RD SHARMA

Solutions

Class 9 Maths

Chapter 13

Ex *13.3*

Q 1: Draw the graph of each of the following linear equations in two variables:

(i) x + y = 4 (ii) x − y = 2 (iii) -x + y = 6 (iv) y = 2x(v) 3x + 5y = 15

(vi) $\frac{x}{2} - \frac{y}{3} = 2$ ***(vii)*** $\frac{x-2}{3}$ ***= y- 3***

(viii) 2y = -x +1

A 1 :

(i) We are given, x + y = 4

We get, y = 4 − x,

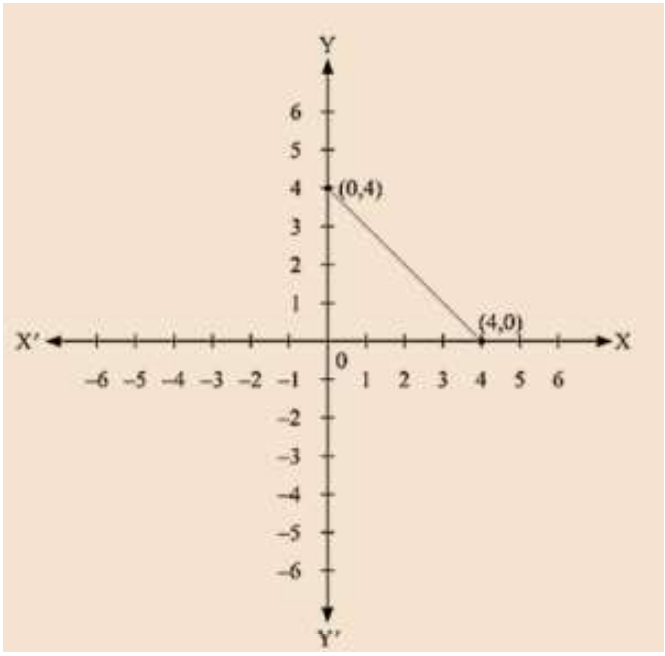
Now, substituting x = 0 in y = 4 − x,

we get y = 4

Substituting x = 4 in y = 4 — x, we get y = 0

Thus, we have the following table exhibiting the abscissa and ordinates of points on the line represented by the given table

X	0	4
Y	4	0



(ii) We are given, x − y = 2

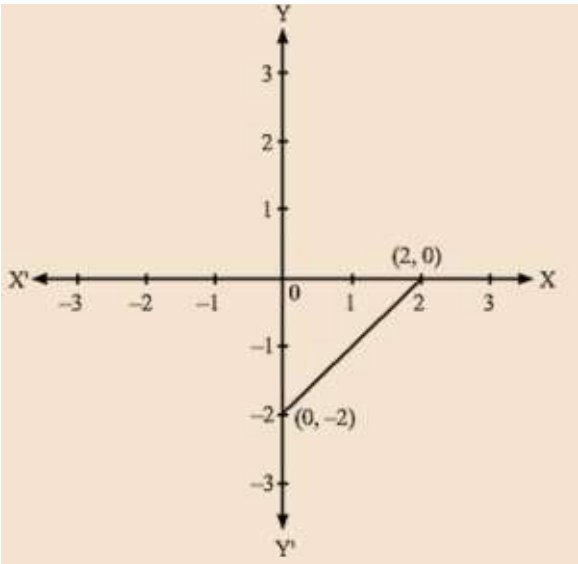
We get, y = x − 2

Now, substituting x = 0 in y= x − 2, we get y = − 2

Substituting x = 2 in y = x − 2, we get y = 0

Thus, we have the following table exhibiting the abscissa and ordinates of points on the line represented by the given equation

X	0	2
Y	-2	0



(iii) We are given, – x + y = 6

We get, y = 6 + x

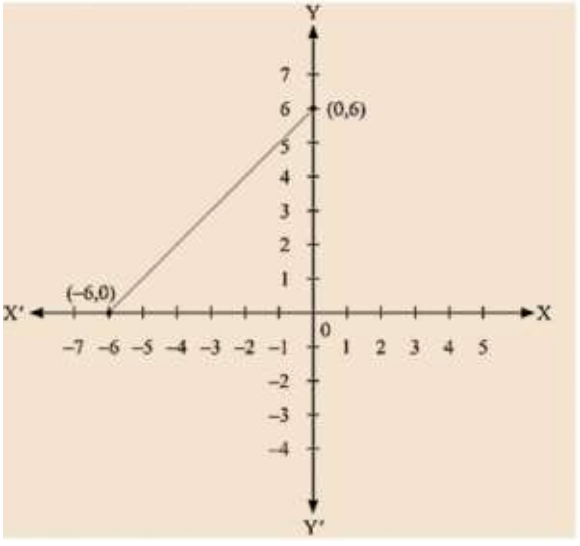
Now, substituting x = 0 in y = 6 + x,

We get y =6

Substituting x = -6 in y = 6+ x, we get y = 0

Thus, we have the following table exhibiting the abscissa and ordinates of points on the line represented by the given equation.

X	0	-6
Y	6	0



(iv) We are given, y = 2x

Now, substituting x = 1 in y = 2x

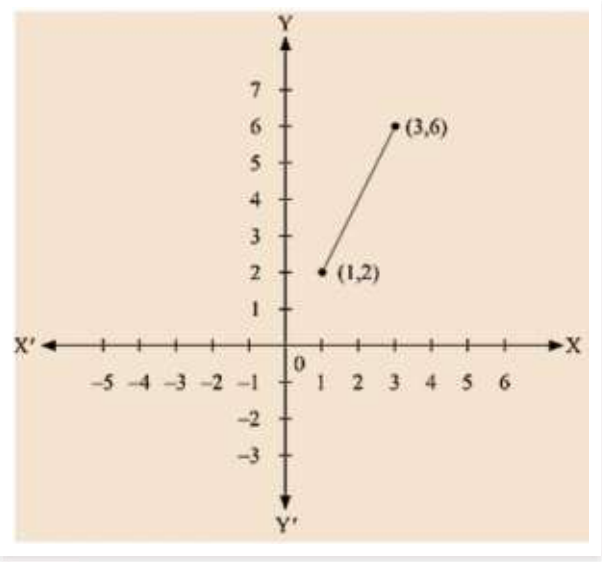
We get y = 2

Substituting x = 3 in y = 2x

We get y = 6

Thus, we have the following table exhibiting the abscissa and ordinates of points on the line represented by the given equation

