CHAPTER 4
LINEAR EQUATIONS IN TWO VARIABLES

1. A linear polynomial in two variables equated to zero gives a linear equation in two variables.
2. The general form of a linear equation in two variables is $ax + by + c = 0$, where a, b, c are constants and a, b are both non-zero.
3. Solution of a Linear Equation in Two Variables

   For a linear equation in two variables (say x and y), a pair of values, one for x and one for y which satisfy the equation is called a solution of the equation.

Note: 1. A linear equation in one variable has a unique solution.

2. A linear equation in two variables has infinitely many solutions.

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SOLUTIONS

EXERCISE 4.1

1. Solve the following linear equations in one variable:

(i) $\frac{x}{3} = -2$

Solution: $\frac{x}{3} = -2$

$\Rightarrow x = -2 \times 3$

$\therefore x = -6$

(ii) $4x + 3 = 15$

Solution: $4x + 3 = 15$

$\Rightarrow 4x = 15 - 3$

$\Rightarrow 4x = 12$

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

$\therefore x = 3$

(iii) $3x + 2 = x + 4$

Solution:

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

(iv) $9x - 4 = 32$

Solution:

$$9x - 4 = 32$$
$$\Rightarrow 9x = 32 + 4$$
$$\Rightarrow 9x = 36$$
$$\Rightarrow x = \frac{36}{9}$$
$$\therefore x = 4$$

(v) $3y + 5(2 - y) = -16$

Solution:

$$3y + 5(2 - y) = -16$$
$$\Rightarrow 3y + 10 - 5y = -16$$
$$\Rightarrow 3y - 5y = -16 - 10$$
$$\Rightarrow -2y = -26$$
$$\Rightarrow y = \frac{-26}{-2}$$
$$\therefore y = 13$$

(vi) $13t - 4(t + 8) - 4 = 0$

Solution:

$$13t - 4(t + 8) - 4 = 0$$
$$\Rightarrow 13t - 4t - 32 - 4 = 0$$
$$\Rightarrow 9t - 36 = 0$$
$$\Rightarrow 9t = 36$$
$$\Rightarrow t = \frac{36}{9}$$
$$\therefore t = 4$$

(vii) $(x-2)(x-3)+2(x-1)(x-3)=3(x-1)(x-2)$

Solution: $(x-2)(x-3)+2(x-1)(x-3)=3(x-1)(x-2)$

$\Rightarrow x^2-3x-2x+6+2(x^2-3x-x+3)=3(x^2-2x-x+2)$

$\Rightarrow x^2-5x+6+2(x^2-4x+3)=3(x^2-3x+2)$

$\Rightarrow x^2-5x+6+2x^2-8x+6=3x^2-9x+6$

$\Rightarrow 3x^2-13x+12=3x^2-9x+6$

$\Rightarrow 3x^2-13x-3x^2+9x=6-12$

$\Rightarrow -4x=-6$

$\Rightarrow x=\frac{-6}{-4}$

$\therefore x=\frac{3}{2}$

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

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

$\Rightarrow \frac{x}{2}-\frac{x}{3}=7-5$

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

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

$\Rightarrow x=2\times 6$

$\therefore x=12$

(ix) $\frac{x+2}{3} - \frac{x-1}{2} = 1$

Solution:

$$\frac{x+2}{3} - \frac{x-1}{2} = 1$$

$$\Rightarrow \frac{2(x+2)-3(x-1)}{6} = 1$$

$$\Rightarrow \frac{2x+4-3x+3}{6} = 1$$

$$\Rightarrow \frac{-x+7}{6} = 1$$

$$\Rightarrow -x + 7 = 6$$

$$\Rightarrow -x = 6 - 7$$

$$\Rightarrow -x = -1$$

$$\therefore x = 1$$

(x) $2(x - 15) = 5(x - 11) + 4$

Solution:

$$2(x - 15) = 5(x - 11) + 4$$

$$\Rightarrow 2x - 30 = 5x - 55 + 4$$

$$\Rightarrow 2x - 5x = -55 + 4 + 30$$

$$\Rightarrow -3x = -55 + 34$$

$$\Rightarrow -3x = -21$$

$$\Rightarrow x = \frac{-21}{-3}$$

$$\therefore x = 7$$

2. Write linear equations in two variables to represent the following statements:

(i) The cost of a pen is eight times that a pencil.

Solution: Let x and y (in Rs.) respectively be the cost prices of a pen and a pencil.

Then, $x = 8y$

$\Rightarrow x - 8y = 0$, which is the required equation.

(ii) The difference of two numbers is 5.

Solution: Let x and y be the two numbers where $x > y$.

Then, the equation is $x - y = 5$.

(iii) Two tables and three chairs cost ₹1200.

Solution: Let ₹ x and ₹ y be the cost of a table and that of a chair respectively.

Then, $2x + 3y = 1200$, which is the required equation.

(iv) Two numbers are in the ration 2: 3.

Solution: Let x and y be the two numbers.

Then, $x : y = 2 : 3$

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

$\Rightarrow 3x = 2y$

$\Rightarrow 3x - 2y = 0$, which is the required equation.

3. Find four different solutions for each of the following equations in two variables.

(i) $x = 3y$

Solution: $x = 3y$

When $y = 0, x = 3 \times 0 = 0$

When $y = 2, x = 3 \times 2 = 6$

When $y = -3, x = 3 \times (-3) = -9$

When $y = 4, x = 3 \times 4 = 12$

So, four different solutions are (0,0), (6,2), (−9,−3), (12,4).

(ii) $4x + 3y = 12$

Solution: $4x + 3y = 12$

$\Rightarrow 4x = 12 - 3y$

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

When $y = 0, x = \frac{12-3\times0}{4} = \frac{12-0}{4} = \frac{12}{4} = 3.$

When $y = 4, x = \frac{12-3\times4}{4} = \frac{12-12}{4} = \frac{0}{4} = 0.$

When $y = -4, x = \frac{12-3\times(-4)}{4} = \frac{12+12}{4} = \frac{24}{4} = 6$

When $y = 8, x = \frac{12-3\times8}{4} = \frac{12-24}{4} = \frac{-12}{4} = -3$

∴ four different solutions are $(3,0), (0,4), (6,-4), (-3,8)$.

(iii) $\boldsymbol{x + 2y = 6}$

Solution:

$$x + 2y = 6$$

$$\Rightarrow x = 6 - 2y$$

When $y = 0$, $x = 6 - 2\times0 = 6 - 0 = 6$

When $y = 2$, $x = 6 - 2\times2 = 6 - 4 = 2$

When $y = -1$, $x = 6 - 2\times(-1) = 6 + 2 = 8$

When $y = 3$, $x = 6 - 2\times3 = 6 - 6 = 0$

So, four solutions are $(6,0), (2,2), (8,-1)$ and $(0,3)$.

(iv) $\boldsymbol{5x + 2y = 0}$

Solution:

$$5x + 2y = 0$$

$$\Rightarrow 2y = -5x$$

$$\Rightarrow y = -\frac{5x}{2}$$

When $x = 2, y = \frac{-5\times2}{2} = -5$

When $x = 4, y = \frac{-5\times4}{2} = -10$

When $x = -6, y = \frac{-5\times(-6)}{2} = 15$

When $x = 8, y = \frac{-5\times8}{2} = -20$

∴ four different solutions are $(2,-5), (4,-10), (-6,15), (8,-20)$.

(v) $\mathbf{3x + 4 = 0}$

Solution: $3x + 4 = 0$

$\Rightarrow 3x = -4$

$\Rightarrow x = \frac{-4}{3}$

$\therefore$ four different solutions are $\left(-\frac{4}{3}, 0\right), \left(-\frac{4}{3}, 1\right), \left(-\frac{4}{3}, 3\right), \left(-\frac{4}{3}, 5\right)$

(vi) $\mathbf{2y - 5 = 0}$

Solution: $2y - 5 = 0$

$\Rightarrow 2y = 5$

$\Rightarrow y = \frac{5}{2}$

$\therefore$ Four different solutions are $\left(0, \frac{5}{2}\right), \left(2, \frac{5}{2}\right), \left(-3, \frac{5}{2}\right), \left(6, \frac{5}{2}\right)$.

4. Check which of the following are solutions of the equation $3x - 2y = 6$ and which are not:

(i) **(2,0)**

Solution: When $x = 2, y = 0$

LHS $= 3 \times 2 - 2 \times 0 = 6 - 0 = 6 =$ RHS

$\therefore$ (2, 0) is a solution of $3x - 2y = 6$

(ii) **(0,3)**

Solution: When $x = 0, y = 3$,

LHS $= 3 \times 0 - 2 \times 3 = 0 - 6 = -6 \neq$ RHS.

$\therefore$ (0,3) is not a solution of $3x - 2y = 6$.

(iii) **(3,0)**

Solution: When $x = 3, y = 0$,

LHS $= 3 \times 3 - 2 \times 0 = 9 - 0 = 9 \neq$ RHS.

$\therefore$ (3,0) is not a solution of $3x - 2y = 6$.

(iv) $\mathbf{(0, -3)}$

Solution: When $x = 0, y = -3$

LHS $= 3 \times 0 - 2 \times (-3) = 0 + 6 = 6 =$ RHS.

$\therefore$ $(0, -3)$ is a solution of $3x - 2y = 6$.

(v) $(-2, -6)$

Solution: When $x = -2, y = -6$

$$\text{LHS} = 3 \times (-2) - 2 \times (-6) = -6 + 12 = 6 = \text{RHS}.$$

$\therefore (-2, -6)$ is a solution of $3x - 2y = 6$

(vi) $(4, 3)$

Solution: When $x = 4, y = 3$,

$$\text{LHS} = 3 \times 4 - 2 \times 3 = 12 - 6 = 6 = \text{RHS}$$

$\therefore (4,3)$ is a solution of $3x - 2y = 0$

5. Find the value of $3x + 2y = k$.

(i) $(1, 2)$ is a solution of $3x + 2y = k$.

Solution: As $(1, 2)$ is a solution of $3x + 2y = k$,

$$3 \times 1 + 2 \times 2 = k$$

$$\Rightarrow 3 + 4 = k$$

$$\therefore k = 7$$

(ii) $(2, -3)$ is a solution of $kx - 3y + 5 = 0$

Solution: As $(2, -3)$ is a solution of $kx - 3y + 5 = 0$,

$$k \times 2 - 3 \times (-3) + 5 = 0$$

$$\Rightarrow 2k + 9 + 5 = 0$$

$$\Rightarrow 2k + 14 = 0$$

$$\Rightarrow 2k = -14$$

$$\Rightarrow k = -\frac{14}{2} = -7$$

$$\therefore k = -7$$

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1. The graph of every linear equation in two variables is a straight line.
2. The graph of $x = c$ is a straight line parallel to Y-axis, passing through$(c, 0)$.
3. The graph of $y = c$ is a straight line parallel to X-axis, passing through $(0, c)$.
4. The graph of $x = 0$ is the Y-axis.
5. The graph of $y = 0$ is the X-axis.
6. The graph of an equation of the type $y = kx$, where k is a constant, always passes through the origin.

SOLUTIONS

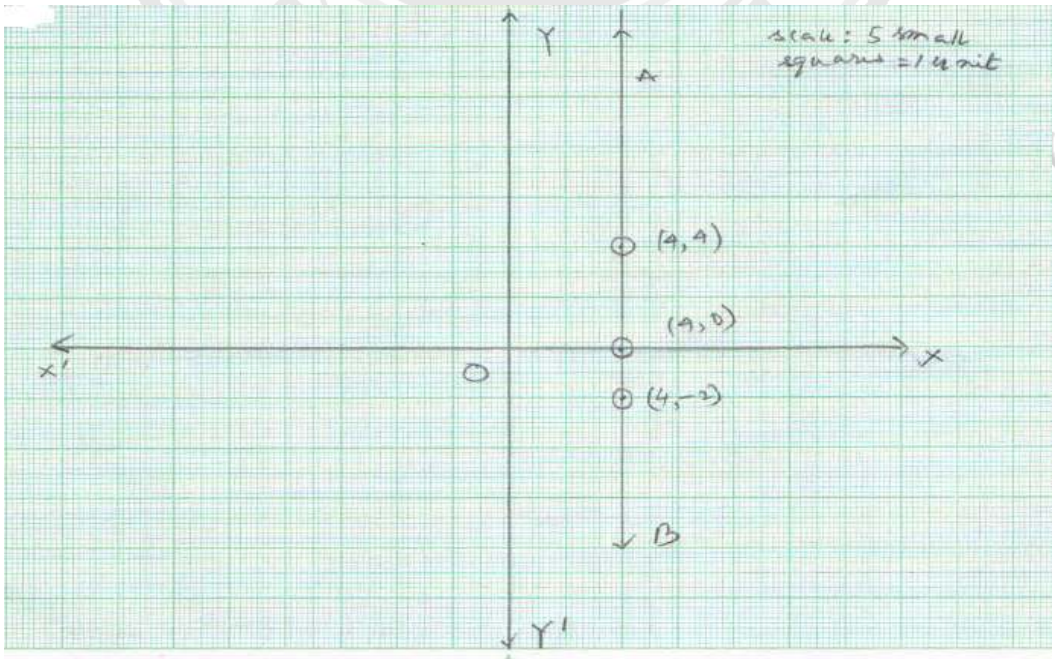
EXERCISE 4.2

1. Draw the graph of the following equations.

(i) $x = 4$

Solution: Table:

