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 $y = 0 \quad \Rightarrow x + 2 \times 0 = 8 \quad \Rightarrow x = 8$

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 $y = 3$

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

$\therefore$ 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.

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

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

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

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

$$2x = -4$$

$$\Rightarrow \ x = -2$$

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

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

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

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

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

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

x	3	6	9
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.

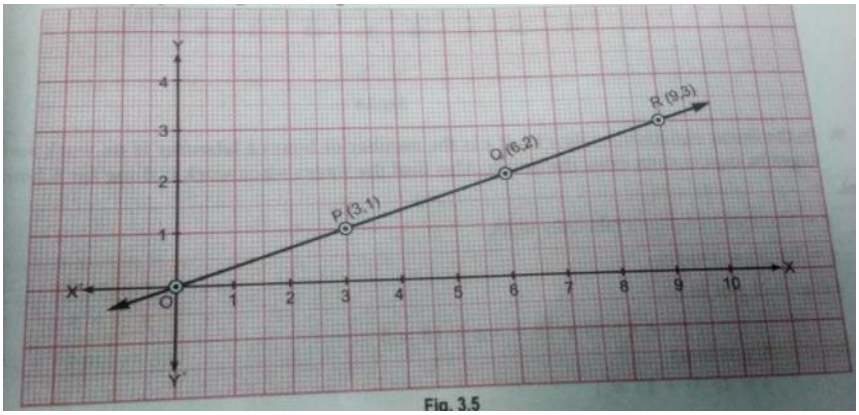

Fig. 3.5

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

$$x = 120 - 80 = 40$$

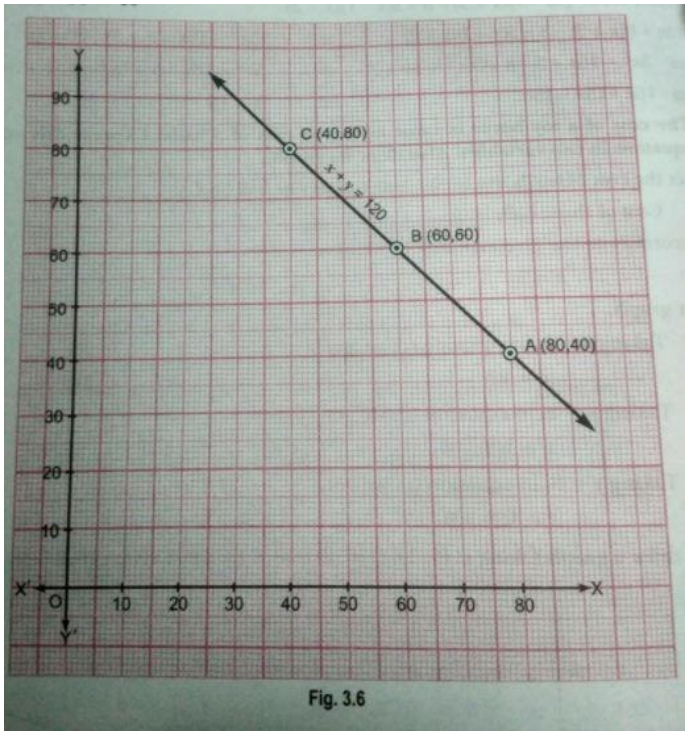

Fig. 3.6

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)

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

$\boldsymbol{x}$	-2	-3	-4
$\boldsymbol{y}$	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

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

$$y = 24 + 13$$

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

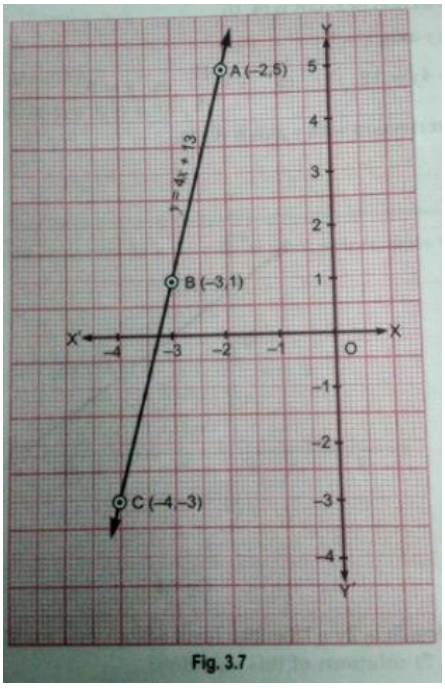

Fig. 3.7

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).

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

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

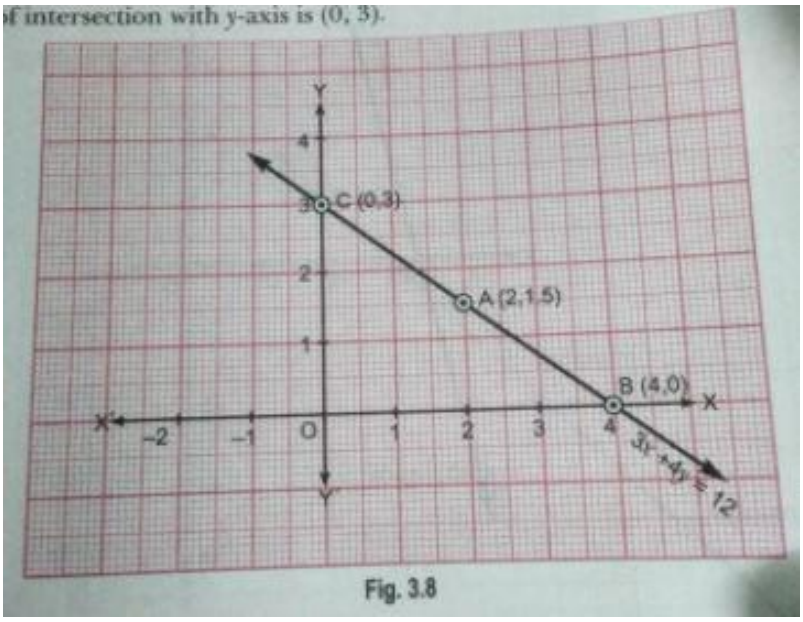

Fig. 3.8

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 ≠ 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).