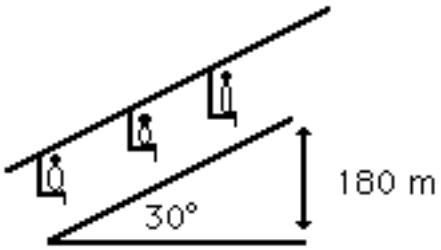
P105 HW#7: ENERGY

1. At the scene of an elevator accident, an investigator is gathering evidence. At some point the cable broke and a one metric ton elevator with 8 passengers of average mass 70 kg each started to descend. Immediately after the cable snaps, the safety measure begins, which creates a friction force of 15,000 N to slow down the elevator. If the final velocity of the elevator was deduced to be 4 m/s, approximately how many stories did the elevator fall. (Note: Each floor is 4 m in height, one metric ton = 1000 kg.) [answer ~11 floors]

2. When a 100 metric ton (1 metric ton = 1,000 kg) flying saucer reaches an altitude of 75 Km. At that moment the saucer has a velocity of 9000 km/hr. If the friction force is 500,000 N, how much force was needed to propel the saucer upward? *Note: Assume that the propulsion system is not internal.* [Answer: ~5.647 MN (Mega-Newtons]

3. At a ski resort a chair lift takes skiers up a 30° hillside to an elevation of 180 m. How much horsepower must the engine have to pull 50 skiers at a time, at a speed of 4.0 m/s, if the average mass of each skier and their equipment is 82 kg each and the frictional energy loss is 3.6MJ (Mega-Joules)? Hint: Power = Work/time [Answer: 161.3 hp]



4. A 1500 kg car moves down a level street under the influence of two forces: a 1000 N forward force exerted on the drive wheels and a 800 N resistive force.
   a. What is the speed of the car after it has traveled 40 m? [Answer: 3.27 m/s]
   b. At the 40 m point the engine switches off and the car coasts up an incline of 7.0°. If the resistive force on the incline is 20%
   less than on the level street, how far along the incline will the car travel? [for part b. ΔS=3.29m]

5. A 10.0-kg block is released from rest at point A in figure. The track is frictionless except for the portion between points B and C, which has a length of 6.00 m. The block travels down the track, hits a spring of force constant 2250 N/m, and compresses the spring 0.300 m from its equilibrium position before coming to rest momentarily. Determine the coefficient of kinetic friction between the block and the rough surface between points B and C. [Answer: μ= 0.328]