SM3-A HANDOUT 4-1 Add and Subtract Rational Expressions

What are "like terms" ?

Adding Fractions $+\frac{4}{3}$

We can add "like fractions"

$$\frac{2}{3}+$$

Combine the numerator over a common denominator.

$$=\frac{2+1+4}{3} \qquad =\frac{7}{3}$$

Identity Property of Multiplication

The numeral "one" multiplied by any number does not change the "value" of the number (the product will have an "equivalent" value).

Used for:

Obtaining Common Denominators:

$$\frac{2}{3}+\frac{3}{5}=\frac{3}{5}*\frac{3}{3}+\frac{2}{3}*\frac{5}{5}=\frac{10}{15}+\frac{9}{15}$$

Rationalizing Denominators:

$$\frac{2}{\sqrt{3}}*\frac{\sqrt{3}}{\sqrt{3}}=\frac{2\sqrt{3}}{3}$$

Least Common Multiple: The smallest number that two other numbers divide evenly.

Used for:

Obtaining Least Common Denominators:

$$\frac{1}{30}+\frac{1}{42} = \frac{1}{6*5}+\frac{1}{6*7} = \frac{1}{6*5}*\frac{7}{7}+\frac{1}{6*7}*\frac{5}{5}$$

Both denominators have a common factor of 6.

Left denominator has an uncommon factor of 5

Multiply $\frac{1}{42}$ by "one" in the form of $\frac{5}{5}$

right denominator has an uncommon factor of 7

Multiply $\frac{1}{30}$ by "one" in the form of $\frac{7}{7}$

Find the LCD

$$\frac{2}{15}+\frac{3}{20}$$

$$\frac{1}{60}+\frac{1}{48}$$

<u>rational numbers</u>

<u>rational expressions</u>

<u>Excluded Value</u>: the value for ‘x’ that results in division by zero

What type of <u>rational expressions</u> can you combine together using addition or subtraction?

“ ______________________________ ”

Which of these expressions are “like expressions”?

1. $\dfrac{x}{(x+1)}$ 2. $\dfrac{3x}{(x-1)}$ 3. $\dfrac{4}{(x-5)}$ 4. $\dfrac{2x^2}{(x+1)}$

Which of these expressions are “like expressions”?

5. $\dfrac{x}{(x+1)(x-1)}$

7. $\dfrac{2x^2}{x^2-2x+1}$

6. $\dfrac{3x}{(x-1)^2}$

8. $\dfrac{4}{(x^2-1)}$

What is the excluded value for each expression?

1. $\frac{x}{(x+1)}$

$x \neq$ ______

2. $\frac{3x}{(x-1)}$

$x \neq$ ______

3. $\frac{4}{(x-5)}$

$x \neq$ ______

4. $\frac{2x^2}{(x+1)}$

$x \neq$ ______

5. $\frac{x}{(x+1)(x-1)}$

$x \neq$ ______

6. $\frac{3x}{(x-1)^2}$

$x \neq$ ______

7. $\frac{2x^2}{x^2-2x+1}$

$x \neq$ ______

8. $\frac{4}{(x^2-1)}$

$x \neq$ ______

Simplifying Fractions

<u>You must FACTOR the fractions.</u>

$$\frac{32}{44} = \frac{4*8}{4*11} \qquad \frac{x^2-4}{x^2-3x+2} = \frac{(x-2)(x+2)}{(x-2)(x-1)}$$

<u>Break them apart into the product of fractions.</u>

$$= \frac{4}{4} * \frac{8}{11} \qquad = \frac{(x-2)}{(x-2)} * \frac{(x+2)}{(x-1)}$$

<u>Notice the fractions that equal ‘1’</u>

$$= 1 * \frac{8}{11} \quad = \frac{8}{11} \qquad = 1 * \frac{(x+2)}{(x-1)} = \frac{(x+2)}{(x-1)}$$

Adding/Subtraction Rational Expressions

The <u>easy</u> problem: $$\frac{2}{7}+\frac{3}{7}=\frac{2+3}{7}=\frac{5}{7}$$

Combine the numerator over a <u>common</u> denominator.

The <u>easy</u> problem: $$\frac{4}{(x-5)}+\frac{3x}{(x-5)}=\frac{4+3x}{(x-5)}$$

Combine the numerator over a <u>common</u> denominator.

Can you combine
4 and 3x ?

Why not?

Your turn: add/subtract

$$\frac{x+2}{2x^2}+\frac{x-4}{2x^2}$$

What property are we using?

____

Can you do it this way?

$$\frac{x+2}{2x^2}+\frac{x-4}{2x^2} = \frac{\cancel{x}+\cancel{2}}{\cancel{2}*\cancel{x}*x}+\frac{\cancel{x}-(\cancel{2}*2)}{\cancel{2}*\cancel{x}*x} = \frac{1}{x}+\frac{-2}{x}$$

Why not?

____

____

Your turn: add/subtract

$$\frac{x+2}{2x^2}+\frac{x-4}{2x^2}$$

I <u>will not</u> allow you to simplify using the Inverse Property of Multiplication until you have factored it into two fractions.

Only then will you be able to see how the Inverse Property of Multiplication changes the rational expression into <u>multiplication by one.</u>

Your turn: add/subtract

$$\frac{(2x-7)}{x^2+2}-\frac{(x-4)}{x^2+2}$$