

4.5 Just Act Rational

A Solidify Understanding Task



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In 4.4 *Are You Rational?*, you saw how connecting rational numbers can help us to think about rational functions. In this task, we'll extend that work to consider operations on rational expressions.

Let's begin with multiplication. In each of the tables below there are missing descriptions and missing parts of expressions. Your job is to follow the process for multiplying rational numbers and use it to complete the descriptions of the process and to work the analogous problems with rational expressions.

1.

Description of the Procedure:	Example Using Numbers	Rational Expression A	Rational Expression B
Given:	$\frac{3}{4} \cdot \frac{5}{6}$	$\frac{x(x-3)}{(x+1)} \cdot \frac{5}{x^2}$	$\frac{(x+1)(x-2)}{(x+2)} \cdot \frac{(x+5)}{(x-2)(x+2)}$
	$\frac{3 \cdot 5}{4 \cdot 6}$		
	$\frac{\cancel{3} \cdot 5}{2 \cdot 2 \cdot 2 \cdot \cancel{3}}$		
Write the simplified form:	$\frac{5}{8}$	$\frac{5(x-3)}{x(x+1)}$ Or $\frac{5x-15}{x(x+1)}$	$\frac{(x+1)(x+5)}{(x+2)^2}$ Or $\frac{x^2+6x+5}{(x+2)^2}$

2. In multiplication, does it matter in which step the simplifying is done? Why?

Now let's try the same process with division.

3. Complete the table below by filling in the missing descriptions or steps for dividing the rational expressions.

Description of the Procedure:	Example Using Numbers	Rational Expression A	Rational Expression B
Given:	$\frac{3}{4} \div \frac{5}{6}$	$\frac{(x-2)}{(x+2)} \div \frac{(x+5)}{x(x+2)}$	$\frac{(x+1)(x-6)}{(x+2)} \div \frac{(x+1)}{(x-3)(x+2)}$
	$\frac{3}{4} \cdot \frac{6}{5}$		
Multiply and simplify:	$\frac{3 \cdot 6}{4 \cdot 5} = \frac{3 \cdot \cancel{2} \cdot 3}{2 \cdot 2 \cdot 5}$		
	$\frac{9}{10}$	$\frac{x(x-2)}{(x+5)}$ Or $\frac{x^2 - 2x}{(x+5)}$	$(x-3)(x-6)$

4. How could you check your answer after performing an operation on a pair of rational expressions?

Are you ready for addition? Try it!

5. Complete the table below by filling in the missing descriptions or steps for adding the rational expressions.

Description of the Procedure:	Example Using Numbers	Rational Expression A
Given	$\frac{2}{3} + \frac{1}{7}$	$\frac{3}{(x+7)} + \frac{4}{(x-4)}$
Determine the factors needed for a common denominator	$\frac{2}{3}\left(\frac{7}{7}\right) + \frac{1}{7}\left(\frac{3}{3}\right)$	$\frac{3}{(x+7)}\left(\frac{x-4}{x-4}\right) + \frac{4}{(x-4)}\left(\frac{x+7}{x+7}\right)$
	$\frac{14}{21} + \frac{3}{21}$	
	$\frac{14+3}{21}$	
Simplify	$\frac{17}{21}$	$\frac{7x+16}{(x+7)(x-4)}$

6. After writing both terms with a common denominator, are they equivalent to the original terms? Explain.

7. Complete the table below by filling in the missing descriptions and steps for adding the rational expressions.

Description of the Procedure:	Rational Expression B
Given	$\frac{2x - 3}{(x + 3)} + \frac{x + 5}{(x - 2)}$
Determine the factors needed for a common denominator	
Simplify	$\frac{3x^2 + x + 21}{(x - 2)(x + 3)}$

8. Is it possible to get an answer to an addition problem that still needs to be reduced? If so, how can you tell if your answer needs to be further simplified?

9. At long last, we have subtraction. Complete the table below by filling in the missing descriptions and steps for adding the rational expressions.

Description of the Procedure:	Example Using Numbers	Rational Expression A
Given:	$\frac{7}{8} - \frac{3}{5}$	$\frac{3x + 1}{x + 5} - \frac{x - 4}{x - 2}$
	$\frac{7}{8} \left(\frac{5}{5}\right) - \frac{3}{5} \left(\frac{8}{8}\right)$	
	$\frac{35}{40} - \frac{24}{40}$	
	$\frac{35 - 24}{40}$	
Simplify	$\frac{11}{40}$	$\frac{2x^2 - 6x + 18}{(x + 5)(x - 2)}$ Or $\frac{2(x^2 - 3x + 9)}{(x + 5)(x - 2)}$

10. What strategies will you use to be sure that you don't make sign errors when subtracting?

READY, SET, GO!

