

Adding and subtracting rational expressions
Springboard 29.2
Lesson 14 p1
Warm-up

Solve

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

$$2) \frac{2}{3} - \frac{3}{5} =$$

Factor

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

$$4) (x^2 - 36)$$

$$5) (4x - 12)$$

Foil

$$6) (x-4)(3x-2)$$

Simplify

$$7) (x^2 - 3x) - (-x^2 + 1)$$

Adding and Subtracting Rational Expressions is just like adding fractions.

$$\frac{1}{5} + \frac{3}{5} = \frac{1+3}{5} = \frac{4}{5}$$

I try:

Subtract and identify any x-values for which the expression is undefined.

$$\textit{Subtract} \quad \frac{3x - 4}{x + 3} - \frac{2x + 5}{x + 3}$$

$$\textit{Subtract} \quad \frac{(3x - 4) - (2x + 5)}{x + 3}$$

$$\textit{Simplify} \quad \frac{x - 9}{x + 3}$$

undefined/restricted when $x+3=0$

$$x=-3$$

I try:

Add and identify any x-values for which the expression is undefined.

$$\text{Add } \frac{x^2 - 5x - 4}{x - 2} + \frac{3x + 8}{x - 2}$$

$$\text{Add } \frac{(x^2 - 5x - 4) + (3x + 8)}{x - 2}$$

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

Find undefined values for the expression

$$x - 2 = 0$$

Undefined when $x = 2$

We try:

$$1) \text{ Add } \frac{2x^2 - x + 1}{x - 2} + \frac{-3x^2 + 2x + 8}{x - 2}$$

2) Subtract $\frac{x^2-5}{x+5} - \frac{3x-8}{x+5}$

You try:

On whiteboards

1) $\frac{5x^2+x-3}{x+3} + \frac{5x^2-3x}{x+3}$

2) $\frac{-2x-4}{5} - \frac{3x^2-11}{5}$

Finding Common Denominators

$$\frac{1}{5}, \frac{1}{2}$$

Find the LCM (lowest common multiple) of $5x$ and $2y^2$

*You want to find something that can be
divided by 5, 2, x , and y^2*
 $10xy^2$

Find the LCM of $4x^6y^4$ and $6x^2y^3$.

What is the LCM of 4 and 6?

What is the LCM of x^6 and x^2 ?

What is the LCM of y^4 and y^3 ?

I Try:

Find the LCM of $3x^2y^5$ and $6x^3y^3$.

We try:

1) Find the LCM of $2x^3y^4$ and $6x^4$.

2) Find the LCM of $4a^3b^5$ and $6ab^4$.

You try on your whiteboards:

1) Find the LCM of $5x^4y^3$ and $2x^5$.

2) Find the LCM of $3x^3y^4$ and $10x^2y^3$.

Find the LCM of polynomials

$$x^2 + 5x + 6, \quad x^2 + 3x + 2$$

	$x^2 + 5x + 6, \quad x^2 + 3x + 2$
Factor them	$(x+3)(x+2) \quad (x+2)(x+1)$
Find the LCM	$(x+3)(x+2)(x+1)$

I try:

Find the LCM of $x^2 + 4x + 4$, $x^2 - 4$

	$x^2 + 4x + 4$, $x^2 - 4$
Factor them	
Find the LCM	

We try:

Find the LCM of $x^2 + 7x + 12$, $x^2 - x$

	$x^2 + 7x + 12$, $x^2 - 16$
Factor them	
Find the LCM	

Find the LCM of $x^2 - 9$, $2x^2 + 5x + 3$

	$x^2 - 9$	$2x^2 + 5x + 3$
Factor them		
Find the LCM		

You try on whiteboards:

Find the LCM of
 $(x^2 - 81)$ and $(x^2 - 18x + 81)$

Find the common denominators

I try:

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

I try:

$$\frac{x}{x^2-4x+4} + \frac{1}{x^2-4}$$

we Try:

$$\frac{1}{x^2-6x-7} - (x^2+3)/(x^2-1)$$

Adding Rational Expressions with different denominators

This is very similar to adding fractions.

$$\frac{1}{3} + \frac{2}{5} = \frac{1(5)}{3(5)} + \frac{2(3)}{5(3)} = \frac{5}{15} + \frac{6}{15} = \frac{5+6}{15} = \frac{11}{15}$$

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

Factor and
find the
Common
Denominator

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

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

$(x+1)(x+2)$ is the common denominator

Convert	$\frac{x - 1}{(x + 1)(x + 2)}$ $\frac{x(x + 2)}{(x + 1)(x + 2)} = \frac{x^2 + 2x}{(x + 1)(x + 2)}$
Add or subtract	$\frac{x - 1}{(x + 1)(x + 2)} + \frac{x^2 + 2x}{(x + 1)(x + 2)}$ $\frac{(x - 1) + (x^2 + 2x)}{(x + 1)(x + 2)}$
Simplify	$\frac{x^2 + 3x - 1}{(x + 1)(x + 2)}, x \neq -1, -2$

$$\frac{2x^2 - 16}{x^2 - 4} - \frac{x + 4}{x + 2}$$

Factor and Find the Common Denominator	$\frac{2x^2 - 16}{x^2 - 4} - \frac{x + 4}{x + 2}$ $\frac{2x^2 - 16}{(x + 2)(x - 2)} - \frac{x + 4}{x + 2}$ $(x + 2)(x - 2)$
Convert	

	$\frac{2x^2 - 16}{(x + 2)(x - 2)} - \frac{(x + 4)(x - 2)}{(x + 2)(x - 2)}$ $\frac{2x^2 - 16}{(x + 2)(x - 2)} - \frac{(x^2 + 2x - 8)}{(x + 2)(x - 2)}$
Add or subtract	$\frac{(2x^2 - 16) - (x^2 + 2x - 8)}{(x + 2)(x - 2)}$
Simplify	

We try:

$$1) \quad \frac{x}{x+3} + \frac{-18}{x^2-9} =$$

You Try on whiteboards:

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

cw
Pg. 450 a,c,e

Even rows talk, Odd rows write

$$2) \quad \frac{2}{x^2-9} - \frac{3}{x^2}$$

[Jeopardy](#)

Simplifying Complex Fractions

Simplify $\frac{\frac{2 + \frac{x}{4}}{x+1}}{x}$

Split it up	$\frac{\frac{2 + \frac{x}{4}}{x+1}}{x} =$ $\left(\frac{2}{x} + \frac{x}{4}\right) \div \frac{x+1}{x}$
Simplify fractions	$\left(\frac{2}{x} + \frac{x}{4}\right) =$

	$\frac{2(4)}{x(4)} + \frac{x(x)}{4(x)} = \frac{8}{4x} + \frac{x^2}{4x}$ $= \frac{x^2 + 8}{4x}$
Solve	$\frac{x^2 + 8}{4x} \div \frac{x + 1}{x}$
	$\frac{x^2 + 8}{4x} \times \frac{x}{x + 1} =$ $\frac{(x^2 + 8)(x)}{4x(x + 1)}$
Simplify	$\frac{x^2 + 8}{4x + 4}$

We try:

Simplify

$$\frac{1 + \frac{1}{x}}{4x + 5}$$

You Try on the whiteboard

Work in pairs

1) Simplify $\frac{\frac{x+1}{5}}{\frac{3}{x}}$

3) Simplify $\frac{\frac{x+3}{x}}{\frac{x+4}{7x}}$