Chapter 4: Linear Equations in Two Variables
Exercise 4.1 (Multiple Choice Questions)

Question 1: The linear equation 2x – 5y = 7 has
(a) **a unique solution** (b) **two solutions**
(c) **infinitely many solutions** (d) **no solution**

Answer: **(c)** In the given equation 2x – 5y = 7, for every value of x, we get a corresponding value of y and vice-versa. Therefore, the linear equation has infinitely many solutions.

Question 2: The equation 2x+ 5y = 7 has a unique solution, if x and y are
(a) **natural numbers** (b) **positive real numbers**
(c) **real numbers** (d) **rational numbers**

Answer: **(a)** In natural numbers, there is only one pair i.e., (1, 1) which satisfy the given equation but in positive real numbers, real numbers and rational numbers there are many pairs to satisfy the given linear equation.

Question 3: If (2, 0) is a solution of the linear equation 2x + 3y = k, then the value of k is
(a) **4** (b) **6** (c) **5** (d) **2**

Answer: **(a)** Since, (2, 0) is a solution of the given linear equation 2x + 3y = k, then put x =2 and y= 0 in the equation.
=> 2 (2) + 3 (0) = k => k = 4
Hence, the value of k is 4.

Question 4: Any solution of the linear equation 2x + 0y + 9 = 0 in two variables is of the form
(a) $\left(-\frac{9}{2}, m\right)$ **(b)** $\left(n,\ -\frac{9}{2}\right)$ **(c)** $\left(0,\ -\frac{9}{2}\right)$ **(d) (-9, 0)**

Answer: **(a)** The given linear equation is
2x + 0y + 9 = 0
=> 2x + 9 = 0
=> 2x = -9
=>x= -9/2 and y can be any real number.
Hence, (-9/2 , m) is the required form of solution of the given linear equation.

Question 5: The graph of the linear equation 2x + 3y = 6 cuts the Y-axis at the point
(a) **(2,0)** (b) **(0, 3)** (c)**(3,0)** (d) **(0, 2)**

Answer: **(d)** Since, the graph of linear equation 2x + 3y = 6 cuts the Y-axis.
So, we put x = 0 in the given equation 2x+ 3y = 6, we get
2 x 0+ 3y = 6 => 3y = 6
y=2.
Hence, at the point (0, 2), the given linear equation cuts the Y-axis.

Question 6: The equation x = 7, in two variables can be written as
(a)**1-x + 1-y = 7** (b)**1-x + 0-y = 7** (c)**O-x + 1-y = 7** (d)**0-x + 0-y = 7**

Answer: **(b)** Here, the Coefficient of y in the given equation x =7 is 0. So, the equation can be written as
1-x + 0-y = 7
Hence, the required equation is 1.x + 0. y = 7.

Question 7: Any point on the X-axis is of the form
(a) **(x, y)** (b) **(0, y)** (c) **(x, 0)** (d) **(x, x)**

Answer: **(c)** Every point on the X-axis has its y-coordinate equal to zero. i.e., y=0
Hence, the general form of every point on X-axis is (x, 0).

Question 8: Any point on the line y = x is of the form
(a) **(a, a)** (b) **(0, a)** (c) **(a, 0)** (d) **(a, – a)**

Answer: **(a)** Every point on the line y = x has same value of x-and y-coordinates i.e., x = a and y = a.
Hence, (a, a) is the required form of the solution of given linear equation.

Question 9: The equation of X-axis is of the form
(a) **x = 0** (b) **y = 0** (c) **x + y = 0** (d) **x = y**

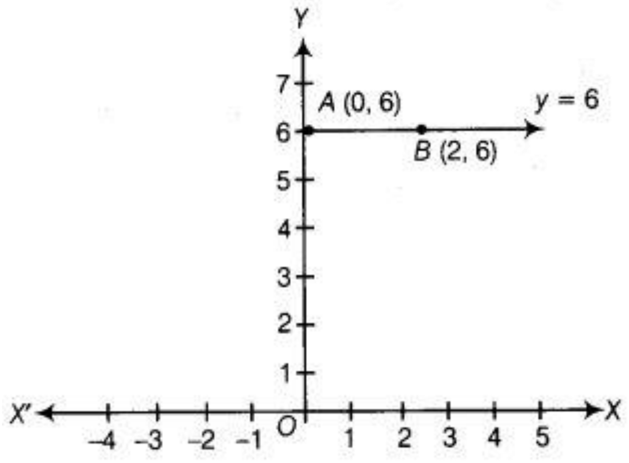
Answer: **(b)** The equation of X-axis is of the form y = 0.

