Physics Honors:
1 Dimensional Kinematics

What does "Distance" mean?

Let's compare two scenarios…

1. I walk from my house to go get lunch, 1 mile away. I eat my lunch, and then walk home

1. I walk from my house to go get lunch, 1 mile away. After lunch, I decide I want ice cream, so I walk another mile to the best ice cream shop.
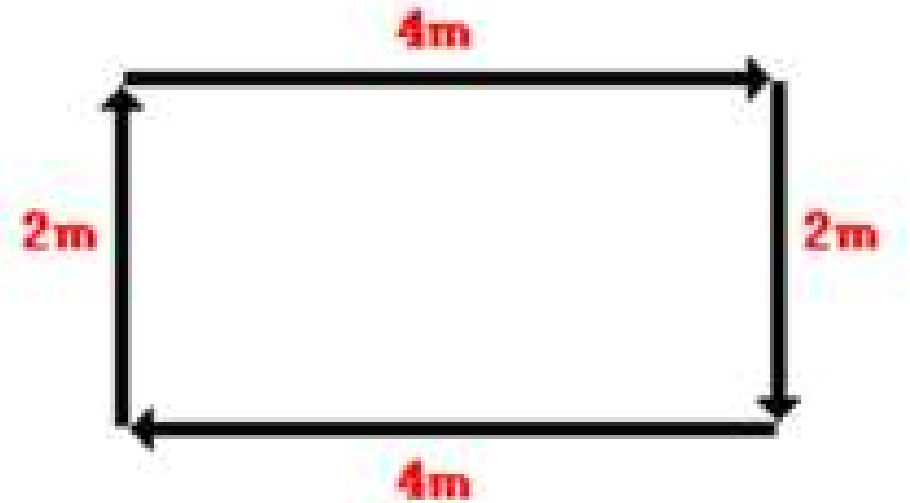
Distance vs. Displacement

When we want to talk about the difference between *where something is,* and *how far it has moved.* We need to use two different terms.

Distance: How much ground an object has covered during its motion

Displacement: How far out of place an object is from where it started

- In this picture, a person walks 4m east, 2m south, 4m west, and then 2m north.

- What is the distance the person walks?
- What is the person's displacement?
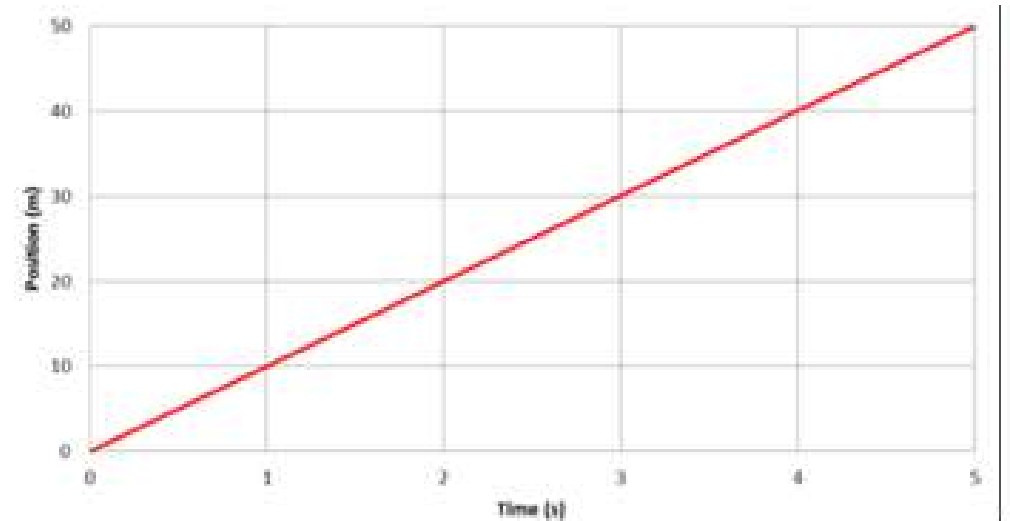
Vector vs Scalar?

The main difference between distance and displacement is the way the direction of motion affects it.

