GHD (∵ Alternate angles are equal)…(1)

∠EIH=∠DHI (∵ Alternate angles are equal)…(2)

From (1) and (2) we get,

∠GHD = 40°

∠DHI = 30°

We know

∠GHD=∠GHD+∠IHD

∠GHD= 40°+30°

∠GHD = 70°

But,

∠ GHD = x

∴ x = 70°

∴ The value of x is 70°.

Practice set 2.3

Q. 1. Draw a line *l*. Take a point A outside the line. Through point A draw a line parallel to line *l*.

Answer : Here we need draw a line *l* then take a point A outside the line and then through that point draw another line parallel to *l*.

Steps of construction:

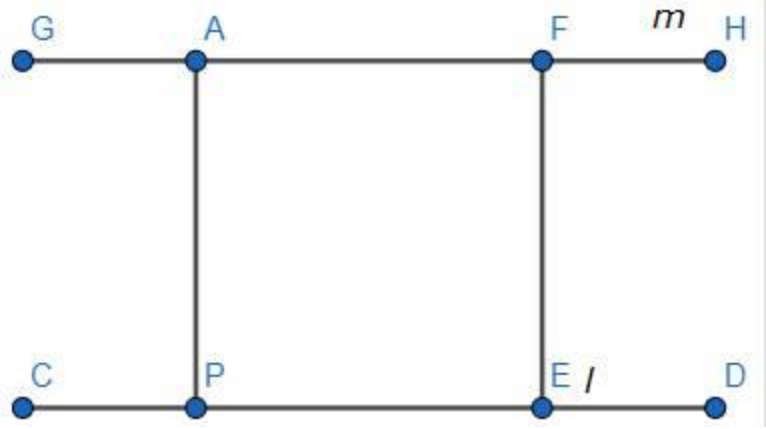
1) Draw a line segment of any length. Mark it as CD.

2) Now from any point say P on that segment draw perpendicular at any distance above or below and name that point A.

3) Now take another perpendicular of same length as of AP, and in same direction.

4) Draw a line through those points.

5) This line is parallel to given line *l*.



Q. 2. Draw a line *l*. Take a point T outside the line. Through point T draw a line parallel to line *l*.

Answer : Here we need draw a line *l* then take a point T outside the line and then through that point draw another line parallel to *l*.

Steps of construction:

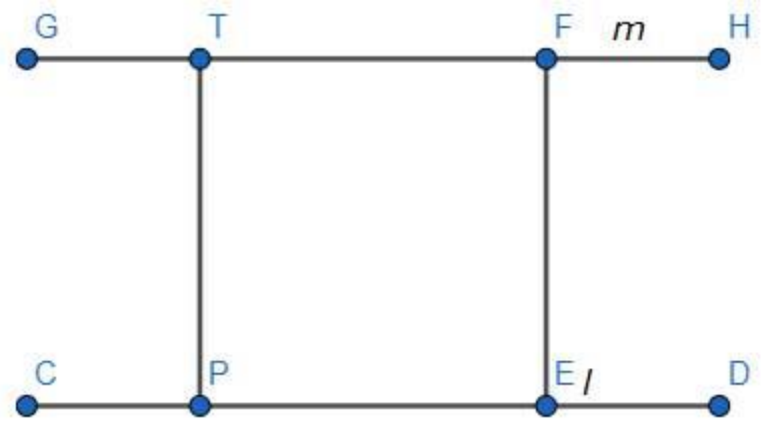
1) Draw a line segment of any length. Mark it as CD.

2) Now from any point say P on that segment draw perpendicular at any distance above or below and name that point T.

3) Now take another perpendicular of same length as of TP, and in same direction.

4) Draw a line through those points.

5) This line is parallel to given line *l*.



Q. 3. Draw a line *m*. Draw *a* line *n* which is parallel to line *m* at a distance of *4* cm from it.

Answer : Method : Draw a line parallel to line *l* at a distance 4 cm.

Steps of construction :

(1) Draw line *l*.

(2) Take two points A and B on the line *l*.

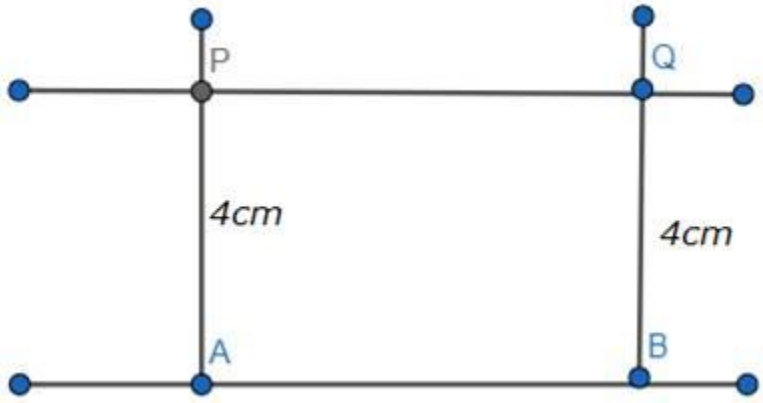
(3) Draw perpendiculars to the line *l* from points A and B.

(4) On the perpendicular lines take points P and Q at a distance of 4cm from

A and B respectively.

(5) Draw line PQ.

(6) Line PQ is a line parallel to the line *l* at a distance 4cm.



Indices And Cube Root

Practice set 3.1

Q. 1. Express the following numbers in index form.

(1) Fifth root of 13
(2) Sixth root of 9
(3) Square root of 256
(4) Cube root of 17
(5) Eighth root of 100
(6) Seventh root of 30

Answer : (1) Fifth root of 13

In general, n^{th} root of 'a' is expressed as $a^{\frac{1}{n}}$.

So, the fifth root of 13 is expressed as $13^{\frac{1}{5}}$.

Here, 13 is base, $\frac{1}{5}$ is the index and $13^{\frac{1}{5}}$ is the index form of the number.

(2) Sixth root of 9

In general, n^{th} root of 'a' is expressed as $a^{\frac{1}{n}}$.

So, the sixth root of 9 is expressed as $9^{\frac{1}{6}}$.

Here, 9 is base, $\frac{1}{6}$ is the index and $9^{\frac{1}{6}}$ is the index form of the number.

(3) Square root of 256

In general, n^{th} root of 'a' is expressed as $a^{\frac{1}{n}}$.

So, the square root of 256 is expressed as $256^{\frac{1}{2}}$.

Here, 256 is base, $\frac{1}{2}$ is the index and $256^{\frac{1}{2}}$ is the index form of the number.

(4) Cube root of 17

In general, n^{th} root of 'a' is expressed as $a^{\frac{1}{n}}$.

So, cube root of 17 is expressed as $17^{\frac{1}{3}}$.

Here, 17 is base, $\frac{1}{3}$ is the index and $17^{\frac{1}{3}}$ is the index form of the number.

(5) Eighth root of 100

In general, n^{th} root of 'a' is expressed as $a^{\frac{1}{n}}$.

So, the eighth root of 100 is expressed as $100^{\frac{1}{8}}$.

Here, 100 is base, $\frac{1}{8}$ is the index and $100^{\frac{1}{8}}$ is the index form of the number.

(6) Seventh root of 30

In general, n^{th} root of 'a' is expressed as $a^{\frac{1}{n}}$.

So, the seventh root of 30 is expressed as $30^{\frac{1}{7}}$.

Here, 30 is base, $\frac{1}{7}$ is the index and $30^{\frac{1}{7}}$ is the index form of the number.

Q. 2. Write in the form 'n^{th} root of a' in each of the following numbers.

1. $(81)^{1/4}$ 2. $(49)^{1/2}$
3. $(15)^{1/5}$ 4. $(512)^{1/9}$
5. $(100)^{1/19}$ 6. $(6)^{1/7}$

Answer : 1. $(81)^{1/4}$

In general, $a^{1/n}$ is written as 'n^{th} root of a'.

So, $(81)^{1/4}$ is written as '4^{th} root of 81'.

2. $(49)^{1/2}$

In general, $a^{1/n}$ is written as 'n^{th} root of a'.

So, $(49)^{1/2}$ is written as 'square root of 49'.

3. $(15)^{1/5}$

In general, $a^{1/n}$ is written as 'n^{th} root of a'.

So, $(15)^{1/5}$ is written as '5^{th} root of 15'.

4. $(512)^{1/9}$

In general, $a^{1/n}$ is written as 'n^{th} root of a'.

So, $(512)^{1/9}$ is written as '9^{th} root of 512'.

5. $(100)^{1/19}$

In general, $a^{1/n}$ is written as 'n^{th} root of a'.

So, $(100)^{1/19}$ is written as '19^{th} root of 100'.

6. $(6)^{1/7}$

In general, $a^{1/n}$ is written as 'n^{th} root of a'.

So, $(6)^{1/7}$ is written as '7^{th} root of 6'.

Practice set 3.2

Q. 1. Complete the following table.

Sr. No.	Numbers	Power of the root	Root of the power
(1)	$(225)^{3/2}$	Cube of square root of 225	Square root of cube of 225
(2)	$(45)^{4/5}$		
(3)	$(81)^{6/7}$		
(4)	$(100)^{4/10}$		
(5)	$(21)^{3/7}$		

Answer :

Sr. No.	Numbers	Power of the root	Root of the power
(1)	$(225)^{3/2}$	Cube of square root of 225	Square root of cube of 225
(2)	$(45)^{4/5}$	Fourth power of fifth root of 45	Fifth root of fourth power of 45
(3)	$(81)^{6/7}$	Sixth power of seventh root of 81	Seventh root of sixth power of 81
(4)	$(100)^{4/10}$	Fourth power of tenth root of 100	Tenth root of fourth power of 100
(5)	$(21)^{3/7}$	Cube of seventh root of 21	Seventh root of cube of 21

Explanation of Table

Generally we can express two meaning of the number $a^{m/n}$.

$a^{m/n} = (a^m)^{1/n}$ means 'n^{th} root of m^{th} power of a'.

$a^{m/n} = (a^{\frac{1}{n}})^m$ means 'm^{th} power of n^{th} root of a'.

(1) $(225)^{3/2}$

$(225^3)^{1/2}$ means 'Cube of square root of 225'.

$(225^{1/2})^3$ means 'Square root of cube of 225'.

(2) $(45)^{4/5}$

$(45^4)^{1/5}$ means 'Fourth power of fifth root of 45'.

$(45^{1/5})^4$ means 'Fifth root of fourth power of 45'.

(3) $(81)^{6/7}$

$(81^6)^{1/7}$ means 'Sixth power of seventh root of 81'.

$(81^{1/7})^6$ means 'Seventh root of sixth power of 81'.

(4) $(100)^{4/10}$

$(100^4)^{1/10}$ means 'Fourth power of tenth root of 100'.

$(100^{1/10})^4$ means 'Tenth root of fourth power of 100'.

(5) $(21)^{3/7}$

$(21^3)^{1/7}$ means 'Cube of seventh root of 21'.

$(21^{\frac{1}{7}})^3$ means 'Seventh root of cube of 21'.

Q. 2. Write the following number in the form of rational indices.

(1) Square root of 5th power of 121.
(2) Cube of 4th root of 324.
(3) 5th root of square of 264.
(4) Cube of cube root of 3.

Answer : We know that 'nth root of mth power of a' is expressed as $(a^m)^{1/n}$

And 'mth power of nth root of a' is expressed as $(a^{\frac{1}{n}})^m$.

(1) Square root of 5th power of 121.

We know that,

'nth root of mth power of a' is expressed as $(a^m)^{1/n}$

So, 'Square root of 5th power of 121' is expressed as $(121^5)^{1/2}$ or $(121)^{5/2}$.

(2) Cube of 4th root of 324.

We know that,

'nth root of mth power of a' is expressed as $(a^m)^{1/n}$

So, 'Cube of 4th root of 324' is written as $(324^{1/4})^3$ or $(324)^{3/4}$.

(3) 5th root of square of 264.

We know that,

'nth root of mth power of a' is expressed as $(a^m)^{1/n}$

So, '5th root of square of 264' is written as $(264^2)^{1/5}$ or

$(264)^{2/5}$.

(4) Cube of cube root of 3.

We know that,

'm^{th} power of n^{th} root of a' is expressed as $(a^{\frac{1}{n}})^m$

So, 'Cube of cube root of 3' is written as $(3^{1/3})^3$ or $(31)^{3/3}$.

Practice set 3.3

Q. 1 A. Find the cube root of the following numbers.

8000

Answer : First find the factor of 8000

$8000 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 5$

For finding the cube root, we pair the prime factors in 3's.

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

$= (2 \times 10)^3$

$= 20^3$

i.e. cube root of 8000 = $(8000)^{1/3} = (20^3)^{1/3} = 20$ (answer).

Q. 1. B. Find the cube root of the following numbers.

729

Answer : First find factors of 729

$729 = 9 \times 9 \times 9$

For finding the cube root, we pair the prime factors in 3's.

$= 9^3$

i.e. cube root of 729 = $(729)^{1/3} = (9^3)^{1/3} = 9$ (answer).

Q. 1. C. Find the cube root of the following numbers.

343

Answer : First find the factor of 343

$343 = 7 \times 7 \times 7$

For finding the cube root, we pair the prime factors in 3's.

$= 7^3$

i.e. cube root of 343 = $(343)^{1/3} = (7^3)^{1/3} = 7$ (answer).

Q. 1. D. Find the cube root of the following numbers.

-512

Answer : First find factors of - 512

$-512 = (-8) \times (-8) \times (-8)$

For finding the cube root, we pair the prime factors in 3's.

$= (-8)^3$

i.e. cube root of -512 = $(-512)^{1/3} = (-8^3)^{1/3} = -8$ (answer).

Q. 1. E. Find the cube root of the following numbers.

-2744

Answer : First find factors of -2744

$-2744 = (-14) \times (-14) \times (-14)$

For finding the cube root, we pair the prime factors in 3's.

$= (-14)^3$

i.e. cube root of -2744 = $(-2744)^{1/3} = (-14^3)^{1/3} = -14$ (answer).

Q. 1. F. Find the cube root of the following numbers.

32768

Answer : First find factor of 32768

$32768 = 32 \times 32 \times 32$

For finding the cube root, we pair the prime factors in 3's.

$= 32^3$

i.e. cube root of 32768 = $\sqrt[3]{32768} = (32^3)^{1/3} = 32$ (answer).

Q. 2. Simplify:

(1) $\sqrt[3]{\frac{27}{125}}$

(2) $\sqrt[3]{\frac{16}{54}}$

(3) If $\sqrt[3]{729} = 9$ **then** $\sqrt[3]{0.000729} = ?$

Answer :

(1) $\sqrt[3]{\frac{27}{125}}$

$\sqrt[3]{\frac{27}{125}} = \frac{\sqrt[3]{27}}{\sqrt[3]{125}} = \frac{\sqrt[3]{3\times3\times3}}{\sqrt[3]{5\times5\times5}} = \frac{\sqrt[3]{3^3}}{\sqrt[3]{5^3}} = \frac{3}{5}$ (answer).

(2) $\sqrt[3]{\frac{16}{54}}$

$\sqrt[3]{\frac{16}{54}} = \frac{\sqrt[3]{8}}{\sqrt[3]{27}} = \frac{\sqrt[3]{2\times2\times2}}{\sqrt[3]{3\times3\times3}} = \frac{\sqrt[3]{2^3}}{\sqrt[3]{3^3}} = \frac{2}{3}$ (answer).

3) If $\sqrt[3]{729} = 9$ then $\sqrt[3]{0.000729} = ?$

$$\sqrt[3]{0.000729} = \sqrt[3]{\frac{729}{1000000}} = \frac{\sqrt[3]{729}}{\sqrt[3]{100\times100\times100}} = \frac{\sqrt[3]{729}}{\sqrt[3]{100^3}}$$

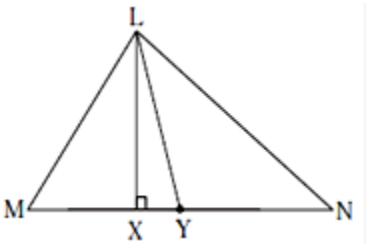
We know that $\sqrt[3]{729} = 9$

So, $\sqrt[3]{0.000729} = \frac{9}{100} = 0.09$ (answer).

Altitudes And Medians Of a Triangle

Practice set 4.1

Q. 1. In ∆LMN, ... is an altitude and ..... is a median. (Write the names of appropriate segments.)

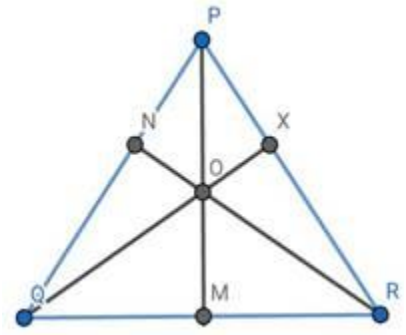


Answer : In ∆LMN, LX is an altitude (because it makes a 90° angle on the base where it falls) and LY is a median (because it divides the base into two equal halves i.e., MY = NY).

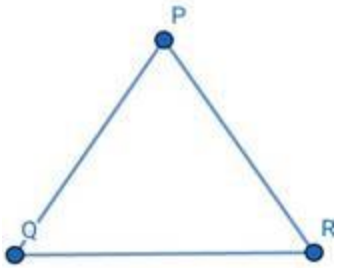
Q. 2. Draw an acute-angled ∆PQR. Draw all of its altitudes. Name the point of concurrence as 'O'.

Answer : To draw altitudes of a triangle:

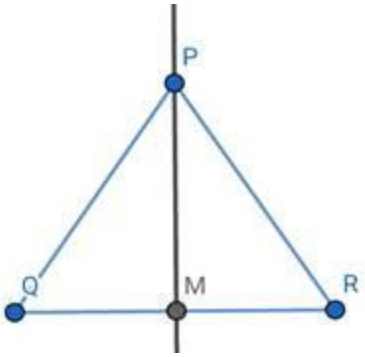
i. Draw an acute-angled ∆PQR.



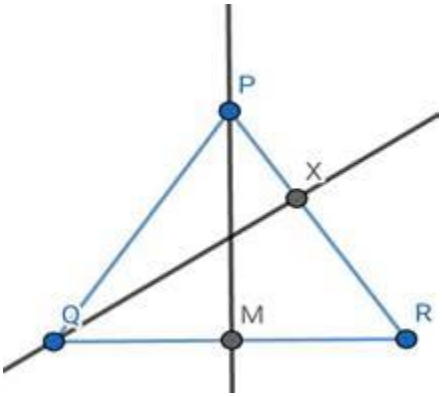
ii. Draw a perpendicular from vertex P on the side QR using a set - square. Name the point where it meets side QR as M. Seg PM is an altitude on side QR.



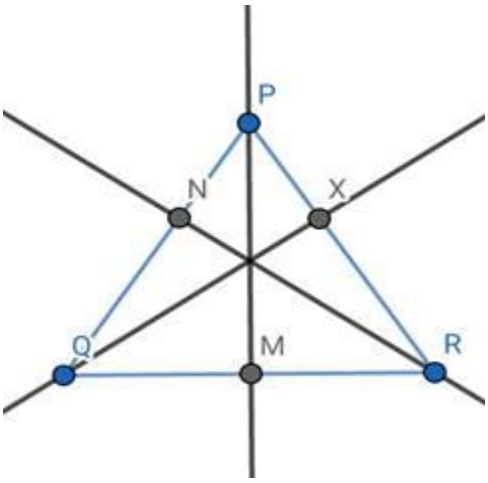
iii. Considering side PR as a base, draw an altitude QX on side XZ. Seg QX is an altitude on side PR.



iv. Consider side PQ as a base, draw an altitude RN on seg PQ. Seg RN is an altitude on side PQ.



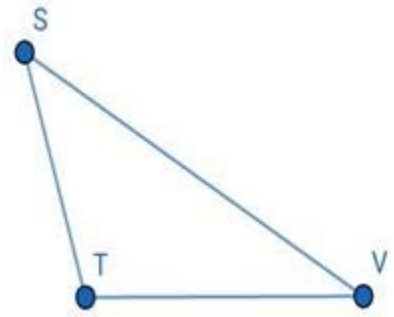
Hence,



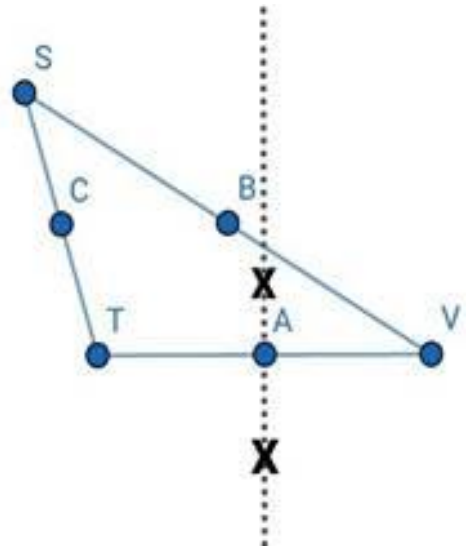
Seg PM, seg QO, seg RN are the altitudes of ∆PQR. The point of concurrence i.e., the orthocentre is denoted by the point O.

Q. 3. Draw an obtuse-angled ∆STV. Draw its medians and show the centroid.

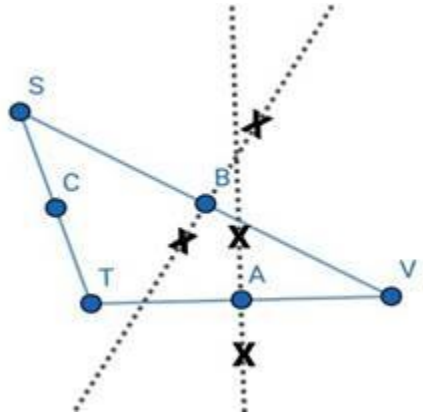
Answer : To draw an obtuse-angled ∆STV.



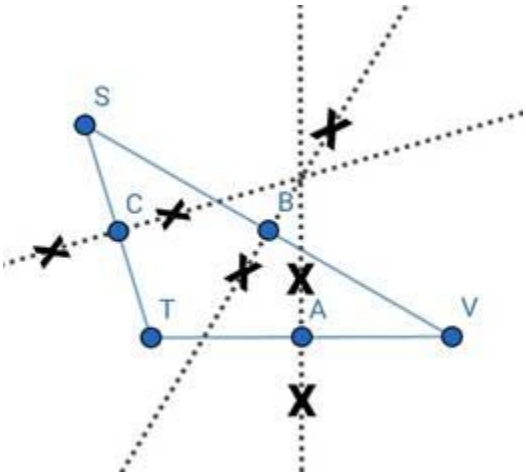
i. Draw a base line of any length, mark it TV. At T draw an obtuse angle mark that line point S. Join S and V points. ΔSTV thus formed is an obtuse angled triangle.



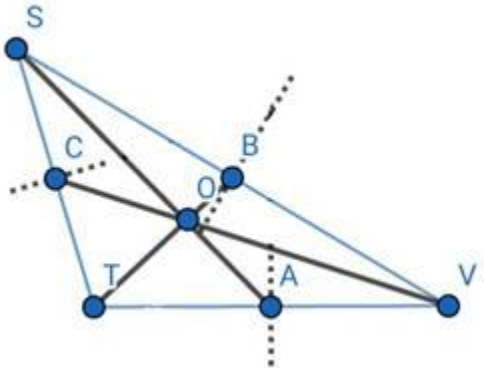
ii. Find the mid-point A of side TV, by constructing the perpendicular bisector of the line segment TV. Draw AS.



iii. Find the mid-point B of side SV, by constructing the perpendicular bisector of the line segment SV. Draw seg BT.



iv. Find the mid-point C of side ST, by constructing the perpendicular bisector of the line segment ST. Draw seg CV.



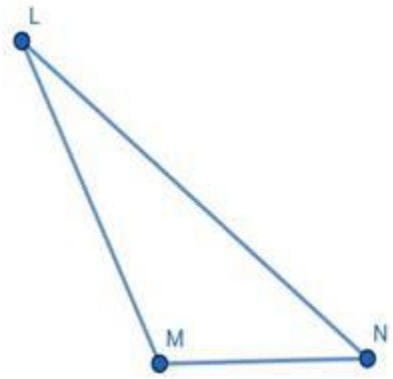
Seg AS, seg BT and seg CV are medians of ∆STV.

Their point of concurrence is denoted by O.

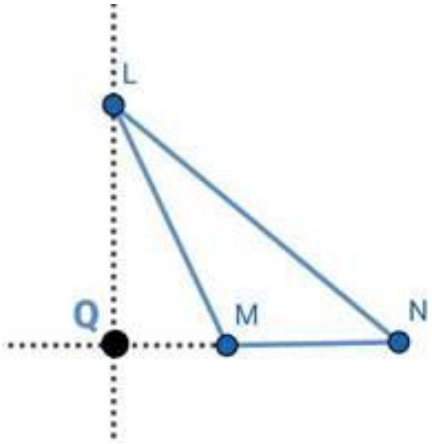
Q. 4. Draw an obtuse-angled ∆LMN. Draw its altitudes and denote the orthocentre by 'O'.

Answer : To draw an obtuse-angled ∆LMN.

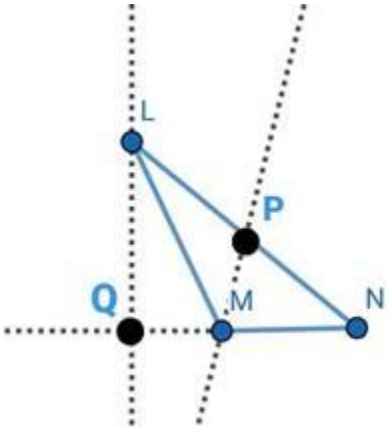
i. Draw a base line of any length, mark it MN. At M draw an obtuse angle mark that line point L. Join L and N points. ΔLMN thus formed is an obtuse angled triangle.



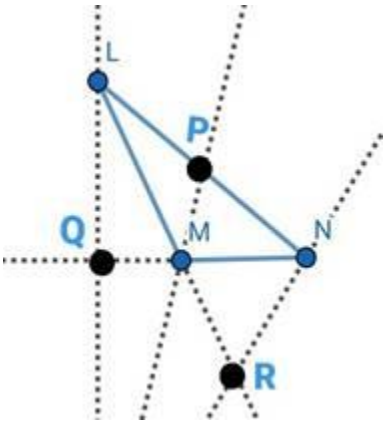
ii. To draw an altitude from vertex L, extend side MN of the triangle from point M with a dashed line, as shown in the figure, and then draw the perpendicular lines from M.



iii. Considering side LN as a base, draw an altitude MP on side LN. Seg MP is an altitude on side LN.

