

Name: _____

Math 8



Unit 1 Part II

In this unit you will...

- ❖ Know and apply the properties of exponents to generate equivalent numerical expressions.
- ❖ Use numbers expressed in the form of a single digit times an integer power of ten to estimate of very large or very small quantities.
- ❖ Express how many times as much one integer is than the other.
- ❖ 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.



Lesson 6: Scientific Notation

Scientific notation is used to represent very large or very small numbers. The following table shows the first five positive and negative powers of 10.

Powers of 10

Positive	Negative
$10^1 = 10$	$10^{-1} = 0.1$
$10^2 = 100$	$10^{-2} = 0.01$
$10^3 = 1,000$	$10^{-3} = 0.001$
$10^4 = 10,000$	$10^{-4} = 0.0001$
$10^5 = 100,000$	$10^{-5} = 0.00001$
and so on...	and so on...

Changing from Standard Form to Scientific Notation

A number is written in scientific notation as the product of a number greater than or equal to 1 but less than 10, and a power of 10. Follow these steps to change a number from standard form to scientific notation.

Step 1: Move the decimal point to the left or right until you have a number greater than or equal to 1 but less than 10.

Step 2: Count the number of places you moved the decimal point to the left or right and use that number as the positive or negative power of 10.

Step 3: Multiply the decimal (from Step 1) by the power of 10 (from Step 2).

Example

Write 5,167,800 in scientific notation.

Move the decimal point 6 places to the left.

5.167800.

Since the decimal point moved 6 places to the left, multiply by 10^6 .

$5.1678 \cdot 10^6$

Therefore, $5,167,800 = 5.1678 \cdot 10^6$.

▶ Example

Write 0.00000364 in scientific notation.
Move the decimal point 6 places to the right.

0.000003.64

Since the decimal point moved 6 places to the right, multiply by 10^{-6} .
 $3.64 \cdot 10^{-6}$

Therefore, $0.00000364 = 3.64 \cdot 10^{-6}$.

Changing from Scientific Notation to Standard Form

To change a number written in scientific notation with a positive power of 10 to standard form, move the decimal point to the right. The power of ten shows the number of places the decimal point will move.

▶ Example

Write $4.91 \cdot 10^8$ in standard form.
Since the exponent is positive, move the decimal point 8 places to the right and add zeros.

$4.91 \cdot 10^8 = 4.91000000 = 491,000,000$

Therefore, $4.91 \cdot 10^8 = 491,000,000$.

To change a number written in scientific notation with a negative power of 10 to standard form, move the decimal point to the left. The power of ten shows the number of places the decimal point will be moved.

▶ Example

Write $3.135 \cdot 10^{-4}$ in standard form.
Since the exponent is negative, move the decimal point 4 places to the left and add zeros.

$3.135 \cdot 10^{-4} = 0.0003.135 = 0.0003135$

Therefore, $3.135 \cdot 10^{-4} = 0.0003135$.

TIP: Most calculators use 'E' to represent $\cdot 10^n$. For instance, the number 4,150,000 can be written in scientific notation as $4.15 \cdot 10^6$, and would appear in a calculator as 4.15E6.

Comparing numbers in scientific notation.

To compare two numbers in scientific notation:

First: compare the powers of 10

The _____ the exponent, the _____ the number.

$$3.2 \times 10^6 \quad \underline{\hspace{2cm}} \quad 3.2 \times 10^4$$

Second: If the powers of 10 are the same, then compare the decimal numbers.

The _____ the decimal, the _____ the number.

$$4.9 \times 10^3 \quad \underline{\hspace{2cm}} \quad 4.7 \times 10^3$$

Compare, Fill in with $<$, $>$, or $=$. **Circle the exponent first, then underline the decimals if necessary!**

1) 3.7×10^{15} _____ 3.7×10^{13}

2) 6.8×10^4 _____ 6.8×10^7

3) 2.3×10^8 _____ 5.2×10^8

Place in order from smallest to greatest. **Circle the exponent first, then underline the decimals if necessary!**

4) 3.2×10^8 , 4.3×10^6 , 7.8×10^{10} , 9.4×10^5 , 2.1×10^8

5) 5.7×10^{11} , 6.4×10^9 , 4.8×10^{10} , 3.8×10^{11} , 8.9×10^9

Write each number in scientific notation.

