Very Short Answer Type Questions

[1 MARK]

Que 1. Write a solution of the linear equation 5x + 0y + 8 = 0 in two variables.

Sol. Given equation is 5x + 0y + 8 = 0

i.e., 5x + 8 = 0 $\Rightarrow x = \frac{-8}{5}$

∴ Required solution is $\left(\frac{-8}{5}, -1\right)$.

Here, y = any integer because coefficient of y is 0.

Que 2. Is (x, 0) a point on the x-axis? Give reason.

Sol. Yes, because the y-coordinate of any point on x-axis is zero.

Que 3. How many solutions does the equation 2x + 5y = 8 has?

Sol. Infinitely many solutions.

Que 4. Check whether the point (a, - a) lies on y = x – a or not.

Sol. Given equation is y = x – a

RHS = x – a = a – a = 0 ≠ y

∴ $(a, -a)$ does not lie on y = x – a

Que 5. If $p = 100r - t$, find the value of p when r = 0.25 and t = 10.

Sol. Given p = 100r – t

= 100(0.25) – 10

= 25 – 10 = 15

Que 6. Write the equation representing y-axis.

Sol. $x = 0$

Que 7. Write the equation representing x-axis.

Sol. $y = 0$

Que 8. What is distance between the graphs of the equations y = -1 and y = 3?

Sol. $4\ units.$

Que 9. How many linear equations satisfy x = 2 and y = -3?

Sol. Infinitely many equations.

Que 10. The weight of a man is four times the weight of a child. Write an equation is two variables for this situation.

Sol. Let the weight of the man be x kg and that of the child be y kg. Then required equation is x = 4y or x – 4y = 0

Que 11. Give the geometric representation of y = 2 as an equation in one variable.

Sol.

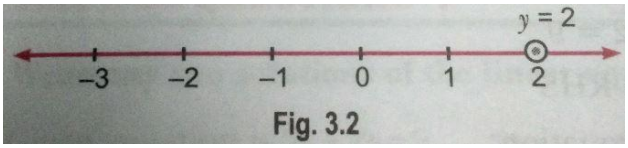


Fig. 3.2

Que 12. Write the equation of a line parallel to y-axis and passing through the point (-4, -5).

Sol. x = 4

Que 13. Write the equation of a line parallel to x-axis and passing through the point (-3, -4).

Sol. y = - 4

Que 14. Is $ax + by + c = 0$, where a, b and c are real numbers, a linear equation in two variables? Give reason.

Sol. yes $ax + by + c = 0$ is linear equation in two variables if both a and b are non-zero.

Que 15. Check whether the graph of the equation y = 3x + 5 Passes through the origin or not.

Sol. On substituting co-ordinates of the origin (0, 0) in the given equation, we get $0 = 3 \times 0 + 5$, which is not true.

So, it does not pass through the origin.

Que 16. For what value of p the point (p, 0) lies on the line 3x + y = 11?

Sol. The point $(p, 2)$ lies on $3x + y = 11$

$$\therefore 3p + 2 = 11 \qquad \Rightarrow p = \frac{9}{3} = 3$$

Que 17. Find the value of k if the line on 2x + y = k Passes through the point (3, 5).

Sol. $2x + y = k$

$\Longrightarrow 2 \times 3 + 5 = k \;\; \Rightarrow k = 11$

Que 18. Write the equation of the line parallel to the x-axis at distance 3 units above x-axis.

Sol. The equation of any line parallel to x-axis at a distance b units is given by y=b.

Here, b = 3 (above x-axis represent positive direction)

⇒ Required equation is y = 3.

Que 19. Express the given statement in the form of a linear equation in two variables. The sun of the ordinate and abscissa of a point is 6.

Sol. x + y = 6

Que 20. Express the given equation as linear equation in two variables in standard form: $\sqrt{3y} = 2x$.

Sol. $2x - \sqrt{3y} + 0 = 0$

Que 21. Express the given statement in the form of a linear equation in two variables. The cost of a half dozen eggs is the same as the cost of one packet bread.

Sol. Let the cost of one egg be ₹ x and cost of one packet bread is ₹ y.

$\therefore$ 6x = y

Que 22. If x = 0 and y = k is a solution of the equation 5x – 3y = 0, find the value of k.

Sol. $5x - 3y = 0$

As $x = 0; y = k$

$$\Rightarrow 5(0) - 3k = 0 \Rightarrow 0 - 3k = 0$$

$$\Rightarrow -3k = 0 \Rightarrow k = \frac{0}{-3} \Rightarrow k = 0$$

Que 23. Find whether $(\sqrt{2}, 3\sqrt{2})$ is a solution of $x - 3y = 9$ or not.

Sol. Assuming $(\sqrt{2}, 3\sqrt{2})$ is a solution of the equation.

$$\therefore x = \sqrt{2}, y = 3\sqrt{2} \qquad \Rightarrow x - 3y = 9$$

$$\Rightarrow \sqrt{2} - 3(3\sqrt{2}) = 9 \qquad \Rightarrow \sqrt{2} - 9\sqrt{2} = 9$$

$\Rightarrow -8\sqrt{2} = 9$ Since LHS ≠ RHS

Hence $(\sqrt{2}, 3\sqrt{2})$ is not a solution of the given equation.

Que 24. Find one solution of $x = y$.

Sol. $x = y$

Let $y = 1$

$\therefore x = 1$

$\therefore$ The solution is (1, 1).

Que 25. In some countries temperature is measured in Fahrenheit, whereas in countries like India in measured in Celsius. Here is a linear equation that converts Fahrenheit to Celsius: $F = \left(\frac{9}{5}\right)c + 32$. If the temperature is 30^0c, then what is the temperature in Fahrenheit?

Sol. Let $F = x$ and $C = y$

$\therefore x = \frac{9}{5}y + 32$

$\therefore \ x = \frac{9}{5}(30) + 32 = 54 + 32 = 86F$

Que 26. $2x + y = 3$ passes from origin. Is this statement true or false?

Sol. When the line passes through origin, co-ordinates will be (0, 0)

$\therefore \quad 2(0) + 0 = 3 \qquad \Rightarrow \ 0 = 3$

Since LHS ≠ RHS, hence the given statement is false.

Que 27. Write three possible linear equations which can pass through point (3,-2).

Sol.

$$x + y = 1 \qquad \ldots(i)$$

$$x - y = 5 \qquad \ldots(ii)$$

$$2x + y = 4 \qquad \ldots(iii)$$

Que 28. Arvind and Vinod have some erasers. Arvind said to Vinod, if you will give me 10 erasers, I will have twice the erasers left with you. Represent this situation as a linear equation in two variables.

Sol. Let number of erasers Arvind has be x

And number of erasers vinod has be y

$$\therefore \quad x + 10 = 2(y - 10)$$

$$\Rightarrow x + 10 = 2y - 20$$

$$\Rightarrow x - 2y + 30 = 0$$

Que 29. If $\pi x + 3y = 25$ and $y = 1$, then find x.

