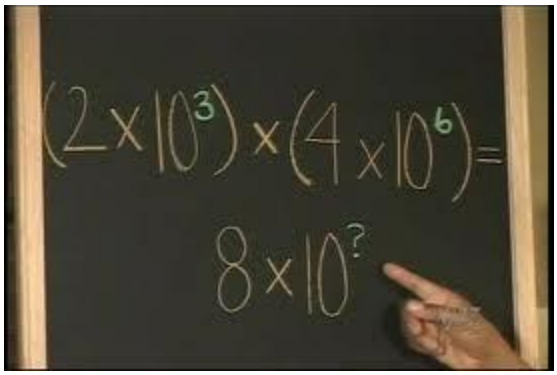
Scientific Notation

65000000.

7 6 5 4 3 2 1

↓

6.5×10^{7}



****The purpose of scientific notation is _____

_____

Examples vs. Counterexamples

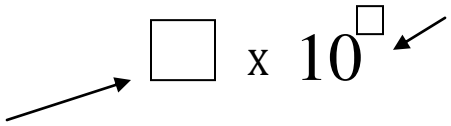
Examples of Scientific Notation	Counter-Examples of Scientific Notation
8.5×10^{6} 9.2×10^{-5} 5×10^{15} 7.265×10^{-4}	8.5 9.4^{6} 22.9 14
Your Conclusion:	

Examples of Scientific Notation	Counter-Examples of Scientific Notation
8.5×10^{6} 9.2×10^{-5} 5×10^{15} 7.265×10^{-4}	81.5×10^{-3} 97.4×10^{6} 22.9×10^{-7} 14×10^{17}
Your Conclusion:	

Examples of Scientific Notation	Counter-Examples of Scientific Notation
$8.52\times10^{6}=8{,}520{,}000$ $9.20\times10^{-5}=0.000092$ $5\times10^{15}=5{,}000{,}000{,}000{,}000{,}000$ $7.265\times10^{-4}=0.0007265$	$8.52\times10^{6}=852{,}000{,}000$ $9.20\times10^{-5}=0.0000092$ $5.263\times10^{8}=526{,}300{,}000{,}000$ $7.265\times10^{-4}=0.00007265$
Your Conclusion:	

Conclusions about scientific notation

- ✓
- ✓
- ✓
- ✓



Write in standard form.

1. $4\times10^{3}=$

2. $3.5\times10^{2}=$

3. There are 2.5×10^{13} red blood cells in a human body. How many red blood cells are there?

4. $4\times10^{-5}=$

5. $1.3\times10^{-3}=$

6. The capillary is one of the minute blood vessels that connect arterioles and venules. The radius of a capillary is 5×10^{-3} mm.

The exponent represents _____NOT the number of zeros!!!!

If the number is larger than one (ex: 2,000), the exponent will be _____.
If the number is smaller than one (ex: 0.005), the exponent will be _____.

Write the following in scientific notation.

1. The speed of light is 186,000 miles per second. How fast is the speed of light in scientific notation?

2. 5,000,000,000 =

3. 3,560,000=

4. A light year is 5,880,000,000,000 miles. How many miles are there in a light year in scientific notation?

5. The average dust mite measures 0.00042 m long. How long is this in scientific notation?

6. 0.00004=

7. 0.0000087=

8. 0.000000784=

9. Describe the similarities and differences between the following numbers:

4.23×10^{5} 4.23×10^{-5}

Steps of Standard to Scientific Notation

-
-
-
-
-

The estimated populations, as of July 2009, of several countries are shown. Decide whether the number is written in scientific notation or standard notation. If the number is not in scientific notation, explain how you know it is not. Then, write the number in scientific notation.

People's Republic of China: 1.331×10^9 people

United States: 3.06×10^8 people

India: 11.66×10^8 people

10. List the countries in order of population from least to greatest without writing the numbers in standard notation.

11. Explain how to compare two large numbers that are written in scientific notation.

_____

_____

_____

Scientific Notation Practice

1. Write in standard form or scientific notation.

Standard Form	Scientific Notation
650,000	
	1.7×10^{9}
0.000012	
0.00000009	
	5×10^{-6}

Fill in the missing part for each problem.

