11-3-17

Aim: SWBAT express very large and very small numbers in scientific notation.

HW: Packet Pg. 27 - 30

Do Now: Question on Packet Page 25

HW: Magnitude

1) What is the smallest power of 10 that will exceed 118,526?

6 digits

$118,526 < 1,000,000 \rightarrow 10^6$

2) What is the smallest power of 10 that will exceed 999,999,999,991?

12 digits

$999,999,999,991 < 1,000,000,000,000 \rightarrow 10^{12}$

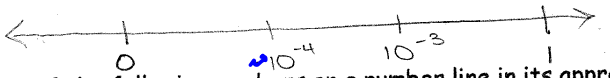
3) Which number is equivalent to 0.0000001: 10^7 or 10^{-7} ? Explain how you know.

10^{-7} because it's saying $\frac{1}{10,000,000}$ which is a very small number.

4) Sarah said that 0.0001 is bigger than 0.001 because the first number has more digits to the right of the decimal point. Is Sarah correct? Explain your thinking using negative powers and the number line.

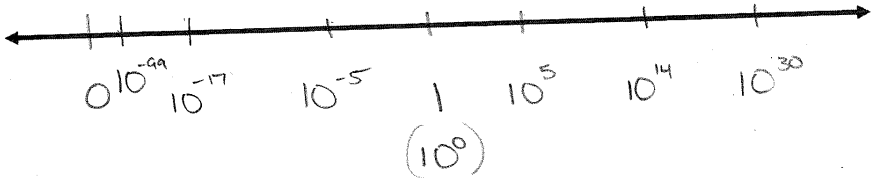
Sarah is incorrect.

$0.0001 = \frac{1}{10,000} = 10^{-4}$ $\quad 0.001 = \frac{1}{1000} = 10^{-3}$



5) Place each of the following numbers on a number line in its approximate location.

10^5 10^{-99} 10^{-17} 10^{14} 10^{-5} 10^{30}



Aim: SWBAT Express very large and very small numbers using scientific notation

Do Now: The average American is responsible for 20,000 kilograms of pollution each year. Can you express this number as a single digit integer times a power of 10?

2×10^4

Scientific Notation

Scientific notation is used to write very large and very small numbers as a product of two factors in the form $d \times 10^n$ where:

Factor #1 (d): Must be a number greater than or equal to 1, but less than 10.

$$1 \leq d < 10$$

Factor #2 (10^n): Must be a power of 10.

- The exponent n tells you how many places to move the decimal point.
- The exponent n is called the ***order of the magnitude***.
- (Numbers greater than 1 have positive exponents.)
- (Numbers less than 1, but greater than 0, have negative exponents.)

Example: Write each number in scientific notation.

$210{,}000 = 2.1 \times 10^5$

$1{,}050{,}000{,}000 = 1.05 \times 10^9$

1) $72{,}050{,}000{,}000 = 7.205 \times 10^{10}$

2) $634{,}000 = 6.34 \times 10^5$

3) $0.0042 = 4.2 \times 10^{-3}$

4) $0.0000831 = 8.31 \times 10^{-5}$

5) $20{,}524 = 2.0524 \times 10^4$

6) $0.00329 = 3.29 \times 10^{-3}$

Example: Write each numeral in **standard form**. (No loops allowed in your final answer.)
$7.106 \bullet 10^4 = 71{,}060$

7) $7.03 \bullet 10^6 =$ 7,030,000

8) $6.0802 \bullet 10^8 =$ 608,020,000

9) $9.73 \bullet 10^{-4} =$ 0.000973

10) $1.04 \bullet 10^{-3} =$ 0.00104

11) $5.706 \bullet 10^5 =$ 570,600

12) $5.706 \bullet 10^{-5} =$ 0.000005706

State whether the following numbers are in scientific notation. If they are not rewrite them in scientific notation.

13) 1.57×10^3 yes

14) 2.76×10^{-4} yes

move left, increase exponent

move right, decrease exponent

15) 12.96×10^5 1.296×10^6

16) 0.24×10^{-6} 2.4×10^{-7}

Comparing numbers in scientific notation.

First compare the powers of 10, or the order of the magnitude. If they are the same than compare the decimal number.

Compare using < or >.

