Dividing Exponential Expressions

Part A

Emily was trying to simplify the exponent expression $\frac{5^7}{5^3}$. She started by writing out the factored forms in the numerator and the denominator. When she looked at this factored form, she noticed a "form of one" (FOO).

1. Write out the factored form of $\frac{5^7}{5^3}$. Where do you see any form(s) of one?

2. Discuss with your group **how you can use** forms of one to simplify Emily's expression. What did you decide? What is your simplified result?

3. Copy and complete the table below in your notebook. Expand each expression into factored form and then rewrite it with new exponents as shown in the example.

Original Form	Factored Form	Simplified Exponent Form
$\frac{x^7}{x^3}$	$\frac{x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x}{x \cdot x \cdot x}$	x^4
$\frac{2^4}{2^2}$		
$\frac{3^4}{3^5}$		
$\frac{x^3y^2}{xy^2}$		
$\frac{x^8y^5}{x^4y^2}$		

4. Work with your group to compare the bases and exponents of the original form to the base and exponent of the simplified exponent form. **Write a statement to describe the relationship you see.**

5. Using the relationship you described above, can you rewrite $\frac{3^{58}}{3^{32}}$ without needing to factor the numerator and denominator? What is your simplified result?

6. Why are you able to use your strategy? Because it "gets you the correct result" is not the answer. ☺ What does using your strategy actually represent? (Hint: Think about forms of one.)

Part B

What happens when you have numerical coefficients? Copy and complete the table below in your notebook. Expand each expression into factored form and then rewrite it with new exponents as shown in the example**. All exponents must be positive and coefficients should be whole numbers.** Some of your simplified forms may still be in fractional form!

Original Form	Factored Form	Simplified Exponent Form
$\frac{12x^4y^3}{4x^2y^2}$	$\frac{12 \cdot x \cdot x \cdot x \cdot x \cdot y \cdot y \cdot y}{4 \cdot x \cdot x \cdot y \cdot y}$	$3x^2y$
$\frac{25x^7}{5^3}$		
$\frac{7x^3y^2}{7x^5y}$		
$\frac{7x^3y^3}{3x^4y} \cdot 6x^2$		
$\frac{12x^2y^4z^2}{9x^3y^2z}$		

Part C

What would your strategy be if the entire fractional expression is raised to a power?

Simplify $\left(\frac{6x^4y^3}{4x^3y^5}\right)^3$.

1. **Applying the exponent first –**

   a. Apply the exponent to everything within the parentheses first. What do you get? (Your answer here should be a fractional expression)

   $\left(\frac{6x^4y^3}{4x^3y^5}\right)^3 =$ ______________________________

   b. Simplify the expression above that you got by applying the 3rd power to the entire fractional expression.

   c. Final simplified answer?

2. **Simplify within the parentheses first –**

   a. Simplify within the parentheses first. What do you get?

   $\left(\frac{6x^4y^3}{4x^3y^5}\right)^3 = \left(\qquad\qquad\qquad\qquad \right)^3$

   b. Apply the 3rd power to your simplified expression.

   c. Final simplified answer?

What do you think?

When you have a fractional expression raised to a power, is it more efficient to apply the exponent first then simplify, or to simplify first and then apply the exponent?