x	4	4	4
y	-2	0	4

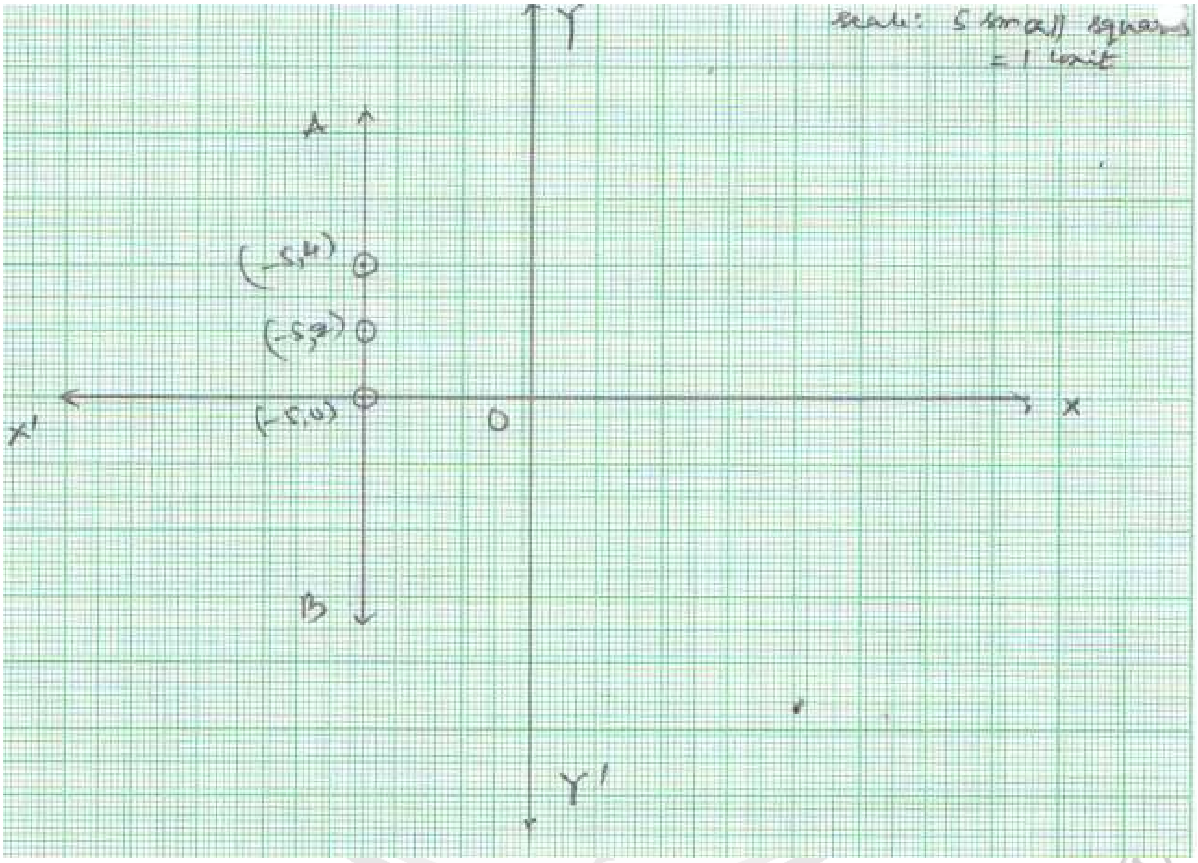


We plot the ordered pairs namely $(4, -2), (4,0), (4,4)$ satisfying $x = 4$ on the Cartesian plane. Joining these points, we get a straight line$\overleftrightarrow{AB}$. This straight line $\overleftrightarrow{AB}$ is the graph of $x = 4$.

(ii) $x = -5$

Solution: Table:

x	-5	-5	-5
y	2	0	-4



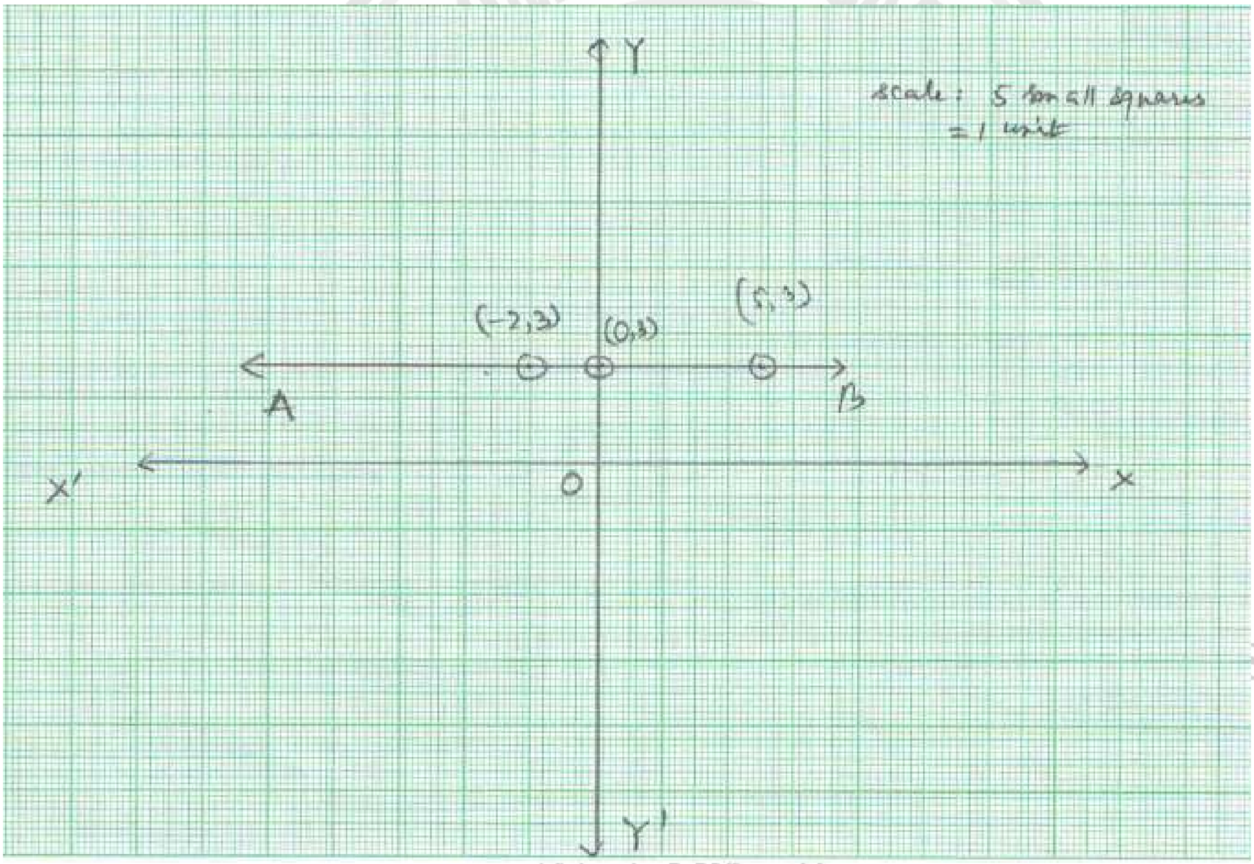
We plot the points representing the ordered pairs namely $(-5,2)$, $(-5,0)$, $(-5,-4)$ satisfying $x = -5$ on the Cartesian plane. Joining these points, we get a straight line $\overleftrightarrow{AB}$. This straight line $\overleftrightarrow{AB}$ is the graph of $x = -5$.

(iii) $y = 3$

Solution:

Table:

x	-2	0	5
y	3	3	3



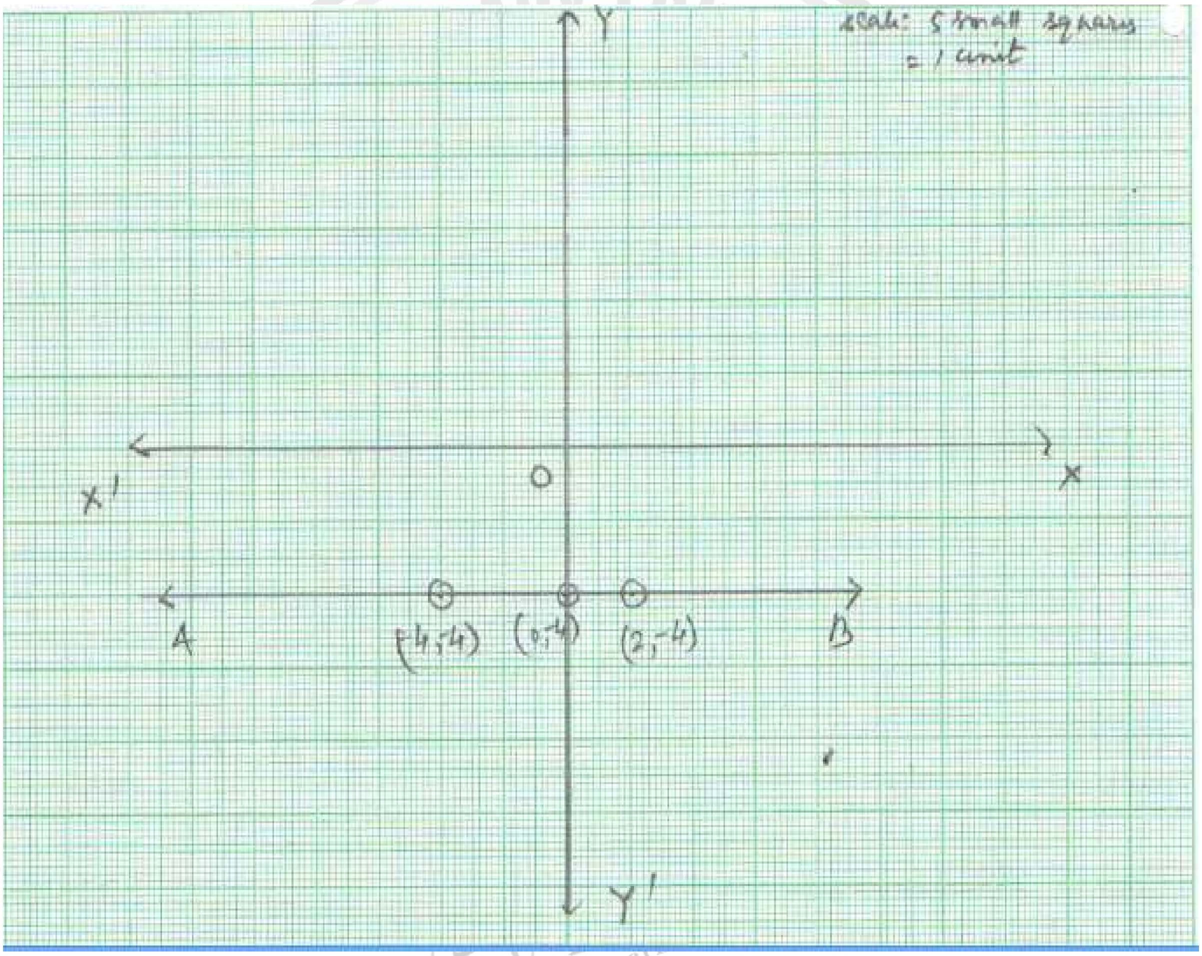
We plot the points representing the ordered pairs namely $(-2,3), (0,3), (5,3)$ satisfying $y = 3$ on the Cartesian plane. Joining the points, we get a straight line $\overleftrightarrow{AB}$ is straight line $\overleftrightarrow{AB}$ is the graph of $y = 3$.

(iv) $y = -4$

Solution:

Table

x	2	0	-4
y	-4	-4	-4



We plot the points representing the ordered pairs namely $(2, -4), (0, -4), (-4, -4)$ satisfying $y = -4$ on the Cartesian plane. Joining these points, we get a straight line $\overleftrightarrow{AB}$. This straight line $\overleftrightarrow{AB}$ is the graph of $y = -4$.

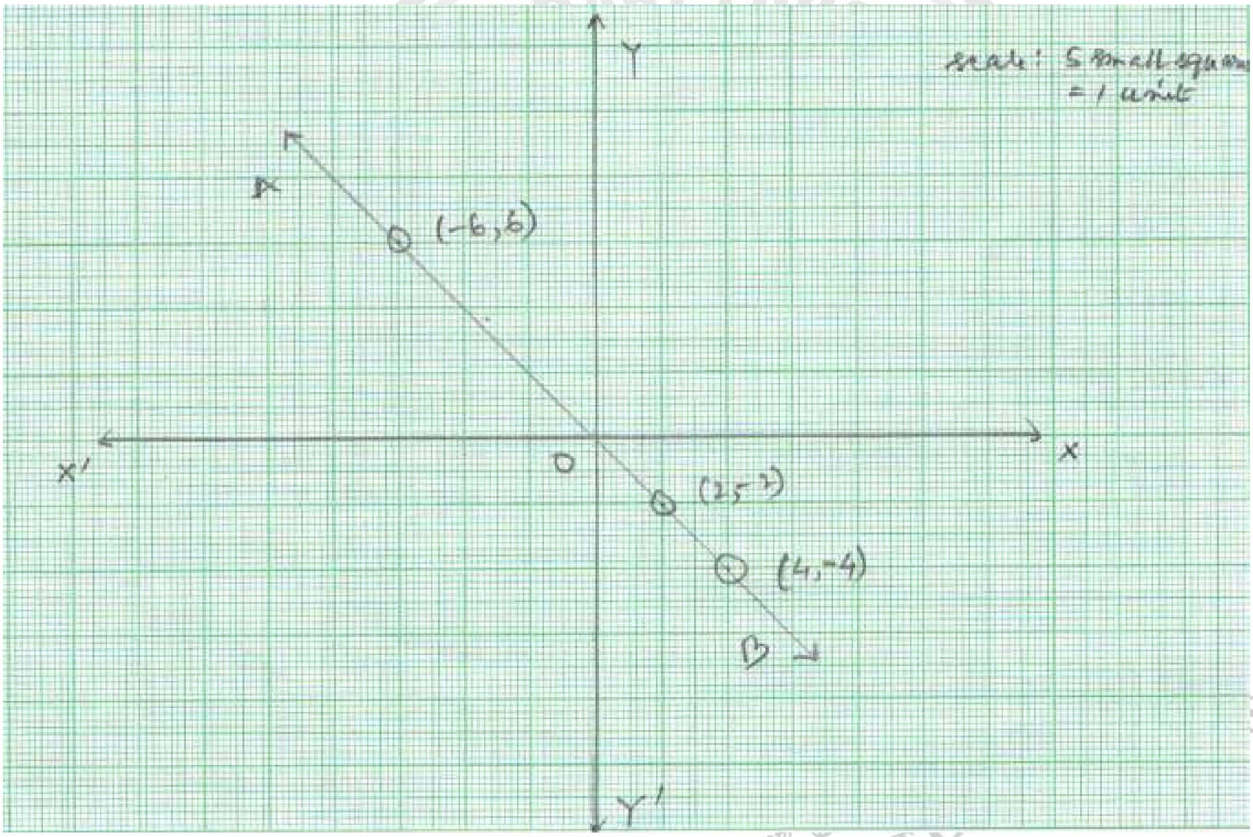
(v) $\boldsymbol{x + y = 0}$

Solution:

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

Table

x	4	-6	2
y	-4	6	-2



We plot the points representing the ordered pairs namely $(4, -4), (-6, 6), (2, -2)$ satisfying $x + y = 0$ on the Cartesian plane. Joining these points, we get a straight line $\overleftrightarrow{AB}$. This straight line $\overleftrightarrow{AB}$ is the graph of $x + y = 0$.