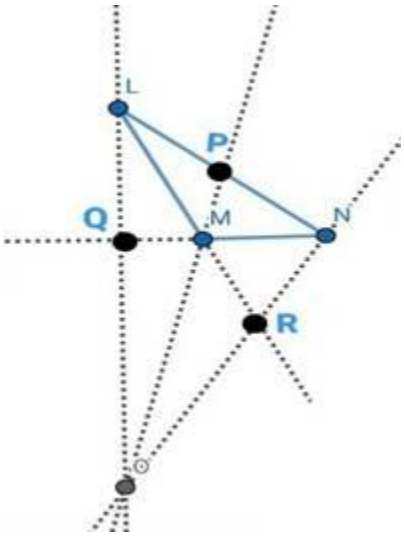


iv. To draw altitude from vertex N, extend side LM of the triangle from point M with dashed line, as shown in the figure, and then draw the perpendicular line from vertex N.



v. Now for the orthocentre, as all the altitudes do not intersect we'll have to extend them so that they can meet giving us an orthocentre of the triangle.

vi. Hence, extend the altitude LQ, from point Q ; MP from point M, and NR from point R.



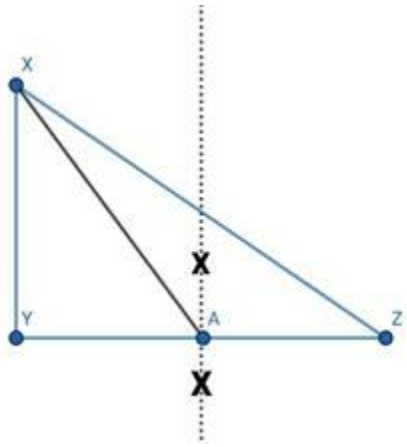
vii. The ortho centre of the Obtuse triangle lies outside the triangle.

viii. The point O denotes the orthocentre of the obtuse-angled ∆LMN.

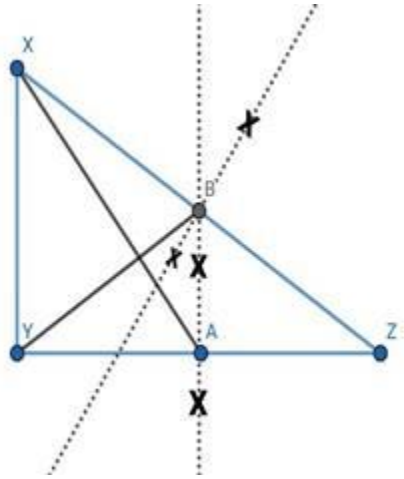
Q. 5. Draw a right angled ∆XYZ. Draw its medians and show their point of concurrence by G.

Answer : To draw an right angled ∆XYZ.

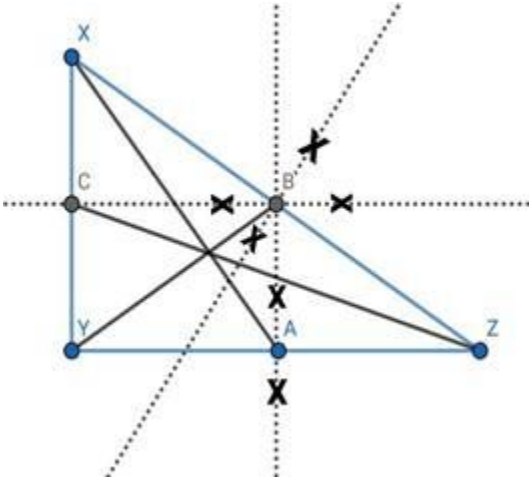
i. Draw a base line of any length, mark it YZ. At Y draw a right angle mark that line point X. Join X and Z points. ΔXYZ thus formed is right angled triangle.



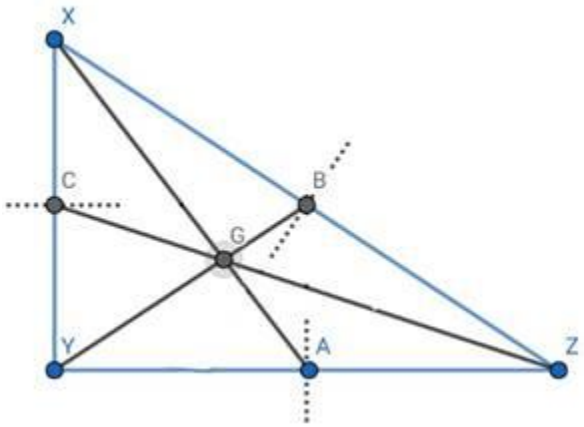
ii. Find the mid-point A of side YZ, by constructing the perpendicular bisector of the line segment YZ. Draw AX.



iii. Find the mid-point B of side XZ, by constructing the perpendicular bisector of the line segment XZ. Draw seg BY.



iv. Find the mid-point C of side XY, by constructing the perpendicular bisector of the line segment XY. Draw seg CZ.

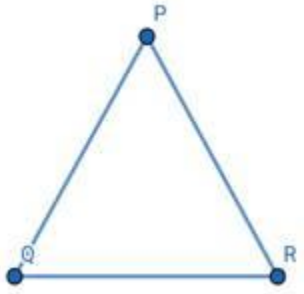


Seg AX, seg BY and seg CZ are medians of ΔXYZ.

Their point of concurrence is denoted by G.

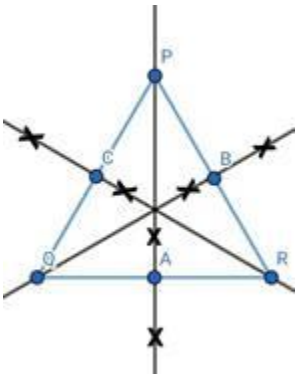
Q. 6. Draw an isosceles triangle. Draw all of its medians and altitudes. Write your observation about their points of concurrence.

Answer : i. Draw an isosceles triangle and name it as PQR.

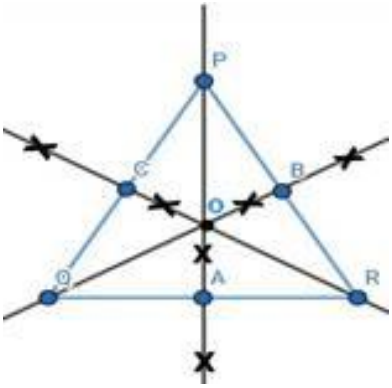


An isosceles triangle is that triangle whose base is the side which is not equal to the other two sides or An isosceles triangle is a triangle which has two equal sides.

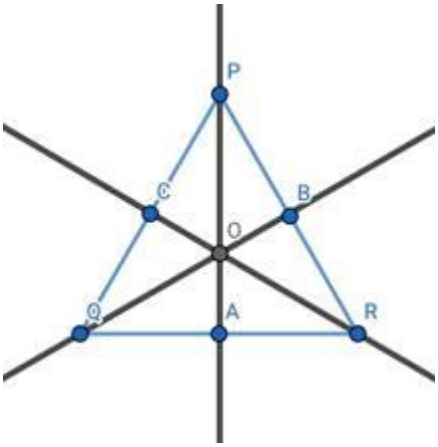
ii. Now, mark the mid-point i.e., A, B, C, of all the sides of the triangle and join it with the opposite vertex i.e., P, Q, R. The line segment i.e., PA, QB, RC hence found are the median of the triangle.



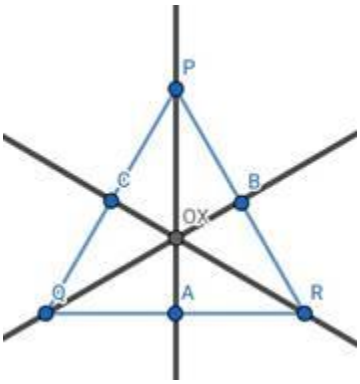
iii. Mark the point of concurrence as 'O'.



iv. Again, draw perpendicular line segment from each vertex.



v. Mark the point of concurrence X.



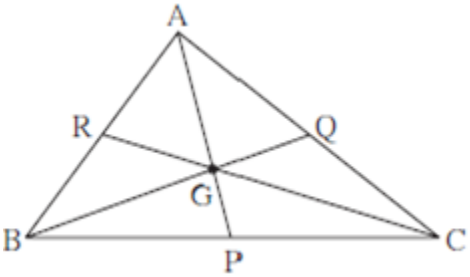
Here we see that both the point of concurrence of medians and altitudes coincides.

In the case of isosceles triangle, the two sides that are equal meet at a vertex, that lies directly above the midpoint of the base. Because of this, the altitude that runs from P to the base intersects the base at its midpoint, making it the median from P to the base as well, which is same for the other two sides also.

Therefore, in an isosceles triangle, the altitude and median are the same line segment, which is shown through the bold line in the above-given figure.

Q. 7. Fill in the blanks.

Point G is the centroid of ∆ABC.



(1) If l(RG) = 2.5 then l(GC) = ...
(2) If l(BG) = 6 then l(BQ) = ...
(3) If l(AP) = 6 then l(AG) = ... and l(GP) = ...

Answer :

1) If $\mathrm{I(RG)} = 2.5$ then $\mathrm{I(GC)} = 5$, as we know that the centroid divides each median in the ratio 2:1.

Hence, $\frac{CG}{RG} = \frac{2}{1}$

GC/2.5 = 2/1

Cross Multiplying we get,

GC × 1 = 2 × 2.5

Therefore, I(GC) = 5

2) If $l(BG) = 6$ then $l(BQ) = 9$, as we know that the centroid divides each median in the ratio 2:1.

Now, $\frac{BG}{QG} = \frac{2}{1}$

6/QG = 2/1

6 × 1 = 2 × QG

6 = 2 × QG

6/2 = QG

Hence, I(QG) = 3.

Since we have to find I(BQ), and from the figure it can be seen that,

(BQ) = I(BG) + I(QG)

Therefore, I(BQ) = 6 + 3

I(BQ) = 9.

3) If $l(AP) = 6$ then $l(AG) = 4$ and I(GP) = 2, as we know that the centroid divides each median in the ratio 2:1 --------(i)

Here both I(AG) and I(GP) are unknown so,

Let I(AG), I(GP) be 2x and x respectively, from equation (i)

Since, I(AP) = I(AG) + I(GP)

6 = 2x + x

$6 = 3x$

$6/3 = x$

$x = 2.$

Therefore, $I(AG) = 2x = 2 \times 2 = 4.$

$I(GP) = x = 2.$

Expansion Formulae

Practice set 5.1

Q. 1. A. Expand.

(a + 2)(a – 1)

Answer : $(a + 2)(a – 1) = a^2 + [(2)+(-1)]\ a + [(2)\times(-1)]$

{ ∵$(x + p)(x + q) = x^2 + (p + q)x + (p \times q)$

Here x = a, p = 2, q = -1}

$= a^2 + (2 – 1)a + (-2)$

$= a^2 + 2a – a – 2$

$= a^2 + a – 2$

Q. 1. B. Expand.

(m – 4)(m + 6)

Answer : $(m – 4)(m + 6) = m^2 + [(- 4)+(6)]\ m + [(- 4)\times (6)]$

{ ∵$(x + p)(x + q) = x^2 + (p + q)x + (p \times q)$}

$= m^2 + (6 – 4)m + (- 24)$

$= m^2 + 6m – 4m – 24$

$= m^2 + 2m – 24$

Q. 1. C. Expand.

(p + 8)(p – 3)

Answer : $(p + 8)(p – 3) = p^2 + [(8)+(- 3)]\ p + [(8)\times(- 3)]$

{ ∵$(x + a)(x + b) = x^2 + (a + b)x + (a \times b)$}

$= p^2 + (8 – 3)p + (- 24)$

$= p^2 + 8p – 3p – 24$

$= p^2 + 5p - 24$

Q. 1. D. Expand.

$(13 + x)(13 - x)$

Answer : $(13 + x)(13 - x) = (13)^2 - (x)^2$

{ $\because (a + b)(a - b) = (a)^2 - (b)^2$}

$= 169 - x^2$

Q. 1. E. Expand.

$(3x + 4y)(3x + 5y)$

Answer : $(3x + 4y)(3x + 5y) = (3x)^2 + [(4y)+(5y)]\ 3x + [(4y)\times(5y)]$

{ $\because (x + a)(x + b) = x^2 + (a + b)x + (a \times b)$}

$= 9x^2 + [(9y) \times (3x)] + 20y^2$

$= 9x^2 + 27xy + 20y^2$

Q. 1. F. Expand.

$(9x - 5l)(9x + 3l)$

Answer : $(9x - 5l)(9x + 3l) = (9x)^2 + [(-5l)+(3l)]\ 9x + [(-5l)\times(3l)]$

{ $\because (x + a)(x + b) = x^2 + (a + b)x + (a \times b)$}

$= 81x^2 + [(-2l) \times (9x)] + (-15l^{2)}$

$= 81x^2 - 18xl - 15l^2$

Q. 1. G. Expand.

$$\left(m + \frac{2}{3}\right)\left(m - \frac{7}{3}\right)$$

Answer :

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

{∵ $(x + a)(x + b) = x^2 + (a + b)x + (a \times b)$}

$$=m^2+\left(\frac{2}{3}-\frac{7}{3}\right)m+\left(-\frac{14}{9}\right)$$

$$=m^2+\left(-\frac{5}{3}\right)m-\frac{14}{9}$$

$$=m^2-\frac{5}{3}m-\frac{14}{9}$$

Q. 1. H. Expand.

$$\left(x+\frac{1}{x}\right)\left(x-\frac{1}{x}\right)$$

Answer :

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

{∵ $(a + b)(a – b) = (a)^2 – (b)^2$}

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

Q. 1. I. Expand.

$$\left(\frac{1}{y}+4\right)\left(\frac{1}{y}-9\right)$$

Answer :

$$\left(\frac{1}{y}+4\right)\left(\frac{1}{y}-9\right)=\left(\frac{1}{y}\right)^2+[\{(4)+(-9)\}\times\left(\frac{1}{y}\right)]+[4\times(-9)]$$

$$= \left(\frac{1}{y}\right)^2 + \left(-\frac{5}{y}\right) - 36$$

$$= \frac{1}{y^2} - \frac{5}{y} - 36$$

Practice set 5.2

Q. 1. A. Expand

$(k + 4)^3$

Answer : $(k + 4)^3 = (k)^3 + [\ 3 \times (k)^2 \times (4)] + [\ 3 \times (k) \times (4)^2\ ] + (4)^3$

{ $\because (a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

Here a = k, b = 4 }

$= k^3 + (3 \times 4)k^2 + (3 \times 16)k + 64$

$= k^3 + 12k^2 + 48k + 64$

Q. 1. B. Expand

$(7x + 8y)^3$

Answer : $(7x + 8y)^3 = (7x)^3 + [\ 3 \times (7x)^2 \times (8y)] + [\ 3 \times (7x) \times (8y)^2\ ] + (8y)^3$

{$\because (a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ }

$= 343x^3 + (3 \times 49 \times 8)x^2y + (3 \times 7 \times 64)xy^2 + 512y^3$

$= 343x^3 + 1176x^2y + 1344xy^2 + 512y^3$

Q. 1. C. Expand

$(7 + m)^3$

Answer : $(7 + m)^3 = (7)^3 + [\ 3 \times (7)^2 \times (m)] + [\ 3 \times (7) \times (m)^2] + (m)^3$

{$\because (a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ }

$= 343 + (3 \times 49)m + (3 \times 7)m^2 + m^3$

= 343 + 147m + 21m^2 + m^3

Q. 1. D. Expand

$(52)^3$

Answer : $(52)^3 = (50 + 2)^3$

$(50 + 2)^3 = (50)^3 + [3 \times (50)^2 \times (2)] + [3 \times (50) \times (2)^2] + (2)^3$

{ $\because (a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ }

= 125000 + (3 × 2500 × 2) + (3 × 50 × 4) + 8

= 125000 + 15000 + 600 + 8

= 140608

Q. 1. E. Expand

$(101)^3$

Answer : $(101)^3 = (100 + 1)^3$

$(100 + 1)^3 = (100)^3 + [3 \times (100)^2 \times (1)] + [3 \times (100) \times (1)^2] + (1)^3$

{$\because (a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ }

= 1000000 + (3 × 10000 × 1) +(3 × 100 × 1)+ 1

= 1000000 + 30000 + 300 + 1

= 1030301

Q. 1. F. Expand

$$\left(x + \frac{1}{x}\right)^3$$

Answer :

$$\left(x + \frac{1}{x}\right) = (x)^3 + \left[3 \times (x)^2 \times \left(\frac{1}{x}\right)\right] + \left[3 \times (x) \times \left(\frac{1}{x}\right)^2\right] + \left(\frac{1}{x}\right)^3$$

{∵$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$}

$$= x^3 + 3x + \frac{3}{x} + \frac{1}{x^3}$$

Q. 1. G. Expand

$$\left(2m + \frac{1}{5}\right)^3$$

Answer :

$$\left(2m + \frac{1}{5}\right) = (2m)^3 + \left[3 \times (2m)^2 \times \left(\frac{1}{5}\right)\right] + \left[3 \times (2m) \times \left(\frac{1}{5}\right)^2\right] + \left(\frac{1}{5}\right)^3$$

{∵ $(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$}

$$= 8m^3 + \left[3 \times 4m^2 \times \left(\frac{1}{5}\right)\right] + \left[3 \times (2m) \times \frac{1}{25}\right] + \frac{1}{125}$$

$$= 8m^3 + \frac{12m^2}{5} + \frac{6m}{25} + \frac{1}{125}$$

Q. 1. H. Expand

$$\left(\frac{5x}{y} + \frac{y}{5x}\right)^3$$

Answer :

$$\left(\frac{5x}{y} + \frac{y}{5x}\right) = \left(\frac{5x}{y}\right)^3 + \left[3 \times \left(\frac{5x}{y}\right)^2 \times \left(\frac{y}{5x}\right)\right] + \left[3 \times \left(\frac{5x}{y}\right) \times \left(\frac{y}{5x}\right)^2\right] + \left(\frac{y}{5x}\right)^3$$

{∵ $(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$}

$$= \frac{125x^3}{y^3} + \left[3 \times \frac{25x^2}{y^2} \times \left(\frac{y}{5x}\right)\right] + \left[3 \times \left(\frac{5x}{y}\right) \times \frac{y^2}{25x^2}\right] + \frac{y^3}{125x^3}$$

$$= \frac{125x^3}{y^3} + \frac{15x}{y} + \frac{3y}{5x} + \frac{y^3}{125x^3}$$

Practice set 5.3

Q. 1. A. Expand

$(2m - 5)^3$

Answer : $(2m - 5)^3 = (2m)^3 - [\,3 \times (2m)^2 \times 5\,] + [\,3 \times (2m) \times (5)^2\,] - (5)^3$

$\{\because (a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$

Here $a = 2m$, $b = -5\}$

$= 8m^3 - [3 \times 4m^2 \times 5] + [3 \times 2m \times 25] - 125$

$= 8m^3 - 60m^2 + 150m - 125$

Q. 1. B. Expand

$(4 - p)^3$

Answer : $(4 - p)^3 = (4)^3 - [\,3 \times (4)^2 \times p\,] + [\,3 \times (4) \times (p)^2\,] - (p)^3$

$\{\because (a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3\}$

$= 64 - [3 \times 6 \times p] + [3 \times 4 \times p^2] - p^3$

$= 64 - 48p + 12p^2 - p^3$

Q. 1. C. Expand

$(7x - 9y)^3$

Answer : $(7x - 9y)^3 = (7x)^3 - [\,3 \times (7x)^2 \times 9y\,] + [\,3 \times (7x) \times (9y)^2\,] - (9y)^3$

$\{\because (a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3\}$

$= 343x^3 - [\,3 \times 49x^2 \times 9y\,] + [\,3 \times 7x \times 81y^2\,] - 729y^3$

$= 343x^3 - 1323x^2y + 1701xy^2 - 729y^3$

Q. 1. D. Expand

$(58)^3$

Answer : $(58)^3 = (60 - 2)^3$

$(60 - 2)^3 = (60)^3 - [\,3 \times (60)^2 \times 2\,] + [\,3 \times (60) \times (2)^2\,] - (2)^3$

$\{\because (a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3\}$

$= 216000 - [3 \times 3600 \times 2] + [3 \times 60 \times 4] - 8$

$= 216000 - 21600 + 720 - 8$

$= 195112$

Q. 1. E. Expand

$(198)^3$

Answer : $(198)^3 = (200 - 2)^3$

$(200 - 2)^3 = (200)^3 - [\,3 \times (200)^2 \times 2\,] + [\,3 \times (200) \times (2)^2\,] - (2)^3$

$\{\because (a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3\}$

$= 8000000 - 240000 + 2400 - 8$

$= 7762392$

Q. 1. F. Expand

$$\left(2p - \frac{1}{2p}\right)^3$$

Answer :

$$\left(2p - \frac{1}{2p}\right)^3 = (2p)^3 - \left[3 \times (2p)^2 \times \left(\frac{1}{2p}\right)\right] + \left[3 \times (2p) \times \left(\frac{1}{2p}\right)^2\right] - \left(\frac{1}{2p}\right)^3$$

$\{\because (a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3\}$

$$= 8p^3 - 6p + \frac{3}{2p} - \frac{1}{8p^3}$$

Q. 1. G. Expand

$$\left(1 - \frac{1}{a}\right)^3$$

Answer :

$$\left(1 - \frac{1}{a}\right)^3 = (1)^3 - \left[3 \times (1)^2 \times \left(\frac{1}{a}\right)\right] + \left[3 \times (1) \times \left(\frac{1}{a}\right)^2\right] - \left(\frac{1}{a}\right)^3$$

{∵ $(a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$}

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

Q. 1. H. Expand

$$\left(\frac{x}{3} - \frac{3}{x}\right)^3$$

Answer :

$$\left(\frac{x}{3} - \frac{3}{x}\right)^3 = \left(\frac{x}{3}\right)^3 - \left[3 \times \left(\frac{x}{3}\right)^2 \times \left(\frac{3}{x}\right)\right] + \left[3 \times \left(\frac{x}{3}\right) \times \left(\frac{3}{x}\right)^2\right] - \left(\frac{3}{x}\right)^3$$

{∵ $(a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$}

$$= \frac{x^3}{27} - x + \frac{9}{x} - \frac{27}{x^3}$$

Q. 2. A. Simplify

$(2a + b)^3 - (2a - b)^3$

Answer : $(2a + b)^3 - (2a - b)^3 = [(2a)^3 + \{3 \times (2a)^2 \times b\} + \{3 \times (2a) \times (b)^2\} + (b)^3] - [(2a)^3 - \{3 \times (2a)^2 \times b\} + \{3 \times (2a) \times (b)^2\} - (b)^3]$

{∵$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ and$(a – b)^3 = a^3 – 3a^2b + 3ab^2 – b^3$ }

= [$8a^3$ +{3 × $4a^2$× b } +{3 × 2a ×b } + b^3] – [$8a^3$ – { 3 × $4a^2$× b } +{3 × 2a × b^2 }– b^3]

= [$8a^3 + 12a^2b + 6ab^2 + b^3$] – [$8a^3 – 12a^2b + 6ab^2 – b^3$]

= $8a^3 + 12a^2b + 6ab^2 + b^3 – 8a^3 + 12a^2b – 6ab^2 + b^3$

= $24a^2b + 2b^3$

Q. 2. B. Simplify

$(3r – 2k)^3 +(3r + 2k)^3$

Answer : $(3r – 2k)^3 +(3r + 2k)^3$ = [$(3r)^3$ -{3 ×$(3r)^2$ ×(2k)} + {3 ×(3r)×$(2k)^2$ } -$(2k)^3$] + [$(3r)^3$ +{3 × $(3r)^2$ ×(2k)} + {3 ×(3r)×$(2k)^2$} +$(2k)^3$]

{ ∵$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ and$(a – b)^3 = a^3 – 3a^2b + 3ab^2 – b^3$}

= [$27r^3$ –{3 × $9r^2$ × 2k } + {3 × 3r × $4k^2$ } – $8k^3$] + [$27r^3$ +{3 × $9r^2$ × 2k } +{3 ×3r ×($4k^2$ } + $8k^3$]

= [$27r^3 – 54r^2k + 36rk^2 – 8k^3$] + [$27r^3 + 54r^2k + 36rk^2 + 8k^3$]

= $27r^3$ - $54r^2k + 36rk^2 – 8k^3 + 27r^3 + 54r^2k + 36rk^2 + 8k^3$

= $54r^3 + 72rk^2$

Q. 2. C. Simplify

$(4a – 3)^3 –(4a + 3)^3$

Answer : $(4a – 3)^3 –(4a + 3)^3$ = [$(4a)^3$ -{3 ×$(4a)^2$ × 3 } + { 3 ×(4a)×$(3)^2$ } -$(3)^3$] - [$(4a)^3$ +{3 × $(4a)^2$ × 3 } +{3 ×(4a)×$(3)^2$ } +$(3)^3$]

{ ∵$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ and $(a – b)^3 = a^3 –3a^2b + 3ab^2 – b^3$ }

= [$64a^3$-{3 × $16a^2$ × 3 } +{3 × 4a × 9} - 27] – [$64a^3$ +{3 × $16a^2$ × 3 } +{3 × 4a × 9} + 27]

= [$64a^3$ - $144a^2$ + 108a -27] – [$64a^3 + 144a^2$ + 108a + 27]

= $64a^3 – 144a^2 + 108a – 27 – 64a^3 – 144a^2 – 108a – 27$

= - $288a^2$ – 54

Q. 2. D. Simplify

$(5x – 7y)^3 + (5x + 7y)^3$

Answer : $(5x – 7y)^3 + (5x + 7y)^3 = [(5x)^3 - \{3 \times (5x)^2 \times (7y)\} + \{3 \times (5x) \times (7y)^2\} - (7y)^3] + [(5x)^3 + \{3 \times (5x)^2 \times (7y)\} + \{3 \times (5x) \times (7y)^2\} + (7y)^3]$

$\{\because (a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ and $(a – b)^3 = a^3 – 3a^2b + 3ab^2 – b^3\}$

$= [\ 125x^3 – \{3 \times 25x^2 \times 7y\ \} + \{3 \times 5x \times 49y^2\ \} – 343y^3\ ] + [\ 125x^3 + \{3 \times 25x^2 \times 7y\ \} + \{3 \times 5x \times 49y^2\ \} + 343y^3\ ]$

$= [125x^3 – 525x^2y + 735xy^2 – 343y^3] + [\ 125x^3 + 525x^2y + 735xy^2 + 343y^3\ ]$

$= 125x^3 – 525x^2y + 735xy^2 – 343y^3 + 125x^3 + 525x^2y + 735xy^2 + 343y^3$

$= 250x^3 + 1470xy^2$

Practice set 5.4

Q. 1. A. Expand

$(2p + q + 5)^2$

Answer : $(2p + q + 5)^2 = (2p)^2 + (q)^2 + (5)^2 + [\ 2 \times (2p) \times (q)] + [\ 2 \times (q) \times (5)] + [\ 2 \times (2p) \times (5)]$

$\{\because (a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ac$

Here $a = 2p$, $b = q$, $c = 5\ \}$

$= 4p^2 + q^2 + 25 + [\ 4pq\ ] + [\ 10q\ ] + [\ 20p\ ]$

$= 4p^2 + q^2 + 25 + 4pq + 10q + 20p$

Q. 1. B. Expand

$(m + 2n + 3r)^2$

Answer : $(m + 2n + 3r)^2 = (m)^2 + (2n)^2 + (3r)^2 + [\ 2 \times (m) \times (2n)] + [\ 2 \times (2n) \times (3r)] + [\ 2 \times (m) \times (3r)]$

