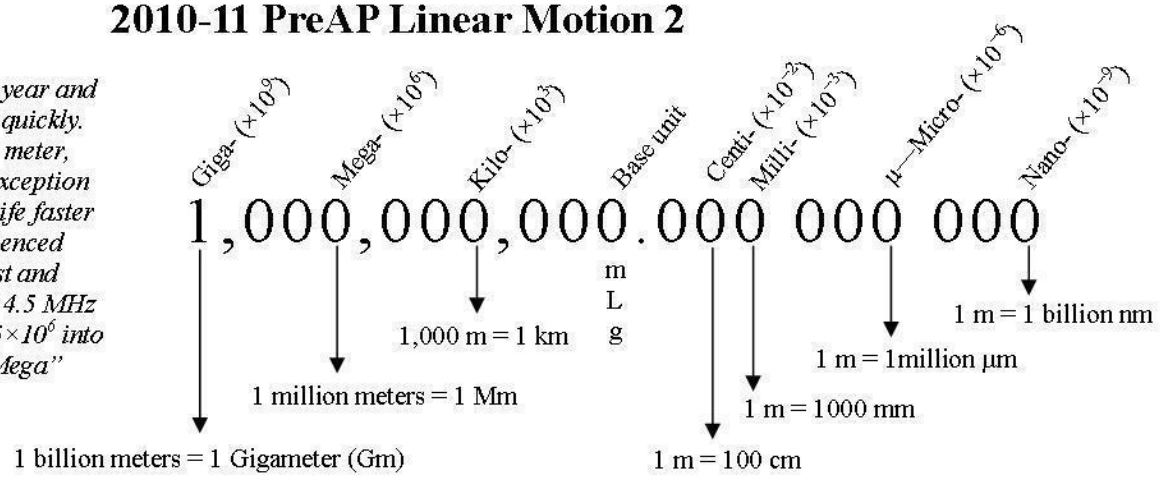
Due Wed., Aug 24

2010-11 PreAP Linear Motion 2

You will use these prefixes all year and need to gain facility with then quickly. Most formulas use base units: meter, liters, etc. The most notable exception is kilograms. Prefixes make life faster and easier. They allow experienced scientists to write formulas fast and clearly. A physicist will write 4.5 MHz on paper, but knows to put 4.5×10^6 into the calculator. 10^6 is what "Mega" stands for.



1. Let's practice converting to the base unit (*use the top part of the above diagram, which you must memorize*).
   A. * 8.2 nL = 8.2×10^{-9} L B. 6.8 kHz = 6.8×10^{3} Hz C. 4.5 μC = 4.5×10^{-6} C
   D. * 12.5 cg = 12.5×10^{-2} g or 1.25×10^{-1} g E. 45 mm = 45×10^{-3} m F. 1.21 GW = 1.21×10^{9} Watts

-1 each

For the next step you have to know how to put large numbers into your scientific calculator. Let's talk in the calculator's language. TI uses the "EE" to mean "×10". So, 8EE6 = 8×10^6. Do NOT use the carat key (^). It is not the same thing and will cause you to be off by a power of ten. Only use the carat key for non-standard powers (like taking something to the 3rd power).

Q1 is step one in large metric conversions. Always start by converting back to the base unit, which can be done in one step! Then you need to set up a conversion factor to get to the next unit. This is much more accurate than moving the decimal.

2. Practicing writing metric conversion factors (bottom of above diagram).
   A. * 1 Mg = 1×10^6 g (or 1,000,000) B. * 10^3 J = 1 kJ (1,000) C. 10^9 nm = 1 m

-1 each

Now we put these two together, as seen below. Again, please follow my procedure. Don't move the dot.

