# PHYSICS 151
## HOMEWORK ASSIGNMENT #6
## DUE FRIDAY, JULY 11

#1 A 40-$N$ crate is pushed, with constant speed, up a ramp by applying an 18.8 $N$ force parallel to the ramp. The ramp is 3.1 $m$ long and tilted at 28°.

(a.) What was the total work done to the crate when it reaches the top of the ramp?

(b.) How much work did gravity do to the crate?

(c.) How much work did the pushing force do the crate?

(d.) How much work did the normal force do to the crate?

(e.) Do your answers to parts (b.) through (d.) confirm your answer to part (a.)? Explain why or why not.

#2 A 20-$kg$ child is on a swing that hangs from 3.0-$m$-long chains.

(a.) What is her speed, $v_i$, at the bottom of the arc if she swings out to a 45° angle before reversing direction?

(b.) From her maximum angle of 45°, the child swings back to the bottom of the arc. While swinging back, a gust of wind hits the child and she returns to the bottom with a speed that is 1.6 times larger than your answer to part (a.). How much work was done by the wind?
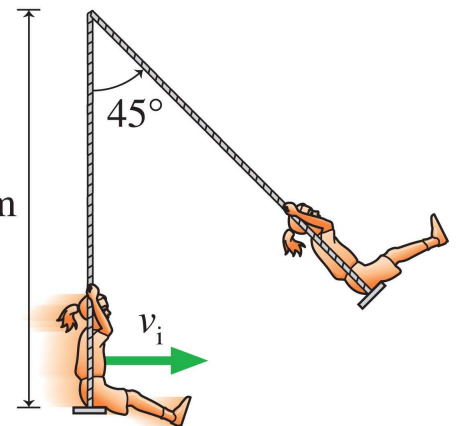
#3 In a physics lab experiment, a 75-$N/m$ spring clamped to a 1.5-$m$-high table shoots a 20-$g$ ball horizontally.

(a.) If the ball is fired by compressing the spring by $20\,cm$, how far away from the table will the ball land? (Ignore air resistance in your calculations.)

(b.) With what speed does the ball hit the ground?

#4 A fish scale, consisting of a spring with constant $k = 150\,N/m$, is hung vertically from the ceiling. A 6.0-$kg$ fish is attached to the end of the unstretched spring and then released from rest. The fish moves downward until the spring is fully stretched then moves back up as the spring begins to contract. What is the maximum distance through which the fish falls?

#5 Two coupled boxcars are rolling along some train tracks at $2.5\,m/s$ when they collide with and couple to a third stationary boxcar.

(a.) Assuming each boxcar has the same mass, what is the final speed of the three coupled boxcars?

(b.) What fraction of the cars' initial kinetic energy is transformed into thermal energy during their collision?

#6 A 45-$kg$ sprinter starts from rest and runs $50\,m$ in $10.0\,s$. A bit unrealistically assume that the sprinter runs the race with a constant acceleration.

(a.) What is the sprinter's average power output during the first two seconds of the race?

(b.) What is the sprinter's average power output during the last two seconds of the race?