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Summer Edition

Eighth Grade Math

Activity 4

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This packet includes four sections that cover the major content of 8th grade math. Each section includes four pages of notes and practice for each topic. For additional support, visit KCS TV on YouTube for instructional videos that accompany each section.

The following content is included in this packet:

	Topic			
	I. Solving Equations and Systems of Equations	**II. The Pythagorean Theorem**	**III. Proportional Relationships and Functions**	**IV. Exponents and Scientific Notation**
Activity 1	Equations with the Distributive Property	The Pythagorean Theorem	Representing Proportional Relationships	Integer Exponents
Activity 2	Solving Systems of Linear Equations by Graphing	Converse of the Pythagorean Theorem	Interpreting the Unit Rate as Slope	Scientific Notation with Positive Powers of 10
Activity 3	Solving Systems by Substitution	Distance Between Two Points	Writing Linear Equations from a Table	Scientific Notation with Negative Powers of 10
Activity 4	Solving Systems by Elimination	Distance Between Two Points 2	Identifying and Representing Functions	Operations with Scientific Notation

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Section IV Activity 1

Integer Exponents

A positive exponent tells you how many times to multiply the base as a factor. A negative exponent tells you how many times to divide by the base. Any number to the 0 power is equal to 1.

$4^2 = 4 \bullet 4 = 16$ $\quad 4^5 = 4 \bullet 4 \bullet 4 \bullet 4 \bullet 4 = 1{,}024$ $\quad a^3 = a \bullet a \bullet a$

$4^{-2} = \frac{1}{4^2} = \frac{1}{4 \bullet 4} = \frac{1}{16}$ $\quad 4^{-5} = \frac{1}{4^5} = \frac{1}{4 \bullet 4 \bullet 4 \bullet 4 \bullet 4} = \frac{1}{1{,}024}$ $\quad a^{-3} = \frac{1}{a^3} = \frac{1}{a \bullet a \bullet a}$

When you work with integers, certain properties are always true. With integer exponents, there are also certain properties that are always true.

When the bases are the same and you multiply, you add exponents.

$2^2 \bullet 2^4 = 2^{2+4}$

$2 \bullet 2 \bullet 2 \bullet 2 \bullet 2 \bullet 2 = 2^6$

$a^m \bullet a^n = a^{m+n}$

When the bases are the same and you divide, you subtract exponents.

$\frac{2^5}{2^3} = 2^{5-3}$

$\frac{2 \bullet 2 \bullet \cancel{2} \bullet \cancel{2} \bullet \cancel{2}}{\cancel{2} \bullet \cancel{2} \bullet \cancel{2}} = 2^2$

$\frac{a^m}{a^n} = a^{m-n}$

When you raise a power to a power, you multiply.

$(2^3)^2 = 2^{3 \bullet 2}$

$(2 \bullet 2 \bullet 2)^2$

$(2 \bullet 2 \bullet 2) \bullet (2 \bullet 2 \bullet 2) = 2^6$

$(a^m)^n = a^{m \bullet n}$

Tell whether you will add, subtract, or multiply the exponents. Then simplify by finding the value of the expression.

1. $\frac{3^6}{3^3} \rightarrow$ _____

2. $8^2 \bullet 8^{-3} \rightarrow$ _____

3. $(3^2)^3 \rightarrow$ _____

4. $5^3 \bullet 5^1 \rightarrow$ _____

5. $\frac{4^2}{4^4} \rightarrow$ _____

6. $(6^2)^2 \rightarrow$ _____

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Section IV Activity 2

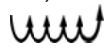
Scientific Notation with Positive Powers of 10

You can change a number from standard notation to scientific notation in 3 steps.

1. Place the decimal point between the first and second digits on the left to make a number between 1 and 10.
2. Count from the decimal point to the right of the last digit on the right.
3. Use the number of places counted in Step 2 as the power of ten.

Example

Write 125,000 in scientific notation.

1.25	1) The first and second digits to the left are 1 and 2, so place the decimal point between the two digits to make the number 1.25.
125,000 	2) The last digit in 125,000 is 5 places to the right.
1.25×10^5	3) The power of 10 is 5.

You can change a number from scientific notation to standard notation in 3 steps.

1. Find the power of 10.
2. Count that number of places to the right.
3. Add zeros as needed.

Example

Write 5.96×10^4 in standard notation.

10^4	1) The power of 10 is 4.
5.9600 	2) Move the decimal point 4 places to the right.
59,600	3) Add two zeros.

Complete to write each number in scientific notation.

1. 34,600

   The number between 1 and 10: ____

   The power of 10: ____

   The number in scientific notation:

   _____

2. 1,050,200

   The number between 1 and 10: ____

   The power of 10: ____

   The number in scientific notation:

   _____

Write each number in standard notation.

