Multiplying Exponential Expressions

Part A

Exponents allow you to rewrite some multiplication problems in a simpler form. Some exponent expressions can also be simplified. 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
$5^2 \cdot 5^5$	$(5 \cdot 5) \cdot (5 \cdot 5 \cdot 5 \cdot 5 \cdot 5)$	5^7
$2^2 \cdot 2^4$	$(2 \cdot 2)(2 \cdot 2 \cdot 2 \cdot 2)$	2^6
$3^7 \cdot 3^2$	$(3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3)(3 \cdot 3)$	3^9
$x^3 \cdot x^5$	$(x \cdot x \cdot x)(x \cdot x \cdot x \cdot x \cdot x)$	x^8
$x^3y^2 \cdot xy^2$	$(x \cdot x \cdot x)(x)(y \cdot y)(y \cdot y)$	x^4y^4
$7^2 \cdot x^3 \cdot 7 \cdot x^2$	$(7 \cdot 7)(7)(x \cdot x \cdot x)(x \cdot x)$	7^3x^5
$2 \cdot x^4 \cdot 3 \cdot xy^2$	$(2)(3)(x \cdot x \cdot x \cdot x)(x)(y \cdot y)$	$6x^5y^2$

1. 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.**

   When you are multiplying two terms that have the same base, you need to calculate the total number of times the base is being multiplied. The exponent tells how many times the base is being multiplied, so your final answer is the original base raised to a power that is the sum of the original exponents.

2. Visualize how you would expand $20^{12} \cdot 20^8$ in your mind. What would this expression be in simplified exponent form? Describe your reasoning.

   The final answer would be 20^{20}

   I visualize 20 being multiplied 12 times and 20 being multiplied 8 times, so 20 is being multiplied a total of 20 times.

3. A group of students rewrote the expression $10^3 \cdot 5^4$ as 50^7. Is their simplification correct? Explain your reasoning. Their simplification is incorrect!

$10^3 \cdot 5^4 = 10 \cdot 10 \cdot 10 \cdot 5 \cdot 5 \cdot 5 \cdot 5$
$= (10 \cdot 5) \cdot (10 \cdot 5) \cdot (10 \cdot 5) \cdot 5$
$= 50 \cdot 50 \cdot 50 \cdot 5$
$= 50^3 \cdot 5$

$50^3 \cdot 5 \neq 50^3 \cdot 50^4$

$50^7 = (50 \cdot 50 \cdot 50)50 \cdot 50 \cdot 50 \cdot 50$
$= 50^3 \cdot 50^4$