2. $89{,}000{,}000 = 8.9\times10^{(\ )}$

3. $548{,}000{,}000 = (\quad)\times10^{8}$

4. $0.0000428 = 4.28\times10^{(\ )}$

5. $0.00003 = (\ \ )\times10^{-5}$

Is the following written in scientific notation? Why or Why not?

6. 37×10^{-6}

7. 4.263×10^{8}

8. 0.36×10^{5}

NAME _____ DATE _____ PERIOD _____

4-8 Skills Practice

Scientific Notation

Express each number in standard form.

1. 1.5×10^3

2. 4.01×10^4

3. 6.78×10^2

4. 5.925×10^6

5. 7.0×10^8

6. 9.99×10^7

7. 3.0005×10^5

8. 2.54×10^5

9. 1.75×10^4

10. 1.2×10^{-6}

11. 7.0×10^{-1}

12. 6.3×10^{-3}

13. 5.83×10^{-2}

14. 8.075×10^{-4}

15. 1.1×10^{-5}

16. 7.3458×10^7

Express each number in scientific notation.

17. 1,000,000

18. 17,400

19. 500

20. 803,000

21. 0.00027

22. 5300

23. 18

24. 0.125

25. 17,000,000,000

26. 0.01

27. 21,800

28. 2,450,000

29. 0.0054

30. 0.000099

31. 8,888,800

32. 0.00912

Choose the greater number in each pair.

33. 8.8×10^3, 9.1×10^{-4}

34. 5.01×10^2, 5.02×10^{-1}

35. 6.4×10^3, 900

36. 1.9×10^{-2}, 0.02

37. 2.2×10^{-3}, 2.1×10^2

38. 8.4×10^2, 839

LEQ: How can you perform operations with numbers written in scientific notation?

What about addition and subtraction??

1. $(8\times10^3)+(5\times10^2)=$

2. $(2.36\times10^4)+(1.6\times10^2)=$

3. $(8\times10^3)-(5\times10^2)=$

4. An ecologist estimates that it takes approximately 196,000 pounds of buried plant matter to produce one gallon of gasoline. Some energy experts estimate that the United States consumed about 140 billion gallons of gasoline in 2008. Calculate the amount of buried plant matter needed to produce the amount of gasoline consumed in 2008. Write your answer in scientific notation.

a. What operation needs to be performed in order to solve this?

b. How can we use our previous knowledge of rewriting large numbers to help us with this problem?

c. How much buried plant matter was needed to produce the amount of gasoline consumed in 2008? Write your answer in scientific notation.

5. $(4\times10^{4})\times(2\times10^{3})$

6. An oil tanker is approximately 1400 feet long. How far would 9500 oil tankers span if they were placed end to end?

a. What operation needs to be performed in order to solve this?

b. What is the approximate length of 9500 oil tankers? Write your answer in scientific notation. (BE CAREFUL)

7. $(6\times10^{2})\times(2\times10^{5})$

Determine the missing piece in each problem.

8. $(4\times10^{7})\times(?\times?)=8\times10^{12}$

9. $(?\times?)\times(3\times10^{6})=9\times10^{14}$

11 Multiplying Numbers in Scientific Notation

★ When you multiply numbers in scientific notation, multiply the numbers together, and then add the powers of 10.

$(5\times10^{2})(8\times10^{3}) = 40\times10^{5}$

Express the product in scientific notation.

$40\times10^{5} = 4.0\times10^{6}$

Find the product.

