

Section 10.1 - Exponents and Scientific Notation

Name: _____ Class: _____

Video Notes

Exponent Rules

<i>Negative Exponents</i>		<i>Product Rule</i>	
$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$		$a^m \cdot a^n = a^{m+n}$	
Change the negative exponent into a positive one by changing the base to its reciprocal		When multiplying terms with like bases, add exponents.	
Example: $3^{-2} =$ _____	Example: $\left(\frac{2}{3}\right)^{-3} =$ _____	Example: $3^5 \cdot 3^8 =$ _____	Example: $3^3 \cdot 3^{-5} =$ _____
<i>Quotient Rule</i>		<i>Power of a Power Rule</i>	
$a^m \div a^n = a^{m-n}$		$(a^m)^n = a^{m \cdot n}$	
When dividing terms with like bases, subtract exponents		When raising a power to a power, multiply exponents	
Example: $\frac{3^9}{3^2} =$ _____	Example: $\frac{3^8}{3^{-2}} =$ _____	Example: $(3^4)^5 =$ _____	Example: $(3^2)^{-4} =$ _____

Scientific Notation Practice

Write 3.72×10^8 in standard notation.	Write 8.1×10^{-5} in standard notation.
Write 2,890,000 in scientific notation.	Write 0.000053 in scientific notation.
Write 35×10^4 in scientific notation.	Write 0.026×10^5 in scientific notation.

Operations with Scientific Notation

Multiplication	Division	Addition or Subtraction
1.) Multiply coefficients. 2.) Add exponents. 3.) Adjust, if necessary.	1.) Divide coefficients. 2.) Add exponents. 3.) Adjust, if necessary.	1.) Adjust exponents to be the same. 2.) Combine coefficients. 3.) Adjust, if necessary.
Example: $(4 \times 10^8)(6 \times 10^9)$	Example: $\frac{1.8 \times 10^7}{3 \times 10^{-4}}$	$(2.5 \times 10^4) + (1.8 \times 10^6)$

Word Problems

Make the problem simpler to identify what operation to use!

<p>Two objects are $2.4 \cdot 10^{20}$ centimeters apart. A signal from one object travels to the other at a rate of $1.2 \cdot 10^5$ centimeters per second. How many seconds does it take the signal to travel from one object to the other? Operation: _____</p>	<p>The 2010 population of India was about 1.16×10^9 people. The 2010 population of the United States was about 3.1×10^8 people. About how many more people lived in India than in the United States in 2010? Operation: _____</p>
---	---

1.) Simplify:

a.) $\frac{3^7 \times 3^9}{3^2}$

b.) $(7^3)^4$

c.) $\frac{5^4}{5^{-8}}$

d.) $\frac{(2^8)^2}{2^{-4}}$

2.) What is $3.471 \cdot 10^{-5}$ written in standard form?

- (A) 3,471,000 (B) 347,100 (C) 0.0003471 (D) 0.00003471

3.) Evaluate: $(2.4 \cdot 10^4)(4.5 \cdot 10^3)$

- (A) $1.08 \cdot 10^7$ (B) $1.08 \cdot 10^8$ (C) $1.08 \cdot 10^{12}$ (D) $1.08 \cdot 10^{13}$

4.) Write 67,000 in scientific notation.

- (A) 670×10^3 (B) 6.7×10^4 (C) 6.7×10^{-4} (D) 6.7×10^3

5.) Which is equivalent to $2^4 \cdot 2^{-6}$?

- (A) -4 (B) $-\frac{1}{4}$ (C) $\frac{1}{4}$ (D) 4

6.) Which expression is **not** equivalent to $\frac{6^3}{6^6}$?

- (A) $\frac{1}{6^2}$ (B) 6^{-3} (C) $\frac{1}{216}$ (D) $\frac{1}{6^3}$

7.) Find the product: $800.5 \times (2 \times 10^6)$

- (A) 1.7×10^7 (B) 1.601×10^7 (C) 1.7×10^9 (D) 1.601×10^9

8.) Which number is equivalent to $\frac{3^4}{3^2}$?

- (A) 2 (B) 9 (C) 81 (D) 729

9.) Simplify: $\frac{4^8}{4^{-4}}$.

- (A) 4^{-32} (B) 4^{-2} (C) 4^4 (D) 4^{12}

- 10.) The population of New York is approximately $2 \cdot 10^7$. The population of New Jersey is approximately $9 \cdot 10^6$. Which statement accurately compares the population of New York and New Jersey?
- (A) The population of New Jersey is about 45 times greater than that of New York.
(B) The population of New York is about 45 times greater than that of New Jersey.
(C) The population of New Jersey is about 2 times greater than that of New York.
(D) The population of New York is about 2 times greater than that of New Jersey.
- 11.) A rectangular yard has a length of $6 \cdot 10^{-2}$ kilometer and a width of $5 \cdot 10^{-3}$ kilometer. Use scientific notation to express the area of the yard in square kilometers, showing each step in the process.
- 12.) Stalactites are cone-shaped formations that hang from the ceilings of underground caverns. Stalactites can grow at the rate of about $5 \cdot 10^{-4}$ inch per year. At this rate, what is the length of a stalactite that grows for $7.5 \cdot 10^4$ years?
- 13.) At a given time, Saturn was 9.1×10^8 miles away from the Sun and Earth was 9.3×10^7 miles from the Sun. By what distance is one planet closer to the Sun than the other planet?
- (A) 2×10^1 (B) 2×10^{15} (C) 8.17×10^7 (D) 8.17×10^8
- 14.) The combined volume of all the tanks at an aquarium is 2.75×10^6 gallons. The aquarium plans to install a new dolphin tank with a volume of 130,000 gallons. What will be the total volume of all of the tanks at the aquarium after the new dolphin tank is installed?
- (A) 2.87×10^6 (B) 3.95×10^6 (C) 2.87×10^5 (D) 3.95×10^5
- 15.) Which expression is equivalent to $4^7 \times 4^{-5}$?
- (A) 4^{12} (B) 4^2 (C) 4^{-2} (D) 4^{-35}