AP Physics 1
Work and Energy Practice Problems

1.) A child pulls a sled through the snow with a force of 45 N applied to the rope at an angle of 36.87° with the horizontal direction of the sled. How much work is done if they move 15 m?

2.) Larry pushes a 150 kg crate with a horizontal force of 345 N a distance of 24.0 m. Assume the coefficient of kinetic friction between the crate and the floor is 0.20.

a.) How much work is done by Larry on the crate?

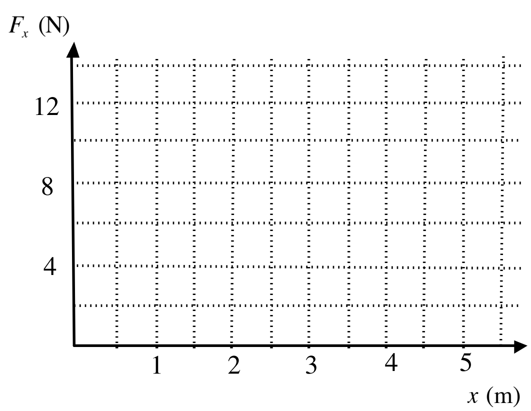
b.) How much work is done by the floor (i.e. friction) on the crate?

c.) What is the net work done on the crate?

d.) If the crate is initially at rest what is its speed after it has moved 24 m?

3.) A single force $F_x = (2.0x + 2.0)$ N acts on a 4.0 kg particle, where x is in meters. As the particle moves along the x-axis from $x = 1.0$ m to $x = 5.0$ m.

a.) Graph the force F versus the position x.



b.) Determine the work done by this force.

c.) What is the kinetic energy of the particle at $x = 5.0$ m if its speed at $x = 1.0$ m is 3.0 m/s?

d.) What is the speed of the particle at $x = 5.0$ m if its speed at $x = 1.0$ m is 3.0 m/s?

4.) How much work must be done to stop a 1000 kg car traveling at 30 m/s?

5.) A 0.20 kg ball is dropped from a 50 m tall building. Use work-energy methods to find the speed of the ball just before it hits the ground. Neglect air resistance.

6.) A ball is thrown straight upward with a speed of 15 m/s. Use work-energy methods to find the maximum height of the ball.

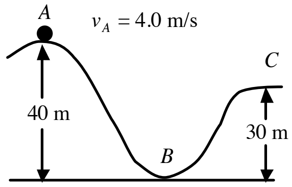
7.) Larry pushes a 25 kg crate up a 53.13˚ incline with a force of 240 N parallel to the incline. The coefficient of kinetic friction between the crate and the incline is 0.20 and the crate is initially at rest. After crate has moved 3.0 m along the incline find

a.) the work done by Larry

b.) the work done by friction

c.) the work done by gravity

d.) the speed of the crate

8.) 

A 2.0 kg ball has a speed of 4.0 m/s at point *A* and is moving to the right. What is the ball's speed at point *C*?

9.) A 0.20 kg projectile is given an initial velocity of 45 m/s at an angle of 53.13° to the horizontal. The projectile is launched from the roof of a 40 m tall building.

a.) What is the kinetic energy of the projectile at its maximum height?

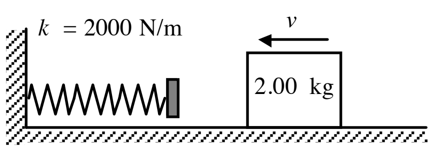
b.) What is the kinetic energy of the projectile just before it strikes the ground?

10.) A 20.0 kg cannonball is fired from a cannon at a muzzle speed of 200 m/s and at an angle of 36.87° with the horizontal. Use the conservation of energy to find the maximum height reached by the cannonball.

11.) A spring has a spring constant *k* of 500 N/m.

a.) How much force is needed to stretch the spring 10 cm?

b.) What is the potential energy stored in the spring when it is compressed 10 cm?

12.) 

The horizontal surface on which the block in the figure to the left slides is frictionless. The speed of the block before it touches the spring is 6.0 m/s.

a.) How fast is the block moving at the instant the spring has been compressed 15 cm?

b.) What is the maximum compression of the spring?

13.) A 1000 kg elevator carries a maximum load of 800 kg. A constant frictional force of 4000 N retards the elevator's motion upward. What minimum power must the motor deliver to lift the fully loaded elevator at a constant speed of 3.00 m/s?

14.) A box with a mass of 15 kg slides up a frictionless incline with an angle of 53.13°. Use conservation of energy to find the initial speed of the box if slides 3.0 m along the incline before sliding back down the incline.