

**Helpful Questions:**

1. What are coefficients of friction and how do they affect the motion of an object on a surface?

$\mu_s$  &  $\mu_k$  → constants that determine how much friction a surface will have

2. When a car is moving, what happens to the velocity and acceleration of the car if the air resistance becomes equal to the force of the tires pushing it forward?

acceleration = zero

velocity = constant

3. A block of wood supported by two concrete blocks is chopped in half by a karate instructor. Identify an action-reaction pair, and compare the forces exerted by each object.

Action: hand on block } equal & opposite

Reaction: block on hand

4. When a horse pulls on a cart, the cart pulls on the horse with an equal but opposite force. How is the horse able to pull the cart?

pull from horse acts on ground as well

\_\_\_\_ 5. Which of the following is the tendency of an object to maintain its state of motion?

- a. acceleration b. force c. inertia d. velocity

\_\_\_\_ 6. If a nonzero net force is acting on an object, then the object is definitely

- a. at rest. b. moving with a constant velocity. c. losing mass. d. being accelerated.

\_\_\_\_ 7. A wagon with a weight of 300.0 N is accelerated across a level surface at  $0.5 \text{ m/s}^2$ . What net force acts on the wagon?

- a. 9.0 N b. 150 N c. 15 N d. 610 N

$$F = \frac{300}{9.8} \cdot 0.5 \text{ m/s}^2$$

mass · a

\_\_\_\_ 8. A small force acting on a human-sized object causes

- a. a small acceleration. b. no acceleration. c. a large acceleration. d. equilibrium.

\_\_\_\_ 9. According to Newton's second law, when the same force is applied to two objects of different masses,

- a. the object with greater mass will experience a great acceleration and the object with less mass will experience an even greater acceleration.  
 b. the object with greater mass will experience a smaller acceleration and the object with less mass will experience a greater acceleration.  
 c. the object with greater mass will experience a greater acceleration and the object with less mass will experience a smaller acceleration.  
 d. the object with greater mass will experience a small acceleration and the object with less mass will experience an even smaller acceleration.



$$45^2 + 60^2 = \sqrt{5625}$$

$$75 \text{ N}$$

\_\_\_ 10. Two perpendicular forces, one of 45.0 N directed upward and the second of 60.0 N directed to the right, act simultaneously on an object with a mass of 35.0 kg. What is the magnitude of the resultant acceleration of the object?

- a. 2.14 m/s<sup>2</sup>   b. 3.00 m/s<sup>2</sup>   c. 5.25 m/s<sup>2</sup>   d. 1.41 m/s<sup>2</sup>

$$\frac{75}{35} = 2.14 \text{ m/s}^2$$

\_\_\_ 11. An airplane with a mass of  $1.2 \times 10^4$  kg tows a glider with a mass of  $0.60 \times 10^4$  kg. If the airplane propellers provide a net forward thrust of  $3.6 \times 10^4$  N, what is the acceleration of the glider?

- a. 2.0 m/s<sup>2</sup>   c. 6.0 m/s<sup>2</sup>   b. 3.0 m/s<sup>2</sup>   d. 9.8 m/s<sup>2</sup>

$$\frac{3.6 \cdot 10^4}{0.6 \cdot 10^4} =$$

\_\_\_ 12. A hammer drives a nail into a piece of wood. Identify an action-reaction pair, and compare the forces exerted by each object.

- a. The nail exerts a force on the hammer; the hammer exerts a force on the wood.  
 b. The hammer exerts a force on the nail; the wood exerts a force on the nail.  
 c. The hammer exerts a force on the nail; the nail exerts a force on the hammer.  
 d. The hammer exerts a force on the nail; the hammer exerts a force on the wood.

\_\_\_ 13. A change in the force of gravity acting on an object will affect the object's

- a. mass.   b. weight.   c. frictional force.   d. inertia.

\_\_\_ 14. There are six books in a stack, and each book weighs 5 N. The coefficient of friction between the books is 0.2. With what horizontal force must one push to start sliding the top five books off the bottom one?

- a. 1 N   b. 3 N   c. 5 N   d. 7 N

$$5 \cdot 5 = 25 \text{ N} \quad \text{Normal } F = 25 \text{ N}$$

$$F_{\text{fric}} = 25 \cdot 0.2 \text{ N} =$$

\_\_\_ 15. An ice skater moving at 10.0 m/s coasts to a halt in  $1.0 \times 10^2$  m on a smooth ice surface. What is the coefficient of friction between the ice and the skates?

- a. 0.025   b. 0.102   c. 0.051   d. 0.205

Do not do!

$$F_{\text{fric}} = F^N \cdot \mu_k$$

$$1.0 \cdot 10^2 \text{ m} \cdot \frac{1 \text{ s}}{10.0 \text{ m}} = 10 \text{ seconds}$$

$$10.0 \text{ m/s} \cdot \frac{1}{10 \text{ s}} = \boxed{1 \text{ m/s}^2}$$

↑ acceleration