U1:L1 Physics Math Review

Units (of measurement) – a standard amount of physical quantity.

IE: ft inches lbs kg g

cm m mm yd km

In physics, measurements must be expressed in their STANDARD units.

These units can be expressed by symbols.

QUANTITY	UNIT	SYMBOL
MASS	Kilograms	kg
LENGTH	meters	m
TIME	Seconds	s

When we are dealing with questions with different units than the base unit we desire, we must convert the units.

SOME IMPORTANT MEASUREMENTS TO REMEMBER…

MASS	LENGTH	TIME
1kg = 1000 g	1m = 100cm	1 minute = 60 seconds
	1 cm = 10 mm	1 hour = 60 minutes
	1km = 1000m	1 day = 24 hours

EXAMPLES:

a) 40 cm = 0.4 m ($\div 100$)

b) 350 g = 0.35 kg ($\div 1000$)

c) 590 seconds = $9.8\overline{3}$ mins ($\frac{590}{60}$)

d) 0.33 km = 330 m ($\times 1000$)

In our study of motion, we will be working with quantities which will require more than a simple conversion. Velocity of vehicles, for example, is often measured with Km/h units.

If we want to convert KM/H velocity to M/S for instance, we must do TWO steps.

EXAMPLES:

Justin Bieber was driving his mini-van to a friend's house. He was travelling 60 km/h. How fast was Bieber driving in m/s?

What do we NEED to know first?

- How many meters in a km? 1000
- How many seconds in an hour? $60 \times 60 = 3600$

$$\frac{60\,\text{Km}}{1\,\text{h}} \times \frac{1000\,\text{m}}{1\,\text{Km}} = \frac{60\,000\,\text{m}}{1\,\text{h}} \times \frac{1\,\text{h}}{3600\,\text{s}} = \frac{60000\,\text{m}}{3600\,\text{s}} = 16.\overline{6}\ \text{m/s}$$

Ratio 1   1

100 km/h in m/s?

$$\frac{100\,\text{Km}}{1\,\text{h}} \times \frac{1000\,\text{m}}{1\,\text{Km}} \times \frac{1\,\text{h}}{3600\,\text{s}} = \frac{100\,000\,\text{m}}{3600\,\text{s}} = 27.\overline{7}\ \text{m/s}$$

2 m/s in km/h?

$$\frac{2\,\text{m}}{1\,\text{s}} \times \frac{1\,\text{Km}}{1000\,\text{m}} \times \frac{3600\,\text{s}}{1\,\text{h}} = \frac{7200\,\text{Km}}{1000\,\text{h}} = 7.2\ \text{km/h}$$

SOLVING EQUATIONS

The **2** major rules are:

1. Perform the opposite operation
   - $+$ — $-$
   - $\times$ — $\div$
   - x^2 — $\sqrt{x}$
   - x^3 — $\sqrt[3]{x}$
2. Whatever you do on one side, you must do to both sides.

BEDMAS ←

EXAMPLE:

$$x^2 - 5 = 20$$
$$\quad +5 \quad +5$$
$$\sqrt{x^2} = \sqrt{25}$$
$$x = 5$$

Solve for x.	
a) x + 3 = 10 $x = 7$	b) x – 3 = 10 $x = 13$
c) 2x = 10 $x = 5$	d) $\frac{x}{2} = 10$ $x = 20$
Solve for required symbol.	
e) $\Delta\vec{d} = \boldsymbol{d_f} - \boldsymbol{d_0}$ (SOLVE FOR $\boldsymbol{d_0}$) $-d_f \quad -d_f$ $\Delta\vec{d} - d_f = -d_0$ $-\Delta\vec{d} + d_f = d_0$	f) $\vec{v} = \frac{\Delta d}{\Delta t}$ (SOLVE FOR $\Delta\boldsymbol{t}$) $\frac{\Delta t\vec{v}}{\vec{v}} = \frac{\Delta d}{\vec{v}}$ $\Delta t = \frac{\Delta d}{\vec{v}}$

SCIENTIFIC NOTATION

Sometimes in Physics we work with very big numbers or very small numbers. Scientific Notation makes working with these numbers easier.