12) 930,000

16) 3,500

20) 62,000

13) 7,430,500

17) 40,800

21) 10,075

14) 7,895,000

18) 97,020,000

22) 174,000,000

15) 8,200,000

19) 48,000,000

23) 854,000,000

Write each number in standard form.

24) 5×10^2

27) 8.5×10^3

30) 1.25×10^2

25) 6.98×10^7

28) 9×10^5

31) 7.215×10^4

26) 5.8×10^3

29) 8.57×10^6

32) 2.2×10^7

Compare, Fill in with $<$, $>$, or $=$ (remember to check the exponent first)

33) 2.9×10^{12} _____ 2.9×10^{13}

36) 4.2×10^8 _____ 2.1×10^9

34) 3.9×10^{12} _____ 5.7×10^{12}

37) 8.4×10^{11} _____ 8.6×10^{11}

35) 4.9×10^{13} _____ 5.6×10^{12}

38) 8.2×10^7 _____ 8.9×10^7

Put in order from small to large.

39) 2.9×10^{12} 2.9×10^{13} 3.4×10^{10} 2.9×10^{10} 7.3×10^{12}

40) 5.8×10^5 7.3×10^8 4.3×10^2 4.7×10^2 2.9×10^5

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Writing in Scientific Notation

Write each number in scientific notation.

1) 0.000006

2) 5400000

3) 60

4) 0.009

5) 6.7

6) 0.0000002

7) 2000000

8) 71×10^3

9) 48900

10) 0.0000009

11) 0.63×10^1

12) 33×10^{-3}

13) 0.000216

14) 0.0042

15) 0.15×10^{-2}

16) 4.8

Write each number in standard notation.

17) 0.9×10^{-1}

18) 2×10^{-1}

19) 2×10^5

20) 804×10^2

21) 2.66×10^4

22) 1.5×10^{-2}

23) 7.75×10^{-1}

24) 8.3×10^7

25) 9.5×10^7

26) 1.71×10^7

27) 0.9×10^{-3}

28) 38×10^2

29) 7.5×10^{-5}

30) 4×10^0

31) 8.4×10^5

32) 4×10^{-5}

SCIENTIFIC NOTATION--Small numbers

In scientific notation, there are always _____ factors. The first factor is a decimal number greater than or equal to one and less than ten. The second factor is the base number 10 to an negative exponent.

$$1.576 \times 10^{-6}$$

$$3.08 \times 10^{-5}$$

$$1.576 \times .000001 =$$

$$3.08 \times .00001 =$$

LESSON 0.000000000043 _____ x 10

size in meters

human hair width

0.000200 m



scientific notation _____

ebola virus

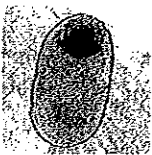
0.000000211 m



scientific notation _____

E. coli bacteria

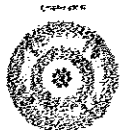
0.000002 m



scientific notation _____

carbon atom

0.0000000022 m



scientific notation _____

SCIENTIFIC NOTATION-Large numbers

Scientific notation is a short form to write **very large** and **very small** numbers.

Large numbers are found in the science and the medical field..

In scientific notation, there are always _____ factors.

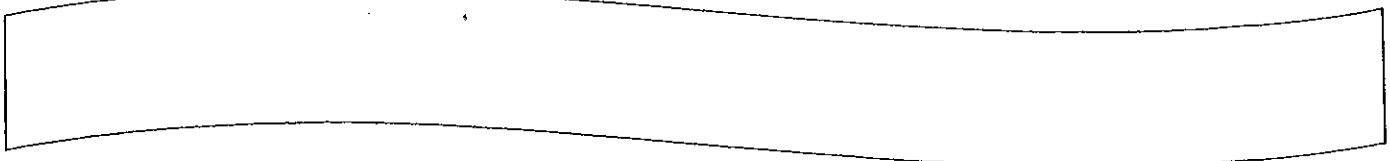
The first factor is a decimal number greater than or equal to one and less than ten.

