

Activity 1: Scientific Notation, Significant Figures, and Calculating Roots and Powers

- Express the following numbers in scientific notation.
 - 10,200
 - 250,000
 - 0.0056
 - 0.000023
 - 123,000,000,000
 - 0.00000000078
- Express the following numbers as their decimal equivalent.
 - 1.23×10^4
 - 6.5×10^{-6}
 - 3.44×10^{17}
 - 9.6×10^{-2}
 - 2.456×10^9
 - 7.86×10^{-12}
- In an Astronomy textbook you come across the fact that the earth is 1.496×10^8 km from the sun. Express this distance as its decimal equivalent.
- A 2010 experiment headed by Aldo Antognini at the Swiss Federal Institute of Technology in Zurich Switzerland estimated the radius of the proton to be

0.000000000000000084 m. Express this distance in scientific notation.

5. Explain, in your own words, how the two previous examples demonstrate why a physicist needs scientific notation.

6. How many significant figures does each of the following numbers have?

- a. 3.45
- b. 6.0078
- c. 120000
- d. 0.00067
- e. 1.2456×10^{17}
- f. 5.00

7. Compute the following numbers to the proper number of significant figures.

- a. 33.2×25.60
- b. $45.4 + 16.54$
- c. $\sqrt{2.50}$

- d. $17.0 \div 2.3$
- e. $(23.4 \times 13) - (1360 \div 3.00)$
- f. $(16.7)^{2.5}$

8. Many types of atoms are radioactive. This means that they are unstable and will change into other types of atoms. In an experiment, a physicist measures the mass of a plutonium atom to be $3.9516 \times 10^{-25} \text{ kg}$. Later, she finds that the plutonium has changed into a Uranium atom with mass $3.8851 \times 10^{-25} \text{ kg}$ and a Helium atom with mass $6.6447 \times 10^{-27} \text{ kg}$. Can you find something surprising from these mass measurements?

9. Express each of the following roots or powers as a single number in scientific notation using the proper number of significant figures. You should find the powers of ten mentally.

(a) $\sqrt{2.75 \times 10^7}$

(b) $\sqrt{7.4 \times 10^{-6}}$

- (c) $(1.2 \times 10^3)^4$
- (d) $(8 \times 10^3)^{2/3}$
- (e) $(6.5 \times 10^{21})^3$

10. Using the distance given to you earlier, find the area of the circle traced out by the earth as it circles the sun. You should find the power of ten mentally.

11. The radius of an atom's nucleus is approximately given by

the equation, $R = R_0 A^{1/3}$, where A is the total number of

protons and neutrons and $R_0 = 1.2 \times 10^{-15} \text{ m}$ is a constant. Use

this equation to find the radius for the gold nucleus which

has 79 protons and 118 neutrons. You should find the power of ten mentally.