Unit 2: Lesson 01 **Solving one-step linear equations**

The **solution** to an equation is the value of the variable that makes the equation true.

To **prove** that a number is the solution to an equation, substitute the number into the equation for each occurrence of the variable and show that the new equation is true (both sides equal each other).
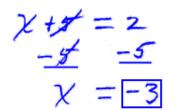

Example 1: Show that x = 5 is a solution to $3x - 1 = 2x + 4$

$$3x - 1 = 2x + 4$$
$$3 \cdot 5 - 1 = 2 \cdot 5 + 4$$
$$15 - 1 = 10 + 4$$
$$14 \overset{\checkmark}{=} 14$$

Solving an equation means, "getting *x* by itself."

To do this it is sometimes necessary to add a number (either negative or positive) to both sides of an equation. The result is a new equation that is still true.

Example 2: Solve x + 5 = 2

$$x + 5 = 2$$
$$\underline{\quad -5 \quad -5}$$
$$x = \boxed{-3}$$

Example 3: Find the solution to x − 4 = 1.

$$x - 4 = 1$$
$$\underline{\quad +4 \quad 4}$$
$$x = \boxed{5}$$

When finding the solution to some equations, it is necessary to multiply (or divide) both sides by a number in order to "get *x* by itself."

In the following examples, multiply both sides by the **reciprocal of the coefficient** of *x* to "get *x* by itself."

Recall that **a number times its reciprocal is 1**.

Example 4: Solve 18 = 6x

$$18 = 6x$$
$$\frac{1}{6} \cdot \frac{18}{1} = \left(\frac{1}{6}\right) 6x$$
$$\frac{18}{6} = x$$
$$\boxed{3} = x$$

Example 5: Find the solution to $-\frac{3}{4}x = 15$.

$$-\frac{3}{4}x = 15$$
$$-\frac{3}{4}\left(-\frac{4}{3}\right)x = \frac{15}{1}\left(-\frac{4}{3}\right)$$
$$x = \frac{-60}{3}$$
$$x = \boxed{-20}$$

Assignment:

1. Show that $x = 3$ is a solution of $x + 2x + 1 = 10$.

2. Prove that $y = -1$ is a solution of $-6y - 14 = -8$.

In the following problems, solve each equation.

3. $m + 12 = -3$

4. $-6 + x = 8$

5. $x - 11 = -18$

6. $-36 = -17 + p$

7. $j + (-1) = 11$

8. $x + 15 = 8$

9. $-3x = 21$

10. $6x = -24$

11. $-115 = -5k$

12. $36.3 = 12.1z$

13. $(2/5)x = 20$

14. $(-1/3)p = -9$

15. $10h = -2/7$

16. $(9/10)x = -99$

*17. 12 + 2 = 2x

*18. 4t = 143 + 1

19. 5 = 2.5 + x

20. 0 = y + (−3.1)

*21. Show that h = − 6 is a solution of (−1/2)h + 4 − h = 13.