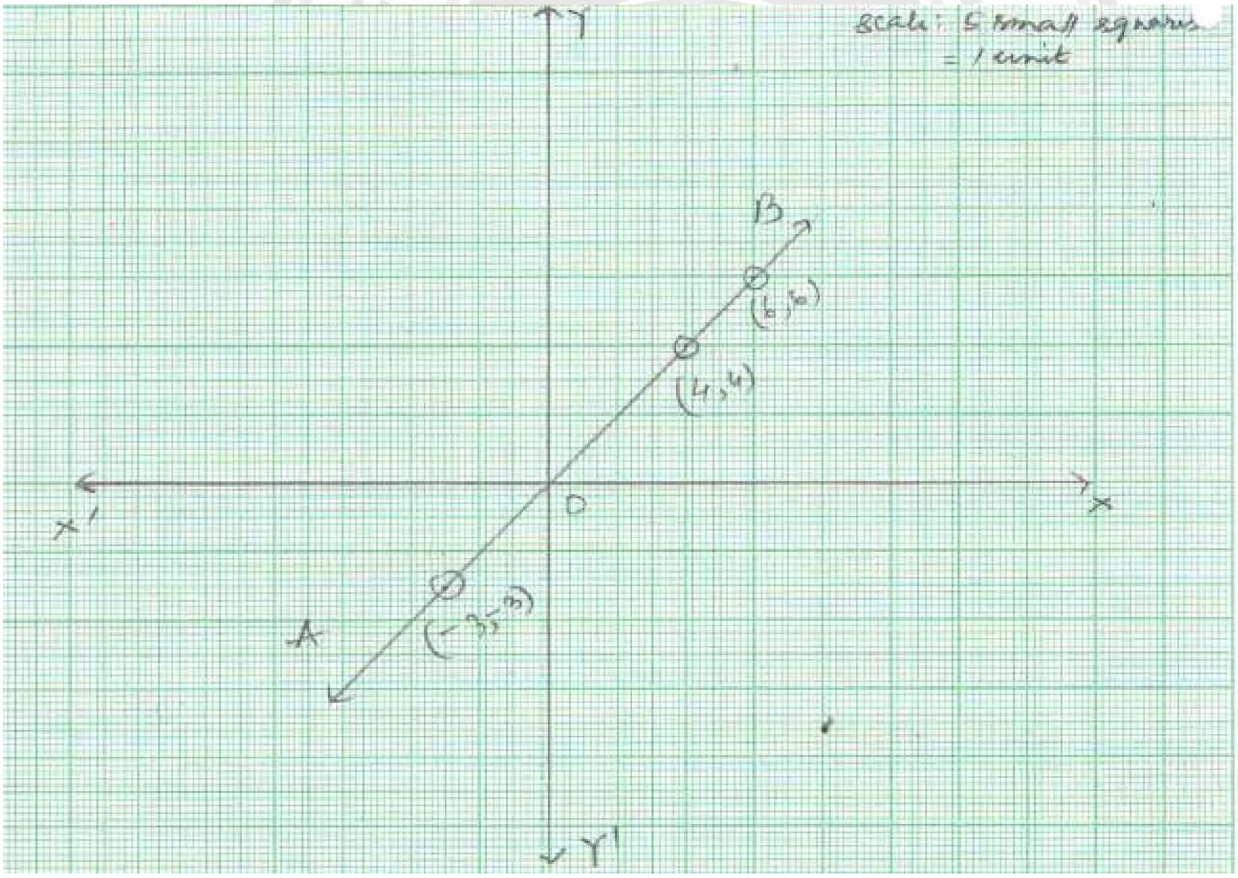
(vi) $\boldsymbol{x - y = 0}$

Solution:

$$x - y = 0 \Rightarrow x = y$$

Table

x	4	-3	6
y	4	-3	6



We plot the points representing the ordered pairs namely $(4,4), (-3,-3), (6,6)$ satisfying $x - y = 0$ on the Cartesian plane. Joining these points, we get a straight line $\overleftrightarrow{AB}$. This straight line $\overleftrightarrow{AB}$ is the graph of $x - y = 0$.

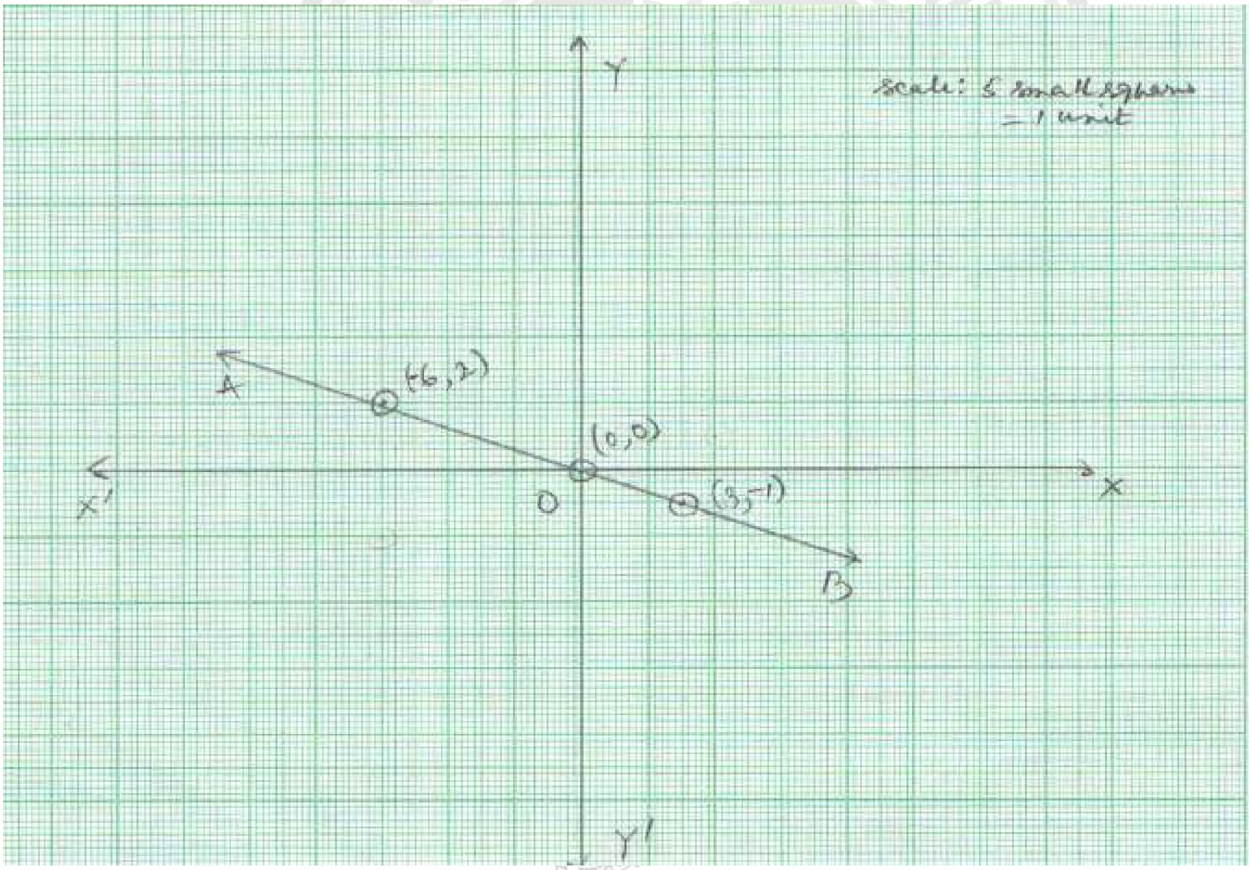
(vii) $\boldsymbol{x + 3y = 0}$

Solution:

$x + 3y = 0 \Rightarrow x = -3y$

Table

x	0	-6	3
y	0	2	-1



We plot the points representing the ordered pairs namely $(0,0), (-6,2), (3,-1)$ satisfying $x + 3y = 0$ on the Cartesian plane. Joining these points, we get a straight line $\overleftrightarrow{AB}$. This straight line $\overleftrightarrow{AB}$ is the graph of $x + 3y = 0$.

2. Draw the graph of the following equation:

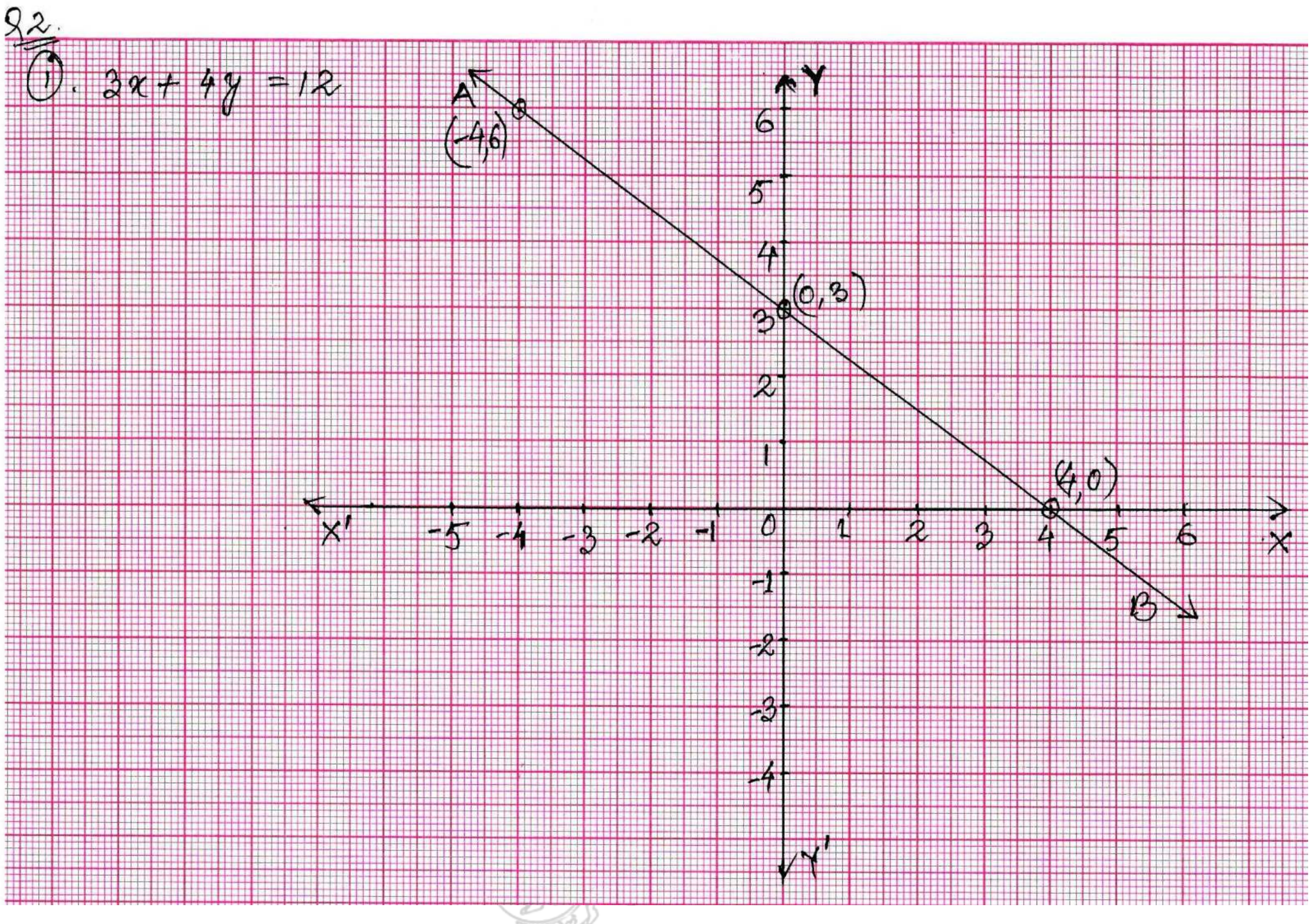
(i) $\mathbf{3x + 4y = 12}$

Solution:

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

Table

x	0	4	-4
y	3	0	6



We plot the points representing the ordered pairs namely $(0,3), (4,0), (-4,6)$ satisfying $3x + 4y = 12$ on the Cartesian plane. Joining these points, we get a straight line $\overleftrightarrow{AB}$. This straight line $\overleftrightarrow{AB}$ is the graph of $3x + 4y = 12$.