Sol. Put $y = 1$ in $\pi x + 3y = 25$

$$\Rightarrow \quad \pi x + 3(1) = 25 \qquad \Rightarrow \pi x = 22$$

$$\Rightarrow \frac{22}{7} x = 22 \qquad \Rightarrow x = 7$$

Que 30. The point where the given line intersects x-axis, the y coordinate is 0.

$\therefore$ 2x + 3(0) = 6 $\Rightarrow$ x = 3

Hence, the co-ordinate of the point is (3, 0).

Short Answer Type Questions – I

[2 marks]

Que 1. Write any two solutions of the linear equation $3x + 2y = 0$

Sol. Given equation is $3x + 2y = 9 \quad \Rightarrow y = \frac{9-3x}{2}$

When $x = 1, y = \frac{9-3}{2} = \frac{6}{2} = 3$

When $x = 1, y = \frac{9+3}{2} = \frac{12}{2} = 6$

∴ Two solutions of the given equation are $(1, 3), (-1, 6)$

Que 2. Determine the point on the graph of the linear equation $x + y = 6$, whose ordinate is 2 times its abscissa.

Sol. Given $y = 2x$, putting $y = 2x$ in the equation $x + y = 6$, we get

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

$$\Rightarrow \quad x = \frac{6}{3} \quad \Rightarrow \quad x = 2$$

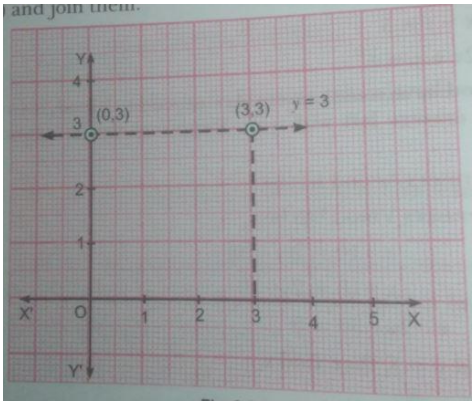
Putting $x = 2$ in the equation $y = 2x \; we \; get, y = 2 \times 2 = 4$

∴ The required point is $(2, 4)$.

Que 3. Draw the graph of the equation represented by the straight line which is parallel to the x-axis and 3 units above it.

Sol. Any straight line parallel to x-axis is given by $y = a$, where a is the distance of the line from the x-axis.

Here $a = 3$. Therefore the equation of the line is $y = 3$. To draw the graph of this equation plot the points $(0, 3)$ and (3, 3) and join them.



Que 4. For what value of c, the linear equation $2x + cy = 8$ has equal values of x and y as its solution?

Sol. $2x + cy = 8, here\ y = x$

$\therefore 2x + cx = 8 \quad \Rightarrow \quad cx = 8 - 2x \quad \Rightarrow c = \frac{8-2x}{x}, x \neq 0$

Que 5. If the point $(3, 4)$ lies on the graph of $3x = ay + 7$, then find the value of a.

Sol. $\therefore (3,4)$ lies on the graph of $3x = ay + 7$

$$\therefore 3(3) = a \times 4 + 7 \quad \Rightarrow 9 = 4a + 7$$

$$\Rightarrow 4a = 2 \quad \Rightarrow a = \frac{1}{2}$$

Que 6. Give the equations of two lines passing through (4,-2). How many more such lines are there, and why?

Sol. The equations of the lines passing through (4, -2) are

$$x + y = 2, \quad 2x + 3y = 2$$

Since, infinitely many lines pass through a point

$\therefore$ There are infinitely many such lines.

Que 7. If the point $(2k - 3, k + 2)$ lies on the graph of the equation $2x + 3y + 15 = 0$ Find the value of k.

Sol. (As $2k - 3, k + 2)$ lies on the line $2x + 3y + 15 = 0$

So, putting $x = 2k - 3$ and $y = k + 2$ in equation, we get

$$\Rightarrow \quad 2(2k - 3) + 3(k + 2) + 15 = 0$$

$$\Rightarrow \quad 4k - 6 + 3k + 6 + 15 = 0$$

$$\Rightarrow \quad 7k + 15 = 0$$

$$\Rightarrow \quad 7k = -15 \quad \Rightarrow k = -\frac{15}{7}$$

Que 8. Force applied on a body of mass 5 kg is directly proportional to the acceleration produced in the body. Represent this solution as a linear equation in two variable.

Sol. Let the force be x and acceleration due to farce be y.

$\therefore x = 5y$

Que 9. If the length of a rectangle is decreased by 3 units and breadth increased by 4 unit, then the area will increase by 9 sq. Represent this situation as a linear equation in two variables.

Sol. Let the length be x and breadth be y.

∴ Area of the rectangle = xy

When length is $x-3$ and breadth is $y+4$

∴ $(x-3)(y+4) = xy+9$

Que 10. Express x in terms of y for the linear equation $\frac{2}{3}x + 4y = -7$.

Sol. $\frac{2}{3}x + 4y = -7 \quad \Rightarrow \quad \frac{2}{3}x = -7 - 4y$

$\Rightarrow \quad 2x = 3(-7-4y) \quad \Rightarrow \quad x = \frac{-21-12y}{2}$

Que 11. Find the coordinate where the linear equation $3x - 4y = 11$ meets at x-axis.

Sol. The point where the given linear equation in two variables meets at x-axis, the y co-ordinate will be 0.

∴ $3x - 4y = 11 \quad \Rightarrow \quad 3x - 4(0) = 11$

$\Rightarrow \quad 3x = 11 \quad \Rightarrow \quad x = \frac{11}{3}$

Hence, the required point is $\left(\frac{11}{3}, 0\right)$.

Que 12. Find the coordinate where the linear equation $4x - \frac{2}{3}y = 7$ meets at y-axis.

Sol. The point where the given linear equation in two variables meets at y-axis, the x co-ordinate will be 0.

∴ $4x - \frac{2}{3}y = 7 \quad \Rightarrow \quad 4(0) - \frac{2}{3}y = 7$

$\Rightarrow \quad -\frac{2}{3}y = 7 \quad \Rightarrow \quad y = \frac{-21}{2}$

Hence, co-ordinate is $\left(0, \frac{-21}{2}\right)$.

Que 13. Write the linear equation represented by line AB and PQ. Also find the co-ordinate of intersection of line AB and PQ.

Sol. AB $\Rightarrow \quad x = -2$

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

∴ Point of intersection of AB and PQ is C (-2,-3).

