CHAPTER 4

Linear Equations in Two Variables

1. OBJECTIVE QUESTIONS

1. Which of the following equation has graph parallel to y-axis?
(a) $y=-2$ (b) $x=1$
(c) $x-y=2$ (d) $x+y=2$

Ans : (b) $x=1$

$x=a$ has the graph which is parallel to y-axis.
$x=1$ is the required equation that has graph parallel to y-axis.

2. The distance between $M(-1,5)$ and $N(x,5)$ is 8 units. The value of x is
(a) -9 or 9 (b) -7 or 9
(c) -9 or 7 (d) -7 or -9

Ans : (c) -9 or 7

The point $M(-1,5)$ and $N(x,5)$ lie on a line parallel to x-axis because their ordinates are same. Since the distance between the points is 8 units, therefore the value of x is -9 or 7.

3. The linear equation $2x-5y=7$ has
(a) A unique solution
(b) Two solutions
(c) Infinitely many solutions
(d) No solution

Ans : (c) Infinitely many solutions

Given linear equation has infinitely many solution.

4. If $P(x,y)$ and $P'(y,x)$ are same points then which of the following is true?
(a) $x+y=0$ (b) $xy=0$
(c) $x-y=0$ (d) $\frac{x}{y}=0$

Ans : (c) $x-y=0$

$$\begin{aligned} P(x,y) &= P'(y,x) \\ x &= y \text{ and } y = x \\ x-y &= 0 \end{aligned}$$

5. The point of the form (a,a) always lies on:
(a) x-axis (b) y-axis
(c) on the line $y=x$ (d) on the line $x+y=0$

Ans : (c) on the line $y=x$

6. $2=-y$ can be expressed in the form $ax+by+c=0$ as
(a) $y+2=0$ (b) $y+0\cdot x+3=0$
(c) $0\cdot x+1\cdot y-2=0$ (d) $0\cdot x+1\cdot y+2=0$

Ans : (d) $0\cdot x+1\cdot y+2=0$

$$\begin{aligned} 2 &= -y \\ 2+y &= 0 \\ x\cdot 0+y\cdot 1+2 &= 0 \text{ in the form as } ax+by+c=0 \end{aligned}$$

7. Age of a father is 7 years more than 3 times the present age of his son. The above statement can be expressed in a linear equation as
(a) $x-3y-7=0$ (b) $x+3y+7=0$
(c) $x+3y-7=0$ (d) $x-3y+7=0$

Ans : (a) $x-3y-7=0$

Let father's age be x and son's age $=y$

$$\begin{aligned} x &= 3y+7 \\ x-3y-7 &= 0. \end{aligned}$$

8. If $(3,-2)$ is a solution of the equation $3x-py-7=0$, then the value of p is
(a) -1 (b) 1
(c) $-\frac{13}{3}$ (d) 2

Ans : (a) -1

$$\begin{aligned} 3(3)-p(-2)-7 &= 0 \\ 2+2p &= 0 \\ p &= -1 \end{aligned}$$

9. If $x=1$ and $y=0$ is the solution of equation $2x+\sqrt{3}\,y-4a=0$, then the value of a is
(a) 7 (b) $\frac{-1}{2}$
(c) $\frac{1}{2}$ (d) $\frac{1}{3}$

Ans : (c) $\frac{1}{2}$

$$2x+\sqrt{3}\,y-4a=0$$

has solution, $x=1,\ y=0$

$$\begin{aligned} 2\times 1+\sqrt{3}\times 0-4a &= 0 \\ 2 &= 4a \\ a &= \frac{1}{2} \end{aligned}$$

10. If $(a,1)$ lies on the graph of $3x-2y+4=0$, then $a=$
(a) $\frac{-2}{3}$ (b) $\frac{2}{3}$

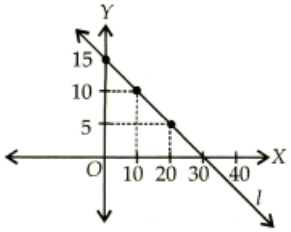
(c) $\frac{3}{2}$ (d) $\frac{-3}{2}$

Ans : (a) $\frac{-2}{3}$

Since $(a,1)$ lies on

$$\begin{aligned} 3x-2y+4 &= 0 \\ 3\times a-2\times 1+4 &= 0 \\ 3a &= -4+2 = -2 \\ a &= \frac{-2}{3} \end{aligned}$$

