

LINEAR
EQUATIONS

CBSE - L. EQ-M AT H E M A T I C S



MATHEMATICS

LINEAR EQUATIONS

CONTENTS

- Linear Equations in one Variable
- General form of Linear Equations in Two variables
- Solution of Linear Equation
- Graph of Linear Equation in Two Variables.
- Equations of Lines Parallel to The X-axis and Y-axis

➤ LINEAR EQUATIONS IN ONE VARIABLE

A statement of equality of two algebraic expressions, which involve one or more unknown quantities is known as an equation.

A linear equation is an equation which involves linear polynomials.

A value of the variable which makes the two sides of the equation equal is called the solution of the equation.

Same quantity can be added/subtracted to/from both the sides of an equation without changing the equality.

Both the sides of an equation can be multiplied/divided by the same non-zero number without changing the equality.

➤ GENERAL FORM OF LINEAR EQUATION IN TWO VARIABLES

$ax + by + c = 0$, $a \neq 0$, $b \neq 0$ or any one from a & b can zero.

❖ EXAMPLES ❖

Ex.1 Express the following linear equations in general form and identify coefficients of x , y and constant term.

Sol.

S.No.	Equation	General form	Coeff. of x , y , constant
(1)	$3x - 2y = 5$	$3x - 2y - 5 = 0$	$3, -2, -5$
(2)	$\frac{3}{7}x - 2 + y = 0$	$\frac{3}{7}x + y - 2 = 0$	$\frac{3}{7}, 1, -2$
(3)	$5y = 2x + 7$	$2x - 5y + 7 = 0$	$2, -5, 7$
(4)	$18y - 72x = 8$	$72x - 18y + 8 = 0$	$72, -18, 8$
(5)	$3\sqrt{7}x - y - \frac{1}{7} = 0$	$3\sqrt{7}x - y - \frac{1}{7} = 0$	$3\sqrt{7}, -1, -\frac{1}{7}$
(6)	$y = 5$	$0x + y - 5 = 0$	$0, 1, -5$
(7)	$\frac{x}{7} = 5$	$\frac{x}{7} + 0.y - 5 = 0$	$\frac{1}{7}, 0, -5$
(8)	$2x + 3 = 0$	$2x + 0y + 3 = 0$	$2, 0, 3$

Ex.2 Make linear equation by the following statements :

- (1) The cost of 2kg of apples and 1 kg of grapes on a day was found to be ₹ 160. After a month, the cost of 4 kg of apples and 2 kg of grapes is ₹ 300. Represent the situation algebraically.

Sol. Let cost of per kg apples & grapes are x & y respectively then by Ist condition :

$$2x + y = 160 \quad \dots(i)$$

& by IInd condition : $4x + 2y = 300 \quad \dots(ii)$

(2) The coach of a cricket team buys 3 bats and 6 balls for ₹ 3900. Later, she buys another bat and 3 more balls of the same kind for ₹ 1300. Represent this situation algebraically.

Sol. Let cost of a bat and a ball are ₹ x & ₹ y respectively. According to questions

$$3x + 6y = 3900 \quad \dots(i)$$

$$\& \quad x + 3y = 1300 \quad \dots(ii)$$

(3) 10 students of class IX took part in a Mathematics quiz. If the number of girls is 4 more than the number of boys.

Sol. Let no. of boys and girls are x & y then according to question

$$x + y = 10 \quad \dots(i)$$

$$\& \quad y = x + 4 \quad \dots(ii)$$

(4) Half the perimeter of a rectangular garden, whose length is 4 m more than its width, is 36 m.

Sol. Let length & breadth are x m and y m.

∴ according to question $\frac{1}{2}$ perimeter = 36

$$\frac{1}{2} [2(\lambda + b)] = 36$$

$$\Rightarrow \quad x + y = 36 \quad \dots(i)$$

also length = 4 + breadth

$$x = 4 + y \quad \dots(ii)$$

(5) The difference between two numbers is 26 and one number is three times the other.

Sol. Let the numbers are x and y & $x > y$

$$\therefore \quad x - y = 26 \quad \dots(i)$$

$$\text{and } x = 3y \quad \dots(ii)$$

(6) The larger of two supplementary angles exceeds the smaller by 18 degrees.

Sol. Let the two supplementary angles are x and y & $x > y$

$$\text{Then } x + y = 180^\circ \quad \dots(i)$$

$$\text{and } x = y + 18^\circ \quad \dots(ii)$$

(7) A fraction becomes $\frac{9}{11}$, if 2 is added to both the numerator and the denominator. If, 3 is added to both the numerator and the denominator it becomes $\frac{5}{6}$.

Sol. Let fraction is $\frac{x}{y}$

$$\text{Now according to question } \frac{x+2}{y+2} = \frac{9}{11}$$

$$\Rightarrow 11x + 22 = 9y + 18$$

$$\Rightarrow 11x - 9y = -4 \quad \dots(i)$$

$$\text{and } \frac{x+3}{y+3} = \frac{5}{6} \Rightarrow 6x + 18 = 5y + 15$$

$$\Rightarrow 6x - 5y = -3 \quad \dots(ii)$$

(8) Five years hence, the age of Sachin will be three times that of his son. Five years ago, Sachin's age was seven times that of his son.

Sol. Let present ages of Sachin & his son are x years and y years.

Five years hence,

age of Sachin = $(x + 5)$ years & his son's age = $(y + 5)$ years

according to question $(x + 5) = 3(y + 5)$

$$\Rightarrow x + 5 = 3y + 15$$

$$\Rightarrow x - 3y = 10 \quad \dots(i)$$

and 5 years ago age of both were $(x - 5)$ years and $(y - 5)$ years respectively

according to question $(x - 5) = 7(y - 5)$

$$\Rightarrow x - 5 = 7y - 35$$

$$\Rightarrow x - 7y = -30 \quad \dots(ii)$$

➤ SOLUTION OF LINEAR EQUATION

Method : Put the value of x (or y) = 0, ± 1 , ± 2 , ± 3 ,, we get values of y (or x). By this we can find many solutions of given equation.

