HONORS PHYSICS **NAME**_____
SUMMER ASSIGNMENT 2019-2020
MR. BOYLE
AIR ACADEMY HGIH SCHOOL

This assignment will be posted on my teacher page and the summer assignment page on the AAHS website.

Complete Google Survey by following the link below.
https://goo.gl/forms/iJwz0dU0pwmwi8Bu1

Introduction to the Course:
The purpose of this summer assignment is to remind yourself of the mathematics that will be applied to an algebra-trigonometric based Physics course through the use of equations that you will actually use in the class. For those of you just starting pre-calculus, learning vectors is always harder the first time you do it. Therefore, be patient with yourself in the first unit. I will give the website link for next year on Schoology the first day of class. On this link, I will post the answers to the summer assignment. The summer assignment will be due the second block that the class meets.

The textbook used and passed out on the first day of class will be James S. Walker's Physics: 2nd Edition (ISBN 0131014161) (2004) (Red cover). I am going to assign problems at the end of the chapter and post the results on-line so that you can better prepare for tests and quizzes during the course. Every unit will also have a test review posted a week before the exam.

If you have any questions about the course or this packet do not hesitate to contact me and I will answer within a week during the summer. I look forward to meeting you and working with you in the fall.
Many regards,
Mr. Brad Boyle
Email: brad.boyle@asd20.org

Directions: The following are situations we will encounter throughout the course in AP physics. These problems are mathematical in nature and can be solved without any knowledge of physics. Be sure to put units on all answers.

Oh, and one last thing. Before starting with any trigonometric problems (sine, cosine, and tangent), make sure that your calculator is in "degrees" and **not** "radians". If you are using a TI – 83 or TI – 84, go to "mode" and make sure "degree" is highlighted.

1) Simplify to find the value of T (Period of a simple harmonic motion):

$$T = 2\pi\sqrt{\frac{45\times10^{-2}\,kg}{2.0\times10^{3}\,\frac{kg}{s^2}}}$$

2) Simplify to find the value of K (Kinetic energy):

$$K = \frac{1}{2}(6.6\times10^{2}\,kg)(2.11\times10^{4}\,m/s)^{2}$$

3) Simplify to find the value of F (electrostatic force):

$$F = \left(9.0\times10^{9}\,\frac{N\cdot m^{2}}{C^{2}}\right)\frac{(3.2\times10^{-9}\,C)(9.6\times10^{-9}\,C)}{(0.32m)^{2}}$$

4) Solve for R_P (resistance in a parallel circuit):

$$\frac{1}{R_P} = \frac{1}{4.5\times10^{2}\,\Omega} + \frac{1}{9.4\times10^{2}\,\Omega}$$

5) Solve for the value of θ (angle of refraction)

$$1.33\sin(25.0°) = 1.50\sin(\theta)$$

6) Find the value of K_{max} (maximum kinetic energy)

$$K_{max} = (6.63\times10^{-34}\,J/s)(7.09\times10^{14}\,s) - 2.17\times10^{-19}\,J$$

Many AP problems ask for students to use variables only. In the following section, solve for the indicated variable. Do not plug in any values for any variables.

7) $v^{2} = v_{o}^{2} + 2a(\Delta x)$ Solve for a (acceleration)

8) $U_{s} = \frac{1}{2}kx^{2}$ Solve for x (displacement of a spring)

9) $T_P = 2\pi\sqrt{\frac{L}{g}}$ Solve for g (acceleration due to gravity).

10) $F_g = G\frac{m_1 m_2}{r^{2}}$ Solve for r (distance between two masses).

11) $mgh = \frac{1}{2}mv^{2}$ Solve for v (velocity of an object).

12) $x = x_0 + v_0 t + \frac{1}{2}at^{2}$ Solve for t (time). Hint: this is a quadratic function

13) $\sin(\theta_c) = \frac{n_1}{n_2}$ Solve for θ_c (critical angle).

14) $\frac{1}{f} = \frac{1}{s_0} + \frac{1}{s_i}$, Solve for s_i (distance of the image from a mirror/lens)

In AP physics, we use the KMS (kilogram, meter, second) system for measurement. However, some problems are often given in other units of measurements. The formulas we will be using in this class are based on the fact that the units of the variables are measured in KMS units. Therefore, we must be able to convert to these units. For each of the following, please convert measurements to the indicated units. If you do not recognize a prefix, you may need to look it up.

15) 4008 g = _____ kg

16) 1.2 km = _____ m

17) 823 nm = _____ m

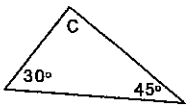
18) 0.77 m = _____ cm

19) 8.8×10^{-8} m = _____ mm

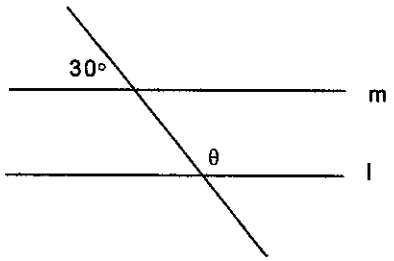
20) 25.0 μm = _____ m

Geometry plays a large role in the physics of surroundings. Solve the following problems.