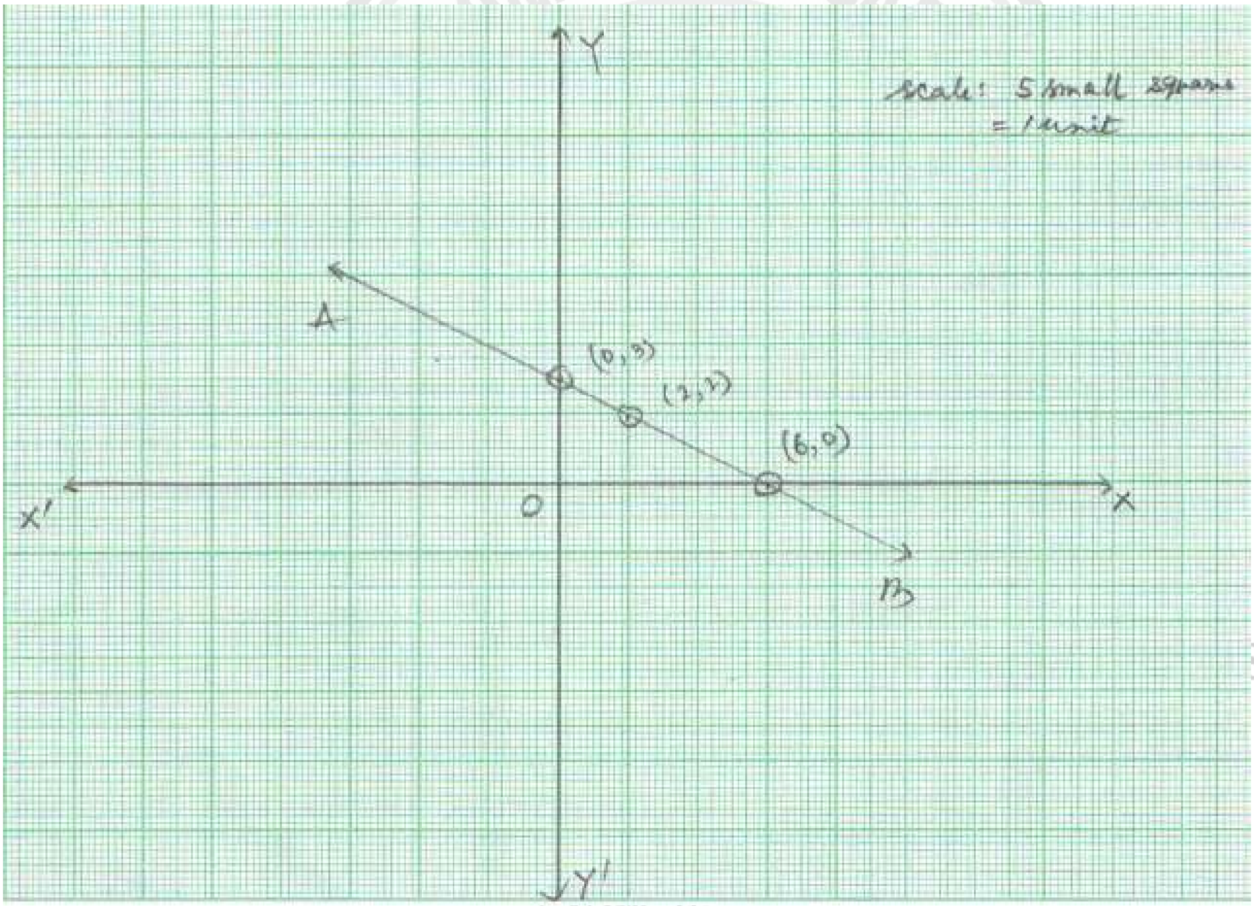
(ii) $x + 2y = 6$

Solution:

$x + 2y = 6 \Rightarrow x = 6 - 2y$

Table

x	6	0	2
y	0	3	2



We plot the points representing the ordered pairs namely, (6,0), (0,3), (2,2) satisfying $x + 2y = 6$ on the Cartesian plane. Joining these points, we get a straight line $\overleftrightarrow{AB}$. This is the graph of $x + 2y = 6$.

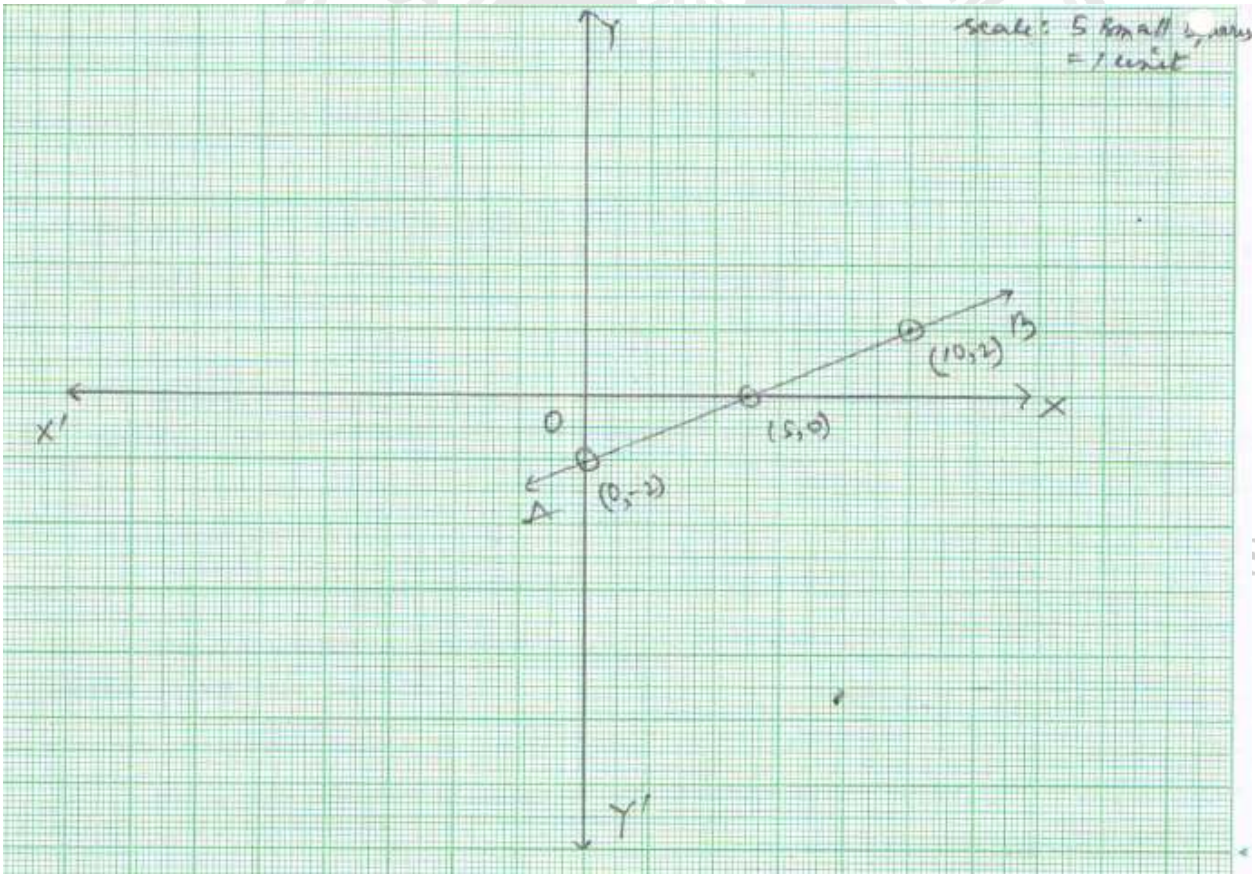
(iii) $2x - 5y = 10$

Solution:

$$2x - 5y = 10 \Rightarrow x = \frac{10 + 5y}{2}$$

Table:

x	5	0	10
y	0	-2	2



We plot the points representing the ordered pairs $(5,0), (0,-2), (10,2)$ satisfying $2x - 5y = 10$ on the Cartesian plane. Joining the points, we get a straight line $\overleftrightarrow{AB}$.

This straight line $\overleftrightarrow{AB}$ is the graph of $2x - 5y = 10$.

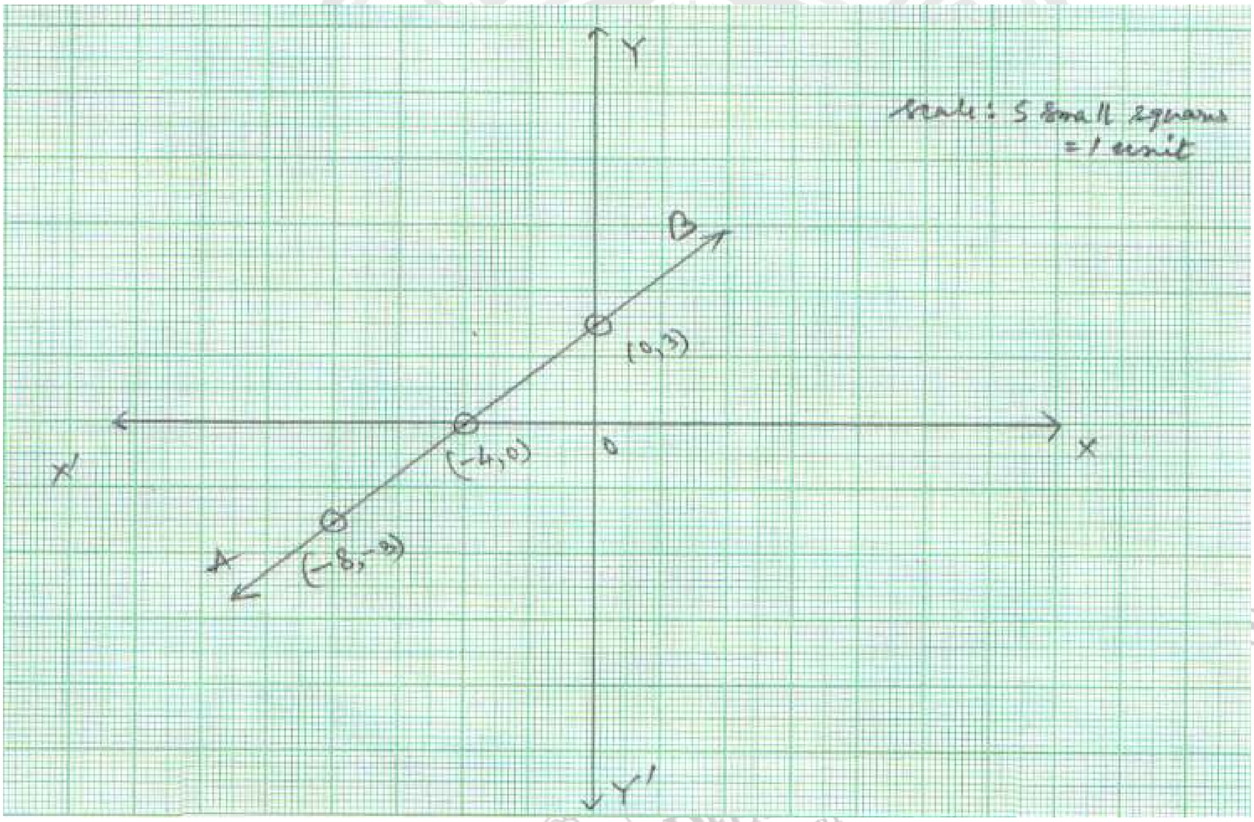
(iv) **$3x = 4y - 12$**

Solution:

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

Table

x	-4	0	-8
y	0	3	-3



We plot the points representing the ordered pairs namely $(-4,0), (0,3), (-8,-3)$ satisfying $3x = 4y - 12$ on the Cartesian plane. Joining the points, we get a straight line $\overleftrightarrow{AB}$. This straight line $\overleftrightarrow{AB}$ is the graph of $3x = 4y - 12$.

