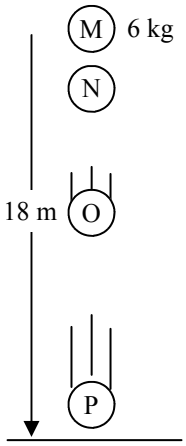
Physics Final Review

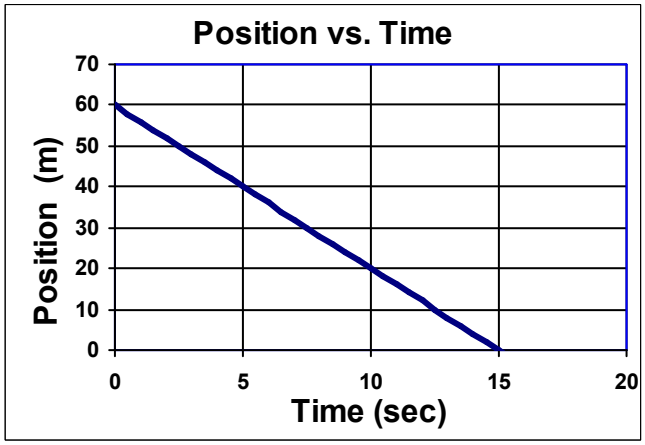
1. A 6kg object is 18m up in the air. It is dropped from rest as shown below. Assume there is no air friction.

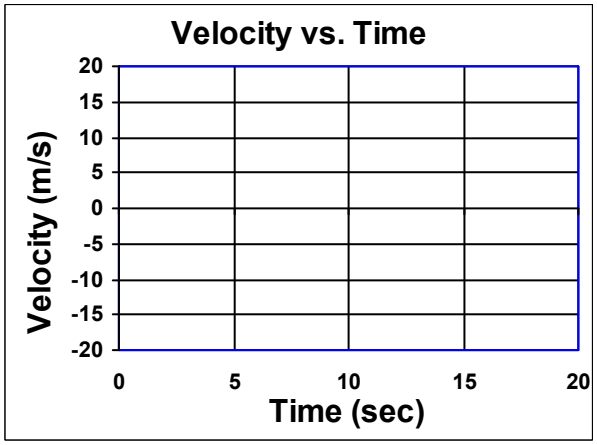


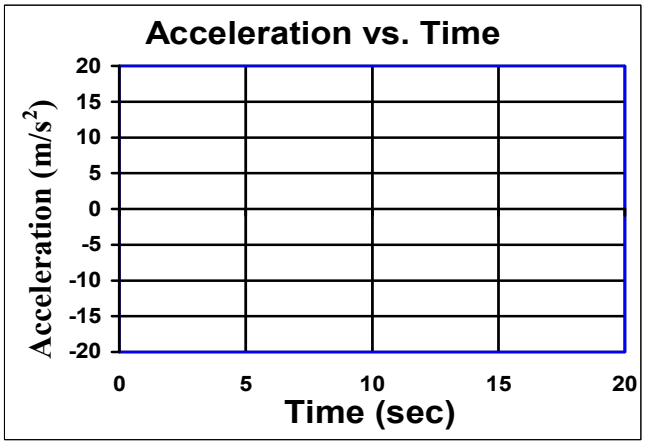
A. What is the mass of the object?
B. What is the weight of the object?
C. What would be the weight of this object in space?
D. Calculate the object's energy at point M.

E. What kind of energy does it have at O?
F. How much energy does it have at P?

G. What is the acceleration of the object at point M?
H. What is the acceleration of the object at point O?
I. What is the displacement of the object (Δy, *its vertical change of position*)?
J. What is the initial velocity of the object?
K. Use a kinematic equation to calculate how much time it takes to hit the ground.





