Motion, Speed, Velocity and Acceleration

GRAPHING MOTION

- **The steeper the line on a distance vs. time graph, the faster the object's velocity.**

- **A curved line indicates a change in velocity (accelerating).**

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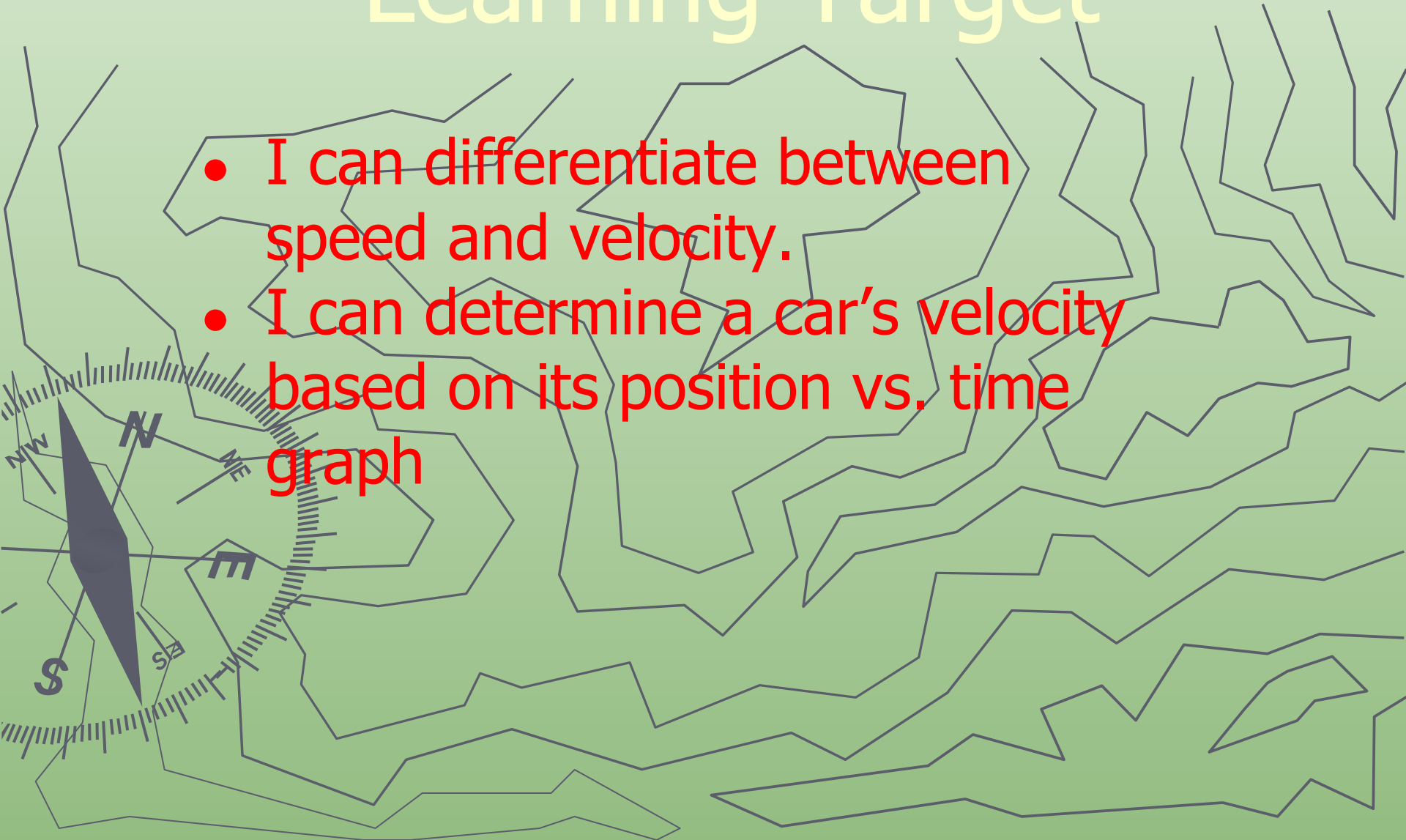
Learning Target