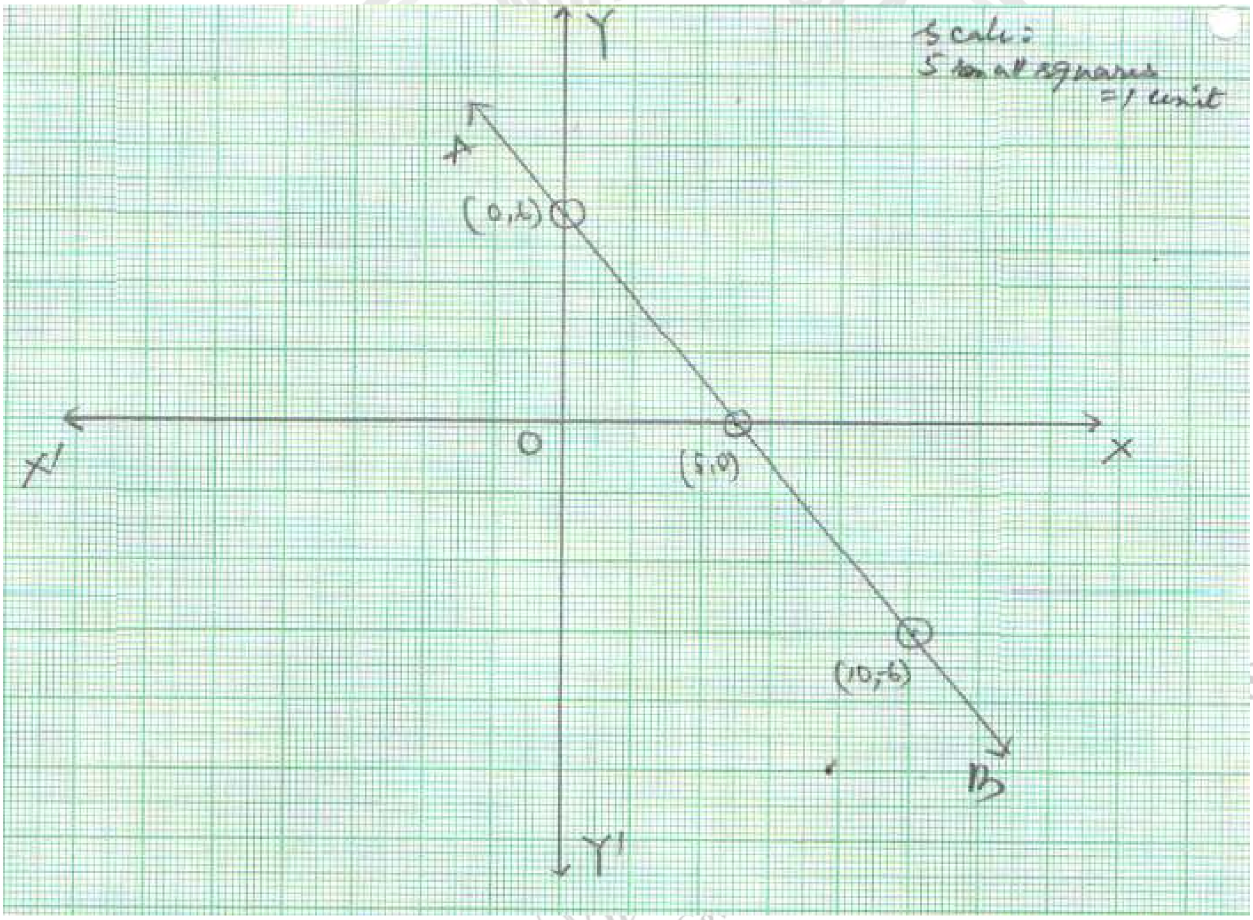
(v) $\frac{x}{5}+\frac{y}{6}=1$

Solution:

$$\frac{x}{5}+\frac{y}{6}=1 \Rightarrow 6x+5y=30 \Rightarrow \frac{30-5y}{6}$$

Table

x	5	0	10
y	0	6	-6



We plot the points representing the ordered pairs namely $(5,0)$, $(0,6)$, $(10,-6)$ satisfying $\frac{x}{5}+\frac{y}{6}=1$ on the Cartesian plane. Joining these points, we get a straight line $\overleftrightarrow{AB}$.

This straight line $\overleftrightarrow{AB}$ is the graph of $\frac{x}{5}+\frac{y}{6}=1$.

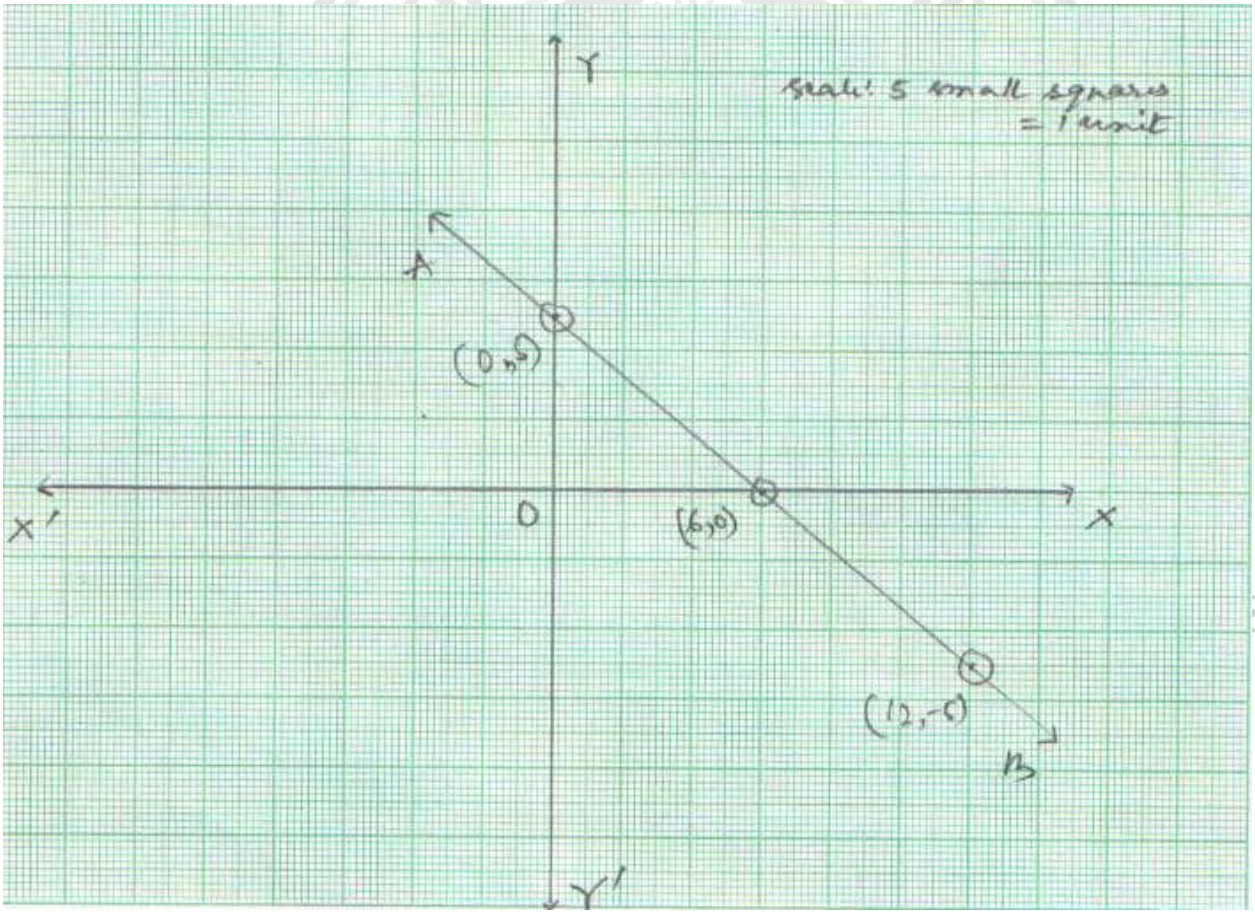
(vi) $\frac{x}{6}+\frac{y}{5}=1$

Solution:

$$\frac{x}{6}+\frac{y}{5}=1 \Rightarrow 5x+6y=30 \Rightarrow \frac{30-6y}{5}$$

Table

x	6	0	12
y	0	5	-5



We plot the points representing the ordered pairs namely $(6,0), (0,5), (12,-5)$ satisfying $\frac{x}{6}+\frac{y}{5}=1$ on the Cartesian plane. Joining the points, we get a straight line $\overleftrightarrow{AB}$. The straight line $\overleftrightarrow{AB}$ is the graph of $\frac{x}{6}+\frac{y}{5}=1$.

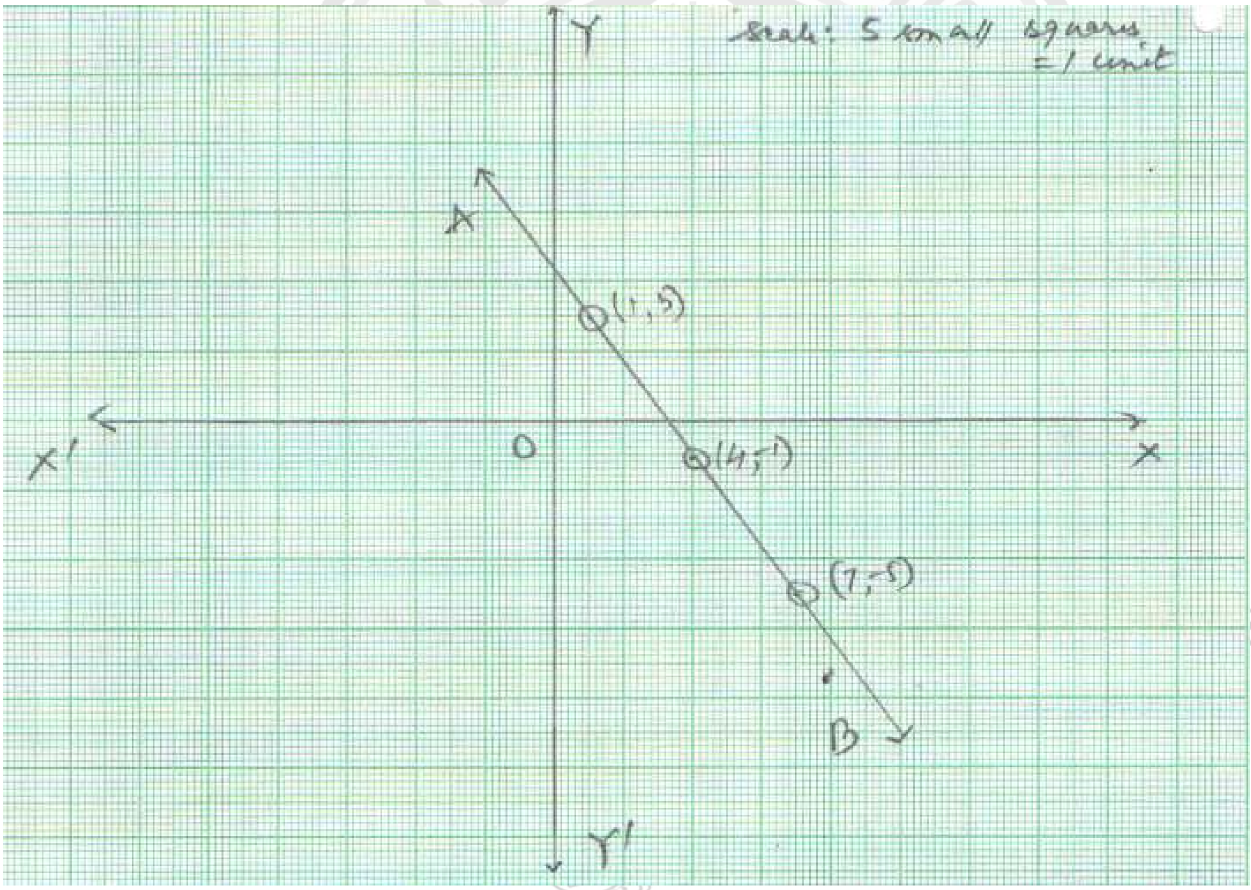
(vii) $\mathbf{4x + 3y = 13}$

Solution:

$$4x + 3y = 13 \Rightarrow 4x = 13 - 3y \Rightarrow x = \frac{13 - 3y}{4}$$

Table

x	4	1	7
y	-1	3	-5



We plot the points representing the ordered pairs namely $(4, -1), (1,3), (7, -5)$ satisfying $4x + 3y = 13$ on the Cartesian plane. Joining the points, we get a straight line $\overleftrightarrow{AB}$. This straight line $\overleftrightarrow{AB}$ is the graph of $4x + 3y = 13$.

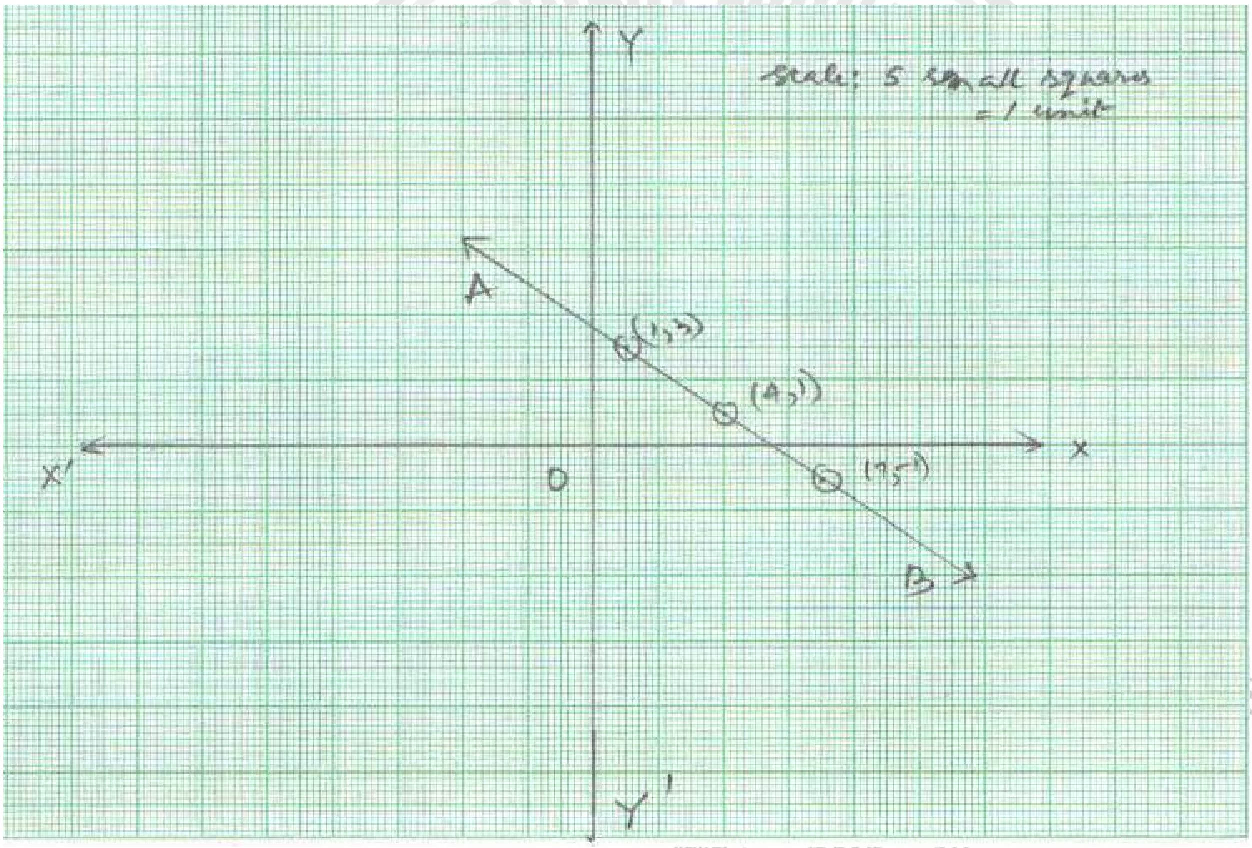
(viii) $\mathbf{2x + 3y = 11}$

Solution:

$$2x + 3y = 11 \Rightarrow x = \frac{11 - 3y}{2}$$

Table

x	4	7	1
y	1	-1	3



We plot the points representing the ordered pairs namely, $(4,1), (7,-1), (1,3)$ satisfying $2x + 3y = 11$ on the Cartesian plane. Joining the points, we get a straight line $\overleftrightarrow{AB}$.

