<u>Welcome to Physics!</u> I am so excited for the coming school year! Be prepared for a lot of in-class investigation, because hands-on is the best way to learn Physics!

A note on how this class will work. We will have the AP Physics students and the Honors Physics students meet in the same class at the same time. As such both honors and AP students *will cover the same breadth of material this year*. The main difference will be the *depth* of material and the assessment expectations placed on the honors and the AP students this year. This is noted as well in this summer assignment where AP students will have to complete all questions whereas Honors students only need to complete most questions. Questions that are labeled [AP only/ H Phy extra credit] are questions that the AP students must complete as a regular question but honors students may choose to complete for extra credit or to leave blank.

The textbook we will be using this year is <u>College Physics, a strategic approach (AP Edition) 4th Edition</u>. You do not need the textbook to do the summer work, but it would definitely help if you could follow along with the text as you go through the prepared videos.

The work I have assigned for summer work covers Chapter 1 and the start of Chapter 2 in your textbook. **<u>I will be collecting the Summer Assignment on the first day of classes. This assignment will be graded and we will be having a quiz on this material during the second week of classes.</u>**

Summer Assignment:

- <u>Unit 1 Formula Sheet</u> – You will be creating your own formula sheet to be used on tests and quizzes throughout the year. For summer work, please begin preparation of your formula sheet by adding pertinent formulas and constants as you watch the videos. Depending on how large you write, your formula sheet may end up being more than one page, but please limit the formula sheet to only formulas and constants. No worked example problems allowed.
- <u>Chapter 1 & 2 Assignments</u> - Each assignment (attached on the following pages) is broken up into main topics that cover the same content as your text and contains a link to a video meant to provide course notes and worked examples followed by problems for you to complete this summer. You must show all work for the sample problems. If you only provide answers, you will receive a zero for the assignment.
    - Please note that the videos are broken up into sections that DO NOT correspond to the textbook you will be using this coming year. The content follows the same basic flow but some sections are renamed or rearranged in the textbook we will be using this year.

If you feel lost or have any important questions about this assignment **it is very important that you reach out to me**. The purpose of this assignment is to make sure we all start out at the same place at the beginning of the year. As such, if you feel that some part of the math section is something you are not skilled in/have not learned yet, I would be happy to help you get to a point where you can succeed this year by working with you over the summer. However, you must let me know of this confusion in order for me to help you. To this end I give my email address below.

Sincerely,

Mr Steele
osteele@nda-worc.org

Physics Summer Assignment

Units and Unit Conversions

Watch the following videos:
http://youtu.be/_XLvpAMdes8?hd=1 (11:13)
https://www.youtube.com/watch?v=cgPYLJ-s5II (5:39, this is primarily on radians)
Add any significant formulas to your formula sheet and complete the following problems.

1. Complete the following unit conversions (show all work!):

    a. 2450 s to hrs
    b. 0.15hrs to s

    c. 1.62kg to g
    d. 42g to kg

    e. 1.5m to cm
    f. 72cm to m

    g. 45 degrees to radians
    h. 2 radians to degrees

2. Solve the following problems (you may use a calculator and only show complete answer). Round your answer to the correct number of sig figs (and use the correct unit on your answer).

    a. 231 m x 51 m x 1.01 m

    b. $\frac{21.01\text{ g}}{5.2\text{ mL}}$

Algebra Review

Solve each of the following equations for the requested variable (show all work!):

1. 5(x-3) = 4-3x   Solve for x.

2. [AP only/ H PHy extra credit] $T = 2\pi\sqrt{\frac{l}{g}}$ Solve for *g*.

3. [AP only/ H PHy extra credit] $\Delta x = v_i t + (0.5)at^2$ Solve for *t*. (this one is kinda gross). Note Δx is one variable. It stands for $\Delta x = x_f - x_i$

4. $-kx = mg$ Solve for x

5. $\tau = m * g * x * sin(\theta)$ solve for x

6. K = ½ m v^2 Solve for v.

7. [AP only/ H PHy extra credit] $T = 2\pi\sqrt{\frac{l}{g}}$ Solve for *l*.