X	1	3
Y	2	6



(v) We are given, 3x + 5y = 15

We get, 15 – 3x = 5y

Now, substituting x = 0 in 5y = 15 – 3x,

We get; 5y = 15

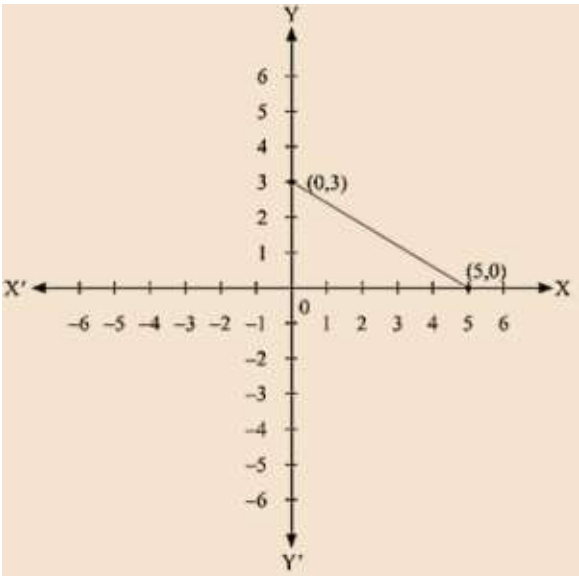
y =3

Substituting x = 5 in 5y = 15 – 3x

we get 5 y = 0

Thus, we have the following table exhibiting the abscissa and ordinates of points on the line represented by the given equation

X	0	5
Y	3	0



(vi) we are given.

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

$\frac{3x-2y}{6} = 2$

3x – 2y = 12

We get, $\frac{3x-12}{2} = y$

Now, substituting x = 0 in $\frac{3x-12}{2} = y$

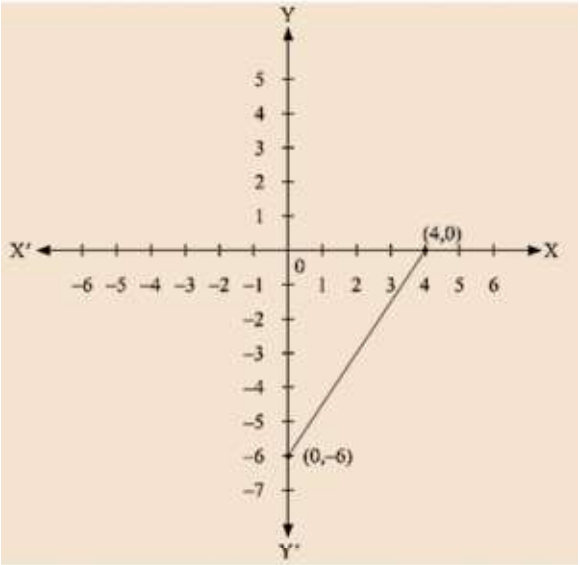
We get y = -6

Substituting x = 4 in $\frac{3x-12}{2} = y$

We get y = 0

Thus, we have the following table exhibiting the abscissa and ordinates of points on the line represented by the given equation

X	0	4
Y	-6	0



(vii) We are given,

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

We get, x-2 = 3(Y-3)

x – 2 = 3y – 9

x = 3y – 7

Now, substituting x = 5 in x = 3y – 7,

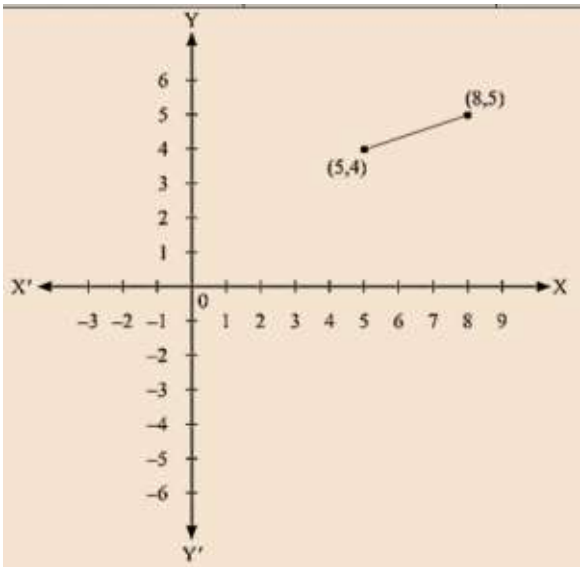
We get; y = 4

Substituting x = 8 in x = 3y – 7 ,

We get; y = 5

Thus, we have the following table exhibiting the abscissa and ordinates of points on the line represented by the given equation

X	5	8
Y	4	5



(viii) We are given, 2y = – x +1

We get, 1 – x = 2Y

Now, substituting x =1 in1 – x = 2Y, we get

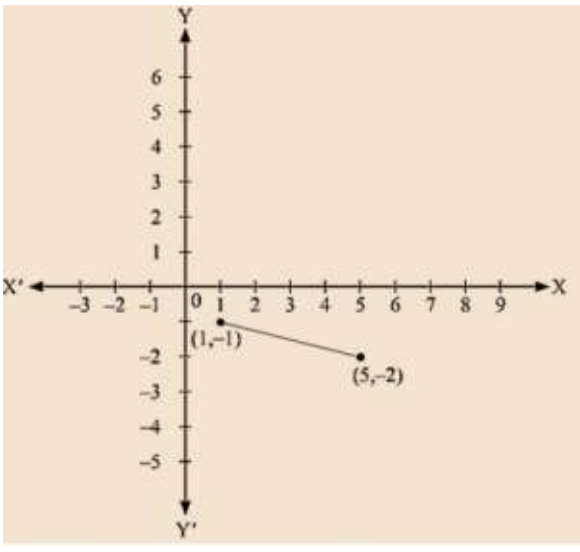
y = 0

Substituting x = 5 in 1 – x = 2Y , we get

y = – 2

Thus, we have the following table exhibiting the abscissa and ordinates of points on the line represented by the given equation

X	1	5
Y	0	-2



***Q 2: Give the equations of two lines passing through (3, 12). How many more such lines are there, and* why?**

A 2:

We observe that x = 3 and y = 12 is the solution of the following equations

4x – y = 0 and 3x – y + 3 = 0

So, we get the equations of two lines passing through (3, 12) are, 4x – y = 0 and 3x – y + 3 = 0.

