# Cycle 13 Motion Basics
## Average Speed & Average Velocity

Name: _____

1. Name one similarity between speed velocity and average velocity. Name one difference.

2. Under what circumstances would the average speed and the average velocity be the same? Under what circumstances would they be different?

3. a) Calculate Usain's average speed in the 100 m in Berlin 2009.
   b) Is average velocity the same or different?
   c) Since this is the current world record, does that number represent the fastest a human has ever run?
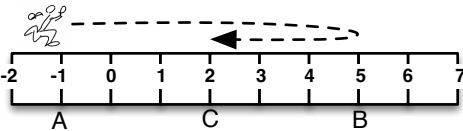
4. The person shown runs from point A (x = -1 m) to point B (x = 5 m) in 4 seconds, then doubles back and ends up at point C (x = 2 m) in another 2 seconds.
   a) Calculate the person's average speed from A to C.
   b) Calculate the person's average velocity from A to C.
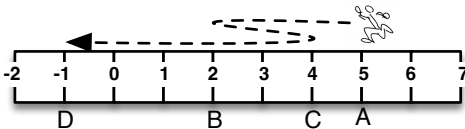
5. The person shown runs from point A (x = 5 m) to point B (x = 2 m) in 3 seconds, then doubles back and runs to C (x = 4 m) in 2 seconds, then turns again and ends up at point D (x = -1 m) in another 3 seconds.
   a) Calculate the person's average speed from A to C.
   b) Calculate the person's average velocity from A to C.

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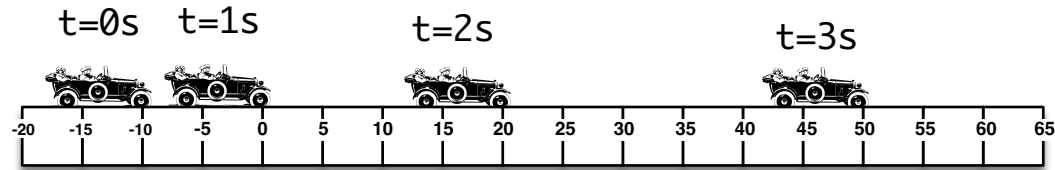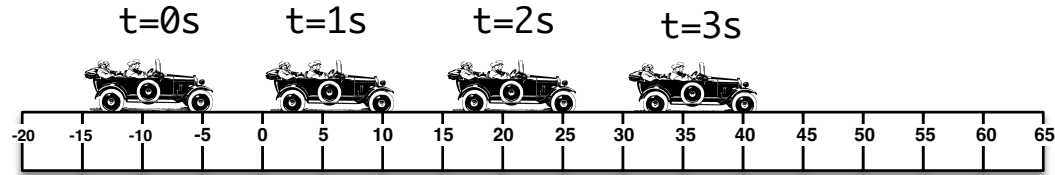Average vs Instantaneous

Fill in the dot patterns:

start Constant velocity (fast)

start Speeding up

start Constant velocity (slow)

start Slowing down

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t=0s   t=1s   t=2s   t=3s

-20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55 60 65

Describe the motion qualitatively. Could you put numbers to the motion?

t=0s t=1s   t=2s   t=3s

-20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55 60 65

Berlin 2009

t (s)	x (m)	v (m/s)
0	0	
1	5	
2	12	
3	21	
4	32	
5	44	
6	56	
7	69	
8	81	
9	93	
10	104	

Estimates based on velocityendurance.com data

Calculate Usain's velocitys for each second.

Do these represent average velocites or instantaneous velocites?

No doubt these numbers give a more accurate picture than simply saying his average velocity for the whole 100 meters, but given this data, do we know what Usain's top velocity was? Explain.