When we calculate distance, we add up how far they travelled without worrying about direction. Does this sound like a scalar or a vector?
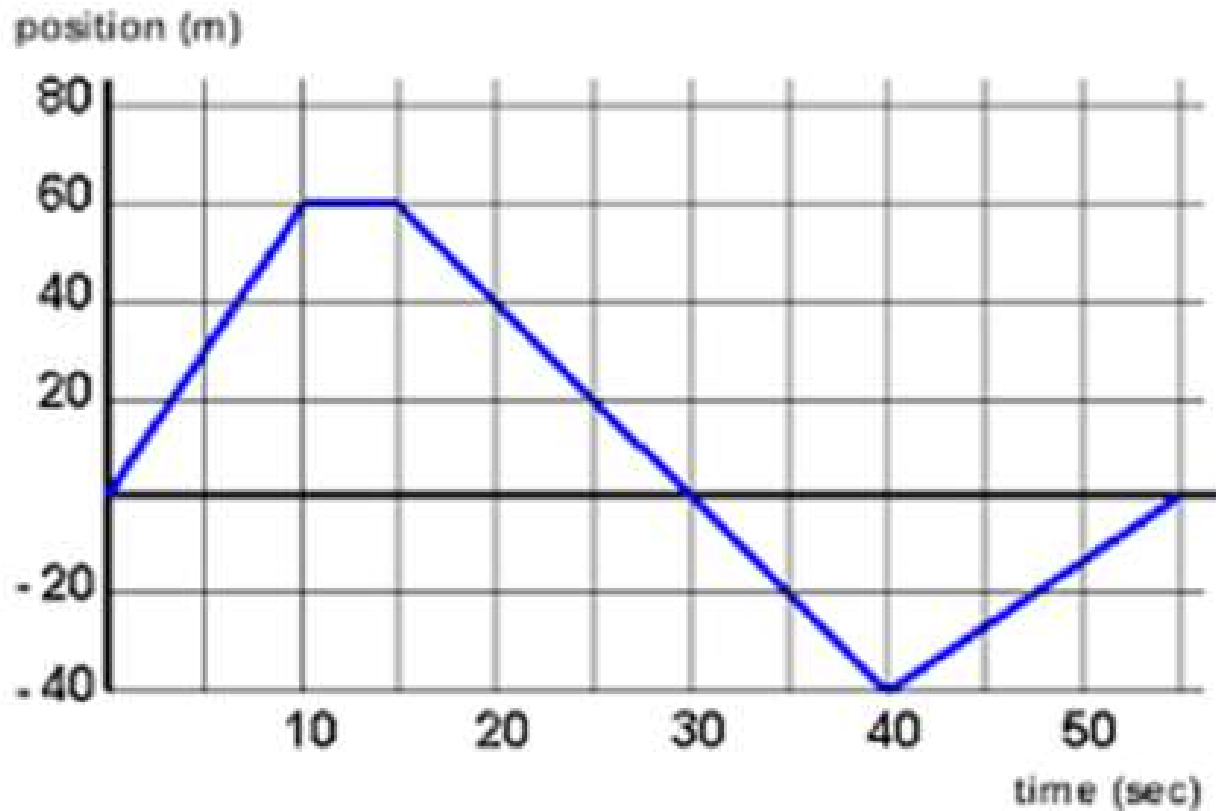
Motion Graphs

Position is where an object is located.

Can position be negative? Can time?

How would you describe the motion of the object in this graph? Is it speeding up, slowing down, or moving at the same speed?

position (m)

time (sec)

- How is this object moving from in the time from 0 seconds to 10 seconds?

- What is this object doing in the time frame from 10 seconds to 15 seconds?

- How is this object moving in the time period from 40 seconds to 50 seconds?

- What is the total distance this object moves?

- At what time(s) is this object's displacement 0?

Speed v Velocity

- Speed is a scalar value that will represent how fast an object is moving.

  - Speed will always be positive because it is a scalar!

- Velocity is a vector value that tells us BOTH how fast an object is moving AND what direction it is moving in.

  - Velocity will use a +/- sign to tell us what direction the object is moving.

  - What else could we use to describe direction?

Calculating Velocity

You can calculate the value of velocity by dividing displacement by time.

Use these variables:
v = speed or velocity
x = distance or displacement (in meters)
t = time (in seconds).

$$v = \frac{x}{t}$$

What is the difference between using distance and displacement?

GUESS method for answering questions

- Identify **G**ivens - (Variable = number unit)

- Identify **U**nknown (Variable = ?)

- State the **E**quation   (From the equation sheet)

- **S**ubstitute the Givens into the Equation

- **S**olve for the Unknown (Arithmetic and Algebra)

Sample Calculations

1. The physics teacher walks twelve meters. It takes the teacher 10 seconds to walk that distance .What was the average speed of the teacher?

