

Name: _____

Class/Block: _____ Date: _____

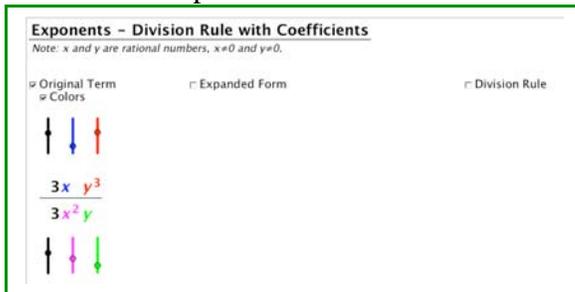
Exploration: Division Rules of Exponents

Introduction

In this exploration you will use the *Exponents - Division Rule with Coefficients* applet to explore division properties of exponents.

Step 1: Launch the *Exponents - Division Rule with Coefficients* applet

- Check the **Colors** checkbox to make each part of the term a different color.
- Move the sliders up and down and observe what happens to the coefficients and terms.



Step 2: Move the sliders to *set up the problem provided*.

$$\frac{x^5}{x^4}$$

- Move the **black** sliders until the numbers at the front of the terms (the coefficients) disappear
- Move the **red** and **green** sliders until the **y** variables disappear
- Move the **blue** slider until the exponent associated with **x** in the numerator is equal to **5**
- Move the **pink** slider until the exponent associated with **x** in the denominator is equal to **4**

Step 3: Check the *Expanded Form* checkbox to see the term expanded out.

- Notice how many times the term in the numerator and denominator is repeated.
- How does the number of times repeated relate to the exponent?

$$\frac{x^5}{x^4} = \frac{x \cdot x \cdot x \cdot x \cdot x}{x \cdot x \cdot x \cdot x}$$

Step 4: Check the *Shade Pairs of 1* checkbox

Notice how the factors of x can be divided out of the numerator and denominator

Shade Pairs of 1

$$\frac{x \cdot x \cdot x \cdot x \cdot x}{x \cdot x \cdot x \cdot x} = x$$

Step 5: Check the *Division Rule* checkbox.

Division Rule

$$x^{5-4}$$

Step 6: Fill in the table for example provided.

Example:

Original Expression	Expanded Form	Division Rule with Solution
$\frac{x^5}{x^4}$	$\frac{x \cdot x \cdot x \cdot x \cdot x}{x \cdot x \cdot x \cdot x} = x$	$x^{5-4} = x$



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Directions: Set up each problem in the applet. Fill in the table. Answer the associated questions.

Problem 1.

Original Expression	Expanded Form	Division Rule with Solution
$\frac{x^4}{x^3}$	_____ =	

1a. In the *Expanded Form*, how does the number of times the x is repeated relate to the exponent?

1b. What operation do you use on the exponents to get the final solution?

1c. In the example above, the exponent for **x** in the *numerator* is 4 and the *denominator* is 3. What is the sign on the solution? (positive or negative)

Problem 2.

Original Expression	Expanded Form	Division Rule with Solution
$\frac{x^3}{x^5}$	_____ =	

2a. In the example above, the exponent for **x** in the *numerator* is 3 and the *denominator* is 5. What is the sign on the solution? (positive or negative)

Problem 3.

Original Expression	Expanded Form	Division Rule with Solution
$\frac{x^5y^3}{x^4y}$	_____ =	

3a. When you have two different bases in the expression, how do you find the solution?

3b. In the example above, what is the sign of the *exponent for x* in the solution?

3c. In the example above, what is the sign of the *exponent for y* in the solution?



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Problem 4.

Original Expression	Expanded Form	Division Rule with Solution
$\frac{x^2 y^4}{x^4 y}$	_____ =	

4a. In the example above, what is the sign of the *exponent for x* in the solution?

4b. In the example above, what is the sign of the *exponent for y* in the solution?

Problem 5.

Original Expression	Expanded Form	Division Rule with Solution
$\frac{14x^3 y^5}{7x y^3}$	_____ =	
$\frac{18x^2 y^4}{6x^5 y^3}$	_____ =	
$\frac{2x^3 y^4}{4x^4 y}$	_____ =	

5a. Explain what happens to the *coefficients* when you apply the division rule to the problems above.

5b. Explain how the operation on *coefficients* is different from what you do with the *exponents*.
Give an example if needed.

Problem 6.

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Original Expression	Expanded Form	Division Rule with Solution
$\frac{y^4}{y^4}$	_____ =	

6a. When you divide like bases with the same exponent, what do you notice about the expanded form?

6b. What is the solution using the division rule?

6b. What is the value of the solution whenever the resulting exponent is zero?

Conclusion:

a. State the division rule in words. Give an example of the division rule.

b. State the zero power rule in words. Give an example of the zero power rule.