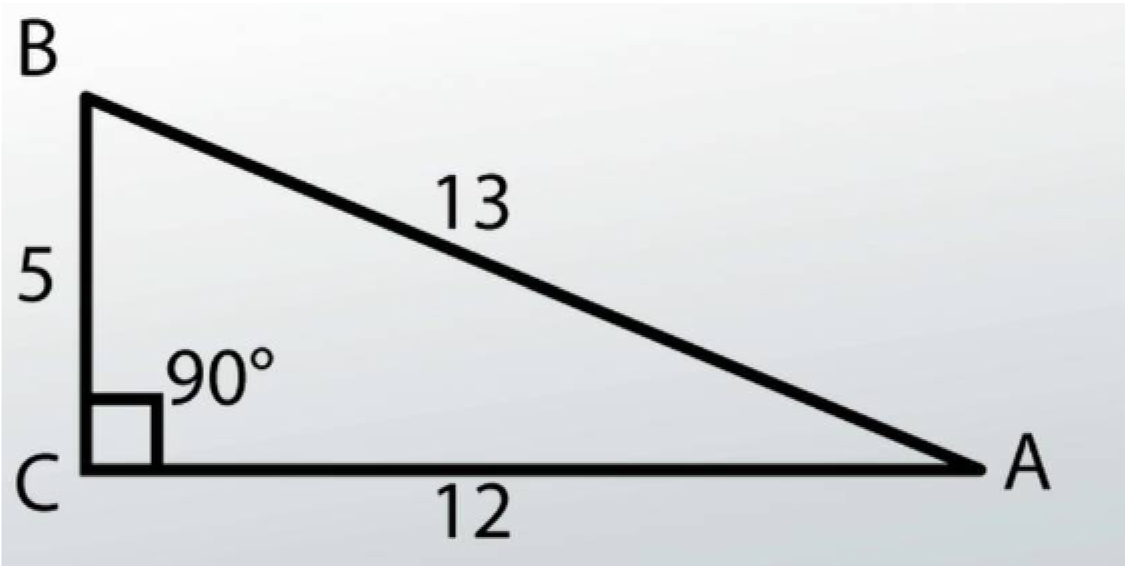
Trigonometry

Watch the following video: http://youtu.be/89MDzITq9VM?hd=1 (13:55)
Add any significant formulas to your formula sheet and complete the following problems.

Show all work and provide the proper answer. The following formulas are provided as reference.

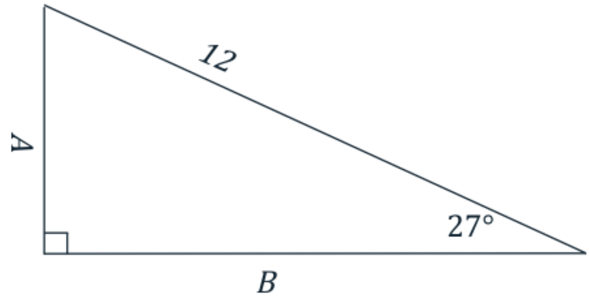
Pythagorean Theorem	SOA CAH TOA
$a^2 + b^2 = c^2$	sin(A)=opposite/hypotenuse cos(A)=adjacent/hypotenuse tan(A)=opposite/adjacent

1. Solve for the A, B angles in the following triangle:

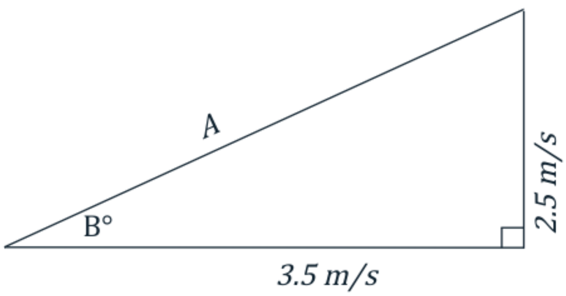


2. [AP only/ H PHy extra credit] A cricket makes a leap on a piece of flat wood at an angle of 25 degrees above the horizontal, it also has a total speed of 20m/s. What is its speed specifically in the vertical direction? What about the horizontal component of the speed?
3. If I walk to the right 10 meters to an elevator that takes me 20m up a building. How far am I from my original position? Or to put another way, if I shot a zipline from where I am to where I was standing before I started walking, how long would the zipline have to be?

