eDay Lessons

Mathematics
Grade 8

Student Name: _____

Common Core State Standards- Expressions and Equations

Work with radicals and integer exponents.

3. Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. *For example, estimate the population of the United States as 3 × 108 and the population of the world as 7 × 109, and determine that the world population is more than 20 times larger.*
4. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

Scientific notation is a way of writing extremely small or large numbers in a way that is easier. A number is in scientific notation when it is written as the product of a number between one and ten multiplied by a power of ten. When a number greater than one is written in scientific notation, the exponent of the power of ten is positive. When a number smaller than one but greater than zero is written in scientific notation, the exponent of the power of ten is negative. For example: $0.00000046 = 4.6 \times 10^{-7}$ and $7{,}600{,}000 = 7.6 \times 10^{6}$.

An easy way to convert a number greater than one to scientific notation is to move the decimal point to the left until you get a number between one and ten. Each time you move the decimal point, you are dividing by ten. The number of places you move the decimal point represents the number of times you divide by ten (i.e., the power of ten you divided by). This is the exponent for the power of ten. Students should multiply the number in scientific notation to verify it is equivalent to the standard form.

For numbers between zero and one, the decimal point will be moved to the right to make a number between one and ten. Numbers between zero and one will have negative exponents.

Adding and Subtracting Numbers Written in Scientific Notation

When performing the operations of addition or subtraction using numbers written in scientific notation, the powers of ten have to be the same. This is similar to addition and subtraction of fractions when the fractions have to have common denominators. The decimal numbers are added or subtracted and the power of ten stays the same. If the answer is not written in scientific notation students are to re-write the answer in scientific notation.

Multiplying and Dividing Numbers Written in Scientific Notation

When performing the operation of multiplication with numbers written in scientific notation, multiply the decimal numbers and add the exponents on the powers of ten. If the answer is not written in scientific notation, then re-write the answer so it is in scientific notation.

Scientific Notation

Day 1

Complete this table.

Scientific Notation	Expanded Form	Standard Form
2.57×10^4		
	2.57×1000	
		257
	2.57×10	
2.57×10^0		
	2.57×0.1	
		0.0257
	2.57×0.001	
2.57×10^{-4}		

What do you notice about the numbers?

What conclusions can you make about numbers in scientific notation with positive exponents?

What conclusions can you make about numbers in scientific notation with negative exponents?

Practice Problems

Day 1

1. Which of the following is the correct way to write 0.00174 in scientific notation?

A. 1.74×10^{3}

B. 1.74×10^{-3}

C. 17.4×10^{-3}

D. 17.4×10^{3}

2. What is 124,000,000 written in scientific notation?

A. 124×10^{6}

B. 12.4×10^{7}

C. 1.24×10^{8}

D. 0.124×10^{9}

Short Answer

This headline appeared in a newspaper.

Every day 7% of Americans eat at Giantburger restaurants

Decide whether this headline is true using the following information.

- There are about 8×10^{3} Giantburger restaurants in America.
- Each restaurant serves on average 2.5×10^{3} people every day.
- There are about 3×10^{8} Americans.

Explain your reasons and show clearly how you figured it out.

Adding Numbers in Scientific Notation

Day 2

When adding with scientific notation, remember that the exponents must be the same in order to complete the problem.

Example 1:

$(3.4 \times 10^{-5}) + (6.2 \times 10^{-5}) = (3.4 + 6.2) \times 10^{-5} = 9.6 \times 10^{-5}$

*Reminder: When the powers are the same:
1. Add the numbers (3.4 + 6.2).
2. The power of ten stays the same (10^{-5}).

Example 2:

$(5.7 \times 10^{4}) + (8.1 \times 10^{7}) = (5.7 \times 10^{4}) + (8100 \times 10^{4})$
$= (5.7 + 8100) \times 10^{4}$
$= 8{,}105.7 \times 10^{4}$
$= 8.1057 \times 10^{7}$

*Reminder: When the powers are different:
1. Rewrite one of the numbers so the power of 10 is the same.
2. Add the numbers (5.7 + 8,100).
3. Be sure the answer is written in scientific notation.

Find the solution to the following problems.

