

**Conceptual Questions**

1. In science fiction movies, spacecraft are often seen with their engines burning. If you were to fly from planet A to planet B, when during your flight would you be required to burn your engines?
2. A karate chop delivers a force of 3000 N to a board that breaks. The force that the board exerts on the hand during this event is
  - a) less than 3000 N
  - b) greater than 3000 N
  - c) 3000 N
  - d) need more information
3. Imagine a head-on collision between a large truck and a small compact car. During the collision,
  - a) the truck exerts a greater amount of force on the car than the car exerts on the truck.
  - b) the car exerts a greater amount of force on the truck than the truck exerts on the car.
  - c) neither exerts a force on the other, the car gets smashed simply because it gets in the way of the truck.
  - d) the truck exerts a force on the car but the car doesn't exert a force on the truck.
  - e) the truck exerts the same amount of force on the car as the car exerts on the truck.
4. An elevator is being lifted up an elevator shaft by a steel cable. When the elevator is moving up the shaft at a *constant velocity*;
  - a) the upward force on the elevator by the cable is greater than the downward force of gravity.
  - b) the amount of upward force on the elevator by the cables is equal to that of the downward force of gravity
  - c) the upward force on the elevator by the cable is less than the downward force of gravity.
  - d) it goes up because the cable is being shortened, not because of the force being exerted on the elevator by the cable.
  - e) the upward force on the elevator by the cable is greater than the downward force due to the combined effects of air pressure and the force of gravity.

5. If the acceleration of an object is zero, are no forces acting on it? Explain.
6. Why might your foot hurt if you kick a heavy desk or chair? Explain.
7. Whiplash sometimes results from an automobile accident when the victim's car is struck violently from the rear. Explain why the head of the victim seems to be thrown backwards in this situation. Is it really?

**Problems**

8. Draw a free-body diagram (FBD) of the **bolded** object for each of the following situations. For each *action force* found on the FBD, identify the *reaction force*.
  - a) An **apple** hangs from a tree

FBD	Action Force & Direction	Reaction Force & Direction

- b) A **box** is being pushed forward along some ice (no friction)

FBD	Action Force & Direction	Reaction Force & Direction

- c) A **box** is being pushed forward along the ground. A child is on the box.

FBD	Action Force & Direction	Reaction Force & Direction