The second factor is the base number 10 to an exponent.

$$1.576 \times 10^6$$

$$3.08 \times 10^5$$

LESSON $630,000,000 = \underline{\hspace{2cm}} \times 10$



Distance from earth

Little Dipper- Polaris

4,080,000,000,000,000 miles

scientific notation _____

Big Dipper- Dubhe

_____ miles

scientific notation _____

Orion- Betelgeuse

_____ miles

scientific notation _____

Sun

_____ miles

scientific notation _____

Name _____ small numbers scientific notation

Write each number in standard form:

- | | |
|---------------------------------|--------------------------------|
| 1) 0.787×10^{-4} _____ | 6) 6×10^{-5} _____ |
| 2) 3.56×10^4 _____ | 7) 56.8×10^3 _____ |
| 3) 3.2×10^{-2} _____ | 8) 2.96×10^{-6} _____ |
| 4) 0.3×10^5 _____ | 9) 0.956×10^7 _____ |
| 5) 9.014×10^{-3} _____ | 10) 4.1×10^{-8} _____ |

Write each number or decimal in scientific notation:

- | | | |
|-----------------|---------------------|--------------------|
| 11) 34,000,000 | 12) 504,000,000,000 | 13) 126,000 |
| 14) 809,500,000 | 15) 76,000,000 | 16) 58,000,000,000 |
| 17) 0.00000059 | 18) 0.000000000308 | 19) 0.00000126 |
| 20) 0.00003 | 21) 0.03509 | 22) 0.00000003892 |

Put in order from smallest to largest.

23) 1.3×10^9 , 2.86×10^7 , 7.6×10^8 , 4×10^7 , 4.42×10^9

24) _____

25) Which number is the largest?

- a) 9.06×10^7
- b) 9.059×10^7
- c) 10.4×10^6
- d) 8×10^8

26) Which number is the largest?

- a) 4.7×10^{-3}
- b) 4×10^{-4}
- c) 7×10^{-3}
- d) 4.7×10^{-3}

27) Which number is the smallest?

- a) 4.56×10^4
- b) 4.65×10^4
- c) 4.5×10^5
- d) 4.566×10^4

28) Which number is the smallest?

- a) 1.2×10^{-3}
- b) 1.2×10^{-2}
- c) 2.1×10^{-2}
- d) 2.1×10^{-3}

Fill in the blank with greater than (>) or less than (<).

29) 5.23×10^4 _____ 5.2×10^4

30) 7.09×10^5 _____ 8.73×10^3

31) 6.36×10^6 _____ 6.4×10^6

32) 2.77×10^{-8} _____ 2.689×10^{-8}

33) 6.5×10^{-6} _____ 5.6×10^{-5}

34) 3.8×10^{-4} _____ 3.45×10^{-7}

Write the standard numeral:

35) twenty-six and forty-eight thousandths _____

36) three thousand nine hundred forty-one _____

37) two hundred seven ten-thousandths _____

38) $(6 \times 10^2) + (8 \times 10^1) + (9 \times 10^{-1}) + (3 \times 10^{-3}) + (4 \times 10^{-4})$ _____

Put in order from small to large:

39) $1.\overline{12}$, 1.15, $1.\overline{2}$, 1.123, $1.2\overline{3}$, $1.\overline{15}$ _____

40) 0.51, $\frac{3}{5}$, $\frac{11}{20}$, $\frac{2}{3}$, 0.62 _____

Multiplying Numbers in Scientific Notation

When multiplying two numbers in scientific notation, multiply their coefficients and add their exponents. You may need to convert the product into scientific notation if the coefficient is smaller than 1, or 10 or greater.

▶ Example

Multiply: $(5.1 \cdot 10^4) \times (2.3 \cdot 10^6)$

Multiply the coefficients: $5.1 \times 2.3 = 11.73$

Add the powers of 10: $4 + 6 = 10$

Check to be sure the product is in scientific notation.

$$\begin{aligned} (5.1 \cdot 10^4) \times (2.3 \cdot 10^6) &= 11.73 \cdot 10^{10} \\ &= 1.173 \cdot 10^{11} \end{aligned}$$

Therefore, $(5.1 \cdot 10^4) \times (2.3 \cdot 10^6) = 1.173 \cdot 10^{11}$

Dividing Numbers in Scientific Notation

When dividing two numbers in scientific notation, divide their coefficients and subtract their exponents. You may need to convert the quotient into scientific notation if the coefficient is smaller than 1, or greater than 10.

