

1. When Jane drives to work, she always places her purse on the passenger's seat. By the time she gets to work, her purse has fallen on the floor in front of the passenger seat. One day, she asks you to explain why this happens in terms of physics. What do you say?
2. You are waiting in line to use the diving board at your local pool. While watching people dive into the pool from the board, you realize that using a diving board to spring into the air before a dive is a good example of Newton's third law of motion. Explain how a diving board illustrates Newton's third law of motion.
3. You know the mass of an object and the force applied to the object to make it move. Which of Newton's laws of motion will help you calculate the acceleration of the object?
4. How many newtons of force are represented by the following amount:  $3 \text{ kg}\cdot\text{m}/\text{sec}^2$ ? Justify your answer.
5. Your shopping cart has a mass of 65 kilograms. In order to accelerate the shopping cart down an aisle at  $0.3 \text{ m}/\text{sec}^2$ , what force would you need to use or apply to the cart?

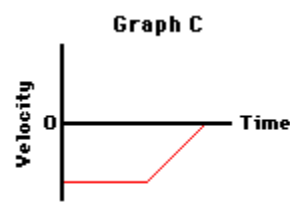
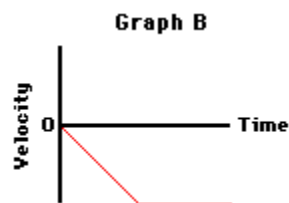
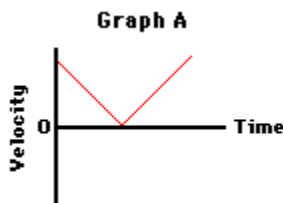
6. A small child has a wagon with a mass of 10 kilograms. The child pulls on the wagon with a force of 2 newtons. What is the acceleration of the wagon?
  
  
  
  
  
  
  
  
  
  
7. You dribble a basketball while walking on a basketball court. List and describe at least 3 pairs of action-reaction forces in this situation.
  
  
  
  
  
  
  
  
  
  
8. Imagine a place in the cosmos far from all gravitational and frictional influences. Suppose that you visit that place (just suppose) and throw a rock. What will the rock do? Why?
  
  
  
  
  
  
  
  
  
  
9. Supposing you were in space in a weightless environment, would it require a force to set an object in motion? Explain.
  
  
  
  
  
  
  
  
  
  
10. Why doesn't a ball roll on forever after being kicked at a soccer game?

11. A 2-kg object is moving horizontally with a speed of 4 m/s. How much net force is required to keep the object moving at this speed and in this direction? Explain.

12. Ben Tooclose is being chased through the woods by a bull moose which he was attempting to photograph. The enormous mass of the bull moose is extremely intimidating. Yet, if Ben makes a zigzag pattern through the woods, he will be able to use the large mass of the moose to his own advantage. Explain this in terms of inertia and Newton's first law of motion.

13. Luke Autbeloe drops an approximately 5.0 kg object (weight = 50.0 N) off the roof of his house into the swimming pool below. Upon encountering the pool, the object encounters a 50.0 N upward resistance force (assumed to be constant). Use this description to answer the following questions. (Down is usually considered a negative direction)

- Which one of the velocity-time graphs best describes the motion of the object? Why?
- True or False: Once the object hits the water, the forces are balanced and the object will stop. Support your answer with reasoning.



14. What is the acceleration of a 0.30 kilogram ball that is hit with a force of 25 N?
15. How much force is needed to accelerate a 68 kilogram-skier at a rate of  $1.2 \text{ m/sec}^2$ ?
16. What is the mass of an object that requires a force of 30 N to accelerate at a rate of  $5 \text{ m/sec}^2$ ?
17. What is the force on a 1 000 kilogram-elevator that is falling freely under the acceleration of gravity only ( $9.8\text{m/s}^2$ )?
18. What is the mass of an object that needs a force of 4 500 N to accelerate it at a rate of  $5 \text{ m/sec}^2$ ?

19. What is the acceleration of a 6.4 kilogram bowling ball if a force of 12 N is applied to it?

20. CHALLENGE: What is the mass of an object that needs a force of 6 600 N to increase its speed from rest to 107 m/s in 2.3 seconds?