

8th Grade Math: ExPWN it! 12

Key

Efficacy of Scientific Notation

Wednesday, September $\frac{14}{14^0}$, 2016

AIMS:

- ✓ SWBAT read, write, and perform operations on numbers expressed in scientific notation.

AGENDA:

- I. Do Now (2 min)
- II. Open/Do Now Review (3 min)
- III. Class Notes: Efficacy of Scientific Notation
- IV. Guided Practice
- V. Independent Practice
- VI. ~~Sprint (IF TIME!)~~
- VII. Practicing our AIMS:
 - ✓ ~~Exit Ticket (5 min)~~
 - ✓ Homework: ExPWN it! 12
- VIII. Close (2 min)

Will your choices help us STRIVE?

“There is
NO SUBSTITUTE
for HARD WORK.”
— THOMAS EDISON

AIMS:

- ✓ SWBAT read, write, and perform operations on numbers expressed in scientific notation.

AIM CHECK:

- ✓ Why do we use exponents to show very large and very small numbers?

- ✓ What operation do the terms "compare" and "ratio" suggest?

**8th Grade
Math**

Efficacy of
Scientific
Notation

Name: Key #:

Date: _____

Homeroom:  Cleveland State
University



ExpWN It! 12

AIM(S):

- ✓ SWBAT read, write, and perform operations on numbers expressed in scientific notation.

DO NOW

Directions: Complete the following questions.

- 1) The estimated world population in 2011 was 7×10^9 . Of the total population, 682 million of those people were left-handed. Approximately what percentage of the world population is left-handed according to the 2011 estimation?

World population: 7×10^9

left-handed: $682,000,000 \approx 700,000,000 = 7 \times 10^8$

Compare: $\frac{7 \times 10^8}{7 \times 10^9} = \frac{7}{7} \times \frac{10^8}{10^9} = 1 \times \frac{1}{10} = \frac{1}{10} = \frac{10}{100} = 10\%$

Approximately 10% of the world is left handed.

Lesson Opener: Powers of Ten video

Watch the video "Powers of Ten" then answer the following questions:

What is the smallest power of 10 (square meters) that can fit the entire profile of the Earth?

10^7 square meters

How many meters long is a light year?

10^{16} meters long

About how many powers of ten (~~square~~ meters) wide is a white blood cell?

10^{-4} meters

Why do we use exponents to write very large or very small numbers?

Ex: because exponents grow/get small
incredibly quickly

Class Notes: Efficacy of Scientific Notation

Directions: Board Equals Paper!

Consider the mass of the proton

0.000 000 000 000 000 000 000 000 001 672 622 kg.

It is more informative to write it in scientific notation:

$$1.672622 \times 10^{-27} \text{ kg}$$

What does the exponent of -27 tell us? It tells us that the first non-zero digit, right of the decimal is 27 digits away.

Similarly, the mass of the electron is

0.000 000 000 000 000 000 000 000 000 000 000 910 938 291 kg.

It is much easier to read this number in scientific notation:

$$9.10938291 \times 10^{-31}$$

The exponent of -31 tells us there are 31 moves before the first non-zero digit.

Review/Example:

Compare the mass of a proton to the mass of an electron:

What does compare mean? \rightarrow ratio = divide

$$\frac{1.672622 \times 10^{-27}}{9.10938291 \times 10^{-31}} = \frac{1.672622 \times 10^{31}}{9.10938291 \times 10^{27}} = \frac{1.672622 \times 10^4}{9.10938291}$$
$$= \frac{16726.22}{9.10938291} \approx \frac{17000}{9.1} = 1868$$

A proton is about 1,868 times larger than an electron.

Guided Practice

Directions: Board=Paper!

As of March 23, 2013, the U.S. national debt was \$16,755,133,009,522 (rounded to the nearest dollar). According to the 2012 U.S. census, there are about 313,914,040 American citizens. What is each citizen's approximate share of the debt?

How precise should we make our answer? Do we want to know the exact amount, to the nearest dollar, or is a less precise answer alright?

We want a relatively precise answer - but the problem says approximate so we'll round for convenience.

$$\approx \frac{1.6755 \times 10^{13}}{3.14 \times 10^8} = \frac{1.6755 \times 10^5}{3.14} = \frac{167550}{3.14} = 53,360$$

Each person's share of debt is about \$53,360.

~~Suppose the geographic area of Los Angeles County is 4,751 sq. mi. If the state of California has area 1.637×10^5 square miles, that means that it would take approximately 35 Los Angeles Counties to make up the state of California. As of 2013, the population of Los Angeles County was 1×10^7 . If the population were proportional to area, what would be the population of the state of California? Write your answer in scientific notation.~~

Switched w/ #4 From I. P.

