Essential Question: How do we solve equations with rational expressions?

Do Now: Solve the following equations.

(a) $33 = \frac{8}{s} + 9$

(b) $\frac{x}{x+4} = 2$

RATIONAL EXPRESSIONS & RATIONAL EQUATIONS

an expression that is the ratio of two polynomials

$\frac{3x}{2}$ $\frac{x+5}{x-2}$ $\frac{x-2}{4}$

an equation with one or more rational expressions

$3x + \frac{x}{3} = 5$ $\frac{x}{x+3} = \frac{8}{x+6}$ $\frac{7}{x} + \frac{3}{4} = \frac{5}{x}$

When solving rational equations, identify any values for the variable which *make the denominator zero*. These values are considered the **restrictions**.

What are the restrictions for the equations in today's Do Now?

$33 = \frac{8}{s} + 9$ $s \neq$ _____

$\frac{x}{x+4} = 2$ $x \neq$ _____

Determine whether the given value of x is a restricted value for the rational equation. Explain how you know.

a) $\frac{3x}{x+6} = 2;\ x = 6$

b) $\frac{x+4}{x-4} = -3;\ x = 4$

SOLVING RATIONAL EQUATIONS

How do we solve an equation containing rational expressions?

Remember…

$$\frac{a}{b}\pm\frac{c}{b}=\frac{a\pm c}{b}$$

(a) Consider the following equation… $\frac{5x}{4}+\frac{x}{4}=12$

- Is the equation a proportion?
- How would you solve this equation?

(b) Let's try another example. $\frac{2x}{5}+1=\frac{13}{5}$

- Is the equation a proportion?
- How would you solve this equation?

(c) What about this equation? $\frac{3x}{2}-\frac{2x}{3}=5$

- Is the equation a proportion?
- How would you solve this equation?

In order to add and subtract fractions, the denominators must BE THE SAME!	
If denominators are not the same, • you must find the **LCD** • write an **equivalent fraction** with the LCD (multiply by a "*form of one*" – **FOO**) • **add/subtract** rational expressions to create a proportion • **cross multiply** • **solve** the equation • **CHECK your answer!**	$\frac{3x}{2}-\frac{2x}{3}=5$

Let's try solving a few more rational equations. Check your solution!

1) $\frac{3x}{4} - \frac{x}{4} = -5$

2) $\frac{x}{6} - \frac{2}{3} = \frac{5}{6}$

3) $\frac{x+3}{5} - \frac{3x}{10} = 7$

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

5) $\frac{3x}{4} - \frac{x-1}{2} = \frac{x}{2}$

6) $\frac{x}{5} - \frac{2x+1}{3} = -5$

The TAKEAWAY

To solve rational equations, combine fractions and create a proportion. Combining fractions requires a common denominator. In order to create fractions with a common denominator, multiply each fraction by a FOO (_____ _____ _____). When a fraction is multiplied by a FOO, an equivalent fraction is created.