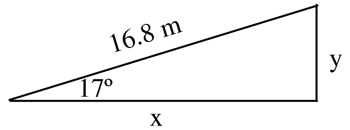
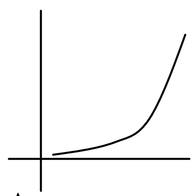
PreAP Linear Motion 10

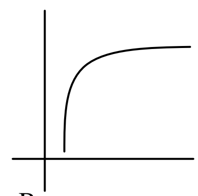


1. Use the triangle at the left to answer the following (please read the notes on the back, first:
   A. opposite = B. Adjacent =
   C. Hypotenuse = D. θ =
   E. * Following the example on the back page, calculate x and y.

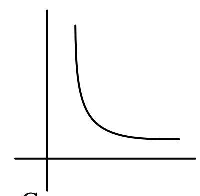
2. From the "How to Straighten Graphs" notes, give the basic function for each of the graphs at the right:



A. y =

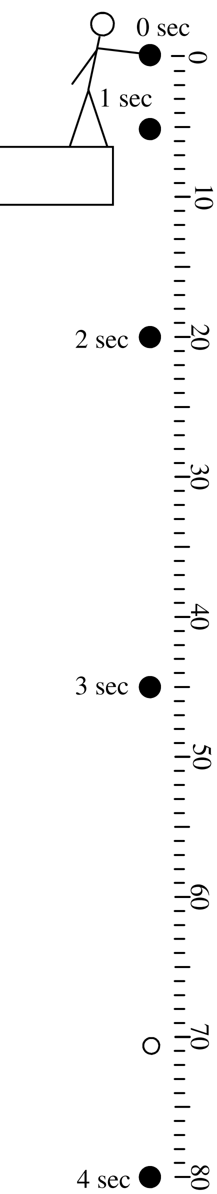


B. y =



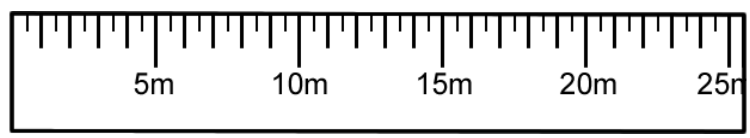
C. y =

3. An object is originally at rest. It then undergoes an acceleration of 10 m/s^2.
   A. * Calculate how far it travels in one second.



   B. * Calculate how far it travels in 2 seconds.

   C. On the ruler at the right, label how far it went in one second as "1 sec". Do the same for how far it went in 2 seconds.
   Between the 1 sec and 2 sec marks on the ruler, you should see that the object went 15 m.



   D. How far is 15 m compared with the original 5 m?
   E. So, in the second second of time, an accelerating object goes _____ times as far as in the first second.
   F. In the full two seconds of time, an accelerated object goes _____ times as far as in the first second.
   This is because t is squared in the equation.

4. Slim Jim is going to help us understand a special type of accelerating object: one only pulled by gravity, known as freefall. So, Slim Jim drops a ball from a platform.
   A. * Jim is holding onto the ball to begin with, so what is its initial velocity?
   B. * Since it is dropped VERTICALLY, will you use Δx or Δy?
   C. * Since the ball is DROPPED, will Δy be + or –?
   D. * Δy after 2 seconds =

   OK, the kinematic equations give the information about two particular points only. So, circle the ball's first position (at 0 sec) and third position (at 2 sec).

   E. ***Assign Variables***: (including "unknown" and "not used")

   Δy =
   Vi =
   Vf =
   a =
   t =

   F. **Equation**:
   G. **Put in #s and solve**:

*This acceleration you just found: a = −10 m/s^2, is known as the "**acceleration due to gravity**" we give it the letter "g". I rounded a bit for ease. In actuality, g = −9.8 m/s^2 near the earth's surface.*

5. *(The kinematics work even with big and small numbers.)* * A beetle walking 0.015 m/s is startled. It ends up walking 0.85m in 0.35seconds. Calculate the beetle's acceleration.

$$\text{Sin}\ \theta = \frac{\text{opp}}{\text{hyp}}$$

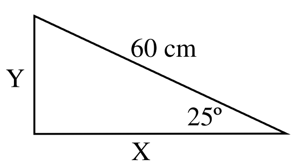
$$\text{Cos}\ \theta = \frac{\text{adj}}{\text{hyp}}$$

$$\text{Tan}\ \theta = \frac{\text{opp}}{\text{adj}}$$

Be sure to be in degrees! Use "Mode" to check. Double check by putting sin30° = and you should get 0.5

Putting sin, cos, or tan in your calculator: for example. Sin60° is a ratio and will come out as a decimal. Enter "sin60" then "=". Will look like "sin(60". You can close the parenthesis if you want, or just hit enter and you get .866. You only HAVE to close the parenthesis if you multiply something after sin. That's why we multiply a number BEFORE sin (cos, tan) when we calculate.

Problem: Find the length of X.



Step 1: Assign Variables

Variables:
θ = 25°
opp. = Y
adj. = X
hyp.= 60 cm

Step 2: Choose a Formula

You know hyp and need adj., so use cos.

$$\cos\theta = \frac{\text{adj.}}{\text{hyp.}}$$

Step 3: Solve

$$\cos\theta = \frac{\text{adj.}}{\text{hyp.}}$$

$$\cos 25° = \frac{X}{60\text{cm}}$$

$$.9063 = \frac{X}{60\text{cm}}$$

$$(60).9063 = X$$

$$X = 54.4\text{cm}$$

1E) y= 4.9 m (since sin17 = .29); figure out x on your own 3A) 5 m 3B) 20 m
4A) vi = 0 m/s 4B) Δy 4C) neg. 4D) Δy = −20 m
5) use $\Delta x = v_i t + ½at^2$, so a = 13.8 m/s^2