3. * Convert 75 km to mm.
   A. Step one: convert 75 km to m, using scientific notation: 75×10^3 m
   B. Step two: write the conversion factor from m to mm: $1\text{ m} = 10^3\text{ mm}$
   C. Step three: use the conversion factor to convert from m to mm: $\frac{75\times10^3\text{ m}}{1}\left(\frac{10^3\text{ mm}}{1\text{ m}}\right) = 75\times10^6\text{ mm}$ or $7.5\times10^7\text{ mm}$

-2 each

4. * Now, on your own. Convert 95 μT to MT, giving your number in scientific notation.
   $\left(\frac{95\times10^{-6}\text{ T}}{1}\right)\left(\frac{1\text{ MT}}{10^6\text{ T}}\right) = 95\times10^{-12}\text{ MT}$
   $9.5\times10^1(10^{-12}) = 9.5\times10^{-11}\text{ MT}$

-3

5. Convert 1.65×10^{-5} GL to cL:
   $\frac{1.65\times10^{-5}\times10^9\text{ L}}{1}\left(\frac{10^2\text{ cL}}{1\text{ L}}\right) = 1.65\times10^{9-5+2} = 1.65\times10^6\text{ cL}$

-4

6. Using the "Sig Fig" notes, how many significant figures do each of the following numbers have?
   A. 6050 — 3 SF B. 20.1 — 3 SF C. 1.0040×10^6 — 5 SF D. 0.1500 — 4 SF

-2 each

7. Using the numbers from Q6, do the following math operations, giving your answers with the correct number of significant figures and correct units.

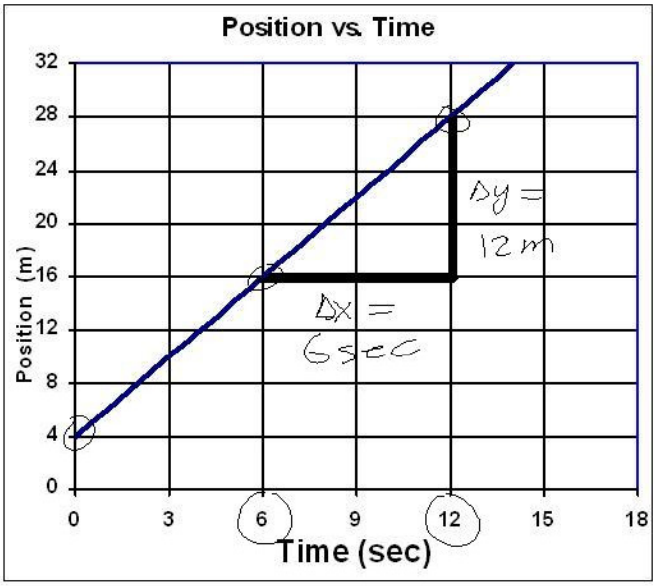
	Calculator answer	With Sig Figs		Calculator answer	With Sig Figs
I. * B(C) =	20180400	3 sig Fig 2.02×10^7	II. A/B =	300.995...	301
III. * A + B =	6070.1	6070 (dec. furth left)	IV. A − D =	6049.85	6050

-2 each

3.3 ft = 1 m	5280 ft = 1 mi
12 in = 1 ft	2.54 cm = 1 in.
I assume you know about seconds, mins, etc	

8. Following the notes EXACTLY: Convert 15 cm to inches. (Must show work.)

$$\frac{15\text{ cm}}{1}\left(\frac{1\text{ in.}}{2.54\text{ cm}}\right) = 5.9\text{ in} \qquad -4w$$



There are "Linear Equation" notes available online for you to follow. I don't think you need to print them.

9. Use the graph at the right to answer the following:
   A. How many "good points" are there?
   3
   B. ON THE GRAPH calculate the slope of the line, including units. (*Study Help available*)

$$m = \frac{\Delta y}{\Delta x} = \frac{12m}{6sec} = 2\ m/sec \qquad -3w$$

   C. What is the y-intercept for this line, with units?

4 m −2w

   D. Write the linear equation for this line. In $y = mx + b$, for "y" and "x" put P and t and the other quantities you found.

−2w $y = mx + b$

becomes: $P = 2t + 4$

$\downarrow$

$x = 2t + 4$