

Name: _____

Date: _____

UNIT 2 LESSON 2: SOLVING EQUATIONS

In today's lesson, we will be solving equations with one variable. We will solve these equations by seeing the structure of the expression involving x and using this structure to "undo" what has been done to it.

Do Now: Consider the equation $5x + 3 = 23$.

- (a) List the operations that have been done to (are changing) the variable x on the left hand side of the equation in the order in which they occurred.
- (b) Solve the equation by reversing what has been done to x . Verify that your value of x is a solution by seeing if it makes the equation true.

This is the most basic of all equation solving techniques. It is the most important solving technique in all of mathematics. Be clear on this:

SOLVING EQUATIONS BY INVERSE OPERATIONS

If the **variable** you are solving for shows up only once, identify the operations that have been done on it and reverse them in the opposite order in which they occur.

Exercise #2: Find the value of x that solves each equation. In each case, first identify the operations that have occurred to x and reverse them. Show each step. HW

(a) $\frac{x-3}{2} + 7 = 23$

(b) $4(x+1) - 2 = -6$

What happened to x ?

What happened to x ?

① Add 1

② Mult. 4

③ Subtract 2

③ Subtract 2

② Div. by 4

① Add 2

↑

Now reverse.

Now reverse.

$$\begin{array}{r}
 4(x+1) - 2 = -6 \\
 \underline{+2} \qquad \qquad \underline{+2} \\
 4(x+1) = -4 \\
 \underline{\div 4} \qquad \qquad \underline{\div 4} \\
 x+1 = -1 \\
 \underline{-1} \qquad \qquad \underline{-1} \\
 x = -2
 \end{array}$$

Often equations can be solved in multiple ways. Let's take a look at the next problem to see an example.

Now You Try: Solve the following equation two different ways. In (a) reverse the operations that have been done to x . In (b), apply the distributive property first.

(a) $-2(x-4)+8=2$ [Reverse the operations]

① Subtract 8
 ② Divide by -2
 ③ add 4

$$\begin{array}{r|l} -2(x-4)+8=2 & \\ \hline -2(x-4) & -6 \\ \hline x-4 & 3 \\ \hline x & 7 \end{array}$$

(b) $-2(x-4)+8=2$ [Use the Distributive Prop First]

① Distribute
 ② Combine like terms
 ③ Inverse operations

$$\begin{array}{r|l} -2(x-4)+8=2 & \\ \hline -2x+8+8 & =2 \\ \hline -2x+16 & =2 \\ \hline -2x & -14 \\ \hline x & 7 \end{array}$$

We should also be prepared to use this technique to solve problems where we must translate between English and mathematics.

Exercise #4: Set up equations that translate the following verbal phrases into mathematics and then solve the equations.

- (a) Ten less than five times a number results in thirty five. What is the number? Carefully set up an equation, solve it, and check your answer for reasonableness. Watch out! Subtraction is involved.

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**SOLVING EQUATIONS
HOMEWORK**

HW!

1. In the expression $\frac{x}{5} - 3$ which is the correct order in which operations have been done to x ?
 - (1) x was divided by 5 and the result was subtracted from 3
 - (2) x had 3 subtracted from it and the result was then divided by 5.
 - (3) x was divided by 5 and 3 was subtracted from the result
 - (4) 5 was divided by x and then 3 was subtracted from the result.

2. Which of the following is the solution to $6x + 1 = 4$? Show the steps or explain how you found the solution.

(1) $x = \frac{7}{6}$	(3) $x = \frac{4}{3}$
(2) $x = \frac{1}{2}$	(4) $x = \frac{5}{6}$

3. The solution to $5(x - 2) - 6 = 24$ is which of the following? Show the steps in your solution process.

(1) $x = 7$	(3) $x = -3$
(2) $x = -12$	(4) $x = 8$

APPLICATIONS

4. If a number is increased by five and the result is then divided by three, the result is seven. Write an equation that models this verbal description and solve the equation for the number described.

5. Max and his friend Zeke are comparing their ages. They figure out that if they double Max's age from 3 years ago and add it to Zeke's current age, the sum is 26. If Zeke is currently 8 years old, determine how old Max currently is.