$\{\because (a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ac\ \}$

$= m^2 + 4n^2 + 9r^2 + [\ 4mn\ ] + [\ 12nr\ ] + [6mr\ ]$

$= m^2 + 4n^2 + 9r^2 + 4mn + 12nr + 6mr$

Q. 1. C. Expand

$(3x + 4y – 5p)^2$

Answer : $(3x + 4y – 5p)^2 = (3x)^2 + (4y)^2 + (- 5p)^2 + [2 \times (3x) \times (4y)] + [2 \times (4y) \times (- 5p)] + [2 \times (3x) \times (- 5p)]$

{ $\because (a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ac$ }

$= 9x^2 + 16y^2 + 25p^2 + [24xy] + [– 40yp] + [– 30xp]$

$= 9x^2 + 16y^2 + 25p^2 + 24xy – 40yp – 30xp$

Q. 1. D. Expand

$(7m – 3n – 4k)^2$

Answer : $(7m – 3n – 4k)^2 = (7m)^2 + (- 3n)^2 + (- 4k)^2 + [2 \times (7m) \times (-3n)] + [2 \times (-3n) \times (-4k)] + [2 \times (7m) \times (-4k)]$

{$\because (a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ac$ }

$= 49m^2 + 9n^2 + 16k^2 + [– 42mn] + [24nk] + [– 56mk]$

$= 49m^2 + 9n^2 + 16k^2 – 42mn + 24nk – 56mk$

Q. 2. A. Simplify

$(x – 2y + 3)^2 + (x + 2y – 3)^2$

Answer : $(x – 2y + 3)^2 + (x + 2y – 3)^2 = [(x)^2 + (- 2y)^2 + (3)^2 + \{2 \times (x) \times (- 2y)\} + \{2 \times (- 2y) \times (3)\} + \{2 \times (x) \times (3)\}] + [(x)^2 + (2y)^2 + (- 3)^2 + \{2 \times (x) \times (2y)\} + \{2 \times (2y) \times (- 3)\} + \{2 \times (x) \times (-3)\}]$

{$\because (a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ac$ }

$= [x^2 + 4y^2 + 9 + \{– 4xy \} + \{– 12y \} + \{6x \}] + [x^2 + 4y^2 + 9 + \{4xy \} + \{– 12y \} + \{– 6x \}]$

$= [x^2 + 4y^2 + 9 – 4xy – 12y + 6x] + [x2 + 4y^2 + 9 + 4xy – 12y – 6x]$

$= x^2 + 4y^2 + 9 – 4xy – 12y + 6x + x^2 + 4y^2 + 9 + 4xy – 12y – 6x$

$= 2x^2 + 8y^2 + 18 – 24y$

Q. 2. B. Simplify

$(3k – 4r – 2m)^2 -(3k + 4r – 2m)^2$

Answer : $(3k – 4r – 2m)^2 -(3k + 4r – 2m)^2 = [(3k)^2 +(- 4r)^2 + (- 2m)^2 +\{2 \times(3k)\times(- 4r)\} +\{2 \times(- 4r)\times (-2m)\} +\{2 \times(3k)\times(- 2m)\}] - [(3k)^2 + (4r)^2 +(- 2m)^2 +\{2 \times(3k)\times(4r)\} +\{2 \times (4r)\times(- 2m)\} +\{2 \times(3k)\times(-2m)\}]$

$\{\because(a + b +c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ac \}$

$= [9k^2 + 16r^2 + 4m^2+\{ – 24kr\} +\{16rm \} +\{ – 12km \}] - [9k^2 + 16r^2 + 4m^2 +\{24kr \} +\{– 16rm \} + \{ – 12km \}]$

$= [9k^2 + 16r^2 + 4m^2 – 24kr + 16rm – 12km] - [9k2 + 16r^2 + 4m^2 + 24kr – 16rm – 12km]$

$= 9k^2 + 16r^2 + 4m^2 – 24kr + 16rm – 12km – 9k^2 – 16r^2 – 4m^2 – 24kr + 16rm + 12km$

$= - 48kr + 32rm$

$= 32rm – 48kr$

Q. 2. C. Simplify

$(7a – 6b + 5c)^2 +(7a + 6b – 5c)^2$

Answer : $(7a – 6b + 5c)^2 +(7a + 6b – 5c)^2 = [(7a)^2 +(- 6b)^2 +(5c)^2 +\{2 \times(7a)\times(- 6b)\} +\{2\times(- 6b)\times (5c)\} +\{2 \times(7a)\times(5c)\}] + [(7a)^2 +(6b)^2 +(- 5c)^2 +\{2 \times(7a)\times(6b)\} +\{2\times(6b)\times (- 5c)\} +\{2 \times(7a)\times(-5c)\}]$

$\{\because(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ac \}$

$= [49a^2 + 36b^2 + 25c^2+\{ – 84ab \} +\{– 60bc \} + \{ 70ac \}] + [49a^2 + 36b^2 + 25c^2+\{84ab \} + \{ - 60bc\} +\{– 70ac \}]$

$= [49a^2 + 36b^2 + 25c^2 – 84ab – 60bc + 70ac] + [49a^2 + 36b^2 + 25c^2 + 84ab – 60bc – 70ac]$

$= 49a^2 + 36b^2 + 25c^2 – 84ab – 60bc + 70ac + 49a^2 + 36b^2 + 25c^2 + 84ab – 60bc – 70ac$

$= 98a^2 + 72b^2 + 50c^2 – 120bc$

Factorisation Of Algebraic Expressions

Practice set 6.1

Q. 1. A. Factorise.

$x^2 + 9x + 18$

Answer : On comparing with standard quadratic equation that is $ax^2 + bx + c$

We have,

a = 1, b = 9 and c = 18

Now here,

Product a × c = 1 × 18 = 18

Factors of 18; 2 × 9 and 6 × 3

Sum should be b = + 9

From above factors (+ 6x + 3x)

Will give + 9x sum

Therefore + 9x is replaced by (+ 6x + 3x)

Now above eq. becomes

$x^2 + 6x + 3x + 18$

$\Rightarrow x(x + 6) + 3(x + 6)$; taking x common

⇒ (x + 3)(x + 6)

Q. 1. B. Factorise.

$x^2 – 10x + 9$

Answer : On comparing with standard quadratic equation that is $ax^2 + bx + c$

We have, 0

a = 1, b = – 10 and c = 9

Now here,

Product a × c = 1 × 9 = 9

Factors of 9; 1 × 9 and 3 × 3

Sum should be b = – 10

From above factors (– 1x – 9x)

Will give – 10x sum

Therefore – 10x is replaced by (– 1x – 9x)

Now above eq. becomes

$x^2 - x - 9x + 9$

$x(x - 1) - 9(x - 1)$; taking x and – 9 common

(x – 1)(x – 9)

Q. 1. C. Factorise.

$y^2 + 24y + 144$

Answer : On comparing with standard quadratic equation that is $ax^2 + bx + c$

We have,

a = 1, b = + 24 and c = + 144

Now here,

Product a × c = 1 × 144 = 144

Factors of 144; 12 × 12; 24 × 6;144 × 1;

48 × 3; 72 × 2

Sum should be b = 24

From above factors (12y + 12y)

Will give + 24y sum

therefore + 24 is replaced by (+ 12y + 12y)

Now above eq. becomes

$$y^2 + 12y + 12y + 144$$

$$y(y + 12) + 12(y + 12)$$

; taking y and + 12 common

(y + 1)(y + 12)

Note: Try to find all factors of “c”, then choose from it that combination whose sum or difference give “b”

Q. 1. D. Factorise.

$5y^2 + 5y – 10$

Answer : On comparing with standard quadratic equation that is $ax^2 + bx + c$

we have,

a = 5, b = + 5 and c = – 10

Now here,

Product a × c = 5 × – 10 = – 50

Factors of 50; 5 × 10; 25 × 2;50 × 1

Sum should be b = + 5

From above factors (– 5y + 10y)

Will give + 5y sum

Therefore + 5y is replaced by (– 5y + 10y)

Now above eq. becomes

$$5y^2 - 5y + 10y - 10$$

$5y(y-1) + 10(y-1)$; taking 5y and + 10 common

(y – 1)(5y + 10)

5(y – 1)(y + 2); 5 common

Note: if given equation's constant a, b, c have common multiple take it out and then factorize.

Q. 1. E. Factorise.

$p^2 – 2p – 35$

Answer : On comparing with standard quadratic equation that is $ax^2 + bx + c$

We have,

a = 1, b = – 2 and c = – 35

Now here,

Product a × c = 1 × – 35 = – 35

Factors of 35; 1 × 35 and 7 × 5

Sum should be b = – 2

From above factors (– 7p + 5p)

Will give – 2p sum

Therefore – 2p is replaced by (– 7p + 5p)

Now above eq. becomes

$p^2 - 7p + 5p - 35$

$(p-7) + 5(p-7)$; taking p and + 5 common

(p – 7)(p + 5)

Q. 1. F. Factorise.

$p^2 – 7p – 44$

Answer : On comparing with standard quadratic equation that is $ax^2 + bx + c$

We have,

a = 1, b = – 7 and c = – 44

Now here,

Product a × c = 1 × – 44 = – 44

Factors of 44; 1 × 44; 2 × 22 ; 4 × 11

Sum should be b = – 7

From above factors (– 11p + 4p)

Will give – 7p sum

Therefore – 7p is replaced by (– 11p + 4p)

Now above eq. becomes

$p^2 - 11p + 4p - 44$

$p(p - 11) + 4(p - 11)$; taking p and + 4 common

(p + 4)(p – 11)

Q. 1. G. Factorise.

m^2 – 23m + 120

Answer : On comparing with standard quadratic equation that is

$ax^2 + bx + c$

We have,

a = 1, b = – 23 and c = + 120

Now here,

Product a × c = 1 × + 120 = + 120

Factors of + 120; 1 × 120; 2 × 60; 4 × 30; 8 × 15; 24 × 5; 40 × 3

Sum should be b = – 23

From above factors (– 15m – 8m)

Will give – 23m sum

Therefore – 23m is replaced by (– 15m – 8m)

Now above eq. becomes

$m^2 - 15m - 8m + 120$

$(m - 15) - 8(m - 15)$; taking m and – 8 common

(m – 15)(m – 8)

Q. 1. H. Factorise.

m^2 – 25m + 100

Answer : On comparing with standard quadratic equation that is $ax^2 + bx + c$

We have,

a = 1, b = – 25 and c = 100

Now here,

Product a × c = 1 × 100 = 100

Factors of 100; 1 × 100; 2 × 50; 4 × 25 ; 20 × 5

Sum should be b = – 25

From above factors (– 20m – 5m)

Will give – 25m sum

Therefore – 25m is replaced by (– 20m – 5m)

Now above eq. becomes

$m^2 - 20m - 5m + 100$

$m(m - 20) - 5(m - 20)$; taking m and – 5 common

(m – 5)(m – 20)

Q. 1. I. Factorise.

$3x^2 + 14x + 15$

Answer : On comparing with standard quadratic equation that is $ax^2 + bx + c$

We have,

a = 3, b = + 14 and c = + 15

Now here,

Product a × c = 3 × 15 = + 45

Factors of 45; 1 × 45; 5 × 9;15 × 3

Sum should be b = + 14

From above factors (+ 9x + 5x)

Will give + 14x sum

Therefore + 14x is replaced by (+ 9x + 5x)

Now above eq. becomes

$x^2 + 9x + 5x + 15$

$(x + 9) + 5(x + 3)$; taking x and + 5 common

(x + 9)(x + 3)

Q. 1. J. Factorise.

$2x^2 + x – 45$

Answer : On comparing with standard quadratic equation that is $ax^2 + bx + c$

We have,

a = 2, b = 1 and c = – 45

Now here,

Product a × c = 2 × – 45 = 90

Factors of 90; 1 × 90; 2 × 45; 10 × 9; 30 × 3

Sum should be b = 1

From above factors (+ 10x – 9x)

Will give + x sum

Therefore + x is replaced by (+ 10x – 9x)

Now above eq. becomes

$2x^2 + 10x - 9x - 45$

$2x(x + 5) - 9(x + 5)$; taking 2x and – 9 common

(x + 5)(2x – 9)

Q. 1. K. Factorise.

$20x^2 – 26x + 8$

Answer : On comparing with standard quadratic equation that is $ax^2 + bx + c$

We have,

a = 20, b = – 26 and c = 8

Now here,

Product a × c = 20 × 8 = 160

Factors of 160; 2 × 80; 4 × 40; 8 × 20; 16 × 10; 32 × 5

Sum should be b = – 26x

From above factors (– 16x – 10x)

Will give – 26x sum

Therefore – 26x is replaced by (– 16x – 10x)

Now above eq. becomes

$20x^2 - 16x - 10x + 8$

$4x(5x - 4) - 2(5x - 4)$; taking 4x and – 2 common

2(2x – 1)(5x – 4)

Q. 1. L. Factorise.

$44x^2 – x – 3$

Answer : On comparing with standard quadratic equation that is $ax^2 + bx + c$

We have,

a = 44, b = – 1 and c = – 3

Now here,

Product a × c = – 132 = 44 × – 3

Factors of 132; 1 × 132; 2 × 66; 4 × 33;12 × 11

Sum should be b = – 1

From above factors (– 12x – 11x)

Will give – 1x sum

Therefore – 1x is replaced by (– 12x – 11x)

Now above eq. becomes

$44x^2 - 12x - 11x - 3$

$4x(11x - 3) - 1(11x + 3)$; taking x and – 9 common

(11x – 3)(4x – 1)

Practice set 6.2

Q. 1. A. Factorise.

$x^3 + 64y^3$

Answer : We know that

$$a^3 + b^3 + 3a^2b + 3ab^2 = (a + b)^3$$

$$a^3 + b^3 = (a + b)^3 - 3a^2b - 3ab^2 \text{ - - - - - (i)}$$

Here a = 1x, b = 4y; putting values in eq.i

$$x^3 + (4y)^3 = (x + 4y)^3 - 3x^2(4y) - 3x(4y)^2$$

$$x^3 + (4y)^3 = (x + 4y)^3 - 3x^2(4y) - 3x(4y)^2$$

$$\Rightarrow x^3 + (4y)^3 = (x + 4y)^3 - 12xy(x + 4y)$$

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

$$x^3 + (4y)^3 = (x + 4y)\{x^2 + 16y^2 + 8xy - 12xy$$

$$x^3 + (4y)^3 = (x + 4y)\{x^2 + 16y^2 - 4xy\}$$

Note: Must memorize cubes upto 12

Q. 1. B. Factorise.

$125p^3 + q^3$

Answer : We know that

$$a^3 + b^3 + 3a^2b + 3ab^2 = (a + b)^3$$

$$a^3 + b^3 = (a + b)^3 - 3a^2b - 3ab^2 \text{ - - - - - (i)}$$

Here a = 5p, b = q; putting values in eq.i

$$(5p)^3 + q^3 = (5p + q)^3 - 3(5p)^2q - 3(5p)q^2$$

$$\Rightarrow (5p)^3 + q^3 = (5p + q)^3 - 15pq(5p + q)$$

$$\Rightarrow (5p)^3 + q^3 = (5p + q)\{(5p + q)^2 - 15pq$$

$$(5p)^3 + q^3 = (5p + q)\{25p^2 + q^2 + 10pq - 15pq$$

$$(5p)^3 + q^3 = (5p + q)\{25p^2 + q^2 - 5pq\}$$

Note: Must memorize cubes upto 12

Q. 1. C. Factorise.

$125k^3 + 27m^3$

Answer : We know that

$$a^3 + b^3 + 3a^2b + 3ab^2 = (a + b)^3$$

$$a^3 + b^3 = (a + b)^3 - 3a^2b - 3ab^2 \text{ - - - - - (i)}$$

Here a = 5k, b = 3m; putting values in eq.i

$$\Rightarrow (5k)^3 + (3m)^3 = (5k + 3m)^3 - 3(5k)^2(3m) - 3(5k)(3m)^2$$

$$\Rightarrow (5k)^3 + (3m)^3 = (5k + 3m)^3 - 45km(5k + 3m)$$

$$\Rightarrow (5p)^3 + (3m)^3 = (5k + 3m)\{(5k + 3m)^2 - 45km\}$$

$$(5k)^3 + (3m)^3 = (5k + 3m)\{25k^2 + 9m^2 + 30km - 45km\}$$

$$(5k)^3 + (3m)^3 = (5k + 3m)\{25k^2 + 9m^2 - 15km\}$$

Note: Must memorize cubes upto 12

Q. 1. D. Factorise.

$2l^3 + 432m^3$

Answer : We know that

$$a^3 + b^3 + 3a^2b + 3ab^2 = (a + b)^3$$

$$a^3 + b^3 = (a + b)^3 - 3a^2b - 3ab^2 \text{ - - - - - (i)}$$

Taking 2 common, we get

$$2(l^3 + 216m^3)$$

Here a = l, b = 6m; putting values in eq.i

$\Rightarrow 2 \times [l^3 + (6m)^3] = 2[(l + 6m)^3 - 3l^2(6m) - 3l(6m)^2]$

$\Rightarrow 2 \times [l^3 + (6m)^3] = 2[(l + 6m)^3 - 18lm(l + 6m)]$

$\Rightarrow 2 \times [l^3 + (6m)^3] = 2[(l + 6m)\{(l + 6m)^2 - 18lm\}]$

$2 \times [l^3 + (6m)^3] = 2(l + 6m)\{l^2 + 36m^2 + 12lm - 18lm\}$

Applying $(a + b)^2 = a^2 + 2ab + b^2$

$2 \times [l^3 + (6m)^3] = 2(l + 6m)\{l^2 + 36m^2 - 6lm\}$

Note: Must memorize cubes upto 12

Q. 1. E. Factorise.

$24a^3 + 81b^3$

Answer : We know that

$a^3 + b^3 + 3a^2b + 3ab^2 = (a + b)^3$

$a^3 + b^3 = (a + b)^3 - 3a^2b - 3ab^2$ - - - - - (i)

Taking 3 as common, we get

$3 \times [8a^3 + 27b^3]$; solving only bracket term first,

Here a = 2a, b = 3b; putting values in eq.i

$(2a)^3 + (3b)^3 = (2a + 3b)^3 - 3(2a)^2(3b) - 3(2a)(3b)^2$

$(2a)^3 + (3b)^3 = (2a + 3b)^3 - 18ab(2a + 3b)$

$(2a)^3 + (3b)^3 = (2a + 3b)\{(2a + 3b)^2 - 18ab\}$

Applying $(a + b)^2 = a^2 + 2ab + b^2$

$(2a)^3 + (3b)^3 = (2a + 3b)\{4a^2 + 9b^2 + 12ab - 18ab\}$

$(2a)^3 + (3b)^3 = (2a + 3b)\{4a^2 + 9b^2 - 6ab\}$

Ans: - $3(2a + 3b)\{4a^2 + 9b^2 - 6ab\}$

Note: Must memorize cubes upto 12

Q. 1. F. Factorise.

$$y^3 + \frac{1}{8y^3}$$

Answer : We know that

$$a^3 + b^3 + 3a^2b + 3ab^2 = (a + b)^3$$

$$a^3 + b^3 = (a + b)^3 - 3a^2b - 3ab^2 \text{ - - - - - (i)}$$

Here a = y, b = $\frac{1}{2y}$; putting values in eq.i

$$y^3 + (\frac{1}{2y})^3 = \left(y + \frac{1}{2y}\right)^3 - 3y^2(\frac{1}{2y}) - 3y(\frac{1}{2y})^2$$

$$y^3 + (\frac{1}{2y})^3 = \left(y + \frac{1}{2y}\right)^3 - \frac{3}{2}y - \frac{3}{4y}$$

$$y^3 + (\frac{1}{2y})^3 = \left(y + \frac{1}{2y}\right)^3 - \frac{3}{2}\left(y + \frac{1}{2y}\right)$$

$$y^3 + (\frac{1}{2y})^3 = \left(y + \frac{1}{2y}\right)\{\left(y + \frac{1}{2y}\right)^2 - \frac{3}{2}\}$$

Applying $(a + b)^2 = a^2 + 2ab + b^2$

$$y^3 + (\frac{1}{2y})^3 = \left(y + \frac{1}{2y}\right)\{y^2 + \frac{1}{4y^2} + 1 - \frac{3}{2}$$

$$y^3 + (\frac{1}{2y})^3 = \left(y + \frac{1}{2y}\right)\{y^2 + \frac{1}{4y^2} - \frac{1}{2}\}$$

Note: Must memorize cubes upto 12

Q. 1. G. Factorise.

$$a^3 + \frac{8}{a^3}$$

Answer : We know that

$$a^3 + b^3 + 3a^2b + 3ab^2 = (a + b)^3$$

$$a^3 + b^3 = (a + b)^3 - 3a^2b - 3ab^2 \text{ - - - - - (i)}$$

Here a = a, b = $\frac{2}{a}$; putting values in eq.i

$$a^3 + (\frac{2}{a})^3 = \left(a + \frac{2}{a}\right)^3 - 3a^2(\frac{2}{a}) - 3a(\frac{2}{a})^2$$

$$a^3 + (\frac{2}{a})^3 = \left(a + \frac{2}{a}\right)^3 - \frac{6a}{1} - \frac{12}{a}$$

$$a^3 + (\frac{2}{a})^3 = \left(a + \frac{2}{a}\right)^3 - 6\left(a + \frac{2}{a}\right)$$

$$a^3 + (\frac{2}{a})^3 = \left(a + \frac{2}{a}\right)\{\left(a + \frac{2}{a}\right)^2 - 6\}$$

Applying $(a + b)^2 = a^2 + 2ab + b^2$

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

$$a^3 + (\frac{2}{a})^3 = \left(a + \frac{2}{a}\right)\{a^2 + \frac{4}{a^2} - 2\}$$

Note: Must memorize cubes upto 12

Q. 1. H. Factorise.

$$1 + \frac{q^3}{125}$$

Answer : We know that

$$a^3 + b^3 + 3a^2b + 3ab^2 = (a + b)^3$$

$$a^3 + b^3 = (a + b)^3 - 3a^2b - 3ab^2 \text{ - - - - - (i)}$$

Here a = 1, b = $\frac{q}{5}$; putting values in eq.i

$$1^3 + (\frac{q}{5})^3 = \left(1 + \frac{q}{5}\right)^3 - 3(\frac{q}{5}) - 3(\frac{q}{5})^2$$

$$1 + (\frac{q}{5})^3 = \left(1 + \frac{q}{5}\right)^3 - \frac{3q}{5} - \frac{3q^2}{25}$$

$$1 + (\frac{q}{5})^3 = \left(1 + \frac{q}{5}\right)^3 - \frac{3q}{5}\left(1 + \frac{q}{5}\right)$$

$$1 + (\frac{q}{5})^3 = \left(1 + \frac{q}{5}\right)\{\left(1 + \frac{q}{5}\right)^2 - \frac{3q}{5}\}$$

Applying $(a + b)^2 = a^2 + 2ab + b^2$

$$1 + (\frac{q}{5})^3 = \left(1 + \frac{q}{5}\right)\{1 + \frac{q^2}{25} + \frac{2q}{5} - \frac{3q}{5}$$

$$1 + (\frac{q}{5})^3 = \left(1 + \frac{q}{5}\right)\{1 + \frac{q^2}{25} - \frac{q}{5}\}$$

Note: Must memorize cubes upto 12

Practice set 6.3

Q. 1. A. Factorise :

$y^3 - 27$

Answer : We know that

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

On comparison with above, we get

a = y, b = 3

$$y^3 - 27 = (y-3)(y^2 + 3y + 9)$$

Note: Must memorize cubes upto 12

Q. 1. B. Factorise :

$x^3 - 64y^3$

Answer : We know that

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

On comparison with above, we get

a = y, b = 3

$$x^3 - 64y^3 = (x-4)(x^2 + 4x + y^2)$$

Note: Must memorize cubes upto 12

Q. 1. C. Factorise :

$27m^3 - 216n^3$

Answer : We know that

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

On comparison with above, we get

a = 3m, b = 6n

$$27m^3 - 216n^3 = (3m-6n)(9m^2 + 18mn + 36n^2)$$

Note: Must memorize cubes upto 12

Q. 1. D. Factorise :

$125y^3 - 1$

Answer : We know that

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

On comparison with above, we get

a = 5y, b = 1

$$125y^3 - 1 = (5y - 1)(25y^2 + 5y + 1)$$

Note: Must memorize cubes upto 12

Q. 1. E. Factorise :

$8p^3 - 27/p^3$

Answer : We know that

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

On comparison with above, we get

a = 2p, b = 3/p

$$8p^3 - 27/p^3 = (2p - 3/p)(4p^2 + 6 + \frac{9}{p^2})$$

Note: Must memorize cubes upto 12

Q. 1. F. Factorise :

$343a^3 - 512b^3$

Answer : We know that

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

On comparison with above, we get

a = 7a, b = 8b

$$343a^3 - 512b^3 = (7a - 8b)(49a^2 + 56ab + 64b^2)$$

Note: Must memorize cubes upto 12

Q. 1. G. Factorise :

$64x^2 - 729y^2$

Answer : We know that

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

On comparison with above, we get

a = 4x, b = 9y

$$64x^3 - 729y^3 = (4x - 9y)(16x^2 + 36xy + 81y^2)$$

Note: Must memorize cubes upto 12

Q. 1. H. Factorise :

16 a^3 – 128/b^3

Answer : We know that

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

Taking 2 common from above given equation;

$$2(8a^3 - \frac{64}{b^3})$$

On comparison with above, we get

a = 2a, b = 4/b

$$8a^3 - \frac{64}{b^3} = 2(2a - \frac{4}{b})(4a^2 + \frac{8a}{b} + \frac{16}{b^2})$$

$$8a^3 - \frac{64}{b^3} = 16(a - \frac{2}{b})(a^2 + \frac{2a}{b} + \frac{4}{b^2}$$

Note: Must memorize cubes upto 12

Q. 2. A. Simplify :

$(x + y)^3 – (x – y)^3$

Answer : We know that

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

On comparing with given equation we get,

a = (3a + 5b), b = (3a – 5b)

$$(x + y)^3 - (x - y)^3 = (x + y - x + y)\{(x + y)^2 + (x + y)(x - y) + (x - y)^2\}$$

Applying $(a + b)^2 = a^2 + 2ab + b^2$ and $(a - b)^2 = a^2 - 2ab + b^2$

$$(x + y)^3 - (x - y)^3 = (2y)\{x^2 + 2xy + y^2 + x^2 - xy + xy - y^2 + x^2 - 2xy + y^2\}$$

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

$$(x + y)^3 - (x - y)^3 = 6x^2y + 2y^3$$

Q. 2. B. Simplify :

$(3a + 5b)^3 – (3a – 5b)^3$

Answer : We know that

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

On comparing with given equation we get,

a = (3a + 5b), b = (3a – 5b)

$$(3a + 5b)^3 - (3a - 5b)^3 = (3a + 5b - 3a + 5b)\{(3a + 5b)^2 + (3a + 5b)(3a - 5b) + (3a - 5b)^2\}$$

Applying $(a + b)^2 = a^2 + 2ab + b^2$ and $(a - b)^2 = a^2 - 2ab + b^2$

$$(3a + 5b)^3 - (3a - 5b)^3 = (10b)\{9a^2 + 30ab + 25b^2 + 9a^2 - 15ab + 15ab25b^2 + 9a^2 - 30ab + 25b^2\}$$

$$(3a + 5b)^3 - (3a - 5b)^3 = (10b)(27a^2 + 25b^2)$$

$$(3a + 5b)^3 - (3a - 5b)^3 = 270a^2b + 250b^3$$

Q. 2. C. Simplify :

$(a + b)^3 – a^3 – b^3$

Answer : We know that

$$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$

On comparing with given equation we get

$$(a + b)^3 - a^3 - b^3 = a^3 + 3a^2b + 3ab^2 + b^3 - a^3 - b^3$$

$$(a + b)^3 - a^3 - b^3 = 3a^2b + 3ab^2$$

Q. 2. D. Simplify :

$p^3 - (p + 1)^3$

Answer : We know that

$$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$

On comparing with given equation we get

a = p, b = 1

$$p^3 - (p + 1)^3 = p^3 - (p^3 + 3p^2 + 3p + 1)$$

$$p^3 - (p + 1)^3 = -3p^2 - 3p - 1$$

Q. 2. E. Simplify :

$(3xy - 2ab)^3 - (3xy + 2ab)^3$

Answer : We know that

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

On comparing with given equation we get,

a = (3xy – 2ab), b = (3xy + 2ab)

$$(3xy - 2ab)^3 - (3xy + 2ab)^3 = (3xy - 2ab - 3xy - 2ab)$$

$$\{(3xy - 2ab)^2 + (3xy - 2ab)(3xy + 2ab) + (3xy + 2ab)^2\}$$

Applying $(a + b)^2 = a^2 + 2ab + b^2$ and

$$(a - b)^2 = a^2 - 2ab + b^2$$

$$(3xy-2ab)^3-(3xy+2ab)^3$$
$$=(-4ab)\{9x^2y^2-12xyab+4a^2b^2+9x^2y^2+6xyab-6xyab-4a^2b^2$$
$$+9x^2y^2+12xyab+4a^2b^2\}$$

$$(3xy-2ab)^3-(3xy+2ab)^3=(-4ab)(27a^2b^2+4a^2b^2)$$

$$(3xy-2ab)^3-(3xy+2ab)^3=-108a^3b^3-16a^3b^3$$

Practice set 6.4

Q. 1. A. Simplify:

$$\frac{m^2-n^2}{(m+n)}\times\frac{m^2+mn+n^2}{m^3-n^3}$$

Answer : We know that

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

$$a^3-b^3=(a-b)(a^2+ab+b^2)$$

Applying these equation in above expression, we get

$$=\frac{(m+n)(m-n)}{(m+n)}\times\frac{m^2+mn+n^2}{(m-n)(m^2+mn+n^2)}$$

= 1

Note: - Try to factorize that term which help in reducing expression.

