Distance + Displacement WS | Name: _____

Note: You may write directly on this paper!!

Motion can be described using words, diagrams, numerical information, equations, and graphs. Using words to describe the motion of objects involves an understanding of such concepts as position, displacement, distance, rate, speed, velocity, and acceleration.

Vectors vs. Scalars

1. Most of the quantities used to describe motion can be categorized as either vectors or scalars. *A vector is a quantity that is fully described by both magnitude and direction. A scalar is a quantity that is fully described by magnitude alone.* Categorize the following quantities by placing them under one of the two column headings.

Define distance: _____

displacement, distance, speed, velocity, acceleration

Scalars	Vectors
skip!	

Define displacement: _____

2. A quantity that is *ignorant of direction* is referred to as a _____.
   a. scalar quantity b. vector quantity

3. A quantity that is *conscious of direction* is referred to as a _____.
   a. scalar quantity b. vector quantity

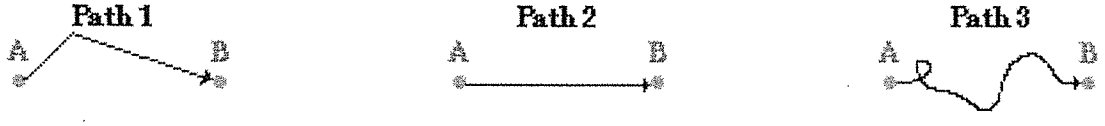
Distance vs. Displacement

As an object moves, its location undergoes change. There are two quantities that are used to describe the changing location. One quantity - **distance** - accumulates the amount of total change of location over the course of a motion. Distance is the amount of ground that is covered. The second quantity - **displacement** - only concerns itself with the initial and final position of the object. Displacement is the overall change in position of the object from start to finish and does not concern itself with the accumulation of distance traveled during the path from start to finish.

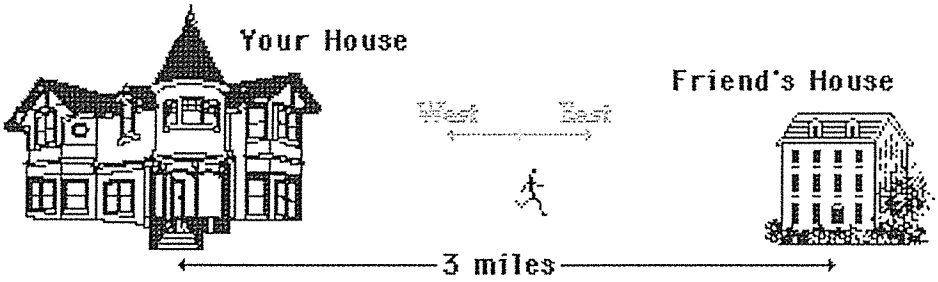
4. True or False: An object can be moving for 10 seconds and still have zero displacement.
   a. True b. False

5. If the above statement is true, then describe an example of such a motion. If the above statement is false, then explain why it is false.

6. Suppose that you run along three different paths from location A to location B. Along which path(s) would your distance traveled be different than your displacement? _____



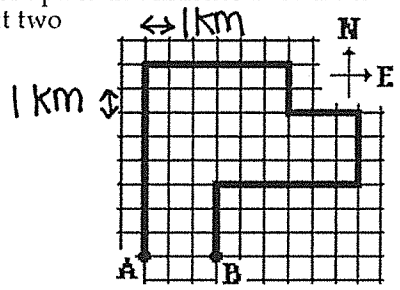
7. You run from your house to a friend's house that is 3 miles away. You then walk home.



a. What distance did you travel? _____ include units!

b. What was the displacement for the entire trip? _____

Observe the diagram below. A person starts at A, walks along the bold path and finishes at B. Each square is 1 km along its edge. Use the diagram in answering the next two questions.



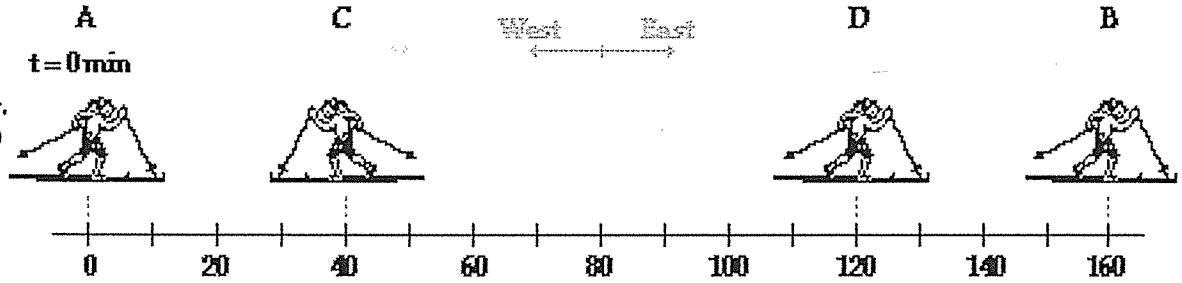
8. This person walks a distance of _____ km.

9. This person has a displacement of _____.

a. 0 km	b. 3 km	c. 3 km, E	d. 3 km, W
e. 5 km	f. 5 km, N	g. 5 km, S	h. 6 km
i. 6 km, E	j. 6 km, W	k. 31 km	l. 31 km, E
m. 31 km, W		n. None of these.	

10. A cross-country skier moves from location A to location B to location C to location D. Each *leg* of the back-and-forth motion takes 1 minute to complete; the total time is 3 minutes. (The unit is *meters*.)

* Read carefully!



a. What is the distance traveled by the skier during the three minutes of recreation?

b. What is the net displacement of the skier during the three minutes of recreation? (aka from A→B→C→D)

c. What is the displacement during the second minute (from 1 min. to 2 min.)? (aka from B→C)

d. What is the displacement during the third minute (from 2 min. to 3 min.)? (aka from C→D)

e) From "D", how many meters would the skier need to travel (& in what direction) to wind up with a total displacement of zero?