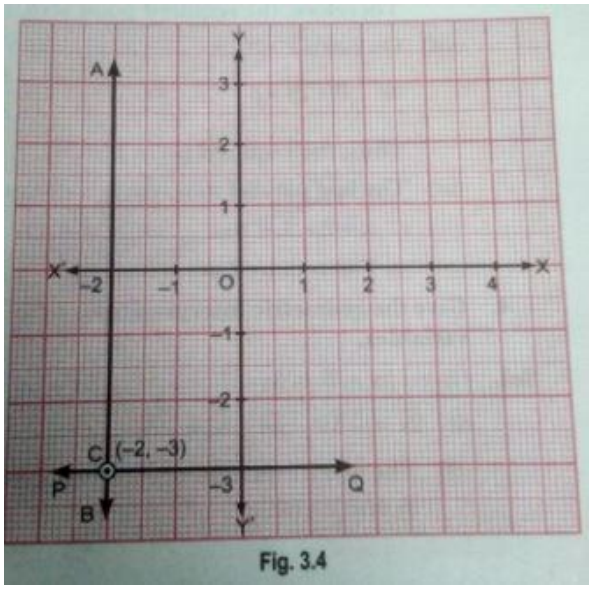


Fig. 3.4

Que 14. Solve for x: $5(4x + 3) = 3(x - 2)$

Sol. $5(4x + 3) = 3(x - 2)$

$\Rightarrow 20x + 15 = 3x - 6$ $\Rightarrow 20x - 3x = -6 - 15$

$\Rightarrow 17x = -21$ $\Rightarrow x = \frac{-21}{17}$

Short Answer Type Questions – II

[3 MARKS]

Que 1. Write two solutions of the equation $4x - 5y = 15$.

Sol. Taking $x = 0$ we get, $4 \times 0 - 5y = 15$

$\Rightarrow \quad y = \frac{-15}{5} \quad \Rightarrow \quad y = -3.$

So (0,-3) is a solution of the given equation.

Similarly by taking $x = 5$, we get

$4 \times 5 - 5y = 15 \quad \Rightarrow \quad 20 - 5y = 15$

$\Rightarrow \quad -5y = 15 - 20 \quad \Rightarrow \quad -5y = -5$

$\Rightarrow \quad y = \frac{5}{5} \quad \Rightarrow \quad y = 1$

Thus, (5, 1) is also a solution.

Que 2. How many solution(s) of the equation $3x + 2 = 2x - 3$ are there on the:

(i) Number line? (ii) Cartesian plane?

Sol. (i) $3x + 2 = 2x - 3$

$\Rightarrow \quad 3x - 2x = -3 - 2 \quad \Rightarrow x = -5$

So, on a number line there is only one solution which is $x = -5$.

In a Cartesian plane there are infinitely many solutions.

Que 3. Find the solution of the linear equation $x + 2y = 8$ which represents a point on

(i) **the x-axis** **(ii) the y −axis**

(iii) the line parallel to x-axis and at a distance of 3 units above it

Sol. (i) On x-axis y = 0 $\Rightarrow x + 2 \times 0 = 8 \quad \Rightarrow x = 8$

Therefore, the required point is (8, 0).

(ii) On y-axis $x = 0$

$\Rightarrow \quad 0 + 2y = 8 \quad \Rightarrow \quad y = \frac{8}{2} \quad \Rightarrow \quad y = 4$

Thus, the required point is (0, 4).

(iii) The line parallel to x-axis, at a distance of 3 units above it is given by $y = 3$

$\therefore \quad x + 2 \times 3 = 8 \qquad \Rightarrow \quad x = 8 - 6 = 2$

$\therefore$ The required point is (2, 3).

Que 4. Give the geometric interpretations of $5x + 3 = 3x - 7$ as an equation (i) in one variable (ii) in two variables.

Sol. Given $5x + 3 = 3x - 7 \qquad 5x - 3x = -7 - 3$

Or $2x = -10$ or $x = -5$

(i) The given equation represents point $x = -5$ on the number line when treated as an equation in one variable.

(ii) The equation $x = -5$ can be written as

$$1.x + 0.y + 5 = 0$$

Which is a linear equation in two variables x and y.

So, it represents a straight line in the Cartesian plane.

Que 5. Solve for x: $\frac{3}{x-1} + \frac{1}{x+1} = \frac{4}{x}$, Where $x \neq 0, x \neq 1, x \neq -1$

Sol.

$$\frac{3}{x-1} + \frac{1}{x+1} = \frac{4}{x} \qquad \Rightarrow \frac{3(x+1) + 1(x-1)}{(x-1)(x+1)} = \frac{4}{x}$$

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

$$\Rightarrow x(4x + 2) = 4(x^2 - 1)$$

$$\Rightarrow 4x^2 + 2x = 4x^2 - 4$$

$$2x = -4$$

$$\Rightarrow \ x = -2$$

Que 6. Solve for x: $(5x + 1)(x + 3) - 8 = 5(x + 1)(x + 2)$

Sol. $(5x + 1)(x + 3) - 8 = 5(x + 1)(x + 2) \quad \Rightarrow \quad (5x^2 + 15x + x + 3) - 8 = 5(x^2 + 2x + x + 2)$

$\Rightarrow \ 5x^2 + 16x + 3 - 8 = 5(x^2 + 3x + 2) \quad \Rightarrow \quad 5x^2 + 16x - 5 = 5x^2 + 15x + 10$

$\Rightarrow 16x - 15x = 15 \qquad \Rightarrow x = 15$

Que 7. The cost of a toy horse is same as that of cost of 3 balls. Express this statement as a linear equation in two variables. Also draw its graph.

Sol. Let the cost of toy horse be x and cost of one ball be ₹ y.

∴ Cost of three balls = 3y

According to the given condition, we have

$$x = 3y \qquad \ldots(i)$$

$\boldsymbol{x}$	3	6	9
$\boldsymbol{y}$	1	2	3
	P	Q	R

For graph,

(a) Taking y=1, in equation(i), we get

$\therefore x = 3(1) = 3$

(b) Taking $y = 2$, in equation (i), we get

$\therefore x = 3(2) = 6$

(c) Taking $y = 3$, in equation (i), we get

$\therefore x = 3(3) = 9$

Now draw a graph taking P (3, 1), Q (6, 2) and R (9, 3) which is given below.

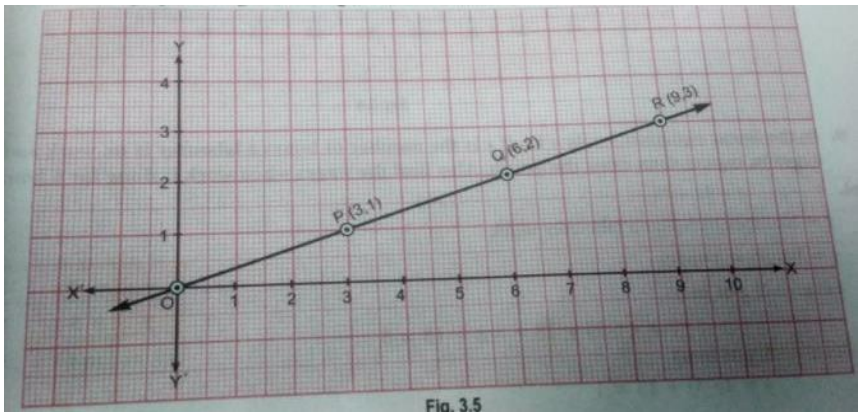


Fig. 3.5

Que 8. Two batsman Rahul and Anil while playing a cricket match scored 120 runs. For this, write a linear equation in two variables and draw the graph.

