Name _____

Displacement: $\Delta x = x_f - x_i$ Displacement is just the distance between the initial (x_i) and final (x_f) positions of an object. Δx can be positive or negative.

Magnitude of Displacement $=$ Just the value (No negative sign) and the units.

Example: An object moves 1 m to the left: $\Delta x = -1m$ and the magnitude is just $1m$.

Total Distance Traveled $=$ sum of the magnitudes of all the individual displacements of an object

Choose the 0 point on the following diagram as the origin of your coordinate system. Let's define to the right as positive, $+$ and to the left as negative $-$.
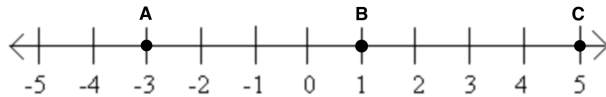
1. An object moves from point **B** to point **C** .

   (a) What is the initial position of the object x_i?

   (b) What is the final position of the object, x_f?

   (c) What is the displacement of the object, Δx?

   (d) What is the total distance traveled by the object?

   (e) What would be the displacement and total distance of the object if it started at point C and ended at point B?
   Displacement:
   Total Distance Traveled:

2. An object moves from point **B** to point **A** .

   (a) What is the displacement of the object, Δx ?

   (b) What is the total distance traveled by the object?

3. An object moves from point **A** to point **C** and then back to point **A** .

   A. +16

   B. +8

   C. 0

   D. -8

   E. -16

   (a) What is the displacement of the object, Δx?

   (b) What is the total distance traveled by the object?

4. An object moves from point **A** to point **C**, then to point **B**, and finally back to point **C**.

   (a) What is the total displacement of the object, Δx?

   (b) What is the total distance traveled by the object?

5. Why is total distance traveled different than the magnitude of displacement?

6. What is a <u>vector</u>? Give an example.   What is a <u>scalar</u>? Give an example.

7. What is <u>average velocity</u>? How is it defined?   What is <u>average speed</u>? How is it defined?

8. What is <u>instantaneous velocity</u>?   What is <u>instantaneous speed</u>?

9. A runner sprints $100m$ in the direction due East in $12s$, then immediately turns around and jogs for $30s$ a distance of $50m$ in the direction due West, back toward the starting point.

   (a) What was the runner's average speed for the whole trip?

   (b) What was the runner's average velocity for the whole trip?

   (c) Sketch position vs time and velocity vs time graphs for the situation.

10. The following position vs time graph describes the motion of a car for a time period of $6s$. Between each of the time intervals (0-1s, 1-3s, 3-4.5s, 4.5-6s) describe the motion of the car and calculate its average velocity.
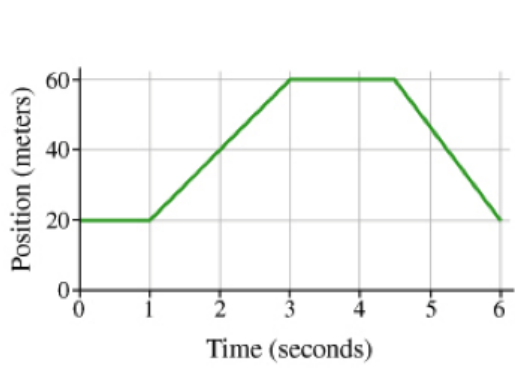
   What was the average velocity of the car in the total time of 6s? **A**:positive, **B**: 0, **C**: negative

11. Why is average speed different from average velocity?