Algebra 2 - Unit 2: Solving Equations

U2 Lesson 1: One Step Equations

- Day 1 Operations: + / - / * / ÷
- Day 2 Types: Radicals and Exponents
- Day 3 Types: Exponentials and Logarithms

Unit 2 is about solving equations. Instead of covering each equation type separately in their own chapters, we will be learning how to solve all of our different types of equations, increasing the difficulty as we progress.

Today's Lesson introduces equation solving with the 4 basic operations.

The goal of solving equations is to get your desired variable by itself through algebraic steps.

First rule for equation solving:

- You are allowed to add, subtract, multiply, or divide by any number or variable, so long as you do it to both sides of the equation.

Examples: Perform the indicated operation to both sides of the equations given.

Add 5.

$x + 10 = 8$

$+5 \quad +5$

$x + 15 = 13$

Add x.

$x = 5$

$+x \quad +x$

$2x = 5 + x$

Subtract 5.

$y - 9 = 4$

$-5 \quad -5$

$y - 14 = -1$

Subtract 2x.

$-3 + x = 0$

$-2x \quad -2x$

$-3 - x = -2x$

Multiply by 4.

$\frac{4}{1} \cdot \frac{x}{2} = 5 \cdot 4$

$\frac{4x}{2} = 20$

$2x = 20$

- Multiply by 3x.

$3x(x+1) = 8 \cdot 3x$

$3x^2 + 3x = 24x$

Divide by 4.

$\frac{2x}{2} = \frac{5}{4}$

$\frac{x}{2} = \frac{5}{4}$

mult. by $\frac{1}{3}$

Divide by 3.

$\frac{1}{3} \cdot \frac{x}{3} = \frac{9}{3}$

$\frac{x}{9} = 3$

- Dividing by a number is the same as multiplying by the reciprocal of that number.

The "Reciprocal" is the number flipped upside down.

Keep this in mind! When you divide a fraction by a number you can just Multiply the denominator by that number as a shortcut.

"Inverse Operations" - Operations that cancel each other when solving equations.

Here is a list of inverse operations being used today:

Addition / Subtraction

Multiplication / Division

Ex: Solve $x+7=8$

$-7 \quad -7$

$x = 1$

These are the same equations, and are solved the same way.

$7+x=8$

$-7 \quad -7$

$x = 1$

Ex: Solve $-9+x=10$

$+9 \quad +9$

$x = 19$

$x-9=10$

$+9 \quad +9$

$x = 19$

Ex: Solve $\frac{8x}{8} = \frac{24}{8}$

$x = 3$

Ex: Solve $\frac{5x}{5} = \frac{6}{5}$

$x = \frac{6}{5}$

Ex: Solve $\frac{5}{1} \cdot \frac{x}{5} = 3 \cdot 5$

$\frac{5x}{5} = 15$

$x = 15$

Ex: Solve $9 \cdot \frac{x}{9} = 4 \cdot 9$

$x = 36$

Special Case: "Canceling" a fraction.

$\frac{3}{2} \cdot \frac{2}{3}x = \frac{6}{1} \cdot \frac{3}{2}$

$\frac{18}{2} = 9$

$x = 9$

If you had a calculator, you could just divide both sides by 2/3, but there is another way to do this by hand in one step.

To cancel a fraction that is being multiplied by your variable, multiply by the reciprocal on both sides. (remember how to multiply fractions?)

$\frac{3}{2} \cdot \frac{2}{3}x = 6 \cdot \frac{3}{2}$

$x = \frac{18}{2} = 9$

Reminder: To multiply fractions, multiply straight across. Convert whole numbers like 6 to 6/1.

Now you try: Solve $\frac{5}{4} \cdot \frac{4}{5}x = 3 \cdot \frac{5}{4}$

$x = \frac{15}{4}$

Something to note: Not all answers are whole numbers. You all need to get comfortable with having fractions as answers. You don't need to convert them to decimals either. Certainly never ever use mixed numbers.

Homework:

U2 L1 Day 1 Worksheet