- I can differentiate between speed and velocity.
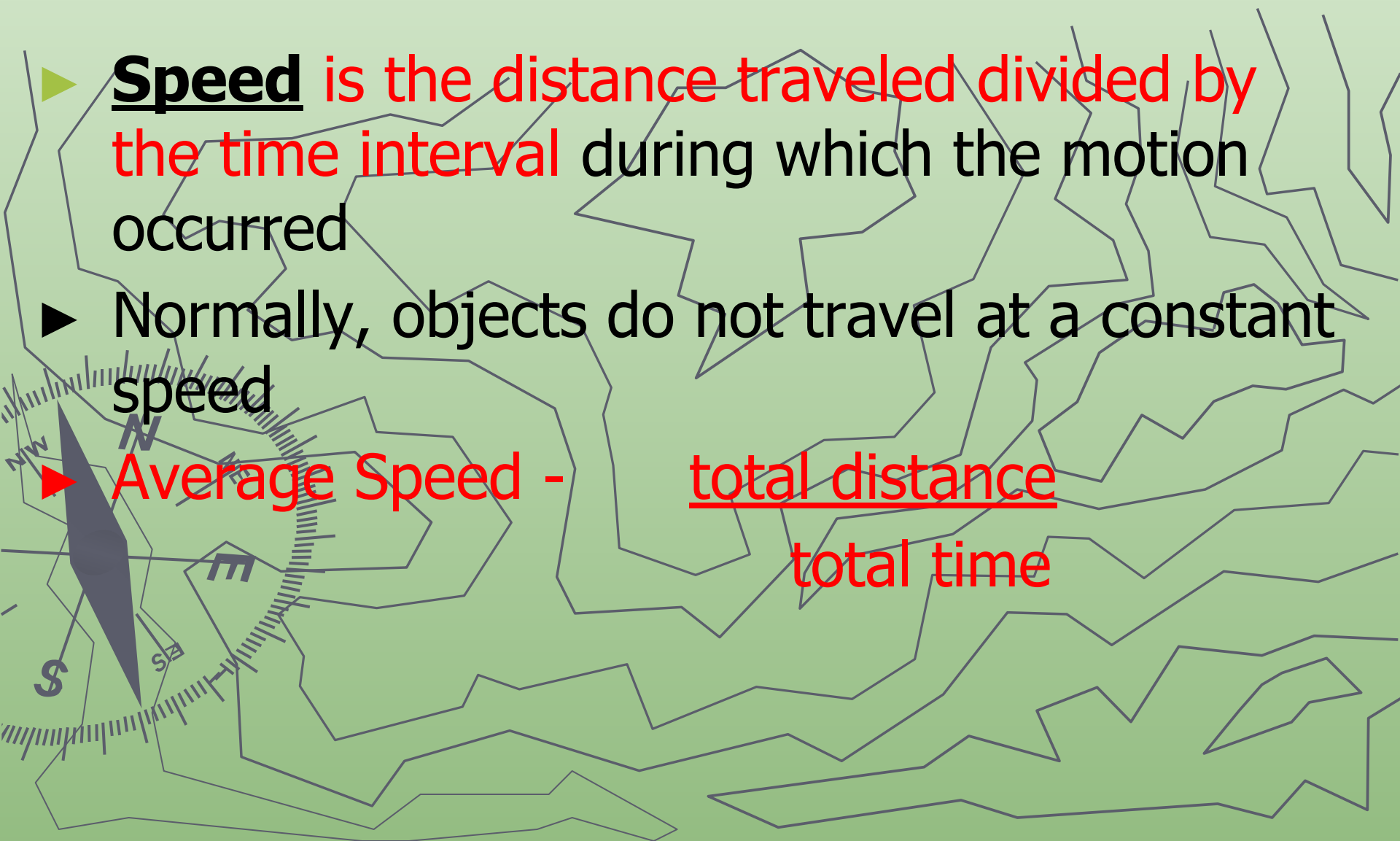- I can determine a car's velocity based on its position vs. time graph