Q. 1. B. Simplify:

$$\frac{a^2+10a+21}{a^2+6a-7}\times\frac{a^2-1}{a+3}$$

Answer : We know that

$a^2-1=(a-1)(a+1)$ and factorization of numerator and denominator

$$= \frac{a^2 + 7a + 3a + 21}{a^2 + 7a - a - 7} \times \frac{(a-1)(a+1)}{a+3}$$

$$= \frac{a(a+7) + 3(a+7)}{a(a+7) - 1(a+7)} \times \frac{(a-1)(a+1)}{a+3}$$

$$= \frac{(a+3)(a+7)}{(a+7)(a-1)} \times \frac{(a-1)(a+1)}{a+3}$$

= a + 1

Note: - Try to factorize that term which help in reducing expression.

Q. 1. C. Simplify:

$$\frac{8x^3 - 27y^3}{4x^2 - 9y^2}$$

Answer : We know that

$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$ and $a^2 - b^2 = (a+b)(a-b)$

$$= \frac{(2x-3y)(4x^2 + 6xy + 9y^2)}{(2x-3y)(2x+3y)}$$

$$= \frac{4x^2 + 6xy + 9y^2}{2x + 3y}$$

Note: - Try to factorize that term which help in reducing expression.

Q. 1. D. Simplify:

$$\frac{x^2 - 5x - 24}{(x+3)(x+8)} \times \frac{x^2 - 64}{(x-8)^2}$$

Answer : Applying $a^2 - b^2 = (a+b)(a-b)$ and factorization, we get

$$= \frac{x^2 - 8x + 3x - 24}{(x+3)(x+8)} \times \frac{(x-8)(x+8)}{(x-8)^2}$$

$$= \frac{x(x-8) + 3(x-8)}{(x+3)(x+8)} \times \frac{(x-8)(x+8)}{(x+8)^2}$$

= 1

Note: - Try to factorize that term which help in reducing expression.

Q. 1. E. Simplify:

$$\frac{3x^2 - x - 2}{x^2 - 7x + 12} \div \frac{3x^2 - 7x - 6}{x^2 - 4}$$

Answer : Applying

$a^2 - b^2 = (a+b)(a-b)$ and factorization, we get, also changing $\div$ into $\times$ by reversing N and D

$$= \frac{3x^2 - 3x + 2x - 2}{x^2 - 4x - 3x + 12} \times \frac{(x+4)(x-4)}{3x^2 - 9x + 2x - 6}$$

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

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

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

Note: - Try to factorize that term which help in reducing expression.

Q. 1. F. Simplify:

$$\frac{4x^2 - 11x + 6}{16x^2 - 9}$$

Answer : Applying

$a^2 - b^2 = (a+b)(a-b)$ and factorization, we get

$$= \frac{4x^2 - 8x - 3x + 6}{(4x-3)(4x+3)}$$

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

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

= x – 2

Note: - Try to factorize that term which help in reducing expression.

Q. 1. G. Simplify:

$$\frac{a^3 - 27}{5a^2 - 16a + 3} \div \frac{a^2 + 3a + 9}{25a^2 - 1}$$

Answer : Applying

$a^2 - b^2 = (a+b)(a-b)$, factorization and $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$ we get, also changing $\div$ into $\times$ by reversing N and D

$$= \frac{(a-3)(a^2 + 3a + 9)}{5a^2 - 15a - a + 3} \times \frac{(5a+1)(5a-1)}{a^2 + 3a + 9}$$

$$= \frac{(a-3)(a^2 + 3a + 9)}{5a(a-3) - 1(a-1)} \times \frac{(5a+1)(5a-1)}{a^2 + 3a + 9}$$

$$= \frac{(a-3)(a^2 + 3a + 9)}{(5a-1)(a-3)} \times \frac{(5a+1)(5a-1)}{a^2 + 3a + 9}$$

= 5a + 1

Note: - Try to factorize that term which help in reducing expression.

Q. 1. H. Simplify:

$$\frac{1 - 2x + x^2}{1 - x^3} \times \frac{1 + x + x^2}{1 + x}$$

Answer : Applying

$a^3 - b^3 = (a-b)(a^2 + ab + b^2), (a-b)^2 = a^2 - 2ab + b^2$ and factorization, we get

$$= \frac{(1-x)^2}{(1-x)(1+x+x^2)} \times \frac{1+x+x^2}{1+x}$$

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

Note: - Try to factorize that term which help in reducing expression.

Variation

Practice set 7.1

Q. 1. Write the following statements using the symbol of variation.

(1) Circumference (c) of a circle is directly proportional to its radius (r).
(2) Consumption of petrol (I) in a car and distance traveled by that car (D) are in direct variation.

Answer :

(1) Circumference $= c$ and radius $= r$

Therefore, $c \propto r$ or $c = kr$, where $k =$ constant

(2) Consumption of petrol in a car $= I$

Distance traveled by that car $= D$

$I \propto D$ OR $I = K \times D$

Q. 2. Complete the following table considering that the cost of apples and their number are in direct variation.

Number of apples (x)	1	4	...	12	...
Cost of apples (y)	8	32	56	...	160

Answer : Since, cost of apples and their number are in direct variation it means that as the number of apple increases, the cost also increases and as the number of apple decreases, the cost also decreases.

Number of apples (x)	1	4	7	12	20
Cost of apples (y)	8	32	56	96	160

$X \propto Y$

EXPLANATION:

• When no. of apples is 1 [$X = 1$]

Cost of apple is 8 [$Y = 8$]

Now, when no. of apples become 4 times then the cost of apples will also become 4 times because they are inversely proportion.

$X = 1 \times 4 = 4$

$Y = 8 \times 4 = 32$

• When Cost of apple is 8 [$Y = 32$]

No. of apples is 4 [$X = 4$]

Now, the cost of apples becomes $\frac{7}{4}$ times.

$Y = 32 \times \frac{7}{4}$

$Y = 56$

∴ No. of apples will also become $\frac{7}{4}$ times.

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

$$X = 7$$

• When no. of apples is 7 [$X = 7$]

Cost of apple is 56[$Y = 56$]

Now, no. of apples becomes $\frac{12}{7}$ times.

$$X = 7 \times \frac{12}{7}$$

$$X = 12$$

∴ Cost of apples will also become $\frac{12}{7}$ times.

$$Y = 56 \times \frac{12}{7}$$

$$Y = 96$$

• When Cost of apple is 96 [$Y = 96$]

No. of apples is 12 [$X = 12$]

Now, the cost of apples becomes $\frac{5}{3}$ times.

$$Y = 96 \times \frac{5}{3}$$

$$= 160$$

∴ No. of apples will also become $\frac{5}{3}$ times.

$$X = 12 \times \frac{5}{3}$$

$$X = 20$$

Q. 3. If $m \propto n$ and when m=154, n=7. Find the value of m, when n=14.

Answer : GIVEN:

M ∝ n

M = 154

N = 7

TO FIND: Value of m, when n=14

PROOF:

M ∝ n

That is, 154∝7

It means that as the value of m increases, the value of n also increases.

When n=14, n becomes 2 times of its original value.

∵ M ∝ n

∴ M will also get double.

M = 154×2

M = 308

M ∝ n

308 ∝ 14

∴ Value of m is 308.

Q. 4. If n varies directly as m, complete the following table.

m	3	5	6.5	. . .	1.25
n	12	20	. . .	28	. . .

Answer : It is given that $m \propto n$. It means that as the value of n increases, the value of m also increases and if the value of n decreases, the value of n also decreases.

m	3	5	6.5	7	1.25
n	12	20	26	28	5

• When m =3

n =12

Now, when m becomes $\frac{5}{3}$ times. ∴ n will also become $\frac{5}{3}$ times.

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

$$n = 12 \times \frac{5}{3}$$

$$n = 20$$

• When $m = 5$

$$n = 20$$

Now, when m becomes 1.3 times.

$$m = 5 \times 1.3$$

$$m = 6.5$$

∴ n will also become 1.3 times.

$$n = 20 \times 1.3$$

$$n = 26$$

• When $m = 6.5$

$$n = 26$$

Now, when m becomes $\frac{14}{13}$ times.

$$m = 5 \times \frac{14}{13} = 28$$

∴ m will also become $\frac{14}{13}$ times.

$$n = 6.5 \times \frac{14}{13} = 7$$

• When m =7

n = 28

Now, when m becomes $\frac{5}{28}$ times.

$$m = 7 \times \frac{5}{28} = 1.25$$

∴ n will also become $\frac{5}{28}$ times.

$$n = 28 \times \frac{5}{28} = 5$$

Q. 5. y varies directly as the square root of x. When x = 16, y = 24. Find the constant of variation and equation of variation.

Answer : It is given that y varies directly as the square root of x.

$x = 16$

$y = 24$

$y = k \times \sqrt{x}$ (k is a constant)

$24 = k \times \sqrt{16}$

$24 = 4K = \frac{24}{4}$

$K = 6$

∴ Required constant $= 6$

Equation: $y = 6\sqrt{x}$

Q. 6. The total remuneration paid to laborers, employed to harvest soybeans is indirect variation with the number of laborers. If remuneration of 4 laborers is Rs1000, find the remuneration of 17 laborers.

Answer : It is given that the total remuneration paid to laborers, employed to harvest soybeans is direct variation with the no. of laborers.

$\text{Total remuneration} \propto \text{No. of laborers}$

Remuneration of 4 labourers $= \text{Rs } 1000$

Remuneration of 1 labour $= \frac{1000}{4} = \text{Rs } 250$

Remuneration of 17 labourers $= \text{Remuneration of 7 labourers} \times 17$

$= 250 \times 17$

$= \text{Rs } 4250$

ALTERNATIVE METHOD

Total remuneration of 4 laborers is Rs 1000.

$1000 \propto 4$

Remuneration of 17 laborers

To get the number of laborers to be 17, the present number of laborers will be multiplied by $\frac{17}{4}$

Since total remuneration is in direct variation with the number of laborers total remuneration will also get $\frac{17}{4}$ times.

$$1000 \times \frac{17}{4} \propto 4 \times \frac{17}{4}$$

$$= 4250 \propto 17$$

∴ Remuneration of 17 labourers = Rs 4250

Practice set 7.2

Q. 1. The information about numbers of workers and the number of days to complete work is given in the following table. Complete the table.

Number of workers	30	20		10	
Days	6	9	12		36

Answer : Number of workers and the number of days to complete a work will be inversely proportional because if the number of workers increases the number of days to complete the work will reduce.

$$\text{Number of workers } \alpha \frac{1}{\text{number of days}}$$

Number of workers	30	20	15	10	5
Days	6	9	12	18	36

When the number of workers = 30

Number of days = 6

$$30 \ \alpha \ \frac{1}{6}$$

$$30 = \frac{k}{6} \text{ [k = constant]}$$

$$k = 180 \text{ - (1)}$$

The value of k will remain the same in all the cases

When the number of days = 12

Number of workers $\alpha \ \frac{1}{12}$

Number of workers $= \frac{k}{12}$ (k=constant)

Number of workers $= \frac{180}{12}$ (from 1)

Number of workers = 15

∴ Number of workers = 15 when the number of days is 12

When the number of workers = 10

$$10 \alpha \frac{1}{\text{number of days}}$$

$$10 = \frac{k}{\text{number of days}}$$

Number of days $= \frac{180}{10}$ (from 1)

Number of days = 18

∴ When the number of workers=10, number of days is 18

When the number of days = 36

Number of workers $\alpha \frac{1}{36}$

Number of workers $= \frac{k}{36}$

Number of workers $= \frac{180}{36}$ (from1)

Number of workers = 5

∴ When the number of days is 36, the number of workers will be 5

Q. 2. Find constant of variation and write equation of variation for every example given below.

(1) $p \alpha \frac{1}{q}$; **if** $p = 15$ **then** $q = 4$

(2) $z \alpha \frac{1}{w}$; **when** $z = 2.5$ **then** $w = 24$

(3) $s \alpha \frac{1}{t^2}$; **if** $s = 4$ **then** $t = 5$

(4) $x \alpha$; **if** $x = 15$ **then** $y = 9$

Answer :

(1) $P \alpha \frac{1}{q} (p = 15, q = 4)$

$15 \alpha \frac{1}{4}$

$15 = \frac{k}{4}$ (k=constant)

$k = 60$

$P \alpha \frac{1}{q}$

$P = \frac{k}{q}$

$P = \frac{60}{q}$

$p \times q = 60$

∴constant of variation is 60 and equation is $p \times q = 60$

(2) $z \alpha \frac{1}{w} (z = 2.5, w = 24)$

$2.5 \alpha \frac{1}{24}$

$2.5 = \frac{k}{24}$ (k=constant)

$K = 60$ (1)

$z \alpha \frac{1}{w}$

$z = \frac{k}{w}$

$z \times w = 60$ (from 1)

∴constant of variation is 60 and equation is $z \times w = 60$

(3) $s \alpha \frac{1}{t^2}$ $(s = 4, t = 5)$

$4 \alpha \frac{1}{5^2}$

$4 = \frac{k}{25}$ (k=constant)

$K = 100$ (1)

$s \alpha \frac{1}{t^2}$

$s = \frac{k}{t^2}$

$st^2 = 100$ (from 1)

∴constant of variation is 100 and the equation is $st^2 = 100$

(4) $x \alpha \frac{1}{\sqrt{y}} (x = 15, y = 9)$

$15 \alpha \frac{1}{\sqrt{9}}$

$15 = \frac{K}{3}$ (k=constant)

$K = 45$ (1)

$x \alpha \frac{1}{\sqrt{y}}$

$x = \frac{k}{\sqrt{y}}$

$x\sqrt{y} = 45$ (from 1)

∴constant of variation is 45 and equation is

$x\sqrt{y} = 45$

Q. 3. The boxes are to be filled with apples in a heap. If 24 apples are put in a box then 27 boxes are needed. If 36 apples are filled in a box how many boxes will be needed?

Answer : The number of apples and number of boxes will be inversely proportional as if the number of apples will be filled in a box then fewer boxes will be needed.

$$\text{Number of apples } \alpha \frac{1}{\text{number of boxes}}$$

Number of apples in a box = 24

Number of boxes needed = 27

$24 \alpha \frac{1}{27}$

$24 = \frac{k}{27}$ (k = constant)

$K = 648$ (1)

In the case, if 36 apples are filled in a box

Let the number of boxes be x

$$36 \alpha \frac{1}{x}$$

$36 = \frac{k}{x}$ (k = constant)

$$36 = \frac{648}{x}$$

$$X = 18$$

Therefore, 18 boxes are needed.

Q. 4. Write the following statements using the symbol of variation.

(1) The wavelength of sound (l) and its frequency (f) are in inverse variation.
(2) The intensity (I) of light varies inversely with the square of the distance (d) of a screen from the lamp.

Answer : (1) Wavelength of sound (l) and frequency (f) are in inverse proportion.

$$l \alpha \frac{1}{f}$$

(2) Intensity (I) of light varies inversely

With the square of the distance (d)

$$I \alpha \frac{1}{d^2}$$

Q. 5. $x \alpha \frac{1}{\sqrt{y}}$ **and when x = 40 then y = 16. If x = 10, find y.**

Answer : We are given that $x \alpha \frac{1}{\sqrt{y}}$

When $x = 40$ then $y = 16$

$40\ \alpha\ \frac{1}{\sqrt{16}}$

$40\ \alpha\ \frac{1}{4}$

$40 = \frac{k}{4}$ (k=constant)

$k = 160$ (1)

If $x = 10$

$x\ \alpha\ \frac{1}{\sqrt{y}}$

$10\ \alpha\ \frac{1}{\sqrt{y}}$

$10 = \frac{k}{\sqrt{y}}$

$10 = \frac{160}{\sqrt{y}}$

$\sqrt{y} = \frac{160}{10}$

$\sqrt{y} = 16$

$y = 16^2$

$y = 256$

Q. 6. X varies inversely as y, when x = 15 then y = 10, if x = 20 then y =?

Answer : We are given that x varies inversely as y

i.e. $x\ \alpha\ \frac{1}{\sqrt{y}}$

When $x = 15$

$Y = 10$

$15 \alpha \frac{1}{10}$

$15 = \frac{k}{10}$ (k=constant)

$k = 150$ (1)

If $x = 20$

$x \alpha \frac{1}{y}$

$20 \alpha \frac{1}{y}$

$20 = \frac{k}{y}$

$20 = \frac{150}{y}$ (from 1)

$Y = 7.5$

Practice set 7.3

Q. 1. Which of the following statements is of inverse variation?

(1) The number of workers on a job and time taken by them to complete the job.
(2) The number of pipes of the same size to fill a tank and the time taken by them to fill the tank.
(3) Petrol filled in the tank of a vehicle and its cost.
(4) Area of the circle and its radius.

Answer : (1) Yes, it is of inverse variation because more the number of workers will be lesser time will be taken.

(2) Yes, it is of inverse variation because more the number of pipes will be lesser time will be taken.

(3) No, it is not of inverse variation because the cost of petrol will increase with respect to its quantity.

(4) No, it is not of inverse variation because a larger circle has a longer radius.

Q. 2. If 15 workers can build a wall in 48 hours, how many workers will be required to do the same work in 30 hours?

Answer : The number of workers building a wall and time taken by them is inversely proportional.

Let x be the number of workers and y be the time taken.

$$\text{Number of workers } \alpha \frac{1}{\text{time taken}}$$

$$x \alpha \frac{1}{y}$$

$$x = \frac{k}{y} \text{ (k is constant) (1)}$$

Number of workers given=15

Time took = 48 hrs

(Put in 1)

$$15 = \frac{k}{48}$$

$$k = 720$$

Wall has to be built in 30 hours

So, $y = 30$

(Put in 1)

$$x = \frac{k}{30}$$

$x = \frac{720}{30}$ (Since $k = 720$)

$x = 24$

So, 24 workers are needed to build the wall in 30 hours.

Q. 3. 120 bags of half liter milk can be filled by a machine within 3 minutes find the time to fill such 1800 bags?

Answer : Number of bags will be directly proportional to the time taken because as the number of bags increases, time to fill them also increases.

Number of bags = 120

Time is taken to fill = 3 min

$\text{Number of bags } \alpha \text{ Time taken}$

$120 \, \alpha \, 3$

$120 = 3k$ (k=constant)

$\frac{120}{3} = k$

$K = 40$ (1)

Number of bags = 1800

Let time taken to fill them be x

$\text{Number of bags } \alpha \text{ Time taken}$

$1800 \, \alpha \, x$

$1800 = k \times x$

$1800 = 40 \times x$ (From 1)

$X = 45$

So, 45 minutes are needed to fill 1800 bags.

Q. 4. A car with a speed of 60 km/hr takes 8 hours to travel some distance. What should be the increase in the speed if the same distance is to be covered in $7\frac{1}{2}$ hours?

Answer : Speed of car and time will be inversely proportional because as the speed increases, time for the journey decreases.

Speed of car $= 60 \text{ km/hr}$

Time $= 8 \text{ hrs}$

$$\text{Speed } \alpha \frac{1}{\text{time}}$$

$$60 \ \alpha \frac{1}{8}$$

$60 = \frac{k}{8}$ (k=constant)

$k = 480$ (1)

Time for which distance is to be covered $= 7\frac{1}{2} \text{ hrs}$

$$= \frac{15}{2} \text{ hrs}$$

Let increase in speed $= x$

$$\text{Speed } \alpha \frac{1}{\text{time}}$$

$$\text{Speed } = \frac{k}{\text{time}}$$

$$60 + x = \frac{k}{\frac{15}{2}}$$

From 1

$$60 + x = 480 \times \frac{2}{15}$$

$$60 + x = 64$$

$$X = 4$$

So, speed should be increased by 4 km/hr.

Discount And Commission

Practice set 9.1

Q. 1. If marked price = Rs 1700, selling price = Rs 1540 then find the discount.

Answer : Given:

Marked Price = Rs 1700

Selling Price = Rs 1540

Now, we know Discount = Marked Price – Selling Price

∴ Discount = 1700 – 1540 = Rs 160

Hence, the discount is Rs 160.

Q. 2. If marked price = Rs 990 and percentage of discount is 10, then find the selling price.

Answer : Given:

Marked Price = Rs 990

Discount = 10%

Now, let us find the ratio $\frac{\text{discount}}{\text{marked price}}$

Let us assume we obtain discount Rs x on the marked price.

$$\Rightarrow \frac{x}{990} = \frac{10}{100}$$

$$\Rightarrow x = \frac{10}{100} \times 990 = 99$$

So, Discount = Rs 99.

We know Selling Price = Marked Price – Discount

∴ Selling Price = 990 – 99 = Rs 891

Hence, the selling price is Rs 891.

Q. 3. If selling price = Rs 900. Discount is 20 %, then find the marked price.

Answer : Given:

Selling Price = Rs 900

Discount = 20%

Now, let us suppose the marked price is Rs x.

Given discount is 20% on the marked price.

⇒ Discount = 0.2x

We know Selling Price = Marked Price – Discount

⇒ 900 = x – 0.2x

⇒ 900 = 0.8x

$$\Rightarrow x = \frac{900}{0.8} = \text{Rs } 1125$$

Hence, the marked price is Rs 1125.

Q. 4. The marked price of the fan is 3000 rupees. Shopkeeper gave 12% discount on it. Find the total discount and selling price of the fan.

Answer : Given:

Marked Price = Rs 3000

Discount = 12%

Given discount is 12% on the marked price.

$$\Rightarrow \text{Discount} = \frac{12}{100} \times 3000 = \text{Rs } 360$$

Hence, the discount is Rs 360.

We know Selling Price = Marked Price – Discount

∴ Selling Price = 3000 – 360 = Rs 2640

Hence, the selling price is Rs 2640.

Q. 5. The marked price of a mixer is 2300 rupees. A customer purchased it for Rs.1955. Find percentage of discount offered to the customer.

Answer : Given:

Marked Price = Rs 2300

Selling Price = Rs 1955

We know Discount = Marked Price – Selling Price

∴ Discount = 2300 – 1955 = Rs 345

Now, let us suppose the percentage of discount is x.

Then, we have

$$\frac{x}{100} = \frac{(\text{Discount given})}{(\text{Marked Price})}$$

$$\Rightarrow \frac{x}{100} = \frac{345}{2300}$$

$$\Rightarrow x = \frac{345}{2300} \times 100 = 15$$

Hence, the percentage of discount offered is 15 (that is 15%).

Q. 6. A shopkeeper gives 11% discount on a television set, hence the cost price of it is Rs. 22,250. Then find the marked price of the television set.

Answer : Given:

Discount = 11%

Cost Price = Rs 22250

Now, let us suppose the marked price is Rs x.

Given discount is 11% on the marked price.

⇒ Discount = 0.11x

We also know the cost price is Rs 22250 after a discount of 11% on the marked price.

$\Rightarrow x - 0.11x = 22250$

$\Rightarrow 0.89x = 22250$

$$\Rightarrow x = \frac{22250}{0.89} = 25000$$

Hence, the marked price is Rs 25000.

Q. 7. After offering discount of 10% on marked price, a customer gets total discount of 17 rupees. To find the cost price for the customer, fill in the following boxes with appropriate numbers and complete the activity.

Suppose, marked price of the item = 100 rupees
Therefore, for customer that item costs
[ ] - [ ] = 90 rupees
Hence, when the discount is [ ] then the selling price is [ ] rupees.
Suppose when the discount is [ ] rupees, the selling price is x rupees.

$$\therefore \frac{x}{\square} = \frac{\square}{\square}$$

$$\therefore x = \frac{\square \times \square}{\square} = \square$$

∴ the customer will get the item for 153 rupees.

Answer : Suppose, marked price of the item = 100 rupees

Therefore, for customer that item costs

[100] - [10] = 90 rupees

(Given the discount is 10% on the marked price.

