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

Do Now: Solve for x. $\frac{4x}{5}-\frac{3x}{4}=\frac{1}{10}$

LCD : 20

$\left(\frac{4}{4}\right)\frac{4x}{5}-\left(\frac{5}{5}\right)\frac{3x}{4}=\frac{1}{10}$

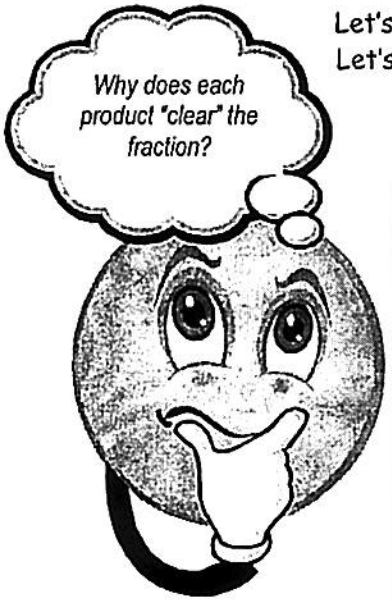
$\frac{16x}{20}-\frac{15x}{20}=\frac{1}{10}$

$\frac{16x-15x}{20}=\frac{1}{10}$

$\frac{x}{20}=\frac{1}{10}$ [create a proportion]

$10x=20$ [cross multiply]

$x=2$



Let's think about another way to solve the problem from the Do Now. Let's begin by simplifying the expressions below.

a. $\frac{5}{\cancel{20}}\left(\frac{1}{\cancel{4}}\right)_1$ $\frac{5}{1} \rightarrow 5$	b. $\frac{3}{\cancel{15}}\left(\frac{x}{\cancel{5}}\right)_1$ $\frac{3x}{1} \rightarrow 3x$
c. $\frac{2}{\cancel{16}}\left(\frac{3x}{\cancel{8}}\right)_1$ $\frac{6x}{1} \rightarrow 6x$	d. $12\left(\frac{x}{6}+\frac{x}{3}\right)$ $\frac{12}{1}\left(\frac{x}{6}\right)+\frac{12}{1}\left(\frac{x}{3}\right)$ $2x+4x \rightarrow 6x$

Key Concept:

The factor is a MULTIPLE of the denominator, therefore the denominator can cross divide and become 1.

Can we solve rational equations using this key concept? Yes!

Consider the following equation from the Do Now... $\frac{4x}{5} - \frac{3x}{4} = \frac{1}{10}$

- What integer value would "eliminate" all denominators?

Solving Rational Equations using the LCD:

- Identify the least common denominator (LCD)
- Multiply each term of the equation by the LCD and simplify
- Solve the equivalent equation (NOTE: the denominator has been eliminated!)
- Check your answer!

$\frac{4x}{5} - \frac{3x}{4} = \frac{1}{10}$

LCD: 20

$20\left(\frac{4x}{5}\right) - 20\left(\frac{3x}{4}\right) = 20\left(\frac{1}{10}\right)$

$4(4x) - 5(3x) = 2$

$16x - 15x = 2$

$x = 2$

Put in calculator and make sure it equals $\frac{1}{10}$

$\frac{4 \cdot 2}{5} - \frac{3 \cdot 2}{4} = \frac{1}{10}$

Let's try solving some more rational equations. Check your answer!

1) $\frac{x}{3} - \frac{2x}{5} = \frac{-7}{15}$ LCD: 15

$15\left(\frac{x}{3}\right) - 15\left(\frac{2x}{5}\right) = \frac{-7}{15}(15)$

$5x - 6x = -7$

$\frac{-x}{-1} = \frac{-7}{-1}$

$x = 7$

2) $\frac{x}{3} = \frac{x}{2} + 2$ LCD: 6

$6\left(\frac{x}{3}\right) = 6\left(\frac{x}{2}\right) + 6(2)$

$2x = 3x + 12$

$-3x \quad -3x$

$\frac{-x}{-1} = \frac{12}{-1}$

$x = -12$

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

$10\left(\frac{x+5}{5}\right) + 10\left(\frac{3x}{10}\right) = 10(7)$

$2(x+5) + 3x = 70$

$2x + 10 + 3x = 70$

$5x + 10 = 70$

$5x = 60$

$x = 12$

4) $\frac{2x}{5} - \frac{x}{4} = \frac{3}{2}$ LCD: 20

$20\left(\frac{2x}{5}\right) - 20\left(\frac{x}{4}\right) = 20\left(\frac{3}{2}\right)$

$4(2x) - 5x = 10(3)$

$8x - 5x = 30$

$3x = 30$

$x = 10$

The TAKEAWAY

In a rational equation, multiplying both sides of the equation by the LCD (least common denominator) creates an equivalent equation "*without any fractions*".