

Equations as Relations (Pages 244–249)

An **equation in two variables** has solutions that are ordered pairs in the form (x, y) . The set of solutions to a problem is called the **solution set**.

Solution of an Equation in Two Variables

If a true statement results when the numbers in an ordered pair are substituted into an equation in two variables, then the ordered pair is a solution of the equation.

EXAMPLES

- A** Solve $y = 2x - 1$ if the domain is $\{1, 0, -1\}$.

Make a table and substitute each value of x into the equation to determine the corresponding value of y .

domain x	$2x - 1$	range y	ordered pair (x, y)
1	$2(1) - 1$	1	$(1, 1)$
0	$2(0) - 1$	-1	$(0, -1)$
-1	$2(-1) - 1$	-3	$(-1, -3)$

solution set: $\{(1, 1), (0, -1), (-1, -3)\}$

- B** Which of the ordered pairs $(3, 5)$, $(0, 1)$, or $(-1, 1)$ are solutions of $y = 2x - 1$?

Substitute the values for x and y into the equation to see if they make a true statement.

Does $5 = 2(3) - 1$? Yes, $5 = 6 - 1$.

Does $1 = 2(0) - 1$? No, $1 \neq 0 - 1$.

Does $1 = 2(-1) - 1$? No, $1 \neq -2 - 1$.

$(3, 5)$ is a solution of $y = 2x - 1$.

PRACTICE

Which ordered pairs are solutions of each equation?

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|-------------------|--------------|--------------|---------------|---------------|
| 1. $y = 2x - 7$ | a. $(4, 1)$ | b. $(8, 9)$ | c. $(-1, -5)$ | d. $(0, 7)$ |
| 2. $y = 9x$ | a. $(2, 11)$ | b. $(-1, 9)$ | c. $(-1, -9)$ | d. $(3, 12)$ |
| 3. $2x + y = 18$ | a. $(1, 15)$ | b. $(0, 18)$ | c. $(-2, 14)$ | d. $(-1, 20)$ |
| 4. $y - 3x = 10$ | a. $(7, 31)$ | b. $(0, 0)$ | c. $(0, 10)$ | d. $(-2, 16)$ |
| 5. $5x + 3y = 24$ | a. $(-1, 5)$ | b. $(4, 2)$ | c. $(3, -1)$ | d. $(0, 8)$ |

Solve each equation if the domain is $\{-2, -1, 0, 2\}$. Graph the solution set.

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|-----------------|------------------|---------------------|
| 6. $y = 3x + 1$ | 7. $y = -2x + 3$ | 8. $x + y = 4$ |
| 9. $2x + y = 2$ | 10. $3x - y = 1$ | 11. $-2x + 2y = -8$ |

Find the domain of each equation if the range is $\{-3, -1, 1, 3\}$.

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| 12. $y = 2x + 1$ | 13. $y = x - 2$ | 14. $4y = 2x$ |
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- 15. Standardized Test Practice** Which of the following is a solution of the equation $2x - y = 10$?

- A** $(-2, -6)$ **B** $(-2, 6)$ **C** $(2, 6)$ **D** $(2, -6)$

Answers: 1. a, b, c, d 2. c, b, d 3. a, b, c, d 4. a, c 5. d 6-11. See Answer Key for graphs. 6. $\{(-2, -5), (-1, -2), (0, 1), (2, 7)\}$ 7. $\{(2, 7), (-1, 5), (0, 3), (2, -1)\}$ 8. $\{(-2, 6), (-1, 5), (0, 4), (2, 2)\}$ 9. $\{(-2, 6), (-1, 4), (0, 2), (2, -2)\}$ 10. $\{(-2, -7), (-1, -4), (0, -1), (2, 5)\}$ 11. $\{(-2, -6), (-1, -5), (0, -4), (2, -2)\}$ 12. $\{-2, -1, 0, 1\}$ 13. $\{-1, 1, 3, 5\}$ 14. $\{-6, -2, 2, 6\}$ 15. D