1. $(4\times10^{3})(3\times10^{2})$ $(9\times10^{1})(2\times10^{3})$ $(5\times10^{4})(3\times10^{2})$
2. $(2\times10^{2})(5\times10^{4})$ $(5\times10^{4})(8\times10^{2})$ $(6\times10^{2})(3\times10^{3})$
3. $(8\times10^{5})(6\times10^{2})$ $(9\times10^{3})(7\times10^{1})$ $(4\times10^{5})(6\times10^{2})$
4. $(7\times10^{4})(9\times10^{3})$ $(6\times10^{2})(2\times10^{3})$ $(9\times10^{4})(3\times10^{2})$

Write true or false. If false, write the correct answer.

5. ____ $(6\times10^{2})(3\times10^{3}) = 1.8\times10^{6}$ ____ $(3\times10^{3})(2\times10^{2}) = 6.0\times10^{6}$
6. ____ $(2\times10^{1})(5\times10^{2}) = 1.0\times10^{3}$ ____ $(7\times10^{2})(8\times10^{4}) = 5.6\times10^{7}$
7. ____ $(3\times10^{3})(4\times10^{3}) = 1.2\times10^{7}$ ____ $(5\times10^{2})(7\times10^{3}) = 3.5\times10^{6}$
8. ____ $(8\times10^{1})(9\times10^{3}) = 7.2\times10^{5}$ ____ $(2\times10^{3})(8\times10^{4}) = 1.6\times10^{7}$
9. There are about 4,600 species of mammals on Earth. Express this as a product of two numbers using scientific notation.

The Scoville scale measures the 'hotness' of a chili pepper by how much capsaicin it contains. Capsaicin is the chemical in the pepper that gives it its 'heat'. The following table shows the Scoville rating for a variety of peppers.

Scoville Rating	Type of Pepper
15,000,000	Pure Capsaicin
5,000,000	Law Enforcement Pepper Spray
30,000	Cayenne Pepper
500	Mild Chile Pepper

10. How many times hotter is the Law Enforcement Pepper Spray than the Mild Chile Pepper?

a. What operation is needed to answer this question?

b. Write this as a ratio based on the table (write your ratio in scientific notation).

c. How many times hotter is the Law Enforcement Pepper Spray than the Mild Chile Pepper? Write your answer in scientific notation.

11. How many times hotter is Pure Capsaicin than a Cayenne Pepper? Write your answer in scientific notation.

12. $(4\times10^4)\div(2\times10^3)$

13. The speed of light is 3 x 10^8 meters/second. If the sun is 1.5x 10^{11} meters from earth, how many seconds does it take light to reach the earth?

a. What operation needs to be performed in order to solve this?

b. How many seconds does it take light to reach the earth? Write your answer in scientific notation.

14. $\dfrac{8\times10^4}{4\times10^2} =$ _____

15. $\dfrac{(1.6\times10^8)}{(2\times10^3)} =$

16. Determine the missing piece in each problem.

a. $(8\times10^9)\div(?\times?) = 4\times10^3$

b. $\dfrac{(?\times?)}{(2\times10^3)} = 3\times10^7$

17. Dr. Dufenheimer's experiment is able to create 9×10^6 bacteria in one hour. Dr. Schnoz is able to create 3×10^8 bacteria in one hour. They decide to run an experiment with five different petri dishes. On each petri dish, they were able to find how many bacteria were created in one day. (see table below)

Petri Dish	**Number of bacteria in one day**
A	5×10^8
B	6×10^7
C	1.1×10^8
D	8.9×10^9
E	6.1×10^9

Which of the petri dishes in the experiment fall between the two doctors' hourly rate? Circle all that apply. You must show your work or explain how you got your answer.

18. The table below shows the average distance of each planet from the constellation Persius. Place a check mark in the last column to state if the distance is greater than 4.9×10^8.

Planet	**Average Distance from the Sun (miles)**	**Place a ✓ if the distance is greater than 4.9×10^8**
Mercury	5,000,400	
Venus	$(3\times10^4)(3\times10^2)$	
Earth	1.3×10^9	
Mars	$\frac{9\times10^{10}}{2\times10^2}$	
Jupiter	$(6\times10^4)(6\times10^5)$	
Saturn	16,250,000,000	
Uranus	$\frac{6\times10^{16}}{3\times10^2}$	
Neptune	9.2×10^7	

Dividing Scientific Notation Practice

Find the quotient.