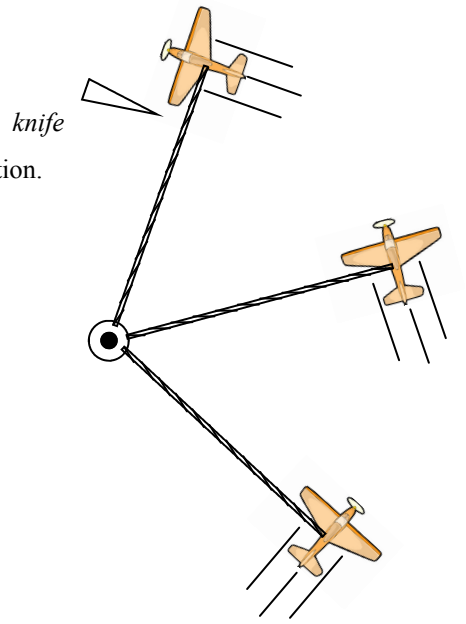


2. A. What is the speed of the object shown on the position vs. time graph above?

B. What is the initial position of the object?

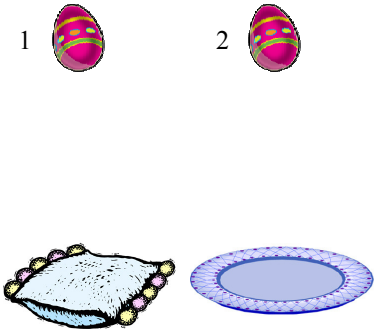
C. Transfer the position vs. time graph to the other two graphs.

3. A toy plane attached to a rope is flying in a circle around a pole.
   A. What force is holding onto the plane?
   B. For each position draw and label the direction of the plane's velocity and acceleration.
   C. At one point a knife cuts the rope. Draw the path that the plane will follow after the rope is cut.



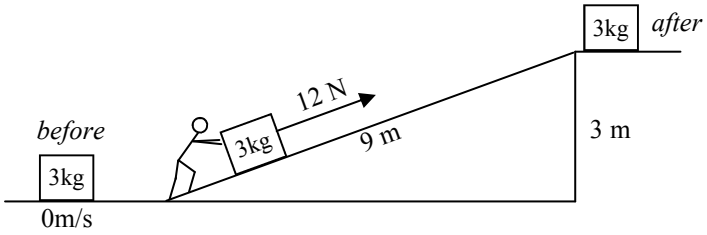
4. Motor A has a rating of 300 W. Motor B has a rating of 200 W.
   A. Which motor is more powerful?
   B. How long would it take Motor A to do 6000 J of work?
   C. How long would it take Motor B to do 6000 J of work?
   D. Which motor did the work quicker?
   E. Which motor did more work?

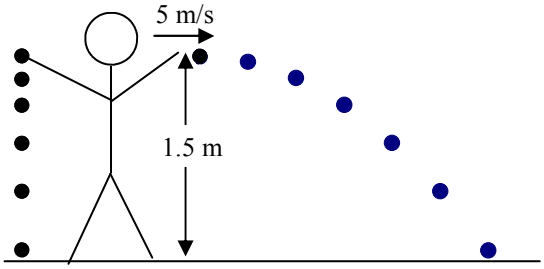
5. True or false (and why)?: "*A more powerful object can do more work.*"



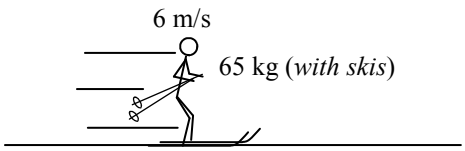
6. Two identical eggs are dropped from the same height. One egg ands on a pillow and the other on a metal plate.
   A. What kind of energy do they start with?
   B. What kind of energy are they gaining?
   C. How does the total energy change as it falls?
   D. Which has the greatest speed at the bottom?
   E. Since they both stop after they hit, which one experiences the greater change of momentum?
   F. Which one experiences a bigger impulse?

7. A 3 kg box is at rest at the bottom of a 9 m long ramp. Slim Jim pushes with 8N to move it to the top of a 3m tall ledge.
   A. How much work does Slim Jim do on the box?
   B. How much energy does it have at the top of the ramp?
   C. How efficient was this energy transfer?





8. Slim Jim drops a ball at the exact same time he throws a ball.
   A. What is the vertical displacement of the thrown ball?
   B. Which ball hits the ground first?
   C. What is the initial vertical velocity of the dropped ball?
   D. What is the initial vertical velocity of the thrown ball?
   E. What is the vertical acceleration of each ball?
   F. What is the horizontal acceleration of the thrown ball?
   G. What is the horizontal velocity of the thrown ball just before it hits the ground?
   H. How much time does it take for the thrown ball to hit the ground?
   I. How far away does the thrown ball land?



9. Slim Jim is skiing on frictionless snow.
   A. What is Slim Jim's mass?
   B. What is Slim Jim's weight?
   C. How much momentum does Slim Jim have?