Question 10: The graph of y = 6 is a Line
(a) **parallel to X-axis at a distance 6 units from the origin**
(b) **parallel to Y-axis at a distance 6 units from the origin**
(c) **making an intercept 6 on the X-axis**
(d) **making an intercept 6 on both axes**

Answer: **(a)** Given equation of line can be written as, a . x + 1 . y = 6
To draw the graph of above equation, we need at least two solutions. When x = 0, then y = 6 When x =2, then y = 6

x	0	2
y	6	6

Here, we find two points A (0, 6) and B (2, 6). So, draw the graph, by plotting the points and joining the line AB.



Question 11: x = 5 and y = 2 is a solution of the linear equation
(a) **x + 2y = 7** (b) **5x + 2y = 7** (c) **x + y = 7** (d) **5x + y = 7**

Answer: **(c)** is the correct option.

(a) Take x + 2y, on putting x=5 and y = 2, we get
5 + 2(2) = 5+ 4 = 9≠7.
So, (5, 2) is not a solution of x + 2y = 7
(b) Take 5x + 2y, on putting x = 5 and y = 2, we get
5x 5 + 2 x2 =25+ 4 = 29≠7
So, (5, 2) is not a solution of 5x + 2y = 7.
(c) Take x + y, on putting x = 5 and y = 2, we get 5+2=7
So, (5,2) is a solution of x + y = 7.
(d) Take 5x + y, on putting x = 5 and y = 2, we get
5×5 + 2=25 + 2 =27 ≠7
So, (5, 2) is not a solution of 5x + y = 7.

Question 12: **If a linear equation has solutions (-2, 2), (0, 0) and (2, – 2), then it is of the form**
(a) **y – x = 0** (b) **x + y = 0**

Answer: **(b)** Let us consider a linear equation ax + by + c = 0 … (i)
Since, (-2,2), (0, 0) and (2, -2) are the solutions of linear equation therefore it satisfies the Eq. (i), we get
At point(-2,2), -2a + 2b + c = 0 …(ii)
At point (0, 0), 0+0 + c = 0 => c = 0 …(iii)
and at point (2, – 2), 2a-2b + c = 0 …(iv)
From Eqs. (ii) and (iii),
c = 0 and – 2a + 2b + 0 = 0, – 2a = -2b,a = 2b/2 =>a = b
On putting a = b and c = 0 in Eq. (i),
bx + by + 0= 0=>bx + by = 0 => – b(x + y)= 0=>x + y = 0, b ≠ 0
Hence, x + y= 0 is the required form of the linear equation.

Question 13:
The positive solutions of the equation ax + by + c = 0 always lie in the
(a) **Ist quadrant**
(b) **IInd quadrant**
(c) **IIIrd quadrant**
(d) **IVth quadrant**
Answer: **(a)** We know that, if a line passes through the Ist quadrant, then all solution lying on the line in first quadrant must be positive because the coordinate of all points in the Ist quadrant are positive.

Question 14:
The graph of the linear equation 2x+ 3y = 6 is a line which meets the X-axis at the point.
(a) **(0, 2)** (b) **(2,0)** (c) **(3, 0)** (d) **(0, 3)**

Answer: **(c)** Since, the graph of linear equation $2x + 3y = 6$ meets the X-axis.
So, we put $y = 0$ in $2x + 3y = 6$ => $2x + 3(0) = 6$
=> $2x + 0 = 6$
=> $x = 6/2$ => $x = 3$
Hence, the coordinate on X-axis is (3, 0).

Question 15: The graph of the linear equation y = x passes through the point
(a) **(3/2, -3/2)** (b) **(0,3/2)** (c) **(1,1)** (d) **(-½,½)**

Answer: **(c)** The linear equation $y = x$ has same value of x and y-coordinates are same. Therefore, the point (1,1) must lie on the line $y = x$.

