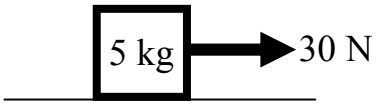
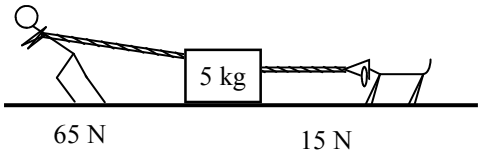
B-Day: Due Thurs., Oct 28
A-Day: Due Fri., Oct 29

2010-11 PreAP Forces 3

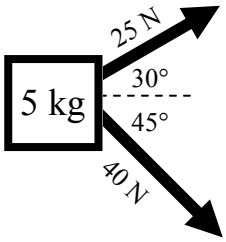




1. Calculate the acceleration of the 5 kg object.

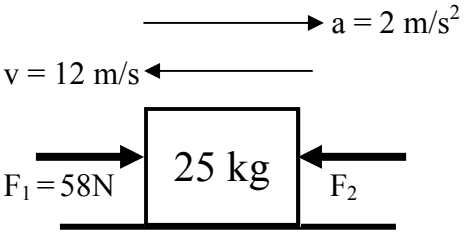
2. Slim Jim is pulling on an object and Bim tries to "help". Calculate the acceleration of the object (*pretend Jim is pulling parallel to the floor*).

So we see that instead of F = ma, we must use ∑F = ma, where ∑F means $F_1 + F_2 + F_3$... etc., keeping track of +s and −s.



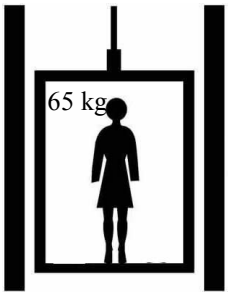
3. Now two forces pull on the 5 kg mass, but at the directions given.
   A. Which force will the resultant be closer to?
   B. Which components will add together: x or y's?
   C. Which components will subtract from each other: x or y's?
   D. Calculate the net force on the object, using what you learned about vectors last chapter.

   E. Then calculate the acceleration of the object (*magnitude and direction, of course).*



4. A 25 kg object is moving 12 m/s to the left. It has an acceleration of 2 m/s^2 to the right.
   A. Is the object speeding up or slowing down?
   B. Is the acceleration positive or negative?
   C. Which force must be bigger?
   D. Use ∑F = ma to calculate F_2.

5. Heavier, lighter, or same as normal weight?
   A. _____ When an elevator starts moving up?
   B. _____ When an elevator is between floors?
   C. _____ When an elevator is stopping while moving up?
   D. _____ When an elevator starts down?
   E. _____ When an elevator is stopping while moving down?

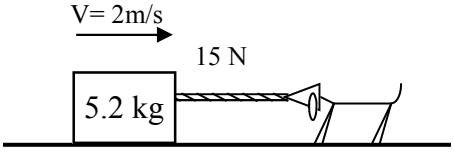


6. A 65 kg person is in an elevator. The elevator has an accelerates of +3 m/s^2.
   A. How heavy do they seem? (*See "Normal Force" notes*)

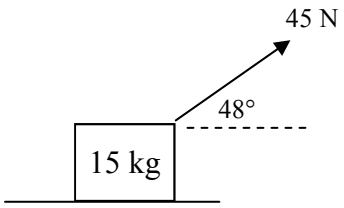
   B. Is the elevator moving up or down?

   C. How heavy do they seem if the elevator has an acceleration of −4 m/s^2.

7. Bim is pulling on a mass at constant speed. There is friction on the floor.
   A. Draw all of the forces acting on the object.
   B. What is the acceleration of the object.
   C. Use ∑F = ma to calculate the force of friction.