This straight line $\overleftrightarrow{AB}$ is the graph of $2x + 3y = 11$.

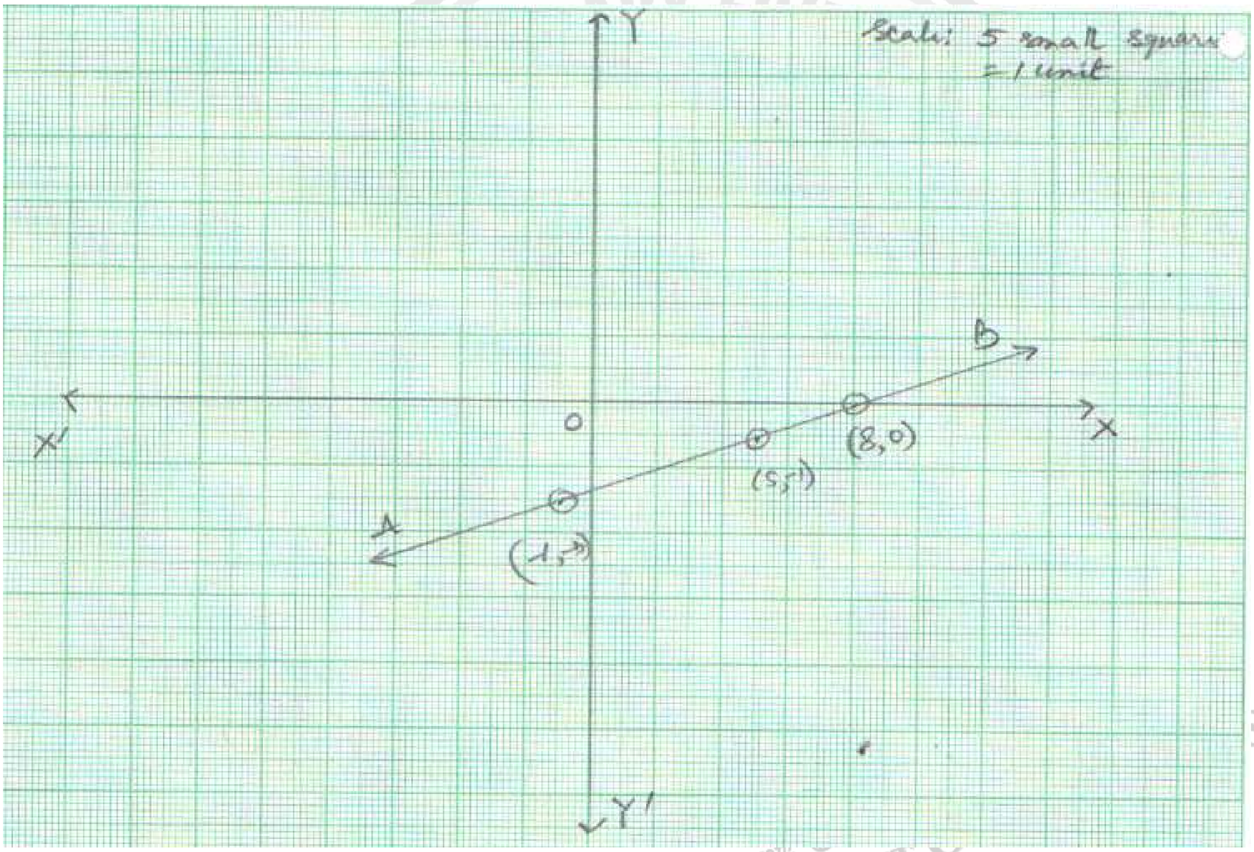
(ix) $x - 3y = 8$

Solution:

$x - 3y = 8 \Rightarrow x = 8 + 3y$

Table

x	8	5	-1
y	0	-1	-3



We plot the points representing the ordered pairs namely $(8,0), (5,-1), (-1,-3)$ satisfying $x - 3y = 8$ on the Cartesian plane. Joining the points, we get a straight line $\overleftrightarrow{AB}$. This straight line $\overleftrightarrow{AB}$ is the graph of $x - 3y = 8$.

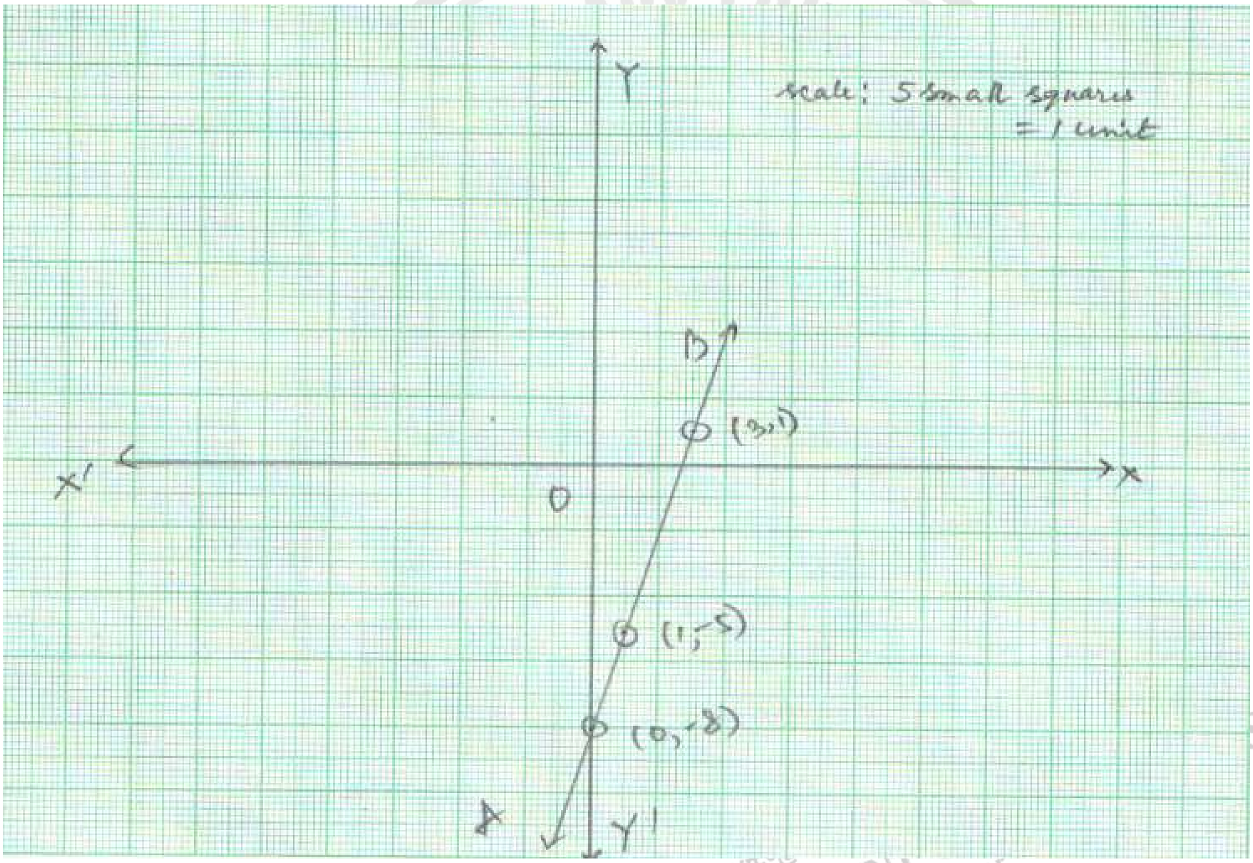
(x) **$3x - y = 8$**

Solution:

$3x - y = 8 \Rightarrow y = 3x - 8$

Table

x	0	1	3
y	-8	-5	1



We plot the points representing the ordered pairs namely $(0,8), (1, -5), (3,1)$ satisfying $3x - y = 8$ on the Cartesian plane. Joining the points, we get a straight line $\overleftrightarrow{AB}$.

This straight line $\overleftrightarrow{AB}$ is the graph of $3x - y = 8$.

3. Draw the graph of $\frac{x}{5}+\frac{y}{3}=1$.

(i) Find the co-ordinates of the points where the graph intersects the two co-ordinate axes.

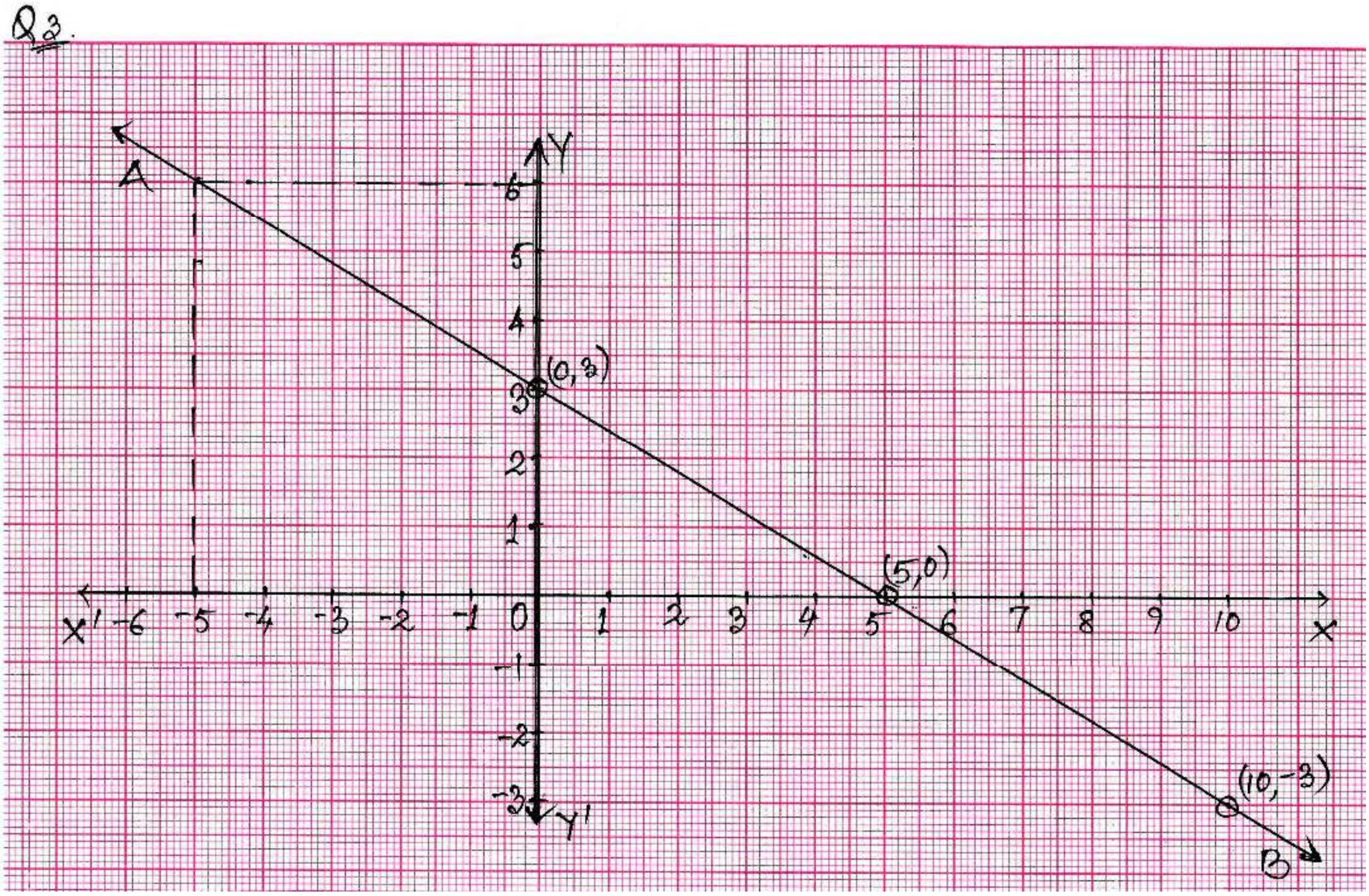
(ii) From the graph find the value of y when $x=-5$.