Question 16: If we multiply or divide both sides of a linear equation with a non-zero number, then the solution of the linear equation
(a) **changes**
(b) **remains the same**
(c) **Only changes in case of multiplication**
(d) **Only changes in case of division**

Answer: **(b)** By property, if we multiply or divide both sides of a linear equation with a non-zero number, then the solution of the linear equation remains the same i.e., the solution of the linear equation is remains unchanged.

Question 17: How many linear equations in x and y can be satisfied by x = 1 and y = 2?
(a) **Only one** (b) **Two** (c) **Infinitely many** (d) **Three**

Answer: **(c)** Let the linear equation be $ax + by + c = 0$.
On putting $x = 1$ and $y = 2$, in above equation we get, $a + 2b + c = 0$, where a, b and c, are real number
Here, different values of a, b and c satisfy $a + 2b + c = 0$. Hence, infinitely many linear equations in x and yean be satisfied by $x = 1$ and $y = 2$.

Question 18: The point of the form (a, a) always lies on
(a) **X-axis** (b) **Y-axis** (c)**the line y = x** **(**d) **the line x + y =0**

Answer: **(c)** Since, the given point (a, a) has same value of x and y-coordinates. Therefore, the point (a, a), must be lie on the line y = x.

Question 19: The point of the form (a, – a) always lies on the line
(a) **x = a** (b) **y = – a** (c) **y = x** **(d**) **x + y = 0**

Answer: **(d)** Taking option (d), x + y = a + (-a) = a – a = 0 [since, give point is of the form (a, -a)]. Hence, the point (a, – a) always lies on the line x + y = 0.

Exercise 4.2 (Very short type question)

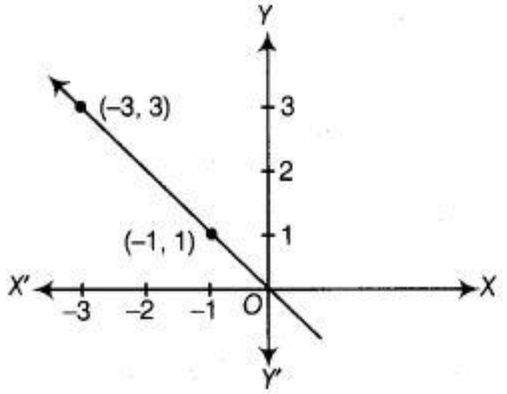
Question 1: The point (0, 3) lies on the graph of the linear equation 3x + 4y = 12.

Answer: True
If we put x = 0 and y = 3 in LHS of the given equation, we find
LHS = 3 x 0+4 x 3 = 0+12 = 12 = RHS
Hence, (0, 3) lies on the linear equation 3x + 4y = 12.

Question 2: The graph of the linear equation x + 2y = 7 passes through the point (0, 7).

Answer: False
If we put x = 0 and y = 7 in LHS of the given equation, we get LHS = (0) + 2 (7)= 0 + 14 = 14 ≠ 7 = RHS
Hence, (0, 7) does not lie on the line x + 2y = 7.

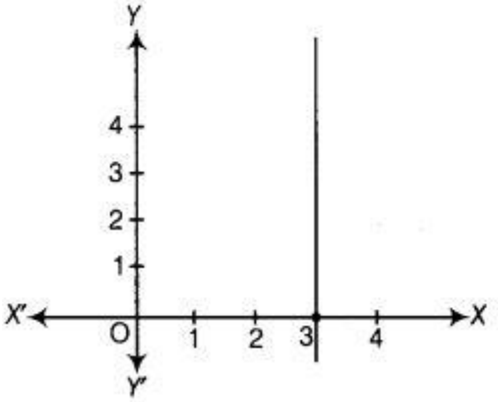
Question 3:
The graph given below represents the linear equation x + y = 0.



Answer: True
If the given points (-1,1) and (- 3, 3) lie on the linear equation x + y = 0, then both

points will satisfy the equation.
So, at point (-1,1), we put x = -1, and y = 1 in LHS of the given equation, we get
LHS = x + y = -1+1 = 0 = RHS
Again, at point (-3 3) put x = – 3 and y = 3 in LHS of the given equation, we get
LHS = x+ y= – 3+ 3= 0 = RHS
Hence, (-1,1) and (-3, 3) both satisfy the given linear equation x + y = 0.

Question 4:
The graph given below represents the linear equation x = 3.



