

Distance VS Displacement

Name: _____

Date: _____

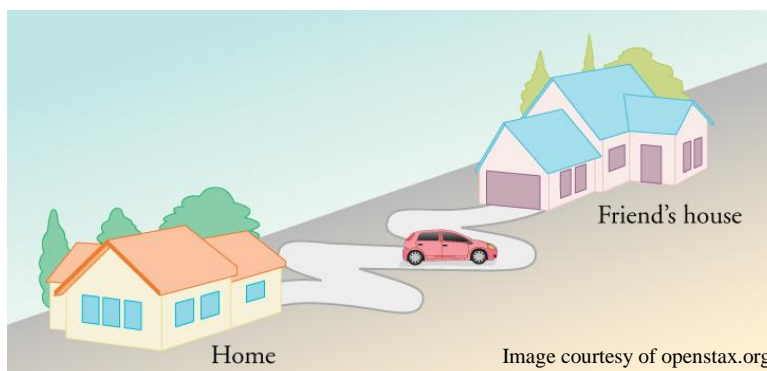
Information: Reference Frames

Everywhere you look, objects are in motion. Each object's motion requires a **reference frame**. When we say that a car is going fast we usually mean compared to the ground. Of course, the ground is also technically moving when we consider the motion of the planet Earth!

Critical Thinking Questions

1. When we speak of the revolution of the Earth, what is a reference frame we could use?
2. Consider an airplane in midflight traveling from New York to London.
 - a) A passenger stands up and walks to the back of the plane where the restroom is. Her speed is 1.8 miles per hour. What is the reference frame?
 - b) The plane is traveling 420 miles per hour. What is the reference frame?
3. Imagine that you are traveling in a windowless ship on a calm sea. Is it possible for you to determine if the ship is moving? Explain.

Information: Distance and Displacement



Imagine that your friend's house is 10 kilometers (km) away, but the road to your friend's house is really curvy. If you travel from your home to your friend's house, your displacement will be 10 km, but the distance you traveled will be greater than 10 km because of the curvy road.

Information: Positive and Negative Displacement

Sometimes it is helpful to assign one direction a positive value and the opposite direction a negative value. For example, if a car drives 30 km and then turns around to drive 50 km in the opposite direction we know the displacement will be 20 km in a direction opposite of the first direction. To clarify directions we could assign a positive sign to the first direction and a negative sign to the second. Our calculation would then be:

$$\text{Displacement} = 30 \text{ km} - 50 \text{ km} = -20 \text{ km}$$

The positive and negative signs are especially helpful for problems that do not mention directions like north, south, west, or east.

Critical Thinking Questions

14. A truck drives 120 km and then turns around to drive 250 km more. Calculate the displacement of the truck.

15. A motorcycle travels 85,449 m in one direction and then 32,877 m in the opposite direction. Calculate the displacement.