Do Now

• Simplify:

 $\frac{1}{t^2 - 4} \div \frac{t^2 + 6t + 9}{t^2 + t - 6}$

Adding and Subtracting Rational Expressions



What is the Least Common Denominator?

Fractions require you to find the Least Common Multiple (LCM) in order to add and subtract them!

Adding Fractions - A Review



LCD is 12.

Find equivalent fractions using the LCD.

Collect the numerators, keeping the LCD.

<u>Remember</u>: When adding or subtracting fractions, you need a common denominator!</u>



$$b. \ \frac{2}{3} - \frac{1}{2} = \frac{4}{6} - \frac{3}{6} \quad = \frac{1}{6}$$

When Multiplying or Dividing Fractions, you don't need a common Denominator



Steps for Adding and Subtracting Rational Expressions:

Factor, if necessary.
Cancel common factors, if possible.
Look at the denominator.

If the denominators are the same,

add or subtract the numerators and place the result over the common denominator.

If the denominators are different,

find the LCD. Change the expressions according to the LCD and add or subtract numerators. Place the result over the common denominator.

4. Reduce, if possible.5. Leave the denominators in factored form.

Addition and Subtraction

Is the denominator the same??

• Example 1a: Simplify $\frac{2}{3x} + \frac{5}{2x}$ Find the LCD: 6x

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Now, rewrite the expression using the LCD of 6x

$$\frac{2}{3x}\left(\frac{2}{2}\right) + \frac{5}{2x}\left(\frac{3}{3}\right) \qquad Simplify...$$
$$= \frac{4}{6x} + \frac{15}{6x}$$
$$= \frac{4+15}{6x} \qquad Add \ the \ fractions...$$

 $= \frac{19}{6x}$



Examples:



Adding and Subtracting with polynomials as denominatorsSimplify: $\frac{3}{x+2} - \frac{8}{x-2}$ Find the LCD: (x+2)(x-2)

Rewrite the expression using the LCD of (x + 2)(x - 2)

$$= \frac{3}{(x+2)} \left(\frac{x-2}{x-2}\right) - \frac{8}{(x-2)} \left(\frac{x+2}{x+2}\right) \qquad \text{Simplify...}$$
$$= \frac{3x-6}{(x+2)(x-2)} - \frac{8x+16}{(x+2)(x-2)}$$
$$\frac{3x-6-(8x+16)}{(x+2)(x-2)} = \frac{3x-6-8x-16}{(x+2)(x-2)}$$

$$\frac{-5x-22}{(x+2)(x-2)}$$

Adding and Subtracting with Binomial Denominators You Try!!!



Simplify:

 $\frac{x+1}{x^2+6x+9} - \frac{1}{x^2-9} = \frac{x+1}{(x+3)(x+3)} - \frac{1}{(x+3)(x-3)}$ $= \frac{(x+1)(x-3)}{(x+3)^2(x-3)} - \frac{(x+3)}{(x+3)^2(x-3)} = \frac{(x+1)(x-3) - (x+3)}{(x+3)^2(x-3)}$

$$=\frac{x^2-3x+x-3-x-3}{(x+3)^2(x-3)}$$

You Try!!!! Simplify:

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

 $x \neq 1, -2 = \frac{2x^2 + 4x - 3x^2 + 3x}{(x-1)(x+2)}$

 $-x^{2}+7x$

(x-1)(x+2)

Simplify:



(x+3)(x+2)(x-1)

You try!!!! Simplify:



(x-3)(x-2)(x-2)

Simplify:

$$\frac{x+3}{x^2-1} - \frac{x-4}{x^2-3x+2} = \frac{(x+3)(x-2) - (x-4)(x+1)}{(x-1)(x+1)(x-2)}$$
$$= \frac{(x+3)(x-2) - (x-4)(x+1)}{(x-1)(x+1)(x-2)}$$
$$= \frac{(x^2+x-6) - (x^2-3x-4)}{(x-1)(x+1)(x-2)}$$
$$= \frac{4x-2}{(x-1)(x+1)(x-2)}$$