Answer: True
Since, given graph is a line parallel to y-axis at a distance 3 units to the right of the origin. Hence, it represents a linear equation x = 3.

Question 5:
The coordinates of points in the table represent some of the solutions of the equation x – y + 2 = 0.

x	0	1	2	3	4
y	2	3	4	-5	6

Answer: False
The coordinates of points are (0, 2), (1,3), (2, 4), (3, – 5) and (4, 6).
Given equation is x-y+2 = 0
At point (0,2), 0 – 2 + 2 = 0 => 0=0, it satisfies.
At point (1,3), 1-3+2 = 3-3 = 0 => 0 = 0, it satisfies.
At point (2, 4), 2-4+2 = 4- 4 = 0 => 0 = 0, it satisfies.
At point (3,-5), 3 – (- 5) + 2 = 3 + 5 + 2 = 10 ≠ 0, it does not satisfy.
At point (4, 6), 4-6+2-6-6 = 0 => 0 = 0, it satisfies.
Hence, point (3, – 5) does not satisfy the equation.

Question 6: Every point on the graph of a linear equation in two variables does not represent a solution of the linear equation.

Answer: False
Since, every point on the graph of the linear equation represents a solution.

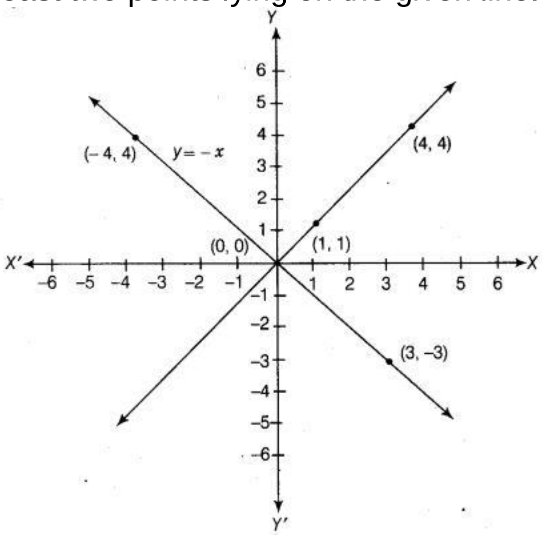
Question 7: The graph of every linear equation in two variables need not be a line.

Answer: False
Since, the graph of a linear equation in two variables always represent a line.

<u>Exercise 4.3 (Short answer type questions)</u>

Question 1: Draw the graphs of linear equations y = x and y = – x on the same Cartesian plane. What do you observe? f Thinking Process
(i) **Firstly find atleast two different points satisfying each linear equation.**
(ii) **Secondly plot these points on a graph paper and get two different lines respective after joining their points.**
(iii) **Further, observe the equations of lines.**

Answer: The given equation is y = x. To draw the graph of this equations, we need at least two points lying on the given line.



For x = 1, y = 1, therefore (1,1) satisfies the linear equation y = x.
For x = 4, y = 4, therefore (4, 4) satisfies the linear equation y = x.
By plotting the points (1,1) and (4, 4) on the graph paper and joining them by a line, we obtain the graph of y = x.
The given equation is y = – x. To draw the graph of this equation, we need atleast two points lying on the given line.
For x = 3, y = – 3, therefore, (3, – 3) satisfies the linear equation y = -x.
For x = – 4, y = 4, therefore, (- 4, 4) satisfies the linear equation y = -x.
By plotting the points (3, – 3) and (- 4, 4) on the graph paper and joining them by a line, we obtain the graph of y = – x.
We observe that, the line y = x and y = – x intersect at the point 0(0, 0).

Question 2: Determine the point on the graph of the linear equation 2x+ 5y = 19 whose ordinate is 1 ½ times its abscissa.
Thinking Process
(i) **Firstly, consider abscissa as x and ordinate as y and make a linear equation under the given condition.**
(ii) **Solving both linear equations to get the value of x and y.**
(iii) **Further, write the coordinates in a point form.**

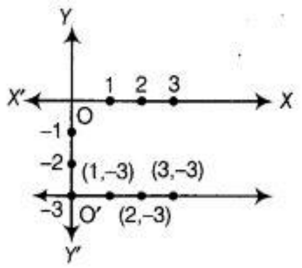
Answer: Let x be the abscissa of the given line 2x + 5y = 19, then by given conditions, Ordinate (y) = $1\frac{1}{2}$ × Abscissa

or, $y = \frac{3}{2}x$ ……………………………………………(1)