2. A car covers 15 kilometers in 30 seconds. What is the car's speed?

3. During the first 50 s a truck traveled at constant speed of 25 m/s. Find the distance that it traveled.

Sample Calculations

1. The physics teachers walks twelve meters. It takes the teacher 10 seconds to walk all four parts of the motion.What was the average speed of the teacher? 1.2 m/s

2. A car covers 15 kilometers in 30 seconds. What is the car's speed? 0.5 km/s or 500 m/s

3. During the first 50 s a truck traveled at constant speed of 25 m/s. Find the distance that it traveled.
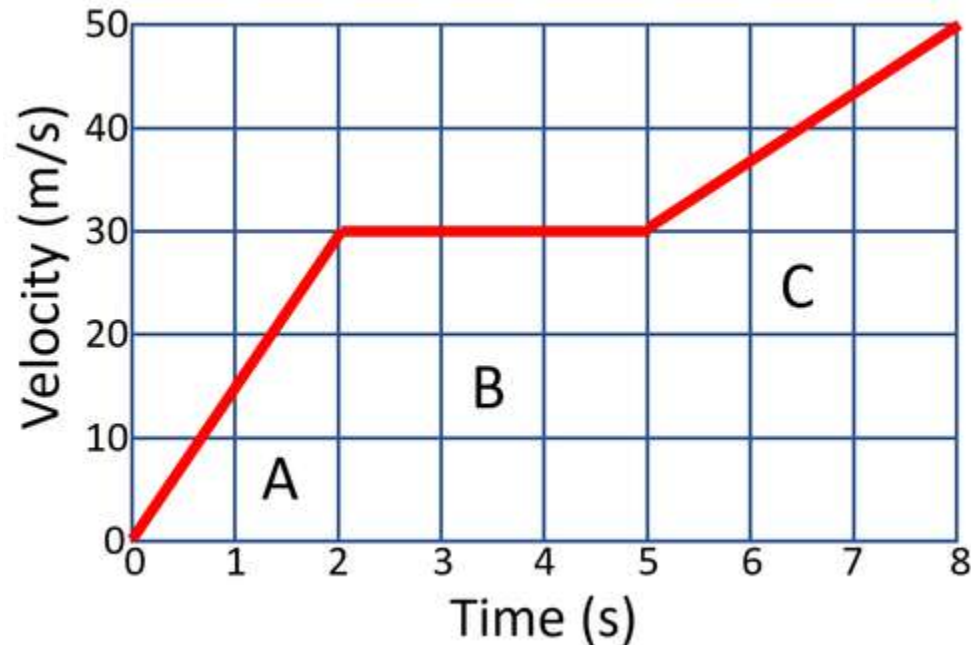
1250 m

Position vs Time Graphs
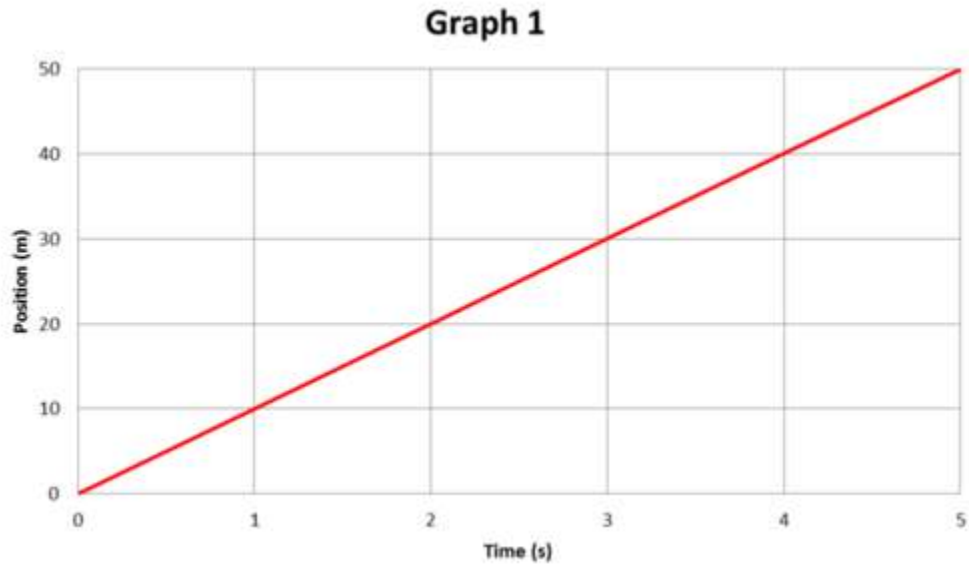
Graph 1

What does the slope of this graph represent?

