Distance vs Displacement / Frames of Reference

Part 1-Frames of Reference

Answer the following questions

1. If a person places their textbook on the seat next to them in their car. They then drive 5 miles north. To the person in the car what is the displacement of the textbook? To the person watching the car drive away, what is the displacement?

2. You are watching a car drive past you at 25 m/s. On the dashboard of the car is a GPS unit. To the person in the car how fast is the GPS unit moving? To you how fast is the GPS unit moving?

3. A person is running 5mph on a treadmill. To the person how fast is she moving? To a person standing off the treadmill watching her move how fast was she moving in reference to the floor?

4. A person in a car going 10m/s north throws a ball out the window at 5m/s north. How fast does the ball move in reference to the person in the car? If someone is watching this standing outside the car how fast is the ball moving?

5. A person in the back of a truck traveling 20m/s east throws an apple core 5m/s west. To the person how fast is the apple moving? To a person standing on the ground watching this, how fast is the apple moving?

6. A person in a car throws a ball 10 m/s out the window of a car moving 15m/s. To an observer, standing outside of the car, how fast is the ball moving. To the person in the car how fast is the ball moving?

7. The earth moves around the sun at 29.67 km/s (67,000 mph). To a person on earth how fast is the planet moving? To a person on mars how fast in the earth moving?

8. The earth spins at 447 m/s (1000 mph) on its axis. To a person on the moon how fast is the school moving? To you how fast is the school moving? What is the schools displacement in a 24 hour period?

9. A person riding down the road in a car passes you standing alongside the road. The car is moving at 20m/s. Just as they pass you they throw a ball up into the air and then catch it. Draw the path that you see the ball take? Draw the path they see the ball take.

Part 2-Distance vs Displacement

Answer the following questions

1. If a student walks 40 meters north stops in her spot and then walks 20 meters south what is the distance the student traveled? What is the displacement?

2. If a student walks 75 meters east stops and then walks 25 meters west what is the student's displacement? How far did the student travel?

3. If a student walks 50 meters south and then he turns around and walks 50 meters north what is his distance and displacement?

4. If a person drives 30 miles north, then 50 miles south what is the distance and the displacement of the car?

5. A truck travels 85 miles north, then 40 miles south, then 60 miles north, what is the distance traveled and the displacement of the truck?

6. A car travels 75 miles east then 95 miles west, then 100 miles east. What is the distance the person travels?

7. A truck travels 30 miles north then 40 miles east. What is the trucks displacement? How far did the truck travel?

8. A person runs 40 feet east, then 60 feet south, then 20 feet west. What is the displacement of the person? What is the distance the person ran?

9. A car travels 60 miles north then 40 miles east then 40 miles north. What is the displacement of the car and the distance the car travels?

10. A truck travels 50 miles east, then 50 miles north then 60 miles east then 60 miles north then 75 west. What is the displacement of the truck? What is the distance the truck travels?

11. (Serway P.109 #23) A shopper pushes a cart 40.0 m south down one aisle and then turns 90.0° east and moves a15.0 m. He then makes another 90.0° north and moves 20.0 m. Find the shopper's displacement.