11. If $(20,-a)$ lies on l whose graph is given then the value of a is



(a) -5 (b) 5
(c) -10 (d) 10

Ans : (a) -5

Since $(20,-a)$ lies on graph
For $x=20$ from graph $y=5$
$(20,5)$ lies on graph

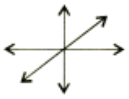
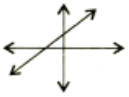
$$\begin{aligned} (20,5) &= (20,-a) \\ -a &= 5 \\ a &= -5. \end{aligned}$$

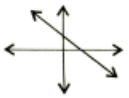
12. A solution of the equation $2x+5y-3=0$ is
(a) $(5,-2)$ (b) $(-5,2)$
(c) $(-1,1)$ (d) $(1,-1)$

Ans : (c) $(-1,1)$

$(-1,1)$ satisfies the equation $2x+5y-3=0$

13. Which could be the graph of $y=x$?

(a)  (b) 

(c)  (d) 

Ans : (a)

For equation $y=x$,$(0,0)$ is one of the solution So, graph should pass through origin $(0,0)$. This is satisfied by only (a).

14. If $(\sqrt{2},-\sqrt{2})$ lies on the graph $4x-3ay=\sqrt{2}$, then the value of a equals
(a) 1 (b) -1
(c) 0 (d) -2

Ans : (b) -1

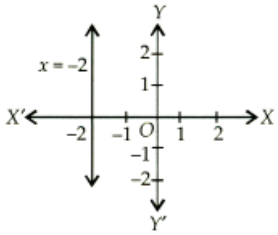
Since $(\sqrt{2},-\sqrt{2})$ lies on $4x-3ay=\sqrt{2}$
It must be solution of $4x-3ay=\sqrt{2}$

$$\begin{aligned} 4\times\sqrt{2}-3a(-\sqrt{2}) &= \sqrt{2} \\ 3a\sqrt{2} &= \sqrt{2}-4\sqrt{2} \\ 3a\sqrt{2} &= -3\sqrt{2} \\ a &= -1 \end{aligned}$$

15. The geometric representation of $x=-2$ meets the x -axis at
(a) $(2,0)$ (b) $(-2,0)$
(c) $(0,2)$ (d) $(0,-2)$

Ans : (b) $(-2,0)$

From graph, $x=-2$, intersect x-axis at $(-2,0)$.



16. If a linear equation has solutions $(-2,2)$, $(0,0)$ and $(2,-2)$, then it is of the form
(a) $y-x=0$ (b) $x+y=0$
(c) $-2x+y=0$ (d) $-x+2y=0$

Ans : (b) $x+y=0$

17. The equation $x=7$, in two variables, can be written as
(a) $1\cdot x+1\cdot y=7$ (b) $1\cdot x+0\cdot y=7$
(c) $0\cdot x+1\cdot y=7$ (d) $0\cdot x+0\cdot y=7$

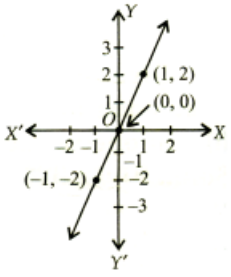
Ans : (b) $1\cdot x+0\cdot y=7$

18. The number of solutions, the equation $3x+5y+15=0$ can have
(a) one only (b) exactly two
(c) zero (d) infinite

Ans : (d) infinite

$3x+5y+15=0$ is a linear equation in two variables and every linear equation in two variables has infinite many solutions.

19. The equation of line shown in the graph is



(a) $x+y=0$ (b) $y=2x$
(c) $y=x$ (d) $y=2x+1$

Ans : (b) $y=2x$

In figure, the points on the line are $(-1,-2),(0,0),(1,2)$. By inspection, $y=2x$ is the equation corresponding to this graph, as the $y-$ coordinate in each case is

double that of the $x-$ coordinate.