Independent Practice

Directions: Complete every question below! Do your best! When done, you may work on the ADVANCED WORK ONLY (not homework ☺)

- 1) Which of the two numbers below is greater? Explain how you know.

$$8.25 \times 10^{15} \text{ and } 8.2 \times 10^{20}$$

the power of 10^{20} is greater than 10^{15} , so 8.2×10^{20} is larger

- 2) About how many times greater is 8.2×10^{20} compared to 8.25×10^{15} ?

$$\frac{8.2 \times 10^{20}}{8.25 \times 10^{15}} = \frac{8.2}{8.25} \times \frac{10^{20}}{10^{15}} \approx 0.99 \times 10^5 = 99000$$

8.2×10^{20} is about 99,000 times larger than 8.25×10^{15} .

- 3) The average distance from Earth to the moon is about 3.84×10^5 km, and the distance from Earth to Mars is approximately 9.24×10^7 km in year 2014. On this simplistic level, how much farther is traveling from Earth to Mars than from Earth to the moon?

$$\begin{aligned} & 9.24 \times 10^7 - 3.84 \times 10^5 \\ & \underbrace{9.24 \times 10^3 \times 10^5 - 3.84 \times 10^5}_{924 \times 10^5 - 3.84 \times 10^5} \\ & \underbrace{(924 - 3.84) \times 10^5}_{920.16 \times 10^5} \end{aligned}$$

Traveling to Mars from Earth is 920.16×10^5 or 9,201,600 km farther than going to the moon.

Keep going! There are more challenges ahead!

- 4) The geographic area of California is 163,696 sq. mi., and the geographic area of the U.S. is 3,794,101 sq. mi. Let's round off these figures to 1.637×10^5 and 3.794×10^6 . In terms of area, roughly estimate how many Californias would make up one U.S. Then compute the answer to the nearest ones.

$$\frac{3.794 \times 10^6}{1.637 \times 10^5} = \frac{3.794}{1.637} \times \frac{10^6}{10^5} = \frac{3.794}{1.637} \times 10 = \frac{37.94}{1.637}$$

≈ 23.18 It would take about 23 Californias to make up the U.S.

- 5) Two of the largest mammals on earth are the blue whale and the African elephant. An adult male blue whale weighs about 170 tonnes or long tons. (1 tonne = 1000 kg). Show that the weight of an adult blue whale is 1.7×10^5 kg.

170 tonnes \times 1000 will equal the # of kg.

$$170 \times 1000 = 170000 = 1.7 \times 10^5 \text{ kg.}$$

- 6) An adult male African elephant weighs about 9.07×10^3 kg. Compute how many times heavier an adult male blue whale is than an adult male African elephant (i.e., find the value of the ratio). Round your final answer to the nearest one.

$$\frac{1.7 \times 10^5}{9.07 \times 10^3} = \frac{1.7}{9.07} \times \frac{10^5}{10^3} = 0.18743 \times 10^2 = 18.743$$

≈ 19 . The blue whale is about 19 times heavier than the elephant.

8th Grade Math Advanced Work (Due 9/15/16)

Directions: Complete this for dollars! Turn in advanced work with your homework.

Name: _____ #: _____ HR: _____

Find each product.

$98 \times 10^{-1} =$

$86 \times 10^{-3} =$

$65 \times 10^{-2} =$

$19 \times 10^3 =$

$48 \times 10^{-3} =$

$89 \times 10^0 =$

$3 \times 10^0 =$

$81 \times 10^3 =$

$41 \times 10^{-2} =$

$49 \times 10^{-2} =$

$41 \times 10^{-3} =$

$72 \times 10^{-3} =$

$75 \times 10^{-3} =$

$38 \times 10^{-2} =$

$37 \times 10^{-3} =$

$47 \times 10^{-1} =$

$26 \times 10^{-2} =$

$19 \times 10^2 =$

$66 \times 10^{-1} =$

$77 \times 10^{-3} =$

Name and Number:

Is this a re-submit? _____

Ms. Huber
614-859-0019
Mshubersmath.weebly.com



Date:

Class:

HOMEWORK

8th Grade Math

ExPWN it! 12
Efficacy of Scientific Notation

_____/ 5 = _____ % DNG
A B C D F

STRIVE Due Date:
9/15/16

Accepted Until:
9/22/16

Directions: Complete all of the below problems (FRONT AND BACK). If you have questions, first check the examples in your packet. Then, check the class website or ask a classmate or guardian for help. Then, you can call your teacher if you still have questions.

- 1) There are approximately 7.5×10^{18} grains of sand on Earth. There are approximately 7×10^{27} atoms in an average human body.
 - a. Are there more grains of sand on Earth or atoms in an average human body?
How do you know?

- b. About how many times more atoms are in a human body compared to grains of sand on Earth?

FLIP OVER!

- 2) Suppose the geographic areas of California and the U.S. are 1.637×10^5 and 3.794×10^6 sq. mi., respectively.
- a. California's population (as of 2012) is approximately 3.804×10^7 people. If population were proportional to area, what would be the U.S. population?

[See question # 4 on I.P.]

- b. The actual population of the U.S. (as of 2012) is approximately 3.14×10^8 . How does the population density of California (i.e., the number of people per square mile) compare with the population density of the U.S.?