❖ EXAMPLES ❖

Ex.3 Find five solutions of

$$(i) \quad 2x + 3y = 6$$

$$(ii) \quad 3x - 2y = 12$$

$$(iii) \quad 7x + y = 15$$

Sol. (i) $2x = 6 - 3y$

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

Now put $y = 0$, $x = \frac{6-0}{2} = 3$

for $y = 1$, $x = \frac{6-3(1)}{2} = \frac{3}{2}$

for $y = 2$, $x = \frac{6-3(2)}{2} = 0$

for $y = 3$, $x = \frac{6-3(3)}{2} = -\frac{3}{2}$

for $y = 4$, $x = \frac{6-3(4)}{2} = -3$

$$\therefore \begin{array}{|c|c|c|c|c|c|} \hline x & 3 & 3/2 & 0 & -3/2 & -3 \\ \hline y & 0 & 1 & 2 & 3 & 4 \\ \hline \end{array}$$

(ii) $3x - 12 = 2y \Rightarrow y = \frac{3x-12}{2}$

Put value of $x = 0, 1, 2, 3, -1$

we get $y = -6, -\frac{9}{2}, -3, -\frac{3}{2}, -8$

$$\begin{array}{|c|c|c|c|c|c|} \hline x & 0 & 1 & 2 & 3 & -1 \\ \hline y & -6 & -9/2 & -3 & -3/2 & -8 \\ \hline \end{array}$$

(iii) $y = 15 - 7x$

Put $x = 0, 1, 2, 3, 4$ we get $y = 15, 8, 1, -6, -13$

$$\therefore \begin{array}{|c|c|c|c|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 \\ \hline y & 15 & 8 & 1 & -6 & -13 \\ \hline \end{array}$$

Ex.4 Find two solutions of

(i) $3x - 7y = 21$ (ii) $8x - 5y = 16$

Sol. (i) $3x - 7y = 21$

Put $x = 0$, $3(0) - 7y = 21$

$$y = \frac{21}{-7} = -3$$

$\therefore x = 0, y = -3$

and put $y = 0 \Rightarrow 3x - 7(0) = 21$

$3x = 21$

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

$\therefore x = 7, y = 0$

$$\therefore \begin{array}{|c|c|c|} \hline x & 0 & 7 \\ \hline y & -3 & 0 \\ \hline \end{array}$$

(ii) $8x - 5y = 16$

Put $x = 0 \Rightarrow 8(0) - 5y = 16$

$$\Rightarrow -5y = 16 \Rightarrow y = \frac{16}{-5} = -3.2$$

$\therefore x = 0, y = -3.2$

and put $y = 0 \Rightarrow 8x - 5(0) = 16$

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

$\therefore x = 2; y = 0$

$$\therefore \begin{array}{|c|c|c|} \hline x & 0 & 2 \\ \hline y & -3.2 & 0 \\ \hline \end{array}$$

Ex.5 Find five solutions of

(i) $3x = 5$

(ii) $7y = 10$

Sol. (i) The equation is only in one variable. So we have to convert into 2 variable $3x + 0.y = 5$

put $y = 0, 1, 2, 3, 4$ $x = \frac{5}{3}, \frac{5}{3}, \frac{5}{3}, \frac{5}{3}, \frac{5}{3}$

$$\begin{array}{|c|c|c|c|c|c|} \hline x & 5/3 & 5/3 & 5/3 & 5/3 & 5/3 \\ \hline y & 0 & 1 & 2 & 3 & 4 \\ \hline \end{array}$$

(ii) $7y = 10$

$\Rightarrow 0.x + 7y = 10$

put $x = 0, 1, 2, 3, 4$,

we get $y = \frac{10}{7}, \frac{10}{7}, \frac{10}{7}, \frac{10}{7}, \frac{10}{7}$

$$\begin{array}{|c|c|c|c|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 \\ \hline y & 10/7 & 10/7 & 10/7 & 10/7 & 10/7 \\ \hline \end{array}$$

Note :

Ordered pair : If value of x & y are represent in form (x, y) then this form is called ordered pair form : Eg. $x = 5, y = \frac{7}{3}$

then ordered pair form = $\left(5, \frac{7}{3}\right)$. First part is called abscissa (x part) and second part is ordinate (y part).

Ex.6 Check the following value of x & y are solution of equation $9x - 8y = 72$ or not

(i) (0, 9) (ii) (0, -9) (iii) (-8, 0)

(iv) (+8, 0) (v) (1, 1) (vi) $\left(\frac{1}{3}, \frac{1}{2}\right)$

Sol. Given equation $9x - 8y = 72$

(i) LHS at point x = 0, y = 9

$$= 9(0) - 8(9) = -72 \neq \text{RHS} \therefore \text{No}$$

(ii) LHS at x = 0, y = -9

$$= 9(0) - 8(-9) = +72 = \text{RHS} \therefore \text{Yes}$$

(iii) LHS = $9(-8) - 8(0)$ (at x = -8, y = 0)

$$= -72 \neq \text{RHS} \therefore \text{No}$$

(iv) LHS = $9(-8) - 8(0)$ (at x = 8, y = 0)

$$= 72 = \text{RHS} \therefore \text{Yes}$$

(v) LHS = $9(1) - 8(1)$ (at x = 1, y = 1)

$$= 9 - 8 = 1 \neq \text{RHS} \therefore \text{No}$$

(vi) LHS = $9\left(\frac{1}{3}\right) - 8\left(\frac{1}{2}\right)$ (at x = $\frac{1}{3}$, y = $\frac{1}{2}$)

$$= 3 - 4 = -1 \neq \text{RHS} \therefore \text{No}$$

Ex.7 Find the value of k in equation $2x + ky = 6$ if (-2, 2) is a solution.

Sol. Θ (-2, 2) is a solution of $2x + ky = 6$

$$\therefore 2(-2) + k(2) = 6$$

$$-4 + 2k = 6 \Rightarrow 2k = 6 + 4$$

$$k = \frac{10}{2} = 5 \quad \text{Ans.}$$

Ex.8 Find value of p if (4, -4) is a solution of $x - py = 8$.

Sol. $x - py = 8$

$$4 - p(-4) = 8$$

$$4p = 8 - 4$$

$$4p = 4$$

$$p = 1 \quad \text{Ans.}$$

Ex.9 Find the value of a if (a, -3a) is a solution of $14x + 3y = 35$.

Sol. Put x = a and y = -3a in given equation

$$14(a) + 3(-3a) = 35$$

$$14a - 9a = 35$$

$$5a = 35$$

$$a = 7 \quad \text{Ans.}$$

GRAPH OF LINEAR EQUATION $ax + by + c = 0$ IN TWO VARIABLES, WHERE $a \neq 0, b \neq 0$

(i) **Step I :**

Obtain the linear equation, let the equation be $ax + by + c = 0$.