20. Abscissa of all points on the y-axis is
(a) 0 (b) 1
(c) -1 (d) None of these
Ans : (a) 0

21. The value of x for which $y=-4$ is a solution of the linear equation $5x-8y=47$ is
(a) -3 (b) 3
(c) $\frac{79}{5}$ (d) $-\frac{79}{5}$
Ans : (b) 3

As $y=-4$ is a solution of $5x-8y=47$
Hence, $5x-8y=47$
$5x+32=47$
$5x=15$
$x=3$

22. Ordinate of all points on the x-axis is
(a) 0 (b) 1
(c) 2 (d) -1
Ans : (a) 0

23. If the point $(3,4)$ lies on the graph of the equation $3y=ax+7$, the value of a is
(a) $\frac{5}{3}$ (b) $\frac{3}{5}$
(c) 1 (d) $\frac{2}{5}$
Ans : (a) $\frac{5}{3}$

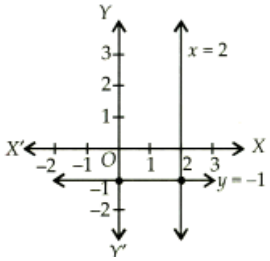
$(3,4)$ lies on $3y=ax+7$
$3\times 4=a\times 3+7$
$12-7=a\times 3$
$a=\frac{5}{3}$

24. 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 the axes
Ans : (a) parallel to x-axis at a distance 6 units from the origin

25. The value of k, if $x=2, y=-1$ is a solution of the equation $2x+3y=k$ is
(a) 6 (b) 7
(c) 5 (d) 1
Ans : (d) 1

$x=2$, $y=-1$ is solution of equation
$2x+3y=k$
$2\times 2+3\times(-1)=k$
$k=4-3$
$k=1$

26. Graph of $x=2$ and $y=-1$ intersect at
(a) $(-1,2)$ (b) $(2,-1)$
(c) $(1,2)$ (d) $(2,1)$
Ans : (b) $(2,-1)$



From graph point of intersection is $(x=2, y=-1)$ i.e., $(2,-1)$.

27. The equation $2x+5y=7$ has a unique solution, if x, y are:
(a) Natural numbers (b) Positive real numbers
(c) Real numbers (d) Rational numbers
Ans : (a) Natural numbers

28. $8y=9$ when written as an equation in two variables, is
(a) $x+8y=9$ (b) $0\cdot x+8y+9=0$
(c) $0\cdot x+8y-9=0$ (d) $0\cdot x+8y=0$
Ans : (c) $0\cdot x+8y-9=0$

$8y=9$
can be written as in two variables as
$0\cdot x+8y-9=0$
$0\cdot x+8\cdot y-9=0$

29. Which of the following equations represents a line parallel to y-axis?
(a) $2y=5x$ (b) $2y=5$
(c) $2x=5$ (d) $2x+3y=5$
Ans : (c) $2x=5$

Line $2x=5$
$x=\frac{5}{2}$ which is parallel to y-axis

30. The linear equation $3x=2y$ when expressed in the form $ax+by+c=0$, then a, b, c are respectively
(a) 3, 2, 0 (b) 3, 2, 1
(c) 3, -2, 0 (d) 3, -2, 1
Ans : (c) 3, -2, 0

We have, $3x=2y$
$3x-2y=0$
$3x+(-2)y+0=0$
Now, comparing it with
$ax+by+c=0$,

we get $a = 3,\ b = -2$ and $c = 0$

31. Which of the following equations represents a line parallel to x-axis?

(a) $3x + 2 = 0$ (b) $3y + 2 = 0$

(c) $3x + 2y = 0$ (d) $3x - 2y = 0$

Ans : (b) $3y + 2 = 0$

$$3y + 2 = 0$$
$$y = -\frac{2}{3}$$

It is the line parallel to x-axis.

32. $ax + by + c = 0$ does not represent equation of line, if

(a) $a = c = 0, b \neq 0$ (b) $c = 0, a \neq 0, b \neq 0$

(c) $b = c = 0, a \neq 0$ (d) $a = b = 0$

Ans : (d) $a = b = 0$

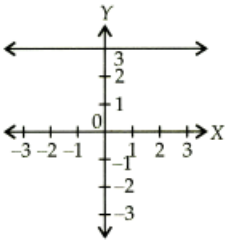
33. An ordered pair that satisfy an equation in two variables is called its.