$\Rightarrow$ Discount = $0.10 \times 100 = 10$ rupees

Also, we have Cost Price = Marked Price - Discount

$\Rightarrow$ Cost Price = 100 – 10 = 90 rupees)

Hence, when the discount is [10] rupees then the selling price is [90] rupees.

Suppose when the discount is [17] rupees, the selling price is x rupees (as it is given that customer gets a 17 Rupees discount).

Q. 8. A shopkeeper decides to sell a certain item at a certain price. He tags the price on the item by increasing the decided price by 25%. While selling the item, he offers 20% discount. Find how many more or less percent he gets on the decided price.

Answer : Let us assume the decided price is Rs 100.

Given the marked price is 25% more than decided price.

$$\Rightarrow \text{Marked Price} = \text{Decided Price} + \frac{25}{100} \times \text{Decided Price}$$

$$\Rightarrow \text{Marked Price} = 100 + \frac{25}{100} \times 100 = \text{Rs } 125$$

Also given that discount is 20% on the marked price.

$$\Rightarrow \text{Discount} = \frac{20}{100} \times 125 = \text{Rs } 25$$

We know Selling Price = Marked Price – Discount

$\therefore$ Selling Price = 125 – 25 = Rs 100

So, when the decided price is Rs 100, the selling price is Rs 100.

Therefore, the shopkeeper sold the item for 0% more than the decided price (neither any profit nor any loss).

Practice set 9.2

Q. 1. John sold books worth rupees 4500 for a publisher. For this he received 15% commission. Complete the following activity to find the total commission John obtained.

Selling price of books = [ ]
Rate of commission = [ ]
Commission obtained = [ ]/[ ] × [ ]
$\therefore$ Commission = [ ] rupees

Answer : Selling price of books = [Rs 4500]

Rate of commission = [15%]

(We have Commission = Commission Rate × Selling Price)

$$\text{Commission obtained} = \frac{[15]}{[100]} \times [4500]$$

∴ Commission = [675] rupees

Q. 2. Rafique sold flowers worth Rs 15,000 by giving 4% commission to the agent. Find the commission he paid. Find the amount received by Rafique.

Answer : Given:

Selling Price = Rs 15000

Commission rate = 4%

We have Commission = Commission Rate × Selling Price

$$\Rightarrow \text{Commission} = \frac{4}{100} \times 15000 = \text{Rs } 600$$

Hence, Rafique paid a commission of Rs 600.

Amount received by Rafique = Selling Price – Commission

∴ Amount received = 15000 – 600 = Rs 14400

Hence, the amount received by Rafique is Rs 14400.

Q. 3. A farmer sold food grains for 9200 rupees through an agent. The rate of commission was 2%. How much amount did the agent get?

Answer : Given:

Selling Price = Rs 9200

Commission rate = 2%

We have Commission = Commission Rate × Selling Price

$$\Rightarrow \text{Commission} = \frac{2}{100} \times 9200 = \text{Rs } 184$$

Hence, agent got a commission of Rs 184.

Q. 4. Umatai purchased following items from a Khadi - Bhandar.

(i) 3 sarees for 560 rupees each.
(ii) 6 bottles of honey for 90 rupees each.
On the purchase, she received a rebate of 12%. How much total amount did Umatai pay?

Answer : Given:

Rebate = 15%

Cost of 3 sarees = 3 × 560 = Rs 1680

Cost of 6 bottles = 6 × 90 = Rs 540

Hence, total cost of purchased items = 1680 + 540 = Rs 2220

Given rebate rate = 12%

We have Rebate = Rebate Rate × Cost Price

$$\Rightarrow \text{Rebate} = \frac{12}{100} \times 2220 = \text{Rs } 266.40$$

Amount payed by Umatai = Total cost – Rebate

∴ Amount payed = 2220 – 266.40 = Rs 1953.60

Hence, the total amount payed by Umatai is Rs 1953.60.

Q. 5. Use the given information and fill in the boxes with suitable numbers.

Smt. Deepanjali purchased a house for Rs 7,50,000 from Smt. Leelaben through an agent. Agent has charged 2% brokerage from both of them.

$$\text{(1) Smt. Deepanjali paid } [\ \ ] \times \frac{[\ \ ]}{[\ \ ]} = \text{Rs}$$

[ ] brokerage for purchasing the house.
(2) Smt. Leelaben paid brokerage of Rs [ ].
(3) Total brokerage received by the agent is Rs [ ].
(4) The cost of house Smt. Deepanjali paid is Rs [ ].
(5) The selling price of house for Smt. Leelaben is Rs [ ].

Answer : Smt. Deepanjali purchased a house for Rs 7,50,000 from Smt. Leelaben through an agent. Agent has charged 2% brokerage from both of them.

(1) Smt. Deepanjali paid $[7,50,000] \times \frac{2}{100} = Rs[15,000]$ brokerage for purchasing the house.

(We have Commission = Commission Rate × Selling Price

$$\Rightarrow \text{Commission} = \frac{2}{100} \times 7,50,000 = Rs\ 15,000$$

(2) Smt. Leelaben paid brokerage of Rs [15,000]

(Since the agent has charged equal brokerage from both of them).

(3) Total brokerage received by the agent is Rs [30,000].

(15,000 each received from buyer and seller)

(4) The cost of house Smt. Deepanjali paid is Rs [7,65,000].

(Amount Deepanjali paid = Selling Price + Brokerage

⇒ Amount paid = 7,50,000 + 15,000 = Rs 7,65,000)

(5) The selling price of house for Smt. Leelaben is Rs [7,35,000].

(Effective Selling Price = Actual Selling Price – Brokerage

⇒ Selling price = 7,50,000 - 15,000 = Rs 7,35,000)

Division Of Polynomials

Practice set 10.1

Q. 1. A. Divide. Write the quotient and the remainder.

$21m^2 \div 7m$

Answer :

$$21m^2 \div 7m = \frac{21m^2}{7m}$$

$$21m^2 \div 7m = \frac{7m(3m)}{7m}$$

$$21m^2 \div 7m = 3m + \frac{0}{7m}$$

Therefore, quotient = 3m, remainder = 0

Q. 1. B. Divide. Write the quotient and the remainder.

$40a^3 \div (-10a)$

Answer :

$$40a^3 \div (-10a) = \frac{40a^3}{-10a}$$

$$40a^3 \div (-10a) = \frac{-4a^2(-10a)}{-10a}$$

$$40a^3 \div (-10a) = -4a^2 + \frac{0}{-10a}$$

Therefore, quotient = $-4a^2$, remainder = 0.

Q. 1. C. Divide. Write the quotient and the remainder.

$(-48p^4) \div (-9p^2)$

Answer :

$$(-48p^4) \div (-9p^2) = \frac{-48p^4}{-9p^2}$$

$$(-48p^4) \div (-9p^2) = \frac{48p^2(p^2)}{9p^2}$$

$$(-48p^4) \div (-9p^2) = \frac{16}{3}p^2 + \frac{0}{-9p^2}$$

Therefore, quotient $= \frac{16}{3}p^2$, remainder $= 0$.

Q. 1. D. Divide. Write the quotient and the remainder.

$40m^5 \div 30m^3$

Answer :

$$40m^5 \div 30m^3 = \frac{40m^5}{30m^3}$$

$$40m^5 \div 30m^3 = \frac{40m^2(m^3)}{30m^3}$$

$$40m^5 \div 30m^3 = \frac{4}{3}m^2 + \frac{0}{30m^2}$$

Therefore, quotient $= \frac{4}{3}m^2$, remainder $= 0$.

Q. 1. E. Divide. Write the quotient and the remainder.

$(5x^3 - 3x^2) \div x^2$

Answer :

$$(5x^3 - 3x^2) \div x^2 = \frac{(5x^3 - 3x^2)}{x^2}$$

$$(5x^3 - 3x^2) \div x^2 = \frac{(5x - 3)x^2}{x^2}$$

$$(5x^3 - 3x^2) \div x^2 = 5x - 3 + \frac{0}{x^2}$$

Therefore, quotient = 5x – 3, remainder = 0.

Q. 1. E. Divide. Write the quotient and the remainder.

$(8p^3 - 4p^2) \div 2p^2$

Answer :

$$(8p^3 - 4p^2) \div 2p^2 = \frac{(8p^3 - 4p^2)}{x^2}$$

$$(8p^3 - 4p^2) \div 2p^2 = \frac{(4p - 2)(2p^2)}{2p^2}$$

$$(8p^3 - 4p^2) \div 2p^2 = 4p - 2 + \frac{0}{2p^2}$$

Therefore, quotient = 4p – 2, remainder = 0.

Q. 1. G. Divide. Write the quotient and the remainder.

$(2y^3 + 4y^2 + 3) \div 2y^2$

Answer :

$$(2y^3 + 4y^2 + 3) \div 2y^2 = \frac{(2y^3 + 4y^2 + 3)}{2y^2}$$

$$(2y^3 + 4y^2 + 3) \div 2y^2 = \frac{(y + 2)(2y^2) + 3}{2y^2}$$

$$(2y^3 + 4y^2 + 3) \div 2y^2 = y + 2 + \frac{3}{2y^2}$$

Therefore, quotient = y + 2, remainder = 3.

Q. 1. H. Divide. Write the quotient and the remainder.

$(21x^4 - 14x^2 + 7x) \div 7x^3$

Answer :

$$(21x^4 - 14x^2 + 7x) \div 7x^3 = \frac{(21x^4 - 14x^2 + 7x)}{7x^3}$$

$$(21x^4 - 14x^2 + 7x) \div 7x^3 = \frac{7x^3(3x) + (-14x^2 + 7x)}{7x^3}$$

$$(21x^4 - 14x^2 + 7x) \div 7x^3 = 3x + \frac{-14x^2 + 7x}{7x^3}$$

Therefore, quotient = 3x, remainder = $-14x^2 + 7x$.

Q. 1. I. Divide. Write the quotient and the remainder.

$(6x^5 - 4x^4 + 8x^3 + 2x^2) \div 2x^2$

Answer :

$$(6x^5 - 4x^4 + 8x^3 + 2x^2) \div 2x^2 = \frac{(6x^5 - 4x^4 + 8x^3 + 2x^2)}{2x^2}$$

$$(6x^5 - 4x^4 + 8x^3 + 2x^2) \div 2x^2 = \frac{2x^2(3x^3 - 2x^2 + 4x + 1)}{2x^2}$$

$$(6x^5 - 4x^4 + 8x^3 + 2x^2) \div 2x^2 = 3x^3 - 2x^2 + 4x + 1 + \frac{0}{2x^2}$$

Therefore, quotient = $3x^3 - 2x^2 + 4x + 1$, remainder = 0.

Q. 1. J. Divide. Write the quotient and the remainder.

$(25m^4 - 15m^3 + 10m + 8) \div 5m^3$

Answer : $$(25m^4 - 15m^3 + 10m + 8) \div 5m^3 = \frac{(25m^4 - 15m^3 + 10m + 8)}{5m^3}$$

$$(25m^4 - 15m^3 + 10m + 8) \div 5m^3 = \frac{5m^3(5m - 3) + 10m + 8}{5m^3}$$

$$(25m^4 - 15m^3 + 10m + 8) \div 5m^3 = 5m - 3 + \frac{10m + 8}{5m^3}$$

Therefore, quotient = 5m – 3, remainder = 10m + 8.

Practice set 10.2

Q. 1. A. Divide and write the quotient and the remainder.

$(y^2 + 10y + 24) \div (y + 4)$

Answer :

$$(y^2 + 10y + 24) \div (y + 4) = \frac{(y^2 + 10y + 24)}{(y + 4)}$$

$$= \frac{y^2 + 6y + 4y + 24}{(y + 4)}$$

$$= \frac{y(y + 6) + 4(y + 6)}{(y + 4)}$$

$$= \frac{(y + 6)(y + 4)}{(y + 4)}$$

$$= y + 6 + \frac{0}{y + 4}$$

Therefore, quotient = y + 6, remainder = 0.

Q. 1. B. Divide and write the quotient and the remainder.

$(p^2 + 7p - 5) \div (p + 3)$

Answer :

$$(p^2 + 7p - 5) \div (p + 3) = \frac{(p^2 + 7y - 5)}{(p + 3)}$$

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

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

$$= \frac{p(p+3)+4(p+3)-17}{(p+3)}$$

$$= \frac{(p+4)(p+3)-17}{(p+3)}$$

$$= p+4-\frac{17}{y+3}$$

Therefore, quotient = p + 4, remainder = -17.

Q. 1. C. Divide and write the quotient and the remainder.

$(3x + 2x^2 + 4x^3) \div (x - 4)$

Answer :

$$(3x+2x^2+4x^3) \div (x-4) = \frac{(3x+2x^2+4x^3)}{(x-4)}$$

$$= \frac{4x^3+2x^2+3x}{(x-4)}$$

$$= \frac{4x^3+2x^2+3x}{(x-4)}$$

$$= \frac{4x^3-16x^2+16x^2+2x^2+3x}{(x-4)}$$

$$= \frac{4x^2(x-4)+18x^2+3x}{(x-4)}$$

$$= \frac{4x^2(x-4)+18x^2-72x+72x+3x}{(x-4)}$$

$$= \frac{4x^2(x-4)+18x(x-4)+75x}{(x-4)}$$

$$= \frac{4x^2(x-4)+18x(x-4)+75x-300+300}{(x-4)}$$

$$= \frac{4x^2(x-4) + 18x(x-4) + 75(x-4) + 300}{(x-4)}$$

$$= 4x^2 + 18x + 75 + \frac{300}{(x-4)}$$

Therefore, quotient = $4x^2 + 18x + 75$, remainder = 300.

Q. 1. D. Divide and write the quotient and the remainder.

$(2m^3 + m^2 + m + 9) \div (2m - 1)$

Answer :

$$(2m^3 + m^2 + m + 9) \div (2m - 1) = \frac{(2m^3 + m^2 + m + 9)}{(2m - 1)}$$

$$= \frac{2m^3 - m^2 + m^2 + m^2 + m + 9}{(2m - 1)}$$

$$= \frac{m^2(2m-1) + 2m^2 + m + 9}{(2m - 1)}$$

$$= \frac{m^2(2m-1) + 2m^2 - m + m + m + 9}{(2m - 1)}$$

$$= \frac{m^2(2m-1) + m(2m-1) + 2m + 9}{(2m - 1)}$$

$$= \frac{m^2(2m-1) + m(2m-1) + 2m - 1 + 1 + 9}{(2m - 1)}$$

$$= \frac{m^2(2m-1) + m(2m-1) + (2m-1) + 10}{(2m - 1)}$$

$$= m^2 + m + 1 + \frac{10}{(2m - 1)}$$

Therefore, quotient = $m^2 + m + 1$, remainder = 10.

Q. 1. E. Divide and write the quotient and the remainder.

$(3x - 3x^2 - 12 + x^4 + x^3) \div (2 + x^2)$

Answer :

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

Rearranging the terms we get,

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

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

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

$$= \frac{x^2(x^2 + 2) - 5x^2 + x(x^2 + 2) + x - 12}{(x^2 + 2)}$$

$$= \frac{x^2(x^2 + 2) + x(x^2 + 2) - 5x^2 + x - 12}{(x^2 + 2)}$$

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

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

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

Therefore, quotient = $x^2 + x - 5$, remainder = $x - 2$

Q. 1. F. Divide and write the quotient and the remainder.

$(6^*)(a^4 - a^3 + a^2 - a + 1) \div (a^3 - 2)$

Answer :

$$(a^4 - a^3 + a^2 - a + 1) \div (a^3 - 2) = \frac{(a^4 - a^3 + a^2 - a + 1)}{a^3 - 2}$$

Rearranging the terms we get,

$$= \frac{a^4 - a - a^3 + 1 + a^2}{(a^2 - 2)}$$

$$= \frac{a^4 - 2a + 2a - a - a^3 + 2 - 2 + 1 + a^2}{(a^3 - 2)}$$

$$= \frac{a(a^3 - 2) + a - (a^3 - 2) - 1 + a^2}{(a^3 - 2)}$$

$$= a - 1 + \frac{a^2 + a - 1}{(a^3 - 2)}$$

Therefore, quotient = a – 1, remainder = $a^2 + a - 1$

Q. 1. G. Divide and write the quotient and the remainder.

(7*)$(4x^4 - 5x^3 - 7x + 1) \div (4x - 1)$

Answer :

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

Factorising the numerator we get,

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

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

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

$$= \frac{\left(x^3(4x-1) - x^2(4x-1) - \frac{x}{4}(4x-1) - \frac{29}{4}x + 1\right)}{(4x-1)}$$

$$= \frac{\left(x^3(4x-1) - x^2(4x-1) - \frac{x}{4}(4x-1) - \frac{29}{4}x + \frac{29}{16} - \frac{29}{16} + 1\right)}{(4x-1)}$$

$$= \frac{\left(x^3(4x-1) - x^2(4x-1) - \frac{x}{4}(4x-1) - \frac{29}{16}(4x-1) - \frac{13}{16}\right)}{(4x-1)}$$

$$= \left(x^3 - x^2 - \frac{x}{4} - \frac{29}{16}\right) - \frac{\frac{13}{16}}{(4x-1)}$$

Statistics

Practice set 11.1

Q. 1. The following table shows the number of saplings planted by 30 students. Fill in the boxes and find the average number of saplings planted by each student.

No. of saplings (Scores) x_i	No. of students (frequency) f_i	$f_i \times x_i$
1	4	4
2	6	[ ]
3	12	[ ]
4	8	[ ]
	N = [ ]	$\Sigma f_i x_i$= [ ]

$$\text{Mean } \bar{x} = \frac{[\ ]}{N}$$

$$= \frac{[\ ]}{[\ ]}$$

$$= \frac{[\ ]}{[\ ]}$$

∴ The average number of trees planted [ ].

Answer :

No. of saplings (Scores) x_i	No. of students (frequency) f_i	$f_i x_i$
1	4	1 × 4 = 4
2	6	2 × 6 = [12]
3	12	3 × 12 = [36]
4	8	4 × 8 = [32]
	N = [30]	$\Sigma f_i x_i$ = [84]

Formula Mean $\bar{X} = \frac{\Sigma f_i x_i}{N}$

Where, x_i = score ; f_i = frequency ; N = total frequency.

$$= \frac{84}{30}$$

$= \frac{28}{10}$

= 2.8

∴ The average no. of trees planted is 2.8.

Q. 2. The following table shows the electricity (in units) used by 25 families of Eklara village in a month of May. Complete the table and answer the following questions.

Electricity used (Units) x_i	No. of families (frequency) f_i	$f_i \times x_i$
30	7	.....
45	2	.....
60	8	.....
75	5	.....
90	3	.....
	N = ...	$\Sigma f_i x_i$=.....

(1) How many families use 45 units electricity?
(2) State the score, the frequency of which is 5.
(3) Find N and $\Sigma f_i x_i$
(4) Find the mean of electricity used by each family in the month of May.

Answer :

Electricity used (Units) x_i	No. of families (frequency) f	$f_i \times x_i$
30	7	30×7= 210
45	2	45×2=90
60	8	60×8=480
75	5	75×5= 375
90	3	90×3=270
	N = Σf_i = 25	$\Sigma f_i x_i$= 1425

From the given table it can be seen that 7 number of families consumed 30 units of electricity, 2 families consumed 45 units of electricity, similarly, 8,5 and 3 number of families consumed 60, 75, and 90 units of electricity respectively.

Further moving on to the questions,

(1) 2, because in the table provided, for x_i= 45, f is 2.

(2) 75, because in the table provided x_i for f_i = 5 is 75.

(3) From the table,

N = Σ f_i

= 7 + 2 + 8 + 5 + 3

= 25.

Σ $f_i x_i$= 210+90+480+375+270

= 1425.

(4) From the table,

Σ f_i x_i = 1425

Σ f_i = 25

Formula

Where, x_i = score ; f_i = frequency ; N = total frequency

$$\therefore \text{Mean } \bar{X} = \frac{\Sigma f_i x_i}{N}$$

= 1425/25

= 57.

Q. 3. The number of members in the 40 families in Bhilar are as follows:

1, 6, 5, 4, 3, 2, 7, 2, 3, 4, 5, 6, 4, 6, 2, 3, 2, 1, 4, 5, 6, 7, 3, 4, 5, 2, 4, 3, 2, 3, 5, 5, 4, 6, 2, 3, 5, 6, 4, 2. Prepare a frequency table and find the mean of members of 40 families.

Answer : 1. Write the scores in the 1st column, in ascending order as x_1< x_2< x_3...

2. Write the tally marks in the next column.

3. Count the tally marks of scores and write the frequency of the score, denoted as f_i.

4. Write the sum of all frequencies below the frequency column.

5. The total frequencies are denoted by ‘N’.

6. In the last column write the products $f_i.x_i$. Find $\Sigma f_i x_i$.

No. of members x_i	Tally marks	No. Of families f_i	$f_i \times x_i$
1	||	2	$2 \times 1 = 2$
2	𝍸 |||	8	$2 \times 8 = 16$
3	𝍸 ||	7	$3 \times 7 = 21$
4	𝍸 |||	8	$4 \times 8 = 32$
5	𝍸 ||	7	$7 \times 5 = 35$
6	𝍸 |	6	$6 \times 6 = 36$
7	||	2	$7 \times 2 = 14$
		Total = 40	Total = 156

Formula

Where, x_i = score ; fi = frequency ; N = total frequency.

$$\therefore \text{Mean } \bar{X} = \frac{\Sigma f_i x_i}{N}$$

$$= 156/40 = 156/40$$

= 3.9

Q. 4. The number of Science and Mathematics projects submitted by Model high school, Nandpur in last 20 years at the state level science exhibition is :

2, 3, 4, 1, 2, 3, 1, 5, 4, 2, 3, 1, 3, 5, 4, 3, 2, 2, 3, 2. Prepare a frequency table and find the mean of the data.

Answer : 1. Write the scores in the 1st column, in ascending order as $x_1 < x_2 < x_3$...

2. Write the tally marks in the next column.

3. Count the tally marks of scores and write the frequency of the score, denoted as f_i

4. Write the sum of all frequencies below the frequency column.

5. The total frequencies are denoted by ‘N’.

6. In the last column write the products $f_i x_i$. Find $\Sigma f_i x_i$

No. of projects x_i	Tally Mark	No. of student who submitted f_i	$f_i \times x_i$
1	III	3	13
2	𝍸 I	6	12
3	𝍸 I	6	18
4	III	3	20
5	II	2	10
		20	Total 55

Formula

Where, x_i = score ; f_i = frequency ; N = total frequency

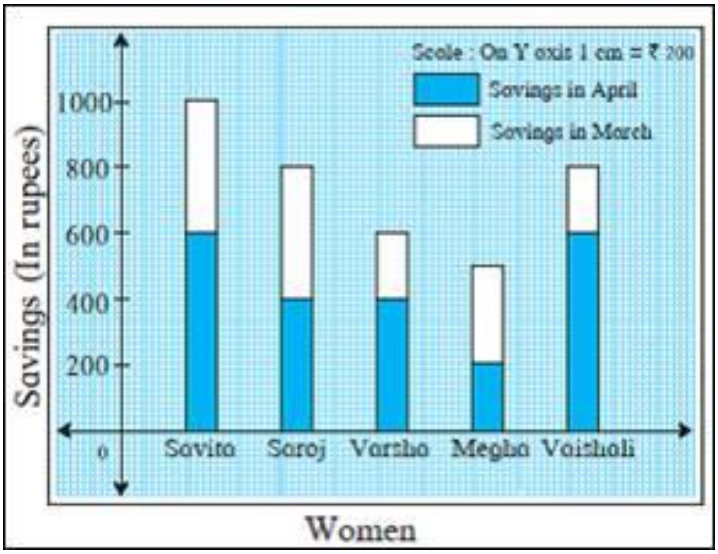
$$\text{Mean } \bar{X} = \frac{\Sigma f_i x_i}{N}$$

$$= 55/20$$

$$= 2.75$$

Practice set 11.2

Q. 1. Observe the following graph and answer the questions.



(1) State the type of the graph.
(2) How much is the savings of Vaishali in the month of April?
(3) How much is the total of savings of Saroj in the months March and April?
(4) How much more is the total savings of Savita than the total savings of Megha?
(5) Whose savings in the month of April is the least?

Answer : (1) The graph given in the question is a sub-divided bar graph.

(2) According to the graph, savings of Vaishali in the month of April is Rs. 400.

(3) According to the graph,

Savings of Saroj in the month of April = Rs. 400

Savings of Saroj in the month of March = Rs. (800-400)

= Rs. 400

The total of savings of Saroj in the months March and April = Rs (400+400)

= Rs 800

(4) According to the graph,

Savings of Savita in the month of April = Rs. 600

Savings of Savita in the month of March = Rs. (1000-600)

= Rs. 400

The total of savings of Savita in the months March and April = Rs. (600+400)

= Rs. 1000.

Again,

Savings of Megha in the month of April = Rs. 200

Savings of Megha in the month of March = Rs. (500-200)

= Rs. 300

The total savings of Megha in the months March and April =Rs. (200+300)

= Rs. 500

Clearly,

The total savings of Saroj is greater than Megha

The difference of their savings = Rs. (1000-500)

= Rs. 500

∴ The total savings of Saroj is Rs. 500 more than that of Megha.

Q. 2. The number of boys and girls, in std 5 to std 8 in a Z.P. school is given in the table. Draw a subdivided bar graph to show the data.

(Scale : On Y axis, 1cm= 10 students)

Standard	5^{th}	6^{th}	7^{th}	8^{th}
Boys	34	26	21	25
Girls	17	14	14	20

Answer : (1) Draw the X- axis and Y- axis on a graph paper.

(2) Mark students on X-axis, keeping equal distances between two consecutive bars.

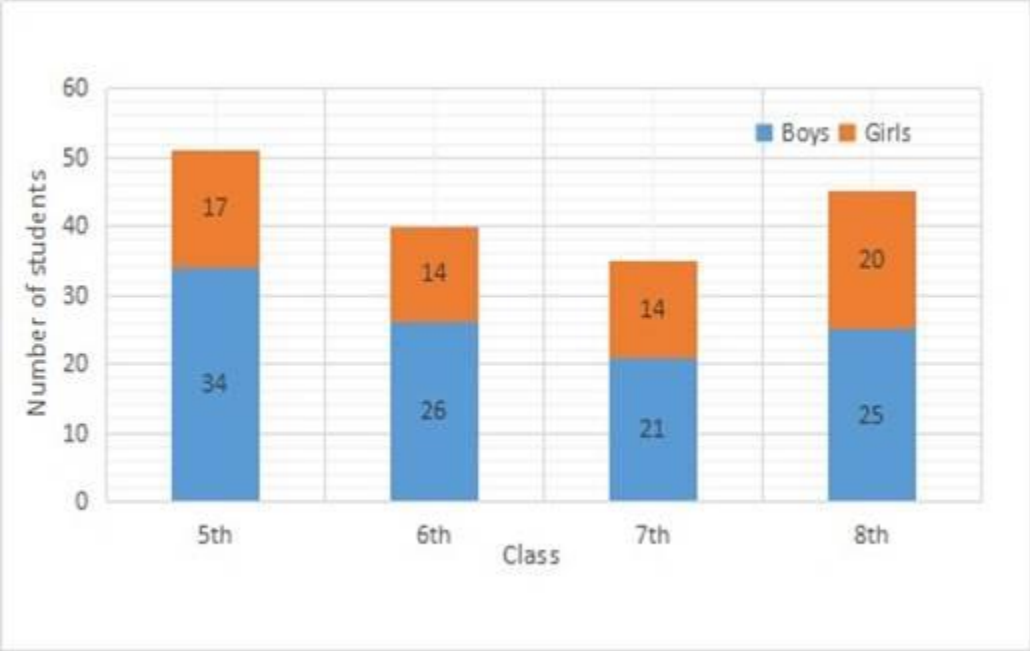
(3) Show a number of students i.e., boys and girls on Y - axis with the scale 1cm = 10 students.

