1. A ball is thrown straight upward and takes 3 seconds to reach its peak. Neglect air resistance. Draw a sketch showing the ball's approximate position at 0 s, 1 s, 2 s, 3 s, 4 s, 5 s, and 6 s.

2. Next to each point on your drawing
   a. label the speed of the ball and draw an arrow to represent the velocity at that point. Explain briefly how you arrived at these answers.

   b. label the acceleration (including direction) of the ball at that point.

3. A ball is released and allowed to fall into a deep well. Ignore air resistance.
   a. Immediately after its release, what is the acceleration of the ball?

   b. What is the instantaneous velocity of the ball after 4 seconds of falling?

   c. What is the acceleration of the ball after 4 sections of falling?

   d. Draw arrows to represent the direction and magnitude of the instantaneous velocity and acceleration of the ball after 1 second of falling, after 2 seconds of falling, and after 3 seconds of falling.

4. A ball is thrown straight upward with an initial speed of 8 m/s. Neglect air resistance.
   a. Immediately after its release what is the acceleration of the ball?

   b. What is the acceleration of the ball when it is half way to its peak?

   c. What is the acceleration of the ball at its peak?

   d. What is the acceleration of the ball when it is half way down from its peak?

   e. What is the speed of the ball at its peak?

   f. Compare the time it takes the ball to reach its peak to the time it takes the ball to fall back down from its peak to the same height from which it was launched. (You do not need a calculation.) Explain your reasoning clearly.

5. A box is falling through the air. At one point the air resistance force on it is 29 N upward. The force of gravity on the box is 49 N downward.
   a. What is the net force on the box?

   b. What is the mass of the box?

   c. What is the acceleration of the box?

6. As Alfred moves from his dorm,. he notices that it takes 30 N to slide a heavy box with a constant velocity across the floor. (Show all work.)
   a. How much does the box accelerate?

   b. Calculate the net force that is acting on the box.

   c. Calculate the force of friction on the box.

7. You push a 25 kg box (from rest) along the floor by constantly applying a force of 50 N. When the box has traveled 20 m (in a time of 10 s), it has a speed of 4 m/s.
   a. Does the box have a speed of 4 m/s over the full 20 m? Why or why not?

   b. Calculate the net force on the box.

   c. Calculate the frictional force on the box.

8. Circle the correct statement and explain your reasoning. A moving object is being accelerated through space by a 5 N force. Suddenly the object encounters another 5 N force in the opposite direction of the first force. The object with both forces acting on it
   a. instantly comes to halt.
   b. decelerates at 9.8 m/s^2 until it stops.
   c. continues to accelerate but not as rapidly as before.
   d. continues at the last speed it had before it encountered the second force.
   e. is unaffected by the force because it exerts an equal and opposite force.

   Justification:

9. A Volkswagon Beetle (a small car) and a Cadillac Escalade (a large SUV) collide in a head on collision.
   a. Does one vehicle experience a greater force of impact? If so, identify which one. Justify your answer. On which of Newton's Laws does your answer depend?

   b. Does one vehicle experience a greater acceleration? If so, identify which one. Justify your answer. On which of Newton's Laws does your answer depend?

10. As you stand on the ground,
   a. How much force does it exert on your feet? Be specific and explain how you figured out your answer.

   b. Does this force cause you to accelerate? How do you know?

   c. Explain why this does not violate Newton's second law.