▶ Example

Divide: $\frac{(3.9 \cdot 10^8)}{(6.5 \cdot 10^{-4})}$

Divide the coefficients: $\frac{3.9}{6.5} = 0.6$

Subtract the powers of 10: $8 - (-4) = 12$

Check to be sure the quotient is in scientific notation.

$$\begin{aligned} \frac{(3.9 \cdot 10^8)}{(6.5 \cdot 10^{-4})} &= 0.6 \cdot 10^{12} \\ &= 6.0 \cdot 10^{11} \end{aligned}$$

Therefore, $\frac{(3.9 \cdot 10^8)}{(6.5 \cdot 10^{-4})} = 6.0 \cdot 10^{11}$

Scientific Notation**Write each number in scientific notation.**

1) 0.000000786

2) 3940

3) 4.7

4) 1260000

5) 0.06

6) 175

Write each number in standard notation.

7) 6.17×10^3

8) 7×10^4

9) 7.31×10^6

10) 5.4×10^{-8}

11) 6.7×10^{-3}

12) 9.59×10^2

Write each number in scientific notation.

13) 0.2×10^6

14) 30×10^{-8}

15) 88.4×10^3

16) 28.8×10^{-9}

Simplify. Write each answer in scientific notation. Show work on page 12 A.

17) $(5.4 \times 10^{-1})(7 \times 10^0)$

18) $(5 \times 10^3)(3.5 \times 10^{-1})$

19) $(6 \times 10^6)(4 \times 10^{-1})$

20) $(4.11 \times 10^5)(8.65 \times 10^{-5})$

21) $(7.68 \times 10^2)(9 \times 10^6)$

22) $(8.31 \times 10^{-3})(6.6 \times 10^{-6})$

(17)

(18)

(

(19)

(20)

(

(21)

(22)

(

(

(

(

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Operations With Scientific Notation

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Simplify. Write each answer in scientific notation.

You may use a calculator.

1) $(1.08 \times 10^{-3})(9.3 \times 10^{-3})$

2) $(2 \times 10^{-4})(8.1 \times 10^{-1})$

3) $(2.32 \times 10^{-6})(4 \times 10^{-5})$

4) $(3.48 \times 10^3)(9.8 \times 10^4)$

5) $(7.1 \times 10^{-5})(6.7 \times 10^{-6})$

6) $(6 \times 10^3)(9.91 \times 10^0)$

7) $\frac{7.1 \times 10^6}{8.2 \times 10^1}$

8) $\frac{5.4 \times 10^{-1}}{3.4 \times 10^1}$

9) $\frac{4 \times 10^4}{3.63 \times 10^{-4}}$

10) $\frac{9 \times 10^{-5}}{9.24 \times 10^{-6}}$

11) $\frac{8.42 \times 10^3}{5 \times 10^2}$

12) $\frac{8.9 \times 10^6}{8.4 \times 10^6}$

13) $(8.9 \times 10^5)^4$

14) $(4 \times 10^{-5})^{-6}$


Practice

Express each product in scientific notation.

1. $(4 \times 10^3)(2 \times 10^2)$

2. $(1 \times 10^5)(7 \times 10^9)$

3. $(5 \times 10^3)(3 \times 10^2)$

HINT
 If the product of the coefficients is 10 or greater, what do you need to do to change it to scientific notation?

4. $(5.5 \times 10^4)(3 \times 10^{-2})$

5. $(3.2 \times 10^{-1})(4.5 \times 10^{-6})$

6. $(8.8 \times 10^{-5})(9.9 \times 10^6)$

Express each product in scientific notation and in standard form.

7. $(2 \times 10^4)(8 \times 10^{-3})$

8. $(4 \times 10^{-7})(7.5 \times 10^5)$

9. $(6.5 \times 10^8)(4.4 \times 10^{-6})$

Express each quotient in scientific notation.

10. $\frac{8 \times 10^8}{5 \times 10^5}$

11. $(5 \times 10^{-5}) \div (4 \times 10^6)$

12. $(1.2 \times 10^5) \div (5 \times 10^{-2})$

Express each quotient in scientific notation and in standard form.

