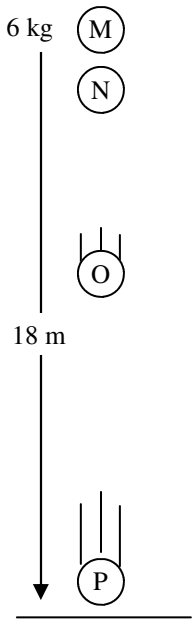
A-Day: Due Fri., Jan 9 (Assigned: 12/7)
B-Day: Due Mon., Jan 10 (Assigned: 12/8)

2008 Fall Finals 1



1. An object is dropped as shown at the left.
   A. What is the weight of the object?
   B. Calculate the energy at point M.

   C. What kind of energy does it have at O?
   D. How much energy does it have at P?

   E. What is the acceleration of the object at point M?
   F. What is the acceleration of the object at point O?
   G. Does the acceleration of the object increase, decrease, or remain constant?
   H. Each second, does the amount of distance it falls increase, decrease or remain constant?
   I. What is the displacement of the object (what is its vertical change of position)?
   J. What is the initial velocity of the object?
   K. How much time does it take to hit the ground?

   L. How fast is it going just before it hits the ground? (*You can do this two ways.*)

   M. As the object falls, is it getting faster, slower, or staying the same speed?
   N. As it falls, does the air resistance (the push of air on it) increase, decrease, or remain the same? (*Think about your hand outside a car's window as the car speed up.*)
   O. Imagine that the object is actually dropped off of a tall cliff, hundreds of meters high. If there is air resistance, will the object continue to speed up forever or eventually hit a maximum speed?

Eventually, the force of air resistance (air friction) pushing up is so big that it balances the force of weight pulling down. As you know, when two forces are equal in magnitude (same size) and opposite in direction the object stops speeding up and stays at that speed. This is known as "terminal velocity".

2. Which has a greater terminal velocity: a parachutist before or after the open their parachute?

3. A golf ball and a ping pong ball are dropped from a plane. Which one has the greatest terminal velocity?

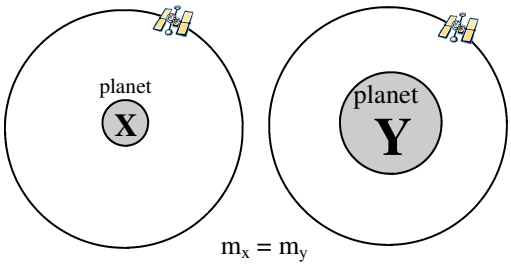
4. From your notes on Gravity:
   A. What does the letter "r" in the gravity equation mean (be exact)?

   B. What does "r" mean for an object on the surface of a plant?

   C. If the size of a planet increases, does "r" increase or decrease?

5. The two identical satellites have the exact same orbit. The masses of the planets are equal, but planet X is smaller.
   A. Which is greater: the force of gravity between satellite 1 and planet X or the force of gravity between satellite 2 and planet Y?

   B. Since Planet X is smaller, it is more d_____.
   C. If the satellites were to land on the planet surfaces, which one will be the heaviest?



Velocity (m/s)	0	2.25	4.5	6.75	9	11.25	13.5
Distance (m)	0	0.5625	2.25	?	9	14.06	?
Time (sec)	0	0.5	1	1.5	2	2.5	3

Definitions: $V_{ave} = \frac{\Delta D}{\Delta t}$ *The average velocity is the change of distance ÷ change of time.* $a_{ave} = \frac{\Delta v}{\Delta t}$ *The average acceleration is the change of velocity ÷ change of time.*

6. The above chart shows the motion of an object (*maybe a carnivorous flying weasel*). It has constant acceleration during the first 3 seconds as shown. (*I'm not allowed to divulge what happened next, but it was not pretty, especially for the poor cyber-cow that got in the way.)*

   A. Find the average acceleration for the 3 seconds shown.

   B. Now use a kinematic equation to find the distance it traveled in the first 1.5 seconds.

   C. What is its average speed for the first 2 seconds?