Sol. Let the runs scored by Rahul be x and that by Anil be y.

According to the given condition, we have

$$x + y = 120 \quad \Rightarrow \quad x = 120 - y \qquad \ldots(i)$$

x	80	60	40
y	40	60	80
	A	B	C

For graph, taking $y = 40$, we get

$$x = 120 - 40 = 80$$

Again, taking $y = 60$, we get

$$x = 120 - 60 = 60$$

And taking $y = 80$, we get

$$x = 120 - 80 = 40$$

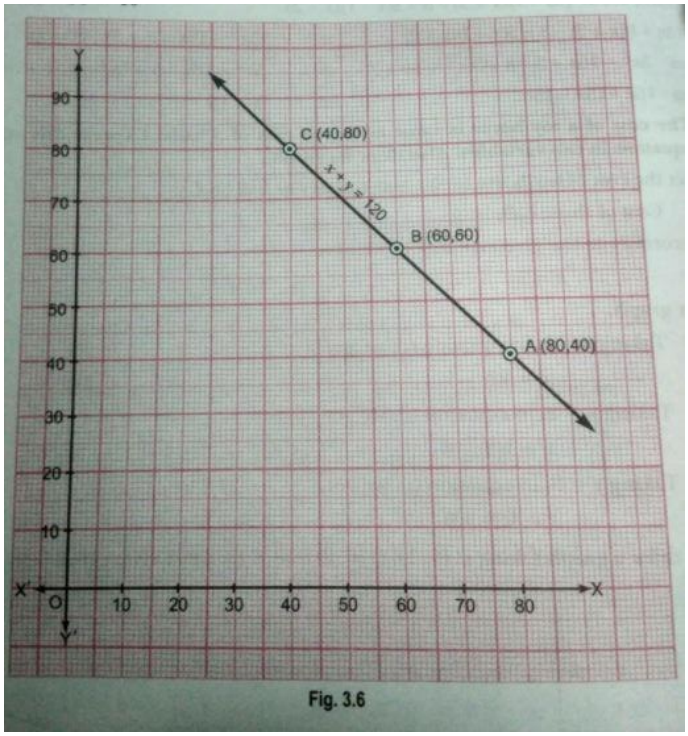


Fig. 3.6

Que 9. In the linear equation $y = 4x + 13$, if x is the number of hours a labourer is on work and y are his wages in rupees then draw the graph. Also find the wages when work is done for 6 hours.

Sol. $y = 4x + 13 \quad \ldots(i)$

$x =$ Number of hours a labourer work

y = Wages in rupees

Let $x = -2$, put in (i)

$$y = 4(-2) + 13 = -8 + 13 = 5$$

Let $x = -3$, put in (i)

$$y = 4(-3) + 13 = 1$$

x	-2	-3	-4
y	5	1	-3
	A	B	C

Let $x = -4, put\ in\ (i)$

$$y = 4(-4) + 13$$

$$= -16 + 13 = -3$$

When work is done for 6 hours means $x = 6$, the wages come out to be

$$y = 4(6) + 13$$

$$y = 24 + 13$$

$$= 37, \text{i. e.}, \text{Rs } 37$$

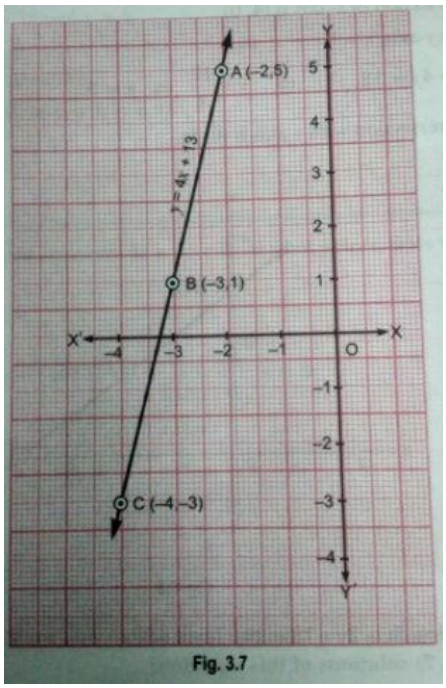


Fig. 3.7

Que 10. Draw the graph of the equation $3x + 4y = 12$ and find the co-ordinates of the points of intersection of the equation with the co-ordinate axes.

Sol. $3x + 4y = 12$

Express y in terms of x.

$$4y = 12 - 3x \qquad \Rightarrow \qquad y = \frac{12 - 3x}{4} \qquad \ldots (i)$$

For graph,

Let $x = 2$, put in (i)

$$y = \frac{12 - 3(4)}{4} = \frac{12 - 6}{4} = \frac{6}{4} = \frac{3}{2} = 1.5$$

Let $x = 4$, put in (i)

$$y = \frac{12 - 3(4)}{4} = \frac{12 - 12}{4} = \frac{0}{4}$$

Let $x = 0$, put in (i)

$$y = \frac{12 - 3(0)}{4} = \frac{12}{4} = 3$$

When line meet x-axis, $y = 0$

x	2	4	0
y	1.5	0	3
	A	B	C

$\therefore 3x + 4(0) = 12$

$$3x = 12 \quad \Rightarrow x = \frac{12}{3} = 4$$

$\therefore$ Point of intersection of x-axis is (4, 0).

$\therefore \qquad 3(0) + 4y = 12 \qquad \Rightarrow \; y = \frac{12}{4} \Rightarrow y = 3$

$\therefore$ Point of intersection with y −axis is (0, 3).

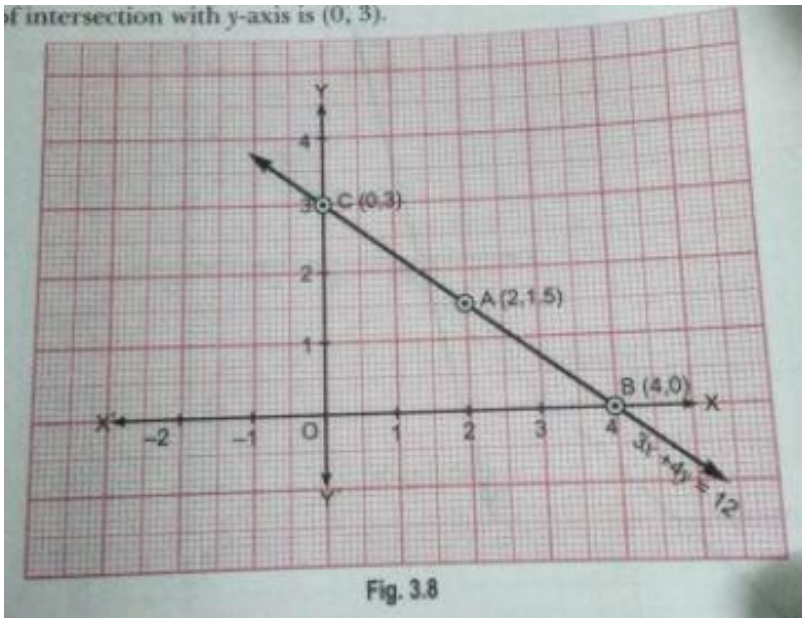


Fig. 3.8

Que 11. Write linear equation $3x + 2y = 18$ in the form of $ax + by + c = 0$. Also write the values of a, b and c. Are (4, 3) and (1, 2) solutions of this equation?

