Exponents

**REVIEW:** \( 4 \cdot 3 \text{ means } 4 + 4 + 4 \)

\[
4 \cdot 3 = 4 + 4 + 4
\]

\[
12 = 12
\]

Multiplication is simply a concise way of writing addition.

Similarly, exponents are a concise way of writing multiplication.

For the expression \( 4^3 \), 4 is called the **base** and the 3 is called the **exponent**.

\[
base^{exponent}
\]

\[
4^3 = 4 \cdot 4 \cdot 4
\]

\[
= ___
\]

**Example 1:**

Evaluate: \( \left( \frac{2}{3} \right)^2 \)

\[
\left( \frac{2}{3} \right)^2 = \left( \frac{2}{3} \right) \left( \frac{2}{3} \right) = ___
\]

**Example 2:**

Evaluate: \( 3^4 \)

\[
= ___
\]
Example 3:

a) \((-2)^3\)

The base is \(\underline{\text{_______}}\).
The exponent is \(\underline{\text{_______}}\).

so, \((-2)^3 = (\underline{\quad})(\underline{\quad})(\underline{\quad})\)

= ________

b) \((-2)^4\)

The base is \(\underline{\text{_______}}\).
The exponent is \(\underline{\text{_______}}\).

so, \((-2)^4 = (\underline{\quad})(\underline{\quad})(\underline{\quad})(\underline{\quad})\)

= ________

c) \(-2^4\)

The base is \(\underline{\text{2}}\).
The exponent is \(\underline{\text{4}}\).

\text{NOTE: The exponent does not apply to the negative sign since there aren’t parentheses like in part b).}

so, \(-2^4 = -(\underline{\quad})(\underline{\quad})(\underline{\quad})(\underline{\quad})\)

= ________
Example 4:

Evaluate: \( 20 - 3^2 \)

**NOTE:** By the Order of Operations, we must first evaluate \( 3^2 \).

\[
20 - 3^2 = 20 - \underline{\phantom{0000}} \underline{\phantom{0000}} \underline{\phantom{0000}} \underline{\phantom{0000}} \underline{\phantom{0000}} \underline{\phantom{0000}} \\
= \underline{\phantom{0000}} \underline{\phantom{0000}} \underline{\phantom{0000}} \underline{\phantom{0000}} \underline{\phantom{0000}} \underline{\phantom{0000}} 
\]

Example 5:

a) What does \( 4x \) mean?

\[ 4x = \]

b) What does \( x^4 \) mean?

\[ x^4 = \]
1. Evaluate:
   a) $2^5$
   b) $(\frac{1}{4})^3$

2. Evaluate:
   a) $3^2$
   b) $(-3)^2$
   c) $-3^2$
   d) $(-3)^3$

3. Evaluate: $16 - 2^4$

4. a) What does $4x$ mean?

   b) What does $x^3$ mean?