21) Solve for the measurement of angle C



22) Find the value of θ. (Assume lines l and m are parallel)

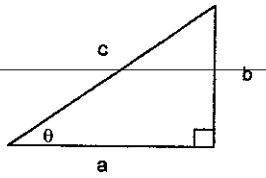


23) A circle has a diameter of 5.4 cm.

a) Find the circumference in *meters*.

b) Find the area in *square meters*.

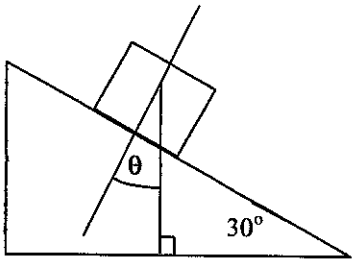
For the questions #24-25 find the indicated values using the diagram below:



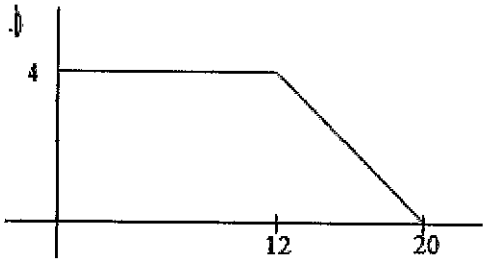
24) $\theta = 55^{\circ}$ and $c = 32\ m$, solve for a and b.

25) $a = 250\ m$ and $b = 180\ m$, solve for θ and c.

26) How large is θ below?



27) What is the area under the curve below? The area under the curve is from the x-axis to whatever function is plotted. In this case, it is an area of a trapezoid.



Vectors

In this class we will use the component method for adding vectors. This concept will be covered in early class with Physics problems, but I would like you to get familiar with the process by reviewing the following website.

https://opentextbc.ca/physicstestbook2/chapter/vector-addition-and-subtraction-analytical-methods/

After you have reviewed the technique, try the following problem.

28) Cameron Per (his friends call him Cam) and Baxter Nature are on a hike. Starting from home base, they make the following movements.

A: 2.65 km, 140° CCW

B: 4.77 km, 252° CCW

C: 3.18 km, 332° CCW

Determine the magnitude and direction of their overall displacement.

Linearization of Data

29). To prepare for one of the first activities of the year, watch the following video on how to linearize data from Mr. Nuna's AP Physics 1 page. Do not worry about the second video.

https://sites.google.com/site/apphysics1online/appendices/2-data-analysis/graph-linearization

This video shows how to analyze data in Google Sheets.

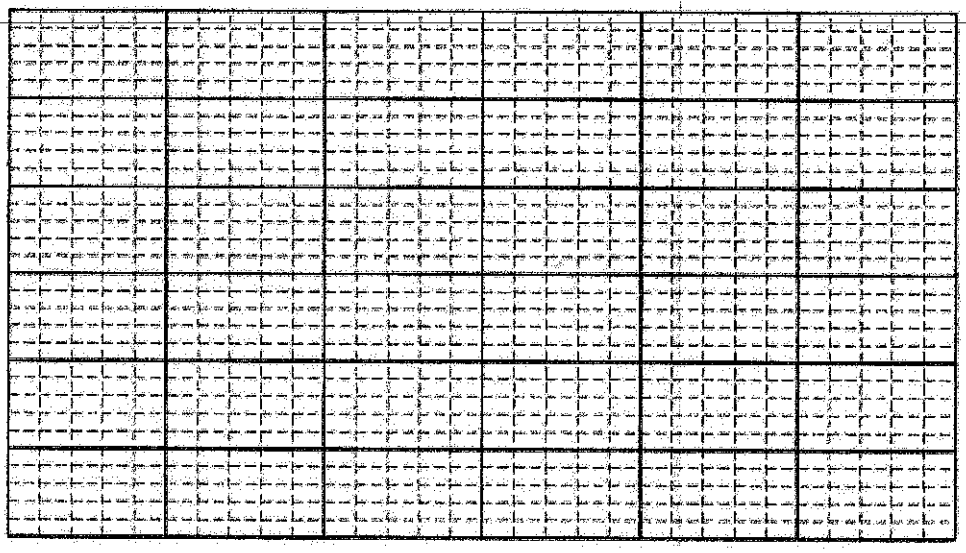
https://www.mrwaynesclass.com/labs/reading/index06.html

After you watched the video, please linearize the following question by using Excel or Google Sheets.

Time (s)	Time ^2 (s^2)	Distance (m)
0.00	0.00	0.00
1.00	1.00	6.90
2.00	4.00	23.60
3.00	9.00	50.10
4.00	16.00	86.40
5.00	25.00	132.50
6.00	36.00	188.40
7.00	49.00	254.10
8.00	64.00	329.60
9.00	81.00	414.90
10.00	100.00	510.00

There is an equation in physics to describe free-fall motion $y = \frac{1}{2} g t^2$, where g is the acceleration of gravity in (m/s^2), y is the vertical distance of drop in meters, and time is in seconds.

Plot y vs t^2 on the graph below.



Find the slope of this graph.

The slope is equal to ½ g. Find g by multiplying the slope by 2.