lulumath

# Power of a Power

Video Notes

Video Link

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Background Knowledge:

- Multiplying Monomials

Simplify:

$(2^5)^3$

$\hookrightarrow 2^5 \cdot 2^5 \cdot 2^5 = 2^{15}$ (2·2·2·2·2 · 2·2·2·2·2 · 2·2·2·2·2) → 5·3

$2^5$ raised to the power of 3 (multiplied by itself 3 times)

*rule for multiplication: add exponents with like bases

$5+5+5=15$

$(2^5)^{100}$

Simplify:

$(x^2)^6$

$\hookrightarrow x^2 \cdot x^2 \cdot x^2 \cdot x^2 \cdot x^2 \cdot x^2 = x^{12}$ → 2·6

$x^2$ multiplied by itself 6 times (power of 6)

Simplify:

$(a^2bc^5)^3$

$\hookrightarrow a^2bc^5 \cdot a^2bc^5 \cdot a^2bc^5 = a^6b^3c^{15}$ (2·3, 1·3, 5·3)

$a^2bc^5$ multiplied by itself 3 times (power of 3)

Simplify: $(2y^7)^6$

coefficient (not an exponent) → $2^6$

$(2y^7)^6 = 2y^7 \cdot 2y^7 \cdot 2y^7 \cdot 2y^7 \cdot 2y^7 \cdot 2y^7 = 64y^{42}$ (7·6)

$2y^7$ multiplied by itself 6 times (power of 6)

Common mistakes:

- $7+6$
  → No! We are raising a power to a power (multiply exponents), not multiplying bases (add exponents)
  $(y^7)^6 = y^{42}$ vs. $y^7 \cdot y^6 = y^{13}$
- coefficient is $2 \cdot 6$
  → No! 2 is also being raised to the power of 6.

You try!

$(5x^8)^3 = 125x^{24}$

$5x^8 \cdot 5x^8 \cdot 5x^8$

$= 125x^{24}$ ($8 \cdot 3 = 24$)

$5^3 = 125$

**Conclusion:**

- To raise a power to a power, we multiply the exponents
- If an expression being raised to a power has a coefficient, make sure to raise that coefficient to the power as well.