(ii) **Step II :**

Express y in terms of x to obtain

$$y = -\left(\frac{ax + c}{b}\right)$$

(iii) **Step III :**

Give any two values to x and calculate the corresponding values of y from the expression in step II to obtain two solutions, say (α_1, β_1) and (α_2, β_2) . If possible take values of x as integers in such a manner that the corresponding values of y are also integers.

(iv) **Step IV :**

Plot points (α_1, β_1) and (α_2, β_2) on a graph paper.

(v) **Step V :**

Join the points marked in step IV to obtain a line. The line obtained is the graph of the equation $ax + by + c = 0$.

❖ EXAMPLES ❖

Ex.10 Draw the graph of the equation $y - x = 2$.

Sol. We have,

$$y - x = 2$$

$$\Rightarrow y = x + 2$$

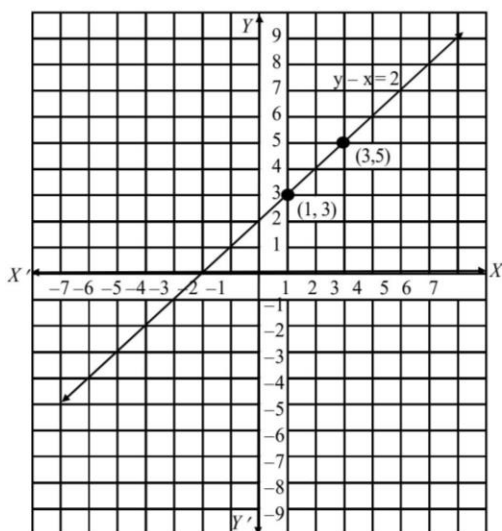
When $x = 1$, we have : $y = 1 + 2 = 3$

When $x = 3$, we have : $y = 3 + 2 = 5$

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	3	5

Plotting the points (1, 3) and (3, 5) on the graph paper and drawing a line joining them, we obtain the graph of the line represented by the given equation as shown in Fig.



- Ex.11** Draw a graph of the line $x - 2y = 3$. From the graph, find the coordinates of the point when
- $x = -5$
 - $y = 0$.

Sol. We have $x - 2y = 3$

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

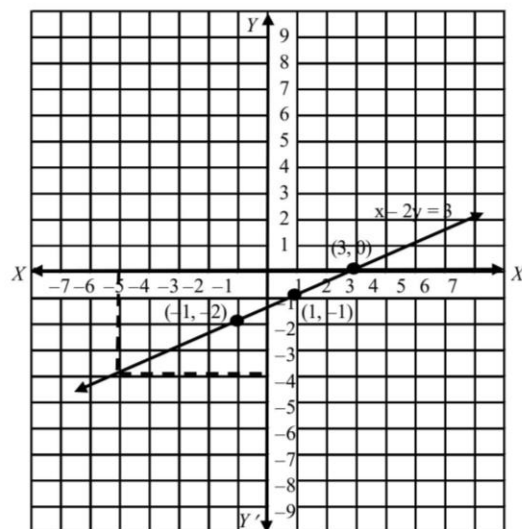
When $x = 1$, we have : $y = \frac{1-3}{2} = -1$

When $x = -1$, we have : $y = \frac{-1-3}{2} = -2$

Thus, we have the following table :

x	1	-1
y	-1	-2

Plotting points (1, -1) & (-1, -2) on graph paper & joining them, we get straight line as shown in fig. This line is required graph of equation $x - 2y = 3$.



To find the coordinates of the point when $x = -5$, we draw a line parallel to y-axis and passing through $(-5, 0)$. This line meets the graph of $x - 2y = 3$ at a point from which we draw a line parallel to x-axis which crosses y-axis at $y = -4$. So, the coordinates of the required point are $(-5, -4)$.

Since $y = 0$ on x-axis. So, the required point is the point where the line meets x-axis. From the graph the coordinates of such point are (3, 0).

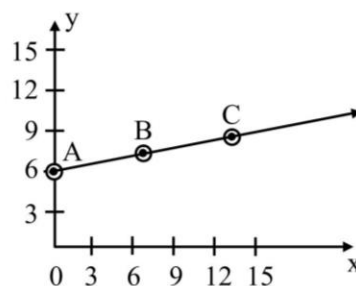
Hence, required points are $(-5, -4)$ and (3, 0).

Ex.12 Draw the graph of

- $x - 7y = -42$
- $x - 3y = 6$
- $x - y + 1 = 0$
- $3x + 2y = 12$

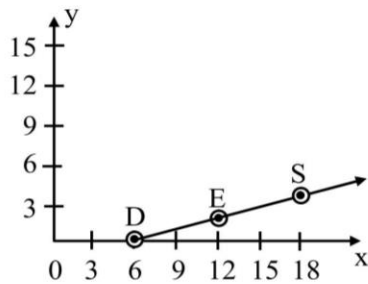
Sol. (i) $x - 7y = -42$

x	0	7	14
$y = \frac{x+42}{7}$	6	7	8
Points	A	B	C



(ii) $x - 3y = 6$

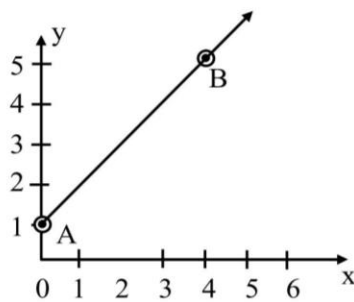
x	6	12	18
$y = \frac{x-6}{3}$	0	2	4
Point s	D	E	F



(iii) $x - y + 1 = 0$

In tabular form

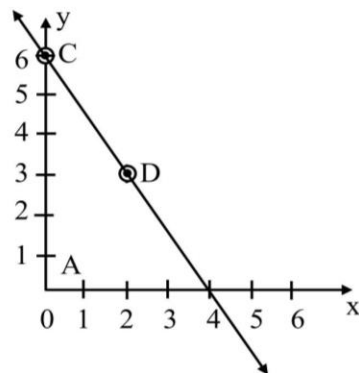
x	0	4
$y = x + 1$	1	5
Point s	A	B



(iv) $3x + 2y = 12$

In tabular form

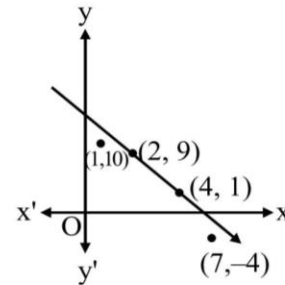
x	0	2
$y = \frac{12-3x}{2}$	6	3
Point s	C	D



Note :

- (i) The graph of any linear equation is a line and every solution of equations lies on the graph of that equation.
- (ii) If a point (a, b) is not on the line then this point is not a solution of given equation.