Sol. $3x + 2y = 18$

In standard form

$$3x + 2y - 18 = 0$$

Or $3x + 2y + (-18) = 0$

On comparison we get, $a = 3, b = 2, c = -18$

If (4, 3) lie on the line, $i.e.,$ solution of the equation LHS = RHS

$\therefore 3(4) + 2(3) = 18$

$12 + 6 = 18$

$18 = 18$

As LHS = RHS, Hence (4, 3) is the solution of given equation.

Again for (1, 2)

$$3x + 2y = 18$$

$$\therefore 3(1) + 2(2) = 18$$

$$3 + 4 = 18$$

$$7 = 18$$

LHS $\neq$ RHS

Hence (1, 2) is not the solution of given equation.

Que 12. Let y varies directly as x. If $y = 12$ when $x = 4$, then write a linear equation. What is the value of y when $x = 5$?

Sol. As y is 3 times of x, when $y = 12$ and $x = 4$

$\Rightarrow \quad y = 3x \qquad \ldots(i)$

So required linear equation is $y = 3x$

When $x = 5$ the value of y will be $y = 3(5) = 15$

$\therefore$ Point is (5, 15).

Long Answer Type Questions

[4 MARKS]

Que 1. Draw the graph of the linear equation $3x + 4y = 6$. At what points, does the graph cut the x-axis and the y-axis?

Sol. $3x + 4y = 6 \quad \Rightarrow 4y = 6 - 3x \quad \Rightarrow \quad y = \frac{6-3x}{4}$

Putting $x = 2$, $\quad y = \frac{6-3(-2)}{4} = \frac{6+6}{4} = \frac{12}{4}, y = 3$

Putting $x = 0$, $\quad y = \frac{6-3\times0}{4} = \frac{6}{4} = 1.5$

Putting $x = 2$, $\quad y = \frac{6-3\times2}{4} = \frac{6-6}{4}, y = 0$

x	-2	0	2
y	3	1.5	0

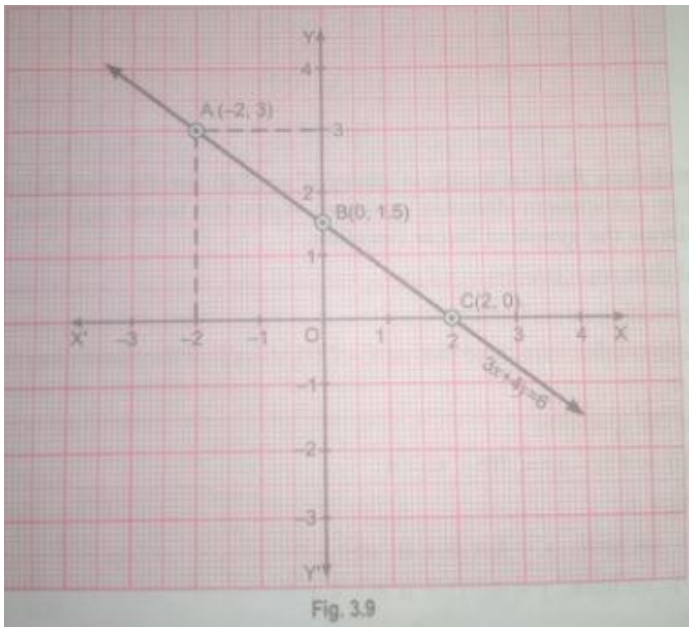


Fig. 3.9

Clearly, the graph line cuts the x-axis at the point $(2, 0)$ and the y-axis at the point $(0, 1.5)$.

Que 2. Solve the equation $2x + 1 = x - 3$, and represent the solution(s) on

(i) the number line.

(ii) the Cartesian plane.

Sol. (i) $2x + 1 = x - 3$

$\Rightarrow \quad 2x - x = -3 - 1$

$\Rightarrow \quad x = -4$

Representation on number line

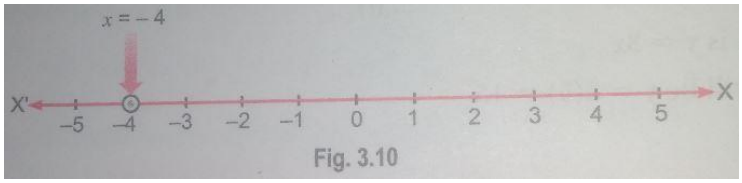


Fig. 3.10

(ii) Representation on Cartesian plane

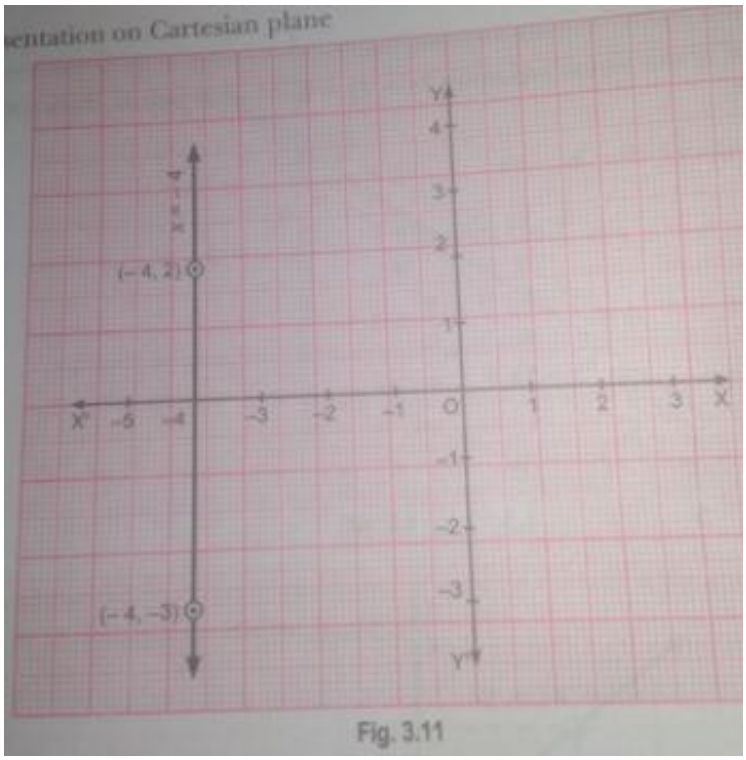


Fig. 3.11

Que 3. The auto-rickshaw fare in a city is charged as ₹ 10 for the first kilometre @ ₹ 4 per kilometre for subsequent distance covered. Write the linear equation to express the above statement. Draw the graph of linear equation.