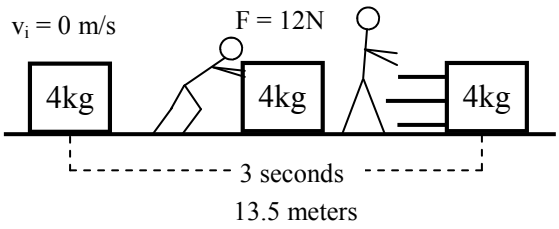
   D. If the snow is frictionless and he doesn't push with his poles, what is his acceleration?
   E. How fast will he be going after 4 seconds?
   F. How far will he go in for 4 seconds?

10. A 4 kg box is at rest on the ground. Slim Jim pushes on the box with 12N. After 3 seconds he has pushed it 13.5 meters and he let's go.
    A. How much work did he do on the box?

    B. How much kinetic energy does it gain?

    C. How much impulse does he give the object?

    D. How much momentum does the object have afterwards?



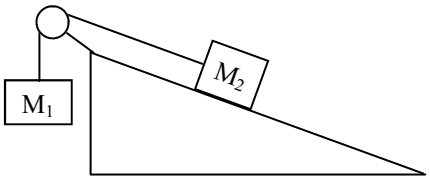
	Calculate the Net Force	Calculate the Acceleration
30 N, 10kg, 25 N		
5 N, 2kg, 15 N		
25 N, 20kg, 25 N		

11. A. Fill in the information at the right.
    B. Which object has the greatest net force acting on it?

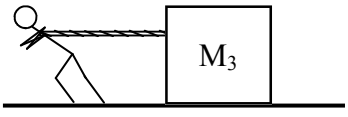
    C. Which object has the greatest acceleration?

    D. Which object has the most inertia?

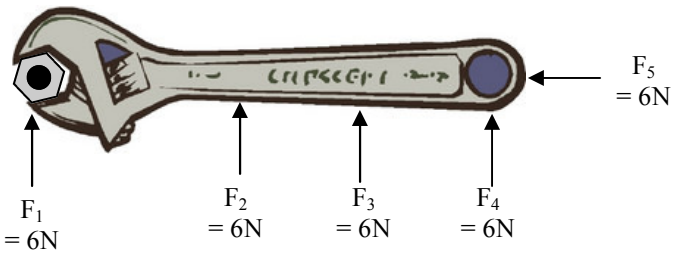
12. Draw and label force diagrams for all three masses.



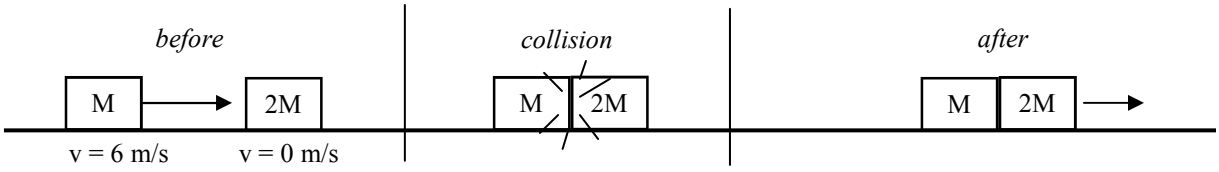
No friction



There is friction

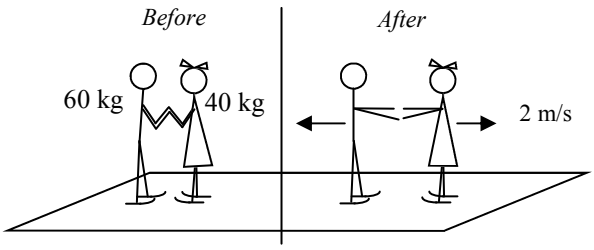


13. A wrench is attempting to torque a bolt.
    A. Which of the forces provide no torque?
    B. Which of the forces provides the most torque?
    C. Give another way to increase torque.



Net momentum _____

14. Two masses collide and stick together, as shown above.
    A. What is the initial momentum of the small mass (using variables)?
    B. What is the initial momentum of the larger mass?
    C. What is the total momentum before the collision?
    D. Which mass feels more force during the collision, the small mass or the large mass?)
    E. After the collision, will the combined masses be moving slower or faster, compared to the speed of the small mass beforehand?
    F. What is the net momentum of the combined object afterwards?



15. Slim Jim and Slim Kim at holding hands while at rest on frictionless ice. They push off from each other.
    A. What is the net momentum of the two beforehand?
    B. What is the net momentum of the two afterwards?
    C. Who feels a greater force?
    D. Who has the faster velocity?
    E. Who has the greater mass?
    F. Who has the greater final momentum?
    G. Under the diagram, calculate Jim's final velocity.