

Chapter 5

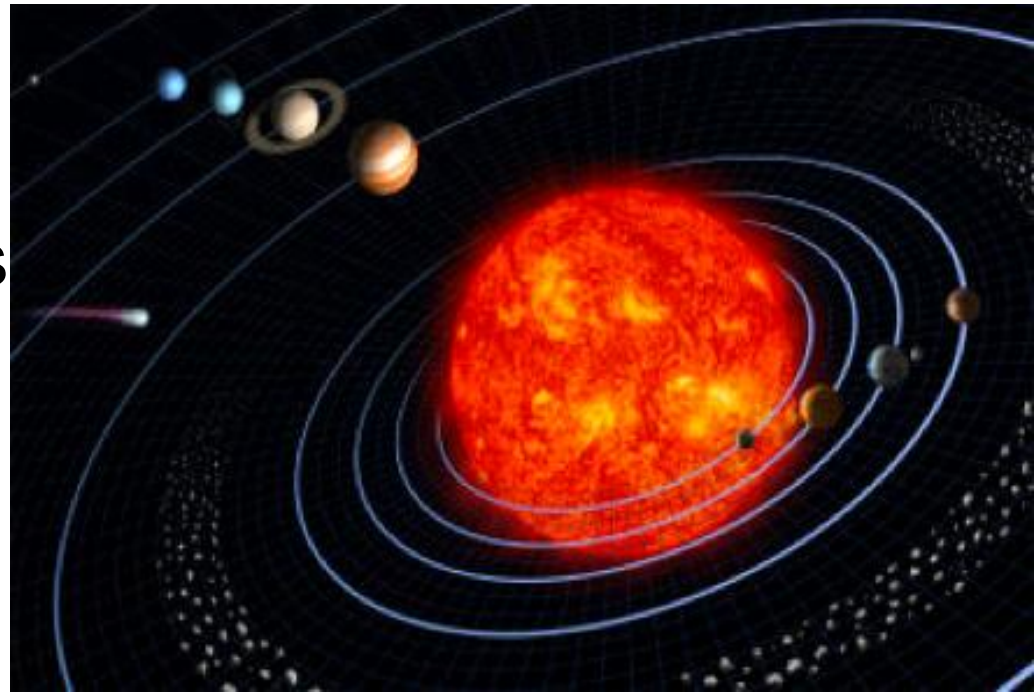
Matter in Motion



Section 1 – Measuring Motion

What is Motion?

- An object is in motion when it is changing its position relative to a reference point.
- Motion is relative.
 - The Earth moves relative to the sun. Both moving and nonmoving objects can be reference points.



Describing Motion

- Speed - How fast?
- Time - How long?
- Distance - How far?
- Velocity - How fast in a ***specific*** direction?
- Acceleration - How fast “how fast” is changing?

“As the Crow Flies”

Distance vs. Displacement

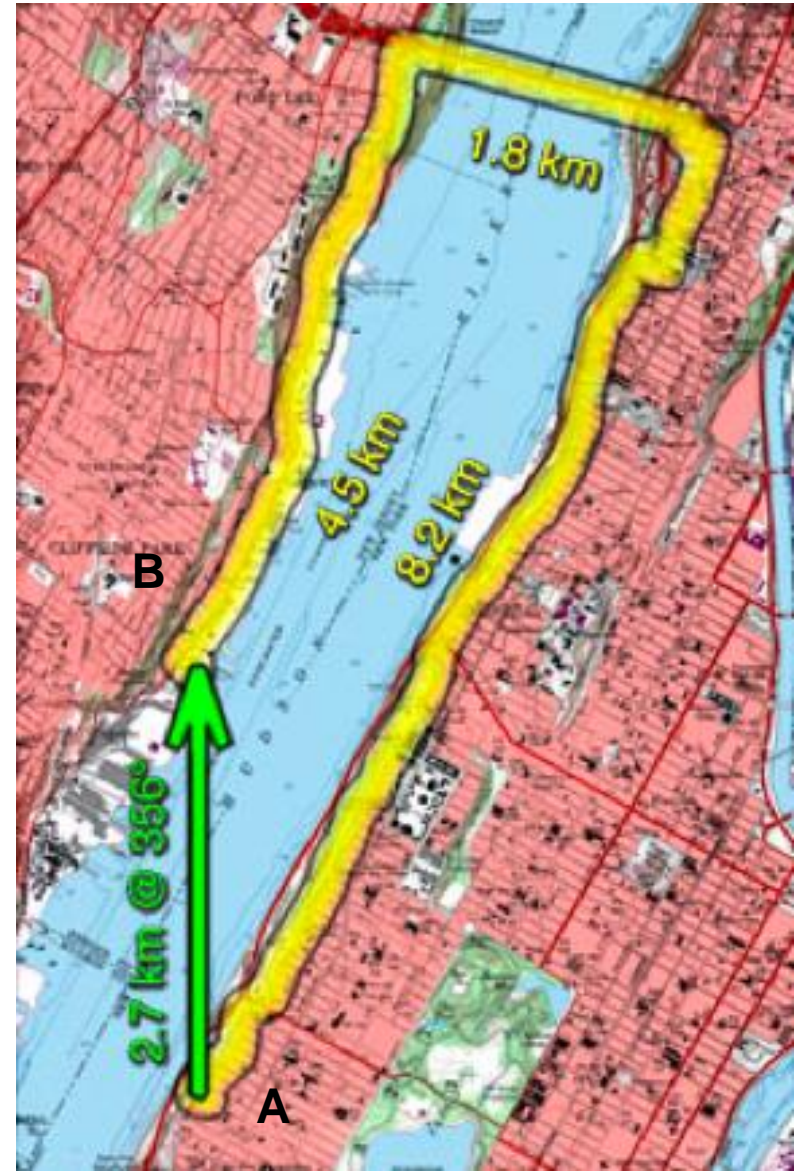
- Distance - the length of a path between two points.
- Displacement - length and direction that an object has moved from its starting point.