Motion

► **<u>Motion</u>** – an object's change in position relative to a reference point

Speed

► **Speed** is the distance traveled divided by the time interval during which the motion occurred

► Normally, objects do not travel at a constant speed

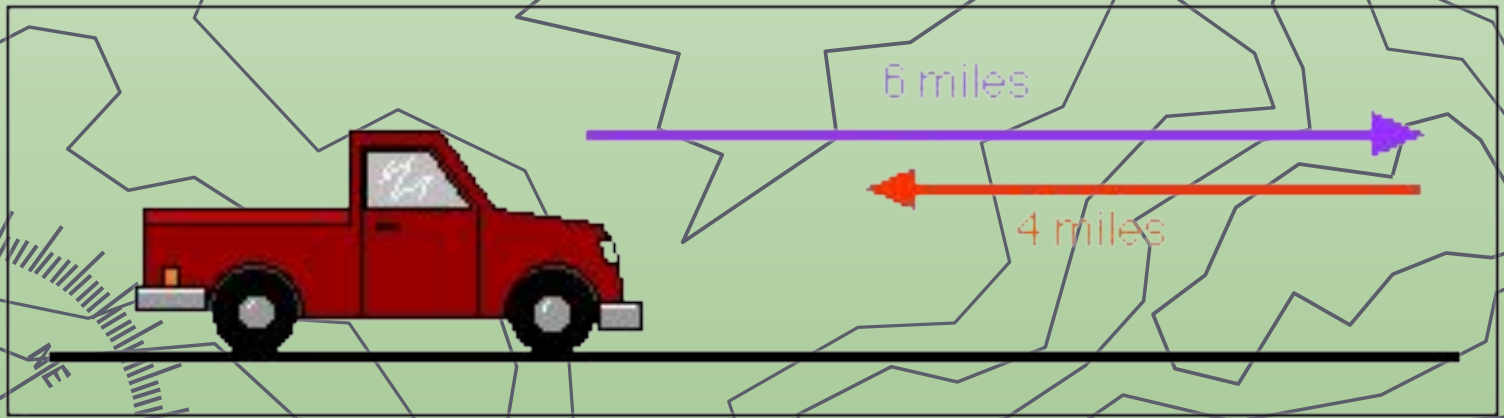► Average Speed -   total distance

total time

Velocity

► **<u>Velocity</u>** is the displacement of an object divided by the time interval. Since displacement includes direction, velocity must also include direction.

► Average velocity -   <u>Displacement</u>

                                   total time

► Imagine two birds leave the same tree at the same time. The both fly at 10km/hr for 5 minutes. Why don't they end up at the same place?

Which Distance?