(4) Show the number of boy students of class 5 by a part of the bar by some mark.

(5) Obviously, the remaining part of the bar will represent the girl students. Show this part by another mark.

(6) Similarly, draw the sub divided bars for the different classes.

(7) Following the above steps, the given information is shown by subdivided bar diagram, in the adjacent figure.



Q. 3. In the following table the number of trees planted in the year 2016 and 2017 in four towns is given. Show the data with the help of subdivided bar graph.

Town year	Karjat	Wadgoan	Shivapur	Khandala
2016	150	250	200	100
2017	200	300	250	150

Answer : (1) Draw the X- axis and Y- axis on a graph paper.

(2) Write the names of towns on X-axis, keeping equal distances between two consecutive bars.

(3) Show number of trees planted with the scale 1cm = 100 trees.

(4) Mark the no. of trees planted in 2016 in the town Karjat.

(5)Show the number of trees planted in 2016 by a part of the bar by some mark.

(6) Obviously, the remaining part of the bar will represent trees planted in the year 2017. Show this part by another mark.

(7) Similarly draw the subdivided bars for the towns Wadgaon, Shivapur, and Khandala.

(8) Following the above steps, the given information is shown by subdivided bar diagram, in the adjacent figure.

Q. 4. In the following table, data of the transport means used by students in the 8th standard for commutation between home and school is given.

Draw a subdivided bar diagram to show the data.
(Scale : On Y axis : 1 cm = 500 students)

Town → / Mean of commutation	Paithan	Yeola	Shahapur
Cycle	3250	1500	1250
Bus and Auto	750	500	500
On foot	1000	1000	500

Answer : (1) Draw the X- axis and Y- axis on a graph paper.

(2) Write the names of towns on X-axis, keeping equal distances between two consecutive bars.

(3) Show number of students taking the different mean of commutation on Y - axis with the scale 1cm = 500 students.

(4) Draw the graphics for the town, Paithan.

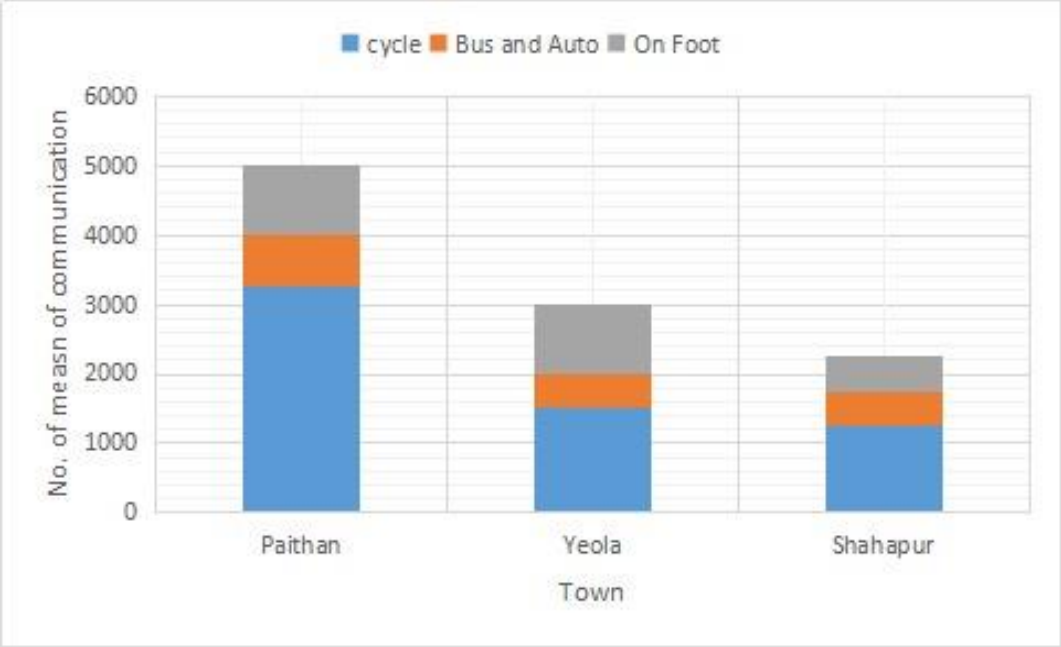
(5) Show the number of students using cycle by a part of the bar by some mark.

(6) Again show the number of students using bus or auto by a part of the bar by some mark.

(7) The remaining part of the bar will represent the students going on foot. Show this part by another mark.

(8) Similarly draw the sub divided bars for the towns Yeola, Shahpur.

(9) Following the above steps, the given information is shown by subdivided bar diagram, in the adjacent figure.



Practice set 11.3

Q. 1. Show the following information by a percentage bar graph.

Division of standard 8	A	B	C	D
Number of students securing grade A	45	33	10	15
Total number of students	60	55	40	75

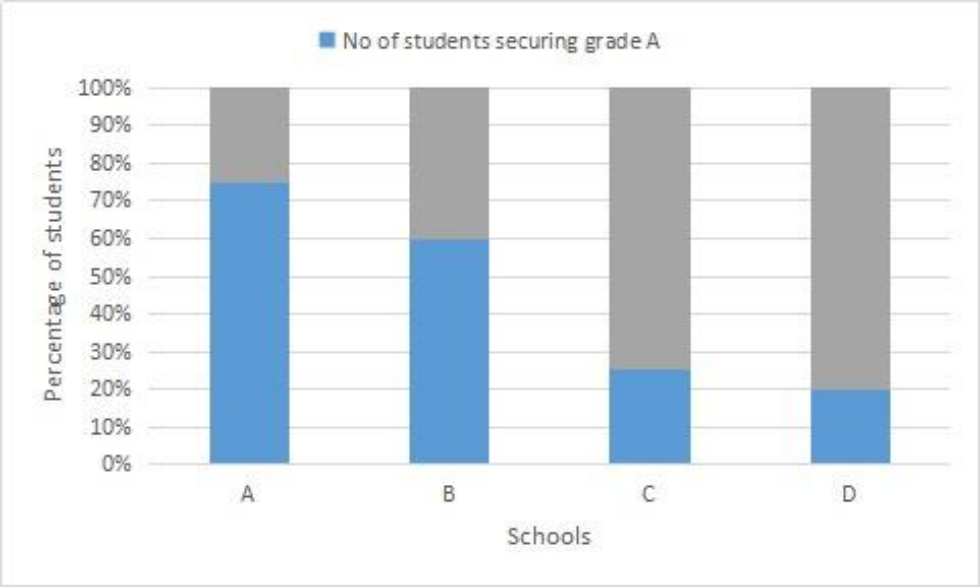
Answer : First of all we prepare a table as follows:

Division of standard	A	B	C	D
Total no. of students	60	55	40	75
No. of students securing Grade A	45	33	10	15
Percentage of students securing Grade A	$\left(\frac{45}{60}\right) \times 100\%$	$\left(\frac{33}{55}\right) \times 100\%$	$\left(\frac{10}{40}\right) \times 100\%$	$\left(\frac{15}{75}\right) \times 100\%$
	75%	60%	25%	20%

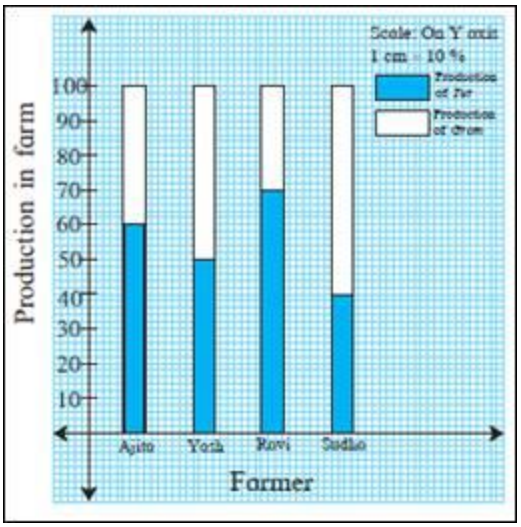
(2) In a percentage bar graph, all bars are of height 100 units. In each bar, we show the percentage of students who secured grade A.

(3) Remaining part shows the percentage of students

Who did not secure grade A?



Q. 2. Observe the following graph and answer the questions.



(1) State the type of the bar graph.
(2) How much percent is the Tur production to total production in Ajita's farm?
(3) Compare the production of Gram in the farms of Yash and Ravi and state whose percentage of production is more and by how much?
(4) Whose percentage production of Tur is the least?
(5) State production percentages of Tur and gram in Sudha's farm.

Answer : (1) The given graph is a Percentage-Bar Graph.

(2) According to the graph, the percentage of Tur production with respect to total production in Anita's farm

$$= \left(\frac{60}{100}\right) \times 100\%$$

(3) According to the graph,

Percentage production of Gram in Yash's farm = (100-50)%

= 50%

Percentage production of Gram in Ravi's farm = (100-70)%

= 30%

Clearly,

The percentage production of Yash is greater than Ravi's farm.

Difference of their production = (50-30)%

= 20%

∴ The Gram production of Yash is 20% more than that of Ravi.

(4) Percentage production of Tur in Ajita's farm = 60%

Percentage production of Tur in Yash's farm = 50%

Percentage production of Tur in Ravi's farm = 70%

Percentage production of Tur in Sudha's farm = 40%

Clearly,

Percentage production of Tur in Sudha's farm is the least.

(5) Production percentage of Tur in Sudha's farm = 40%

Production percentage of Gram in Sudha's farm = (100-40)%

= 60%

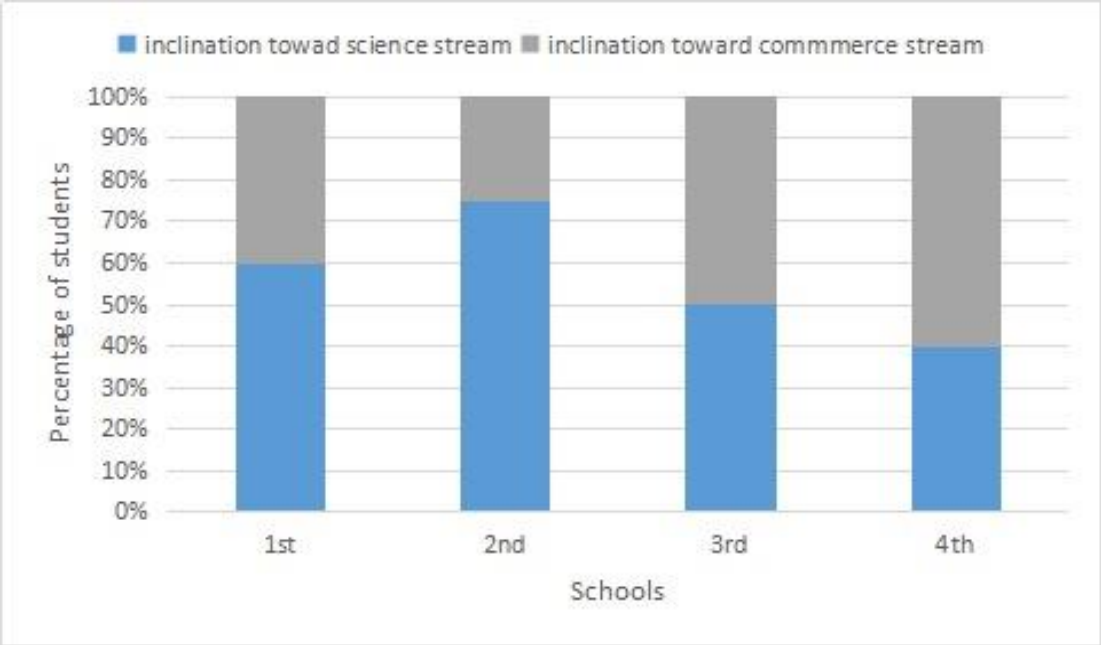
Q. 3. The following data is collected in a survey of some students of 10th standard from some schools. Draw the percentage bar graph of the data.

School	1st	2nd	3rd	4th
Inclination towards science steam	90	60	25	16
Inclination towards commerce steam	60	20	25	24

Answer : (1) First of all we prepare a table as follows:

Schools	1st	2nd	3rd	4th
Total no. of students	90+60=150	60+20=80	25+25=50	16+24=40
No. of students inclining towards science stream	90	60	25	16
No. of students inclining towards commerce stream	60	20	25	24
Percentage of students inclining towards science stream	$\left(\frac{90}{150}\right)\times 100\%$ =60%	$\left(\frac{60}{80}\right)\times 100\%$ =75%	$\left(\frac{25}{20}\right)\times 100\%$ =50%	$\left(\frac{16}{40}\right)\times 100\%$ =40%
Percentage of students inclining towards commerce stream	$\left(\frac{60}{150}\right)\times 100\%$ =40%	$\left(\frac{20}{80}\right)\times 100\%$ =25%	$\left(\frac{25}{20}\right)\times 100\%$ =50%{	$\left(\frac{24}{40}\right)\times 100\%$ =60%

(2) In a percentage bar graph, all bars are of height 100 units. In each bar we show percentage of students inclining towards different streams.



Equations in One Variable

Practice set 12.1

Q. 1. A. Each equation is followed by the values of the variable. Decide whether these values are the solutions to that equation.

x – 4 = 3, x = – 1, 7, – 7

Answer : Given x – 4 = 3

Adding 4 on both sides

So x = 4 + 3 = 7

7 is the only solution of this given equation

Q. 1. B. Each equation is followed by the values of the variable. Decide whether these values are the solutions to that equation.

9m = 81, m = 3, 9, – 3

Answer : Given 9m = 81

Dividing by 9 on both sides

$$m = \frac{81}{9}$$

So, m = 9

9 is the only solution of this given equation

Q. 1. C. Each equation is followed by the values of the variable. Decide whether these values are the solutions to that equation.

2 a + 4 = 0, a = 2, – 2, 1

Answer : Given 2 a + 4 = 0

Adding – 4 on both sides

2a = – 4

a = – 2

– 2 is the only solution of this given equation

Q. 1. D. Each equation is followed by the values of the variable. Decide whether these values are the solutions to that equation.

3 – y = 4, y = – 1, 1, 2

Answer : Given 3 – y = 4

Adding – 4 + y on both side

y = – 1

– 1 is the only solution of this given equation

Q. 2. A. Solve the following equations

17p – 2 = 49

Answer : Given 17p – 2 = 49

Adding 2 on both sides

17p = 51

Dividing by 17 on both sides

$$p = \frac{51}{17} = 3$$

Q. 2. A. Solve the following equations

17p – 2 = 49

Answer : Given 17p – 2 = 49

Adding 2 on both sides

17p = 51

Dividing by 17 on both sides

$$p = \frac{51}{17} = 3$$

Q. 2. B. Solve the following equations

2m + 7 = 9

Answer :

Given 2m + 7 = 9

Adding – 7 on both sides

2m = 2

Dividing by 2 on both sides

m = 1

Q. 2. C. Solve the following equations

3x + 12 = 2x – 4

Answer : Given 3x + 12 = 2x – 4

Adding – 12 – 2x on both sides

3x – 2x = – 12 – 4

X = – 16

Q. 2. D. Solve the following equations

5(x – 3) = 3(x + 2)

Answer : Given 5(x – 3) = 3(x + 2)

Expanding the equation

5x – 15 = 3x + 6

Adding 15 – 3X on both sides

5x – 3x = 15 + 6

2x = 21

x = 21/2

Q. 2. E. Solve the following equations

$$\frac{9x}{8} + 1 = 10$$

Answer : Given $\frac{9x}{8} + 1 = 10$

$$\frac{9x}{8} = 10 - 1$$

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

Multiplying $\frac{8}{9}$ on both sides

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

Q. 2. F. Solve the following equations

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

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

Taking LCM of 7 and 3, that is 21

Now multiplying both side of given equation by 21

3y + 7(y – 4) = 42

Expanding the given equation

10y – 28 = 42

Adding 28 on both sides

10y = 70

y = 7

Q. 2. G. Solve the following equations

$$13x - 5 = \frac{3}{2}$$

Answer : Given $13x - 5 = \frac{3}{2}$

Multiplying by 2 on both sides

26x – 10 = 3

Adding 10 on both sides

26x = 13

Dividing by 26 on both sides

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

Q. 2. H. Solve the following equations

3(y + 8) = 10(y – 4) + 8

Answer : Given 3(y + 8) = 10(y – 4) + 8

Expanding

3y + 24 = 10y – 40 + 8

Adding –3y on both sides

24 = 7y – 40 + 8

Adding 32 on both sides

7y = 56

Dividing by **7** on both sides

y = 8

Q. 2. I. Solve the following equations

$$\frac{x-9}{x-5}=\frac{5}{7}$$

Answer : Given $\frac{x-9}{x-5}=\frac{5}{7}$

Multiplying 7(x – 5) on both sides

7(x – 9) = 5(x – 5)

Expanding

7x – 63 = 5x – 25

Adding 63 – 5x on both sides

2x = 38

Dividing by 2 on both sides

x = 19

Q. 2. J. Solve the following equations

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

Answer : Given $\frac{y-4}{3}+3y=4$

Multiplying by **3** on both sides

y – 4 + 9y = 12

10y – 4 = 12

Adding 4 on both sides

10y = 16

Dividing by 10 on both sides

$$y = \frac{16}{10} = \frac{8}{5}$$

Q. 2. K. Solve the following equations

$$\frac{b + (b + 1) + (b + 2)}{4} = 21$$

Answer : Given $\frac{b + (b + 1) + (b + 2)}{4} = 21$

Multiplying by 4 on both sides

b + (b + 1) + (b + 2) = 84

Adding – 3 on both sides

3b + 3 = 84

Dividing both side by 3

3b = 81

b = 27

Practice set 12.2

Q. 1. Mother is 25 years older than her son. Find son's age if after 8 years ratio of son's age to mother's age will be 4/9

Answer : let the age of son be x, so age of mother is x + 25

After 8 years, gather e of son is x + 8 and age of mother is x + 25 + 8

So according to give conditions $\left[\frac{x + 8}{x + 25 + 8}\right] = \frac{4}{9}$

Now solving the equation

Multiplying both sides by $\frac{9}{4}$

$$\frac{9}{4}\left[\frac{x + 8}{x + 25 + 8}\right] = 1$$

Multiplying both sides by 4(x + 25 + 8)

9(x + 8) = 4(x + 33)

Expanding the equation

9x + 72 = 4x + 132

Adding – 4x – 72 on both sides

5x = 60

Dividing by 10 on both sides

x = 12

So, age of son is 12 years

Q. 2. The denominator of a fraction is greater than its numerator by 12. If the numerator is decreased by 2 and the denominator is increased by 7, the new fraction is equivalent with 1/2. Find the fraction.

Answer : let the numerator be x, so d the enominator is x + 12

New numerator is x – 2, new the denominator is x + 12 + 7

So according to given conditions $\frac{x-2}{x+12+7} = \frac{1}{2}$

Multiplying both sides by 2

$$\frac{2(x-2)}{x + 12 + 7} = 1$$

Multiplying by x + 19 on both sides

2(x – 2) = x + 19

2x – 4 = x + 19

Adding – x on both sides

x – 4 = 19

Adding 4 on both sides

x = 23

So, numerator is 23 and denominator is 12 + 23 = 35

Required fraction is $\frac{23}{35}$

Q. 3. The ratio of weights of copper and zinc in brass is 13:7. Find the weight of zinc in a brass utensil weighing 700 gm.

Answer : Let the weight of zinc be x

Copper/zinc = copper/x = 13/7

Copper = 13x/7

So according to given conditions

x + 13x/7 = 700

Multiplying both side by 7

7x + 13x = 4900

20x = 4900

Dividing both side by 20

x = 245

So, weight of zinc is 245g

Q. 4. Find three consecutive whole numbers whose sum is more than 45 but less than 54.

Answer : Let the lowest number be X, so other numbers are x + 1

And x + 2

According to given conditions 45 < x + (x + 1) + (x + 2) < 54

Solving this equation, we have 45 < 3x + 3 < 54

Adding – 3 on both sides

$42 < 3x < 51$

Dividing by 3 on both sides

$14 < x < 17$

So $x = 15$ or $x = 16$

So consecutive numbers are 15,16,17 or 16,17,18

Q. 5. In a two-digit number, a digit at the ten's place is twice the digit at unit's place. If the number obtained by interchanging the digits is added to the original number, the sum is 66. Find the number

Answer : Let the number at digit place be x

So, da igit at tens place is 2x.

Number is $10 \times 2x + x = 21x$

Now interchanging the digits, at digit place we have 2x and at tens place x. number is $10 \times x + 2x = 12x$

According to the given condition's $12x + 21x = 66$

$33x = 66$

Dividing both side by 33

$X = 2$

Digit at tens place is $2 \times 2 = 4$

Number is 42

Q. 6. Some tickets of Rs.200 and some of Rs.100, of a drama in a theatre were sold. The number of tickets for Rs.200 sold was 20 more than the number of tickets for Rs.100. The total amount received by the theatre by the sale of tickets was Rs.37000. Find the number of Rs.100 tickets sold.

Answer : Let the number of Rs.100 ticket sold be x

Number of Rs.200 ticket sold is x + 20

According to given conditions 100x + 200(x + 20) = 37000

300x + 4000 = 37000

Adding - 4000 on both sides

300x = 33000

Dividing both side by 300

x = 110

Number of Rs.100 tickets sold are 110

Q. 7. Of the three consecutive natural numbers, five times the smallest number is 9 more than four times the greatest number, find the numbers.

Answer : let the numbers be x,x + 1,x + 2 of which **X** being the smallest. According to given conditions 5x = 9 + 4(x + 2)

Expanding

5x = 9 + 4x + 8

Adding - 4x on both sides

x = 17

So, numbers are 17,18,19

Q. 8. Raju sold a bicycle to Amit at 8% profit. Amit repaired it spending Rs.54. Then he sold the bicycle to Nikhil for Rs.1134 with no loss and no profit. Find the cost price of the bicycle for which Raju purchased it.

Answer : Let the cost of the cycle for Raju be **X**

$$\text{Profit made by selling } = \frac{8}{100}\text{x}$$

$$\text{Total selling price } = \text{x} + \left(\frac{8}{100}\right)\text{x}$$

$$\text{For Amit total cost including repair } = \text{x} + \left(\frac{8}{100}\right)\text{x} + 54$$

So according to given conditions total cost = total selling price

$$x + \left(\frac{8}{100}\right)x + 54 = 1134$$

Adding -54 on both sides

$$x + \left(\frac{8}{100}\right)x = 1080$$

Multiplying by 100 on both side

100x + 8x = 108000

108x = 108000

Dividing by 108 on both side

x = 1000

So, cost of cycle to Raju is Rs.1000

Q. 9. A Cricket player scored 180 runs in the first match and 257 runs in the second match. Find the number of runs he should score in the third match so that the average of runs in the three matches be 230.

Answer : Let the runs required in third match be **X**

So according to given conditions $\frac{257 + 180 + x}{3} = 230$

Multiplying both side by **3**

257 + 180 + x = 690

Subtracting **180** from both sides

257 + x = 510

Subtracting 257 from both sides

x = 253

Therefore 253 runs are required.

Q. 10. Sudhir's present age is 5 more than three times the age of Viru. Anil's age is half the age of Sudhir. If the ratio of the sum of Sudhir's and Viru's age to three times Anil's age is 5:6, then find Viru's age.

Answer : Let the age of Viru be x

Sudhir age = 3x + 5

$$\text{Anil age} = \frac{3x + 5}{2}$$

According to given conditions, $\frac{x + 3x + 5}{\frac{3(3x+5)}{2}} = \frac{5}{6}$

$$\frac{2(4x + 5)}{3(3x + 5)} = \frac{5}{6}$$

Multiplying $\frac{6}{5}$ on both side

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

Multiplying 3(3x + 5) on both sides

2(4x + 5) = 3(3x + 5)

Expanding

8x + 10 = 9x + 15

Adding – 8x on both side
X + 15 = 10

Adding – 5 on both side
x = – 5

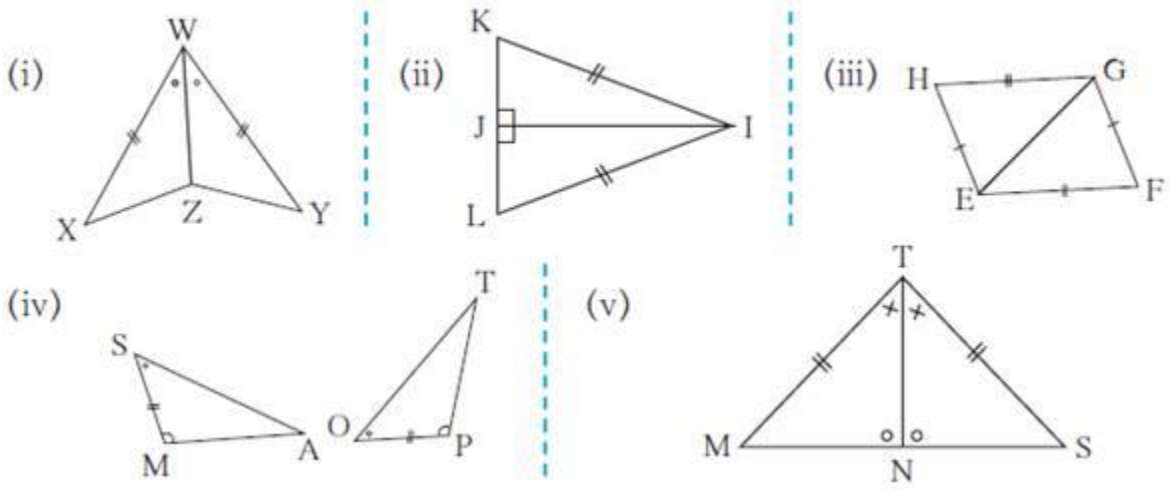
But since age cannot be negative so, x = 5

Hence age is 5 years.

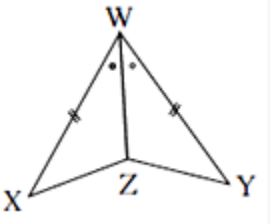
Congruence Of Triangles

Practice set 13.1

Q. 1. In each pair of triangles in the following figures, parts bearing identical marks are congruent. State the test and correspondence of vertices by which triangles in each pairs are congruent.



