

M8: Unit 1: Day 10

Warm-Up: find on page 55 of text

link



7 The areas of the world's oceans are listed in the table. Order the oceans according to their area from least to greatest. (Example 5)

29600000

Arctic, Southern, Indian, Atlantic, Pacific

World's Oceans	
Ocean	Area (mi ²)
Atlantic	2.96×10^7
Arctic	5.43×10^6
Indian	2.65×10^7
Pacific	6×10^7
Southern	7.85×10^6

1. Fill in the top row of the place value chart below with the name of the place value that each number digit given refers to

thousand millions	hundred millions	ten millions	millions	hundred-thousands	ten-thousands	thousands	hundreds	tens	ones	.	tenths	hundredths	thousandths	ten-thousandths	hundred-thousandths
1	5	8	8	4	6	3	1	0	8	.	7	3	4	1	1
10^9	10^8	10^7	10^6	10^5	10^4	10^3	10^2	10^1	10^0	.	10^{-1}	10^{-2}	10^{-3}	10^{-4}	

2. Fill in the power of ten in the last row in the table above that corresponds with each place value. Some of them have been filled in for you.

Write each number in standard form. (Examples 1 and 2)

1. $3.16 \times 10^3 = \underline{3,160}$ $1.1 \times 10^{-4} = \underline{0.00011}$ $2.52 \times 10^{-5} = \underline{.0000252}$

Show your work.

Write each number in scientific notation. (Examples 3 and 4)

4. $43,000 = \underline{4.3 \times 10^4}$

5. $0.0072 = \underline{7.2 \times 10^{-3}}$

6. $0.0000901 = \underline{9.01 \times 10^{-5}}$

Fill in each with $<$, $>$, or $=$ to make a true statement.

10. $678,000$ 6.78×10^6

6.25×10^3 6.3×10^3

We are going to use what we already know to multiply and divide numbers expressed in scientific notation.

Review: Commutative Property

Numbers can be added in any order.

For Example:

$$3 + 4 + 7$$

$$4 + 7 + 3$$

$$7 + 4 + 3$$

Numbers can be multiplied in any order.

For Example:

$$5 \cdot 6 \cdot 8$$

$$8 \cdot 5 \cdot 6$$

$$6 \cdot 8 \cdot 5$$

Review: Exponent Rules

Rule name	Rule	Example
Product rules	* $a^n \cdot a^m = a^{n+m}$	$2^3 \cdot 2^4 = 2^{3+4} = 128$
	$a^n \cdot b^n = (a \cdot b)^n$	$3^2 \cdot 4^2 = (3 \cdot 4)^2 = 144$
Quotient rules	* $a^n / a^m = a^{n-m}$	$2^5 / 2^3 = 2^{5-3} = 4$
	$a^n / b^n = (a / b)^n$	$4^3 / 2^3 = (4/2)^3 = 8$

$$* (a^n)^m = a^{(n \cdot m)}$$

Page 60:

Evaluate $(7.2 \times 10^3)(1.6 \times 10^4)$. Express the result in scientific notation.

$$\begin{aligned}
 (7.2 \times 10^3)(1.6 \times 10^4) &= (7.2 \times 1.6)(10^3 \times 10^4) \\
 &= (11.52)(10^3 \times 10^4) \\
 &= 11.52 \times 10^{3+4} \\
 &= 11.52 \times 10^7 \\
 &= 1.152 \times 10^8
 \end{aligned}$$

Commutative and Associative Properties

Multiply 7.2 by 1.6.

Product of Powers

Add the exponents.

Write in scientific notation.

Got It? Do these problems to find out.

a. $(8.4 \times 10^2)(2.5 \times 10^6)$

$$\begin{aligned}
 &(8.4)(2.5)(10^2)(10^6) \\
 &\rightarrow 21 \times 10^8 \\
 &\rightarrow 2.1 \times 10^9
 \end{aligned}$$

b. $(2.63 \times 10^4)(1.2 \times 10^{-3})$

$$\begin{aligned}
 &(2.63 \times 1.2)(10^4 \times 10^{-3}) \\
 &(3.156)(10^1) \\
 &3.156 \times 10^1
 \end{aligned}$$

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In 2010, the world population was about 6,860,000,000. The population of the United States was about 3×10^8 . About how many times larger is the world population than the population of the United States?

Estimate the population of the world and write in scientific notation.

$$6,860,000,000 \approx 7,000,000,000 \text{ or } 7 \times 10^9$$

$$\text{Find } \frac{7 \times 10^9}{3 \times 10^8}$$

$$\frac{7 \times 10^9}{3 \times 10^8} = \left(\frac{7}{3}\right) \left(\frac{10^9}{10^8}\right)$$

Associative Property

$$\approx 2.3 \times \left(\frac{10^9}{10^8}\right)$$

Divide 7 by 3. Round to the nearest tenth.

$$\approx 2.3 \times 10^{9-8}$$

Quotient of Powers

$$\approx 2.3 \times 10^1$$

Subtract the exponents.

So, the population of the world is about 23 times larger than the population of the United States.

Page 61: **Got It?** Do this problem to find out.

- c. The surface area of Lake Superior, the largest of the Great Lakes, is 8×10^4 square kilometers. The surface area of the smallest Great Lake, Ontario, is 18,160 square kilometers. About how many times as great is the area covered by Lake Superior than Lake Ontario?

$$4.40$$

$$\approx 4.4 \times 1$$

$$4.4$$

$$\left(\frac{8 \times 10^4}{1.816 \times 10^4} \right)$$

$$1.8160$$

Practice Page 62:

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

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

how
our
work. →

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

$$\left(\frac{8.37}{2.7}\right) \times \left(\frac{10^8}{10^3}\right)$$
$$3.1 \times 10^5$$

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)

Practice Page 63:

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

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)

Adding and Subtracting numbers expressed in Scientific Notation:

3. $(6.89 \times 10^4) + (9.24 \times 10^5)$

$(6.89 \times 10^4) + (9.24 \times 10^5)$

$= (6.89 \times 10^4) + (92.4 \times 10^4)$

$= (6.89 + 92.4) \times 10^4$

$= 99.29 \times 10^4$

$= 9.929 \times 10^5$

Write 9.24×10^5 as 92.4×10^4 .

Distributive Property

Add 6.89 and 92.4.

Rewrite in scientific notation.

4. $(7.83 \times 10^8) - 11,610,000$

$(7.83 \times 10^8) - (1.161 \times 10^7)$

$(7.83 \times 10^8) - (1.161 \times 10^7)$

$= (78.3 \times 10^7) - (1.161 \times 10^7)$

$= (78.3 - 1.161) \times 10^7$

$= 77.139 \times 10^7$

$= 7.7139 \times 10^8$

Rewrite 11,610,000 in scientific notation.

Write 7.83×10^8 as 78.3×10^7 .

Distributive Property

Subtract 1.161 from 78.3.

Rewrite in scientific notation.

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