Name: Hr: AP Physics C Unit 7 Work Done Worksheet 1

To be Submitted

Work

Use work/energy arguments to solve each of the following problems.

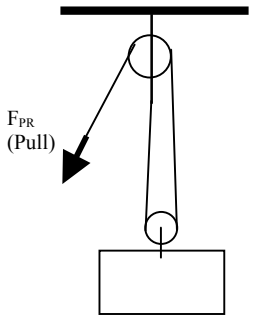
1. In order to lift a 2000 N piano directly onto a platform that is 1.5 meters above the ground, a force of 2000 N must be applied vertically on the piano. Suppose that this is not possible for the movers concerned, but they do have a ramp with a 15° incline and the piano has surprisingly good wheels on the bottom.

a. How much force do the movers have to apply in order for the piano to move up the ramp at a constant speed?

b. How much work did they do on the piano?

c. How much work would they have done if they had been able to lift the piano directly up in the air?

2. A pulley system can be used to decrease the amount of force that is applied to a rope to lift an object. For example, the system shown at the right allows the 500 N block to be lifted by a pull that is less than 500 N.



a. What is the magnitude of the pull that is needed to lift the block?

b. How much work does the gravitational force do on the block as it is lifted 3.0 meters? Is this affected by the pulley system?

c. How can this be consistent with the work-energy relationship for the block system?

3. A 1.5 kg cart is pulled from rest 0.8 m along a horizontal, frictionless surface by a rope that is inclined 45° above the horizontal. If the tension in the rope is 5 N, what is the speed of the cart at the end of the 0.8 m?

4. A 0.5 kg ball is launched at a speed of 10 m/s. Find the work done by gravity on the ball from the bottom to the top of the path when the ball is launched:

a. Directly up in the air.

b. At an angle of 30° from the vertical.

c. At an angle of 60° from the vertical.

d. At an angle of 90° from the vertical.

e. Explain what happens to the initial energy.

5. A 2 kg shot is dropped from 1000 m and experiences a drag force of $0.005\ v^2$. How much work does the air do on the shot?

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6. A 0.10 kg ball is placed in a spring-loaded launcher, which has a spring constant of 300 N/m. The spring is compressed by 15 cm.

   a. If the launcher is fired horizontally, what is the speed of the ball as it leaves the barrel?

   b. If the launcher is fired vertically, what is the speed of the ball as it leaves the barrel?

7. What is the spring constant in a pogo-stick that is designed to compress by 20 cm when a 25 kg child jumps from a height of 30 cm?

8. Use the following graph to find the amount of work done by the force for each of the following intervals:

   a. 0 m – 3 m
   b. 3 m – 4 m
   c. 4 m – 5 m
   d. 5 m – 6 m
   e. 0 m – 6 m