

Name: _____ Date: _____ Per: _____
 UB CWK #1 Scientific Notation
 Think about the following question: Why do you text?

Most of us would agree that texting is a fast and efficient way of communicating. In fact, texting allows us to abbreviate many common phrases. Mathematicians and scientists have a way of expressing really large and really small numbers in a fast and efficient way; it is called **Scientific Notation**. Just like texting allows you to communicate quickly, scientific notation is a special way of writing a number that would otherwise be tedious to write if it were left in standard form.

1. The table below includes numbers written in standard form or scientific notation. Change the numbers written in scientific notation into standard form and vice versa. Use a calculator if needed.

Scientific Notation		Scientific Notation		Standard Form	
Calculator Notation	Exponent Notation	Calculator Notation	Exponent Notation	Standard Number	Standard Number
a. 10^0	10^0	2×10^0	2×10^0	1	2
b. 10^1	10^1	2×10^1	2×10^1	10	20
c. 10^2	10^2	2×10^2	2×10^2	100	200
d. 10^3	10^3	2×10^3	2×10^3	1,000	2,000
e. 10^4	10^4	2×10^4	2×10^4	10,000	20,000
Watch for Patterns					
f. $4 \cdot 10^3$	4×10^3	$4.2 \cdot 10^3$	4.2×10^3	4,000	4,200
g. $6 \cdot 10^5$	6×10^5	$6.9 \cdot 10^5$	6.9×10^5	600,000	690,000
h. $7 \cdot 10^8$	7×10^8	$7.12 \cdot 10^8$	7.12×10^8	700,000,000	712,000,000
i. $8.1 \cdot 10^3$	8.1×10^3	$8.1 \cdot 10^4$	8.1×10^4	8,100	81,000
j. $4 \cdot 10^9$	4×10^9			4,000,000,000	

2. From the table above, write two things you learned about scientific notation.
 * higher exponent, larger # * Moving decimals based on exponent
 * $\times 10^n$ * Between 1-10

3. Complete the following statements:
 a. In scientific notation, as the exponent power goes up by 1, the standard number's decimal is...
 b. In scientific notation, as the exponent power goes down by 1, the standard number's decimal is...

The definition for scientific notation

A number that is in Scientific Notation takes on the form $a \times 10^n$ where a is called the **significant figure** and $1 \leq a < 10$ and n is an integer. The number after the \times , or 10^n , is called the **order of magnitude**.

4. Change these **LARGE** scientific notation numbers to standard notation and vice versa. Make up a number for the blank cells.

Scientific Notation	Standard Notation	Scientific Notation	Standard Notation
a. 6.345×10^8	634,500,000	e. 5.33×10^3	5,330
b. 8.04×10^4	80,400	f. 4.2×10^5	420,000
c. 4.26×10^5	426,000	g. 9.04×10^9	9,040,000,000
d. 1×10^0	1	h. 9.9×10^5	990,000

5. Now try these **SMALL** numbers. See if you can figure out the method (one example is given). Make up a number for the blank cells.

Scientific Notation	Standard Notation	Scientific Notation	Standard Notation
Example: 3.2×10^{-3}	0.0032	Example: 5.4×10^{-6}	0.0000054
a. 4.2×10^{-8}	0.000000042	c. 7.5×10^{-4}	0.00075
b. 8.12×10^{-7}	0.000000812	f. 4.005×10^{-3}	0.004005
c. 7.625×10^{-3}	7.625	g. 9.2×10^{-10}	0.00000000092
d.		h.	

6. Express 4,532,344 in scientific notation with 3 significant figures.

4.532344×10^6

4.53×10^6

3 digits for significant figure

7. Express 0.00045323 in scientific notation with 2 significant figures.

4.5×10^{-4}

8. Type the following into a calculator: 5,555,555 multiplied by 5,555,555,555. What does the answer say?

3.086419752 E19

SCI NOT

3.09×10^{19}

Exponent

Some calculators can give you answers in scientific notation. Other calculators have different ways of displaying scientific notation. One way they can display scientific notation is 3.08E19. This means 3.08×10^{19} .

Standard form

30,900,000,000,000,000,000

9. Write this number in standard form.

$5.625 \times 10^{-3} = 0.005625$

11. A calculator gives you an answer of 9.22E8. Write this number in scientific notation and standard form.

$9.22 \times 10^8 = 922,000,000$

12. Enter the following problems into your calculator, write the answer in scientific notation and standard form. Express your answer with three significant figures.

a. $(3 \times 10^3) + (5.45 \times 10^4)$
 $5,750,000$
 5.75×10^6
 b. $(3.2 \times 10^{-2}) - (5.4 \times 10^2)$
 $-559,968$
 -5.4×10^2
 c. $(2 \times 10^4)(1.4 \times 10^{-3})$
 $280,000$
 2.8×10^4

13. Explain why the numbers 402.2×10^{21} and 0.247×10^4 are not written in scientific notation.
 has to be smaller than 10
 has to be bigger than 1

14. Observe the numbers given below, if the number is written in scientific notation circle it. If it is not written in scientific notation change it to scientific notation. You will need to think about how many spaces you will have to move the decimal and how that will affect the exponent.

a. 348×10^9	b. 0.004026×10^9	c. 0.00742×10^{-3}
3.48×10^{10}	4.026×10^6	7.42×10^{-6}
d. 45.5×10^{-9}	e. 6.05×10^4	f. 3.03554×10^{-7}
4.55×10^{-5}		

If I make the significant figure:
 * smaller, the exponent increases
 * larger, the exponent decreases

15. As of September 2014 Facebook was worth \$2,000,000,000. Write this number in scientific notation.

2×10^9
 9.9×10^5

16. The diameter of a human hair is 0.000099 meters long. Write this number in scientific notation.

17. A computer at a radio station stores all of the station's music digitally. The computer can display the amount of time it will take to play through its entire library of music. The DJ car choose if she wants to display this total amount of playing time in seconds, minutes, hours, and years. The radio station has about 7,000 songs on the computer that have an average playing time of 3 minutes for each song.

a. Calculate the total amount of music in minutes that is on the radio station's computer. Write this number in scientific notation.

$21000 = 2.1 \times 10^4 \text{ min}$

b. If the DJ is planning a playlist for the entire week, should she display the total amount of time in seconds, minutes, hours, days, or years? Convert the playing time into your desired unit of time.

1260000 sec
 21000 min
 350 hrs
 14.58 days
 The mass of a snowflake is approximately 0.000003 kilograms.
 a. Write this number in scientific notation.
 $3 \times 10^{-6} \text{ kg}$

b. If you are only concerned about the mass of one snowflake circle the unit below that would best represent this quantity. Convert the mass of the snowflake to your chosen unit of measurement.

- Milligrams 3×10^6
- Grams 3×10^{-3}
- Kilograms

c. Suppose there are approximately 1,000,000 snowflakes in one giant snowball. What unit should you choose to represent the weight of the snowball? Find the mass of the snowball with your chosen unit.

3000000 mg
 3000 g
 3 kg

d. A snowplow is removing snow from a parking lot and dumping it into a dump truck. What unit of measurement would be most appropriate to represent the weight of the snow in the truck?

kg or tons

19. A sea floor spreads at a rate of 10 centimeters per year. If you collect data on the spread of the sea floor each week what unit of measurement would be most appropriate to use? Convert the rate at which the sea floor spreads to your chosen unit of measurement.

- Centimeters
- Meters
- Millimeters 100 mm per year
- $100 / 52 \text{ mm per week}$