Eg.



Θ (2, 9) and (4, 1) are on the line

\therefore these two points are solution of given equation

But (1, 10) and (7, -4) are not on the line so these two are not solutions.

Ex.13 If $\left(\frac{9}{2}, 6\right)$ is lies on graph of $4x + ky = 12$ then find value of k.

Sol. Θ $x = \frac{9}{2}$ and $y = 6$ are on the line

\therefore put these value in given equation

$$4\left(\frac{9}{2}\right) + k(6) = 12$$

$$18 + 6k = 12$$

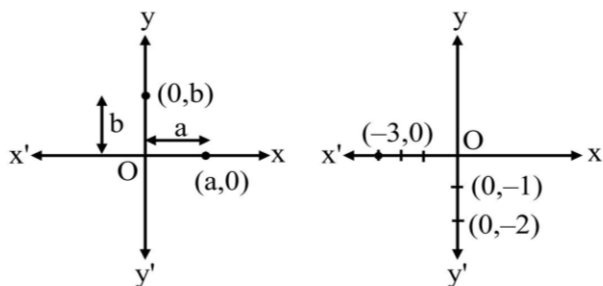
$$6k = 12 - 18$$

$$6k = -6$$

$$k = -1 \text{ Ans.}$$

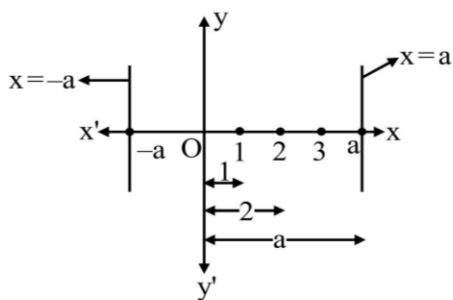
Note :

- (1) Equation of x-axis is $y = 0$ and any point in ordered pair form which is on the x axis is $(\pm a, 0)$.
- (2) Equation of y axis is $x = 0$ and any point on y axis is $(0, \pm b)$

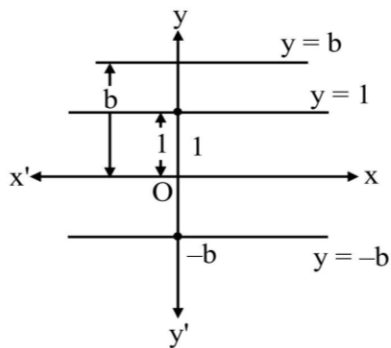


(3) Graph of line $x = \pm a$ is parallel to y axis

(4) Graph of line $y = \pm b$ is parallel to x axis



Graph of $x = -a$ and $x = +a$

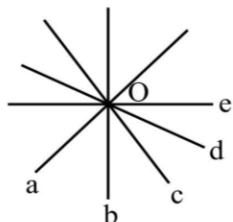


Graph of $y = 1, y = b, y = -b$

◆ **Concurrent lines :**

Three or more lines are called concurrent if all lines pass through a common point. These all lines a, b, c, d, e are passes through O.

∴ These are concurrent lines



Note :

From a point there are infinite lines can pass, so we can find (or make) infinite equations of lines which passes through a given point.

Ex.14 Find five equations of lines which passes through $(3, -5)$.

Sol. $x + y = -2, x - y = 8,$
 $2x + y = 1, 2x - y = 11,$
 $2x + 3y + 9 = 0$

➤ **EQUATIONS OF LINES PARALLEL TO THE X-AXIS AND Y-AXIS**

We can represent graph of these equations in two types of geometrically

(A) in one variable or on number line

(B) in two variable or on the Cartesian plane

In one variable, the solution is represent by a point. While in two variable, the solution is represent by a line parallel to x or y axis.

◆ **EXAMPLES** ◆

Ex.15 Give the geometric representation of $x = 5$ as an equation in

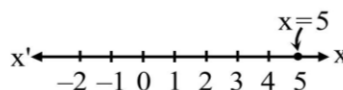
(i) one variable

(ii) two variable

(iii) also find the common solution of $x = 5$ & $x = 0$

Sol. (i) $x = 5$

it is in only one variable so representation on number line



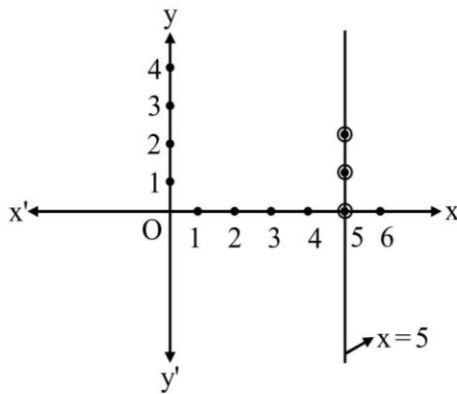
(ii) In two variables (or on Cartesian plane)

first we have to represent equation in two variables $x + 0.y = 5$ (i)

now we have to find two or three solutions of equations (i)

x	5	5	5
y	0	1	2

Then mark these points on graph with proper scale & join them



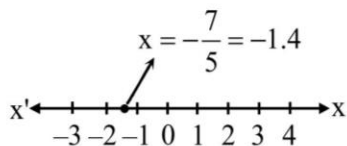
Scale : on both axis 10 lines or
 1 big box = 1 cm

- (iii) Θ $x = 5$ is line parallel to y axis and
 $x = 0$ is y axis.
 \therefore both are parallel
 \therefore no common solution

Ex.16 Give geometric representation of $5x + 7 = 0$
 as an equation

- (i) in one variable (or on a number line)
 (ii) in two variable (or on Cartesian plane)

