Homework 9

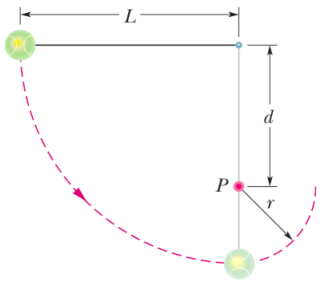
Due Wednesday, November 6th at 7pm

Finish reading Ch. 8 and start Ch. 10.

Exercises:

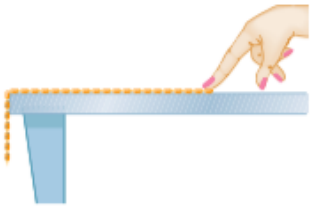
1. HRW Ch. 8, P15.
2. HRW Ch. 8, P17.

3. The string pictured at right is $L = 120$ cm long, has a ball attached to one end, and is fixed at its other end. The distance d from the fixed end to a fixed peg at point P is 75 cm. When the initially stationary ball is released with the string horizontal as shown, it will swing along the dashed arc. What is its speed when it reaches (a) its lowest point and (b) its highest point after the string catches on the peg?



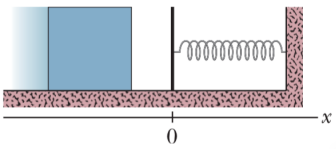
4. HRW Ch. 8, P27.

5. In the Figure at right, a chain is held on a frictionless table with one-fourth of its length hanging over the edge. If the chain has length $L = 30$ cm and mass $m = 0.012$ kg, how much work is required to pull the hanging part back onto the table?



6. HRW Ch. 8, P38.

7. In the Figure at right, a block of mass m =2.5 kg slides head on into a spring of spring constant $k = 320$ N/m. When the block stops, it has compressed the spring by 7.5 cm. The coefficient of kinetic friction between block and floor is 0.25. While the block is in contact with the spring and being brought to rest, what are (a) the work done by the spring force and (b) the increase in thermal energy of the block-floor system? (c) What is the block's speed just as it reaches the spring?



8. When a click beetle is upside down on its back, it jumps upward by suddenly arching its back, transferring energy stored in a muscle to mechanical energy. This launching mechanism produces an audible click, giving the beetle its name. Videotape of a certain click-beetle jump shows that a beetle of mass $m = 4.0$ milligrams moved directly upward by 0.77 mm during the launch and then to a maximum height of $h = 0.3$ m. During the launch, what are the average magnitudes of (a) the external force on the beetle's back from the floor and (b) the acceleration of the beetle in terms of g? Check out this YouTube video to see these cool animals in action.

9. HRW Ch. 8, P65.

Physical problem:

10. A boy is initially seated on the top of a hemispherical ice mound of radius $R = 12$ m. He begins to slide down the ice, with a negligible initial speed, see Figure at right. Approximate the ice as being frictionless. At what height does the boy lose contact with the ice? How fast is he going when this happens?