On putting $y = \frac{3}{2}x$ in given equation, we get
$2x + 5\left(\frac{3}{2}\right)x = 19$
or, 4x + 15x = 19 × 2
or, 4x + 15x = 38
or, 19x = 38
or, x = 2

On substituting the value of x in eq.(1), we get,
$y = \frac{3}{2} \times 2 = 3$
or, y = 3
hence, the required point is (2,3)

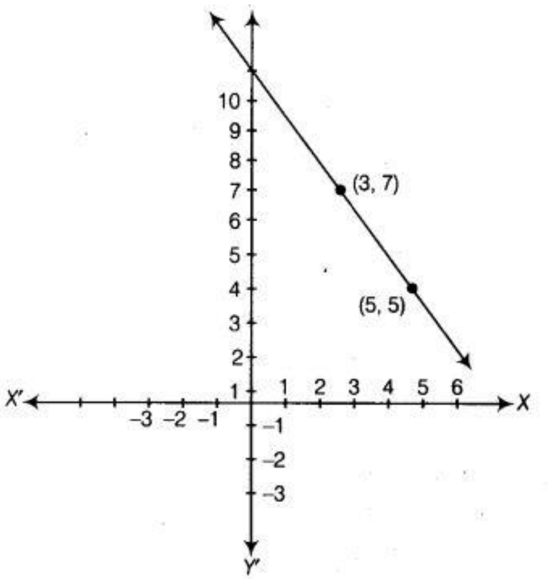
Question 3: Draw the graph of the equation represented by a straight Line which is parallel to the X-axis and at a distance 3 units below it.
Answer: Any straight line parallel to X-axis in negative direction of Y-axis is given by y = – k, where k is the distance of the line from the X-axis. Here, k = 3.



Therefore, the equation of the line is y = -3. To draw the graph of this equation, plot the points (1,—3), (2, -3) and (3, -3) and join them. This is the required graph.

Question 4: Draw the graph of the linear equation whose solutions are represented by the points having the sum of the coordinates as 10 units.

Answer: As per question, the sum of the coordinates is 10 units.
Let x and y be two coordinates, then we get x + y = 10.

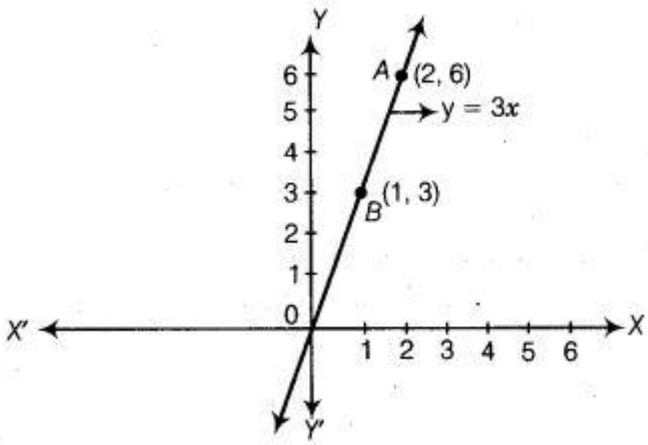


For x = 5, y = 5, therefore, (5, 5) lies on the graph of x + y = 10.
For x = 3, y = 7, therefore, (3, 7) lies on the graph of x + y = 10.
Now, plotting the points (5, 5) and (3, 7) on the graph paper and joining them by a line, we get graph of the linear equation x + y = 10.

Question 5: Write the linear equation such that each point on its graph has an ordinate 3 times its abscissa.
Answer: Let the abscissa of the point be x,
According to the question, Ordinate (y) = 3 x Abscissa
or, y = 3x When x = 1, then y = 3 x 1 = 3 and when x = 2, then y = 3 x 2 = 6.

x	1	2
y	3	6

Here, we find two points A (1,3) and B (2, 6). So, draw the graph by plotting the points and joining the line AB.



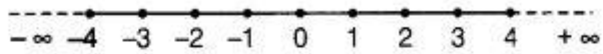
Hence, y = 3x is the required equation such that each point on its graph has an ordinate 3 times its abscissa.

