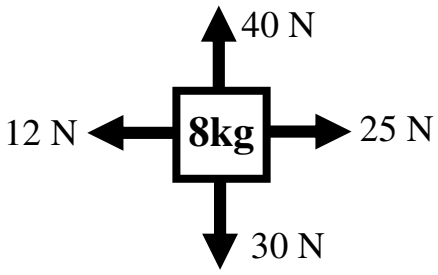
A-Day: Due Mon., 10/19
B-Day: Due Tues., 10/20

2009 PreAP Forces 1

1. Mass "m" is at rest and has two forces pulling on it.
   A. Which way will M move?
   B. Why?
   C. If left is negative, what is the net force on M?
   D. If M = 35 kg, what is its acceleration?

This symbol: "Σ", means "sum". It means to add together numbers, keeping track of positives and negatives.
Example: $x_1 = 5$; $x_2 = -4$; $x_3 = 2$; $x_4 = -5$. $\Sigma x = -2$.



2. A. What is the net force in the x direction for the 8 kg object (ΣFx)?

   B. What is ΣFy ?

   C. Using ΣFx and ΣFy, find the net force on the object, remembering that forces are vectors and require magnitude AND direction.

   D. Now that you have your net force, calculate the acceleration of the mass.

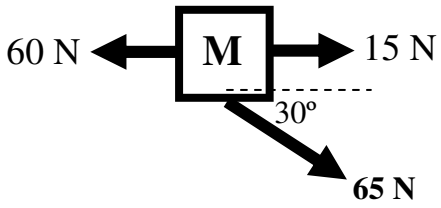
3. Write Newton's three laws of motion.
   I.

   II.

   III.

4. Use the diagram at the right to answer the following.
   A. Find the net force on the object.
   (Hint: Break the angled force into its x and y components, then you can solve just like #2.)

   B. If the object accelerates 3.8 m/s2, find the mass of the object.

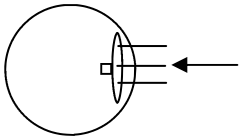


5. If you push harder on an object, will it have more or less acceleration?
6. If the mass of an object increases, will it's acceleration be greater or less than a less massive object (given the same force)?
7. If you reduce the mass of an object to 1/3, by how much does the acceleration change?
8. If you double the force on an object, by how much does the acceleration change?

9. Imagine a giant air hockey table, several miles across (way cool!). Because there is a layer of air everywhere, there is NO friction.

   A. The disc is pushed and moves at 3 m/s to the right. How far will the disc go?
   B. Because there is no friction, what will its speed be after 40 seconds?

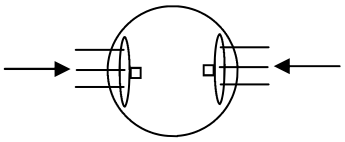
   Now imagine two fans are placed on the disc to push it either left or right. If the right fan turns on, the disc will be pushed to the left. If the left fan turns on, the disc will be pushed to the right.



   A. If the disc is at rest to begin with and the right fan comes on what happens to the disc?

   B. If the disc is moving 2 m/s to the left and the right fan comes on, what will happen to the disc?

   C. If the disc is moving at a constant 4 m/s to the left and both fans come on at the same time and with the same force, what will happen to the disc?



10. A 6 kg object is moving 3 m/s to the left. After 8 seconds it ends up 3 m to the right of its initial position.
   A. Find the acceleration of the above object.

   B. Find the net force on the object.

11. F, F_T, F_W, $F_{friction}$, or F_N?

   A. _____Due to a string.
   B. _____Opposes weight for objects on surfaces.
   C. _____You push down on an object on a table, this increase.
   D. _____Caused by gravity.
   E. _____Would decrease on the moon.
   F. _____Decreases if a surface is smooth.
   G. ____ You place a heavy object onto a board. The board will break if this is too small.
   H. ____ Always vertical.
   I. ____ If a surface is tilted, this changes direction, too.
   J. ____ Has the units of newtons.
   K. ____ Doesn't exist for hanging objects.

11. From the notes:
   A. What are the units for weight?
   B. What are the units for force?
   C. What are the units for mass?

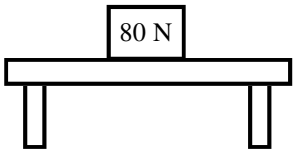
12. Calculate the weight of a 12 kg object.

13. Calculate the mass of a 180 N object.

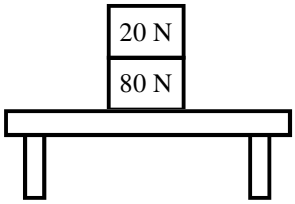
14. Calculate the mass of a 16 kg object.

15. If a 5 kg mass has a weight of 72 N on planet Zorg, what is the acceleration due to gravity on Zorg?

The normal force is a supporting force. Think of normal force this way: if the object was put on your hand, Fn is how hard you have to push up to keep the object from falling. (How heavy it feels. Its weight is pulling it down and you are pushing it up. The heavier it feels the more normal force you have to use .)

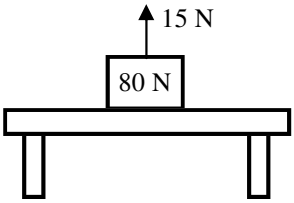


16. An 80 N object is placed on a table.
    A. How much normal force must the table provide?

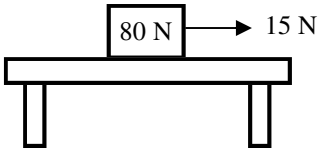


B. If a 20 N, is placed on top of the 80 N object, how much normal force is exerted by the table?

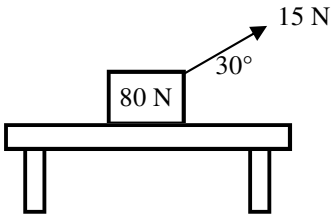
C. How much normal force is provided by the top of the 80 N object?



D. If the 20 N object is removed and you pull up on the 80 N object with 15 N, how much normal force does the table exert?



E. The 15 N force is changed so that it is horizontal. What is the normal force on the object (from the table)?



The 15 N force is then turned to 30°.

F. How much of the 15 N force is pulling up on the 80 N object?

G. Calculate F_N on the 80 N object.

17. Static (Fs) or Kinetic (Fk) Friction?

____Gripping friction
____Tries to stop an object when it's moving.
____How much force to keep an object sliding.
____Sliding friction.
____Calculate with μ_k.
____How much it takes to start an object sliding.
____ On a playground slide.
____ Requires F_N to calculate.
____ Car tires normally.
____ Is greater.
____ Car tires when they "spin out".