1. d (both objects are traveling at a constant speed and direction)

2. a

3. d (at that moment, the object's velocity is zero but it will not stay at zero)

4. b (for slowing down, the acceleration is opposite the velocity)

5. 44.1 m

   The physics says that, based on Newton's second law, the change in velocity in 3 seconds is 29.4 m/s (net force per mass is 9.8 N/kg since gravity is the only force acting on the stone). Since it started at rest, that means the initial velocity is zero and the final velocity (just before landing) is 29.4 m/s (since the change in velocity is 29.4 m/s). Since it is accelerating uniformly as it falls (no air resistance), the average velocity must be midway between the initial and final, or 14.7 m/s. From the definition of average velocity, this must equal the displacement divided by the time. We know the time is 3 seconds, so we can solve for the displacement.

6. a) about 3 m/s, b) about −3 m/s, c) about −0.6 m/s^2.

   There are several ways to do this. The simplest is to apply the definition of average velocity: $\vec{v}_{\text{avg}} = \Delta\vec{s}/\Delta t$. Since the graph is of s vs. t, the average slope between any two points on the graph will give the average velocity during the time interval between the two points. The slope at the beginning can be estimated by looking at the slope between 0 and 1 seconds. The slope at the end can be estimated by looking at the slope between 9 and 10 seconds.

   To estimate the acceleration, use the definition of acceleration ($\vec{a}_{\text{avg}} = \Delta\vec{v}/\Delta t$. Take the difference between the two velocities (keep in mind that one is negative) and divide by the time interval.

7. 43.8 m

   The physics says that, based on Newton's second law, the box will first speed up because there is a force imbalance. There is friction (0.3 of the normal force, which is 39.2 N because the box has a mass of 4 kg) but that friction is less than the applied force (I get 11.76 N for the friction). The force imbalance in this case 8.24 N.

From Newton's second law, we know that there will be a change in velocity equal to the net force times the time divided by the mass. Plugging in, I get a change of velocity equal to 10.3 m/s.

Since it started at rest, that means it was moving at 10.3 m/s at the end of the 5 seconds, for an average velocity of 5.15 m/s. Using the definition of average velocity, I get that the box moved a distance equal to 25.75 m.

At that point, the applied force is removed. We still have a force imbalance, due to the friction. Again, from Newton's second law, we know that there will be a change in velocity equal to the net force times the time divided by the mass. In this case, I know the change in velocity, since it was moving 10.3 m/s and then comes to rest. Thus, I can find the time that must've elapsed. I get 3.5034 s.

Knowing the time, and knowing the average velocity (5.15 m/s, since it started at 10.3 m/s and ended at rest), I can using the definition of average velocity to find how far it went during this time. I get a distance equal to 18.04252 m.

Adding the two distances I get a total distance of 43.79252 m.