CHAPTER 2

KINEMATICS: DESCRIPTION OF MOTION

1. (a) scalar (b) vector (c) scalar (d) vector

2. Yes, the coordinates of the object depend on the reference point. No, displacement is independent of reference point. It remains the same (same direction and magnitude).

3. (a).

4. (c).

5. Yes, for a round-trip. No, distance is always greater than or equal to the magnitude of displacement.

6. No final position can be given. The position could be anywhere from 0 to 500 m.

7. At constant velocity, speed is the magnitude of velocity.

8. No, this is generally not the case. The average velocity could be zero (for a round trip), while the average speed is never zero.

9. The distance traveled is greater than or equal to 300 m. The object could travel a variety of ways as long as it ends up at 300 m north. If the object travels straight north, then the minimum distance is 300 m.

10. Displacement is the change in position. So the magnitude of the displacement for half a lap is 300 m.

    For a full lap (the car returns to its starting position), the displacement is zero.

11. Displacement is the change in position. So it is 1.65 m down.

12. \( d = 1 \text{ mi} = 1609 \text{ m}, \quad \Delta t = 3 \text{ min} \times 43.13 \text{ s} = 223.13 \text{ s}. \)

    So \( \vec{s} = \frac{d}{\Delta t} = \frac{1609 \text{ m}}{223.13 \text{ s}} = 7.2 \text{ m/s}. \)

13. \( \vec{s} = \frac{d}{\Delta t}, \quad \therefore d = \vec{s} \Delta t = (90 \text{ km/h})(1 \text{ h}) = 30 \text{ km}. \)

    No, this is generally not the magnitude of the actual displacement unless the bus is traveling on a straight road in only one direction.