Answer : (i) In the triangles of ΔXWZ & ΔYWZ,



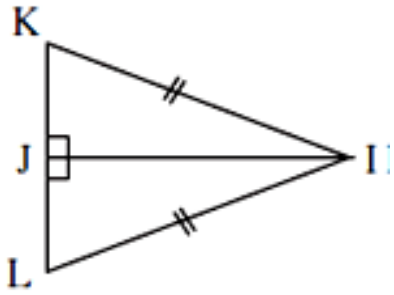
∵ Side XW = Side YW (Given)

∵ ∠XWZ =∠YWZ (Given)

∵ Side WZ is common between two Δs. (Given)

∴ By the property of **SAS**, it is proved that ΔXWZ≅ΔYWZ

(ii) In the triangles of ΔKJI & ΔLJI,

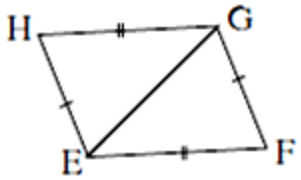


∵ Side KI = Side LI (Given Hypotenuse)

∵ Side IJ is same in both the triangles.

∴ By the property of **Hypotenuse Side Test**, it is proved that ΔKJI≅ΔLJI.

(iii) In the triangles of ΔHEG & ΔFGE,



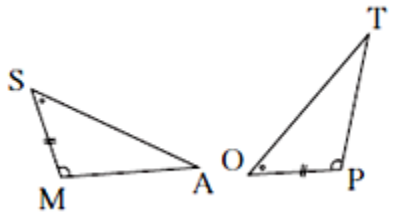
∵ Side HG = Side FE (Given)

∵ Side HE = Side FG (Given)

∵ Side EG is common between two Δs. (Given)

∴ By the property of **SSS**, it is proved that ΔHEG≅ΔFGE.

(iv) In the triangles of ΔSMA & ΔOPT,



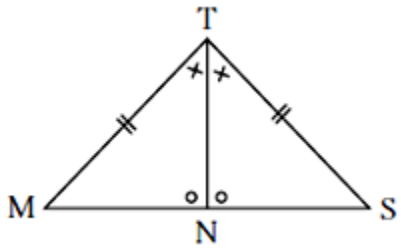
∵ ∠MSA=∠POT (Given)

∵ Side SM = Side OP (Given)

∵ ∠AMS=∠TPO (Given)

∴ By the property of **ASA**, it is proved that ΔSMA≅ΔOPT.

(v) In the triangles of ΔMTN & ΔSTN,



∵ ∠MNT=∠SNT (Given)

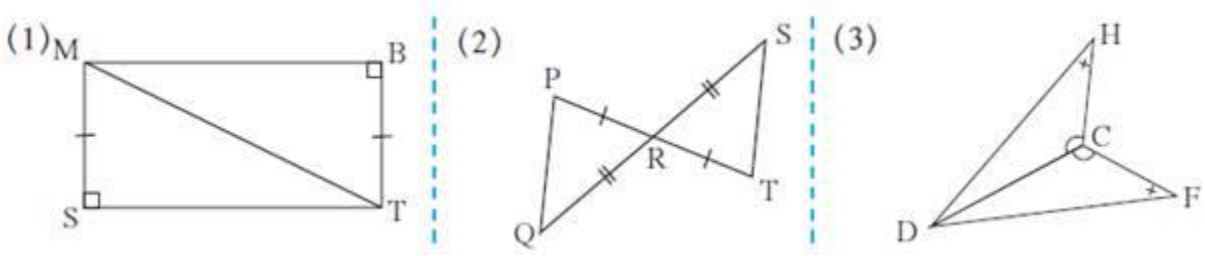
∵ Side TN is common between two Δs. (Given)

∵ ∠MTN=∠STN (Given)

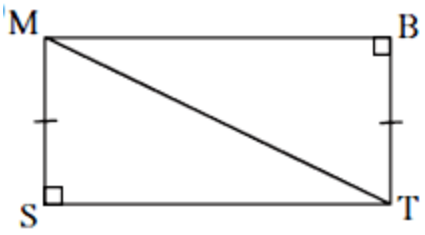
∴ By the property of **ASA**, it is proved that ΔMTN≅ΔSTN.

Practice set 13.2

Q. 1. In each pair of triangles given below, parts shown by identical marks are congruent. State the test and the one to one correspondence of vertices by which triangles in each pair are congruent and remaining congruent parts.



Answer : (i) In the triangles of ΔMST & ΔTBM,



∵ Side MT = Side TM (Given Hypotenuse is common between two Δs)

∵ Side MS = Side TM

∴ By the property of **Hypotenuse Side Test**, it is proved that ΔMST≅ΔTBM.

∴ The observations are as

Side ST = Side BM

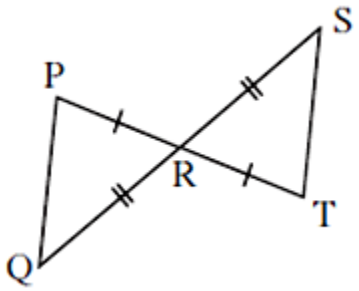
∠MST =∠TBM

MST TBM

∠SMT =∠BTM

∠STM =∠BMT.

(ii) In the triangles of ΔPRQ & ΔTRS,



∵ Side PR = Side TR (Given)

∵ ∠PRQ=∠TRS (Given vertically opposite angles)

∵ Side SR = Side TR (Given)

∴ By the property of **SAS**, it is proved that ΔPRQ ≅ ΔTRS.

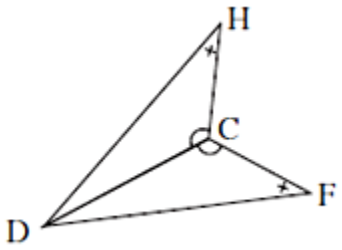
∴ The observations are as

Side PQ = Side TS

∠QPR = ∠RTS

∠RQP =∠RST

(iii) In the triangles of ΔDCH & ΔDCF,



∵ ∠DCH=∠DCF (Given)

∵ ∠DHC=∠DFC (Given)

∵ Side DC is common between two Δs. (Given)

∴ By the property of **AAS**, it is proved that ΔDCH≅ΔDCF.

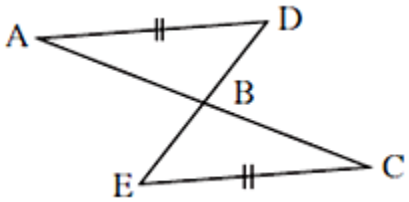
∴ The observations are as

Side HC = Side FC

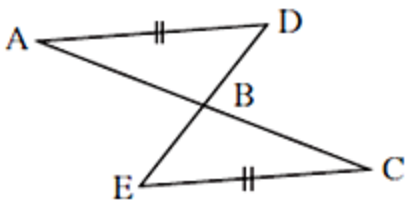
Side DH = Side DF

∠CDH = ∠CDF.

Q. 2. In the adjacent figure, segment AD = Segment EC. Which additional information is needed to show that ΔABD and ΔEBC will be congruent by A-A-S test?



Answer : In the triangles of ΔABD & ΔEBC,



∠ABD = ∠EBC [Vertically opposite angles]

∵ Side AD = Side EC (Given)

∴ In order to show the congruence between two Δs ΔABD & ΔEBC by the property of **AAS**, some information has to be required:-

Either AD ‖EC or ∠BAD = ∠BEC or ∠BDA = ∠BCE

Hence proved.

Compound Interest

Practice set 14.1

Q. 1. Find the amount and the compound interest.

No.	Principal (₹)	Rate (p.c.p.a.)	Duration (years)
1	2000	5	2
2	5000	8	3
3	4000	7.5	2

Answer : (a) Principal = 2000/-, Rate = 5% (p.c.p.a), Duration (n) = 2 years

$\because A = P\left(1 + \frac{R}{100}\right)^n$

$\therefore A = 2000\left(1 + \frac{5}{100}\right)_2$

$A = 2000\ (1+0.05)^2$

$A = 2000\ (1.05)^2$

$A = 2000\ (1.1025)$

$\therefore A = 2205/-$

$\therefore C.I = A - P$

$\therefore C.I = 2205 - 2000$

C.I. = 205/-

∴ Amount is 2205/- and Compound interest is 205/- .

b. Principal = 5000/-, Rate = 8% (p.c.p.a), Duration (n) = 3 years

$$\because A = P\left(1 + \frac{R}{100}\right)^n$$

$$\therefore A = 5000\left(1 + \frac{8}{100}\right)_3$$

$A = 5000\ (1 + 0.08)^3$

$A = 5000\ (1.08)^3$

$A = 5000\ (1.259712)$

∴ A= 6298.56/-

∵ C.I. = A - P

∴ C.I. = 6298.56 - 5000

C.I. = 1298.56/-

∴ Amount is 6298.56/- and Compound interest is 1298.56/- .

c. Principal = 4000/-, Rate = 7.5% (p.c.p.a), Duration (n) = 2 years

$$\because A = P\left(1 + \frac{R}{100}\right)^n$$

∴ $A = 4000\ (1 + 0.075)^2$

$A = 4000\ (1.075)^2$

$A = 4000\ (1.155625)$

∴ A= 4622.5/-

∵ C.I. = A - P

∴ C.I. = 4622.5 - 4000

C.I. = 622.5/-

∴ Amount is 4622.5/- and Compound interest is 622.5/- .

Q. 2. Sameerrao has taken a loan of ₹ 12500 at a rate of 12 p.c.p.a. for 3 years. If the interest is compounded annually then how many rupees should he pay to clear his loan?

Answer : Principal = 12500/-, Rate = 12% (p.c.p.a), Duration (n) = 3 years

$$\because A = P\left(1 + \frac{R}{100}\right)^n$$

$$\therefore A = 12500\left(1 + \frac{12}{100}\right)_3$$

$A = 12500\ (1+ 0.12)^3$

$A = 12500\ (1.12)^3$

$A = 12500\ (1.404928)$

∴ A = 17561.60/-

∴ Sameerao has to pay an amount of 17561.60/- .

Q. 3. To start a business Shalaka has taken a loan of ₹ 8000 at a rate of $10\frac{1}{2}$ p.c.p.a. After two years how much compound interest will she have to pay?

Answer : Principal = 8000/-, Rate = 10.5% (p.c.p.a), Duration (n) = 2 years

$$\because A = P\left(1 + \frac{R}{100}\right)^n$$

$$\therefore A = 8000\left(1 + \frac{10.5}{100}\right)^2$$

$A = 8000\ (1+0.105)^2$

$A = 8000\ (1.105)^2$

$A = 8000\ (1.221025)$

∴ A = 9768.2/-

$\because$ C.I. = A - P

$\therefore$ C.I. = 9768.2 - 8000

C.I. = 1768.2/-

$\therefore$ Shalaka has to pay a compound interest of 1768.2/- .

Practice set 14.2

Q. 1. On the construction work of a flyover bridge there were 320 workers initially. The number of workers were increased by 25% every year. Find the number of workers after 2 years.

Answer : Present number of workers = 320 workers, Rate (increase) = 25% (p.c.p.a), Duration (n) = 2 years

$$\because A = P\left(1 + \frac{R}{100}\right)^n$$

$$\therefore A = 320\left(1 + \frac{25}{100}\right)^2$$

$A = 320\ (1+0.25)^2$

$A = 320\ (1.25)^2$

$A = 320\ (1.5625)$

$\therefore A = 500/-$

$\therefore$ The number of workers after 2 years will be 500.

Q. 2. A shepherd has 200 sheep with him. Find the number of sheeps with him after 3 years if the increase in number of sheeps is 8% every year.

Answer : Present number of sheeps (P) = 200 sheeps, Rate = 8% (p.c.p.a), Duration (n) = 3 years

$$\because A = P\left(1 + \frac{R}{100}\right)^n$$

$$\therefore A = 200\left(1+\frac{8}{100}\right)^3$$

$A = 200\ (1+0.08)^3$

$A = 200\ (1.08)^3$

$A = 200\ (1.259712)$

$\therefore A = 251.9424$

A = 252 sheeps (Rounded off)

∴ The number of sheeps after 3 years is 252.

Q. 3. In a forest there are 40,000 trees. Find the expected number of trees after 3 years if the objective is to increase the number at the rate 5% per year.

Answer : Present Trees (P) = 40000 trees, Rate = 5% (p.c.p.a), Duration (n) = 3 years

$$\because A = P\left(1+\frac{R}{100}\right)^n$$

$$\therefore A = 40000\left(1+\frac{5}{100}\right)^3$$

$A = 40000\ (1+0.05)^3$

$A = 40000\ (1.05)^3$

$A = 40000\ (1.157625)$

∴A= 46305/-

∴ The expected number of trees after 3 years will be 46305.

Q. 4. The cost price of a machine is 2,50,000. If the rate of depreciation is 10% per year find the depreciation in price of the machine after two years.

Answer : Principal = 250000/-, Rate (decrement) = 10% (p.c.p.a), Duration (n) = 2 years

$$\because A = P\left(1+\frac{R}{100}\right)^n$$

$$\therefore A = 250000 \left(1 + \frac{-10}{100}\right)^2$$

$$A = 250000 \left(1 - \frac{10}{100}\right)^2$$

$A = 250000 (1-0.1)^2$

$A = 250000 (0.9)^2$

$A = 250000 (0.81)$

∴ A= 202500/-

∵ C.I. = A - P

∴ Depreciation in Price (C.I.) = 202500 – 250000

Depreciation in Price (C.I.) = -47500/-

(-) sign denotes the depreciation in amount.

∴ Depreciation in Price of the machine after 2 years will be 47500/- .

Q. 5. Find the compound interest if the amount of a certain principal after two years is
₹ 4036.80 at the rate of 16 p.c.p.a.

Answer : Amount= 4036.80/-, Rate = 16% (p.c.p.a), Duration (n) = 2 years

$$\because A = P \left(1 + \frac{R}{100}\right)^n$$

$$\therefore 4036.80 = P \left(1 + \frac{16}{100}\right)^2$$

$4036.80 = P (1+0.16)^2$

$4036.80 = P (1.16)^2$

$4036.80 = P (1.3456)$

∴ P = 3000/-

∵ C.I. = A - P

∴ C.I. = 4036.80 - 3000

C.I. = 1036.80/-

∴ Compound interest is 1036.80/- .

Q. 6. A loan of ₹ 15000 was taken on compound interest. If the rate of compound interest is 12 p.c.p.a. find the amount to settle the loan after 3 years.

Answer : Principal = 15000/-, Rate = 12% (p.c.p.a), Duration (n) = 3 years

$$\because A = P\left(1 + \frac{R}{100}\right)^n$$

$$\therefore A = 15000\left(1 + \frac{12}{100}\right)_3$$

$A = 15000\ (1+0.12)^3$

$A = 15000\ (1.12)^3$

A = 15000 (1.404928)

∴ A= 21073.92/-

∴ Amount to settle the loan after 3 years is 21073.92/- .

Q. 7. A principal amounts to ₹ 13924 in 2 years by compound interest at 18 p.c.p.a. Find the principal.

Answer : Amount= 13924/-, Rate = 18% (p.c.p.a), Duration (n) = 2 years

$$\because A = P\left(1 + \frac{R}{100}\right)^n$$

$$\therefore 13924 = P\left(1 + \frac{18}{100}\right)_2$$

$13924 = P\ (1+0.18)^2$

$13924 = P\ (1.18)^2$

13924 = P (1.3924)

∴ A = 10000/-

∴ The principal is 10000/- .

Q. 8. The population of a suburb is 16000. Find the rate of increase in the population if the population after two years is 17640.

Answer : Present Population (P) = 16000/-, Rate = R% (p.c.p.a), Duration (n) = 2 years

Population after 2 years (A) =17640/-

$$\because A = P\left(1 + \frac{R}{100}\right)^n$$

$$\therefore 17640 = 16000\left(1 + \frac{R}{100}\right)^2$$

$$\frac{17640}{16000} = 1 + \frac{R}{100}$$

$$\frac{17640}{16000} - 1 = \frac{R}{100}$$

$$\frac{R}{100} = \frac{1640}{16000}$$

∴ R = 5%

∴ The population of that suburb will increase at the rate of 5%.

Q. 9. In how many years ₹ 700 will amount to ₹ 847 at a compound interest rate of 10 p.c.p.a.

Answer : Principal = 700/-, Rate = 10% (p.c.p.a), Duration (n) = n years Amount = 847/-

$$\because A = P\left(1 + \frac{R}{100}\right)^n$$

$$\therefore 847 = 700\left(1 + \frac{10}{100}\right)^n$$

$$\frac{847}{700} = \left(1 + \frac{10}{100}\right)^n$$

1.21 = $(1 + 0.1)^n$

1.21 = $(1.1)^n$

∴ n = 2 years

∴ The number of years required to gain an amount of 847/- from a principal of 700/- is 2.

Q. 10. Find the difference between simple interest and compound interest on ₹ 20000 at 8 p.c.p.a.

Answer : Principal = 20000/-, Rate = 8% (p.c.p.a), Duration (n) = n years

∵ For the first year, compound interest and simple interest will be same, so it will vary from second year, therefore assuming the duration as 2 years in the same case.

$$\because A = P\left(1 + \frac{R}{100}\right)^n$$

$$\therefore A = 20000\left(1 + \frac{8}{100}\right)^2$$

A = 20000 $(1+0.08)^2$

A = 20000 $(1.08)^2$

A = 20000 (1.1664)

∴ A = 23328/-

∵ C.I. = A - P

C.I. = 23328 – 20000

∴ C.I. = 3328/-

$$\because S.I. = \frac{P \times R \times n}{100}$$

$$\therefore S.I. = \frac{20000 \times 8 \times 2}{100}$$

S.I. = 3200/-

∴ Difference = C.I. – S.I.

Difference = 3328 – 3200

Difference = 128 /-

∴ The difference between simple interest and compound interest is 128/- .

Area

Practice set 15.1

Q. 1. If the base of a parallelogram is 18 cm and its height is 11 cm, find its area.

Answer : We know that,

Area of parallelogram = base × height

Given that base of parallelogram = 18cm

And, the height of parallelogram = 11cm

Area of parallelogram = 18 × 11

= **198 sq cm**

Q. 2. If the area of a parallelogram is 29.6 sq cm and its base is 8 cm, find its height.

Answer : We know that,

Area of parallelogram = base × height

$$\Rightarrow \text{height} = \frac{\text{area of parallelogram}}{\text{base}}$$

Given that area of parallelogram = 29.6cm

And, the base of parallelogram = 8cm

$$\Rightarrow \text{height} = \frac{29.6}{8}$$

= 3.7 cm

Q. 3. Area of a parallelogram is 83.2 sq cm. If its height is 6.4 cm, find the length of its base.

Answer : We know that,

Area of parallelogram = base × height

$$\Rightarrow \text{lenght of base} = \frac{\text{area of parallelogram}}{\text{height}}$$

Given that area of parallelogram = 83.2cm

And, the height of parallelogram = 6.4cm

$$\Rightarrow \text{lenght of base} = \frac{83.2}{6.4}$$

= 13 cm

Practice set 15.2

Q. 1. Lengths of the diagonals of a rhombus are 15cm and 24 cm, find its area.

Answer : We know that,

Area of rhombus = $\frac{1}{2}$×product of the length of diagonals

Given that length of one of the diagonals is 15cm

And the other is 24cm

⇒ Area of rhombus = 1/2×15×24

= 180 sq cm

Q. 2. Length of the diagonals of a rhombus are 16.5 cm and 14.2 cm, find its area.

Answer : We know that,

Area of rhombus = $\frac{1}{2}$ × product of the length of diagonals

Given that length of one of the diagonals is 16.5cm

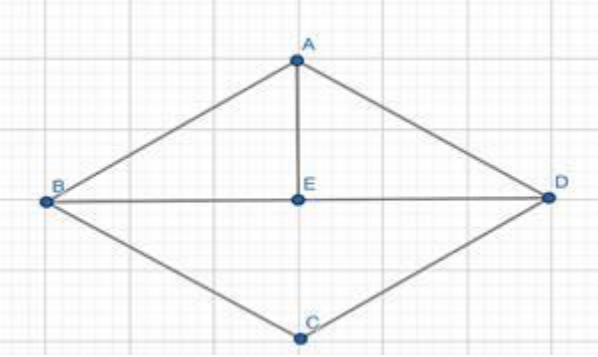
And the other is 14.2cm

$$\Rightarrow \text{ area of rhombus } = \frac{1}{2} \times 16.5 \times 14.2$$

= 117.5 sq cm

Q. 3. If the perimeter of a rhombus is 100 cm and length of one diagonal is 48 cm, what is the area of the quadrilateral?

Answer :



We know that perimeter of rhombus = 4 × side of the rhombus

Given perimeter of rhombus = 100cm

Side AB of rhombus = 100/4 = 25cm

Let BD be the diagonal given = 48cm

We know that diagonals of a rhombus bisect each other

∴ E is the midpoint of BD

⇒ BE = 24 cm

Now, ∆ABE is the right angle triangle at E

∴ Using Pythagoras theorem,

$AE^2 + BE^2 = AB^2$

$$AE = \sqrt{AB^2 - BE^2}$$

$= \sqrt{25^2 - 24^2}$

AE = 7cm

Area of rhombus = 4 × area of ∆ABE

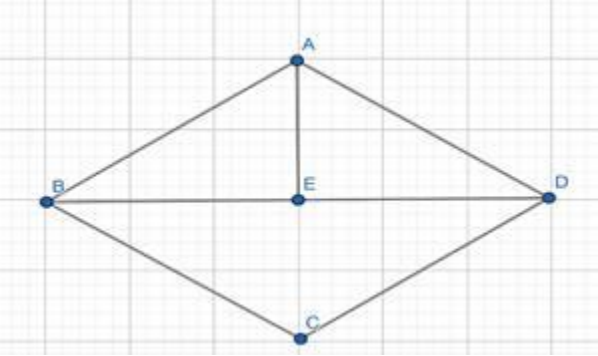
$= 4 \times \frac{1}{2} \times BE \times AE$

= 2 × 24 × 7

= 336 sq cm

Q. 4. If the length of a diagonal of a rhombus is 30 cm and its area is 240 sq cm, find its perimeter.

Answer :



We know that,

$\text{Area of rhombus} = \frac{1}{2} \times \text{product of the length of diagonals}$

Given that area of rhombus = 240 sq cm

And diagonal BD = 30cm

$240 = \frac{1}{2} \times 30 \times \text{other diagonal, AC}$

⇒ other diagonal, AC = 240 × 2 ÷ 30

AC = 16cm

We know that diagonals of a rhombus bisect each other,

So let E be the midpoint of their point of intersection.

Now, AE = 16/2 = 8cm

And BE = 30/2 = 15cm

Now, ∆ABE is right angle triangle

∴ Using Pythagoras theorem,

$AE^2 + BE^2 = AB^2$

$$\Rightarrow AB = \sqrt{AE^2 + BE^2}$$

$$\Rightarrow AB = \sqrt{8^2 + 15^2}$$

⇒ AB = 17cm

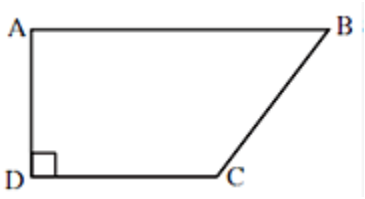
We know that perimeter of rhombus = 4 × side of rhombus

= 4 × 17

= 68 cm

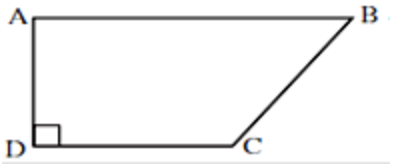
Practice set 15.3

Q. 1. In □ ABCD, l (AB) = 13 cm, l (DC) = 9 cm, l (AD) = 8 cm, find the area of□ABCD.



Answer : We know that,

$$\text{area of trapezium} = \frac{1}{2} \times \text{sum of lenght of parallel sides} \times \text{distance between parallel sides}$$



From the fig. it is clear that AB and CD are the 2 parallel sides

Given that AB = 13cm, CD = 9cm and AD = 8cm

Here sum of parallel sides, i.e., AB + CD = 13 + 9 = 22

Hence,

$$\text{area of trapezium} = \frac{1}{2} \times \text{sum of lenght of parallel sides} \times \text{distance between parallel sides}$$

$$\text{area of trapezium ABCD} = \frac{1}{2} \times 22 \times 8$$

= 88 sq cm

Q. 2. Length of the two parallel sides of a trapezium is 8.5 cm and 11.5 cm respectively and its height is 4.2 cm, find its area.

