Let's explore patterns with exponents when we multiply powers.

Multiplying Powers

1. Complete the table to explore patterns in the exponents when multiplying powers. You may skip a single box in the table, but if you do, be prepared to explain why you skipped it.

Expression	Expanded Form	Single Power
$12^2 \cdot 12^3$	$(12 \cdot 12)(12 \cdot 12 \cdot 12)$	12^5
$3^4 \cdot 3^3$	$(3 \cdot 3 \cdot 3 \cdot 3) \cdot (3 \cdot 3 \cdot 3)$	3^7
$x^4 \cdot x^4$	$x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x$	x^8
$10^3 \cdot 10^5$	$(10 \cdot 10 \cdot 10)(10 \cdot 10 \cdot 10 \cdot 10 \cdot 10)$	10^8
$4^{18} \cdot 4^{23}$	Skip	4^{41}

2. If you chose to skip one entry in the table, which entry did you skip? Why?

3. Use the patterns you found in the table to rewrite $10^n \cdot 10^m$ as an equivalent expression with a single exponent, like $10^{\square}$.

$10^n \cdot 10^m = 10^{n+m}$

4. Use your rule to write $2^4 \cdot 2^0$ with a single exponent. What does this tell you about the value of 2^0?

$2^4 \cdot 2^0 = 2^4$ $\qquad 2^0 = 1$

5. The state of Georgia has roughly 10^7 human residents. Each human has roughly 10^{13} bacteria cells in his or her digestive tract. How many bacteria cells are there in the digestive tracts of all the humans in Georgia?

$10^7 \cdot 10^{13} = 10^{20}$

Extra Example

$3^{15} \cdot 3^{10} = 3^{25}$