CHAPTER 4

Linear Equation in Two Variables

CLASS 9TH

NCERT EXERCISE AND SOLUTIONS - MATHEMATICS

EXERCISE 4.1

1. **The cost of a notebook is twice the cost of a pen. Write a linear equation in two variables to represent this statement.**
(Take the cost of a notebook to be ₹x and that of a pen to be ₹y)

SOLUTION:

Let the cost of a notebook be = ₹x

Let the cost of a pen be = ₹y

According to the question,

The cost of a notebook is twice the cost of a pen. i.e., cost of a notebook = 2 × cost of a pen

$x = 2 \times y \Rightarrow x = 2y$

$x - 2y = 0$

$x - 2y = 0$ is the linear equation in two variables to represent the statement, 'The cost of a notebook is twice the cost of a pen.'

2. **Express the following linear equations in the form ax + by + c = 0 and indicate the values of a, b and c in each case.**

(i) $2x + 3y = 9.3\overline{5}$ (ii) $x - \frac{y}{5} - 10 = 0$ (iii) $-2x + 3y = 6$ (iv) $x = 3y$

(v) $2x = -5y$ (vi) $3x + 2 = 0$ (vii) $y - 2 = 0$ (viii) $5 = 2x$

SOLUTION:

(i) $2x + 3y = 9.3\overline{5}$

Re-arranging the equation, we get,

$2x + 3y - 9.3\overline{5} = 0$

The equation $2x + 3y - 9.3\overline{5} = 0 = 0$ can be written as,

$2x + 3y + \left(-9.3\overline{5}\right) = 0$

Now comparing $2x + 3y + \left(-9.3\overline{5}\right) = 0$ with $ax + by + c = 0$

We get,

$a = 2$

$b = 3$

$c = -9.3\overline{5}$

(ii) $\mathbf{x - \frac{y}{5} - 10 = 0}$

The equation $x - \frac{y}{5} - 10 = 0$ can be written as, $1x + \left(\frac{-1}{5}\right)y + (-10) = 0$

Now comparing $x + \left(\frac{-1}{5}\right)y + (-10) = 0$ with $ax + by + c = 0$ We get,

$a = 1$

$b = -\left(\frac{1}{5}\right)$

$c = -10$

(iii) $-2x + 3y = 6$

Re-arranging the equation, we get,

$-2x + 3y - 6 = 0$

The equation $-2x + 3y - 6 = 0$ can be written as, $(-2)x + 3y + (-6) = 0$

Now, comparing $(-2)x + 3y + (-6) = 0$ with $ax + by + c = 0$ We get, $a = -2$

$b = 3$

$c = -6$

(iv) $x = 3y$

Re-arranging the equation, we get, $x - 3y = 0$

The equation $x - 3y=0$ can be written as, $1x + (-3)y + (0) = 0$

Now comparing $1x + (-3)y + (0) = 0$ with $ax + by + c = 0$

We get $a = 1$

$b = -3$

$c = 0$

(v) $2x = -5y$

Re-arranging the equation, we get, $2x + 5y = 0$

The equation $2x + 5y = 0$ can be written as, $2x + 5y + 0 = 0$

Now, comparing $2x + 5y + 0 = 0$ with $ax + by + c = 0$ We get $a = 2$

$b = 5$

$c = 0$

(vi) $3x + 2 = 0$

The equation $3x + 2 = 0$ can be written as, $3x + 0y + 2 = 0$

Now comparing $3x + 0y + 2= 0$ with $ax + by + c = 0$

We get a = 3

b = 0

c = 2

(vii) y – 2 = 0

y – 2 = 0

The equation y – 2 = 0 can be written as,

0x + 1y + (–2) = 0

Now comparing 0x + 1y + (–2) = 0 with ax + by + c = 0 We get a = 0

b = 1

c = –2

(viii) 5 = 2x

Re-arranging the equation, we get, 2x = 5

i.e., 2x – 5 = 0

The equation 2x – 5 = 0 can be written as, 2x + 0y – 5 = 0

Now comparing 2x + 0y + (–5) = 0 with ax + by + c = 0 We get a = 2

b = 0

c = –5

EXERCISE 4.2

1. Which one of the following options is true, and why?

y = 3x + 5 has

(i) A unique solution **(ii) Only two solutions**

(iii) Infinitely many solutions

SOLUTION:

Let us substitute different values for x in the linear equation y = 3x + 5

x	0	1	2	….	100
y, where y=3x + 5	5	8	11	….	305

From the table, it is clear that x can have infinite values, and for all the infinite values of x, there are infinite values of y as well.

Hence, (iii) infinitely many solutions is the only option true.

2. Write four solutions for each of the following equations:

(i) 2x + y = 7 **(ii) πx + y = 9** **(iii)** x = 4y

SOLUTION:

(i) 2x + y = 7

To find the four solutions of 2x + y =7, we substitute different values for x and y. Let x = 0

Then, $2x + y = 7$

$(2 \times 0) + y = 7$

$y = 7$

$(0, 7)$

Let $x = 1$

Then,

$2x + y = 7$

$(2 \times 1) + y = 7$

$2 + y = 7$

$y = 7 - 2$

$y = 5$

$(1, 5)$

Let $y = 1$

Then,

$2x + y = 7$

$(2x) + 1 = 7$

$2x = 7 - 1$

$2x = 6$

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

$x = 3$

$(3, 1)$

Let $x = 2$

Then,

$2x + y = 7$

$(2 \times 2) + y = 7$

$4 + y = 7$

$y = 7 - 4$

$y = 3$

$(2, 3)$

The solutions are (0, 7), (1,5), (3,1), (2,3)

(ii) $\pi x + y = 9$

To find the four solutions of $\pi x + y = 9$, we substitute different values for x and y.