13. $(9 \times 10^{-4}) \div (3 \times 10^{-5})$

14. $\frac{3.6 \times 10^8}{2.4 \times 10^6}$

15. $(8.4 \times 10^3) \div (2 \times 10^{-2})$

7. Find the product.

$$(1.9 \times 10^3)(4.5 \times 10^2)$$

- A. 8.55×10^1
- B. 8.55×10^3
- C. 8.55×10^5
- D. 8.55×10^6

8. Find the quotient.

$$\frac{2.89 \times 10^2}{3.4 \times 10^{-2}}$$

- A. 0.85×10^0
- B. 0.85×10^4
- C. 8.5×10^3
- D. 8.5×10^5

9. Mohammed copied this problem into his notebook.

$$(3.4 \times 10^5)(3.8 \times 10^{-9})$$

A. Use the associative and commutative properties to rearrange the factors.

*Do not use calculator.
Show all work in the
space provided.*

B. Find the product. Write the product in standard form.

Adding and Subtracting in Scientific Notation

1. $(3.45 \times 10^3) + (4.65 \times 10^4) =$

2. $(5.11 \times 10^2) - (2.11 \times 10^{-2}) =$

3. $(8.9 \times 10^2) + (4.67 \times 10^3) =$

4. $(9.45 \times 10^{-2}) - (2.1 \times 10^{-1}) =$

5. $(7.45 \times 10^{-5}) + (2.6 \times 10^{-8}) =$

MATH HANDBOOK TRANSPARENCY WORKSHEET**2****Operations with Scientific Notation**Use with Appendix B,
Operations with
Scientific NotationDo Not use calculator. Show all work below.

1. Perform the following operations and express the answers in scientific notation.

a. $(1.2 \times 10^5) + (5.35 \times 10^6)$

Ⓐ

b. $(6.91 \times 10^{-2}) + (2.4 \times 10^{-3})$

c. $(9.70 \times 10^6) + (8.3 \times 10^5)$

d. $(3.67 \times 10^2) - (1.6 \times 10^1)$

e. $(8.41 \times 10^{-5}) - (7.9 \times 10^{-6})$

f. $(1.33 \times 10^5) - (4.9 \times 10^4)$

Ⓑ

2. Perform the following operations and express the answers in scientific notation.

a. $(4.3 \times 10^8) \times (2.0 \times 10^6)$

You may use
a calculator.

b. $(6.0 \times 10^3) \times (1.5 \times 10^{-2})$

c. $(1.5 \times 10^{-2}) \times (8.0 \times 10^{-1})$

d. $\frac{7.8 \times 10^3}{1.2 \times 10^4}$

e. $\frac{8.1 \times 10^{-2}}{9.0 \times 10^2}$

f. $\frac{6.48 \times 10^5}{(2.4 \times 10^4)(1.8 \times 10^{-2})}$

Using Scientific Notation to Estimate

You can use scientific notation to estimate certain measurements and how much bigger one measurement is in terms of another.

Example

How many times larger is the circumference of the Earth than the width of the United States?

First you need to estimate the width of the United States, which is about $3.0 \cdot 10^3$ miles. The circumference of the Earth is about $3.0 \cdot 10^5$ miles. To find how many times larger, divide the circumference of the Earth by the width of the United States.

$$\frac{3.0 \cdot 10^5}{3.0 \cdot 10^3} = 1 \cdot 10^{5-3} = 1 \cdot 10^2 = 100$$

The circumference of the Earth is about 100 times the width of the United States.

Example 3

California, the most populous state, has approximately 4×10^7 people living in it.

The population of the entire United States is approximately 3×10^8 people. About how many times greater is the population of the United States than the population of California?

Strategy Decide if you should multiply or divide. Then solve the problem.

Step 1 Decide on which operation to use.

To find how many times greater, divide 3×10^8 by 4×10^7 .

Step 2 Divide the first factors and then divide the power-of-10 factors.

$$\frac{3}{4} = 0.75 \qquad \frac{10^8}{10^7} = 10^{8-7} = 10^1 = 10$$

$$\text{So, } \frac{3 \times 10^8}{4 \times 10^7} = 0.75 \times 10 = 7.5$$

Solution The population of the United States is $7\frac{1}{2}$ times the population of California.



Coached Example

A computer was used to draw a rectangle with an area of 0.000007 square meter. Would it be better to measure the area in square meters or square millimeters? Use the conversion below to help determine your answer.

$$1 \text{ square meter (m}^2\text{)} = 1 \times 10^6 \text{ square millimeters (mm}^2\text{)}$$

Rewrite 0.000007 in scientific notation. 0.000007

The decimal point was moved _____ places to the right.