Solution:

$$\frac{x}{5}+\frac{y}{3}=1 \Rightarrow 3x+5y=15 \Rightarrow x=\frac{15-5y}{3}$$

Table

x	5	0	10
y	0	3	-3



We plot the points representing the ordered pairs namely (5,0), (0,3), $(10,-3)$ satisfying $\frac{x}{5}+\frac{y}{3}=1$. Joining the points, we get a straight line $\overleftrightarrow{AB}$. This straight line $\overleftrightarrow{AB}$ is the graph of $\frac{x}{5}+\frac{y}{3}=1$.

(i) The graph intersects the co-ordinate axes at (5,0) and (0,3)

(ii) From the graph, the value of y when $x=-5$ is 6.

4. Using the same unit and the same axes, draw the graph of the following equations:
$2x - y = 2$ and $3x + 2y = 17$
Find the co-ordinates of the point where the graphs intersect.

Solution:

$$2x - y = 2 \Rightarrow y = 2x - 2$$

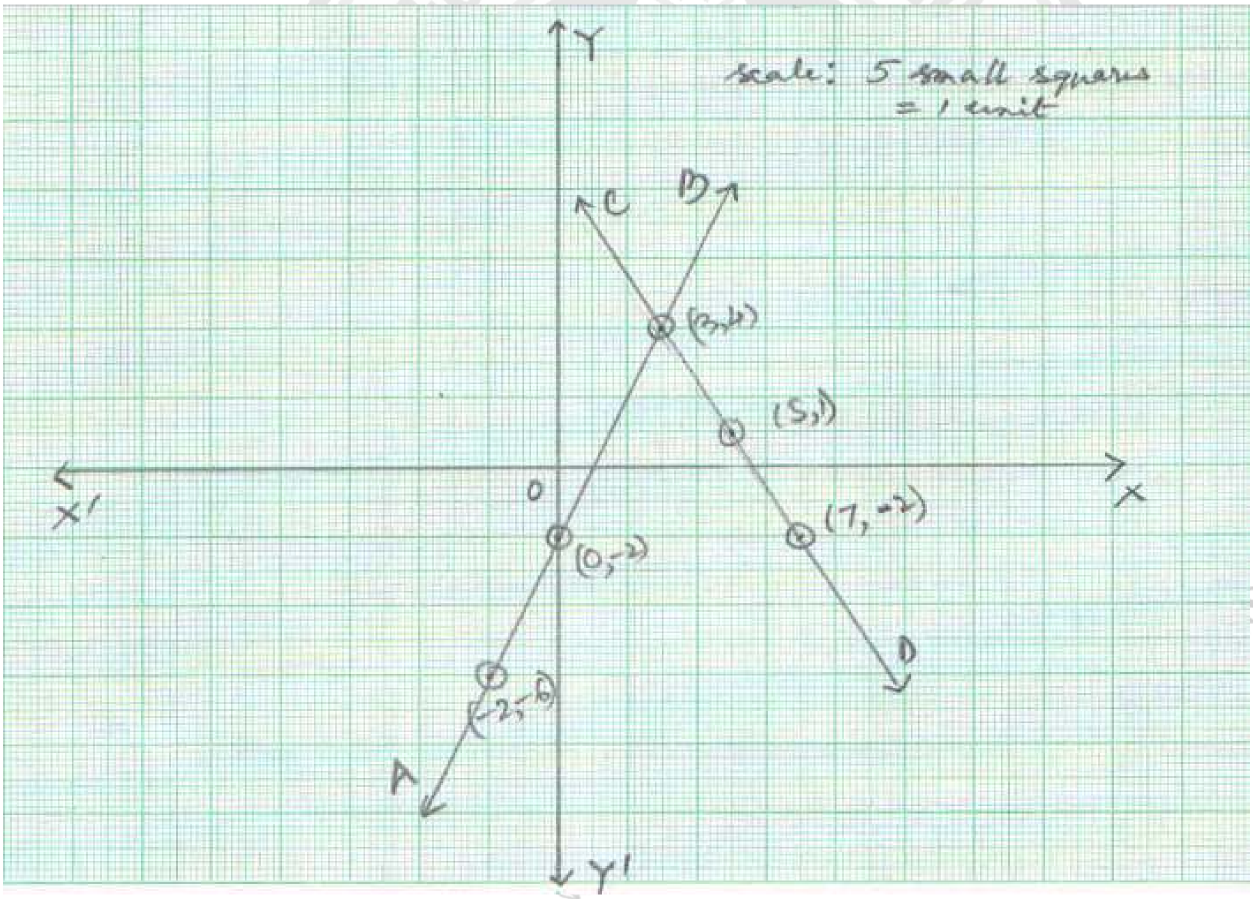
Table I

x	0	3	-2
y	-2	4	-6

$$3x + 2y = 17 \Rightarrow x = \frac{17 - 2y}{3}$$

Table II

x	5	7	3
y	1	-2	4



We plot the points representing ordered pairs satisfying $2x - y = 2$ on the Cartesian plane. Joining the points we get a straight line $\overleftrightarrow{AB}$ which is the graph of $2x - y = 2$. Again we plot the points representing the ordered pairs satisfying $3x + 2y = 17$ on the same Cartesian plane and using the same unit. Joining the points we get a straight line which is the graph of $3x + 2y = 17$. These two graphs $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ intersect at the point $(3,4)$.

5. If the point $(-5, 6)$ lies on the graph $3x + ky = 15$, find the value of k.

Solution: As the point $(-5,6)$ lies on the graph of $3x + ky = 15$, $(-5,6)$ satisfies the equation

$$3x + ky = 15,$$

$$\therefore 3 \times (-5) + k \times 6 = 15$$

$$\Rightarrow -15 + 6k = 15$$

$$\Rightarrow 6k = 15 + 15$$

$$\Rightarrow 6k = 30$$

$$\Rightarrow k = \frac{30}{6}$$

$$\therefore k = 5$$

6. In a city, the taxi fare for the first kilometer is ₹10 and fare for subsequent distance is ₹6 per km. Taking the distance covered as x km. and the total fare as Rs. y, write a linear equation for this information and draw its graph $(x \geq 1)$.

Solution: The distance covered = x km.

Total fare = Rs. y

Then, $10 + (x - 1) \times 6 = y$

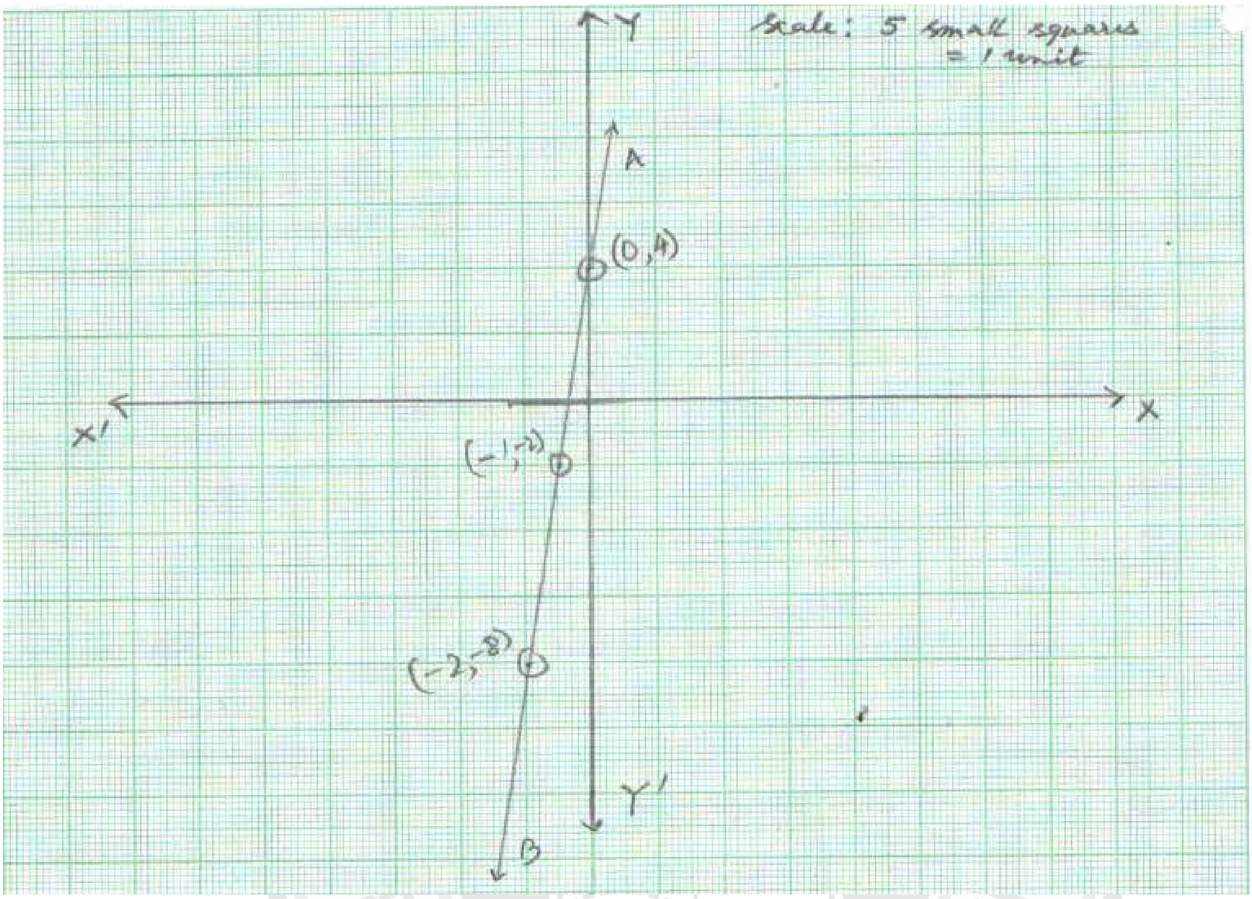
$\Rightarrow 10 + 6x - 6 = y$

$\Rightarrow 6x - y + 4 = 0$, which is the required equation.

$\Rightarrow y = 6x + 4$

Table

x	0	-1	-2
y	4	-2	-8



We plot the points representing the ordered pairs namely, $(0,4), (-1,-2), (-2,-8)$ satisfying $6x - y + 4 = 0$ on the Cartesian plane. Joining the points, we get a straight line $\overleftrightarrow{AB}$.

This straight line $\overleftrightarrow{AB}$ is the graph of $6x - y + 4 = 0$.

7. The force applied on a body is directly proportional to the acceleration produced, constant of proportionality being the mass of the body. Write the equation to express this situation and draw the graph of the equation when the mass of the body is 3 units.

Solution: Let x be the force applied and y be the acceleration produced.

$\therefore x \propto y$

$\Rightarrow x = my$, where m=mass of the body called the constant of proportionality.

When m =3 units,

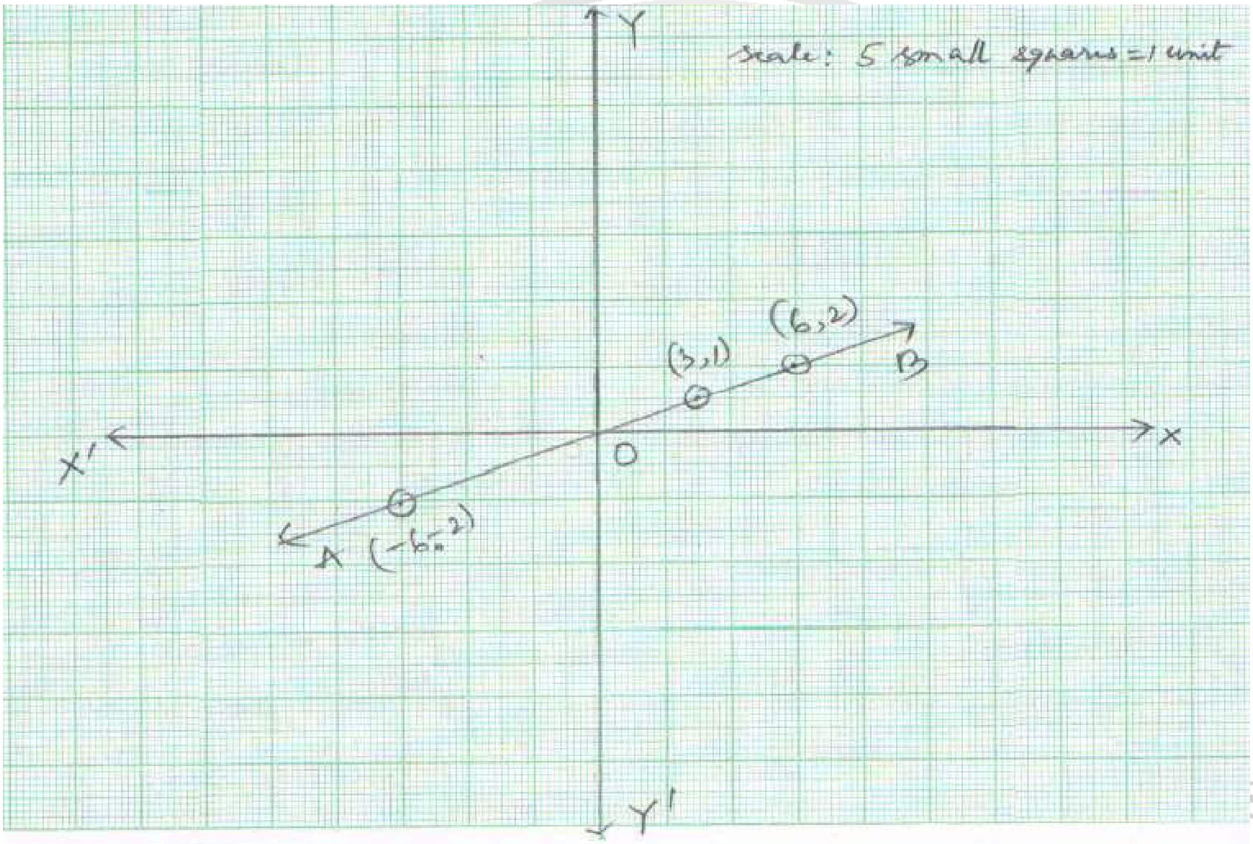
$x = 3y$

$\Rightarrow x - 3y = 0$ which is the linear equation.

