NAME: _____ PERIOD: ___ 3.13.20

• EXPONENTS AND SCIENTIFIC NOTATION STUDY GUIDE •

Solve each of the problems below. These represent the types of questions on your test. Be sure to ask questions if you need more help with a topic.

I CAN APPLY PROPERTIES OF INTEGER EXPONENTS. 8.EE.1

Simplify the expressions. Leave answers as a value or variable raised to an exponent.

1. $16^{10} \bullet 16^{4}$	2. $\frac{g^{19}}{g^{12}}$	3. $(20^{7})^{5}$
4. $(n^{6})^{3} \bullet n^{0}$	5. $\frac{8^{22}}{8^{9}} \bullet 8^{11}$	6. $\frac{17^{4} \bullet 17^{10}}{17^{5}}$

I CAN APPLY PROPERTIES OF INTEGER EXPONENTS. 8.EE.1

Simplify the expressions. Leave answers as a value or variable raised to a positive exponent.

7. b^{-8}	8. $(3^{5})^{-5}$	9. $10^{-12} \bullet 10^{2}$
10. $\frac{7^{8} \bullet 7^{1}}{7^{15}}$	11. $\frac{y^{5}}{y^{10}} \bullet y^{2}$	12. $\frac{(11^{2})^{3}}{11^{6}} \bullet 11^{-4}$

I CAN APPLY PROPERTIES OF INTEGER EXPONENTS. 8.EE.1

13. How much greater is $(2^{3})^{2}$ than $2^{3} \bullet 2^{2}$?	14. What is the value of $\frac{(15^{4})^{2}}{15^{8}}$?	15. Determine if the following equation is true or false. $\frac{(a^{9})^{1}}{a^{4}} = \frac{a^{8} \bullet a^{1}}{a^{4}}$

I CAN APPLY PROPERTIES OF INTEGER EXPONENTS. 8.EE.1

16. Which is greater, 4^{-2} or 2^{-4}? How do you know?

17. Find the value of x to make the following equation true.

$$\frac{n^{10}}{n^{12}} = (n^x)^1$$

18. Find the value of x to make the following equation true.

$$(3^2)^3 \bullet 3^x = \frac{3^7 \times 3^3}{3^{11}}$$

19. TRUE or FALSE ?

$$\frac{q^0 \bullet q^5}{q^2} = \frac{(q^3)^2}{q^3}$$

20. TRUE or FALSE ?

$$\frac{y^5 \bullet y^0}{y^3} = (y^2)^1$$

21. TRUE or FALSE ?

$$(x^4)^3 = (x^3)^4$$

22. - 26. I CAN PERFORM OPERATIONS WITH SCIENTIFIC NOTATION. (Fill in blanks) 8.EE.4

STANDARD NOTATION	SCIENTIFIC NOTATION
	$7.645 \bullet 10^8$
0.000327	
	$3.4 \bullet 10^4$
	$1.16 \bullet 10^9$
0.024	
2,800	
	$1 \bullet 10^3$
	$9.9 \bullet 10^{-6}$
	$9 \bullet 10^{-5}$
0.00633	

ADDING AND SUBTRACTING WITH SCIENTIFIC NOTATION

SAME POWERS OF 10	• To add or subtract values written in scientific notation, the numbers must have the same _____ of 10. • If the powers of 10 are the same, simply add or subtract the numbers out front, and keep the power of 10.
DIFFERENT POWERS OF 10	• Because of place value, if the numbers in scientific notation do not have the same power of 10, you can choose to _____ one of the numbers, giving it the same power of 10. • Otherwise, convert values to standard notation and rewrite in scientific notation at the end.

MULTIPLYING AND DIVIDING WITH SCIENTIFIC NOTATION

MULTIPLICATION	• To multiply values in scientific notation, rearrange the multiplication problem and apply the laws of exponents. • For example: $(4.5 \times 10^5)(2 \times 10^3) =$ (_____)(_____) • Therefore, the final answer in scientific notation would be: _____
DIVISION	• To divide values in scientific notation, rearrange the division problem and apply the laws of exponents. • For example: $\frac{8 \times 10^6}{4 \times 10^3} =$ _____ × _____ • Therefore, the final answer in scientific notation would be: _____

PROPERTIES OF EXPONENTS

EXPONENTS	• We know that 5^3 means _____. • In the example above, 5 is called the _____ and 3 is called the _____. • Any number raised to the power of one is equal to _____. (Ex. $8^1 =$ _____ and $50^1 =$ _____.) • Any number raised to the power of zero is equal to _____. (Ex. $12^0 =$ _____ and $100^0 =$ _____.)
MULTIPLYING LIKE BASES	• When like bases are being multiplied, their exponents can be _____. • In other words, $x^a \cdot x^b = x^{a+b}$
DIVIDING LIKE BASES	• When like bases are being divided, their exponents can be _____. • In other words, $\frac{x^a}{x^b} = x^{a-b}$
A POWER TO A POWER	• When an exponent is raised to another exponent, the exponents can be _____. • In other words, $(x^a)^b = x^{a \cdot b}$

I CAN ESTIMATE LARGE AND SMALL VALUES USING POWERS OF TEN. **8.EE.3**

27. Rewrite the following value as a single digit times a power of ten. 82,900,000	28. Rewrite the following value as a single digit times a power of ten. 0.0000068	29. Last month, Levi had written 125 words of his book. This month, he is up to 12,580 words. About how many times more words has he written this month than the first month?

I CAN USE SCIENTIFIC NOTATION FOR LARGE AND SMALL QUANTITIES. 8.EE.4

30. A marine biologist discovered species with a diameter of 0.00085 inches. Express this measurement using scientific notation.

31. Frankie entered a sweepstakes to win a grand prize of $10,500,000,000. Express this amount using scientific notation.

32. Which of the following is a correct representation of 0.000005?

A. 50×10^{-7}
B. 5×10^{-6}
C. 5×10^{6}
D. $.5 \times 10^{-5}$

33. Which of the following has a value that is greater than 10,000 but less than 100,000?

A. 9.86×10^{3}
B. 1.6×10^{5}
C. 5×10^{3}
D. 8.721×10^{4}

I CAN PERFORM OPERATIONS WITH SCIENTIFIC NOTATION. 8.EE.4

34. $(8.45 \times 10^{6}) - 1{,}200{,}000$

Scientific: _____

Standard: _____

35. $.000033 + (5 \times 10^{-5})$

Scientific: _____

Standard: _____

36. After Becca's half-marathon, her pedometer showed 23,580 steps, while Alex recorded 2.42×10^{4} steps after the same race. What is the combined amount of their steps?

Scientific: _____

Standard: _____

37. $\dfrac{7.2 \times 10^{-3}}{4 \times 10^{-5}}$

Scientific: _____

Standard: _____

38. $(5{,}280)(3 \times 10^{6})$

Scientific: _____

Standard: _____

39. From her campsite, Ava estimated that she could see 2,500 stars without a telescope. She read once that a certain galaxy had 5×10^{11} stars. How many times more stars does the galaxy contain than what Ava estimates she can see?

Scientific: _____

Standard: _____