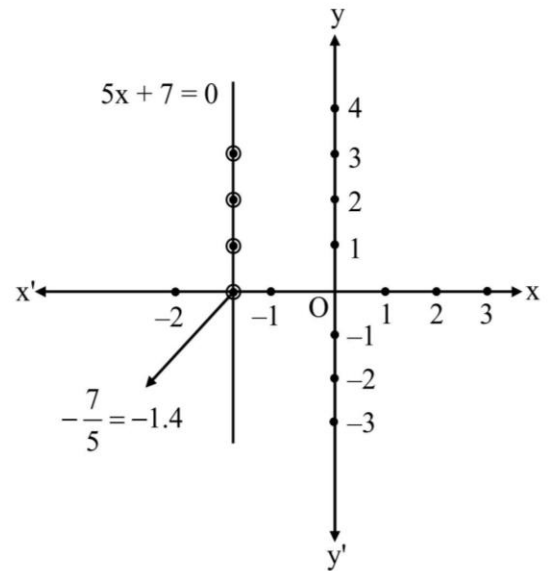
Sol. (i) $5x + 7 = 0$
 $\Rightarrow 5x = -7$
 $\Rightarrow x = -\frac{7}{5}$
 $= -1.4$



(ii) $5x + 0.y = -7$

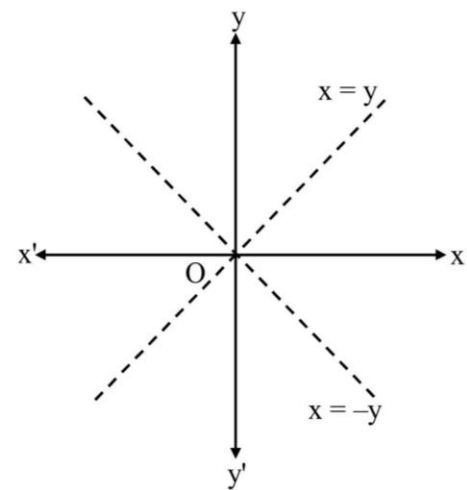
x	-7/5	-7/5	-7/5	-7/5
y	0	1	2	3

Scale : on both axis 10 lines or 1 box
 = 1 cm



Note :

If constant term 'c' is zero in equation
 $ax + by + c = 0$ then line will pass through
 origin (always)

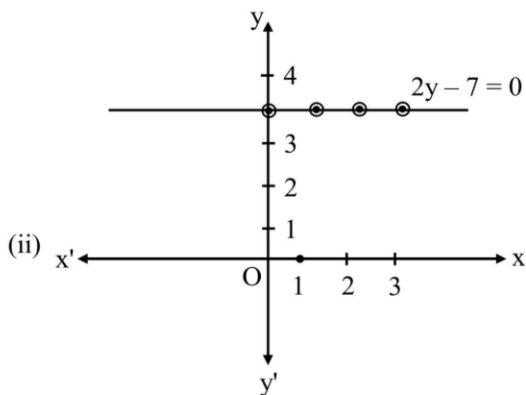
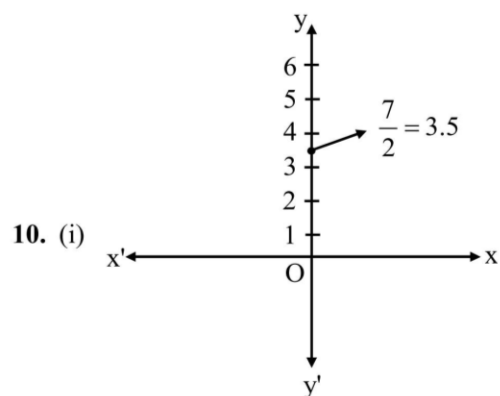
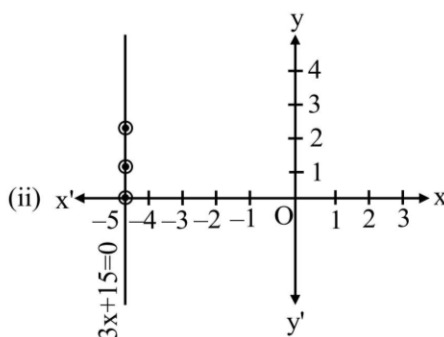
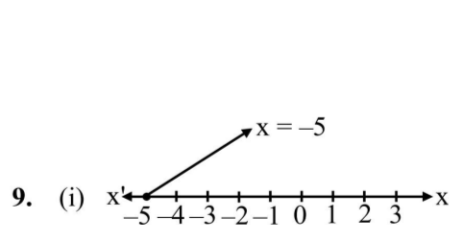
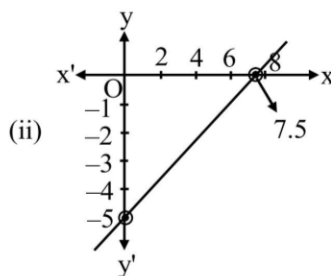
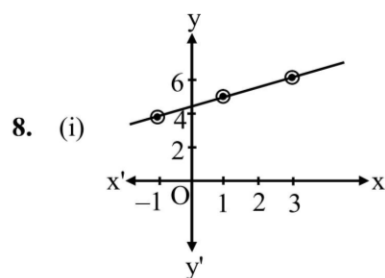


