INTRODUCTION AND MATH OVERVIEW

SCIENTIFIC NOTATION

Students need to know how to perform the following calculations on a calculator. For multi-step calculations, keep all digits of intermediate results and round off only the final answer.

$6 * 10^{24} * 3.45 =$

$6.02*10^{23} * 1.5 =$

$\frac{3.24\times10^{-21}}{9.1\times10^{-31}\times2.0\times10^{-4}} =$

$2.3* 6.7 * 10^{-4} =$

$\frac{3.24\times10^{-21}}{9.1\times10^{-31}} =$

UNIT CONVERSION

25 miles = _____ meters

1 hour = _____ seconds

25 miles/hour = _____ meters/second

Discuss speed limits in residential areas.

TRIGONOMETRY

Go to the appendix for trigonometry review.

GRAPH

Students will learn to construct graphes and perform data analysis. The follow table lists time and distance data. Graph on Excel the following three graphs. Each graph should have title, subtitle, names of lab partners, labels for both x-axis and y axis.

Time t (seconds)	Distance x (meters)
1	1
2	4
3	9

Distance as a function of time, x(t) - use x as the vertical axis.

Distance as a function of square of time, $x(t^2)$ – use x as the vertical axis.

Time as a function of distance, t(x) – use t as the vertical axis.

APPLICATION OF ALGEBRA IN PHYSICS

Algebra is used in solving most of the problems in this course. However, the application may seem different than the typical problems in the algebra class. In mathematics, symbols x, y, z are usually used for unknowns; symbols a, b, c are usually used for constants. In physics,

1. All letters can be used as unknowns or constants. Displacement can be Δy or Δx.

2. A letter with a subscript is usually used to represent a particular property. Here v_0 represent the velocity at time t=0.
3. Symbols for physical properties are case sensitive. M and m are different properties.

Solve the following equations. Notice the way symbols are used to represent different properties..

1. There are four variables in the following equation. Solve for v.

   $v^2 = {v_0}^2 + 2g\Delta y$

   Use v_0=0, g= -9.8, and Δy= -1.00*10^3 .

   Answer the following questions before starting the calculation.

What variables are there in this equations?	
What are the unknown quantities?	
What variables are known quantities?	
We may solve for only one unknown in one equation. Is this the case?	

2. Solve the quadratic equation:

   $y = -4.90\ t^2$

   Use y = -1.00 * 10^2m. Solve for t

3. Solve for a as a function of M, m, g using the following set of linear equations:

$$\begin{cases} Mg - T = Ma \\ T - Mg = ma \end{cases}$$

What variables are there in this equations?	
What are the unknown quantities?	
What variables are known quantities?	
We may solve for one unknown in one equation or two in two equations. Is this the case?	

CALCULUS (OPTIONAL)

This is for students who have completed Calculus I. Give the first order derivative of the following functions with respect to t.

$y(t) = v_0 t + \frac{1}{2} at^2$, where v_0 and a are constants.

$v(t) = 5.5\ t$

$y(t) = sin\ (2\pi ft + \theta_0)$, where f and θ_0 are constants.

MEASUREMENT

THEORY

1. All measurement results need units. What are the SI base units for the following properties?
   Length _____
   Mass _____
   Time _____

2. What are the units for volume? List what you know and complete the following conversion.

   1 m^3 = _____ c.c. (cubic centimeter, or cm^3)
   1 m^3 = _____ ml

3. Write down the number of significant digits in the following measurements. Which one is most accurate?
   0.56 m _____
   0.560 m _____
   0.5603 m _____

SIZE AND MASS OF A BALL

Measurement	Diameter Value	Unit	Mass	Unit
1				
2				
3				

Average measured diameter = _____ (reminder: value & unit)
Average measured mass = _____ (reminder: value & unit)

HEIGHT OF A BALL

Measurement	Height value	Unit
1		
2		
3		

Average height = _____

TIME OF FLIGHT

Measurement	Time Value	Unit
1		
2		
3		

Average time = _____

MASS OF SUGAR