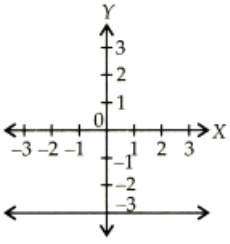
(a) Zero (b) Root

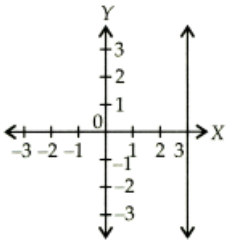
(c) Solution (d) Both (b) and (c)

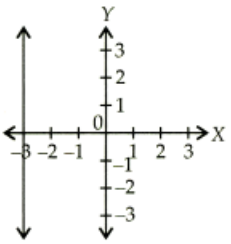
Ans : (c) Solution

34. Geometric representation of x=-3 as an equation in two variables is

(a) 

(b) 

(c) 

(d) 

Ans : (d)

$x = -3$ is a line parallel to y-axis and passes through the point $(-3, 0)$.

35. Richa had 10 chocolates, let her brother borrowed y chocolates from her and then Richa had 4 chocolates. Which equation models this solution?

(a) $10 - y = 4$ (b) $10 + y = 4$

(c) $10y = 4$ (d) $4y = 10$

Ans : (a) $10 - y = 4$

$$\text{Total number of chocolates Richa had} = 10$$
$$\text{Number of chocolates her brother borrowed} = y$$
$$\text{Number of chocolates left with Richa} = 4$$
$$10 - y = 4$$

36. Which of the following is a solution of the equation $2x + 3y = 6$?

(a) $(1, 2)$ (b) $(1, 1)$

(c) $(-3, 4)$ (d) $(3, 1)$

Ans : (c) $(-3, 4)$

We have, $2x + 3y = 6$

a. $(1, 2)$ means $x = 1$ and $y = 2$. Putting these values in $2x + 3y = 6$, we get

$$\text{L.H.S} = 2 \times 1 + 3 \times 2 = 8 \neq \text{R.H.S}$$

$(1, 2)$ is not a solution of $2x + 3y = 6$

b. $(1, 1)$ means $x = 1$ and $y = 1$, Putting these values in $3x + 3y = 6$, we get

$$\text{L.H.S} = 2 \times 1 + 3 \times 1 = 5 \neq \text{R.H.S}$$

$(1, 1)$ is not a solution of $2x + 3y = 6$

c. $(-3, 4)$ means $x = -3$ and $y = 4$, Putting these values in $2x + 3y = 6$, we get

$$\text{L.H.S} = 2 \times (-3) + 3 \times 4$$
$$= -6 + 12 = 6 = \text{R.H.S}$$

$(-3, 4)$ is a solution of $2x + 3y = 6$

d. $(3, 1)$ means $x = 3$ and $y = 1$, Putting these values in $2x + 3y = 6$, we get

$$\text{L.H.S} = 2 \times 3 + 3 \times 1 = 9 \neq \text{R.H.S}$$

$(3, 1)$ is not a solution of $2x + 3y = 6$

2. FILL IN THE BLANK

DIRECTION : Complete the following statements with an appropriate word/term to be filled in the blank space(s).

1. An equation of the form $cy + d = 0$, where c, d are real numbers and $c \neq 0$, in the variable y geometrically represents a ..... on the number line.

Ans : point

2. An equation of the type $y = mx$ represents a line passing through the .....

Ans : origin.

3. The graphs of $x = a$ is a straight line parallel to the ..... axis.

Ans : y

4. A linear equation in two variables has ..... solutions.

Ans : infinitely many

5. $x = 0$ is the equation of the ..... axis and $y = 0$ is the equation of the ..... axis.

Ans : y, x

6. The graphs of every linear equation in two variables is a .....

Ans : straight line

7. The graphs of $y = a$ is a straight line parallel to the

..... axis.

Ans : x

8. Every ..... of the linear equation is a point on the graph of the linear equation.

Ans : solution

3. TRUE/FALSE

DIRECTION : Read the following statements and write your answer as true or false.

1. An equation of the form $ax+by+c=0$, where a, b and c are real numbers, such that a and b are both zero, is called a linear equation in two variables.

Ans : False

2. The graph of the equation $y=mx+c$ passes through the origin.

Ans : False

Because $x=0$, $y=0$ does not satisfy the equation.

3. $y=3x+5$ has a unique solution.