Sol. Let the total distance covered $= x$ km

The total fare charged $= ₹\, y$

Since for the first kilometre, fare charged is **₹** 10, therefore for remaining $(x - 1)$ kilometre fare will be$₹\, 4(x - 1)$.

According to the question

$$y = 10 + 4\,(x - 1) = 10 + 4x - 4$$

$$y = 4x + 6$$

When $x = 0$, we have, $y = 4 \times 0 + 6$, so $y = 6$

When $x = -1$, we have, $y = 4(-1) + 6 = -4 + 6$

$y = 2$

When $x = -2$, we have, $y = 4(-2) + 6$

$\Rightarrow \quad y = -2$

x	0	-1	-2
y	6	2	-2

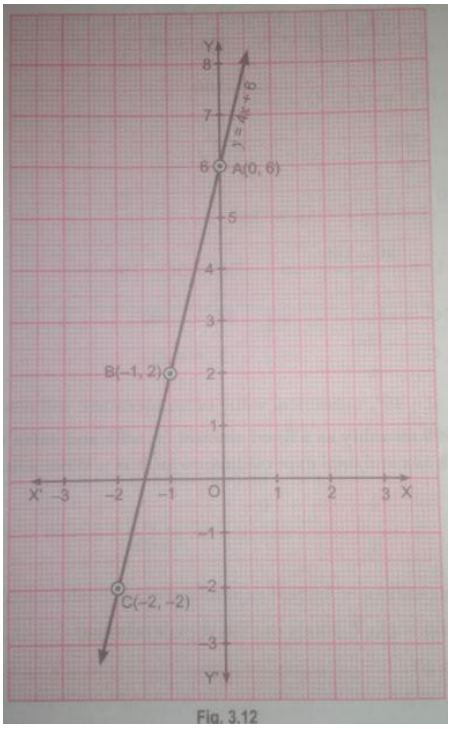


Fig. 3.12

Fig. 3.12 represents the graph of the linear equation $y = 4x + 6$.

Que 4. The linear equation that converts Fahrenheit (F) to Celsius (C) is given by the relation. $C = \frac{5F-160}{9}$

(i) If the temperature is 86^0 F, what is the temperature in Celsius?

(ii) If the temperature 35^0 C, what is the temperature in Fahrenheit?

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

(iv) What is the numerical value of the temperature which is same in both the scales?

Sol. (i) $C = \frac{5F-160}{9}$, putting $F = 86^0F$, we get

$$C = \frac{5\times86-160}{9} = \frac{430-160}{9} = \frac{270}{9} \quad \Rightarrow \quad C = 30^0C$$

(ii) $C = \frac{5F-160}{9}$, putting $C = 35^0C$ we get, $35 = \frac{5F-160}{9}$

$$\Rightarrow \quad 315 = 5F - 160 \quad \Rightarrow \quad 5F = 315 + 160 = 475$$

$$F = \frac{475}{5} = 95 \quad \Rightarrow \quad F = 95^0F$$

(iii) $C = \frac{5F-160}{5}$, putting $C = 0^0C$ we get, $0 = \frac{5F-160}{9}$

$$\Rightarrow \quad 5F - 160 = 0 \quad \Rightarrow \quad 5F = 160$$

$$\Rightarrow \quad F = \frac{160}{5} = 32 \quad \Rightarrow \quad F = 32^0F$$

Putting F = 0^0 we get, $C = \frac{5\times0-160}{9}$

$$\Rightarrow \quad C = \frac{-160}{9} \quad \Rightarrow \quad C = \left(\frac{-160}{9}\right)^0 C$$

(iv) $C = \frac{5F-160}{9}$, putting $F = C$, we get

$$C = \frac{5C-160}{9} \quad \Rightarrow \quad 9C = 5C - 160$$

$$9C - 5C = -160 \quad \Rightarrow \quad 4C = -160$$

$$\Rightarrow \quad C = \frac{-160}{4} \quad \Rightarrow \quad C = -40$$

Thus, at -40^0, numerical value of temperature will remain same in both the scales.

Que 5. A family spends ₹ 500 monthly as a fixed amount on milk and extra milk costs ₹ 20 per kg. Taking

Quantity of extra milk as x and total expenditure on milk as y. Write a linear equation and fill the table.

x	0		2
y		1000	

Sol. If the quantity of extra milk be $'x'$ kg and expenditure be ₹ $'y'$ then according the given condition,

$$y = 20x + 500$$ (As ₹ 500 is the fixed expenditure) ...(i)

Put $x = 0$ in equation (i)

$$y = 20(0) + 500$$

$$y = ₹\,500$$

Put $y = 1000$ in equation (i)

$$1000 = 20x + 500$$

$$1000 - 500 = 20x$$

$$500 = 20x$$

$$x = \frac{500}{20} = 25kg$$

Put $x = 2$ in equation (i)

$$y = 20(2) + 500$$

$$y = 40 + 500$$

$$y = ₹\,540$$

x	0	**25**	2
y	**500**	1000	**540**

Que 6. Draw the graph of linear equation $x = 4$ and $y = 5$. Find the area formed by the two graphs and the axes.

Sol. $x = 4 \quad y = 5$

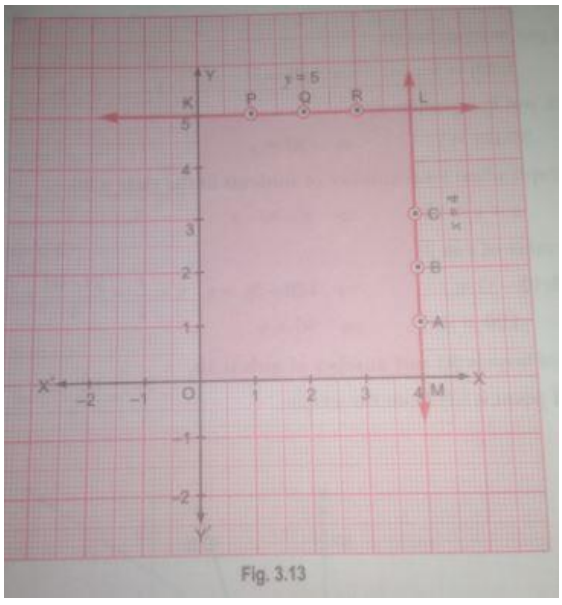


Fig. 3.13

$x = 4$ in two variables is $x + 0y = 4$ $y = 5$ in two variables is $0x + y = 5$

$\boldsymbol{x}$	4	4	4
$\boldsymbol{y}$	1	2	3
	A	B	C

$\boldsymbol{x}$	1	2	3
$\boldsymbol{y}$	5	5	5
	P	Q	R

∴ Required area is OKLM with $x = 4, y = 5$ and both the axes.

The enclosed figure, $i.e.,$ OKLM is rectangle having length $OM = 4$ units and breadth $OK = 5$ units.

∴ Area of rectangle/enclosed figure will be $= L \times B = 4 \times 5 = 20\ sq.$ Units

Que 7. The ratio of girls and boys in a class is $1:3$. Set up an equation between the students of a class and boys and then draw its graph. Also find the number of boys in a class of 40 students from the graph.