The original number is less than _____, so the exponent will be negative.

$$0.000007 = 7 \times 10^{-\text{---}}$$

Multiply to convert that number of square meters to square millimeters:

$$(7 \times 10^{-\text{---}})(1 \times 10^6)$$

Multiply the first factors: $7 \times 1 = \text{_____}$

Multiply the power-of-10 factors: _____

The area is _____ square millimeters.

It is better to measure the area in square _____ because it is better to measure a small area using a _____ unit.

Directions: For questions 13 through 18, compute. Leave your answer in scientific notation.

13. $\frac{(4.8 \cdot 10^2)}{(2.4 \cdot 10^6)} =$ _____

14. $(6.2 \cdot 10^{-8}) \cdot (-3.17 \cdot 10^7) =$ _____

15. $\frac{(1.24 \cdot 10^9)}{(3.1 \cdot 10^7)} =$ _____

16. $(2.476 \cdot 10^{11}) \cdot (6.58 \cdot 10^5) =$ _____

17. $\frac{(5.6 \cdot 10^{-11})}{(2.24 \cdot 10^{-6})} =$ _____

18. $(9.18 \cdot 10^{11}) \cdot (2.2 \cdot 10^{-1}) =$ _____

Directions: For questions 19 through 21, solve the problems by computing with scientific notation.

19. The speed of light is about $3 \cdot 10^8$ meters per second. About how far can light travel in 2 hours? (Hint: Convert time to seconds.)

20. There are 39.37 inches in 1 meter. How many inches are in $8 \cdot 10^4$ meters?

21. A liter of water has about $3.3 \cdot 10^{22}$ molecules in it. About how many molecules would there be in 3,500 liters of water?

Express each product or quotient in scientific notation. Then check your answer with your calculator, explaining the calculator display.

16. $(2.5 \times 10^8)(1.2 \times 10^7)$

17. $(9.1 \times 10^{-3})(1.9 \times 10^{-8})$

18. $(8.25 \times 10^8) \div (1.5 \times 10^{-2})$

19. $(1.1 \times 10^{-5}) \div (5.5 \times 10^{11})$

Choose the best answer.

20. Momentum can be calculated by multiplying mass and speed. Which is the momentum of an object with a mass of 3.3×10^4 kg traveling at a speed of 3.2×10^3 m/s?

- A. 1.056×10^7 kg · m/s
- B. 1.56×10^7 kg · m/s
- C. 1.056×10^8 kg · m/s
- D. 1.56×10^8 kg · m/s

21. A computer can perform 4.5×10^2 instructions in a second. Which expression shows how long it would take to perform 1.8×10^{10} instructions?

- A. 4×10^5 seconds
- B. 4×10^7 seconds
- C. 4×10^8 seconds
- D. 8.1×10^{12} seconds

22. **WRITE MATH** Salvador estimates that there are about 1.5×10^4 grains of sand in a cubic centimeter of sand. He then estimates that there are about 7×10^{17} cubic centimeters of beach sand in the world. Explain the steps you would take to find how many grains of beach sand there are in the world.

23. **DEMONSTRATE** Experiment with your calculator to see when very small or very large numbers are converted to scientific notation. Why do you think the calculator is programmed to change the format for numbers at that size?

Show your work.

d. _____

e. _____

f. _____

5. $593,000 + (7.89 \times 10^6)$

$593,000 + (7.89 \times 10^6)$
 $= (5.93 \times 10^5) + (7.89 \times 10^6)$
 $= (0.593 \times 10^6) + (7.89 \times 10^6)$
 $= (0.593 + 7.89) \times 10^6$
 $= 8.483 \times 10^6$

Rewrite 593,000 in scientific notation.
Write 5.93×10^5 as 0.593×10^6
Distributive Property
Add 0.593 and 7.89.

Got It? Do these problems to find out.

- d. $(8.41 \times 10^3) + (9.71 \times 10^4)$
- e. $(1.263 \times 10^9) - (1.525 \times 10^7)$
- f. $(6.3 \times 10^5) + 2,700,000$



Guided Practice



Evaluate each expression. Express the result in scientific notation. (Examples 1 and 2)

1. $(2.6 \times 10^5)(1.9 \times 10^2) =$ _____

2. $\frac{8.37 \times 10^8}{2.7 \times 10^3} =$ _____

Show your work.

