Solving 2-Step Equations with Rational Numbers

Introduction: After learning how to solve 2-step equations, today are 2-step equations are going to involve rational numbers.

"Today we are going to solve equations with rational numbers, fractions & decimals. I am going to show you a couple methods for solving these types of problems"

Example 1 Method 1: Traditional

$$-x + - = -$$

"The first method we will use is the tradition method where we leave the fractions the way they are and use fractions operations to solve the equation"

"Notice that we are multiplying and adding with

Example 1: Method 3 Clear Fractions

"One more strategy. We are going to clear the equation of the fractions."

Method 3: Clear Fractions

$\frac{1}{2}x \quad \frac{1}{5} \quad \frac{1}{4}$

"What is the Least Common Multiple of 2, 5, and 4?" Hint: think about common denominators [20}

"We are going to multiple everything by the LCM/LCD, 20"

$\frac{1}{2}(20)x + \frac{1}{5}(20) = \frac{1}{4}(20)$

"Now let's simplify."

$\_\_ x + \_\_ = \_\_$

$\frac{\bullet}{\quad} x + \frac{\bullet}{\quad} = \frac{\bullet}{\quad}$

"What are the equivalent forms of 1?" $\frac{}{\#} - - \frac{\%}{\&}$

Cross out each equivalent form of 1 as students same it.

$10x + 4 = 5$

"By multiplying everything by the LCD, we had equivalent forms of 1 that cleared the denominators. Now we have an equation with only integers."

"Let's finish solving for ."

$10x \quad 4 \quad 1 \quad 4$

$x =$

$\frac{10x}{10} = \frac{1}{10}$

$x = \_\_$

You Try 1 (Think-Pair-Share)

"Now I would like you to try a problem with your partner. Solve using 2 of the 3 methods"

$-x \quad - = -$

Have students work on You Try 1**.** Students should work with their partner, but they each should be writing the solution in their notes.

When pairs have finished, have students come to the board and show their work for each of the 3 methods.

Debrief the You Try.

Solution:

Method 1: Traditional Method 2: Common Denominators

Example 2: Method 2 Clear Fractions

"Now let's try it by clearing the denominators"

$$\frac{2}{5} - \frac{2}{15}x \quad \frac{14}{15}$$

"What would be the LCD?" [15]

Let's get common denominators"

"What equivalent form of 1 do we multiply — by?" [—]

— % & — (—x = —

— (—x = —

"Hw would we clear the fractions?"[multiply everything by 15]

—( ) —( )x = —( )

Do we have any equivalent forms of 1?" {Yes,]

"How would we use decomposition to get by itself? [break 14 into 8 + 6]

"Now we have an addend of 6 on both sides we can remove."

"How can we use decomposition to get by itself?" [show and]

"What do we have on both sides we can remove?" [a product of 2]

"If the opposite of is 4, what is ?" [-4]

Example 2: Method 3 Decomposing & Factoring

"We are going to take another look at the problem. This time using factoring, which will be similar to using the distributive property."

$\frac{2}{5} - \frac{2}{15}x \quad \frac{14}{15}$

"Let's decompose the numerators and denominators for $\frac{2}{15}$ and $\frac{14}{15}$."

$\frac{2}{5} \quad \frac{2}{5}\frac{1}{3}x \quad \frac{2}{5}\frac{7}{3}$

"Let's rewrite that as…"

$- \quad -\bullet -x = -\bullet -$

"What is a common factor of all the terms?" $\frac{2}{5}$

"On the left, we are going to factor out the common factor of $-$ …. Think Distributive Property"

$-\overset{\#}{\%} --x$

"What factor can we remove from both sides?" $\lceil -$

$--x = -$

"Decompose $\frac{7}{3}$ into $\frac{3}{3} \quad \frac{4}{3}$"

$1 \quad \frac{1}{3} = \frac{3}{3} + \frac{4}{3}$

$1 - \frac{1}{3} = 1 + \frac{4}{3}$

"We have an addend of 1 on both sides of the equation, let's remove it."

$\frac{1}{3}x \quad \frac{4}{3}$

"If the denominators are the same, the numerators are equal."

$-1x \quad 4$

"If the opposite of is 4, what is ?" [-4]

$x = -4$

You Try 2b (Think-Pair-Share)

"Now I would like you to try a problem with your partner. Solve using at least 2 of the 3 methods"

Have students work on You Try 2

Example 3: Method 3 Change to Fractions

"For our 3

You Try 3:

"Now I would like you to try a problem with your partner. Solve this one using 2 of the 3 methods"

Have students work on You Try 3**.**

Method 1: $\frac{2}{5}-\frac{2}{15}x=\frac{14}{15}$ Method 2: Method 3:

Traditional/Decomposition	Clear Denominators	Decomposition/Factoring
	$\frac{2}{5}-\frac{2}{15}x=\frac{14}{15}$	$\frac{2}{5}-\frac{2}{15}x=\frac{14}{15}$
	$\left(\frac{3}{3}\right)\frac{2}{5}-\frac{2}{15}x=\frac{14}{15}$	$\frac{2}{5}-\frac{2\bullet 1}{5\bullet 3}x=\frac{2\bullet 7}{5\bullet 3}$
		$\frac{2}{5}-\frac{2}{5}\bullet\frac{1}{3}x=\frac{2}{5}\bullet\frac{7}{3}$

Check:

Method 1: Method 2:

Method 1:	Method 2:	Method 3:
Traditional	Clear Decimals	Change to Fractions