Kinetic Energy

Example Problems:

1. A 60.0 kg student is running at a uniform speed of 2.70 m/s. What is the kinetic energy of the student?

$$E_k = \frac{1}{2}mv^2$$
$$= \frac{1}{2}(60.0\ kg)(2.75\ m/s)^2$$
$$= 219\ J$$

2. The kinetic energy of a 2.1 kg object is 1.00×10^3 J. What is the speed of this object?

$$E_k = \frac{1}{2}mv^2$$
$$v = \sqrt{\frac{2E_k}{m}}$$
$$= \sqrt{\frac{2(1.00 \times 10^3\ J)}{2.10\ kg}}$$
$$= 31\ m/s$$

Practice Problems:

1. A 3.0 kg object is travelling at a constant speed of 7.5 m/s. What is the kinetic energy of this object?

(84 J)

2. The kinetic energy of a 20.0 N object is 5.00×10^2 J. What is the speed of this object?

(22.1 m/s)

3. A 10.0 N object is accelerated uniformly from rest at a rate of 2.5 m/s^2. What is the kinetic energy of this object after it has accelerated a distance of 15.0 m?

(38 J)

4. An 8.0 kg object is dropped from a height of 7.0 m. What is the kinetic energy of this object as it hits the ground?

(5.5×10^2 J)

5. A 10.0 N object has kinetic energy of 3.00×10^2 J. What is the speed of the object?

(24.3 m/s)

6. What is the kinetic energy of a 5.0 kg object when an average net force of 8.7 N accelerates it uniformly from rest for 0.12 s?

(0.11 J)

Part 2

Practice Problems:

1. A heavy object is dropped. If this object reaches the floor at a speed of 3.2 m/s, from what height was it dropped?

(0.52 m)

2. A heavy object is dropped from a vertical height of 8.0 m above the ground. What is the speed of this object as it hits the ground?

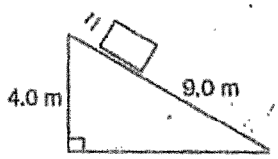
(13 m/s)

3. A heavy object is dropped from the top of a building. If this object hits the ground with a speed of 37.0 m/s, how tall was the building?

(69.8 m)

4. A heavy object is thrown vertically down from the top of a 1.3×10^2 m building at a speed 11.0 m/s. What is the velocity as it hits the ground?

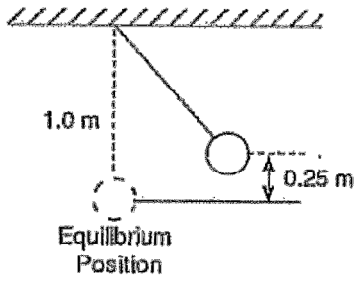
(52 m/s

5. 

A heavy box slides down a frictionless incline as shown in the diagram. If the box starts from rest at the top of the incline, what is its speed at the bottom?

(8.9 m/s)

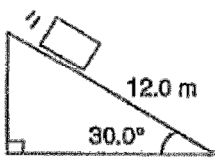
6.



A pendulum is dropped from the position as shown in the diagram (0.25 m) above the equilibrium position). What is the speed of the pendulum bob as it passes through the equilibrium position?

(2.2 m/s)

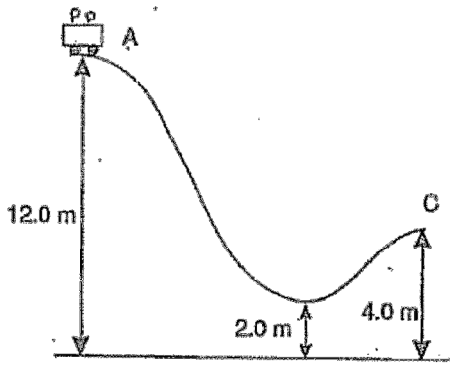
7.



A heavy box slides down a frictionless incline as shown in the diagram. If the box starts from rest at the top of the incline, what is its speed at the bottom?

(10.8 m/s)

8.



A roller coaster car starts from rest at point A. What is the speed of this car at point C if the track is frictionless?

(13 m/s)

9. An archer exerts an average horizontal force of 12 N on his bow-arrow system in pulling the string back 0.30 m. If the arrow has a mass of 0.45 kg, and at the target is 5.0 m away, what is the horizontal speed of the arrow as it hits the target?

(4.0 m/s)