3. In 2005, 8.1×10^{10} text messages were sent in the United States. In 2010, the number of annual text messages had risen to 1,810,000,000,000. About how many times as great was the number of text messages in 2010 than 2005? (Example 2)

Evaluate each expression. Express the result in scientific notation. (Examples 3-5)

4. $(8.9 \times 10^9) + (4.2 \times 10^6) =$ _____

5. $(9.64 \times 10^8) - (5.29 \times 10^6) =$ _____

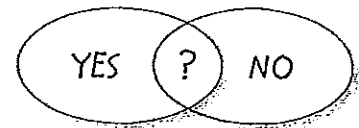
6. $(1.35 \times 10^6) - (117,000) =$ _____

7. $5,400 + (6.8 \times 10^5) =$ _____

8. **Building on the Essential Question** How does scientific notation make it easier to perform computations with very large or very small numbers? _____

Rate Yourself!

Are you ready to move on?
Shade the section that applies.



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Independent Practice

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eHelp

Evaluate each expression. Express the result in scientific notation. (Examples 1 and 2)

1. $(3.9 \times 10^2)(2.3 \times 10^6) =$ _____

2. $(4.18 \times 10^{-4})(9 \times 10^{-4}) =$ _____

Show your work

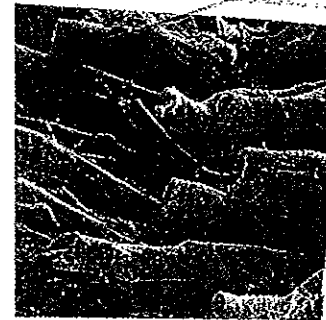
3. $(9.75 \times 10^3)(8.4 \times 10^{-6}) =$ _____

4. $\frac{9.45 \times 10^{10}}{1.5 \times 10^6} =$ _____

5. $\frac{1.14 \times 10^6}{4.8 \times 10^{-6}} =$ _____

6. $\frac{9 \times 10^{-11}}{2.4 \times 10^8} =$ _____

7. **STEM** Neurons are cells in the nervous system that process and transmit information. An average neuron is about 5×10^{-6} meter in diameter. A standard table tennis ball is 0.04 meter in diameter. About how many times as great is the diameter of a ball than a neuron? (Example 2)
- _____
- _____



Evaluate each expression. Express the result in scientific notation. (Examples 3–5)

8. $(9.5 \times 10^{11}) + (6.3 \times 10^9) =$ _____

9. $(1.03 \times 10^9) - (4.7 \times 10^7) =$ _____

10. $(1.357 \times 10^9) + 590,000 =$ _____

11. $87,100 - (6.34 \times 10^4) =$ _____

12. **CCSS Persevere with Problems** Central Park in New York City is rectangular in shape and measures approximately 1.37×10^4 feet by 2.64×10^2 feet. If one acre is equal to 4.356×10^4 square feet, how many acres does Central Park cover? Round to the nearest hundredth.

H.O.T. Problems Higher Order Thinking

13. **CCSS Find the Error** Enrique is finding $\frac{6.63 \times 10^{-6}}{5.1 \times 10^{-2}}$. Circle his mistake and correct it.

.....

$$\frac{6.63 \times 10^{-6}}{5.1 \times 10^{-2}} = \left(\frac{6.63}{5.1}\right) \left(\frac{10^{-6}}{10^{-2}}\right)$$

$$= 1.3 \times 10^{-6-2}$$

$$= 1.3 \times 10^{-8}$$



14. **CCSS Which One Doesn't Belong?** Identify the expression that does not belong with the other three. Explain your reasoning.

14.28×10^9
 $(3.4 \times 10^6)(4.2 \times 10^3)$
 1.4×10^9
 $(3.4)(4.2) \times 10^{(6+3)}$

.....

15. **CCSS Persevere with Problems** A googol is the number 1 followed by 100 zeros. How many times greater is a googol of meters than a nanometer?

.....

Standardized Test Practice

16. A music download Web site announced that over 4×10^9 songs were downloaded by 5×10^7 registered users. What is the average number of downloads per user?
- (A) 8×10^{-1}
 (B) 1.25×10^{-2}
 (C) 1.25×10^2
 (D) 8×10^1

Extra Practice

Evaluate each expression. Express the result in scientific notation.

