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

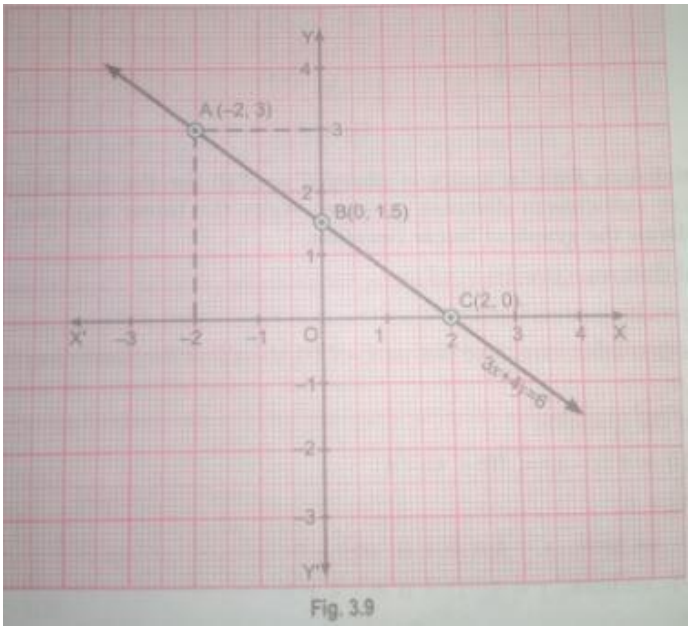

Fig. 3.9

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

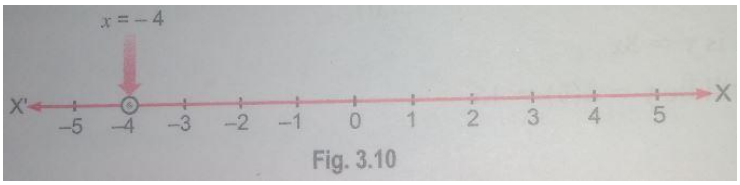

Fig. 3.10

(ii) Representation on Cartesian plane

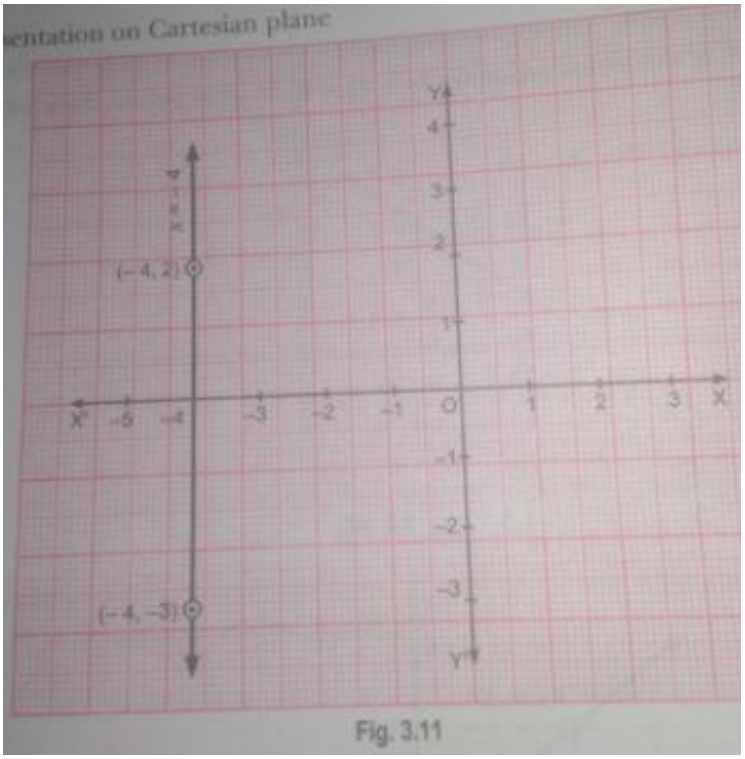

Fig. 3.11

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

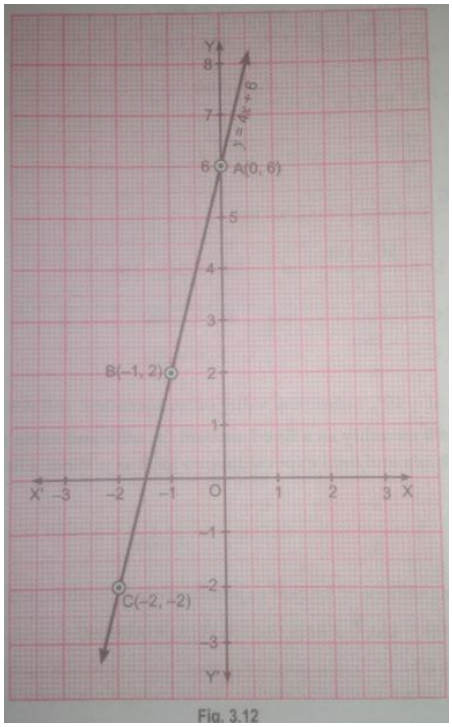

Fig. 3.12

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. $x = 4$ $y = 5$

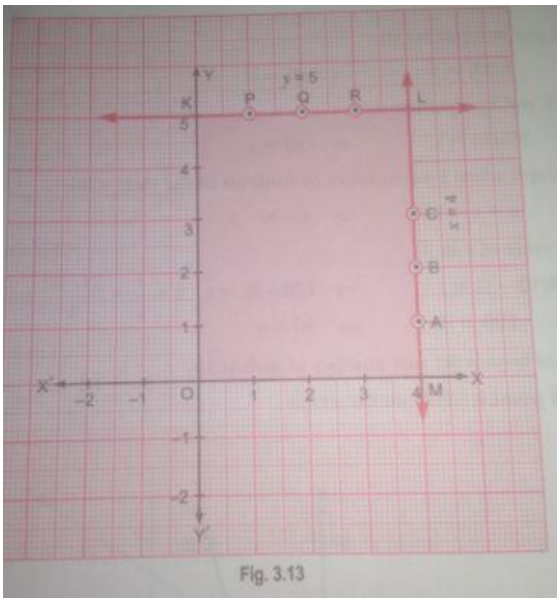

Fig. 3.13

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

x	4	4	4
y	1	2	3
	A	B	C

x	1	2	3
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
x	10	20	-10
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.

