

Powers and Exponents

A power is the result of repeated multiplication of the same factor. A power can be written in a form that has two parts: a number called the **base** and a number called the **exponent**. The exponent shows the number of times the base is used as a factor.

$$\text{base} \rightarrow 5^3 = 5 * 5 * 5$$

← exponent

Power	In Words	Value	Repeated factors
12^1	Twelve to the first power	12	
8^2	Eight to the second power (OR) Eight squared	64	$8 * 8$
2^3	Two to the third power (OR) Two cubed	8	$2 * 2 * 2$
3^4	Three to the fourth power	81	$3 * 3 * 3 * 3$ $9 * 9$

Multiplication Symbols:

- * () [] "the product of"

Examples:

1) $10 \cdot 10 \cdot 10$

$$10^3 = 1,000$$

2) $(4.3)(4.3)$

$$(4.3)^2 = 18.49$$

3) $x \cdot x \cdot x \cdot x \cdot x$

$$x^5$$

4) m^3 when $m = 3$

$$3^3 = 27$$

5) p^5 when $p = 1$

$$1^5 = 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 = 1$$

6) 0^8

$$0 \cdot 0 \cdot 0 \cdot 0 \cdot 0 \cdot 0 \cdot 0 \cdot 0 = 0$$

Multiply and Divide Exponents

What happens when you multiply two powers with the same base?

$$a^4 \cdot a^3 = \underbrace{a \cdot a \cdot a \cdot a}_{\text{orange}} \cdot \underbrace{a \cdot a \cdot a}_{\text{green}} = a^7$$

$$x^2 \cdot x^2 = \underbrace{x \cdot x}_{\text{purple}} \cdot \underbrace{x \cdot x}_{\text{green}} = x^4$$

Multiply
Product of Powers Property: To multiply powers with the same base, Add the exponent.

Examples:

$$1) 5^1 \cdot 5^2 = 5^3$$

$$2) 4^6 \cdot 4^4 \cdot 4^3 = 4^{13}$$

$$3) x^6 \cdot x^9 = x^{15}$$

$$4) 3x^2 \cdot 5x^5 = 15x^7$$

$$4x^6 \cdot 3x^2 =$$

What happens when you divide two powers with the same base?

$$\frac{a^5}{a^2} = \frac{\cancel{a} \cdot \cancel{a} \cdot a \cdot a \cdot a}{\cancel{a} \cdot \cancel{a}} = a \cdot a \cdot a = a^3$$

$$\frac{x^4}{x^3} = \frac{\cancel{x} \cdot \cancel{x} \cdot x \cdot x}{\cancel{x} \cdot \cancel{x} \cdot x} = x^1$$

Divide
Quotient of Powers Property: To divide powers with the same base, Subtract the exponent.

Examples:

$$1) \frac{7^6}{7^2} = \frac{\cancel{7} \cdot \cancel{7} \cdot 7 \cdot 7 \cdot 7 \cdot 7}{\cancel{7} \cdot \cancel{7}} = 7^4 \quad 2) \frac{x^8}{x^2} = x^6$$

$$3) \frac{n^5}{n^5} = n^0 = 1$$

$$4) \frac{p^{10}}{p^9} = p^1 = p$$

Homework: page 12 #14-28 (evens), and page 197 #16-32 (evens), 33

Adapted: page 12 #14-28 (evens) and page 197 #16, 18, 20, 22, 26, 32