

## Warm-Up...

Simplify the expression

$$\begin{aligned} & \frac{4}{x^2 + 6x + 5} - \frac{2}{x^2 + 8x + 15} \\ & \frac{4}{(x+5)(x+1)} - \frac{2}{(x+3)(x+5)} \\ & = \frac{4(x+3) - 2(x+1)}{(x+5)(x+1)(x+3)} \\ & = \frac{4x+12-2x-2}{(x+5)(x+1)(x+3)} \\ & = \frac{2x+10}{(x+5)(x+1)(x+3)} \quad \frac{3x+12}{3(x+4)} \\ & = \frac{2(x+5)}{(x+5)(x+1)(x+3)} \\ & = \frac{2}{(x+1)(x+3)} \end{aligned}$$

• Combining Operations with Rational Expressions

$$\frac{43x^2 - 84x - 136}{4(x-3)(x+1)(x-2)}$$

Remember...MUST follow order of operations (BEDMAS) Solution:

Solution:

$$\frac{2x^3}{3y^2} \cdot \frac{9y}{10x} - \frac{2y}{3x}$$

$$\frac{9x^3 - 10y^2}{15xy}$$

Reduce

$$\frac{18x^3y}{30xy^2} - \frac{2y}{3x}$$

$$\frac{3x^2}{5y} - \frac{2y}{3x}$$

$$\frac{3x^2(3x) - 2y(5y)}{15xy}$$

$$\frac{9x^3 - 10y^2}{15xy}$$

$$\frac{x+1}{2x-6} \div \frac{2(x+1)^2}{2-x} + \frac{11}{x-2} =$$

$$\frac{\cancel{x+1}}{2(x-3)} \cdot \frac{2-x}{2(x+1)^{\cancel{2}}} + \frac{11}{x-2}$$

$$\frac{2-x}{4(x-3)(x+1)} + \frac{11}{x-2}$$

$$\frac{(2-x)(x-2) + 11(4)(x-3)(x+1)}{4(x-3)(x+1)(x-2)}$$

$$\frac{2x - 4 - x^2 + 2x + 44(x^2 - 2x - 3)}{4(x-3)(x+1)(x-2)}$$

$$\frac{4x - 4 - x^2 + 44x^2 - 88x - 132}{4(x-3)(x+1)(x-2)}$$

$$= \frac{43x^2 - 84x - 136}{4(x-3)(x+1)(x-2)}$$

Here is one from your textbook...see how you make out.

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$$\frac{15}{(x+6)(x+3)}$$

d)  $\frac{x+1}{x+6} - \frac{x^2-4}{x^2+2x} \div \frac{2x^2+7x+3}{2x^2+x}$

$$\frac{x+1}{x+6} - \frac{(x-2)(x+2)}{x(x+2)} \cdot \frac{x(2x+1)}{(x+3)(2x+1)}$$

Factor:  
 $2x^2+6x+7x+3$   
 $2x(x+3)+1(x+3)$   
 $(x+3)(2x+1)$

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

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

$$\frac{x^2+4x+3 - (x^2+4x-12)}{(x+6)(x+3)}$$

$$= \frac{15}{(x+6)(x+3)}$$

## Simplifying complex fractions...fractions within fractions!!

Here is an example:

$$\frac{\frac{1}{2} + \frac{1}{3}}{\frac{1}{4} + \frac{2}{3}}$$

Simplify this expression...

$$\frac{\left(\frac{3+2}{6}\right)}{\left(\frac{3+8}{12}\right)} = \frac{\left(\frac{5}{6}\right)}{\left(\frac{11}{12}\right)} = \frac{5}{6} \div \frac{11}{12} = \frac{5}{6} \cdot \frac{12}{11} = \frac{10}{11}$$

What were your strategies??

**Simplifying Complex Fractions — First Technique.** To simplify a complex fraction, proceed as follows:

1. Simplify the numerator.
2. Simplify the denominator.
3. Simplify the division problem that remains.

$$\frac{\frac{1}{2} + \frac{1}{3}}{\frac{1}{4} + \frac{2}{3}}$$

**Simplifying Complex Fractions — Second Technique.** To simplify a complex fraction, proceed as follows:

1. Find a common denominator for both numerator and denominator.
2. Clear fractions from the numerator and denominator by multiplying each by the common denominator found in the first step.

$$\text{LCD} = 12$$

$$\frac{1}{2} \cdot \frac{6}{6} = \frac{6}{12}$$

$$\left( \frac{\frac{1}{2} + \frac{1}{3}}{\frac{1}{4} + \frac{2}{3}} \right) 12$$

Note that the technique indicates that you should multiply the numerator and denominator by the common denominator...NOT...change the denominators.

$$\left( \frac{\frac{1}{4} + \frac{2}{3}}{\frac{1}{4} + \frac{2}{3}} \right) 12$$

Does this make sense?? Let's have a look

$$= \frac{6 + 4}{3 + 8} = \frac{10}{11}$$

Practice Problems...

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