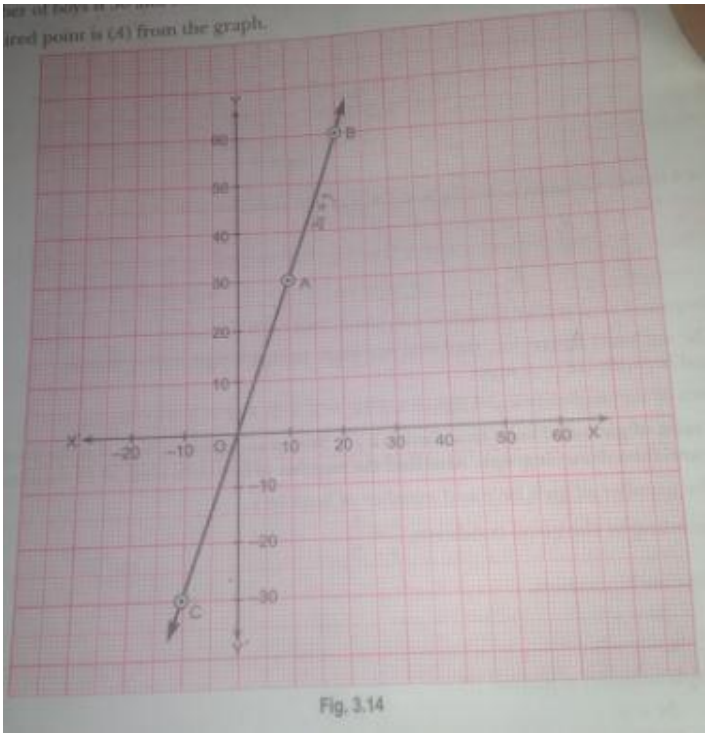

Fig. 3.14

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)

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

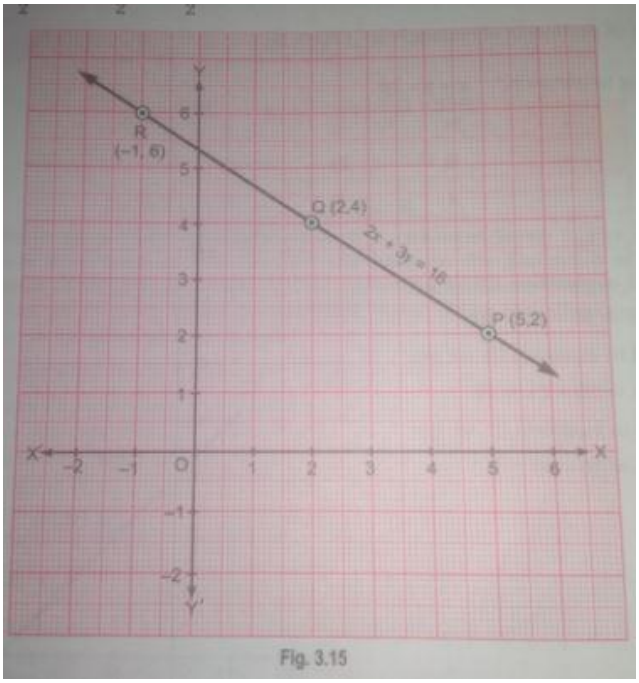

Fig. 3.15

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)

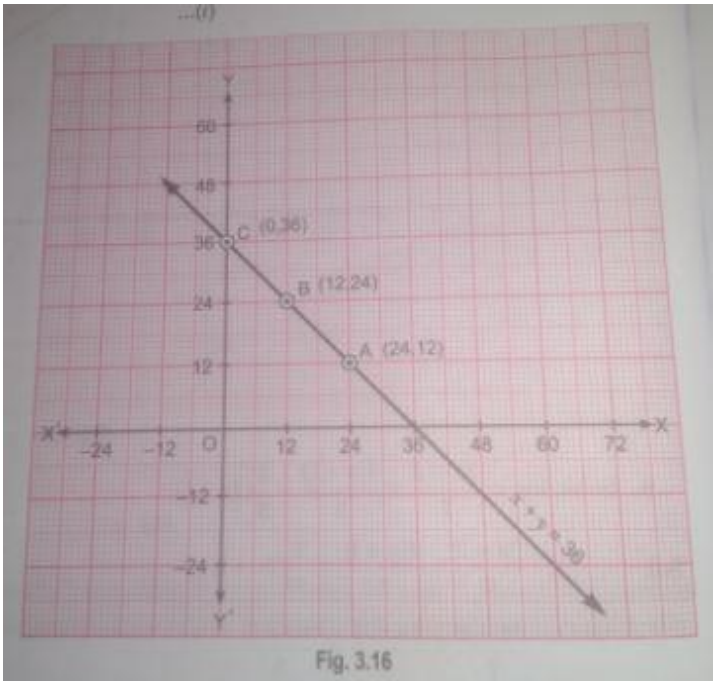
Y
60
48
C (0,36)
36
B (12,24)
24
A (24,12)
12
X'
X
-24
-12
O
12
24
36
48
60
72
-12
-24
Y'
x + y = 36

Fig. 3.16