Ans : False

4. The line parallel to the y-axis at a distance 4 units to the left of y-axis is given by the equation $x=-a$.

Ans : True

Since the line parallel to y-axis at a distance a units to the left to y-axis is given by the equation $x=-a$.

5. (0, 2) is a solution for $x-2y=4$

Ans : False

6. All the points (2, 0), $(-3,0)$, (4, 2) and (0, 5) lie on the x-axis.

Ans : False

The points (2, 0), $(-3,0)$ lie of the x-axis. The point (4, 2) lies in the first quadrant. The point (0, 5) lies on the y-axis.

7. $\left(2,\frac{1}{2}\right)$ is a solution for $x=4y$

Ans : True

8. The solution of a linear equation is not affected when the same number is added to both the sides of the equation.

Ans : True

4. MATCHING QUESTIONS

DIRECTION : In the section, each question has two matching lists. Choices for the correct combination of elements from Column-I and Column-II are given as options (a), (b), (c) and (d) out of which one is correct.

1. Match the equation given in Column-I with their solution sets given in Column-II.

Column-I		Column-II	
(P)	$2x+y=7$	(1)	$(0,9)$
(Q)	$x-2y=4$	(2)	$(1,5)$
(R)	$x-4y=0$	(3)	$(0,0)$
(S)	$px+y=9$	(4)	$(4,0)$

	P	Q	R	S
(a)	4	1	3	2
(b)	1	4	3	2
(c)	4	3	1	2
(d)	2	4	3	1

Ans : P − 2, Q − 4, R − 3, S − 1

(P) $2x+y=7$

$y=7-2x$

When, $x=1,\ y=7-2=5$

$(1,5)$ is the solution.

(Q) $x-2y=4$

$x=4+2y$

When, $y=0$

$x=4+2\times 0=4$

(4, 0) is the solution.

$(0,0)$ is solution

(R) $x-4y=0$

$x=4y$

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

$(0,0)$ is the solution.

(S) $px+y=9$

When $x=0,\ y=9$

$(0,9)$ is the solution.

2. In European countries temperature is measured in Fahrenheit, whereas in Asian countries, it is measured in Celsius. the linear equation that converts Fahrenheit to Celsius is $C=1/9(F-32)\times 5$

Match the temperatures given in Column-I with temperatures given in Column-II.

Column-I		Column-II	
(P)	26°C in $F=$	(1)	104°
(Q)	64°F in $C=$	(2)	8.9°
(R)	48°F in $C=$	(3)	78.8°
(S)	40°C in $F=$	(4)	17.8°

	P	Q	R	S
(a)	4	1	3	2
(b)	3	4	2	1
(c)	4	3	1	2
(d)	2	1	3	4

Ans : P − 3, Q − 4, R − 2, S − 1

$$C = \frac{1}{9}(F-32)\times 5$$

(P) $C = 26^\circ$

$$\frac{1}{9}(F-32)\times 5 = 26^\circ$$

$$F-32 = \frac{26^\circ \times 9}{5}$$

$$F = 46.8^\circ + 32 = 78.8^\circ$$

(Q) $F = 64^\circ$

$$\frac{1}{9}(64^\circ - 32)\times 5 = C$$

$$\frac{32^\circ \times 5}{9} = C$$

$$C = 17.8^\circ$$

(R) $F = 48^\circ$

$$\frac{1}{9}(48^\circ - 32)\times 5 = C$$

$$\frac{16^\circ \times 5}{9} = C$$

$$C = 8.9^\circ$$

(S) $C = 40^\circ$

$$\frac{1}{9}(F-32)\times 5 = 40^\circ$$

$$F-32 = \frac{40^\circ \times 9}{5}$$

$$F = 72^\circ + 32$$

$$F = 104^\circ$$

3. Math the following

	Column-I		Column-II
(P)	$x = a$	(1)	x-axis
(Q)	$y = a$	(2)	Straight line parallel to x-axis
(R)	$y = mx$	(3)	Straight line parallel to y-axis
(S)	$y = 0$	(4)	Straight line passing through origin

Ans : P − 3, Q − 2, R − 4, S − 1

4. Math the following

	Column-I		Column-II
(P)	$x + y = 0$	(1)	(3/2, 3)
(Q)	$y - 2x = 0$	(2)	$(-5, 5)$
(R)	$3x + 5y = 0$	(3)	$(5, -2)$
(S)	$2x - y = 12$	(4)	(0, 0)
		(5)	$(-5, 3)$
		(6)	$(5, -3)$

Ans : P − (2, 4), Q − 1, R − (5, 6), S − 3

5. ASSERTION AND REASON

DIRECTION : In each of the following questions, a statement of Assertion is given followed by a corresponding statement of Reason just below it. Of the statements, mark the correct answer as

(a) Both assertion and reason are true and reason is the correct explanation of assertion.