► Farmer Jones drives 6 miles down a straight road. She turns around and drives 4 miles back. What was her average speed for this trip if it took 1 hour?
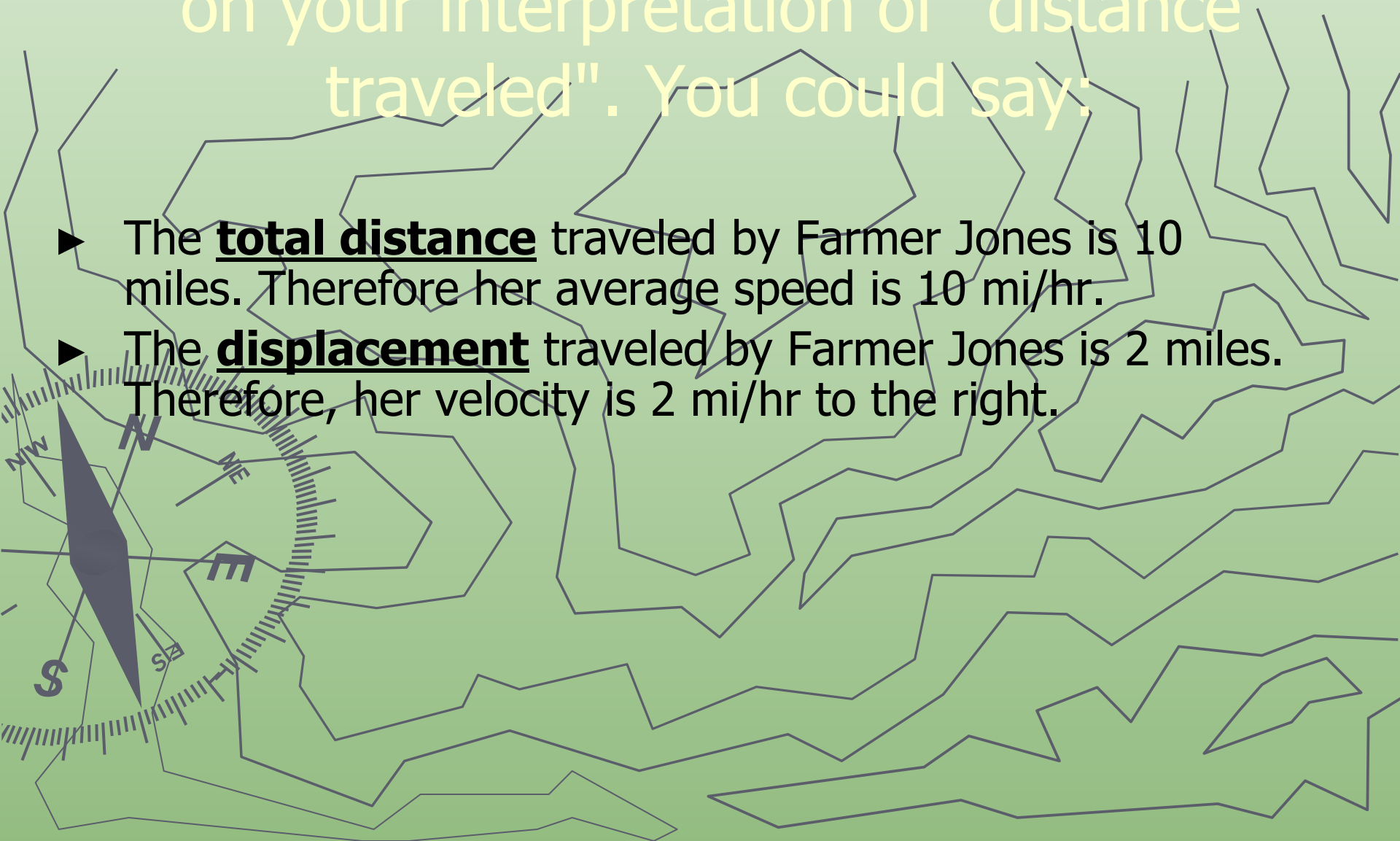
6 miles

4 miles

What is the object's speed?
What is the object's velocity?

Your answer to this problem depends on your interpretation of "distance traveled". You could say:

► The **total distance** traveled by Farmer Jones is 10 miles. Therefore her average speed is 10 mi/hr.

► The **displacement** traveled by Farmer Jones is 2 miles. Therefore, her velocity is 2 mi/hr to the right.

