

Day 2 – Solving One & Two Step Equations

Equation:

- = Sign
- Solve Equations
- Properties of Equality (Inverse Operations)
- "Sentence"

An "Equation" does have an Equals sign

$$4n^2 + 7 = 11$$

Inverse Operations:

- |                |   |             |
|----------------|---|-------------|
| Addition       | ↔ | Subtraction |
| Multiplication | ↔ | Division    |
| Square         | ↔ | Square Root |

No More "Cancelling"

When you first learned to solve equations in middle school, you might have used the words "cancel". We are no longer going to use the word "cancel." Take a look at the following examples:

$$\begin{array}{r} x - 120 = 80 \\ +120 \quad +120 \\ \hline x = 200 \end{array}$$

← Adding the opposite  
Additive inverse  
Adding to zero

$$\begin{array}{r} \frac{k}{2} = 16 \\ \frac{k}{2} \times 2 = 16 \times 2 \\ \hline k = 32 \quad \checkmark \end{array}$$

← Multiplying by the Reciprocal  
Multiplicative Inverse  
Divides/Multiplies to one

Solving One Step Equations Practice

Practice: Solve each equation.

1. 
$$\begin{array}{r} x - 4 = 3 \\ +4 \quad +4 \\ \hline x = 7 \end{array}$$

Operation You See: (-)

Inverse Operation: (+)

2. 
$$\begin{array}{r} y + 4 = 3 \\ -4 \quad -4 \\ \hline y = -1 \end{array}$$

Operation You See: (+)

Inverse Operation: (-)

3. 
$$\begin{array}{r} \cancel{3} \cdot \frac{s}{\cancel{3}} = 9 \cdot 3 \\ \hline s = 27 \end{array}$$

Operation You See: (÷)

Inverse Operation: (×)

4. 
$$\begin{array}{r} 6p = 12 \\ \div 6 \quad \div 6 \\ \hline p = 2 \end{array}$$

Operation You See: (×)

Inverse Operation: (÷)

Practice: Solve each equation on your own.

a. 
$$\begin{array}{r} 8 + m = -4 \\ -8 \quad -8 \\ \hline m = -12 \end{array}$$

b. 
$$\begin{array}{r} -5d = 25 \\ \div -5 \quad \div -5 \\ \hline d = -5 \end{array}$$

c. 
$$\begin{array}{r} \cancel{3} \cdot \frac{x}{\cancel{3}} = 6 \cdot \frac{3}{1} \\ \hline x = \frac{18}{1} = 18 \end{array}$$

OR 
$$\begin{array}{r} \cancel{3} \cdot \frac{x}{\cancel{3}} = 6 \cdot 3 \\ \hline x = 18 \end{array}$$

Solving Two Step Equations

When solving equations with more than one step, you still want to think about how you can "undo" the operations you see. Multi-step equations mean you might have to add, subtract, multiply, or divide all in one problem to isolate the variable. When solving multi-step equations, you are using inverse operations, which is like doing PEMDAS in reverse order or in other words "Don't Call Me After Midnight."

Distribute, Combine Like Terms, Move Variable (Isolate), Add or Subtract, Multiply or Divide

$$\begin{array}{r} a. 3x + 5 = 14 \\ -5 \quad -5 \\ \hline 3x = 9 \\ \frac{3x}{3} = \frac{9}{3} \\ x = 3 \end{array}$$

$$\begin{array}{r} b. 2n - 6 = 4 \\ +6 \quad +6 \\ \hline 2n = 10 \\ \frac{2n}{2} = \frac{10}{2} \\ n = 5 \end{array}$$

$$\begin{array}{r} c. \frac{x-2}{4} = 1 \\ \cdot 4 \quad \cdot 4 \\ \hline x - 2 = 4 \\ +2 \quad +2 \\ \hline x = 6 \end{array}$$

Practice: Solve each equation, showing all steps, for each variable.

$$\begin{array}{r} 1. 3x - 4 = 14 \\ +4 \quad +4 \\ \hline 3x = 18 \\ \frac{3x}{3} = \frac{18}{3} \\ x = 6 \end{array}$$

$$\begin{array}{r} 2. 2x + 4 = 10 \\ -4 \quad -4 \\ \hline 2x = 6 \\ \frac{2x}{2} = \frac{6}{2} \\ x = 3 \end{array}$$

$$\begin{array}{r} 3. -3y = 22 \\ -7 \quad -7 \\ \hline -3y = 15 \\ -3 \quad -3 \\ \hline y = -5 \end{array}$$

$$\begin{array}{r} 4. 0.5m - 1 = 8 \\ +1 \quad +1 \\ \hline 0.5m = 9 \\ \frac{0.5m}{0.5} = \frac{9}{0.5} \\ m = 18 \end{array}$$

$$\begin{array}{r} 5. -6 + \frac{x}{4} = -5 \\ +6 \quad +6 \\ \hline \frac{x}{4} = 1 \\ \cdot 4 \quad \cdot 4 \\ \hline x = 4 \end{array}$$

$$\begin{array}{r} 6. \frac{x-8}{4} = -5 \cdot 4 \\ \cdot 4 \quad \cdot 4 \\ \hline x - 8 = -20 \\ +8 \quad +8 \\ \hline x = -12 \end{array}$$

Error Analysis with Solving Equations

William solved the following equation on his homework last night. However, he solved it incorrectly. Describe the mistake William made and what he should have done instead. Then re-solve the equation to find the correct answer.

**X**

$$\begin{array}{l} 4 = \frac{y}{8} + 1 \\ 32 = y + 1 \\ 31 = y \end{array}$$

Mistake: order of operations: subtract 1, then multiply by 8

Corrected Solution:

$$\begin{array}{r} 4 = \frac{y}{8} + 1 \\ -1 \quad -1 \\ \hline 3 = \frac{y}{8} \\ \cdot 8 \quad \cdot 8 \\ \hline 24 = y \end{array}$$