73,000,000	BECOMES	7.3×10^{7}

A simple way to look at transferring to Scientific Notation is thinking "how many

_____________ points do I have to move to move the _______________?"

SO… 7 3 , 0 0 0 , 0 0 0 .

Scientific Notation is written in two parts. There are the '________________' which

are before the 'x 10' ('times ten') symbol, and then the 'superscript' or

'____________________' of 'x 10' which is written on the top edge after 10.

7.3×10^{7}

"the digits" "the exponent"

❖ Make sure the digits are between ____________ and ______________.

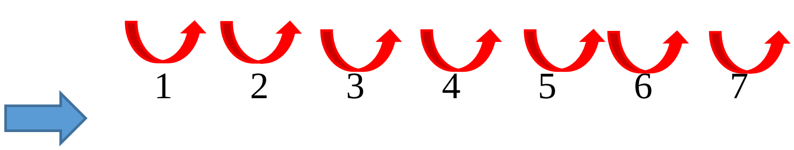
What about working with very small numbers? Separating small numbers is similar

to working with large numbers, but we count the decimal points _______________.

0.00000073	BECOMES	7.3×10^{-7}

BECAUSE…

0 . 0 0 0 0 0 0 7 3



Try it Out!

	Scientific Notation:
23,000,000	
55,555,000,000,000	
900	
0.0000000044	
0.006	
0.0000000000000008	

	Back to non-Scientific Notation:
3.05×10^{-4}	
8.8×10^{-8}	
2.1×10^{-11}	
1.23×10^{3}	
8.8×10^{9}	

SIGNIFICANT FIGURES

Significant figures are important because they tell you how accurate your data is! There are a few rules in determining what numbers are 'significant' and which are not:

- Any number that is ______________ is ______________________

- Any ____________ that is ____________________two numbers (204) is __________________________—they are part of what makes the number…

SO…123, 409 and 999 all have THREE significant figures.

- Any zero that is _________________________________ numbers is ________________________ALWAYS. (0.00043 has TWO significant figures)

- Any zero that is ____________________________________ numbers is only ______________________if there is a _________________________________

SO…10,000 miles has 1 significant figure (the 1), yet 10,000.00 has 7 significant figures (the 1 and all the zeroes). 10,000 can only be assumed accurate to the ten-thousand, whereas 10,000.00 is accurate to the hundredth.

- When you write numbers in scientific notation, only the ____(the 'times') are considered ___________________________. Any numbers _______________ the "x" are ______________________________

SO…5.4×10^{6} has two significant figures (5 and 4). 407×10^{-9} has three significant figures (4, 0 and 7).

TRY IT OUT!

	# OF SIG FIGS	SIG FIGS ARE…
100		
100.0		
100.00		
444.440		
7.7×10^{-10}		
405		

Some of the following numbers have more than two significant figures. Round each of these to two significant figures. Place your answer in the box provided. For those numbers with two or fewer significant digits, place an “X” in the box.

9,000		105.2	
89.235		985.12	

Rules: Mathematical Operations

- In **addition** and **subtraction**, the result is rounded off so that it has the same number of digits as the measurement having the fewest decimal places (counting from left to right)

  100 (3 sig. figs.) + 23.643 (5 sig. figs.) = 123.643

  This should be rounded to 124 (3 sig. figs.)

- In **multiplication** and **division**, the result should be rounded off so as to have the same number of significant figures as in the component with the least number of significant figures

  3.0 (2 sig. figs.) × 12.60 (4 sig. figs.) = 37.8000

  This should be rounded to 38 (2 sig. figs.)

EXAMPLES:

Complete the following arithmetic operations and express the answer with the correct number of significant figures. Place your answer in the box provided.

0.0241 + 0.11 =		123.69 - 20.1 =	
0.14 + 1.2243 =		47.2 - 0.01 =	
23.2 / 4.1 =		1010 x 3001 =	
25.7x8.6 =		1.80(25.3) =	