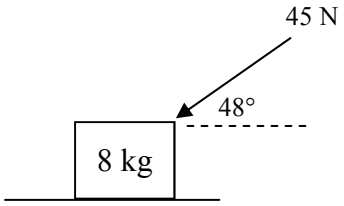


$\mu_s = 0.2$
$\mu_k = 0.15$

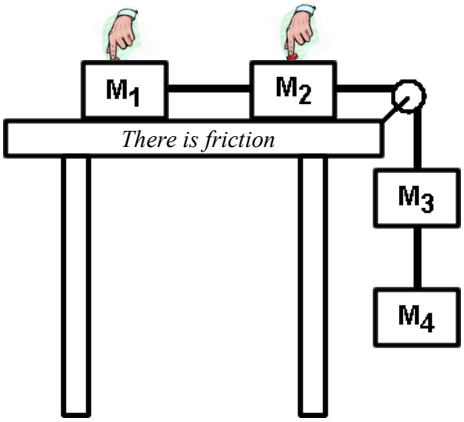


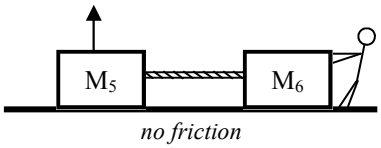
8. * A 45 N force pulls on a 15 kg object an angle of 48°. The coefficients of friction are given.
   A. Break up the 45 N force into its x and y components (draw and label it on the diagram).
   B. Calculate the normal force on the object.
   C. Calculate static and kinetic friction on the object.
   D. Will the object slide?
   E. If the object doesn't slide, how much more force is necessary to get it to slide?
   F. If it does slide, calculate its acceleration.

$\mu_s = 0.2$
$\mu_k = 0.15$

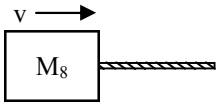


9. This time, the 45 N force pushes DOWN on the object.
   A. Since the force is pushing down, will the normal force be greater or less than the force of weight of the object?
   B. Calculate the frictional forces on the object.
   C. Decide if the object will slide or not.
   D. Calculate its acceleration OR how much more force is necessary to start it sliding.

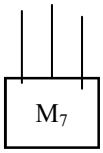




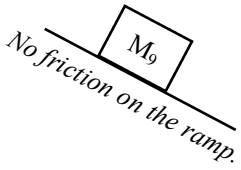
no friction

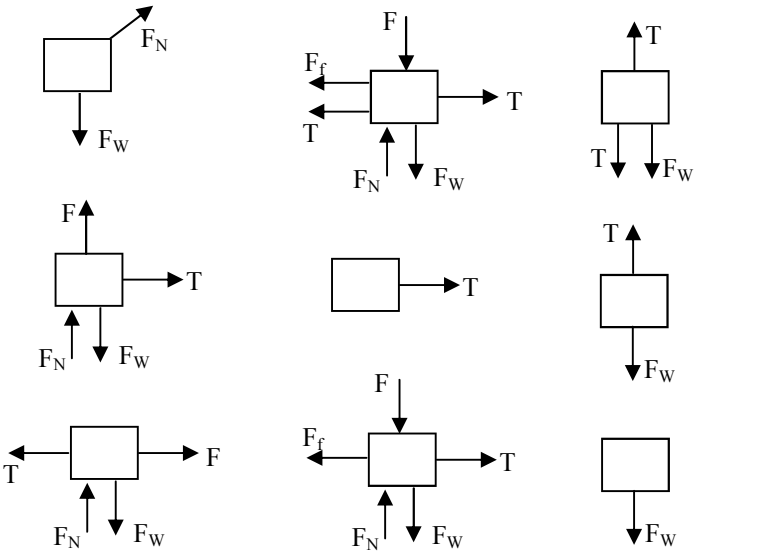


Looking down on an object that is sliding on ice.



Falling in a vacuum, so there is no air friction.

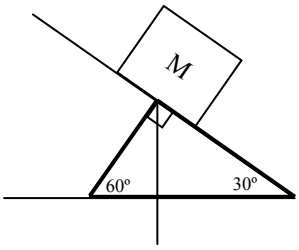


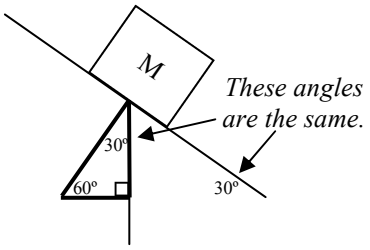


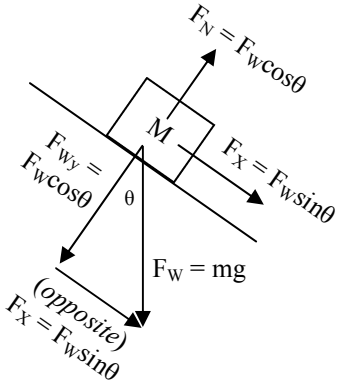
10. * Identify the force diagrams for the nine above masses.