Let $x = 0$

Then,

$\pi x + y = 9$

$(\pi \times 0) + y = 9$

$y = 9$

$(0, 9)$

Let x = 1

Then,

$\pi x + y = 9$

$(\pi \times 1) + y = 9$

$\pi + y = 9$

$y = 9 - \pi$

$(1, 9 - \pi)$

Let y = 0

Then,

$\pi x + y = 9$

$\pi x + 0 = 9$

$\pi x = 9$

$x = \frac{9}{\pi}$

$\left(\frac{9}{\pi}, 0\right)$

Let x = −1

Then,

$\pi x + y = 9$

$(\pi \times -1) + y = 9$

$-\pi + y = 9$

$y = 9 + \pi$

$(-1, 9 + \pi)$

The solutions are $(0, 9)$, $(1, 9 - \pi)$, $\left(\frac{9}{\pi}, 0\right)$, $(-1, 9 + \pi)$

(iii) $x = 4y$

To find the four solutions of $x = 4y$, we substitute different values for x and y.

Let x = 0

Then,

$x = 4y$

$0 = 4y$

$4y = 0$

$y = \frac{0}{4}$

$y = 0$

$(0, 0)$

Let x = 1

Then,

$x = 4y$

$1 = 4y$

$4y = 1$

$y = \frac{1}{4}$

$\left(1, \frac{1}{4}\right)$

Let $y = 4$

Then,

$x = 4y$

$x = 4 \times 4$

$x = 16$

$(16, 4)$

Let $y = 1$

Then,

$x = 4y$

$x = 4 \times 1$

$x = 4$

$(4, 1)$

The solutions are $(0, 0)$, $\left(1, \frac{1}{4}\right)$, $(16, 4)$, $(4, 1)$

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

(i) (0, 2)

(ii) (2, 0)

(iii) (4, 0)

(iv) $\left(\sqrt{2}, 4\sqrt{2}\right)$

(v) (1, 1)

SOLUTION:

(i) $(0, 2)$

$(x, y) = (0, 2)$

Here, $x = 0$ and $y = 2$

Substituting the values of x and y in the equation $x - 2y = 4$, we get, $x - 2y = 4$

$\Rightarrow 0 - (2 \times 2) = 4$

But, $-4 \neq 4$

$(0, 2)$ is not a solution of the equation $x - 2y = 4$

(ii) $(2, 0)$

$(x, y) = (2, 0)$

Here, x = 2 and y = 0

Substituting the values of x and y in the equation x − 2y = 4, we get,

x − 2y = 4

$\Rightarrow 2 - (2 \times 0) = 4$

$\Rightarrow 2 - 0 = 4$

But, $2 \neq 4$

(2, 0) is not a solution of the equation x − 2y = 4

(iii) (4, 0)

(x, y) = (4, 0)

Here, x = 4 and y = 0

Substituting the values of x and y in the equation x − 2y = 4, we get, x – 2y = 4

$\Rightarrow 4 - 2 \times 0 = 4$

$\Rightarrow 4 - 0 = 4$

$\Rightarrow 4 = 4$

(4, 0) is a solution of the equation x – 2y = 4

(iv) $\left(\sqrt{2}, 4\sqrt{2}\right)$

(x, y) = $\left(\sqrt{2}, 4\sqrt{2}\right)$

Here, $x = \sqrt{2}$ and $y = 4\sqrt{2}$

Substituting the values of x and y in the equation x – 2y = 4, we get, x – 2y = 4

$\Rightarrow \sqrt{2} - \left(2 \times 4\sqrt{2}\right) = 4$

$\sqrt{2} - 8\sqrt{2} = 4$

But, $-7\sqrt{2} \neq 4$

$\left(\sqrt{2}, 4\sqrt{2}\right)$ is not a solution of the equation x – 2y = 4

(v) (1, 1)

(x, y) = (1, 1)

Here, x = 1 and y = 1

Substituting the values of x and y in the equation x – 2y = 4, we get,

x –2y = 4

$\Rightarrow 1 - (2 \times 1) = 4$

$\Rightarrow 1 - 2 = 4$

But, $-1 \neq 4$

(1, 1) is not a solution of the equation x – 2y = 4

4. Find the value of k, if x = 2, y = 1 is a solution of the equation 2x + 3y = k.

SOLUTION:

The given equation is

$2x + 3y = k$

According to the question, $x = 2$ and $y = 1$

Now, substituting the values of x and y in the equation $2x + 3y = k$, We get,

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

$\Rightarrow 4 + 3 = k$

$\Rightarrow 7 = k$

$k = 7$

The value of k, if $x = 2$, $y = 1$ is a solution of the equation $2x + 3y = k$, is 7.