APES

Summer Math Assignment

2024 - 2025

Welcome to AP Environmental Science!

During the first week of school, you will be given an initial assessment that will check your understanding of basic math skills modeled on the problems you will find below. Topics include the use of scientific notation, metric conversions, percent change, and dimensional analysis. The assessment will include similar questions and will be counted as a grade for the first marking period.

Over the last couple of years, there have been major changes to the AP environmental science exam. You will be allowed to use a graphing calculator on the exam, however, this also means that the math will likely be more challenging.

If you require some review of the concepts in this packet, please go to the "About" section of the Google Classroom page where you will find links to videos that you may find helpful.

A Chemistry review packet that is posted on Google Classroom is due on the first day of school at **8:15am.** You must register for the APES Summer Google Classroom page using the following code: **mycdpqy** in order to access the assignments. A more detailed set of directions are posted on Google Classroom.

APES Summer Work: Basic Math Concepts

Directions: Please complete the following to the best of your ability. No calculators allowed! Please round to the nearest 10^{th} as appropriate.

1. Convert the following numbers into scientific notation.

   16, 502 = _____

   0.0067 = _____

   0.015 = _____

   600 = _____

   3850 = _____

   0.222 = _____

2. Convert from scientific notation to regular notation.

   6.96×10^{3} = _____

   3.46×10^{-5} = _____

   2.54×10^{4} = _____

   9.1×10^{-2} = _____

   5.0×10^{-3} = _____

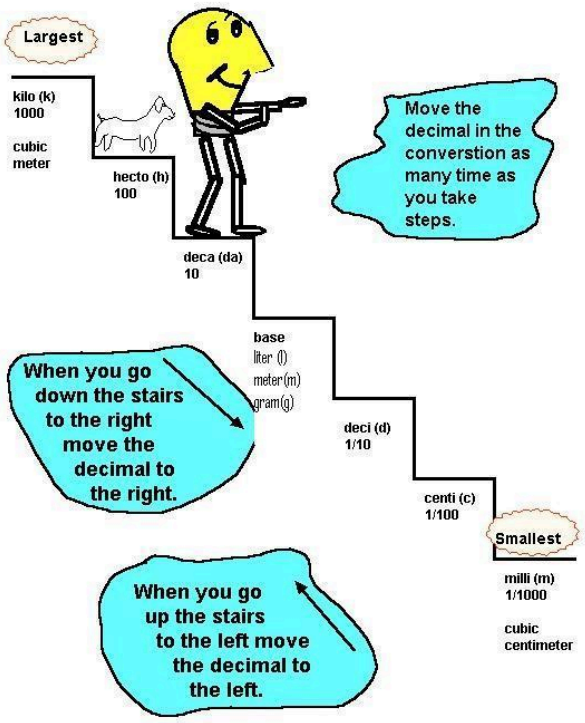
   9.444×10^{2} = _____

Solve the following problems:

$2.1 \times 10^{5} \times 3.3 \times 10^{4}$ =

$9.0 \times 10^8 \div 4.5 \times 10^3 =$

3. Metric Conversion: convert the following numbers as indicated.



25 cm = _____ km

0.01 km = _____ mm

476 g = _____ kg

578 mm = _____ m

35 kW = _____ W

Percent Change: Use the following equation to assist in solving the next two problems.

$$\textbf{Percent change} = \frac{|\text{past-present}|}{\text{past}} \textbf{ x 100}$$

4. Calculate the percent increase in world grain production per person between 1950 and 2000 using the following data.

Year	Per capita world grain production (kg)
1950	200
1970	223
1990	240
2000	250

5. The total fertility rate (TFR) of a country is the average number of births per women in that country. In Madagascar the TFR went from 6.0 in 1995 down to 5.0 in 2005. What is the percent change in the TFR in Madagascar from 1995 to 2005?

Dimensional Analysis:

Dimensional analysis (also called the factor-label method) is a mathematical system using conversion factors to move from one unit of measurement to a different unit of measurement. For example, you can use dimensional analysis to calculate how many seconds are in a day. (http://www2.franciscan.edu/academic/mathsci/mathscienceintegation/MathScienceIntegation-617.htm)

A good video to go over dimensional analysis can be found here:

http://www.youtube.com/watch?v=fEUaQdaOBKo

The key with dimensional analysis is that each of the conversion factors is equal to one. Using these factors will allow you to move from one unit of measurement to another.

Remember that:

$\frac{2}{2} = 1$ $\frac{520}{520} = 1$ $\frac{x}{x} = 1$ $\frac{cm}{cm} = 1$

Examples of conversion factors:

$\frac{60 \text{ sec}}{1 \text{ min}} = 1 = \frac{1 \text{ min}}{60 \text{ sec}}$ $\frac{1 \text{ inch}}{2.54 \text{ cm}} = 1 = \frac{2.54 \text{ cm}}{1 \text{ cm}}$

Note in these last two examples that the conversion factor can be used in either form and both are equal to 1. Determining which form should be used depends on the units you start with and the units requested for your answer.

If you want to determine how many seconds are in one day, you would set up your dimensional analysis problem as shown below. Note the importance of UNITS! When solving these problems in APES, units are vital! The units help you determine which way to use the conversion factors. Also, if you do not show the units in your set-up *and* answer you do not get credit for your work.

$$\frac{1\text{day}}{1} \times \frac{24\text{ hours}}{1\text{ day}} \times \frac{60\text{ minutes}}{1\text{ hour}} \times \frac{60\text{ seconds}}{1\text{ minute}} = 86{,}400\text{ seconds}$$

In this example, I can cross out "day" in both the numerator denominator because $\frac{\text{day}}{\text{day}}$ = 1. This is true for hours and minutes as well and leaves us with the answer we are looking for which is in seconds. Notice in the example above that day is put over 1. Often a problem starts with the given value over 1. In the example that follows, start with $\frac{8\text{ inches}}{1}$.

Solve the following problems using dimensional analysis.

How many millimeters are in 8 inches? Please round your answer to the nearest 10th. **1 inch = 2.54 cm**. Please show the set up and work for the problem. Units must be shown throughout the problem!

Use the assumptions in the table below to perform the calculations that follow.

Assume that the total global area of corals growing in reefs is 2.5 x 10^{11} m^2.
Assume that corals only grow vertically and that the average vertical growth rate of corals is 3 mm/year.
Assume that the average density of $CaCO_3$ in corals is 2.0 x 10^3 kg/m^3.

- ✓ Calculate the current annual global increase in volume, **in m^3**, of $CaCO_3$ in coral reefs. Show all steps in your calculation.

✓ Calculate the current annual global increase in mass, **in kg,** of $CaCO_3$ in coral reefs. Show all steps in your calculation.

✓ Because of ocean acidification, it is expected that in 2050 the mass of $CaCO_3$ deposited annually in coral reefs will be **20 percent less than is deposited currently**. Calculate how much less $CaCO_3$, in kg, is expected to be deposited in 2050 than would be deposited if ocean water pH were to remain at its current value.