We know that passing through the given point infinitely many lines can be drawn.

So, there are infinitely many lines passing through (3, 12)

Q 3 : A three-wheeler scooter charges Rs 15 for first kilometer and Rs 8 each for every subsequent kilometer. For a distance of x km, an amount of Rs y is paid. Write the linear equation representing the above information.

A 3 :

Total fare of Rs y for covering the distance of x km is given by

y = 15 + 8(x – 1)

y = 15 + 8x – 8

y = 8x + 7

Where, Rs y is the total fare (x – 1) is taken as the cost of first kilometer is already given

Rs 15 and 1 has to subtracted from the total distance travelled to deduct the cost of first

Kilometer.

Q 4 : ***A lending library has a fixed charge for the first three days and an additional charge for each day thereafter. Aarushi paid Rs 27 for a book kept for seven days. If fixed charges are Rs x and per day charges are Rs y. Write the linear equation representing the above information.***

A 4 :

Total charges of Rs 27 of which Rs x for first three days and Rs y per day for 4 more days is given by

x + y (7 – 3) = 27

x + 4y = 27

Here, (7 –3) is taken as the charges for the first three days are already given at Rs x and we have to find the charges for the remaining four days as the book is kept for the total of 7 days.

Q5: A number is 27 more than the number obtained by reversing its digits. If its unit's and ten's digit are x and y respectively, write the linear equation representing the statement.

A5:

The number given to us is in the form of ' yx ',

Where y represents the ten's place of the number

And x represents the unit's place of the number.

Now, the given number is 10y + x

Number obtained by reversing the digits of the number is 10x + y

It is given to us that the original number is 27 more than the number obtained by reversing its digits

So, 10y + x = 10x + y + 27

10y – y + x – 10x = 27

9y – 9x = 27

9 (y – x) = 27

y – x = 27/9 = 3

x – y + 3 = 0

Q6: The Sum of a two digit number and the number obtained by reversing the order of its digits is 121. If units and tens digit of the number are x and y respectively, then write the linear equation representing the above statement.

A6 :

The number given to us is in the form of ' yx' ,

Where y represents the ten's place of the number and x represents the units place of the number

Now, the given number is 10y + x

Number obtained by reversing the digits of the number is 10x+ y

It is given to us that the sum of these two numbers is 121

So, (10y + x)+ (I0x + y) = 121

10y + y + x + 10x = 121

11y + 11x = 121

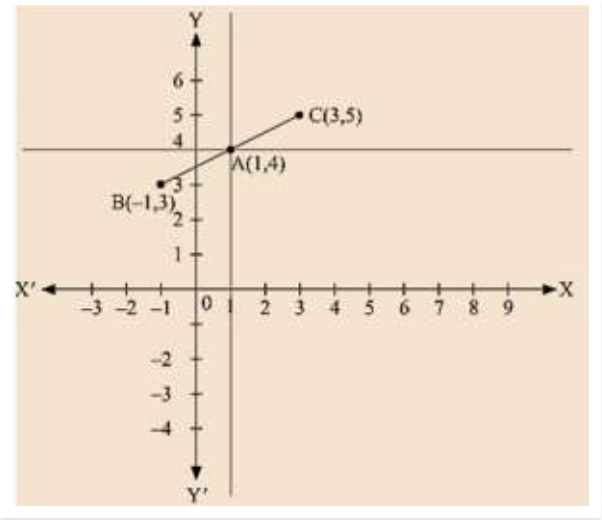
11 (y + x) = 121

x + y = 121/11 = 11

x + y = 11

Q7 : Plot the Points (3,5) and (-1,3) on a graph paper and verify that the straight line passing through the points, also passes through the point (1,4)

A7:



By plotting the given points (3, 5) and (-1, 3) on a graph paper, we get the line BC.

We have already plotted the point A (1, 4) on the given plane by the intersecting lines.

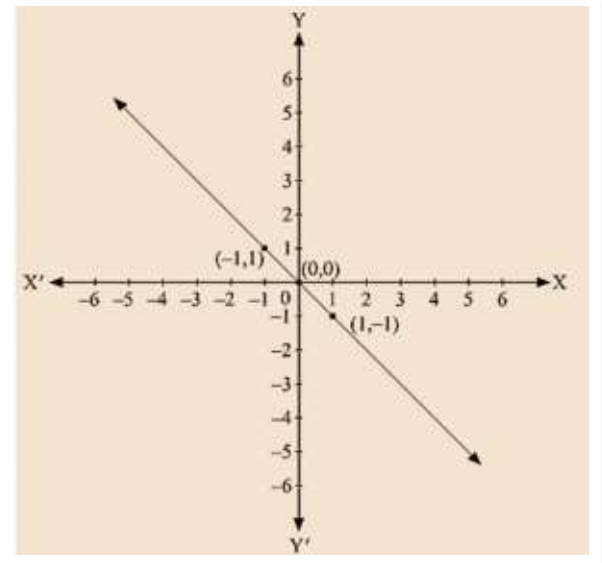
Therefore, it is proved that the straight line passing through (3, 5) and (-1, 3) also passes through A (1, 4).

Q8: From the choices given below, choose the equations whose graph is given in fig

(i) y = x (ii) x + y = 0 (iii) y = 2x (iv) 2 + 3y = 7x

Ans: We are given co-ordinates (1, – 1) and (-1, 1) as the solution of one of the following equations.

We will substitute the value of both co-ordinates in each of the equation and find the equation which satisfies the given co-ordinates.



(i) We are given, y = x

Substituting x =I and y = -1 ,

we get; 1 ≠ -1

L.H.S ≠ R.H.S

Substituting x = -1 and y = 1 ,

we get; -1 ≠1

L.H.S ≠R.H.S

Therefore, the given equation y = x does not represent the graph in the figure.

(ii) We are given,

x + y = 0

Substituting x =1 and y = -1 , we get

=> 1 + (-1) = 0

=> 0 = 0

L.H.S = R.H.S

Substituting x = —1 and y = 1 ,we get

(-1)+ 1 = 0

0 = 0

L.H.S = R.H.S

Therefore, the given solutions satisfy this equation.

Thus, it is the equation whose graph is given.