Reading a Position vs. Time Graph

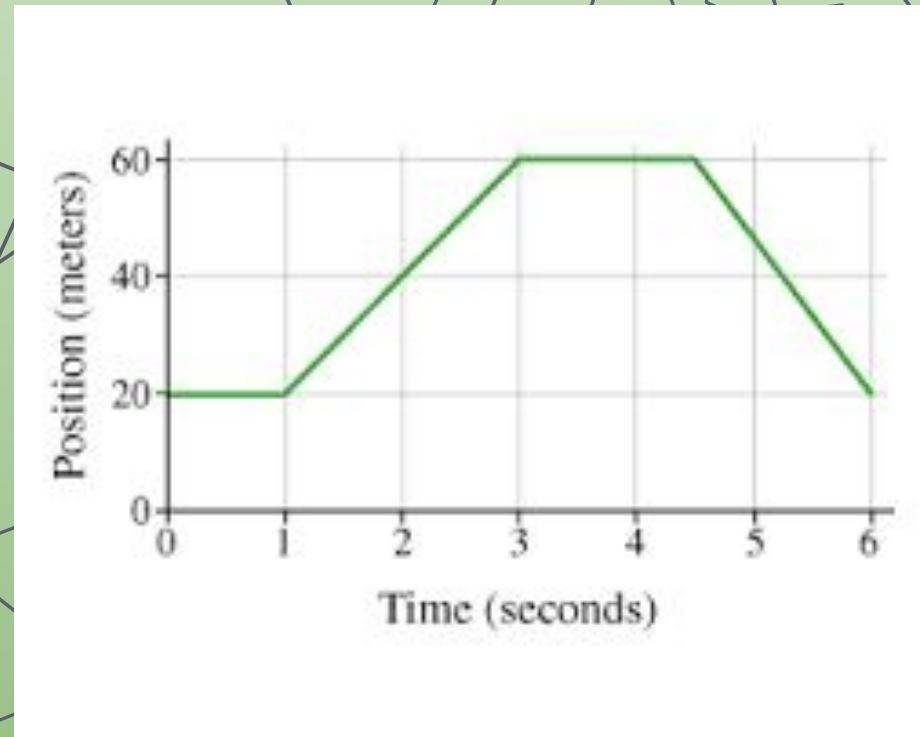What is the object's initial position?

- Initial position would be at t=0
- What is the position at t=0?
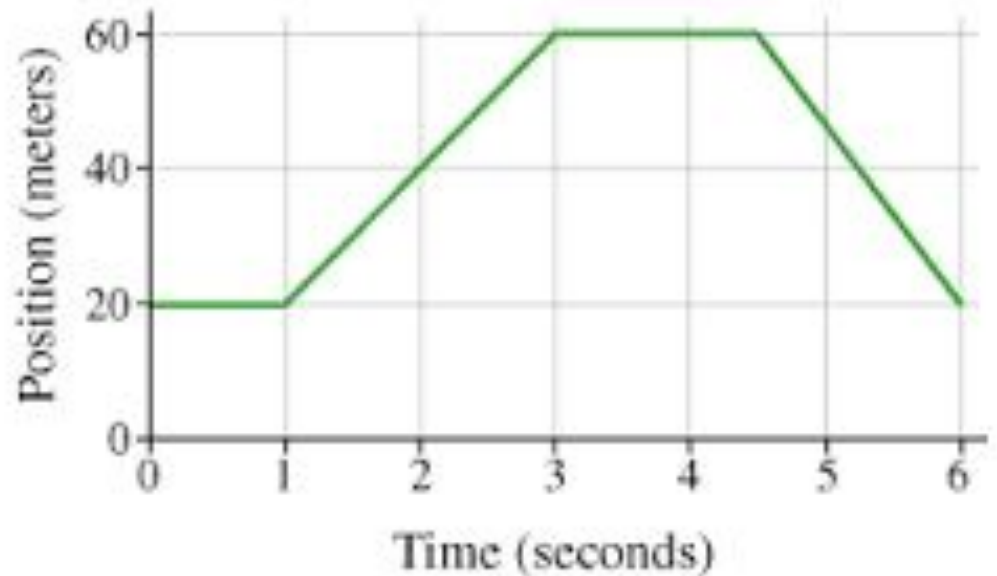
Reading a Position vs. Time Graph
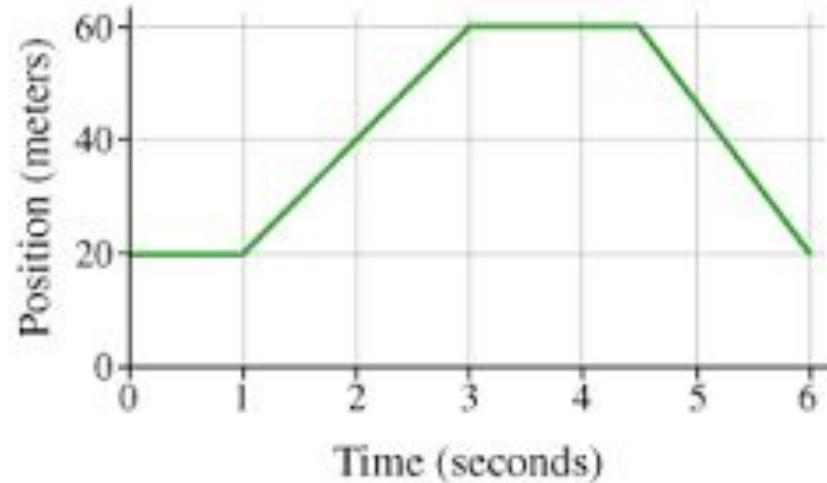
What is the object's displacement from 0-4 seconds?