Sol. Let the number of girls be x and number of boys be y.

∴ According to the given condition, $\frac{x}{y} = \frac{1}{3}$

On cross multiplication,

$$3x = y \qquad \ldots(i)$$

Or $3x - y = 0$

For graph consider equation (i)

$$3x = y$$

	A	B	C
$\boldsymbol{x}$	10	20	-10
$\boldsymbol{y}$	30	60	-30

Let $x = 10$, put in equation (i)

∴ $3(10) = y$

$30 = y$

Let $x = 20$, put in equation (i)

$3(20) = y \quad \Rightarrow \quad 60 = y$

Let $x = -10$, put in equation (i)

$$3(-10) = y \quad \Rightarrow \quad -30 = y$$

From the graph when total number of students in the class is 40.

$$\Rightarrow \quad x + y = 40 \quad \Rightarrow \quad x = 40 - y$$

Putting the value of x in (i)

$$3(40 - y) = y \quad \Rightarrow \quad 120 - 3y = y$$

$$120 = 4y \quad \Rightarrow \quad 30 = y$$

∴ Number of boys is 30 and number of girls is 10.

The required point is (A) from the graph.

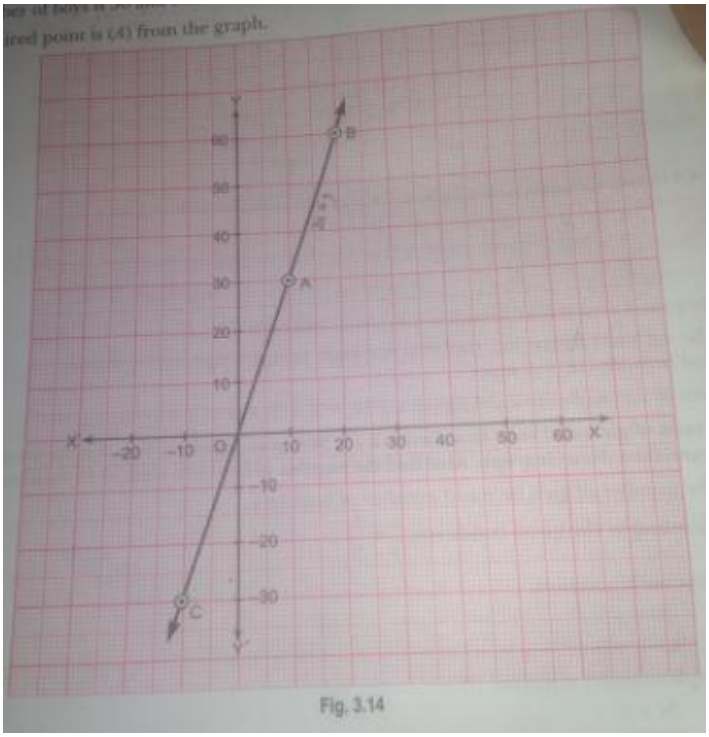


Fig. 3.14

Que 8. Let cost of a pen and a pencil be "x" and "y" respectively. A girl pays ₹ 16 for 2 pens and 3 pencils. Write the given data in the form of a linear equation in two variables. Also represent it graphically.

Sol. Let the cast of a pen = ₹ x, and cost of a pencil = ₹ y

According to the given condition,

$$2x + 3y = 16 \quad \Rightarrow \quad x = \frac{16-3y}{2} \quad \ldots(i)$$

	P	Q	R
x	5	2	-1
y	2	4	6

Let $y = 2$, put in equation (i)

$$x = \frac{16-3(2)}{2} = \frac{16-12}{2} = \frac{10}{2} = 5$$

Let $y = 4$, put in equation (i)

$$x = \frac{16-3(4)}{2} = \frac{16-12}{4} = \frac{4}{2} = 2$$

Let $y = 6$, put in equation (i)

$$x = \frac{16-3(6)}{2} = \frac{16-18}{2} = \frac{-2}{2} = -1$$

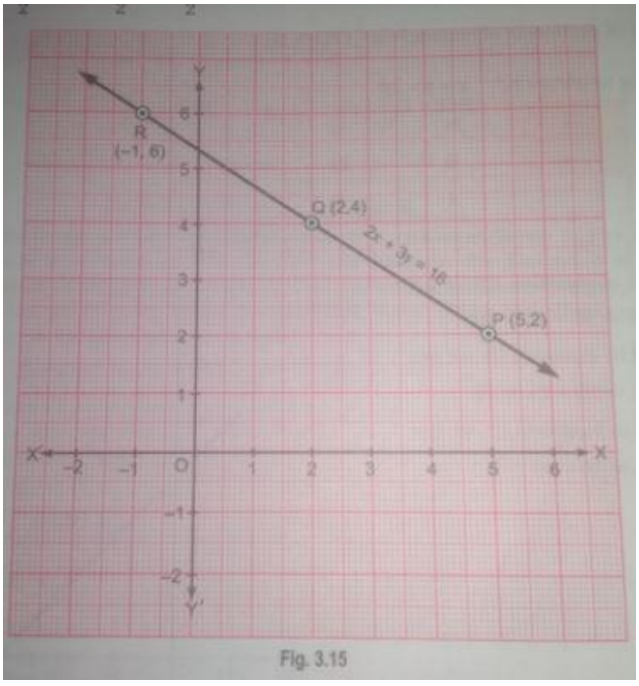


Fig. 3.15

Que 9. Solve for x: $\frac{3x+2}{7} + \frac{4(x+1)}{5} = \frac{2}{3}(2x+1)$

Sol. $\frac{3x+2}{7} + \frac{4(x+1)}{5} = \frac{2}{3}(2x+1)$

$$\frac{3x+2}{7} + \frac{4x+4}{5} = \frac{4x+2}{3}$$

Taking LCM on LHS

$$\frac{5(3x+2)+7(4x+4)}{35} = \frac{4x+2}{3}$$

$\Rightarrow$ $$\frac{15x+10+28x+28}{35} = \frac{4x+2}{3}$$

$\Rightarrow \quad \frac{43x+38}{35} = \frac{4x+2}{3}$

$\Rightarrow \quad 3(43x + 38) = 35(4x + 2)$

$129x + 114 = 140x + 70$

$\Rightarrow \quad -140x + 129x = -114 + 70$

$-140x + 129x = -44$

$\Rightarrow \quad -11x = -44 \quad \Rightarrow \quad x = 4$

Que 10. Half the perimeter of a rectangular garden in 36m. Write a linear equation which satisfies the data. Draw the graph for the same.

Sol. Let the length of rectangle be x and breadth be y.