(b) Both assertion and reason are true but reason is not the correct explanation of assertion.

(c) Assertion is true but reason is false.

(d) Assertion is false but reason is true.

1. **Assertion :** There are infinite number of lines which passes through $(2, 14)$.
Reason : A linear equation in two variables has infinitely many solutions.
Ans : (b) Both assertion and reason are true but reason is not the correct explanation of assertion.

Through a point infinite lines can be drawn.
Through $(2, 14)$ infinite number of lines can be drawn.
Also a line has infinite points on it hence a linear equation representing a line has infinite solutions.

2. **Assertion :** A linear equation $2x + 3y = 5$ has a unique solution.
Reason : A linear equation in two variables has infinitely many solutions.
Ans : (d) Assertion is incorrect but Reason is correct.

3. **Assertion :** For all values of $k, \left(\frac{-3}{2}, k\right)$ is a solution of the linear equation $2x + 3 = 0$.
Reason : The linear equation $ax + b = 0$ can be expressed as a linear equation in two variables as $ax + y + b = 0$.
Ans : (c) Assertion is true but reason is false.

$$\left(-\frac{3}{2}, k\right) \text{ is a solution of } 2x + 3 = 0$$

$$2 \times \left(-\frac{3}{2}\right) + 3 = -3 + 3 = 0$$

$\left(-\frac{3}{2}, k\right)$ is the solution of $2x + 3 = 0$

for all values of k.
Also $ax + b = 0$ can be expressed as a linear equation in two variables as $ax + 0 \cdot y + b = 0$.

4. **Assertion :** All the points (1, 0), $(-1, 0)$, (2, 0) and (5, 0) lie on the x-axis.
Reason : Equation of the x-axis is $y = 0$.
Ans : (a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

5. **Assertion :** The graph of the linear equation $x - 2y = 1$ passes through the point $(3, 1)$.
Reason : Every point lying on graph is not a solution of $x - 2y = 1$.
Ans : (c) Assertion is true but reason is false.

If $(3, 1)$ lies on the graph of $x - 2y = 1$

For $x - 2y = 1, (3, 1)$

is a solution as $3 - 2 \times 1 = 1$.

6. **Assertion :** The point (0, 3) lies on the graph of the linear equation $3x + 4y = 12$.
Reason : (0, 3) satisfies the equation $3x + 4y = 12$.
Ans : (a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

7. **Assertion :** The equation of $2x + 5 = 0$ and $3x + y = 5$ both have degree 1.
Reason : The degree of a linear equation in two variables is 2.
Ans : (c) Assertion is true but reason is false.

Every linear equation has degree 1.
$2x + 5 = 0$ and $3x + y = 5$ are linear equations. So, both have degree 1.

8. **Assertion :** The graph of the equation $3x + y = 0$ is a line passing through the origin.
Reason : An equation of the form $ax + by + c = 0$, where a, b, c are real numbers is called a linear equation in x and y.
Ans : (b) Both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.

9. **Assertion :** The graph of every linear equation in two variables need not be a line.
Reason : Graph of a linear equation in two variables is always a line.
Ans : (d)Assertion is incorrect but Reason is correct.

10. **Assertion :** The point $(1,1)$ is the solution of $x + y = 2$.
Reason : Every point which satisfy the linear equation is a solution of the equation.
Ans : (a) Both assertion and reason are true and reason is the correct explanation of assertion.

Putting $(1,1)$ in the given equation, we have

$$\text{L.H.S} = 1 + 1 = 2 = \text{R.H.S}$$

$$\text{L.H.S} = \text{R.H.S}$$

Hence $(1,1)$ satisfy the $x + y = 2$. So it is the solution of $x + y = 2$.