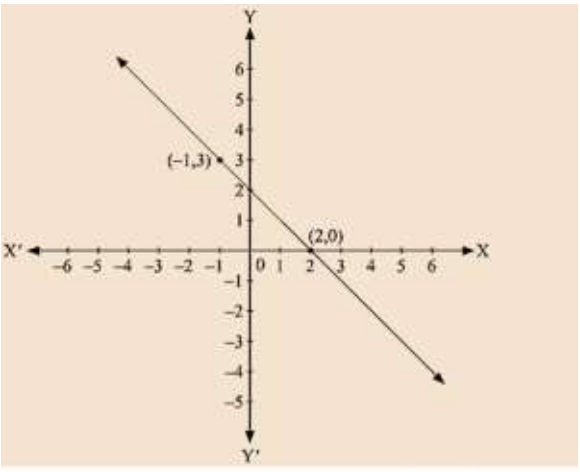
Q9: From the choices given below, choose the equation whose graph is given fig:

(i) y = x + 2 (ii) y = x − 2 (iii)y = − x + 2 (iv) x + 2y = 6

A9:

We are given co-ordinates (-1, 3) and (2, 0) as the solution of one of the following equations.

We will substitute the value of both co-ordinates in each of the equation and find the equation which satisfies the given co-ordinates.



(i) We are given, y=x+2

Substituting x = − 1 and y = 3 ,we get

3 ≠ − 1 + 2

L.H.S $\neq$ R.H.S

Substituting x = 2 and y = 0 ,we get

0 $\neq$ 4

L.H.S $\neq$R.H.S

Therefore, the given solution does not satisfy this equation.

(ii) We are given, y = x – 2

Substituting x = —1 and y = 3 ,we get

3 = – 1 – 2

L.H.S $\neq$ R.H.S

Substituting x = 2 and y = 0 ,we get

0 = 0

L.H.S = R.H.S

Therefore, the given solutions does not completely satisfy this equation.

(iii) We are given, y = – x + 2

Substituting x = – 1 and y = 3,we get

3 = – (– 1) + 2

L.H.S = R.H.S

Substituting x = 2 and y = 0 ,we get

0 = -2 + 2

0 = 0

L.H.S = R.H.S

Therefore, the given solutions satisfy this equation.

Thus, it is the equation whose graph is given.

Q 10 : If the point (2, -2) lies on the graph of linear equation, 5x + 4y = 4, find the value of k.

A10 :

It is given that the point (2,-2) lies on the given equation,

5x + ky = 4

Clearly, the given point is the solution of the given equation.

Now, Substituting x = 2 and y = – 2 in the given equation, we get 5x + ky = 4

5 x 2 + (– 2) k = 4

2k = 10 – 4

2k = 6

k = 6/2

k = 3

Q 11 : Draw the graph of equation 2x + 3y = 12. From the graph, find the co ordinates of the point:

(i) whose y-coordinate is 3 (ii)whose x coordinate is -3

A11:

We are given,

2x +3y =12

We get, $y = \frac{12-2x}{3}$

Substituting, x = 0 in $y = \frac{12-2x}{3}$, we get

$y = \frac{12-2\times0}{3}$

y = 4

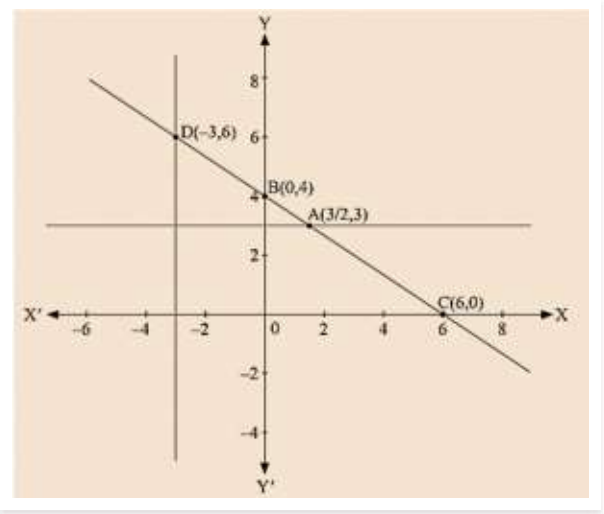
Substituting x = 6 in $y = \frac{12-2x}{3}$

$y = \frac{12-2\times6}{3}$

y = 0

Thus, we have the following table exhibiting the abscissa and ordinates of points on the line represented by the given equation

X	0	6
Y	4	0



By plotting the given equation on the graph, we get the point B (0, 4) and C (6,0).

(i) Co-ordinates of the point whose y axis is 3 are A (3/2, 3)

(ii) Co-ordinates of the point whose x -coordinate is −3 are D (-3, 6)

Q 12: Draw the graph of each of the equations given below. Also, find the coordinates of the points where the graph cuts the coordinate axes:

(i) 6x − 3y = 12 (ii) − x + 4y = 8 (iii) 2x + y = 6 (iv) 3x + 2y + 6 = 0

A12 :

(i) We are given,

6x − 3y = 12 We get,

y = (6x —12) /3

Now, substituting x = 0 in y = − (6x − 12)/3 we get

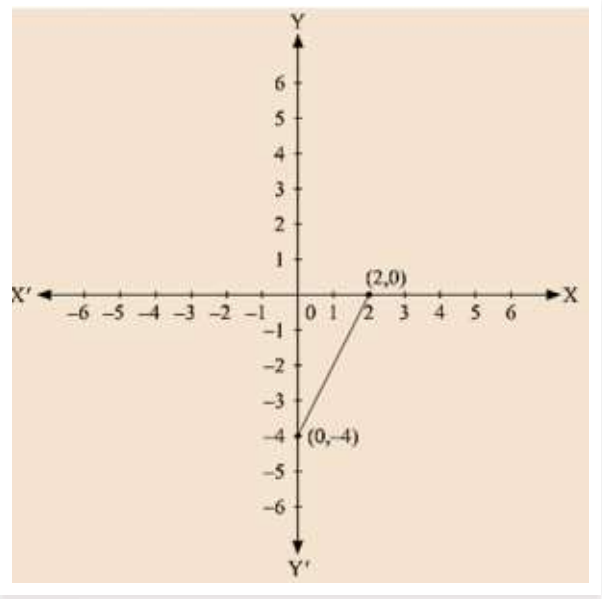
y =- 4

Substituting x = 2 in y = (- 6x —12)/3, we get

y = 0

Thus, we have the following table exhibiting the abscissa and ordinates of points on the line represented by the given equation

x	0	2
y	-4	0



Co-ordinates of the points where graph cuts the co-ordinate axes are y = − 4 at y axis and x = 2 at x axis. (ii) We are given,