∴ Perimeter of rectangle $= 2(x + y)$

And half of perimeter of rectangle is $\frac{1}{2}[2(x + y)]$

According to question, $x + y = 36$

$\boldsymbol{x}$	24	12	0
$\boldsymbol{y}$	12	24	36
	A	B	C

$x = 36 - y \quad \ldots(i)$

Put $y = 12$ in equation(i). We get

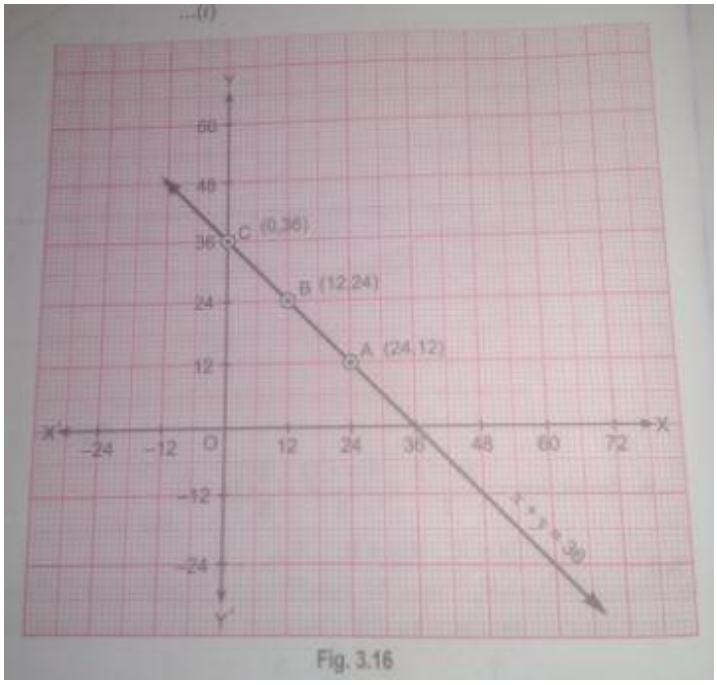
∴ $x = 36 - 12 = 24$

Put $y = 24$ in equation(i), we get

$x = 36 - 24 = 12$

Put $y = 36$ in equation(i), we get

∴ $x = 36 - 36 = 0$


...(i)
Y
60
48
36
C (0,36)
24
B (12,24)
12
A (24,12)
X'
-24
-12
O
12
24
36
48
60
72
X
-12
-24
Y'
x + y = 36
Fig. 3.16

HOTS (Higher Order Thinking Skills)

Que 1. At what point does the graph of the linear equation $2x + 3y = 9$ meet a line which is parallel to the y-axis, at a distance of 4 units from the origin and on the right of the y-axis?

Sol. The line parallel to the y-axis at a distance of 4 units from the origin and on the right of the y-axis is given by $x = 4$.

Putting $x = 4$ in $2x + 3y = 9$, we get

$$2x \times 4 + 3y = 9 \quad \Rightarrow \quad 3y = 9 - 8 \quad \Rightarrow \quad y = \frac{1}{3}$$

$\therefore$ The required point is $\left(4, \frac{1}{3}\right)$.

Que 2. The temperature of a liquid can be measured in Kelvin units as x K or in Fahrenheit units as y^0F. The relation between the two system of measurement of temperature is given by the linear equation $y = \frac{9}{5}(x - 273) + 32$

(i) Find the temperature of the liquid in Fahrenheit if the temperature of the body is 313K.
(ii) If the temperature is 158^0F, then find the temperature in Kelvin.

Sol. (i) When x = 313K, $y = \frac{9}{5}(313 - 273) + 32 = \frac{9}{5}(40) + 32 = 72 + 32 = 104^0$F

(ii) When y = 158^0F, then $158 = \frac{9}{5}(x - 273) + 32$

$$\Rightarrow \quad 158 - 32 = \frac{9}{5}(x - 273) \quad \Rightarrow \quad 126 = \frac{9}{5}(x - 273)$$

$$\Rightarrow \quad 126 \times \frac{5}{9} = x - 273 \quad \Rightarrow \quad 70 = x - 273$$

$$\Rightarrow \quad x = 70 + 273 \quad \Rightarrow \quad x = 343 \text{ K}$$

Que 3. The work done by a body on application of a constant force is the product of the constant force and distance travelled by the body in the direction of force. Express this in the form of a linear equation in two variables and draw its graph by taking the constant force as 3 units. What is the work done when the distance travelled is 2 units? Verify it by plotting the graph.

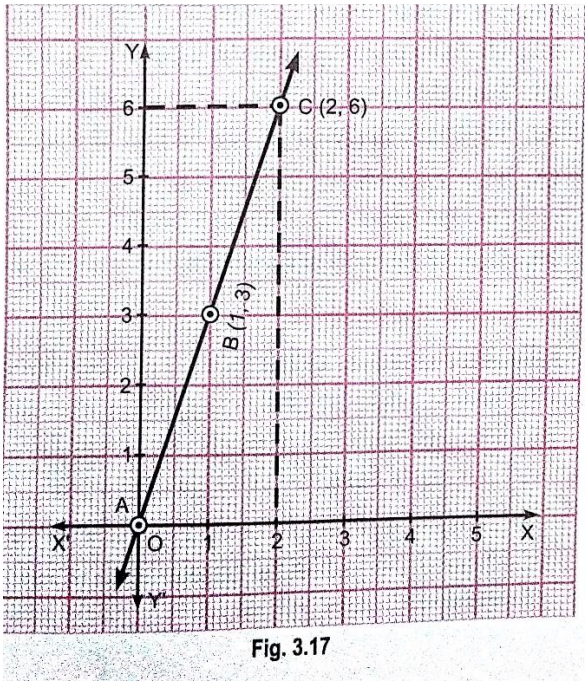


Fig. 3.17

Sol. Work done = (constant force) x (distance) = 3 x (distance) i.e., y = 3x, where y (units) is the work done and x (units) is the distance travelled. Since x = 2 units (given), therefore, work done = 6 units. To plot the graph of the linear equation y = 3x, we need at least two solution of the equation. x = 0, y = 0 satisfies the given equation. Also x = 1, y = 3 and x = 2, y = 6 satisfies the equation.

Now we plot the points

A (0, 0), B (1, 3) and C (2, 6) and join A, B and C [Fig. 3.17]. The graph of the equation is a straight line.

To verify from the graph, draw a perpendicular to the x-axis at the point (2, 0) meeting the graph at the point C. Clearly the coordinates of C are (2, 6) If means the work done is 6 units.

Value Based Questions

Que 1. On her birthday, Amisha donated 2 toffees to each children of an orphanage and 15 chocolates to adults working there. Taking the total items distributed as x and the number of children y, write a linear equation in two variables for the above situation.
(a) Write the equation in standard for.
(b) How many children are there if total 61 items were distributed?
(c) What values does Amisha possess?

Sol. X = 2y + 15
(a) x – 2y – 15 = 0
(b) 61 = 2y + 15 $\Rightarrow$ y = $\frac{46}{2} = 23$ children

(c) Caring, kind, socially active.

Que 2. The number of sincere students (x) in a class is two more than twice the number of careless students (y). Write a linear equation in two variables for this situation. How does sincerity help and carelessness harm a student?

Sol. X = 2 + 2y
sincere students always progress in life as they value time and channelize their talent in productive activities while a careless student always wastes him talent and time.