Chapter 6

1. Nothing. Both describe the same observation about motion.
2. Objects at rest stay at rest and objects in motion stay in motion with constant velocity, unless acted upon by an outside force.
3. True.
4. False.
5. The short answer is "friction." The longer answer is that in A, both the ball and the surface of the ramp are smooth. There is not much friction between the two and so the ball travels almost as high up the other side as the height from where it was released. In B, the surface of the ramp is much rougher than in A, which increases the friction and causes a greater force opposing the ball's travel than in A; therefore, it stops at a lower height.
6. True.
7. Speed is a rate of travel, whereas velocity is a rate of travel combined with a direction. In other words, velocity is a vector (both magnitude and direction) and speed is not (only magnitude).
8. You should not agree with me. Inertia is not relevant only to objects in motion but pertains equally to moving and stationary objects. Inertia is simply the property that an object tends to stay in its present state, whether in motion or at rest.
9. True.
10. The first law says that an object in motion will stay in motion with constant velocity unless an external force acts upon it. The ball stopped because an external force, friction, acted upon and caused it to stop.
11. True.
12. False.
13. Mass the amount of matter an object contains and weight is the gravitational pull on the mass of an object.
14. True.
15. You need to explain to her the difference between weight and mass. Mass is how much matter an object contains, is expressed in kg and does not change. Weight is how much gravitational pull acts on an object, is expressed in newtons and changes depending upon the gravitational strength of the body exerting the gravitational pull on the object. Your friend has confused the two and is clearly measuring weight, not mass. Therefore, the units should be expressed in newtons (N)
16. True.
17. My suggested answer is a very detailed one, but the basics are that, in Figure 1, the coin is at static equilibrium and its inertia keeps it motionless. In Figure 2, even though the card is moving, the coin isn't because of its inertia to maintain a motionless state. In Figure 3, now the support of the card is gone and the coin falls into the cup as the force of gravity pulls it downward. The longer answer is: In figure 1, the coin is at rest on top of the card. The force of gravity pulling down on the coin is equaled by the force of the card pushing back up against the coin. Since there is no net force acting on the coin and it isn't moving, it is in static equilibrium (as is the card). The coin's inertia and the card's inertia keep them motionless. In figure 2, a force has been introduced to the card, which disrupts the static equilibrium of the card as the new force acts to place it into motion. However, the coin is not attached to the card, and its inertia keeps it motionless. The card's new inertia continues to move it to the right as the coin's inertia continues to keep it motionless. As soon as the card is pulled completely out from under the coin, then the coin's inertia changes due to the force of gravity now pulling the coin down into the cup. While the coin is falling, its new inertia "down" keeps it moving, and will continue to keep it moving until another force acts upon it. As soon as the coin hits the bottom of the cup, it has encountered a new force in the form of the bottom of the cup pushing up against it and it is motionless. It assumes static equilibrium again.