− x + 4y = 8

We get,

$y = \frac{8+x}{4}$

Now, substituting x = 0 in $y = \frac{8+x}{4}$, we get

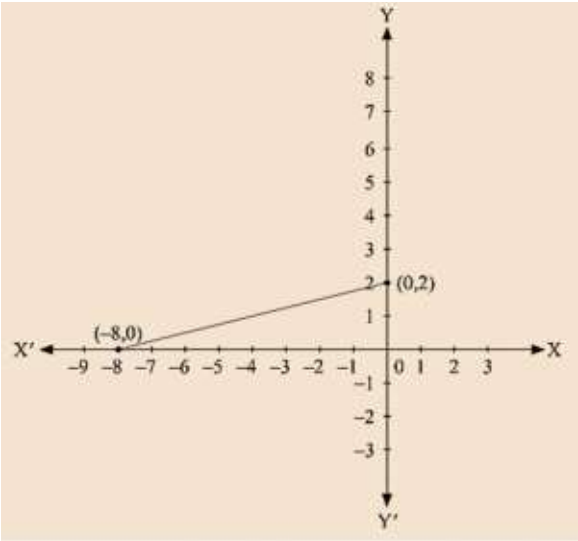
y = 2

Substituting x = -8 in $y = \frac{8+x}{4}$,we get

y = 0

Thus, we have the following table exhibiting the abscissa and ordinates of points on the line represented by the given equation

X	0	-8
Y	2	0



Co-ordinates of the points where graph cuts the co-ordinate axes are y = 2 at y axis and x = —8 at x axis.

(iii) We are given,

2x + y = 6

We get, y = 6 – 2x

Now, substituting x = 0 in y = 6 -2x we get

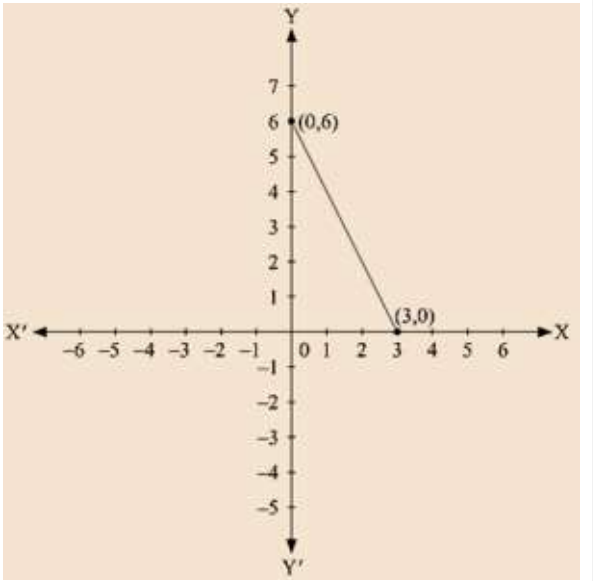
y = 6

Substituting x = 3 in y=6-2x, we get

y=0

Thus, we have the following table exhibiting the abscissa and ordinates of points on the line represented by the given equation

X	0	3
Y	6	0



Co-ordinates of the points where graph cuts the co-ordinate axes are y = 6 at y axis and x =3 at x axis.

(iv) We are given,

3x+2y+6=0

We get, $y = \frac{-(6+3x)}{2}$

Now, substituting x = 0 in $y = \frac{-(6+3x)}{2}$,we get

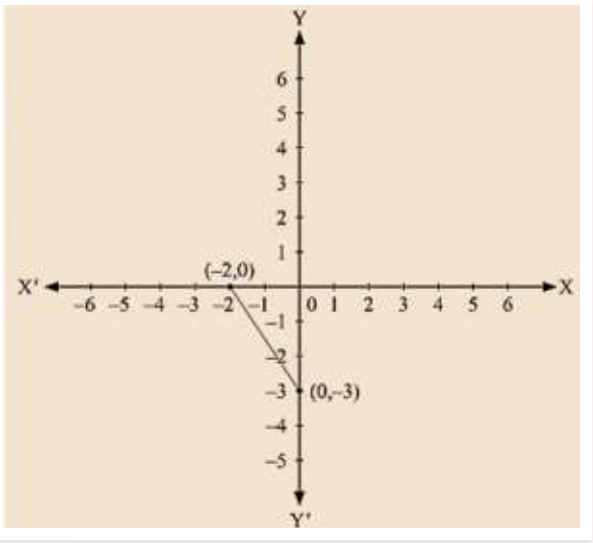
y= – 3

Substituting x = –2 in $y = \frac{-(6+3x)}{2}$, we get

y = 0

Thus, we have the following table exhibiting the abscissa and ordinates of points on the line represented by the given equation

X	0	-2
y	-3	0



Co-ordinates of the points where graph cuts the co-ordinate axes are y = – 3 at y axis and x = – 2 at x axis.

Q 13 : Draw the graph of the equation 2x + y = 6. Shade the region bounded by the graph and the coordinate axes. Also, find the area of the shaded region.

A13 :

We are given,

2x + y = 6

We get,

y = 6 – 2x

Now, substituting x = 0 in y = 6 – 2x,

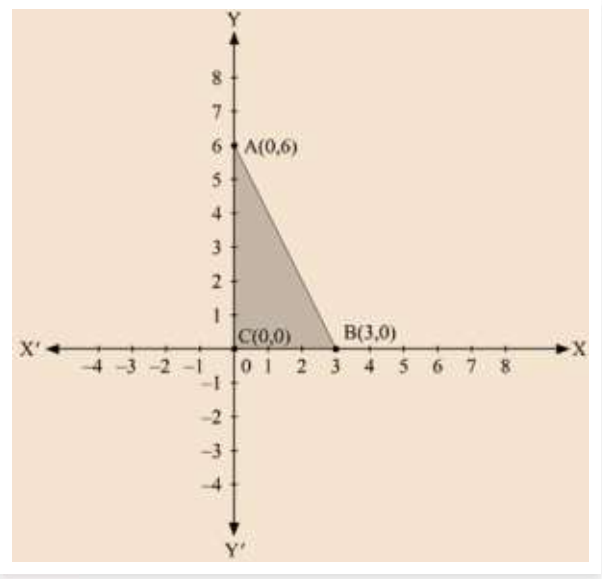
we get y = 6

Substituting x =3 in y = 6— 2x,

we get y = 0

Thus, we have the following table exhibiting the abscissa and ordinates of points on the line represented by the given equation

X	0	3
Y	6	0



The region bounded by the graph is ABC which forms a triangle.