1. $(2.3 \times 10^{3}) + (6.9 \times 10^{3})$

2. $(4.4 \times 10^{-6}) + (8.8 \times 10^{-6})$

3. $(4.81 \times 10^{3}) + (7.913 \times 10^{5})$

4. $(3.6 \times 10^{-2}) + (4.0 \times 10^{-1})$

5. $(2.154 \times 10^{-2}) + (3.5 \times 10^{2})$

6. $(7.5 \times 10^{4}) + (5.9 \times 10^{6})$

Subtracting Numbers in Scientific Notation

Day 2

Example 1:

$(3.2 \times 10^3) - (1.7 \times 10^3) = (3.2 - 1.7) \times 10^3 = 1.5 \times 10^3$

*Reminder: When the powers are the same:
1. Subtract the numbers (3.2 – 1.7).
2. The power of ten stays the same (10^3).

Example 2:

$(4.23 \times 10^5) - (3.5 \times 10^3) = (423 \times 10^3) - (3.5 \times 10^3)$
$= (423 - 3.5) \times 10^3$
$= 419.5 \times 10^3$
$= 4.195 \times 10^5$

*Reminder: When the powers are different:
1. Rewrite one of the numbers so the power of 10 is the same.
2. Subtract the numbers (423 – 3.5).
3. Be sure the answer is written in scientific notation.

Solve the following problems. All answers are to be written in scientific notation.

1. $(4.61 \times 10^4) - (2.75 \times 10^4)$

2. $(5.2 \times 10^{-3}) - (2.58 \times 10^{-3})$

3. $(6.1 \times 10^4) - (2.43 \times 10^2)$

4. $(8.32 \times 10^{-3}) - (5.9 \times 10^{-4})$

5. $(7.61 \times 10^6) - (2.87 \times 10^4)$

6. $(6.03 \times 10^{-2}) - (3.8 \times 10^{-3})$

Multiplying Numbers in Scientific Notation

Day 3

Reminder: Exponents do not need to be the same when multiplying with scientific notation. You can use the commutative property when multiplying.

1. Multiply the numbers between 1 and 10 together.
2. Multiply the powers of 10 by adding the exponents.
3. Make sure to put the product in scientific notation.

Example 1:

$(3 \times 10^4)\ (7.2 \times 10^6) = (3 \times 7.2)\ (10^4 \times 10^6) = 21.6 \times 10^{10} = 2.16 \times 10^{11}$

Example 2:

$(1.7 \times 10^{-6})\ (3.2 \times 10^{-2}) = (1.7 \times 3.2)\ (10^{-6} \times 10^{-2}) = 5.44 \times 10^{-8}$

Solve the problems below. Be sure to show your work.

1. $(2.4 \times 10^3)\ (1.5 \times 10^5)$

2. $(5.2 \times 10^{-6})\ (1.1 \times 10^{-3})$

3. $(6.8 \times 10^4)\ (4.2 \times 10^4)$

4. $(3.6 \times 10^{-3})\ (5.5 \times 10^{-5})$

5. $(7.42 \times 10^{12})\ (1.4 \times 10^{-3})$

6. $(2.13 \times 10^{-6})\ (9.01 \times 10^{-7})$

Dividing Numbers in Scientific Notation

Day 3

Reminder: Exponents do not need to be the same when dividing with scientific notation.

1. Divide the first two numbers.
2. Subtract the second exponent from the first exponent.
3. Be sure the quotient is in scientific notation.

Example:

$$(9.6 \times 10^4) \div (6.4 \times 10^2) = (9.6 \div 6.4) \times (10^4 \div 10^2) = 1.5 \times 10^2$$

Solve the following problems. Be sure to write the answer in scientific notation and show your work.

1. $(4.25 \times 10^6) \div (1.7 \times 10^3)$

2. $(3.6 \times 10^7) \div (1.2 \times 10^3)$

3. $(8.08 \times 10^{-10}) \div (4.0 \times 10^{-3})$

4. $(5.25 \times 10^8) \div (3.5 \times 10^3)$

5. $(4.5 \times 10^8) \div (9 \times 10^2)$

6. $(5.76 \times 10^{-7}) \div (3 \times 10^{-9})$