EXERCISE # 1

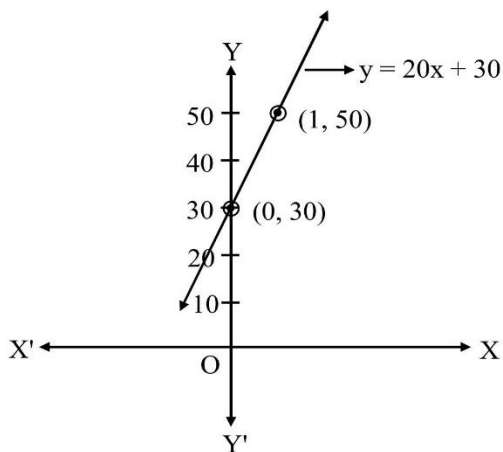
- Q.1** Write the three solutions for each of the following
 (i) $x = 9y$
 (ii) $x + \sqrt{3}y = 6$
 (iii) $2x + \pi y = 3.4$
- Q.2** Find the solutions of the form $x = a$, $y = 0$ and $x = 0$, $y = b$ for the following equations :
 $2x + 5y = 10$ and $2x + 3y = 6$.
 Is there any common solution?
- Q.3** Check which of the following are solutions of the equation $2x - y = 6$ and which are not :
 (i) $(3, 0)$
 (ii) $(0, 6)$
 (iii) $(2, -2)$
 (iv) $(\sqrt{3}, 0)$
 (v) $\left(\frac{1}{2}, -5\right)$
- Q.4** If $x = -1$, $y = 2$ is a solution of the equation $3x + 4y = k$, find the value of k .
- Q.5** Find the value of λ , if $x = -\lambda$ and $y = \frac{5}{2}$ is a solution of the equation $x + 4y - 7 = 0$.
- Q.6** If $x = 2\alpha + 1$ and $y = \alpha - 1$ is a solution of the equation $2x - 3y + 5 = 0$, find the value of α .
- Q.7** Find the value of a & b if $(-1, 2)$ is solution of $ax + y + 1 = 0$ and $2x + by + 8 = 0$.
- Q.8** Draw the graph of
 (i) $2y - x = 9$
 (ii) $2x - 3y = 15$
- Q.9** Represent geometrically $3x + 15 = 0$ on
 (i) the number line (ii) on Cartesian plane
- Q.10** Draw the graph of line $2y - 7 = 0$ in
 (i) form of 1 variable
 (ii) in form of two variables
- Q.11** Find the value of x for which $y = 20$ is a solution of the equation $5x + 20y = 200$.
- Q.12** Find the condition such that ordered pair (m, n) satisfies the equation $ax + by + c = 0$.
- Q.13** Express x in terms of y given that $\frac{x}{3} + 2y = 5$.
 Check whether $(3, 2)$ is a solution of the given equation.
- Q.14** The cost of petrol in a city is $\text{₹}50$ per litre. Set up a linear equation with x representing the number of litres any y representing the total cost in ₹ .
- Q.15** The work done by a body on application of a constant force is directly proportional to the distance travelled by the body. Express this in the form of an equation in few variables and draw the graph of the same by taking the constant as 4 units. Read from the graph the work done when the distance travelled by the body is (i) 2 units (ii) 3 units.
- Q.16(a)** The taxi fare in a city is as follows :
 For the first kilometer, the fare is $\text{₹}50$ and for the subsequent distance it is $\text{₹}20$ per km, taking the distance covered as x km and total fare as $\text{₹}y$. Write a linear equation for this information and draw its graph.
- (b)** The Autorikshaw fare in a city is charged $\text{₹}10$ for the first kilometer and $\text{₹}4$ per kilometer for subsequent distance covered. Write the linear equations to express the above statement. Draw the graph of the linear equation.
- Q.17** A man leaves half of his property for his wife, one third for his daughter and remaining for his son. If son's share is 60,000, how much money did he leave and how much money did his wife and son get ?

ANSWER KEY

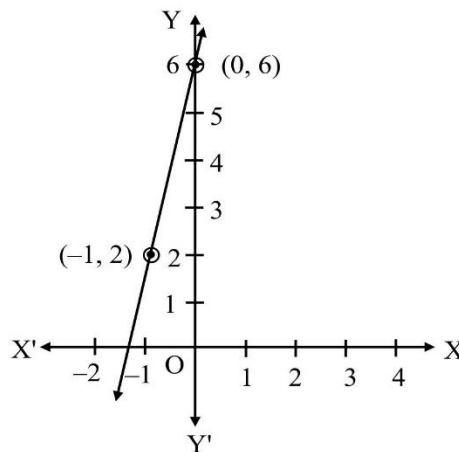
1. (i) $(0, 0), (9, 1), (18, 2)$ (ii) $(6, 0), (6 - \sqrt{3}, 1), (6 + \sqrt{3}, -1)$ (iii) $(1.7, 0), \left(\frac{3.4 + \pi}{2}, -1\right), (1.7 - \pi, -2)$.
2. $x = 5, y = 0$ and $x = 0, y = 2$ are two solutions of $2x + 5y = 10$.
 $x = 0, y = 2$ and $x = 3, y = 0$ are two solutions of $2x + 3y = 6$.
 Yes, $x = 0, y = 2$ is common solution.
3. (i) Yes (ii) No (iii) Yes (iv) No (v) Yes
4. $k = 5$ 5. $\lambda = 3$ 6. $\alpha = -10$ 7. $a = 3, b = -3$



11. -40
12. $am + bn + c = 0$
13. $x = -6y + 15$; Yes.
14. $y = 50x$.
15. $y = Kx$; If $K = 4$, $y = 4x$; Again for $x = 2$, $y = 8$; $x = 3$, $y = 12$
16. (a) $y = 20x + 30$



- (b) $y = 4x + 6$



17. $\text{₹} 3,60,000$, $\text{₹} 1,80,000$ and $\text{₹} 1,20,000$.

EXERCISE # 2

Q.1 Draw the graph of the following linear equations

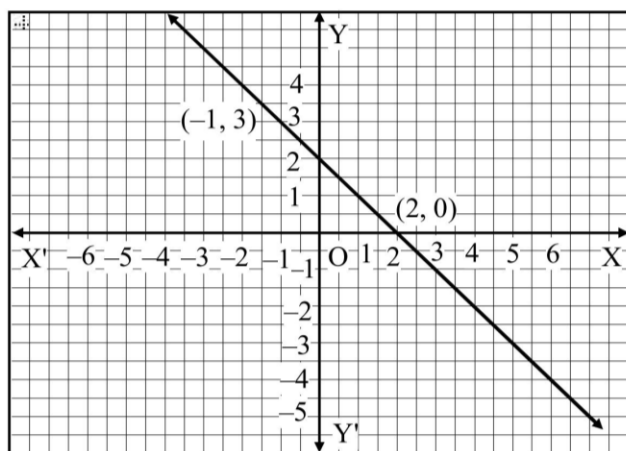
- (i) $x + y = 4$ (ii) $x - y = 2$ (iii) $y = 3x$
 (iv) $3 = 2x + y$ (v) $x = y$ (vi) $x + y = 0$
 (vii) $y = -x + 2$

Q.2 Find the value of p if $(3, 2)$ is a solution of $px - 5y + p^2 = 0$.

Q.3 Draw the graphs of the equations $x - y = 1$ and $2x + y = 8$. Shade the area bounded by these two lines and y -axis. Also, determine this area.

Q.4 From the choices given below, choose the equation whose graph is given in figure

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



Q.5 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.

