Work-Energy Calculations

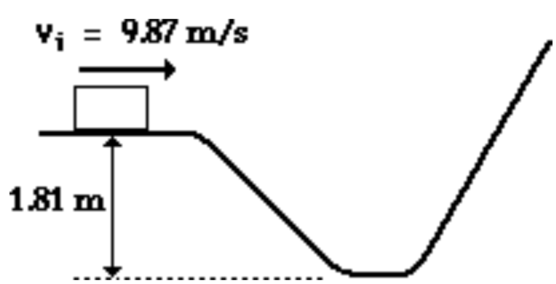
Study **Lesson 2** of the **Work, Energy and Power** chapter at **The Physics Classroom:**

http://www.physicsclassroom.com/Class/energy/u5l2bc.html

For the following questions, begin with the work-energy equation, cancel terms, substitute and solve.

1. A glider is gliding through the air at a height of 416 meters with a speed of 45.2 m/s. The glider dives to a height of 278 meters. Determine the glider's new speed.

$$KE_i \quad + \quad PE_i \quad + \quad W_{ext} \quad = \quad KE_f \quad + \quad PE_f$$



2. A box with mass **m** is sliding along on a friction-free surface at 9.87 m/s at a height of 1.81 m. It travels down the hill and then up another hill.
   a. Find the speed at the bottom of the hill.

$$KE_i \quad + \quad PE_i \quad + \quad W_{ext} \quad = \quad KE_f \quad + \quad PE_f$$

   b. Find the maximum vertical height to which the box will rise on the opposite hill.

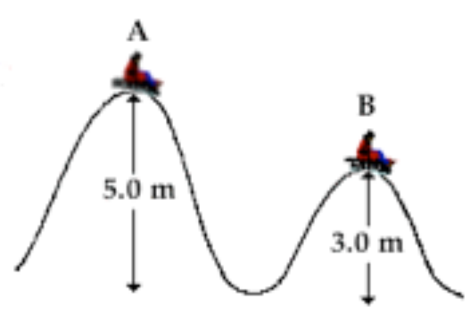
$$KE_i \quad + \quad PE_i \quad + \quad W_{ext} \quad = \quad KE_f \quad + \quad PE_f$$

3. A 1423-kg car is moving along a level highway with a speed of 26.4 m/s. The driver takes the foot off the accelerator and the car experiences a retarding force of 901-N over a distance of 106 m. Determine the speed of the car after traveling this distance.

$$KE_i \quad + \quad PE_i \quad + \quad W_{ext} \quad = \quad KE_f \quad + \quad PE_f$$

4. A sledder starts from rest atop a 5.0-m high hill (A). She sleds to the bottom and up to the top of the adjacent 3.0-m high hill. How fast is the sledder going at point B? Ignore friction.

$$KE_i + PE_i + W_{ext} = KE_f + PE_f$$



5. A 4768-kg roller coaster train full of riders approaches the loading dock at a speed of 17.1 m/s. It is abruptly decelerated to a speed of 2.2 m/s over a distance of 13.6 m. Determine the retarding force that acts upon the roller coaster cars.

$$\mathbf{KE_i} \quad + \quad \mathbf{PE_i} \quad + \quad \mathbf{W_{ext}} \quad = \quad \mathbf{KE_f} \quad + \quad \mathbf{PE_f}$$

6. A catcher's mitt recoils a distance of 12.9 cm in bringing a 142-gram baseball to a stop. If the applied force is 588 N, then what was the speed of the baseball at the moment of contact with the catcher's mitt?

$$\mathbf{KE_i} \quad + \quad \mathbf{PE_i} \quad + \quad \mathbf{W_{ext}} \quad = \quad \mathbf{KE_f} \quad + \quad \mathbf{PE_f}$$

7. An unknown force is applied to a 12 kg mass. The force acts at an angle of 30 degrees above the horizontal. Determine the force acting if the force acts for a horizontal displacement of 22 meters and increases the 12 kg mass's speed from 11 m/s to 26 m/s.

$$\mathbf{KE_i} \quad + \quad \mathbf{PE_i} \quad + \quad \mathbf{W_{ext}} \quad = \quad \mathbf{KE_f} \quad + \quad \mathbf{PE_f}$$

8. A physics teacher exerts a force upon a 3.29-kg pile of snow to both lift it and set it into motion. The snow leaves the shovel with a speed of 2.94 m/s at a height of 0.562 m. Determine the work done upon the pile of snow.

$$\mathbf{KE_i} \quad + \quad \mathbf{PE_i} \quad + \quad \mathbf{W_{ext}} \quad = \quad \mathbf{KE_f} \quad + \quad \mathbf{PE_f}$$

9. A 250.-gram cart starts from rest and rolls down an inclined plane from a height of 0.541 m. Determine its speed at a height of 0.127 m above the bottom of the incline.

$$\mathbf{KE_i} \quad + \quad \mathbf{PE_i} \quad + \quad \mathbf{W_{ext}} \quad = \quad \mathbf{KE_f} \quad + \quad \mathbf{PE_f}$$

10. A 4357-kg roller coaster car starts from rest at the top of a 36.5-m high track. Determine the speed of the car at the top of a loop that is 10.8 m high.

$$\mathbf{KE_i} \quad + \quad \mathbf{PE_i} \quad + \quad \mathbf{W_{ext}} \quad = \quad \mathbf{KE_f} \quad + \quad \mathbf{PE_f}$$