AC at y axis is the base of triangle having AC = 6 units on y axis.

BC at x axis is the height of triangle having BC = 3 units on x axis.

Therefore, Area of triangle ABC, say A is given by A = (Base x Height)/2

A = (AC x BC)/2

A = (6 x 3)/2

A = 9 sq. units

Q 14 : Draw the graph of the equation $\frac{x}{3} + \frac{y}{4} = 1$ ***. Also, find the area of the triangle formed by 3 4 the line and the coordinates axes.***

A14:

We are given.

$\frac{x}{3} + \frac{y}{4} = 1$

4x +3y =12

We get,

$y = \frac{12-4x}{3}$

Now, substituting x = 0 in $y = \frac{12-4x}{3}$,we get

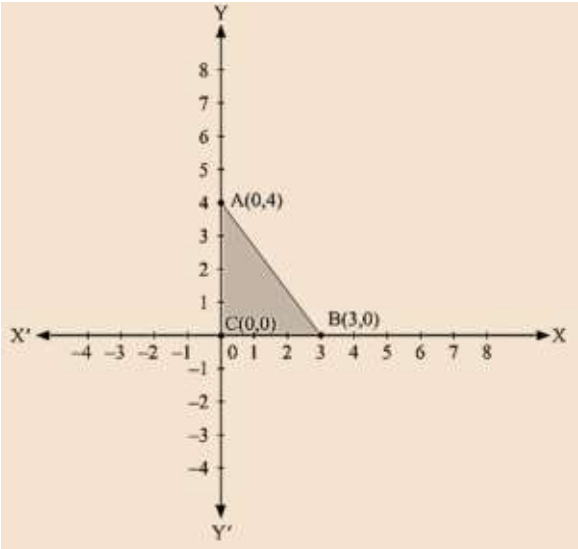
y =4

Substituting x=3 in $y = \frac{12-4x}{3}$, we get

y = 0

Thus, we have the following table exhibiting the abscissa and ordinates of points on the line represented by the given equation

X	0	3
Y	4	0



The region bounded by the graph is ABC which forms a triangle.

AC at y axis is the base of triangle having AC = 4 units on y axis.

BC at x axis is the height of triangle having BC = 3 units on x axis.

Therefore,

Area of triangle ABC, say A is given by

A = (Base x Height)/2

A= (AC x BC)/2

A = (4 x 3)/2

A = 6 sq. units

Q 15 : Draw the graph of y = | x |.

A15:

We are given,

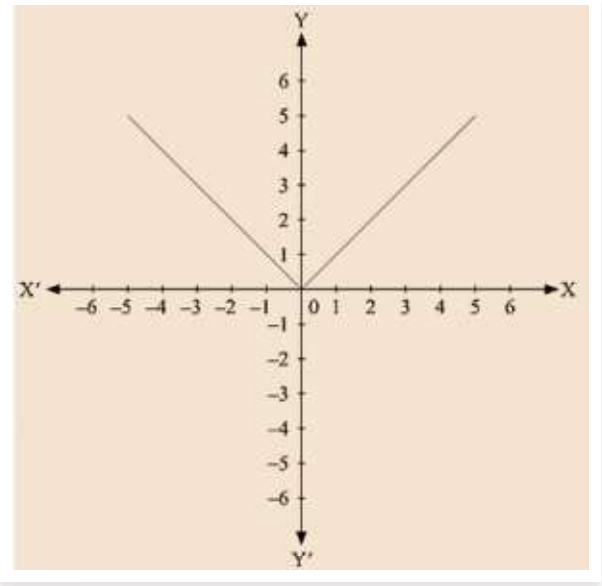
y = |x|

Substituting x = 1 , we get y = 1

Substituting x = -1, we get y = 1

Substituting x = 2, we get y = 2

Substituting x = -2, we get y = 2



For every value of x, whether positive or negative, we get y as a positive number.

Q 16: Draw the graph of y = |x| + 2.

A16:

We are given,

Y = |x|+2

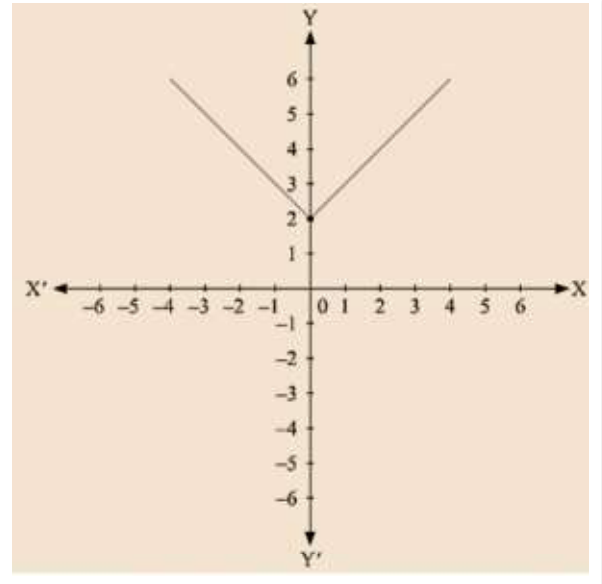
Substituting x = 0 we get y=2

Substituting x = I , we get y=3

Substituting x =-1 , we get Y = 3

Substituting x = 2, we get y = 4

Substituting x = -2, we get y = 4



For every value of x, whether positive or negative, we get y as a positive number and the minimum value of y is equal to 2 units.

Q 17 : Draw the graphs of the following linear equations on the same graph paper: 2x + 3y = 12, x − y = 1 Find the coordinates of the vertices of the triangle formed by the two straight lines and the y-axis. Also, find the area of the triangle.

A17:

We are given,

2x +3y =12

We get, $y = \frac{12-2x}{3}$

Now, substituting x = 0 in $y = \frac{12-2x}{3}$, we get

y =4

Substituting x=6 in $y = \frac{12-2x}{3}$, we get

y = 0

Thus, we have the following table exhibiting the abscissa and ordinates of points on the line represented by the given equation

X	0	6
Y	4	0

Plotting A(0,4) and E(6,0) on the graph and by joining the points , we obtain the graph of equation

2x+3y=12.