- Displacement =

  Final Position-Initial Position

- Displacement = 60m-20m = 40m

Reading a Position vs. Time Graph

What is the object's total displacement from 0-6 seconds?
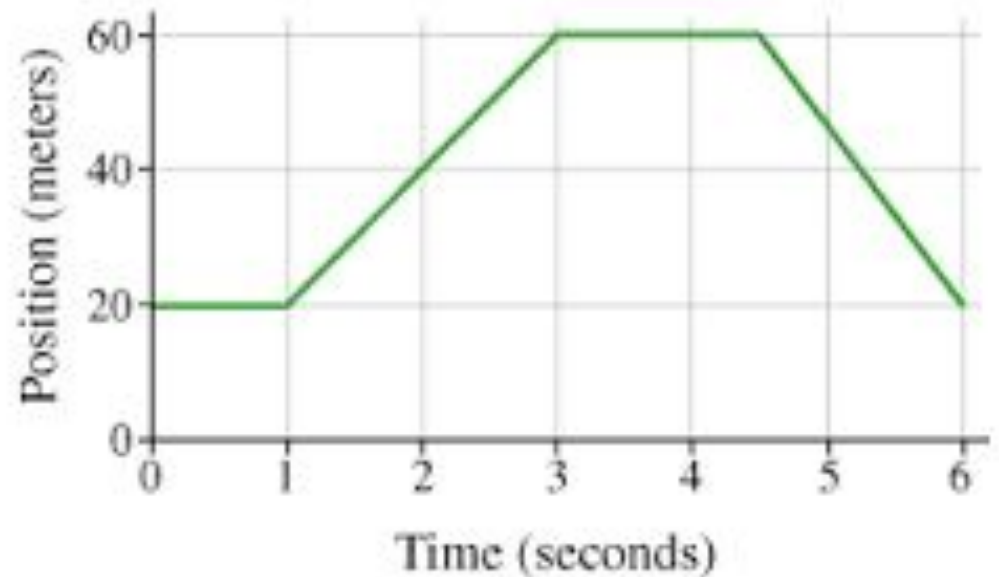
Displacement = 20m-20m = 0m

Reading a Position vs. Time Graph

- What is the object's Instantaneous velocity at 2 s?
- Instantaneous velocity = slope of line
- + 20 m/s

Reading a Position vs. Time Graph

- What is the object's average velocity from 0-3 seconds
- Average Velocity = displacement/time
- velocity= +40/3 m/s