Velocity vs time graphs

- What would you say about this object's velocity in the first 3 seconds?

- What does the flat line between 2-5 seconds represent?

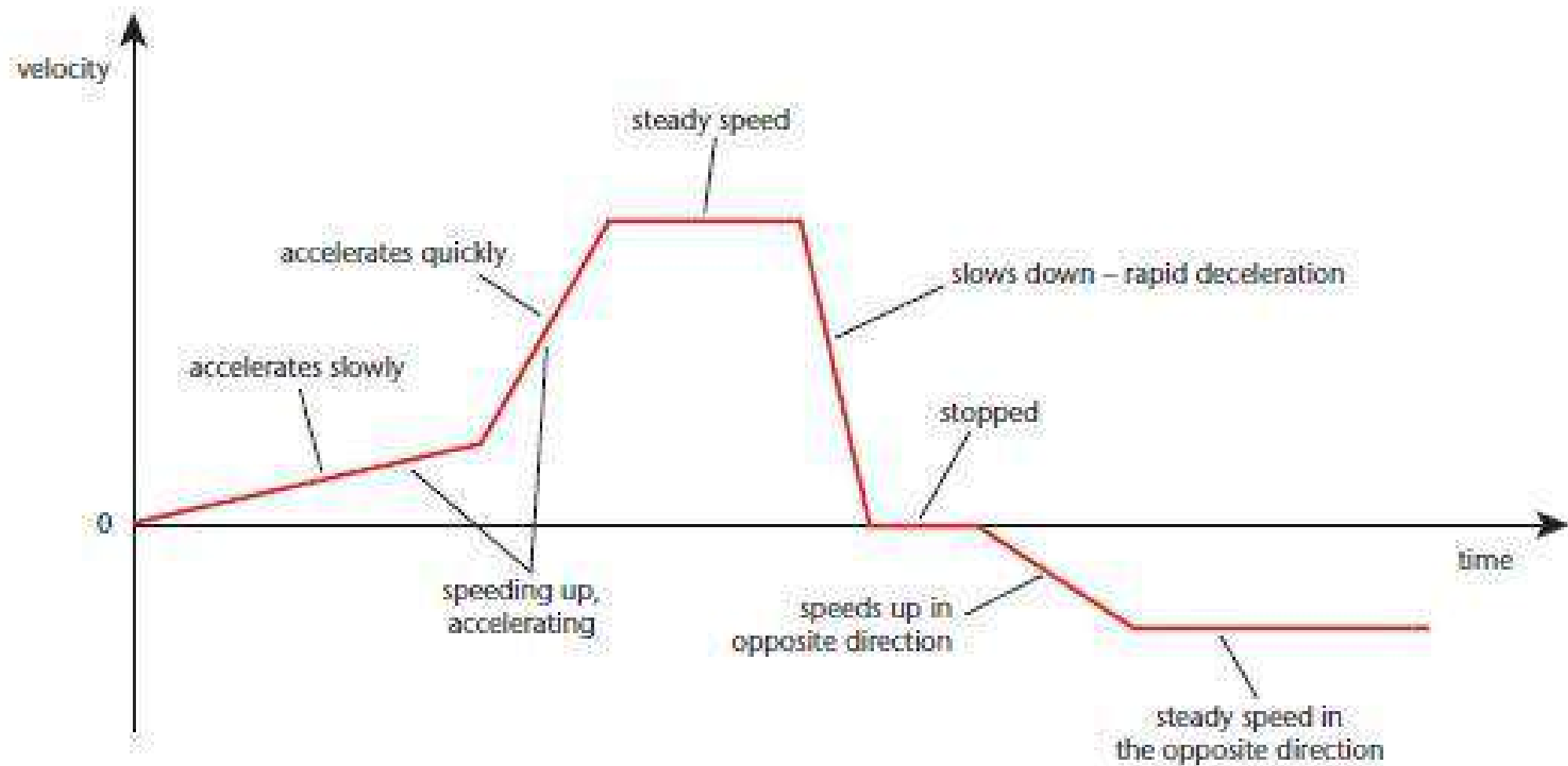- What does the slope of this line represent?

velocity

steady speed

accelerates quickly

slows down – rapid deceleration

accelerates slowly

stopped

0

speeding up,
accelerating

speeds up in
opposite direction

time

steady speed in
the opposite direction

Fig. 9.2 A velocity–time graph.