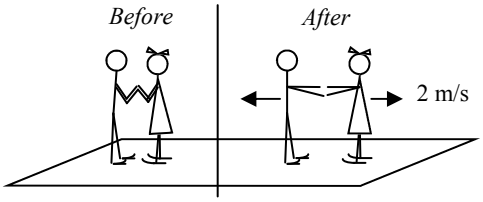
Mon., Dec 10

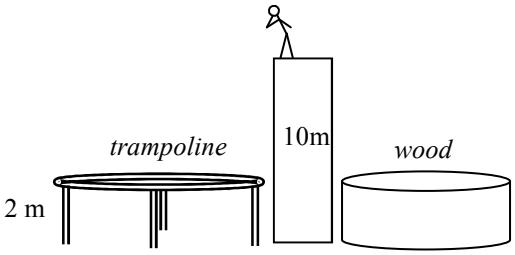
PreAP Momentum 6

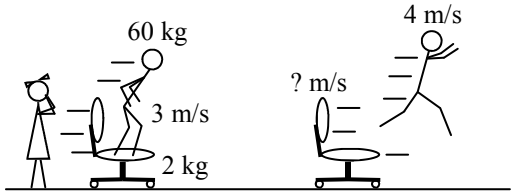
With some Energy 11



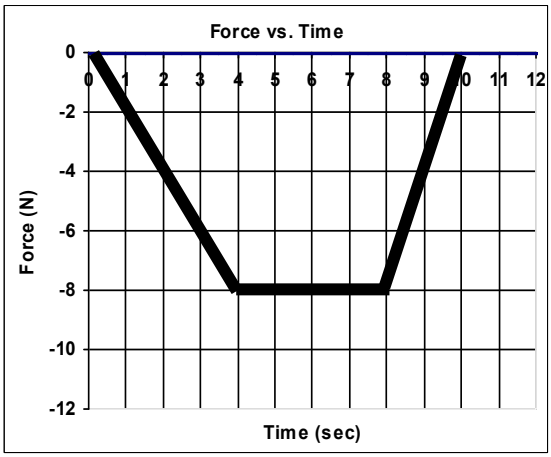
1. * Slim Jim and Kim go ice skating. Standing amorously on the ice, they push off from each other. Jim is 60 kg and Kim is 40 kg. If Kim ends up moving to the right at 2 m/s. How fast is Jim moving?

2. Slim Jim is choosing to jump onto a trampoline or a wood block.
   A. In which case will he have the most momentum before hitting?
   B. In which case will feel the most force?
   C. In which case will he take more time to stop?
   D. * In which case will he feel the greatest impulse?
   E. * Jim jumps from 10 m. How fast is Jim moving when he lands on the 2 m tall trampoline? (*Good choice, Jim!)*

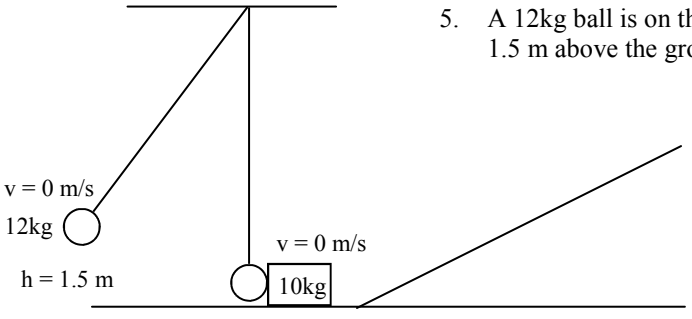




3. Much to Kim's horror, Slim Jim tries to impress her. Since she knows he is a very poor skate boarder, he chooses to jump from a 2 kg rolling chair, instead. Calculate the final velocity of the chair.



4. A 3.5 kg object moving 6 m/s experiences the forces shown.
   A. When is there a positive force?
   B. When is the object coasting (no acceleration)?
   C. * Calculate the impulse shown on the graph.
   D. Calculate the change of momentum of the object.
   E. * Calculate the final velocity of the object.

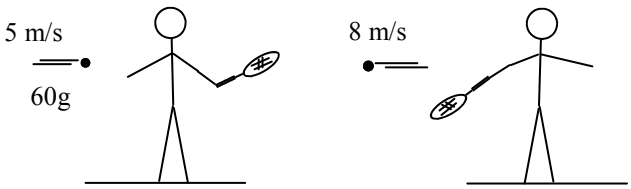


5. A 12kg ball is on the end of a long string. The ball is then pulled back so that it is 1.5 m above the ground. At the bottom of its swing, it strikes a 10 kg box. ($g = 10 m/s^2$)
   A. * Calculate the velocity of the ball just before it strikes the box.

   After the collision the ball is still going 0.25 m/s to the right.
   B. * How fast is the box moving right after the collision?

   The box slides up the ramp.
   C. What vertical height does the box reach?

6. Slim Jim hits a tennis ball, as shown.



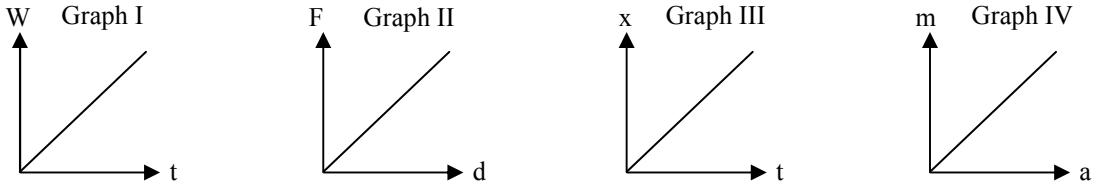
A. * What is the mass of the ball in kg?
B. * Calculate the initial momentum of the ball.

C. Calculate the final momentum of the ball.

D. * Calculate the ball's change of momentum.

E. Was the force on the ball + or −?
F. Was the impulse on the ball + or −?
G. What was the impulse on the ball?

Physics basics, again.
Division = slope. When you see m/s (speed), that's the slope of a position vs time graph. Anything in an equation that is divided is slope of a graph. Examples: $a = \Delta v/t$ or $P = W/t$. All of these are slope.
Multiplication = area. Whenever an equation has multiplied variables, graphically, you find the area on the graph. Examples: $W = Fd$, $D = ST$. Often it is easier to use the units. For example: Work is in joules or N•m. Multiple force in N by distance (or displacement) in m.



Energy 11 Q15. Decide which graph and which process (slope or area) you would use to find the following.

A. * To calculate power:
B. * To calculate torque:
C. To calculate spring constant:
D. To calculate speed:
E. To calculate force:
F. To calculate work:

1) −1.33 m/s; 2D) same; 2E) use conservation of energy. 4C) first triangle is −16 kgm/s; total = −56kgm/s
4E) −10 kgm/s 5A) Use energy. v = 5.48 m/s 5B) use momentum v = 6.28 m/s
6A) 0.06 kg 6B) 0.30 kgm/s 6D) −0.78 kgm/s

E11Q15: A) slope of Graph I (W/t) B) area of Graph II (Fd)