Your turn.

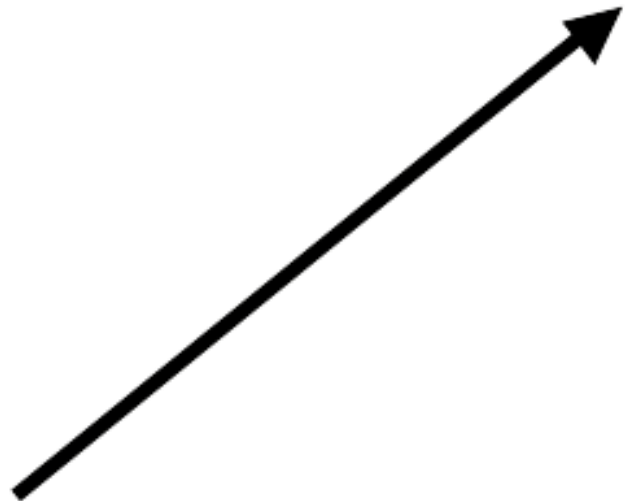
Study the city map.

1. What is the distance on foot to get from A to B?
2. What is the displacement from A to B?



Vector

- A quantity that consists of both a magnitude and direction.
- Displacement is a vector.
- Velocity is a vector.
- Acceleration is a vector.



Measuring Speed

Fastest Cars



244 mph



763 mph



350 mph



347 mph

Fastest “Toys”



Fastest Roller Coaster

“Kingda Ka” Six Flags New Jersey

128 mph



Fastest Animals



Fastest Man & Woman



Justin Gatlin 100m/9.77sec

Florence Griffith-Joyner

100m/10.49 sec



Fastest Airplane and Train

X - 43



1806.95 mph

Mach 9.8

Shanghai Maglav



268 mph

Fastest Space Vehicle

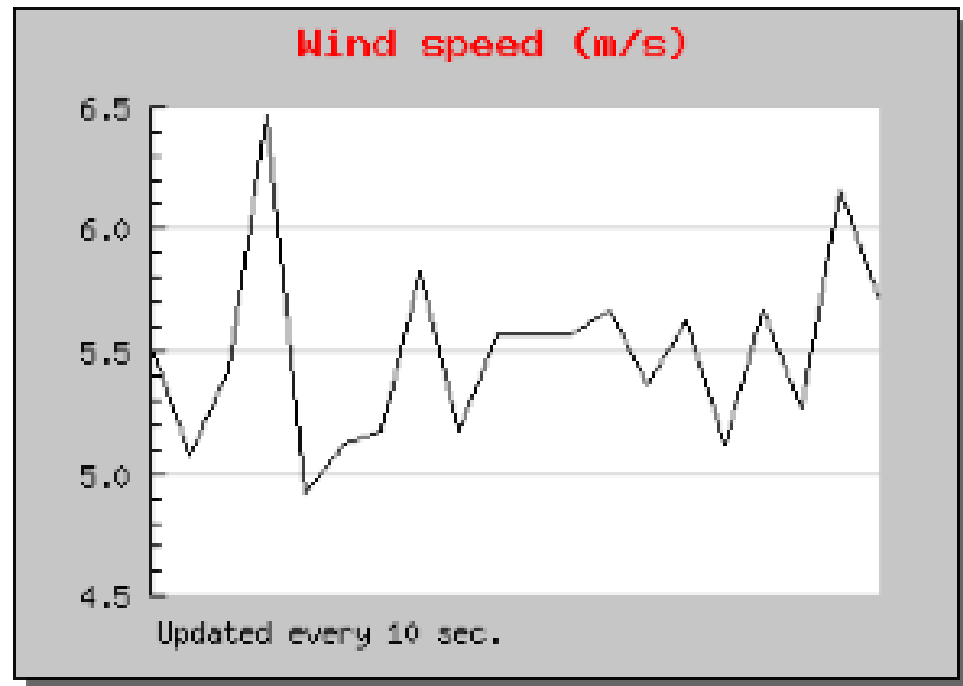
Voyager 1

39,000 mph



Two Kinds of Speed

- Average speed
 - The distance divided by the travel time.
- Instant speed
 - The speed an object is moving at a given instant in time.



