

## Solutions of Linear Equations in Two Variables

An equation in the form of  $y = mx + b$  is a linear equation in two variables. The variables are  $x$  and  $y$ , and  $m$  and  $b$  represent constants (numerals).

EXAMPLES:

$$y = +2x + 4 \quad m = 2, b = 4$$

$$1 \qquad 1$$

$$y = -\frac{1}{2}x - 3 \quad m = -\frac{1}{2}, b = -3$$

$$2 \qquad 2$$

$$y = -\frac{1}{3}x + 8 \quad m = -\frac{1}{3}, b = 8$$

A solution of a linear equation in two variables is an ordered pair of numbers where the first number is the  $x$ -value and the second number is the  $y$ -value. If we replace  $x$  and  $y$  in the equation with the solution, we will get a true statement.

EXAMPLE: Check that the ordered pair  $(1, 6)$  is a solution of the equation  $y = +2x + 4$ .

$$y = +2x + 4$$

$$6 = 2(1) + 4$$

$$6 = 2 + 4$$

$$6 = 6 \qquad \text{True}$$

The ordered pair  $(1, 6)$  is a solution of  $y = +2x + 4$ . It is not the *only* solution. The ordered pairs

$(-2, 0)$ ,  $(-1, 2)$ , and  $(-1, 2)$  are also solutions.

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$$y = +2x + 4$$

$$0 = -2 + 2(2) + 4$$

$$0 = -2 + 4 + 4$$

$$0 = 0$$

$$y = +2x + 4$$

$$5 = 2(-1) + 4$$

$$5 = 2(-1) + 4$$

$$5 = 2(-1) + 4$$

$$5 = 5$$

$$5 = 5$$

$$y = +2x + 4$$

$$2 = -1 + 2(1) + 4$$

$$2 = -1 + 2 + 4$$

$$2 = 2$$

Each equation has an infinite number of solutions. Picking **any number** for  $x$  and solving for  $y$  will give an ordered pair solution.

EXAMPLE: Find the value of  $y$  that corresponds to  $x=4$ .

$$\begin{aligned}
 y &= +2x + 4 \\
 &= 2(4) + 4 \\
 &= +8 + 4 \\
 y &= 12 \quad (4, 12 \text{ is a solution})
 \end{aligned}$$

EXAMPLE: Find the value of  $y$  that corresponds to  $x = -3$ .

$$\begin{aligned}
 y &= +2x + 4 \\
 &= -6 + 4 \\
 y &= -2 \quad (-3, -2) \text{ is a solution}
 \end{aligned}$$

EXAMPLE: Find the value of  $y$  that corresponds to  $x = \frac{3}{4}$ .

$$\begin{aligned}
 y &= +2x + 4 \\
 &= 2\left(\frac{3}{4}\right) + 4 \\
 &= \frac{6}{4} + 4 \\
 &= \frac{6}{4} + \frac{16}{4} \\
 &= \frac{22}{4} \\
 y &= \frac{11}{2} \quad \left(\frac{3}{4}, \frac{11}{2}\right) \text{ is a solution}
 \end{aligned}$$

EXAMPLE: Is  $(1, -1)$  a solution of  $y = -2x + 3$ ?

$$\begin{aligned}
 y &= -2x + 3 \\
 -1 &= -2(1) + 3 \\
 -1 &= -2 + 3 \\
 -1 &= 1 \quad (1, -1) \text{ is a solution}
 \end{aligned}$$

EXAMPLE: Is  $(3, -4)$  a solution of  $y = -2x + 3$ ?

$$\begin{aligned}
 y &= -2x + 3 \\
 -4 &= -2(3) + 3
 \end{aligned}$$

$$- = 46 - 3$$

$$-4 \neq 3 \quad (3, -4) \text{ is not a solution}$$

**EXERCISES:**

1. Is  $(2, -3)$  a solution of  $y = -x + 7$ ?
2. Is  $(1, -3)$  a solution of  $y = -2x - 1$ ?
3. Is  $(-5, 3)$  a solution of  $y = - + \frac{2}{5}x - 1$ ?
4. Is  $(0, 0)$  a solution of  $y = -\frac{3}{4}x$ ?
5. Is  $(2, 3)$  a solution of  $y = -3x + 1$ ?
6. Find the ordered pair solution of  $y = 4x + 1$  corresponding to  $x = -1$ .
7. Find the ordered pair solution of  $y = \frac{3}{4}x - 1$  corresponding to  $x = 4$ .
8. Find the ordered pair solution of  $y = \frac{2}{5}x - 5$  corresponding to  $x = 0$ .
9. Find the ordered pair solution of  $y = - + 4x - 1$  corresponding to  $x = -2$ .
10. Find the ordered pair solution of  $y = -5x - 4$  corresponding to  $x = -1$ .

**KEY:**

- |        |        |             |            |              |
|--------|--------|-------------|------------|--------------|
| 1. No  | 3. Yes | 5. No       | 7. (4, 2)  | 9. (2-, 9)   |
| 2. Yes | 4. yes | 6. (1- -,3) | 8. (0, -5) | 10. (1- -,9) |