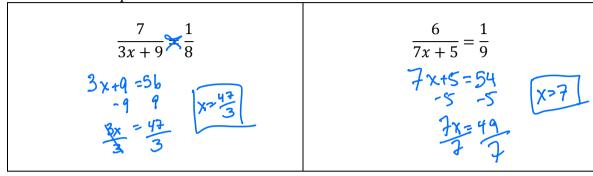LEARNING OBJECTIVE: We will solve equations with variable expressions in the denominator and rewrite equations as compound equations. (Alg1M1L13)

ACTIVATING PRIOR KNOWLEDGE:
We can solve equations with variables in the denominator.

$$\frac{7}{3x+9} \neq \frac{1}{8}$$ $3x+9 = 56$ $-9 \quad 9$ $\frac{3x}{3} = \frac{47}{3}$ $\boxed{x = \frac{47}{3}}$	$$\frac{6}{7x+5} = \frac{1}{9}$$ $7x+5 = 54$ $-5 \quad -5$ $\frac{7x}{7} = \frac{49}{7}$ $\boxed{x = 7}$

CONCEPT DEVELOPMENT:
We should rewrite expressions as compound statements noting any values for the variables that are disallowed.
Examples:
$\frac{5}{x+2}$ has a meaningful value for all values of x, except $x = -2$.

Why? Because $\frac{5}{\boxed{0}}$ would be dividing by zero, and we do not want to do that!

So, $\frac{5}{x+2}$ should be read as a compound statement:

$$\boxed{\frac{3x-6}{x-2}} = \frac{3(x-2)}{x-2} \qquad \frac{5}{x+2} \ and \ x+2 \neq 0$$

What is the value of $\frac{3x-6}{x-2}$? What values of x are disallowed?

$$x \neq 2$$

What are the values of x that are **not** permissible in this expression?

$$\frac{10}{x+5} \quad x \neq -5$$	$$\frac{x^2-25}{(x^2-9)(x+4)}$$ $(x-3)(x+3)$ $x \neq 3, \ x \neq -4, \ x \neq -3$

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GUIDED PRACTICE:

Steps to Solving Equations with Variable Expressions in the Denominator
1. Rewrite the Equation as a System of Equations.
2. Solve the equation and exclude the values of x that lead a denominator of 0.
3. Express your solution in set notation.

$\frac{1}{x} = \frac{3}{x-2}$ and $x \neq 0$ and $x \neq 2$ $3x = x-2$ $\{-1\}$ $-x \quad -x$ $\frac{2x}{2} = \frac{-2}{2}$ $\boxed{x = -1}$	$\frac{2}{x} = \frac{3}{x-4}$ and $x \neq 0$ and $x \neq 4$ ✳ $3x = 2x-8$ $-2x \quad -2x$ $\{-8\}$ $\boxed{x = -8}$
$\frac{x+3}{x-2} = \frac{5}{x-2}$ and $x \neq 2$ $5(x-2) = (x+3)(x-2)$ $5(x-2) - (x+3)(x-2) = 0$ $(x-2)(5-x-3) = 0$ $-x+2=0$ or $x-2=0$ $(x-2)(-x+2) = 0 \ (-1)$ $(x-2)(x-2) = 0$ $x = 2$ $\emptyset \ \{\}$	$\frac{x}{x+6} = -\frac{6}{x+6}$ and $x \neq -6$ $x = -6$ $\{\} \ \emptyset$
$\frac{x}{7-x} = \frac{2x}{1}$ and $x \neq 7$ $2x(7-x) = x$ $14x - 2x^2 = x$ $-x \qquad -x$ $\{0, 6.5\}$ $13x - 2x^2 = 0$ $x(13-2x) = 0$ $x = 0$ $13-2x = 0$	$\frac{3+x}{3-x} = \frac{3+2x}{3-2x}$ and $x \neq 3$ and $x \neq 1.5$ $(3-x)(3+2x) = (3+x)(3-2x)$ $9+6x-3x-2x^2 = 9+3x-6x-2x^2$ $3x = -3x$ $\frac{6x}{6} = \frac{0}{6}$ $\{0\}$ $\boxed{x = 0}$

2   Alg1M1L13: Equations with Variable Expressions in the Denominator

Independent Practice:

Problem Set from Lesson 18?

Closure:

Write an equation that will have the restriction $x \neq -3, x \neq 14,$ and $x \neq 0.$

Notes:

This maps to Lesson 18 in Alg 1 Mod 1 of ENY.