We are given,

x − y = 1

We get, y = x − 1

Now, substituting x = 0 in y=x-1,

we get y = -1

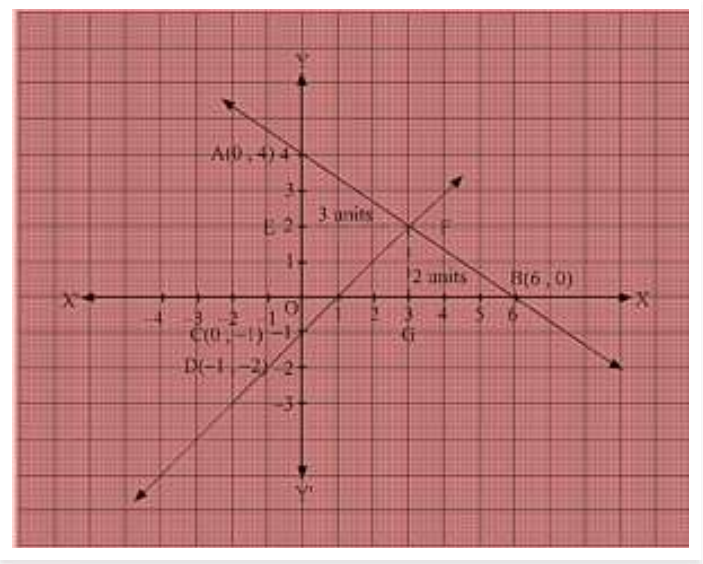
Substituting x in y=x-1,

we get y = -2

Thus, we have the following table exhibiting the abscissa and ordinates of points on the line represented by the given equation

X	0	-1
Y	-1	-2

Plotting D(0,) and E(-1,0) on the graph and by joining the points , we obtain the graph of equation x— y = I .



By the intersection of lines formed by 2x + 3y = 12 and x—y=1 on the graph, triangle ABC is formed on y axis.

Therefore, AC at y axis is the base of triangle ABC having AC = 5 units on y axis.

Draw FE perpendicular from F on y axis. FE parallel to x axis is the height of triangle ABC having FE = 3 units on x axis.

Therefore, Area of triangle ABC, say A is given by A = (Base x Height)/2 =(AC x FE)/2 = (5×3)/2 =>15/2 = 7.5 sq. units

Q 18 : Draw the graphs of the linear equations 4x − 3y + 4 = 0 and 4x + 3y − 20 = 0. Find the area bounded by these lines and x-axis.

A18 :

We are given, 4x − 3y + 4 = 0

We get, $y = \frac{4x+4}{3}$

Now, substituting x = 0 in $y = \frac{4x+4}{3}$, we get

Substituting x = -I in $y = \frac{4x+4}{3}$

we get y =0

Thus, we have the following table exhibiting the abscissa and ordinates of points on the line represented by the given equation

x	0	-1
y	4/3	0

Plotting E(0, 4/3) and A (-1, 0) on the graph and by joining the points, we obtain the graph of equation

4x − 3y + 4 = 0.

We are given, 4x + 3y − 20 = 0

We get,

$y = \frac{20-4x}{3}$

Now, substituting x = 0 in $y = \frac{20-4x}{3}$, we get

y = 7

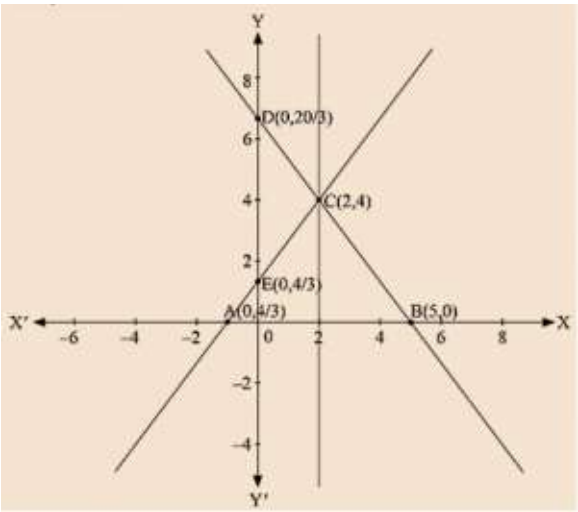
Substituting x = 5 in $y = \frac{20-4x}{3}$, we get

y = 0

Thus, we have the following table exhibiting the abscissa and ordinates of points on the line represented by the given equation

X	0	5
Y	20/3	0

Plotting D (0,20/3) and B(5,0) on the graph and by joining the points , we obtain the graph of equation 4x +3y – 20 = 0.



By the intersection of lines formed by 4x-3y + 4 = 0 and 4x+ 3y – 20 = 0 on the graph,

Triangle ABC is formed on x axis. Therefore, AB at x axis is the base of triangle ABC having AB = 6 units on x axis.

Draw CF perpendicular from C on x axis.

CF parallel to y axis is the height of triangle ABC having CF = 4 units on y axis.

Therefore, Area of triangle ABC, say A is given by

A = (Base x Height)/2

A =(AB x CF)/2

A = (6 x 4)/2

k= 12 sq. units

Q19 : The path of a train A is given by the equation 3x + 4y -12 = 0 and the path of another train B is given by the equation 6x + 8y – 48 = 0. Represent this situation graphically.

A19:

We are given the path of train A, 3x + 4y – 12 = 0

We get,

$y = \frac{12-3x}{4}$

Now, substituting x = 0 in $y = \frac{12-3x}{4}$, we get

Y=3

Substituting x = 4 in $y = \frac{12-3x}{4}$, we get

y = 0

Thus, we have the following table exhibiting the abscissa and ordinates of points on the line represented by the given equation

X	0	4
Y	3	0

Plotting A(4,0) and E(0,3) on the graph and by joining the points , we obtain the graph of equation 3x+4y-12 = 0.

