Section G: Average Speed and Average Velocity
Unit: One-Dimensional Kinematics
Level 2
Prerequisites: Distance and Displacement; The Speed Formula

Objectives:
- Memorize the definitions of **vectors** and **scalars**
- That means word for word!
- Know the difference between *speed* and *velocity*
- Know the formulas for *average speed* and *average velocity*. Be able to calculate both!

Part C: Speed vs. Velocity

Speed How fast you are moving (distance / time)
Velocity Speed with direction, how fast you are moving *and* where you are going

C.1
For each situation, write your speed and your velocity.

	Speed	**Velocity**
I am driving east at 65 miles per hour.		
I am walking north at 3 m/s.		
I just jumped out of an airplane, and I am now moving at 20 m/s.		
A baseball player hits a baseball straight up into the air at 34 m/s.		

C.2 Velocity is a vector, which means it has *magnitude* and *direction*. What is another word for the magnitude of velocity?

C.3 I am in a go-kart traveling around in a circle at a constant speed of 8 m/s.
Is my velocity constant? How do you know?

Average Speed and Average Velocity

	Symbol	What is it?	Vector or Scalar?
Distance	d	How far you move in total, how many steps you take.	Scalar
Displacement	Δx	Change in position, How far you are from where you started	Vector
Average Speed	$\frac{d}{\Delta t}$	Distance / time	Scalar
Average Velocity	$\frac{\Delta x}{\Delta t}$	Displacement / time	Vector

1. Why does displacement have a delta (Δ) in the symbol?

2. I move 5 meters left then 3 meters right. It takes me 16 seconds.
Draw this:

What is my distance?

What is my displacement?

What is my average speed?

What is my average velocity?

3. You drive 9 miles east to your grandmother's house and then 5 miles west to the grocery store. It takes you 2 hours.
Draw this:

What is your distance?

What is your displacement?

What is your average speed?

What is your average velocity?

4. You run 50 meters down the track, then continue another 40 m *in the same direction*. It takes you 12 seconds.
Draw this:

What is your distance?

What is your displacement?

What is your average speed?

What is your average velocity?

5. I drive 50 km north, then 30 km south, then 40 more km south. It takes 10 hours.
Draw this:

What is my distance?

What is my displacement?

What is my average speed?

What is my average velocity?

6. I get in my car, drive 500 meters around my block, and I arrive back at my house. The whole trip takes me 60 seconds.
Draw this:

What is my distance?

What is my displacement?

What is my average speed?

What is my average velocity?

7. Write a circumstance where your average speed is very high, but your average velocity is very low.

Answers:

1.
Displacement is change in position and Δ is the symbol for change?

2.
distance = 6 m
displacement = 2 meters left
average speed = 0.375 m/s
displacement = 0.125 m/s left

3.
distance = 14 miles
displacement = 4 miles east
average speed = 7 mph
displacement = 2 mph east

4.
distance = 90 m
displacement = 90 m down the track
average speed = 7.5 m/s
displacement = 7.5 m/s down the track

5.
distance = 120 km
displacement = 20 km south
average speed = 12 km/hour
displacement = 2 km/hour south

6.
distance = 500 meters
displacement = 0
average speed = 8.3 m/s
displacement = 0

7. Any time that you move very fast but end close to the same place you started.