Now, $x - 3y = 0 \Rightarrow x = 3y$

Table

x	3	6	-6
y	1	2	-2



We plot the points representing the ordered pairs namely, $(3,1), (6,2), (-6,-2)$ satisfying $x - 3y = 0$ on the Cartesian plane. Joining the points, we get line $\overleftrightarrow{AB}$. This straight line $\overleftrightarrow{AB}$ is the graph of $x - 3y = 0$.

8. Ramesh and Yaima, two students of class ix of a school, together contributed ₹ 125 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.

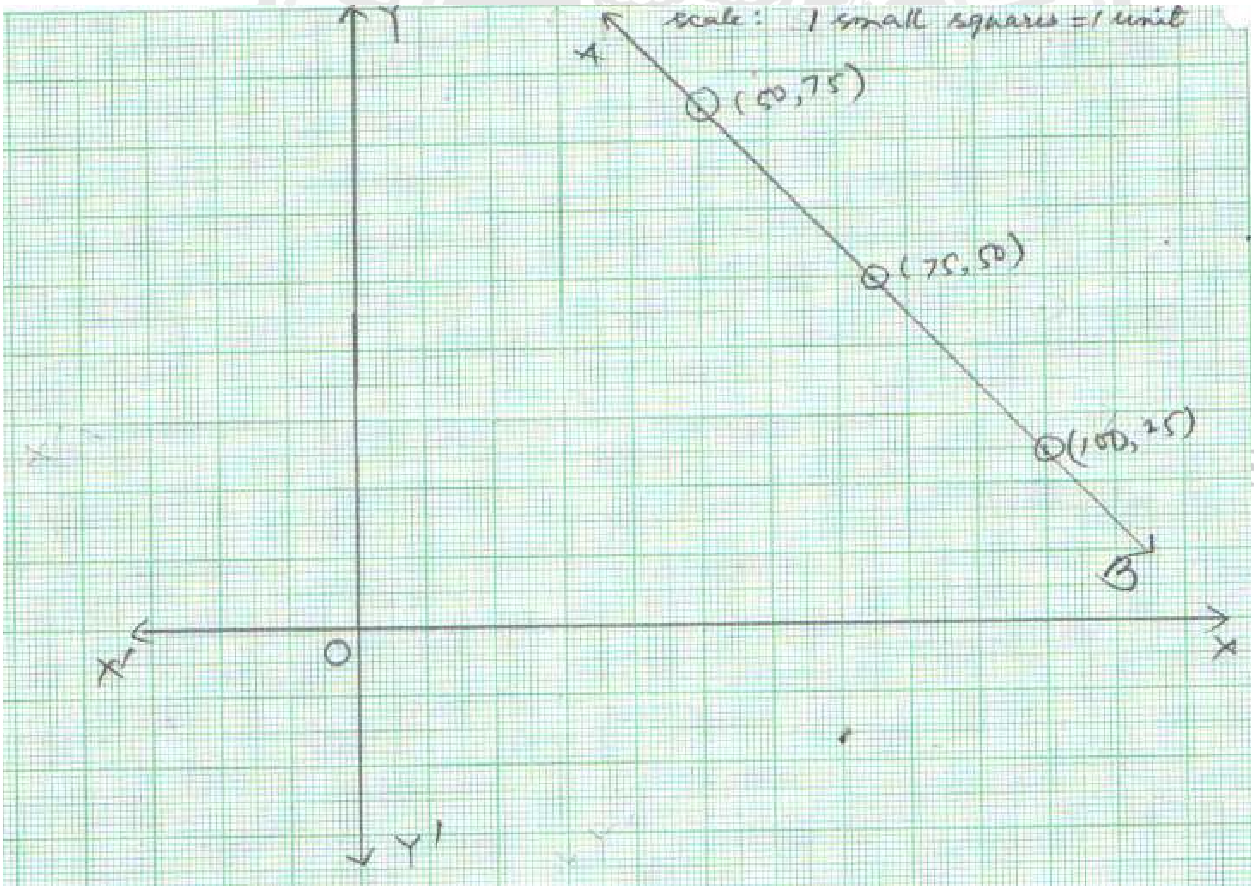
Solution: Let ₹ x and ₹ y be the sums of money contributed by Ramesh and Yaima respectively. The linear equation is $x + y = 125$.

Now, $x + y = 125$

$\Rightarrow x = 125 - y$

Table

x	100	75	50
y	25	50	75



We plot the points representing the ordered pairs namely, $(100,25), (75,50), (50,75)$ satisfying $x + y = 125$ on the Cartesian plane. Joining the points, we get a straight line $\overleftrightarrow{AB}$. This straight line $\overleftrightarrow{AB}$ is the graph of $x + y = 125$.

9. In countries like Britain and USA, temperature is measured in Fahrenheit whereas in countries like India, it is measured in Celsius. The linear equation that converts Fahrenheit to Celsius is given below:

$$\boldsymbol{F = \frac{9}{5}C + 32}$$

Draw the graph of the above linear equation and answer the following questions from the graph:

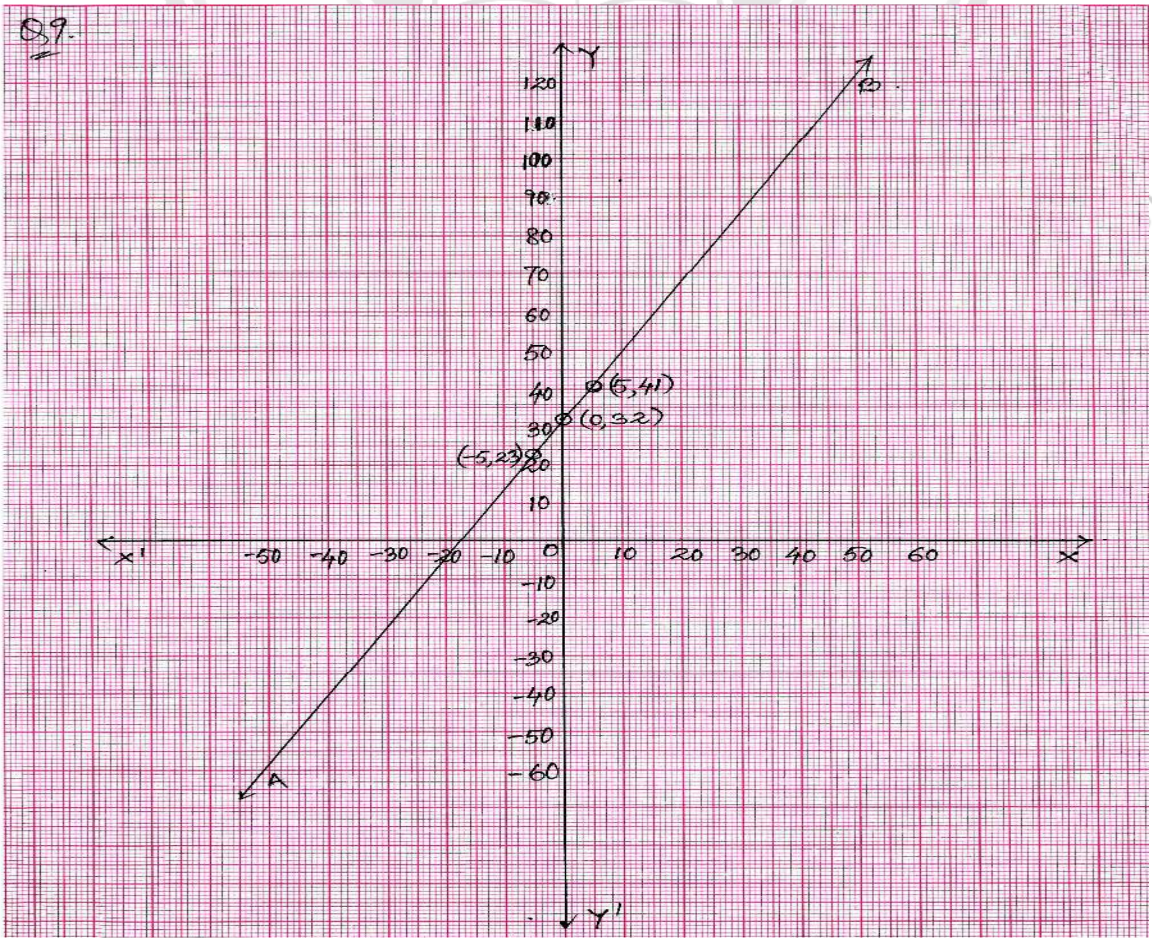
(i) If the temperature is $40°C$, what is its measure in Fahrenheit?
(ii) If the temperature is $113°F$, what is its measure in Celsius?
(iii) If the temperature is $0°C$, what is the measure in Fahrenheit and if the temperature is $0°F$, what is the measure in Celsius?
(iv) Find the temperature of which Fahrenheit and Celsius reading are the same.

Solution: Let x and y be the Celsius and Fahrenheit measures of temperature.

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

Table

x	0	-1	1
y	32	23	41



We plot the points representing the ordered pairs namely $(0,32), (-5,23), (5,41)$ satisfying $y = \frac{9}{5}x + 32$ on the Cartesian plane. Joining the points, we get a straight line $\overleftrightarrow{AB}$.

This straight line $\overleftrightarrow{AB}$ is the graph of $y = \frac{9}{5}x + 32$.

(i) If the temperature is $40°C$, then the temperature in Fahrenheit will be $104°F$.

(ii) If the temperature is $113°F$, its measure in Celsius is $45°C$

(iii) If the temperature is $0°C$, the measure in Fahrenheit is $32°F$ and if the temperature is $0°F$, the measure in Celsius is $-17.8°C$(approx.).

(iv) The temperature of which the Fahrenheit and Celsius reading are the same is $-40°$.

10. The number of degrees and grades in an angle are in the ratio $9:10$. Write a linear equation to express this statement. Draw the graph of the same and answer the following questions from the graph.

(i) If the measure of an angle is $36°$, what is its measure in grades?

(ii) If the measure of an angle is 70^g, what is its measure in degrees?

Solution: Let x and y be the number of degrees and grades in an angle.

We have, $x:y = 9:10$

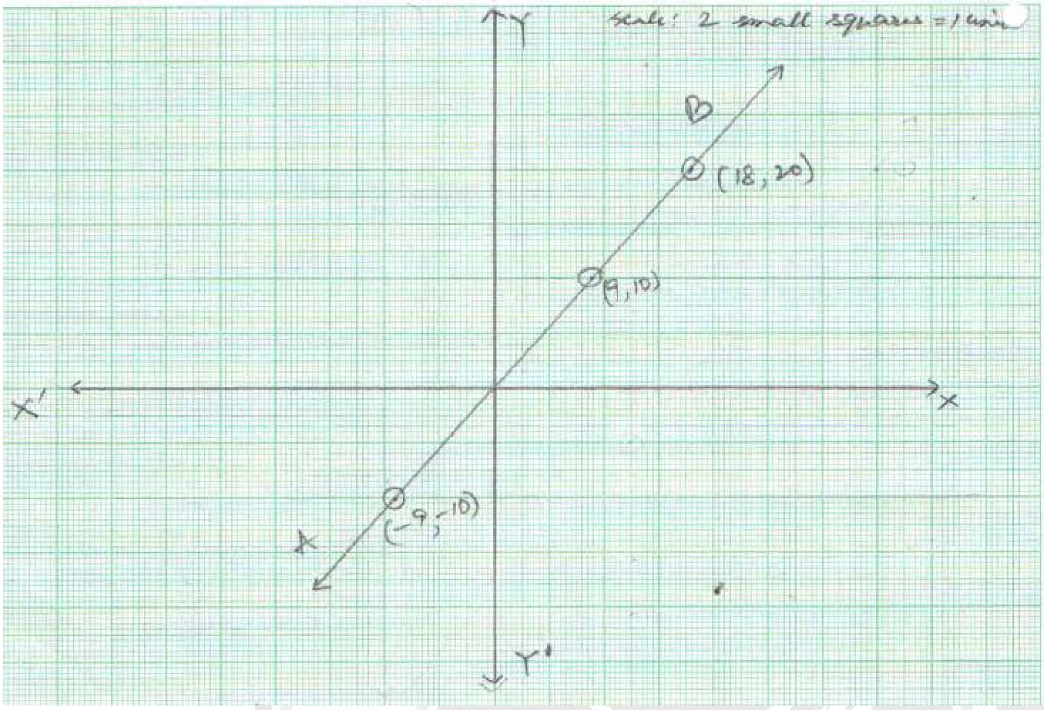
$\Rightarrow \frac{x}{y} = \frac{9}{10} \Rightarrow 10x = 9y$

$\Rightarrow 10x - 9y = 0$, which is the required equation.

$\Rightarrow x = \frac{9y}{10}$

Table

x	9	-9	18
y	10	-10	20



We plot the points representing the ordered pairs namely $(9,10)$, $(-9,-10)$, $(18,20)$ satisfying $10x - 9y = 0$ on the Cartesian plane. Joining the points, we get a straight line $\overleftrightarrow{AB}$. This straight line $\overleftrightarrow{AB}$ is the graph of $10x - 9y = 0$.

(i) If the measure of an angle is $36°$, the measure in grades is 40^g.

(ii) If the measure of an angle is 70^g, the measure in degree is $63°$.

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