Question 6: If the point (3, 4) lies on the graph of 3y = ax + 7, then find the value of a.

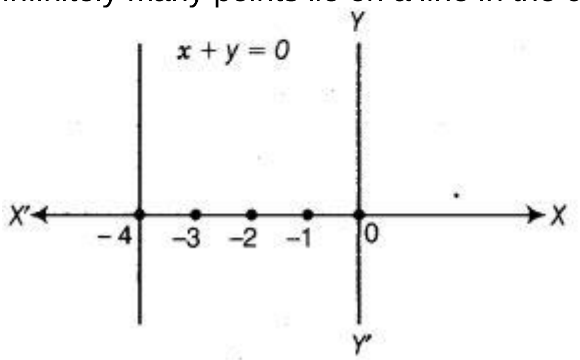
Answer: Since, the point (x = 3, y = 4) lies on the equation 3y = ax + 7, then the equation will be , satisfied by the point.
Now, put x = 3 and y = 4 in given equation, we get
3(4) = a (3)+7
or, 12 = 3a+7
or, 3a = 12 – 7
or, 3a = 5
Hence, the value of a is 5/3.

Question 7: How many solutions) of the equation 2x + 1 = x – 3 are there on the (ii) Cartesian plane?

Answer: 2x + 1 = x – 3
2x-x = -3-1
∴ x = – 4 ……………………………………………………………………(1)
and it can be written as 1.x + 0. y = – 4 ……………………………………….(2)
(i) Number line represent the all real values of x on the X-axis. Therefore, x = – 4 is exactly one point which lies on the number line.



(ii) Whereas the equation x + 4 = 0 represent a straight line parallel to Y-axis and infinitely many points lie on a line in the cartesian plane.



Question 8: Find the solution of the linear equation x+2y = 8 which represents a point on
(i) **X-axis** (ii) **Y-axis**

Answer: We have, x + 2y = 8 ,……………………………………(1)
(i) When the point is on the X-axis, then put y = 0 in Eq. (1), we get
x+2 (0)=8
or, x = 8 Hence, the required point is (8, 0).
(ii) When the point is on the Y-axis, then put x = 0 in Eq. (1), we get
0 + 2y = 8
or, y = 8/2 = 4
Hence, the required point is (0, 4).

Question 9: For what value of c, the linear equation 2x + cy = 8 has equal values of x and y for its solution?

Answer: The given linear equation is 2x + cy= 8. …………………………………..(1)
Now, by condition, x and y-coordinate of given linear equation are same, i.e., x = y.
Put y = x in Eq. (1), we get,
2x + cx = 8
or, cx = 8 – 2x
or, c = $\frac{8-2x}{x}, x \neq 0$
Hence, the required value of c is $\frac{8-2x}{x}$.

Question 10: Let y varies directly as x. If y = 12 when x = 4, then write a linear equation. What is value of y when x = 5?
Thinking Process
(i) **Firstly, write the given condition as y ∝ x, then remove their proportionality sign by considering arbitrary constant k.**
(ii) **Secondly, substitute the value of x and y in the obtained equation and determine the value of k.**
(iii) **Further, substitute the value of k in obtained equation, to get the required equation.**

Answer: Given that, y varies directly as x i.e., y ∝ x, or, y = kx……………………(1)
Given, y = 12 and x = 4
12 = 4k
or, k = $\frac{12}{4}$ ……………………………….[From eq.(1)]
or, k = 3
On putting the value of k in eq (1) we get, y = 3x …………………………….(2)
When x = 5 then from eq. (2) we get, y = 3×5
or, y = 15
hence, the value of y is 15.

Exercise 4.4 (Long Answer type question)