Name _____

Period _____

Date _____

READY

Topic: Recalling trigonometric functions

Use the given triangle to write the values of $\sin A$, $\cos A$, and $\tan A$ and $\sin B$, $\cos B$, and $\tan B$.

1.

$\sin A =$

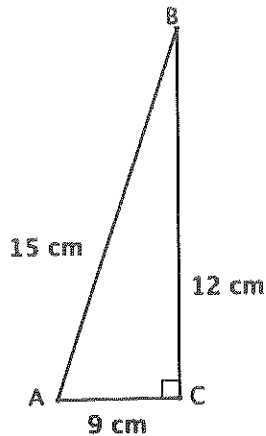
$\cos A =$

$\tan A =$

$\sin B =$

$\cos B =$

$\tan B =$



2.

$\sin A =$

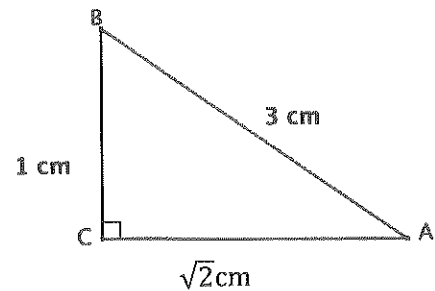
$\cos A =$

$\tan A =$

$\sin B =$

$\cos B =$

$\tan B =$



3.

$\sin A =$

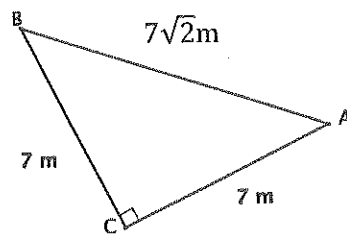
$\cos A =$

$\tan A =$

$\sin B =$

$\cos B =$

$\tan B =$



4.

$\sin A =$

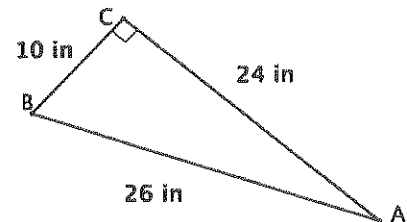
$\cos A =$

$\tan A =$

$\sin B =$

$\cos B =$

$\tan B =$



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SET

Topic: Adding, subtracting, multiplying, and dividing rational functions

5. Angela simplified the following rational expressions. Only one of the three problems is correct. Determine which one she answered correctly. Then identify Angela's errors in the two that are incorrect and correct them.

a. $\frac{5x}{(x-3)} + \frac{2}{(x-1)}$

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

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

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

b. $\frac{x}{(x+3)} - \frac{4(x+3)}{(x-1)}$

$$\frac{x}{1} - \frac{4}{(x-1)}$$

$$\frac{x(x-1)}{(x-1)} - \frac{4}{(x-1)}$$

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

c. $\frac{(x+1)(x-2)}{(x+2)} \times \frac{(x+5)}{(x-2)(x+2)}$

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

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

$$\frac{x^2 + 6x + 5}{x^2 + 4x + 4}$$

Simplify each expression. Reduce when possible.

6. $\frac{2x+6}{(x+1)} - \frac{4}{(x+1)}$

7. $\frac{2x}{x+2} + \frac{x-1}{x-5}$

8. $\frac{x^2+6x+8}{x^2-5x+4} \cdot \frac{x^2+3x-4}{x^2+4x+4}$

9. $\frac{4x+8}{5x-20} \div \frac{x^2-3x-10}{x^2-4x}$

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

11. $\frac{x-10}{x-4} - \frac{x+2}{4-x}$

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Topic: Comparing rational numbers and rational expressions

12. Rational numbers and rational expressions are comparable because they have similar features. Complete the table below by writing the comparable situation for each statement written.

Rational Numbers	Rational Expressions
Whole numbers are rational numbers with a denominator of one.	a)
b)	Rational expressions are undefined when the denominator is equal to zero.
When you add, subtract, multiply or divide two rational numbers, the result is also a rational number.	c)
Rational fractions are classified as proper fractions when the numeric value of the numerator is smaller than the denominator.	d)

GO

Topic: Finding values of x that affect the domain of a rational expression

Identify the values of x for which the expression is undefined, if any.

13. $\frac{10}{x-4}$

14. $\frac{22}{x}$

15. $\frac{x-7}{x+15}$

16. $\frac{2x}{5}$

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