Q.6 In countries like USA and Canada, temperature is measured in Fahrenheit, whereas in countries like India, it is measured in Celsius. Here is a linear equation that converts Fahrenheit to Celsius :

$$F = \left(\frac{9}{5}\right)C + 32$$

(i) Draw the graph of the linear equation given above, using Celsius for x -axis and Fahrenheit for y -axis

(ii) If the temperature is 30°C , what is the temperature in Fahrenheit ?

(iii) If the temperature is 95°F , what is the temperature in Celsius?

(iv) If the temperature is 0°C , what is the temperature in Fahrenheit and if the temperature is 0°F , what is the temperature in Celsius ?

(v) Is there a temperature which is numerically the same in both Fahrenheit and Celsius? If Yes, find it.

Q.7 The taxi fare in a city is as follows. For the first kilometer, the fare is ₹ 8, for the subsequent distance it is ₹ 5 per km. Taking the distance covered as x km and total fare as ₹ y , write a linear equation for this information, and draw its graph.

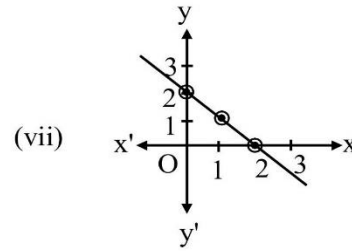
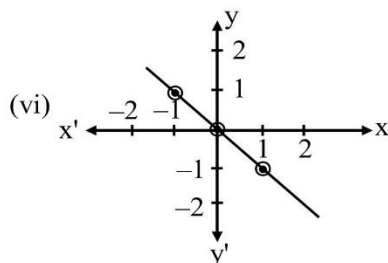
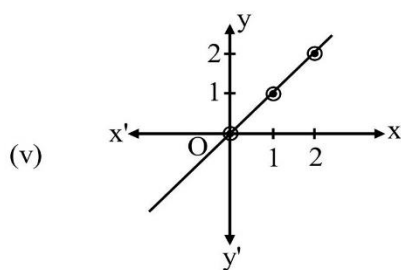
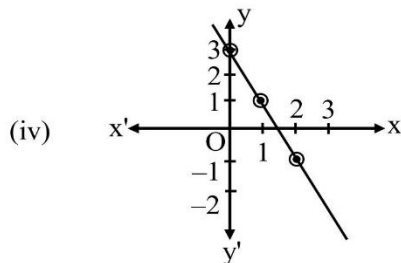
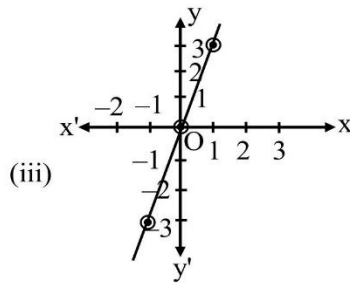
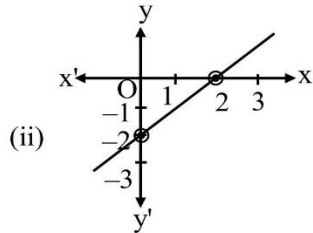
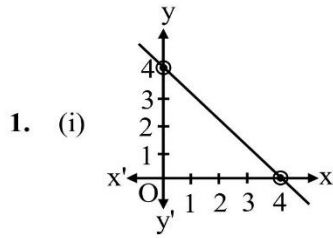
Q.8 Yamini and Fatima, two students of class IX of a school, together contributed ₹ 100 towards the Prime Minister's Relief Fund to help the earthquake victims. Write a linear equation which satisfies this data and draw the graph of the same.

Q.9 If the work done by a body on application of a constant force is directly proportional to the distance travelled by the body, express this in the form of an equation in two variables and draw the graph of the same by taking the constant force as 5 unit. Also, read from the graph the work done when the distance traveled by the body is (i) 2 units (ii) 0 units.

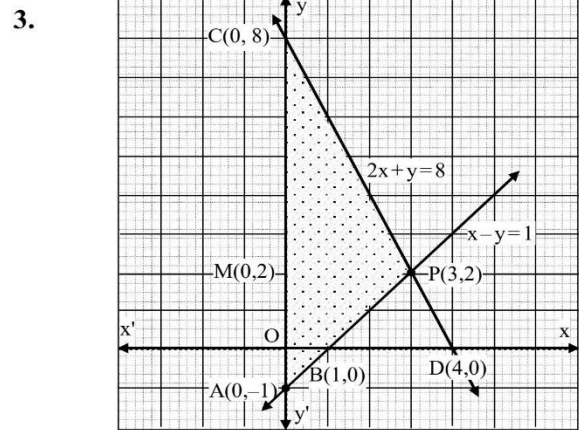
Q.10 If $x = 1, y = 2$ is a solution of the equation $a^2x + ay = 3$, then find the values of a .

- Q.11** In a $\triangle ABC$, $\angle C = 3\angle B = 2(\angle A + \angle B)$. Find the angles.
- Q.12** If the length of a rectangle is reduced by 5 units and its breadth is increased by 2 units, then the area of the rectangle is reduced by 80 sq units. However, if we increase its length by 10 units and decrease the breadth by 5 units, its area is increased by 50 sq units. Make linear equations to find the length and breadth of the rectangle.
- Q.13** If three times the larger of two numbers is divided by the smaller one, we get 4 as the quotient and 3 as the remainder. Also, if seven times the smaller number is divided by the large one, we get 5 as the quotient and 1 as the remainder. Find the linear equation to find the numbers.
- Q.14** The sum of the digits of a two-digit number is 12. The number obtained by interchanging its digits exceeds the given number by 18. Find the number.
- Q.15** Each one of A and B has some money. If A gives ₹ 30 to B then B will have twice the money left with A. But, if B gives ₹ 10 to A then A will have thrice as much as is left with B. How much money does each have?
- Q.16** The coach of a cricket team buys 7 bats and 6 balls for Rs. 3800. Later, he buys 3 bats and 5 balls for Rs. 1750. Find the cost of each bat and each ball.
- Q.17** What number must be added to each of the numbers, 5, 9, 17, 27 to make the numbers in proportion ?
- Q.18** The difference between two numbers is 26 and one number is three times the other. Find them.
- Q.19** The sum of the digits of a two-digit number is 9. Also, nine times this number is twice the number obtained by reversing the order of the number. Find the number.
- Q.20** A fraction becomes $\frac{4}{5}$ if 1 is added to each of the numerator and denominator. However, if we subtract 5 from each, the fraction becomes $\frac{1}{2}$. Find the fraction.
- Q.21** Draw the graph of the equation $2y + x = 7$ and determine from the graph whether $x = 3$ and $y = 2$ is a solution.
- Q.22** Solve the following system of equations graphically. Also, find out the points, where these lines meet the x-axis.
- $$x - 2y = 1$$
- $$2x + y = 7$$
- Q.23** For what value of k will the following system of equations have a unique solution.
- (i) $2x + ky = 1$ and $3x - 5y = 7$
 (ii) $x - 2y = 3$ and $3x + ky = 1$
 (iii) $2x + 5y = 7$ and $3x - ky = 5$
- Q.24** In $\triangle ABC$, $\angle A = y^\circ$, $\angle B = (y - 9)^\circ$, $\angle C = x^\circ$. Also $\angle B - \angle C = 48^\circ$, find the three angles.
- Q.25** Draw the graph of $6 - 1.5x = 0$.