3. 1.057×10^3

   _____

4. 3×10^8

   _____

5. 5.24×10^5

   _____

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Section IV Activity 3

Scientific Notation with Negative Powers of 10

You can convert a number from standard form to scientific notation in 3 steps.

1. Starting from the left, find the first non-zero digit. To the right of this digit is the new location of your decimal point.
2. Count the number of places you moved the decimal point. This number will be used in the exponent in the power of ten.
3. Since the original decimal value was less than 1, your power of ten must be negative. Place a negative sign in front of the exponent.

Example

Write 0.00496 in standard notation.

4.96	1) The first non-zero digit is 4, so move the decimal point to the right of the 4.
4.96×10^{3}	2) The decimal point moved 3 places, so the whole number in the power of ten is 3.
4.96×10^{-3}	3) Since 0.00496 is less than 1, the power of ten must be negative.

You can convert a number from scientific notation to standard form in 3 steps.

1. Find the power of ten.
2. If the exponent is negative, you must move the decimal point to the left. Move it the number of places indicated by the whole number in the exponent.
3. Insert a leading zero before the decimal point.

Example

Write 1.23×10^{-5} in standard notation.

10^{-5}	1) Find the power of ten.
.0000123	2) The exponent is –5, so move the decimal point 5 places to the left.
0.0000123	3) Insert a leading zero before the decimal point.

Write each number in scientific notation.

1. 0.0279 _____
2. 0.00007100 _____
3. 0.0000005060 _____

Write each number in standard notation.

4. 2.350×10^{-4} _____
5. 6.5×10^{-3} _____
6. 7.07×10^{-5} _____

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Section IV Activity 4

Operations with Scientific Notation

To add or subtract numbers written in scientific notation:

Check that the exponents of powers of 10 are the same.
If not, adjust the decimal numbers and the exponents.
Add or subtract the decimal numbers.
Write the sum or difference and the common power of 10 in scientific notation format.
Check whether the answer is in scientific notation.
If it is not, adjust the decimal and the exponent.

$(a \times 10^n) + (b \times 10^n) = (a + b) \times 10^n$
$(a \times 10^n) - (b \times 10^n) = (a - b) \times 10^n$

$(1.2 \times 10^5) - (9.5 \times 10^4)$
$(1.2 \times 10^5) - (0.95 \times 10^5)$ ← Adjust to get same exponent.
$(1.2 - 0.95) \times 10^5$
0.25×10^5 ← Not in scientific notation.
2.5×10^4 ← Answer

To multiply numbers written in scientific notation:

Multiply the decimal numbers.
Add the exponents in the powers of 10.
Check whether the answer is in scientific notation.
If it is not, adjust the decimal numbers and the exponent.

$(a \times 10^n) \times (b \times 10^m) = ab \times 10^{n+m}$

$(2.7 \times 10^8) \times (8.9 \times 10^4)$
$(2.7 \times 8.9) \times 10^{8+4}$
24.03×10^{12} ← Not in scientific notation.
2.403×10^{13} ← Answer

To divide numbers written in scientific notation:

Divide the decimal numbers.
Subtract the exponents in the powers of 10.
Check whether the answer is in scientific notation.
If it is not, adjust the decimal numbers and the exponent.

$(a \times 10^n) \div (b \times 10^m) = a \div b \times 10^{n-m}$

$(6.3 \times 10^7) \div (9.0 \times 10^3)$
$(6.3 \div 9.0) \times 10^{7-3}$
0.7×10^4 ← Not in scientific notation.
7.0×10^3 ← Answer

Compute. Write each answer in scientific notation.

1. $(2.21 \times 10^7) \div (3.4 \times 10^4)$ _____
2. $(5.8 \times 10^6) - (4.3 \times 10^6)$ _____
3. $(2.8 \times 10^3)(7.5 \times 10^4)$ _____

Answer Key

IV. Exponents and Scientific Notation

Activity 1: Integer Exponents

1. subtract; 27
2. add; 1/8
3. multiply; 729
4. add; 625
5. subtract; 1/16
6. multiply; 1,296

Activity 2: Scientific Notation with Positive Powers of 10

1. 3.46; 4; 3.46×10^4
2. 1.0502; 6; 1.0502×10^6
3. 1,057
4. 300,000,000
5. 524,000

Activity 3: Scientific Notation with Negative Powers of 10

1. 2.79×10^{-2}
2. 7.1×10^{-5}
3. 5.06×10^{-7}
4. 0.000235
5. 0.0065
6. 0.0000707

Activity 4: Operations with Scientific Notation

1. 6.5×10^2
2. 1.5×10^6
3. 2.1×10^8