Physics 111 Session 5

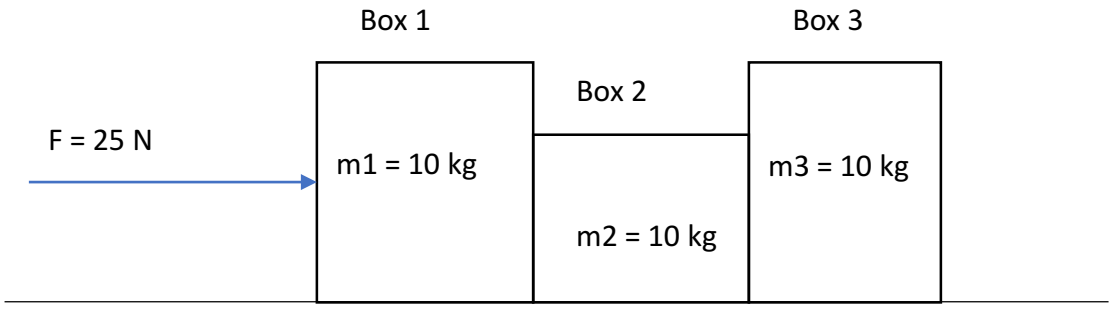
Projectile Motion:

1) A catapult launches a 100 kg stone at an angle of 60 degrees with an initial velocity of 10 m/s.
   a) How far does the stone go? 8.84 m
   b) How long does it take the stone to get there? 1.77 s
   c) What is the maximum height of the stone? 3.83 m

2) A skydiver jumps out of a plane going 85 m/s at an altitude of 3,500 meters, and his parachute fails. Ignore the effects of air resistance.
   a) How long does it take the skydiver to reach the ground? 26.7 s
   b) How far does the skydiver go before he hits the ground? 2272 m
   c) If the plane stays in steady, level flight while the skydiver is falling, what is the relative velocity of the plane with respect to the skydiver in the horizontal direction? 0 m/s

Newton's laws:

3) Consider the boxes on a frictionless surface below:



   a) Draw a free body diagram for box 1 Should have weight, normal force, F=25N, and the force of box 2 pushing on box 1
   b) Find the acceleration the boxes are experiencing a = .833 m/s^2
   c) What force is box 3 exerting on box 2? 8.33 N
   d) What force is box 2 exerting on box 1? 16.6 N

4) A car with a mass of 2000 kg is going 30 m/s, and takes 6 seconds to come to a stop. What is the force the breaks exert on the car? a = 5 m/s^2, so F = 10,000 N

5) A person pulls their child on a sled across a frozen lake. If the kid and the sled weigh 50kg together, and the person pulls on the rope at an angle of 20 degrees with a force of 200N, what is the acceleration of the sled across the lake? 3.76 m/s^2