11. * For the left-most mass in the second row, write the x and y second law equations.

12. Write the x and y second law equations for the left most mass in the third row.



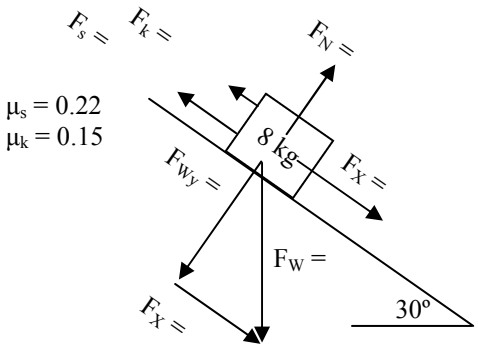


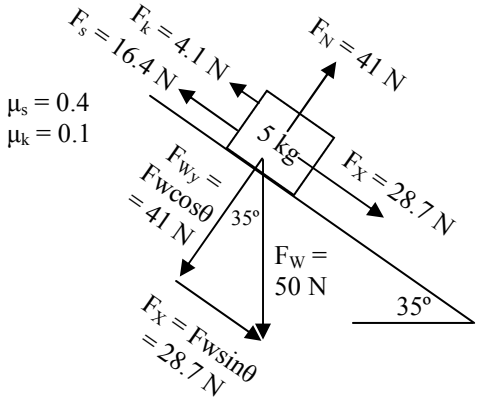


Sometimes we tilt our x and y-axis to make our job easier. Study the diagrams above carefully.

13. For ramps:
    A. To calculate the portion of the weight pulling down the ramp do we use sin or cos?
    B. The weight always points which way?
    C. The normal force is equal and opposite to which portion of the weight: sin or cos?
    D. Which way will friction point? Up or down the ramp?

14. Using the example at the bottom right to fill in the blanks on the diagram below.
    (*NOTE: The numbers are different. Don't just copy the numbers from the right diagram to the left diagram.*)





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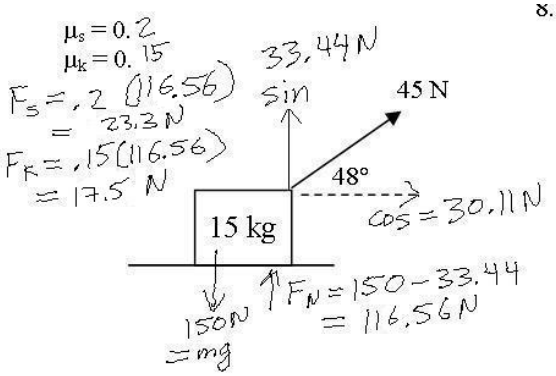


A. Break up the 45 N force into its x and y components (draw and label it on the diagram). ✓

B. Calculate the normal force on the object. 113.56 N

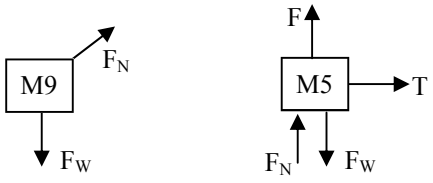
C. Calculate static and kinetic friction on the object. $F_s = 22.7$ N $F_K = 11.4$ N

D. Will the object slide? yes, $30.11 > 22.7$

E. If the object doesn't slide, how much more force is necessary to get it to slide? N/a

F. If it does slide, calculate its acceleration.

$\Sigma F = ma$
$30.11 - 17.5 = 15a$ $a = .84$ m/s²



Q11: x-dir: $T = ma$ (only the horizontal forces)
y-dir: $F_N + F - F_W = ma$ (only the vertical forces)