Concept: Scientific Notation

Name:

Warm Up

1. Express each of the following as a power with a base of 10.

   Example: $100 = 10^2$

   (a) $1000 = 10^{\_\_}$ (b) $10{,}000 = 10^{\_\_}$ (c) $1{,}000{,}000 = 10^{\_\_}$

   (d) $0.01 = 10^{\_\_}$ (e) $0.0001 = 10^{\_\_}$ (f) $0.000{,}01 = 10^{\_\_}$

COMPUTER COMPONENT

Instructions: In UMATH X follow the **Content Menu** path:

Exponents > **Scientific Notation**

- Work through all Sub Lessons of the following Lessons **in order**:
  - *Why Use Scientific Notation?*
  - *Scientific Notation of Large Numbers*
  - *Scientific Notation of Small Numbers*
  - *Volume Formulas Involving Exponents*
  - *Examples*

Additional Required Materials: Scientific calculator

- As you work through the computer exercises, you will be prompted to make notes in your notebook/math journal.

NOTES

1. Fill in the blanks.

   - Very _____ or very _____ numbers are often written in _____ _____.
   - Numbers written in scientific notation must be expressed as a _____ of:
   - A number _____ than _____ but _____ than or _____ to _____
   - A _____ of _____

Example:

14,000,000,000 in scientific notation is _____ × 10 ⁻⁻

Steps to expressing large numbers in scientific notation:

Step 1: Place a _____ after the first _____digit.

Step 2: Drop the _____ zeros.

Step 3: _____ by a _____ of _____ to compensate for moving the _____. (*Hint: Count the number of places the* _____ *is* _____)

Practice:

"The Andromeda Galaxy contains at least 200,000,000,000 stars."
(http://www.ieer.org/clssroom/scinote.html)

200,000,000,000 = _____ × 10 ⁻⁻

Steps to expressing large numbers in scientific notation:

Step 1: Write the _____ after the first _____ digit.

Step 2: Drop the _____ zeros.

Step 3: _____ by a _____ of _____ to compensate for moving the _____. (*Hint: Count the number of places the* _____ *has been*_____)

Remember: *The exponent will be* ***negative***.

Practice:

"The weight of an alpha particle, which is emitted in the radioactive decay of Plutonium -239, is 0.000,000,000,000,000,000,000,000,006,649"
(http://www.ieer.org/clssroom/scinote.html)

0.000,000,000,000,000,000,000,000,006,649 = _____ × 10⁻⁻

OFF COMPUTER EXERCISES

1. Express each of the following large numbers in scientific notation.

(a) 120 =

(b) 3000 =

(c) 65,000 =

(d) 34,000 =

(e) 45,000,000 =

(f) 4,000,000,000,000 =

2. Express each of the following small numbers in scientific notation.

(a) 0.002 =

(b) 0.000,0045 =

(c) 0.000,003 =

(d) 0.000,000,64 0.004 =

(e) 0.004 =

(f) 0.000,000,000,000,000,08 =

3. Express each in standard notation.

Example: $1.24 \times 10^{-3} = 0.001\ 24$

(a) 2.5×10^{-4} =

(b) 2.5×10^{8} =

(c) 2.51×10^{-6} =

(d) 2.51×10^{6} =

4. Express each in scientific notation.

(a) 13,000 =

(b) 0.005,06 =

(c) 7,091,000 =

(d) -0.000,005 =

(e) $36 \times 42 \times 456$ =

Express your answers in the following questions in scientific notation.

5. The measured daily deposit of a pollutant on a city is approximately 3.5×10^{-5} g/cm. If a city has an area of 200 square kilometers and the pollutant is distributed evenly, *calculate the amount of pollutant that falls on the city.*

   (a) *in one day.*

   (b) *in one year.*

6. If 1100 silkworm eggs weigh 1.3g, *how much does each egg weigh?*

*A **googol** can be written in conventional notation as follows:*

1 googol $= 10^{100}$

$= 10,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,$
$000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000$

*A **googolplex** is the number one followed by one googol zeroes, or ten raised to the power of one googol:*

$10^{googol} = 10^{(10100)}$.

In the documentary Cosmos, physicist and broadcast personality Carl Sagan estimated that writing a googolplex in base-10 numerals (i.e., "1,000,000,000...") would be physically impossible, since doing so would require more space than the known universe occupies.

http://en.wikipedia.org/wiki/Googol

Challenge

Interesting Facts:

The earth is nearly 150,000,000 km (93,000,000 miles) from the sun.
http://en.wikipedia.org/wiki/Astronomical_unit

The speed of light is approximately 300,000 kilometre per second (186,000 miles per second).
http://www.school-for-champions.com/science/lightspeed.htm

If the sun unexpectedly disappeared, *how much time would go by before the sky on earth was dark?*