

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:

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

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

$$y = -3x + 8 \quad m = -3, b = 8$$

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 $y = 2x + 4$.

$$y = 2x + 4$$

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

$$6 = 2 + 4$$

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

The ordered pair $(1, 6)$ is a solution of $y = 2x + 4$. It is not the *only* solution. The ordered pairs $(-2, 0)$, $\left(\frac{1}{2}, 5\right)$, and $(-1, 2)$ are also solutions.

$$y = 2x + 4$$

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

$$0 = -4 + 4$$

$$0 = 0$$

$$y = 2x + 4$$

$$5 = 2\left(\frac{1}{2}\right) + 4$$

$$5 = 1 + 4$$

$$5 = 5$$

$$y = 2x + 4$$

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

$$2 = -2 + 4$$

$$2 = 2$$

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 $x = 4$.

$$y = 2x + 4$$

$$y = 2(4) + 4$$

$$y = 8 + 4$$

$$y = 12 \quad (4, 12) \text{ is a solution}$$

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

$$y = 2x + 4$$

$$y = 2(-3) + 4$$

$$y = -6 + 4$$

$$y = -2 \quad (-3, -2) \text{ is a solution}$$

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

$$y = 2x + 4$$

$$y = 2\left(\frac{3}{4}\right) + 4$$

$$y = \frac{6}{4} + 4$$

$$y = \frac{3}{2} + \frac{8}{2}$$

$$y = \frac{11}{2} \quad \left(\frac{3}{4}, \frac{11}{2}\right) \text{ is a solution}$$

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

$$y = 2x - 3$$

$$-1 = 2(1) - 3$$

$$-1 = 2 - 3$$

$$-1 = -1 \quad (1, -1) \text{ is a solution}$$

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

$$y = 2x - 3$$

$$-4 = 2(3) - 3$$

$$-4 = 6 - 3$$

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

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:

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

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