How can average speed be calculated?

- Average speed = total distance \div time

$$s = d \div t$$

- You try: A car travels 240 miles in 4 hours. What is its average speed? _____
- Express the answer in miles per hour.
- You try: A car travels 240 miles in 3 hours. What is its average speed? _____
- Express the answer in miles per hour.

Instant speed

- The speed at which an object is traveling at an instant in time.
 - A car's speedometer measures instant speed.
 - A police radar gun measures instant speed.



Velocity

- The speed of an object in a direction.

- Abbreviation - v



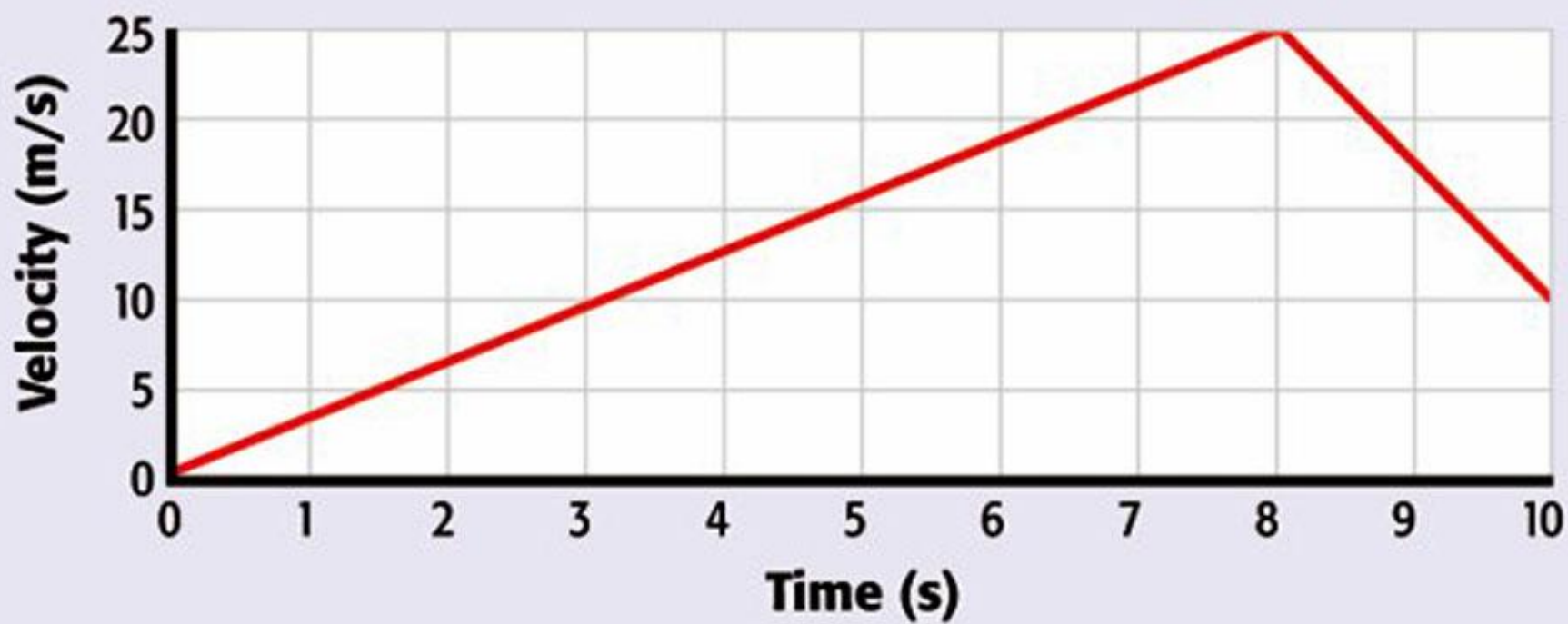
- compare speed vs.. velocity

- How could a car travel at a constant speed but be changing its velocity

Acceleration

- Rate at which velocity changes
 - How much and how fast
- Positive acceleration – increase in velocity
- Negative acceleration or deceleration – decrease in velocity

A Graph Showing Acceleration



Centripetal Force

- Acceleration in a circular motion
- An example

