Name: _____

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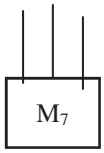
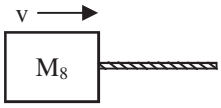
Advanced Forces Practice

1. Match the following Newton's Second Law equations with the correct mass at the right. These equations could be in either the x or y-directions.

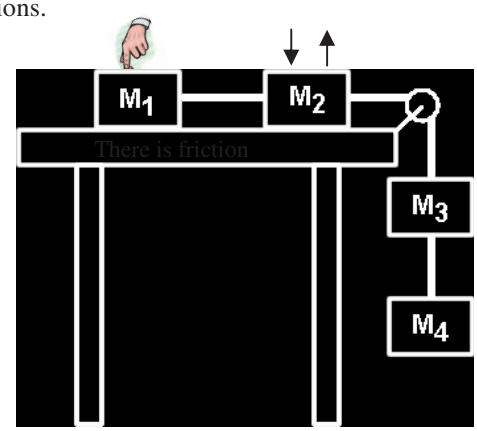
A. _____ $T = ma$
B. _____ $T - T - F_W = ma$
C. _____ $F_N - F - F_W = ma$
D. _____ $T - F_f = ma$
E. _____ $F_N + F - F_W = ma$
F. _____ $F_N + F - F - F_W = ma$
G. _____ $T - F_f = 0$
H. _____ $T - T - F_f = ma$
I. _____ $F_W = ma$
J. _____ $T - F_W = ma$
K. _____ $F_N - F_W = ma$
L. _____ $F - T = ma$

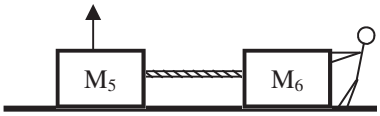


Falling in a vacuum

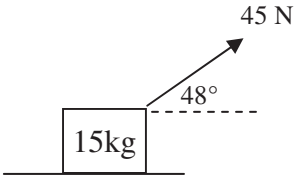


At constant speed, with friction. Looking down on the object.



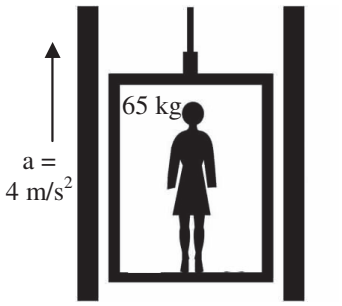


no friction



2. A 15 kg mass has a 45 N force pulling on it at an angle of 48° above the horizon. The mass is on a surface that has the following coefficients of friction: $\mu_s = 0.34$ and $\mu_k = 0.16$.
   A. Decide if it will move, if it starts at rest.

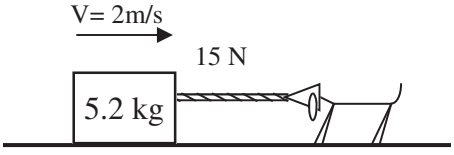
   B. Calculate the acceleration if it is already moving.



3. A. Calculate how heavy the 65 kg lady in the elevator feels.

   B. What would a scale (reading weight) read that is under her feet?

   C. What would a scale read if the elevator's cable was cut?



4. Slim Jim's dog "Bim" is pulling 15N on a 5.2 kg mass at a constant velocity of 2 m/s. There is friction between the mass and the floor.
   A. Draw and label all of the forces acting on the mass.
   B. What is the acceleration of the object?

   C. Calculate the force of friction on the mass.

   D. Calculate the coefficient of friction of the floor.

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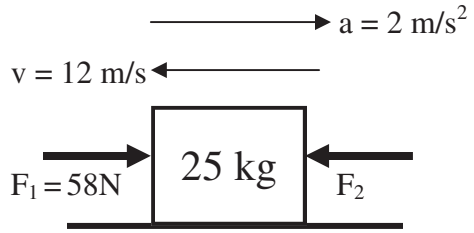
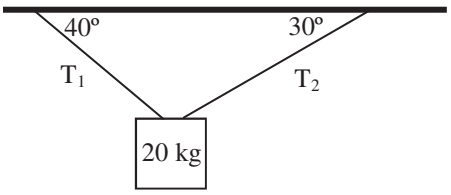


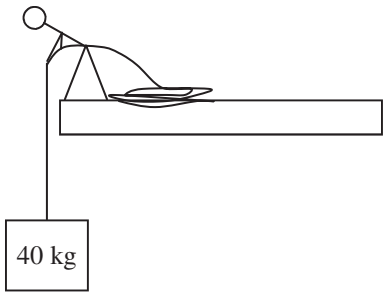
5. A 25 kg object has a velocity of −12 m/s and has an acceleration of +2 m/s^2.
   A. Is the object moving to the left, to the right, or at rest?
   B. Is the object speeding up or slowing down?
   C. Are the forces balanced or unbalanced?
   D. How do you know?
   E. Which force is greater: F_1 or F_2?
   F. Calculate the net force acting on the object.

   G. Calculate the magnitude of force 2.



6. A 20 kg object is suspended by two ropes. Calculate the tension in each rope.
   A. Since it is suspended, its acceleration must equal what?
   B. Break up the tensions into their x and y-components (*you will use just variables*).

   C. Write the x and y equations for Newton's Second Law and solve. There will be two unknowns and two equations.



7. Slim Jim has a rope attached to an 40 kg box.
   A. If the box is not moving or at constant speed, what is it's acceleration?

   B. What is the tension in the rope?

   C. If Slim Jim pulls the object up with an acceleration of 2.5 m/s^2, find the tension in the rope.

8. Find the acceleration for each of the 5 kg masses below. On the right there is only one mass and Slim Jim pulls down with 200 N.