4. In a very odd car trip, Tommy started out traveling 25 miles due west then made a sharp turn and continued 90 miles due south. How far away did he end up from his starting position (looking for the distance "as the crow flies"…a straight line from start to finish)?
5. If I climb a ladder that is leaning against a wall such that its base is 1.5m away from the base of the wall and the top of the ladder reaches 3m up the wall, what is the length of the ladder and the angle it forms against the ground. Assume the wall and the ground form a right angle.
6. Solve for the requested side lengths in the following triangle:



7. [AP only/ H PHy extra credit] Joslyn threw a softball with an x-component of the velocity of 3.5 m/s and a y-component of the velocity of 2.5 m/s. What are the magnitude and angle (above the horizon) of the total velocity of the softball as it leaves Joslyn's hand? (use the triangle below to help you)



<u>Vectors and scalars</u>

Watch the following video:
https://www.youtube.com/watch?v=fNk_zzaMoSs (9:51)
http://youtu.be/xySMK9_XAMg?hd=1 (15:00)

My apologies, but the last few seconds of video were cut off.
*What is missing is that the sin(35)*15 = 8.6 m/s for the vertical component.*

Add any significant formulas to your formula sheet and complete the following problems.

1. Label each of the following quantities as a vector or a scalar:
   a. 35 mph due East
   b. 75°
   c. 25 minutes
   d. 5 miles at a heading of 35° North of East

2. [AP only/H do for extra credit]Maddie threw a softball with a x-component of the velocity of 3.5 m/s and the y-component of the velocity of 2.5 m/s. What are the magnitude and angle (above the horizon) of the total velocity of the softball as it leaves Maddie's hand?

3. [AP only/H do for extra credit] Draw the vector [5,3] on a coordinate grid.

Displacement

Watch the following videos:
https://www.youtube.com/watch?v=vQCkYm3v3aA (4:13)
http://youtu.be/mkRWvdX-lFQ?hd=1 (14:02)
Add any significant formulas to your formula sheet and complete the following problems.

1. Can the displacement ever be more than the distance traveled? Explain your reasoning.

2. What is the displacement of the cross-country team if they begin at the school, run 10 miles and finish back at the school? What is the distance traveled?

3. [AP only/ H PHy extra credit] Michaela traveled 6 miles east, 6 miles north, and then 2 miles west. What distance did she travel, and what was the magnitude of her final displacement?

Speed & Velocity

Watch the following video:
https://www.youtube.com/watch?v=X4Wxd4m-QVc (2:27)
http://youtu.be/bqVIRdHO7Q8?hd=1 (14:52)
Add any significant formulas to your formula sheet and complete the following problems.

1. If I am traveling at a velocity of 55 mph due north, what is my speed?

2. You bike at a constant speed of 5.2 m/s for 15 s. How far do you travel?

3. [AP only/ H PHy extra credit] Light from the Sun reaches Earth in about 8.3 minutes. The speed of light is 3.00×10^8 m/s. What is the distance from the Sun to the Earth?

4. During a track event, it takes a runner 23 seconds to run 500 meters. What is the runner's average velocity?

5. You and a friend are each driving 50.0 km. You travel at 90.0 km/hr and your friend travels at 95.0 km/hr. How much sooner will your friend finish the trip?

6. [AP only/bonus for H Phy] A canoeist paddles upstream at a velocity of 2.0 m/s for 4.0 seconds and then floats downstream at 4.0 m/s for 4.0 seconds. What is the average velocity of the canoe during the 8 second time interval?

<u>Acceleration</u>

Watch the following videos:
https://www.youtube.com/watch?v=J3SdZwMcWhA (2:01)
http://youtu.be/ya3L_Ijbs74?hd=1 (10:42)
Add any significant formulas to your formula sheet and complete the following problems.

1. Is it possible for an object to increase its speed (go faster) while its acceleration is negative? Explain your reasoning.

2. [AP only/ H PHy extra credit] Can an object reverse its direction while its acceleration is constant? Explain your reasoning.

3. During the Daytona 500, a race car accelerates uniformly from 5 m/s to 17 m/s in 2.5 seconds. What was the acceleration of the car?

4. [AP only/ H PHy extra credit] A golf ball rolls up a hill toward a hole. Assume the direction toward the hole is positive. If the golf ball starts with a speed of 2.0 m/s and slows at a constant rate of 0.50 m/s^2, what is the velocity after 2.0 s?