17. $(3.7 \times 10^{-2})(1.2 \times 10^3) = 444 \times 10^1$

$(3.7 \times 10^{-2})(1.2 \times 10^3) = (3.7 \times 1.2) \times (10^{-2} \times 10^3)$
 $= 4.44 \times 10^{-2+3}$
 $= 4.44 \times 10^1$

Homework Help

18. $\frac{4.64 \times 10^{-4}}{2.9 \times 10^{-6}} = 1.6 \times 10^2$

$\frac{4.64 \times 10^{-4}}{2.9 \times 10^{-6}} = \frac{4.64}{2.9} \times \frac{10^{-4}}{10^{-6}}$
 $= 1.6 \times 10^{-4 - (-6)}$
 $= 1.6 \times 10^2$

19. $\frac{3.24 \times 10^{-4}}{8.1 \times 10^{-7}} =$ _____

20. $(7.3 \times 10^5) + 2,400,000 =$ _____

21. $(8.64 \times 10^6) + (1.334 \times 10^{10}) =$ _____

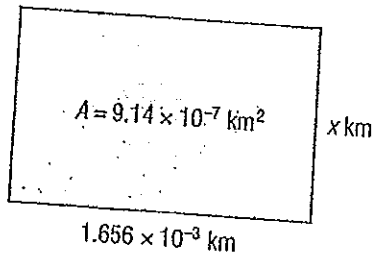
22. $(1.21 \times 10^5) - 9,500 =$ _____

23. **Persevere with Problems** A circular swimming pool holds 1.22×10^6 cubic inches of water. It is being filled at a rate of 1.5×10^3 cubic inches per minute. How many hours will it take to fill the swimming pool? _____

24. **Financial Literacy** In 2010, the national debt of the United States was about 14 trillion dollars. In 2003 it was about 7×10^{12} dollars. About how many times larger was the national debt in 2010 than in 2003? _____

Standardized Test Practice

25. The rectangle has an area of 9.14×10^{-7} square kilometers.



What is the approximate length of the missing side?

- (A) 2.74×10^{-6}
- (B) 5.52×10^{-4}
- (C) 1.656×10^{-3}
- (D) 1.51×10^{11}

26. There are approximately 45 hundred species of mammals on Earth and 2.8×10^4 species of fish. What is the difference in the number of species?

- (F) 6.2×10^0
- (G) 2.35×10^4
- (H) 1.6×10^{-1}
- (I) 3.25×10^4

27. Alaska is the largest state in the United States with an area of about 1.5×10^6 square kilometers. Rhode Island is the smallest state with an area of about 2,700 square kilometers. About how many times larger is Alaska than Rhode Island?

- (A) 5
- (B) 50
- (C) 500
- (D) 5,000

Common Core Review

28. A cube measures 6.6 inches on each side. 6.G.2

a. Find the area of one face of the cube.

b. Find the volume of the cube.

29. Complete the table shown. 6.EE.1

x	x^2	x^3	x	x^2	x^3
1			7		
2			8		
3			9		
4			10		
5			11		
6			12		

Name: _____ Period: _____ Unit 1 Quiz Review

Write each number in scientific notation.

1. 56.8×10^3

3. 809,500,000

2. 0.00000059

4. 0.956×10^7

Write each number in standard form.

5. 1.576×10^{-6}

7. 3.56×10^4

6. 0.3×10^5

8. 6×10^{-5}

Evaluate the expression and write your answer in scientific notation.

9. $(5.4 \times 10^{-1}) \times (7 \times 10^0)$

12. $\frac{7.26 \times 10^4}{3.63 \times 10^{-4}}$

10. $(8.31 \times 10^{-3}) \times (6.6 \times 10^{-6})$

13. $(7.3 \times 10^5) + 2,400,000$

11. $\frac{8.42 \times 10^3}{5 \times 10^2}$

14. $(8.64 \times 10^6) + (1.334 \times 10^{10})$

$$(1.21 \times 10^5) - 9,500$$

$$16. (9.64 \times 10^8) - (5.29 \times 10^6)$$

Solve the word problems.

17. The width of the United States is about 3.0×10^3 miles and the circumference of the Earth is about 3.0×10^5 miles. How many times larger is the circumference of the Earth than the width of the United States?

The population of the entire United States is approximately 3×10^8 people and California has a population of approximately 4×10^7 people. How many times greater is the population of the United States than California?

19. Neptune is approximately 4×10^4 kilometers in diameter. Mars is approximately 8×10^3 kilometers in diameter. How many times larger is the diameter of Neptune than the diameter of Mars?