Answer : We know that,

$$\text{area of trapezium} = \frac{1}{2} \times \text{sum of lenght of parallel sides} \times \text{distance between parallel sides}$$

Given that length of 2 parallel sides = 8.5cm and 11.5cm

⇒ Sum of parallel sides = 8.5 + 11.5 = 20

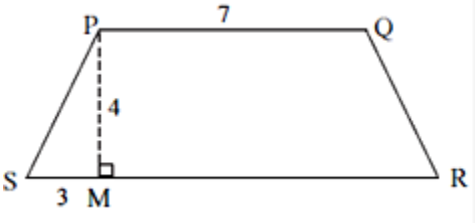
And, distance between them = 4.2cm

$$\text{area of trapezium ABCD} = \frac{1}{2} \times 20 \times 4.2$$

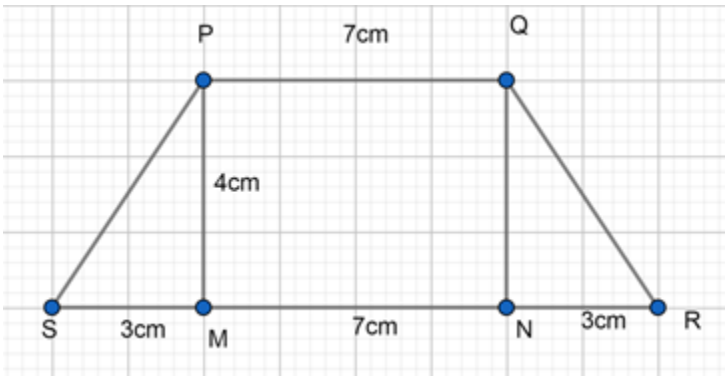
= 42 sq cm

Q. 3. □PQRS is an isosceles trapezium l (PQ) = 7 cm. seg PM ⊥ seg SR, l(SM) = 3 cm,

Distance between two parallel sides is 4 cm, find the area of PQRS



Answer :



Given that the trapezium is isosceles. Therefore from the fig. it is clear that SM = NR = 3cm

Also, PQ = MN = 7cm

Now, length of side SR = 3 + 7 + 3 = 13cm

Therefore, the sum of parallel sides of trapezium = 7 + 13 = 20

And the distance between them = 4 cm

$$\text{area of trapezium} = \frac{1}{2} \times \text{sum of lenght of parallel sides} \times \text{distance between parallel sides}$$

$$\text{area of trapezium ABCD} = \frac{1}{2} \times 20 \times 4$$

= 40 sq cm

Practice set 15.4

Q. 1. Sides of a triangle are cm 45 cm, 39 cm, and 42 cm, find its area.

Answer : To find the area of a triangle whose three sides are given we have the Heron's formula

$$\Delta = \sqrt{s(s-a)(s-b)(s-c)}$$

Where, Δ is an area of a triangle.

$$s = \text{semi perimeter of triangle}$$

$$= \frac{a+b+c}{2}$$

And a, b, c are the three sides of the triangle

In this question, we have the three sides of the triangle which are 45cm, 39cm, and 42cm

$$\Rightarrow s = \frac{45+39+42}{2}$$

= 63m

S - a = 63 - 45 = 18

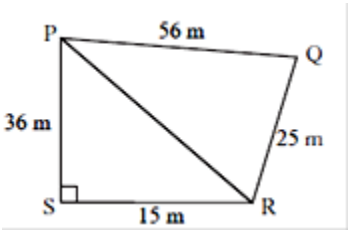
S - b = 63 - 39 = 24

S - c = 63 - 42 = 21

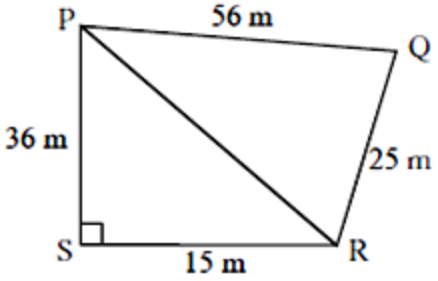
Hence $\text{area of triangle} = \sqrt{63 \times 18 \times 24 \times 21}$

= 756 sq m

Q. 2. Look at the measures shown in the adjacent figure and find the area of□PQRS.



Answer : In the given fig. Δ PRS is right angle triangle at S



Therefore, using Pythagoras theorem,

$PS^2 + SR^2 = PR^2$

$\Rightarrow 36^2 + 15^2 = PR^2$

$\Rightarrow PR = \sqrt{36^2 + 15^2}$

= 39m

Now,

Area of ∆PRS = $\frac{1}{2}$ × base × height

= $\frac{1}{2}$ × PS × SR

= $\frac{1}{2}$ × 36 × 15

= 270 sq m

Now the area of triangle PQR, using heron's formula

Here, sides are 56 cm, 25 cm, and 39 cm

Therefore,

$$s = \frac{56 + 25 + 39}{2}$$

S = 60

S – a = 60 – 56 = 4

S – b = 60 – 25 = 35

S – c = 60 – 39 = 35

$\text{area}, \Delta = \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{60 \times 35 \times 4 \times 21}$

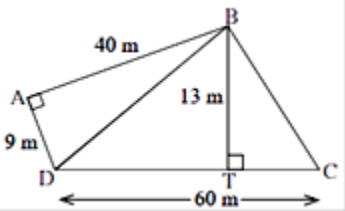
= 420 sq m

Hence, the area of the quadrilateral PQRS = area of ∆PQR + ∆PSR

= 420 + 270

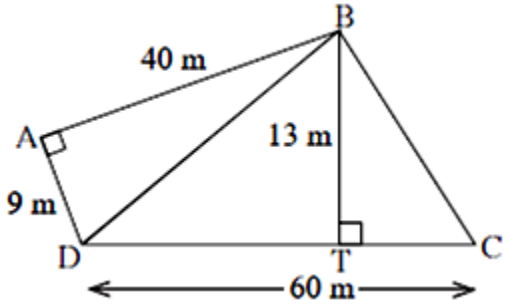
= 690 sq m

Q. 3. Some measures are given in the adjacent figure, find the area of□ ABCD.



Answer : In the given fig. ABD is right angled triangle at A,

Given that AB = 40cm, and AD = 9cm



Therefore, the area of triangle ABD

$= \frac{1}{2} \times \text{ base } \times \text{ height}$

$= \frac{1}{2} \times \text{AD} \times \text{AB}$

$$= \frac{1}{2} \times 40 \times 9$$

= 180 sq. m

Now, the area of triangle, ∆BCD

$$= \frac{1}{2} \times \text{ base } \times \text{ height}$$

$$= \frac{1}{2} \times CD \times BT$$

$$= \frac{1}{2} \times 60 \times 13$$

$$= 390 \text{ sq m}$$

Now area of quadrilateral ABCD,

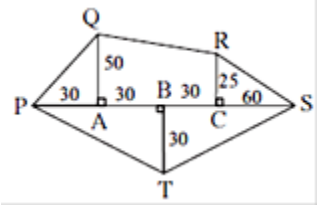
= 180 + 390

= 570 sq. m

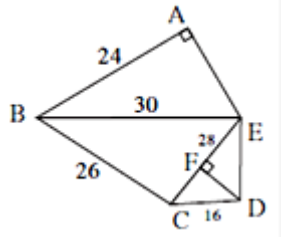
Practice set 15.5

Q. 1. Find the areas of given plots. (All measures are in meters.)

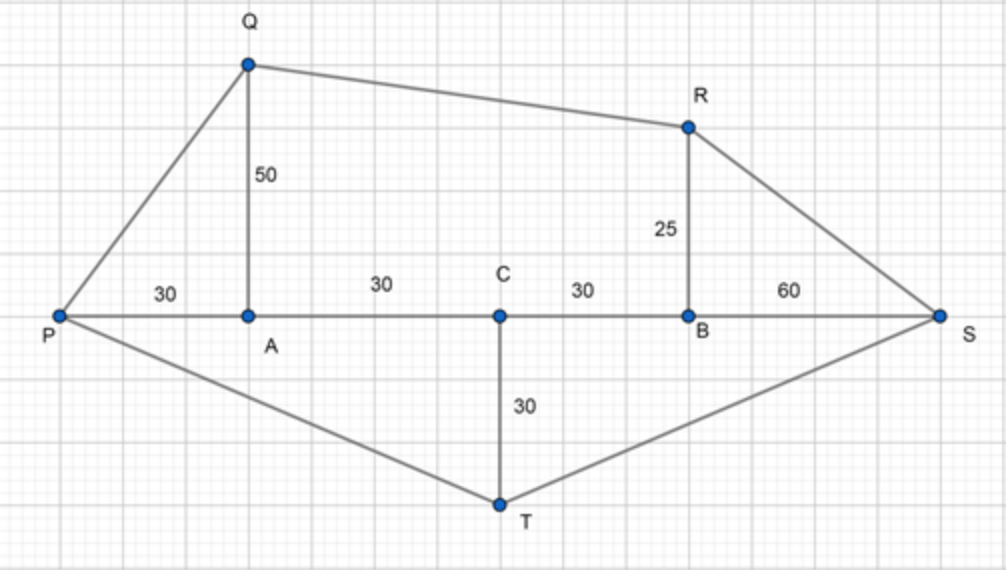
(1)



(2)



Answer : (1)



Given that,

PA = 30m, AC = 30m, and CT = 30m

PC = PA + AC = 30 + 30 = 60m

∆PCT is right angled triangle at C

Area of ∆PCT = 1/2 × PC × CT

$$= \frac{1}{2} \times 30 \times 60$$

= 900m……(1)

In, ∆SCT is right angled triangle at C

SB = 60m, BC = 30m, and CT = 30m

Area of ∆SCT = 1/2× base × height

$$= \frac{1}{2} \times SC \times CT$$

$= \frac{1}{2} \times 30 \times 90$

= 1350m…….(2)

In ∆SBR is right angled triangle at B

SB = 60m, BR = 25m

Area of ∆SBR = 1/2 × base × height

$= \frac{1}{2} \times SB \times BR$

$= \frac{1}{2} \times 60 \times 25$

= 750m……..(3)

In ∆APQ is right angled triangle at A

AP = 30m, AQ = 50m

Area of ∆APQ = $\frac{1}{2}$ × base × height

$= \frac{1}{2} \times AP \times AQ$

$= \frac{1}{2} \times 50 \times 30$

= 750m……(4)

Now, in trapezium ABRQ

AQ and RB are the 2 parallel sides

Also, AQ = 50m and BR = 25m

⇒ AQ + BR = 75m

The distance between AQ and BR = 60m

Hence,

$$\text{area of trapezium ABRQ} = \frac{1}{2} \times \text{sum of lenght of parallel sides} \times \text{distance between parallel sides}$$

$$= \frac{1}{2} \times 60 \times 75$$

= 2250 sq. m…….(5)

Now area of quadrilateral PQRST = (1)+(2)+(3)+(4)+(5)

= 900+1350+750+750+2250

= 6000 sq m

(2) The data for this question is inadequate.

Practice set 15.6

Q. 1. Radii of the circles are given below, find their areas.

(1) 28 cm
(2) 10.5 cm
(3) 17.5 cm

Answer : (1) We know that

area of circle = πr^2

Here given that radius of the circle is 28cm

$\therefore \text{area of circle} = \pi(28^2)$

= 784π sq. cm

= 2464 sq. cm

(2) Here the radius of the circle = 10.5 cm

$\therefore \text{area of circle} = \pi(10.5^2)$

= 110.25π sq. cm

= 346.5 sq. cm

(3) Here the radius of the circle is 17.5cm

$\therefore \text{area of the circle} = \pi(17.5^2)$

= 306.25π sq. cm

= 961.625 sq. cm

Q. 2. Areas of some circles are given below find their diameters.

(1) 176 sq cm
(2) 394.24 sq cm
(3) 12474 sq cm

Answer : (1) We know that area of circle = πr^2

Here area of circle = 176cm

$$\Rightarrow 176 = \pi r^2$$

$$\Rightarrow r^2 = \frac{176}{\pi}$$

$$\Rightarrow r = \sqrt{56}\text{cm}$$

$$\Rightarrow d = 2r = 2\left(\sqrt{56}\right)\text{cm}$$

(2) Here area of circle = 394.24 sq. cm

$$\Rightarrow \pi r^2 = 394.24$$

$$\Rightarrow r^2 = 125.49$$

$\Rightarrow$ r = 11.2 cm

D = 2r = 2(11.20) = 22.4 cm

(3) Here area of circle = 12474 sq. cm

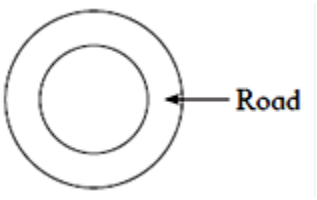
$$\Rightarrow \pi r^2 = 12474$$

$$\Rightarrow r^2 = 3970$$

$$\Rightarrow r = 63\text{cm}$$

D = 2r = 2(63) = 126cm

Q. 3. The diameter of the circular garden is 42 m. There is a 3.5 m wide road around the garden. Find the area of the road.



Answer : Given that the diameter of the garden (inner circle) = 42m

Therefore, inner radius, r = 21m

Also, given that road surrounds the garden and is 3.5 m wide.

Therefore, the diameter of the road (outer circle) will be = 42 + 2(3.5) = 49m

And then outer radius, R = 24.5m

Now, the area of road = area of the outer circle – area of the inner circle

Area of outer circle = πR^2

= $\pi(24.5)^2$

= 1885 sq. m

area of inner circle = πr^2

= $\pi(21)^2$

= 1385 sq. m

Hence, area of road = 1885-1385 = 500 sq. m

Q. 4. Find the area of the circle if its circumference is 88 cm.

Answer : We know that,

The Circumference of a circle = $2\pi r$

Given circumference = 88cm

$\Rightarrow 2\pi r = 88$

r = 14cm

Now, area of circle = πr^2

$= \pi(14)^2$

$= 615.75$ sq. cm

Surface Area And Volume

Practice set 16.1

Q. 1. Find the volume of a box if its length, breadth, and height are 20 cm, 10.5 cm and 8 cm respectively.

Answer : Given:

Length = 20 cm

Breadth = 10.5 cm

Height = 8 cm

The box is nothing but a cuboid

Volume of cuboid = l × b × h

= 20 × 10.5 × 8

= 1680 cm^3

∴The volume of the box is 1680 cm^3

Q. 2. A cuboid shape soap bar has volume 150 cc. Find its thickness if its length is 10 cm and breadth is 5 cm.

Answer : Given:

Volume of soap bar = 150 cc

Length = 10 cm

Breadth = 5 cm

Height = ?

The volume of cuboid = l × b × h

150 = 10 × 5 × h

$$h = \frac{150}{10 \times 5}$$

$$h = \frac{150}{50}$$

h = 3 cm

The height of soap bar is 3 cm

Q. 3. How many bricks of length 25 cm, breadth 15 cm, and height 10 cm are required to build a wall of length 6 m, height 2.5 m, and breadth 0.5 m?

Answer : Given:

For one brick,

Length = 25 cm, breadth = 15 cm, height = 10 cm

For wall,

Length = 6 m = 6 × 100 cm = 600 cm

Breadth = 0.5 m = 0.5 × 100 = 50 cm

Height = 2.5 m 2.5 × 100 = 250 cm

Now, the number of bricks required to build a wall is given by,

$$n = \frac{\text{Volume of wall}}{\text{Volume of one brick}}$$

Both wall and brick are cuboidal in shape.

Hence, the volume is given by,

The volume of wall = l × b × h

= 600 × 50 × 250

= 7500000 cm^3

The volume of one brick = l × b × h

= 25 × 15 × 10

= 3750 cm^3

$\therefore n = \frac{7500000}{3750}$ = 2000 bricks

∴ 2000 bricks are required to build a wall of dimensions 6 × 0.5 × 2 m.

Q. 4. For rainwater harvesting, a tank of length 10 m, breadth 6 m, and depth 3m are built. What is the capacity of the tank? How many liters of water can it hold?

Answer : Given:

Length of tank = 10 m

Breadth of tank = 6 m

The height of tank = 3 m

Capacity is nothing but the volume of the tank.

As for length, breadth and height are given, the tank is cuboidal in shape.

The volume of tank = l × b × h

= 10 × 6 × 3

= 180 m^3

The capacity of the tank is 180 m^3

Now,

1 m^3 = 1000 litre

∴180 m^3 = 180 × 1000 = 180,000 litre

∴ The tank can hold 180,000 litres of water

Practice set 16.2

Q. 1. In each example given below, the radius of the base of a cylinder and its height are given. Then find the curved surface area and total surface area.

(1) r = 7 cm, h = 10 cm
(2) r = 1.4 cm, h = 2.1 cm
(3) r = 2.5 cm, h = 7 cm

(4) r = 70 cm, h = 1.4 cm
(5) r = 4.2 cm, h = 14 cm

Answer : Curved surface area of cylinder(CSA) = 2πrh

Total surface area of cylinder(TSA) = 2πr(h+r)

1. r = 7 cm, h = 10 cm

CSA = 2πrh

= 2 × 3.14 × 7 × 10

= 440 cm^2

TSA = 2πr(h+r)

= 2 × 3.14 × 7(10+7)

= 748 cm^2

2. r = 1.4 cm, h = 2.1 cm

CSA = 2πrh

= 2 × 3.14 × 1.4 × 2.1

= 18.48 cm^2

TSA = 2πr(h+r)

= 2 × 3.14 × 1.4(2.1+1.4)

= 30.8 cm^2

3. r = 2.5 cm, h = 7 cm

CSA = 2πrh

= 2 × 3.14 × 2.5 × 7

= 110 cm^2

TSA = 2πr(h + r)

= 2 × 3.14 × 2.5(7+2.5)

= 149.29 cm^2

4. r = 70 cm, h = 1.4 cm

CSA = 2πrh

= 2 × 3.14 × 70 × 1.4

= 616 cm^2

TSA = 2πr(h+r)

= 2 × 3.14 × 70(70+1.4)

= 31416 cm^2

5. r = 4.2 cm, h = 14 cm

CSA = 2πrh

= 2 × 3.14 × 4.2 × 14

= 369.6 cm^2

TSA = 2πr(h + r)

= 2 × 3.14 × 4.2(4.2+14)

= 480.48 cm^2

Q. 2. Find the total surface area of a closed cylindrical drum if its diameter is 50 cm and height is 45 cm. (π = 3.14)

Answer : Total surface area of cylinder(TSA) **=** 2πr(h+r)

Here, $r = \frac{\text{diameter}}{2} = \frac{50}{2} = 25 \text{ cm}$

h = 45 cm

Total Surface Area = 2 × 3.14 × 25(45+25)

= 10990 cm^2

Total Surface Area of Cylinder is 10990 cm^2

Q. 3. Find the area of base and radius of a cylinder if its curved surface area is 660 sq. cm and height is 21 cm

Answer : Area of base of cylinder = $\pi \times r^2$

Curved surface area of cylinder(CSA) = $2\pi \times r \times h$

Here, CSA = 660 sq. cm, h = 21 cm, r =?

CSA = $2\pi \times r \times h$

660 = $2\pi \times r \times 21$ $r = \frac{660}{2\pi \times 21}$

$$r = \frac{660}{2 \times 3.14 \times 21}$$

r = 5 cm

Area of base = $\pi \times r^2$

= $3.14 \times 25 \times 25$

= 78.5 cm^2

Area of the base is 78.5 cm^2 and radius is 5 cm

Q. 4. Find the area of the sheet required to make a cylindrical container which is open at one side and whose diameter is 28 cm and height is 20 cm. Find the approximate area of the sheet required to make a lid of height 2 cm for this container.

Answer : Given:

Diameter = 28 cm

$$\text{Radius} = \frac{\text{diameter}}{2} = \frac{28}{2} = 14 \text{ cm} \quad \text{height} = 2 \text{ cm}$$

As the cylindrical container is open at one side, Total area of a cylinder is given as,

Area of Cylinder = area of the base + curved surface area

Area of base **=** $\pi \times r^2$

Curved surface area = $2\pi \times r \times h$

∴ Area of Cylinder = $\pi \times r^2 + 2\pi \times r \times h$

$= 3.14 \times 14^2 + 2 \times 3.14 \times 14 \times 20$

$= 615.44 + 1759.3$

$= 2376\ cm^2$

Now, the area of the sheet required to make a cylindrical container is nothing but an area of the cylinder.

∴ Area of Sheet = $2376\ cm^2$

Now, we need to make a lid for the open cylinder. Given the height of the lid is 2 cm.

As the lid is for the cylinder, it's radius will be the radius of the cylinder.

Hence, For lid,

Radius = 14 cm

Height = 2 cm

Area of lid = area of the base of the lead + curved surface area

$= \pi \times r^2 + 2\pi \times r \times h$

$= 3.14 \times 14^2 + 2 \times 3.14 \times 14 \times 2$

$= 615.44 + 175.84$

$= 792\ cm^2$

$\therefore$ Area of Sheet $= 2376\ cm^2$

$\therefore$ Area of Lid $= 792\ cm^2$

Practice set 16.3

Q. 1. Find the volume of the cylinder if height (h) and radius of the base (r) are as given below.

(1) r = 10.5 cm, h = 8 cm
(2) r = 2.5 m, h = 7 m
(3) r = 4.2 cm, h = 5 cm
(4) r = 5.6 cm, h = 5 cm

Answer : Volume of cylinder = $\pi \times r^2 \times h$

1. r = 10.5 cm, h = 8 cm

Volume $= \pi \times r^2 \times h$

$= 3.14 \times 10.5^2 \times 8$

$= 2772\ cm^3$

2. r = 2.5 m, h = 7 m

Volume $= \pi \times r^2 \times h$

$= 3.14 \times 2.5^2 \times 7$

$= 137.5\ cm^3$

3. r = 4.2 cm, h = 5 cm

Volume $= \pi \times r^2 \times h$

$= 3.14 \times 4.2^2 \times 5$

$= 277.2\ cm^3$

4. r = 5.6 cm, h = 5 cm

Volume $= \pi \times r^2 \times h$

$= 3.14 \times 5.6^2 \times 5$

$= 492.8\ cm^3$

Q. 2. How much iron is needed to make a rod of length 90 cm and diameter 1.4 cm?

Answer : Given,

length/height of the cylindrical rod = 90 cm

The radius of rod $= \frac{\text{diameter}}{2} = \frac{1.4}{2} = 0.7\ \text{cm}$

Here, we need to calculate the amount of iron required to make a rod.

That mean, we need to calculate the volume of the rod.

Volume of rod = $\pi \times r^2 \times h$

$= 3.14 \times 0.7^2 \times 90$

$= 138.6\ cm^3$

∴ Amount of iron required is $138.6\ cm^3$

Q. 3. How much water will a tank hold if the interior diameter of the tank is 1.6 m and its depth is 0.7 m?

Answer : Given,

Radius $= \frac{\text{diameter}}{2} = \frac{1.6}{2} = 0.8\ \text{m}$

Height = 0.7 m

The volume of tank = $\pi \times r^2 \times h$

$= 3.14 \times 0.8^2 \times 0.7$

$= 1.408\ m^3$

Now, $1m^3 = 1000$ litre

$1.408\ m^3 = 1408$ litre

∴ The tank can hold 1408 liter of water

Q. 4. Find the volume of the cylinder if the circumference of the cylinder is 132 cm and height is 25 cm.

Answer : Given,

Circumference = 132 cm

Height = 25 cm

Volume = ?

The circumference of cylinder = 2 × π × r

132 = 2 × π × r

$$r = \frac{132}{2 \times 3.14} = 21\ m$$

The volume of cylinder = π × r^2 × h

= 3.14 × 21^2 × 25

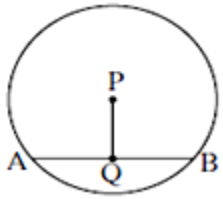
= 34650 cm^3

∴ The volume of the cylinder is 34650 cm^3

Circle : Chord And Arc

Practice set 17.1

Q. 1. In a circle with centre P, chord AB is drawn of length 13 cm, seg PQ ⊥ chord AB, then find *l*(QB).



Answer : We know that,

The perpendicular from the centre of a circle to a chord bisects the chord.

Therefore, it is given that,

AB = 13 cm

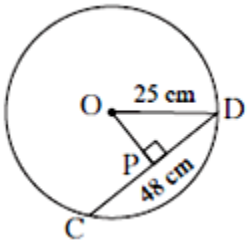
PQ perpendicular to AB

|(QB) = AB/2

| (QB) = 13/2

| (QB) = 6.5 cm

Q. 2. Radius of a circle with centre O is 25 cm. Find the distance of a chord from the centre if the length of the chord is 48 cm.



Answer : As we know that, the perpendicular from the centre of a circle to a chord bisects the chord.

Therefore, OP perpendicular to CD and OP bisects the CD. Therefore, it makes a right angle triangle, which is ∆OPD. We have OD=25 cm and PD=48/2=24 cm.

By Pythagoras theorem,

$OD^2 = OP^2 + PD^2$

$OP^2 = OD^2 - PD^2$

$OP^2 = (25)^2 - (24)^2$

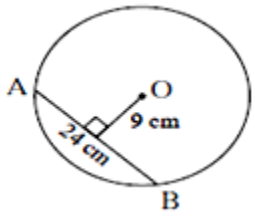
$OP^2 = 625 – 576$

$OP^2 = 49$

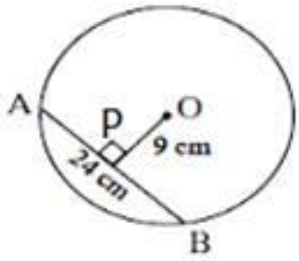
OP = 7 cm

Therefore, distance of the chord from the centre is 7 cm.

Q. 3. O is the centre of the circle. Find the length of the radius, if the chord of length 24 cm is at a distance of 9 cm from the centre of the circle.



Answer :



As we know that, the perpendicular from the centre of a circle to a chord bisects the chord.

So let P is the point, which bisects chord AB. So OP is perpendicular, it makes a right angle triangle ∆OPA.

Now we have OP = 9cm and AP as 12 cm

So by Pythagoras theorem,

$AO^2 = AP^2 + PO^2$

$AO^2 = (12)^2 + (9)^2$

$AO^2 = 144+81$

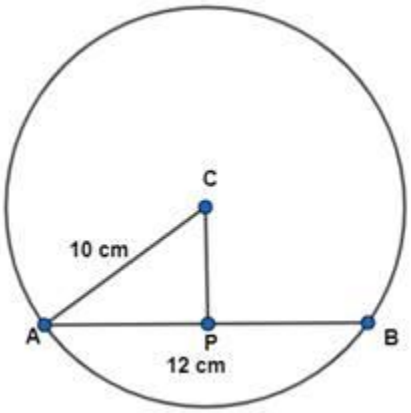
$AO^2 = 225$

AO = 15 cm

Length of radius is 15 cm.

Q. 4. C is the centre of the circle whose radius is 10 cm. Find the distance of the chord from the centre if the length of the chord is 12 cm.

Answer :



As we know that, the perpendicular from the centre of a circle to a chord bisects the chord.

So here we have C as a centre where CP is perpendicular on AB which bisects the chord AB and radius as CA = 10 cm and chord length = 12 cm, so AP=6cm.

It makes a right angle triangle ΔCPA.

Therefore, by using Pythagoras theorem, we have,

$AC^2 = CP^2 + AP^2$

We have to find CP so

$CP^2 = AC^2 - AP^2$

$CP^2 = (10)^2 – (6)^2$

$CP^2 = 100 – 36$

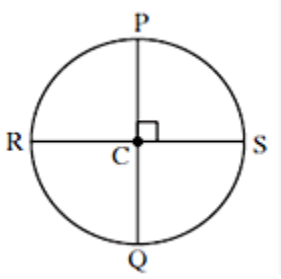
$CP^2 = 64$

CP = 8 cm

Therefore, a distance of the chord from the centre is 8 cm.

Practice set 17.2

Q. 1. The diameters PQ and RS of the circle with centre C are perpendicular to each other at C. State, why arc PS and arc SQ are congruent. Write the other arcs, which are congruent to arc PS

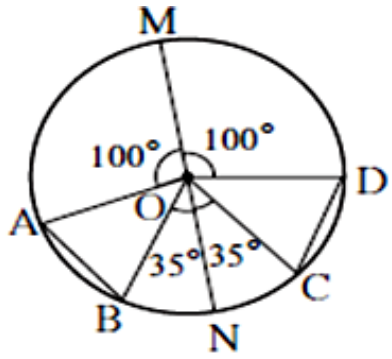


Answer : As we know that, according to the theorem of the circle, two arcs are congruent, if their central angles are congruent, so arc PS and arc SQ are congruent because the angles between the chords are same and both are at 90° of the centre.

The other arcs, which are congruent to arcs PS, are

arc PS ≅ arc PR ≅ arc RQ because if two arcs of a circle are congruent, then their corresponding arcs are also congruent.

Q. 2. In the adjoining figure O is the centre of the circle whose diameter is MN. Measures of some central angles are given in the figure. Hence, find the following



(1) m ∠AOB and m ∠COD
(2) Show that arc AB ≅ arc CD
(3) Show that chord AB ≅ chord CD

Answer : (1) In given figure, we can see that

$\angle NOC + \angle COD + \angle DOM = 180°$ (linear pair)

$35° + \angle COD + 100° = 180°$

$\angle COD = 180° – 135° = 45°$

So $\angle COD$ and $\angle AOB = 45°$

(2) arc AB ≅ arc CD because the arcs are of equal measure 45° each angle and equal angle made equal sector.

(3) Chord AB ≅ chord CD because corresponding chords of congruent arcs are congruent.