1	$(9\times10^7)\div(3\times10^5)$	$(4\times10^4)\div(2\times10^6)$	$(3\times10^4)\div(2\times10^1)$
2	$(2\times10^4)\div(1\times10^6)$	$(8\times10^3)\div(4\times10^1)$	$(5\times10^6)\div(1\times10^7)$
3	$(7\times10^5)\div(1\times10^3)$	$(6\times10^2)\div(2\times10^5)$	$(8\times10^3)\div(2\times10^4)$
4	$(3\times10^6)\div(1\times10^4)$	$(4\times10^2)\div(2\times10^6)$	$(6\times10^7)\div(3\times10^5)$

Simplify each expression. Express the quotient in scientific notation.

13. $\dfrac{(8 \times 10^5)}{(2 \times 10^2)}$

$$\frac{(8 \times 10^5)}{(2 \times 10^2)} = \left(\frac{8}{2}\right)\left(\frac{10^5}{10^2}\right)$$

$$= (4)(10^{5-2})$$

$$= (4)(10^3)$$

$$= 4 \times 10^3$$

14. $\dfrac{(12 \times 10^8)}{(6 \times 10^3)}$

15. $\dfrac{(15 \times 10^{-7})}{(5 \times 10^4)}$

16. $\dfrac{(18 \times 10^{-2})}{(3 \times 10^{-6})}$

17. $\dfrac{(1.508 \times 10^7)}{(2.6 \times 10^3)}$

18. $\dfrac{(5.92 \times 10^6)}{(3.7 \times 10^4)}$

According to many scientists, Argentinosaurus is the heaviest known dinosaur. It weighed 220,000 pounds. How much would 1500 Argentinosaurus dinosaurs weigh? Use scientific notation to calculate the weight.

Seismosaurus is the longest known dinosaur. It measured 1800 inches. How far would 3000 Seismosaurus dinosaurs span if they were placed head to tail? Use scientific notation to calculate the length.

The pygmy shrew is the world's smallest mammal by weight. It weighs just 0.0013 kilograms. How much would 3,000,000 pygmy shrews weigh? Use scientific notation to calculate the weight.

Exit Ticket #2

Name:_____Date:_____P:_____

Solve and write your answer in scientific notation.

1. $(3\times10^{5})\times(2\times10^{4})$

2. $(5\times10^{2})\times(6\times10^{5})$

3. $(8\times10^{7})\div(4\times10^{3})$

4. Dr. Thomas is a research scientist. She has 40,000 bacteria in a petri dish. She needs to reproduce the bacteria for her research. Assuming each petri dish contains the same amount of bacteria, how many bacteria will she have if she is able to produce 5000 petri dishes filled with bacteria? Write your answer in scientific notation.

Fill in the missing numbers.

5. $(\square\times10^{\square})\times(3\times10^{4})=9\times10^{12}$

5. $\dfrac{(8\times10^{\square})}{(\square\times10^{2})}=4\times10^{6}$

Exit Ticket #1

Name:_____Date:_____P:_____

1. Write the following numbers in standard form or scientific notation.

Standard Form	Scientific Notation
890,000,000	
	2.87×10^{9}
0.0000032	
	3.1×10^{-5}

2. Explain why the following is NOT written in scientific notation. 52×10^{6}.

3. Factories A and B produce potato chips. They use the same basic ingredients: potatoes, oil, and salt. Last year, each factory used different amounts of these ingredients , as shown in the table.

Ingredient	Factory A (lbs)	Factory B (lbs.)
Potato	4.87×10^{6}	3,309,000
Oil	356,000	5.61×10^{5}
Salt	2.87×10^{5}	193,500

a. Which factory used more potatoes last year? _____

b. Which factory used more oil? _____