ANSWER KEY



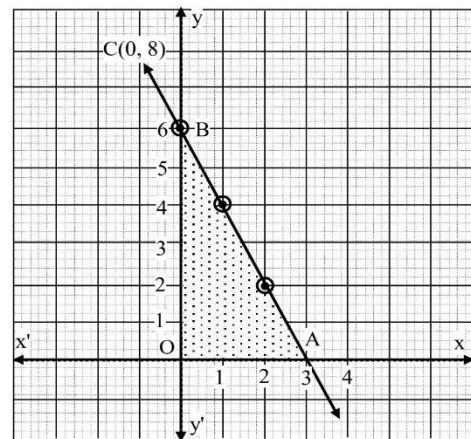
2. $p = -5$ or 2



Area = 13.5 sq. units.

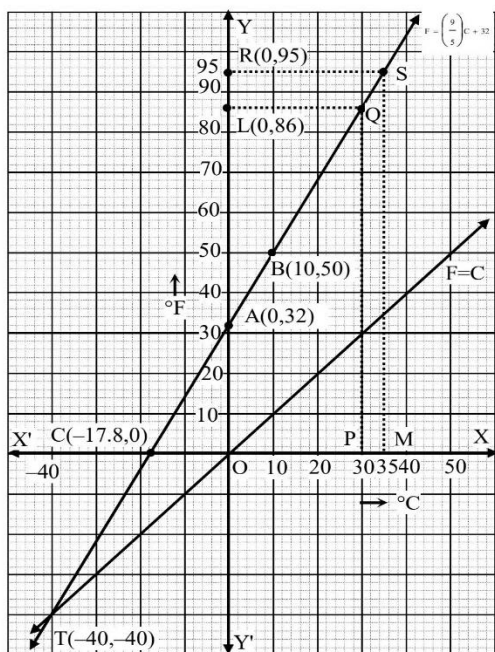
4. (iii) $y = -x + 2$

5.



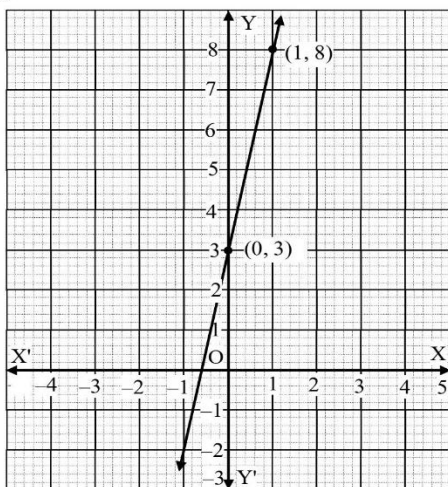
Area = 9 cm²

6.(i)



- (ii) 86°F
- (iii) 35°C
- (iv) -17.8°C
- (v) Yes, $-40^\circ\text{C} = -40^\circ\text{F}$

7. $y = 5x + 3$



15. $A = j - 62, B = j - 34$

16. $j - 500, j - 50$

17. 3

18. 39, 13

19. 18

20. $\frac{7}{9}$

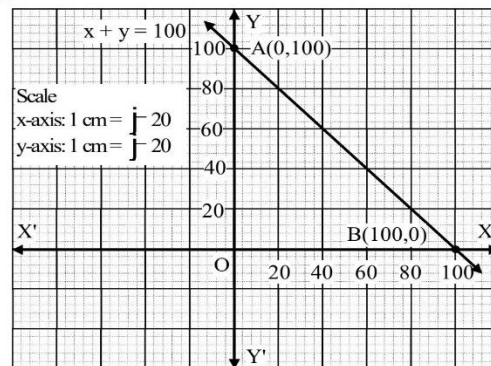
21. Yes

22. $x = 3, y = 1, (1, 0), \left(\frac{7}{2}, 0\right)$

23. (i) $k \neq \frac{-10}{3}$ (ii) $k \neq -6$ (iii) $k \neq \frac{-15}{2}$

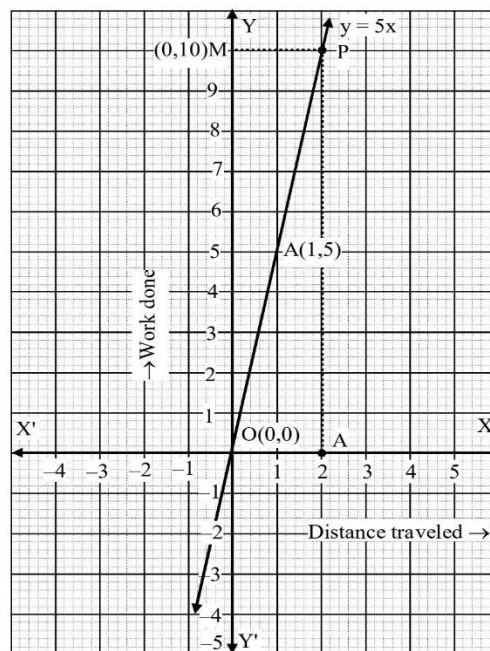
24. $82^\circ, 73^\circ, 25^\circ$

8. $x + y = 100$



9. $y = 5x$

- (i) 10 units
- (ii) 0



10. $a = 1, -3$

11. $\angle A = 20^\circ, \angle B = 40^\circ, \angle C = 120^\circ$

12. $5y - 2x = 70, 2y - x = 20$

13. $3x - 4y = 3, 5x - 7y = -1$

14. 57

25.