We are given the path of train B,

6x + 8y – 48 = 0

We get, $y = \frac{48-6x}{8}$

Now, substituting x = 0 in $y = \frac{48-6x}{8}$,we get

y=6

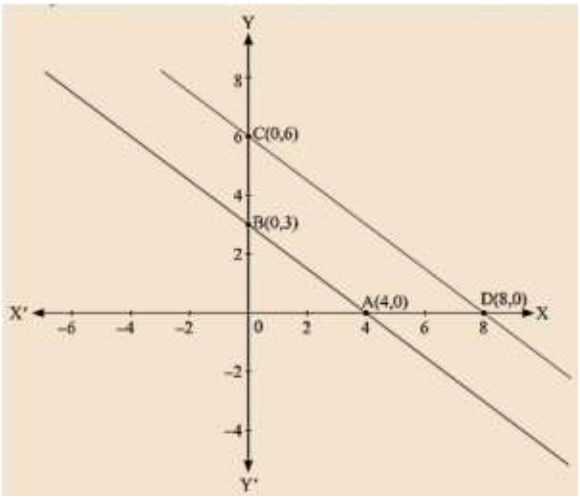
Substituting x = 8 in $y = \frac{48-6x}{8}$, we get

y=0

Thus, we have the following table exhibiting the abscissa and ordinates of points on the line represented by the given equation

X	0	8
Y	6	0

Plotting C(0,6) and D(8,0) on the graph and by joining the points , we obtain the graph of equation 6x+8y-48=0



Q 20 : Ravish tells his daughter Aarushi, "Seven years ago, I was seven times as old as you were then. Also, three years from now, I shall be three times as old as you will be". If present ages of Aarushi and Ravish are x and y years respectively, represent this situation algebraically as well as graphically.

A20:

We are given the present age of Ravish as y years and Aarushi as x years.

Age of Ravish seven years ago = y − 7

Age of Aarushi seven years ago = x − 7

It has already been said by Ravish that seven years ago he was seven times old then Aarushi was then

So, y − 7 = 7 (x − 7)

Y − 7 = 7 x − 49

7x − y = − 7 + 49

7x − y − 42 = 0 ——(1)

Age of Ravish three years from now = y + 3

Age of Aarushi three years from now = x+3

It has already been said by Ravish that three years from now he will be three times older then Aarushi will be then So,

Y + 3 = 3 (x + 3)

y + 3 = 3x + 9

3x + 9 − y − 3 = 0

3x − y + 6 = 0 ——(2)

(1) and (2) are the algebraic representation of the given statement.

We are given,

7x − y- 42 = 0

We get,

Y = 7x – 42

Now, substituting x = 0 in y = 7x —42,

we get y = -42

Substituting x = 6 in y = 7x – 42,

we get y = 0

Thus, we have the following table exhibiting the abscissa and ordinates of points on the line represented by the given equation

X	0	6
Y	-42	0

We are given,

3x – y + 6 =0

We get,

Y = 3x + 6

Now, substituting x=0 in y = 3x + 6,

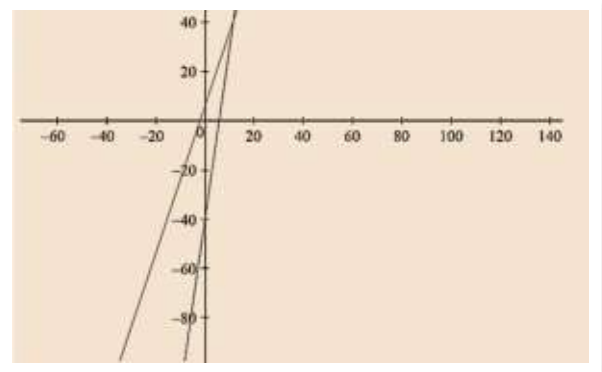
We get y = 6

Substituting x= —2 in y = 3x + 6,

We get y = 0

Thus, we have the following table exhibiting the abscissa and ordinates of points on the line represented by the given equation

X	0	-2
Y	6	0



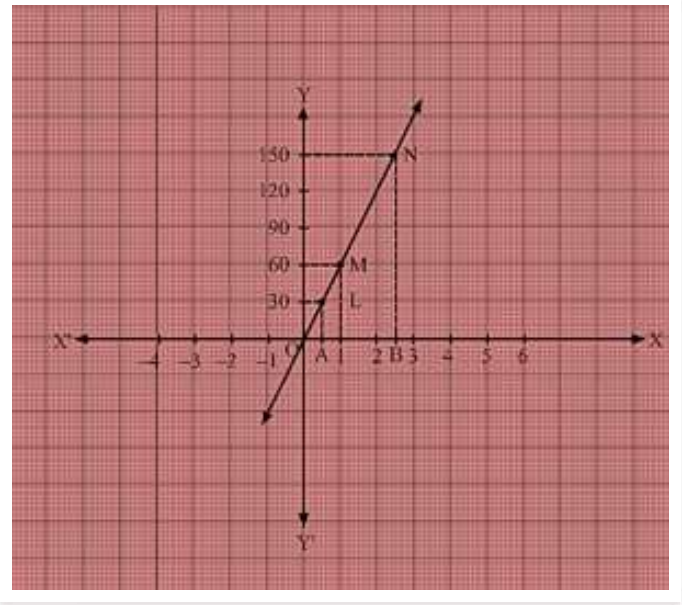
The red -line represents the equation 7x—y-42 =0.

The blue-line represents the equation 3x —y +6 =0.

Q21: Aarushi was driving a car with uniform speed of 60 km/h. Draw distance-time graph From the graph, find the distance travelled by Aarushi in (i) $2\frac{1}{2}$ ***Hours (ii)*** $\frac{1}{2}$ ***Hour***

A21:

Aarushi is driving the car with the uniform speed of 60 km/h. We represent time on X-axis and distance on Y-axis Now, graphically



We are given that the car is travelling with a uniform speed 60 km/hr. This means car travels 60 km distance each hour. Thus the graph we get is of a straight line.

Also, we know when the car is at rest, the distance travelled is 0 km, speed is 0 km/hr and the time is also 0 hr. Thus, the given straight line will pass through O (0 , 0) and M (1 , 60).

Join the points 0 and M and extend the line in both directions.

Now, we draw a dotted line parallel to y-axis from x = 12 that meets the straight line graph at L from which we draw a line parallel to x-axis that crosses y-axis at 30. Thus, in 12hr, distance travelled by the car is 30 km.

Now, we draw a dotted line parallel to y-axis from x = 212 that meets the straight line graph at N from which we draw a line parallel to x-axis that crosses y-axis at 150. Thus, in 212hr, distance travelled by the car is 150 km.

(i) Distance = Speed x Time Distance travelled in $2\frac{1}{2}$ hours is given by

Distance=60 x $2\frac{1}{2}$

Distance = 60 x 5/2

Distance = 150 Km

(ii) Distance = Speed x Time Distance travelled in $\frac{1}{2}$ hour is given by

Distance=60 x $2\frac{1}{2}$

Distance = 30 km