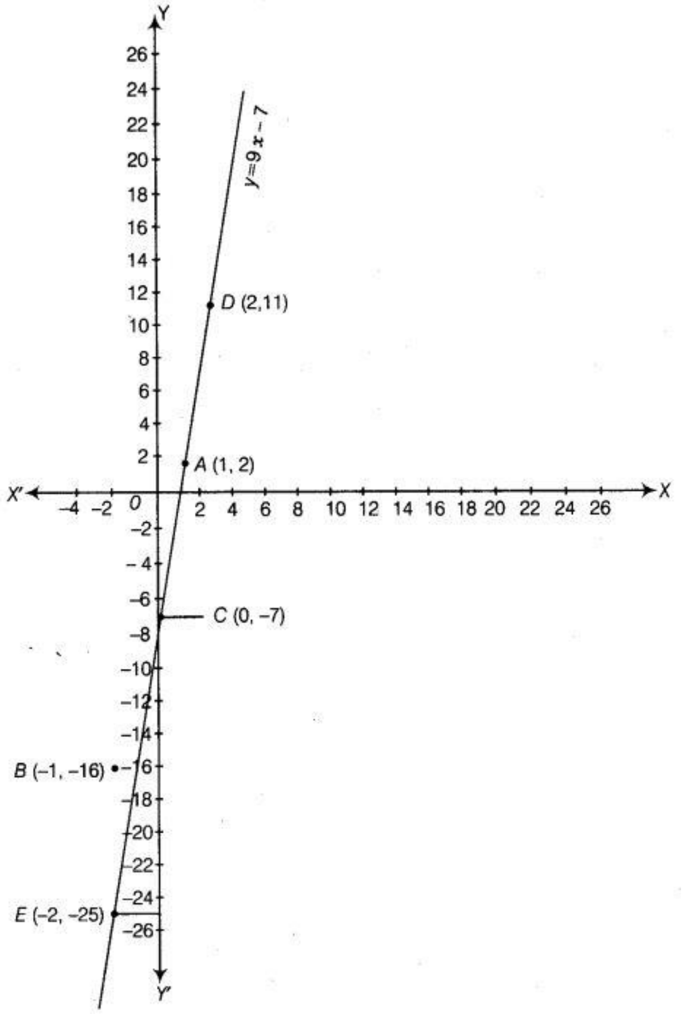
Question 1: Show that the points A (1, 2), B (-1, -16) and C (0, -7) lie on the graph of the linear equation y = 9x – 7.
Thinking Process
(i) **Firstly, make a table for the equation y = 9x – 7.**
(ii) **Secondly, plot the obtained points from the table on a graph and join them to get a straight line.**
(iii) **Further, we plot the given points on a graph paper and find that whether these points lie on the line or not.**

Answer: Firstly, to draw the graph equation y = 9x – 7
When x = 2, then y = 9(2) – 7 = 18 – 7 = 11

When x = -2, then y = 9 (-2) – 7 = -18 – 7 = -25

x	2	-2
y	11	-25

Here, we find two points D(2, 11) and E(-2, -25)
So, draw the graph by plotting the points and joining the line DE.



Now, we plot the given points A (1,2), B (-1, -16) and C (0, -7) on the graph paper. We see that all the points lie on DE line.

Question 2: The following observed values of x and y are thought to satisfy a linear equation. Write the linear equation

x	6	-6
y	-2	6

Draw the graph, using the values of x, y as given in the above table. At what points the graph of the linear equation
(i) **cuts the X-axis?**
(ii) **cuts the Y- axis?**

Answer: Given, points are (6, -2) and (-6, 6).
Let the linear equation y = mx + c is satisfied by the points (6, -2) and (-6, 6) then at the point (6, -2),
-2 = 6m + c…………………………………………………….…………(1)
and at point (-6, 6), 6 = -6m + c ……………………………………………….(2)
On subtracting eq(2) from eq(1) we get,
12m = - 8
or, m = $\frac{-8}{12}$
or, m = $-\frac{2}{3}$

On putting the value of m in eq(1) we get,
-2 = 6($-\frac{2}{3}$) + c
or, -2 = -4 + c
or, c = -2 + 4
or, c = 2

On putting m = $-\frac{2}{3}$ and c = 2 in linear eq y = mx + c we get,
y = $-\frac{2}{3}x$ + 2
or, y = $\frac{-2x+6}{3}$
or, 3y = -2x + 6
or, 3y + 2x = 6
When the graph of the linear eq.

(i) Cut the x-axis
Then put y = 0 in eq. 2x + 3y = 6, we get
2x + 3(0) = 6
or, 2x = 6
or, x = 3

(ii) Cut the y-axis
then put x = 0 in eq. 2x + 3y = 6, we get
2(0) + 3y = 6
or, 3y = 6
or, y = 2

Therefore, the graph the linear eq cuts the X-axis at the points (3, 0) and the Y-axis at the point (0,2)