Problems

9.1 Work, Power, and the Work–Energy Theorem 14.

A baseball player exerts a force of 100\,\text{N} on a ball for a distance of 0.5\,\text{m} as he throws it. If the ball has a mass of 0.15\,\text{kg}, what is its velocity as it leaves his hand?

a. -36.5\,\text{m/s}
b. -25.8\,\text{m/s}
c. 25.8\,\text{m/s}
d. 36.5\,\text{m/s}

15.

A boy pushes his little sister on a sled. The sled accelerates from 0 to 3.2 m/s . If the combined mass of his sister and the sled is 40.0 kg and 18 W of power were generated, how long did the boy push the sled?

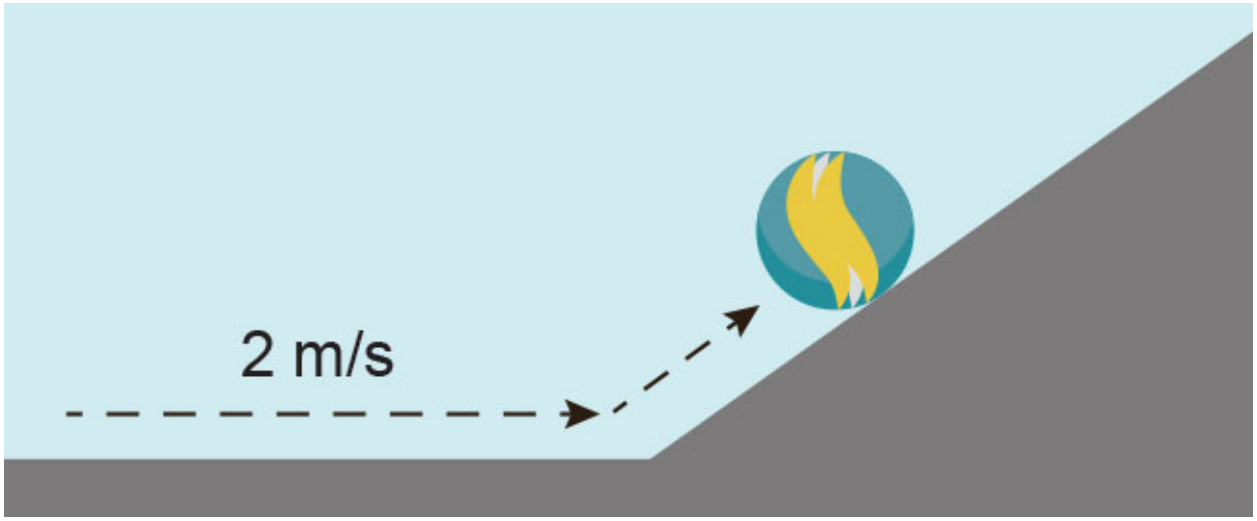
a. 205 s
b. 128 s
c. 23 s
d. 11 s

9.2 Mechanical Energy and Conservation of Energy 16.

What is the kinetic energy of a 0.01\,\text{kg} bullet traveling at a velocity of 700\,\text{m/s}?

a. 3.5\,\text{J}
b. 7\,\text{J}
c. 2.45 \times 10^3\,\text{J}
d. 2.45 \times 10^5\,\text{J}

17.



A marble is rolling across a flat surface with a velocity of 2 m/s. It begins to roll up a ramp. Ignoring rotational kinetic energy and friction, what will be the vertical height of the marble when it comes to a stop before rolling back down?

a. 0.1\,\text{m}
b. 0.2\,\text{m}
c. 0.4\,\text{m}
d. 2\,\text{m}

18.

The potential energy stored in a compressed spring is

$U = \frac{1}{2}kx^2$

, where k is the force constant and x is the distance the spring is compressed from the equilibrium position. Four experimental setups described below can be used to determine the force constant of a spring. Which one(s) require measurement of the fewest number of variables to determine k? Assume the acceleration due to gravity is known.

I. An object is propelled vertically by a compressed spring.
II. An object is propelled horizontally on a frictionless surface by a compressed spring.
III. An object is statically suspended from a spring.
IV. An object suspended from a spring is set into oscillatory motion.

a. I only
b. III only
c. I and II only
d. III and IV only

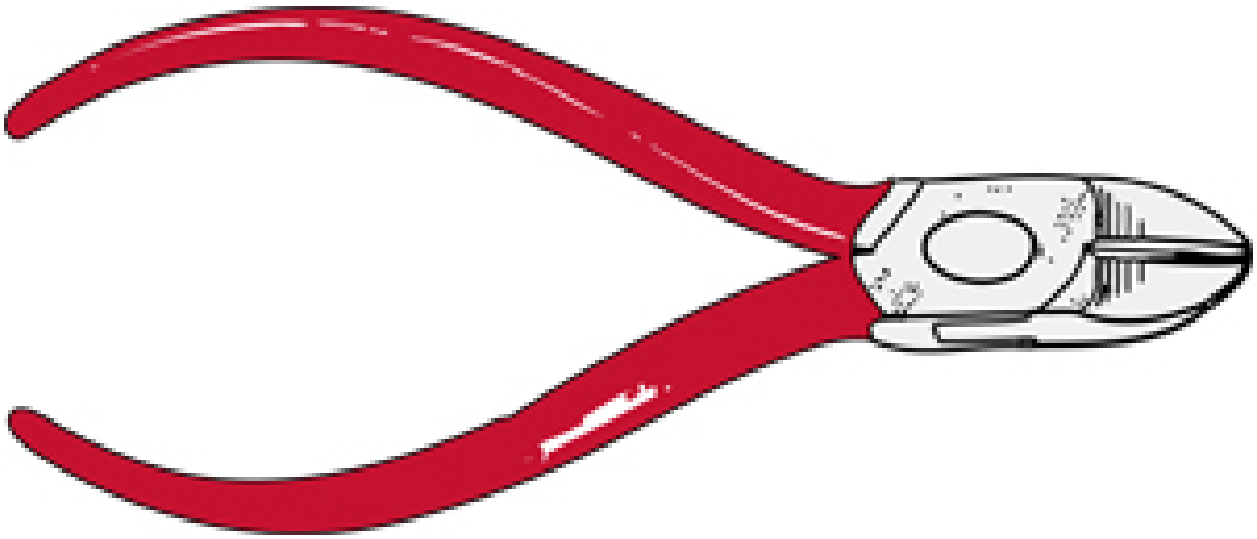
9.3 Simple Machines 19.

A man is using a wedge to split a block of wood by hitting the wedge with a hammer. This drives the wedge into the wood creating a crack in the wood. When he hits the wedge with a force of 400 N it travels 4 cm into the wood. This caused the wedge to exert a force of 1,400 N sideways increasing the width of the crack by 1 cm . What is the efficiency of the wedge?

a. 0.875 percent
b. 0.14
c. 0.751
d. 87.5 percent

20.

An electrician grips the handles of a wire cutter, like the one shown, 10 cm from the pivot and places a wire between the jaws 2 cm from the pivot. If the cutter blades are 2 cm wide and 0.3 cm thick, what is the overall IMA of this complex machine?



a. 1.34
b. 1.53
c. 33.3
d. 33.5