1) $3.7 \bullet 10^7$ > $8.5 \bullet 10^4$

2) $7.5 \bullet 10^3$ < $9.42 \bullet 10^3$

3) $9.5 \bullet 10^4$ > $3.7 \bullet 10^4$

4) $9.75 \bullet 10^5$ < $3.5 \bullet 10^6$

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HW: Scientific Notation

1) Numbers with negative exponents are _____ than one.

2) When writing numbers in scientific notation Factor #1 must be greater than or equal to ___ and less than _____. Factor #2 must be a power of _____.

3) The exponent in a number expressed in scientific notation is called the _____.

Write each number in scientific notation.

4) 6,700 = _____ **5)** 0.0036 = _____

6) 0.462 = _____ **7)** 73,500,000 = _____

Write each number in standard form.

8) $8.19 \bullet 10^{4}$ = _____

9) $5.7 \bullet 10^{-4}$ = _____

10) $1.24 \bullet 10^{-3}$ = _____

11) $6.038 \bullet 10^{6}$ = _____

12) Is $19.56 \bullet 10^{5}$ in scientific notation? YES or NO

13) Explain your answer to question #12.

_____

_____

14) Is the $32.68 \bullet 10^{8}$ in scientific notation?_____ If no write the number in scientific notation:_____

15) Is the $0.234 \bullet 10^{5}$ in scientific notation?_____ If no write the number in scientific notation:_____

Compare using > or <.

16) $3.51 \bullet 10^{8}$ _____ $6.72 \bullet 10^{8}$

17) $2.72 \bullet 10^{5}$ _____ $1.25 \bullet 10^{7}$

18) $4.5 \bullet 10^{-2}$ _____ $5.7 \bullet 10^{-5}$

Order Original Values

19) **Rewrite** each number in scientific notation and order them from **largest** to **smallest**:

3.91×10^{5} =
39,100 =
$.391 \times 10^{3}$ =
391×10^{4} =
0.00391×10^{6} =

20) Order from **least** to **greatest**.

4.01×10^{-3}
0.0000401×10
401×10^{-4}
0.401×10^{-4}
4.01×10^{-1}

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Aim: SWBAT Practice working with Scientific Notation.

Do Now:
When writing numbers in scientific notation:

Factor #1 must be _____ or _____ to 1.

Factor #2 must be a power of _____.

Write the power of 10 that makes a true statement.

1) 8,000,000 = 8 x _____ 2) 450,000 = 4.5 x _____

3) 0.00006 = 6 x _____ 4) 0.000000077 = 7.7 x _____

5) 380,000,000 = 3.8 x _____ 6) 0.00092 = 9.2 x _____

Classwork/Homework:

Write the following numbers in scientific notation.

1) 87,050,000 2) 0.000000398 3) 420,000 4) 0.0000008

5) 0.0000015 6) 926,000 7) 0.00109 8) 5,000,000,000

Write the following numbers in standard form.

9) 5.9×10^{6} 10) 4.58×10^{4} 11) 7.5×10^{-5} 12) 5.5×10^{-3}

13) 9.0×10^{2} 14) 1.82×10^{-4} 15) 3×10^{-9} 16) 4×10^{8}

Explain why each of the following numbers are not written in scientific notation.

17) 41×10^{3}

18) 0.3×10^{-7}

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19) In the year 2005, a company made a profit of about $\$3.8 \times 10^5$. In 2006, the company made about \$400,000. In which year did the company make a greater profit? Explain.

20) The size of Specimen A is 5×10^{-7} cm. The size of Specimen B is 0.00055 cm. Which specimen is smaller. Explain.

21) Write the number six trillion in standard notation and scientific notation.

_____ _____

Standard Notation **Scientific Notation**

22) Describe and correct the error in writing the number in standard form.

$4.1 \times 10^{-6} = 4{,}100{,}000$

State whether the following number is written in scientific notation. If the answer is no then rewrite the number in scientific notation.

23) 1.8×10^9 24) 21.2×10^3 25) 7×10^{-4}

26) 105.6×10^5 27) 14.8×10^{-3} 28) 0.267×10^{-8}

Fill-in the missing information to make each equation a true statement.

29) $1.0035 \times 10^{\square} = 100{,}350{,}000$ 30) $56{,}194 = \square \times 10^4$

31) $0.000008 = 8 \times 10^{\square}$ 32) $\square \times 10^{-9} = 0.000000004802$

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