Measuring Vectors: Displacement and Velocity
SPH4C

A vector quantity has both magnitude and _____.

The direction is given _____: e.g.,

Examples of vectors include:

- _____

- _____

- _____

- _____

Displacement is <u>not</u> simply distance travelled + a direction.

E.g., the distance travelled here by a driver commuting from

Manhattan to N.J. was _____ even though the

displacement was only _____.

Example: Ms. Rosebery walks 2 m [East] and then 1 m [West].
           What was her distance travelled?
           What was her displacement?

           Distance travelled: _____

           Displacement vector diagram:

           She is _____.

           We can also represent [East] as the positive direction and [West] as the
negative   direction:

           $\Delta \vec{d}$ =

It is conventional to represent the following directions as positive:

- _____
- _____
- _____
- _____
- _____

Velocity is similarly <u>not</u> simply speed + a direction.

<u>Example</u>: Ms. Rosebery walks 2 m [East] and then 1 m [West] in 3 s.
What was her average speed?
What was her average velocity?

Average velocity is rarely calculated for an object changing direction. It makes more sense to

talk about the _____ **velocity**, which <u>is</u> the speed + the direction

_____

Assuming Ms. Rosebery walked at constant speed, what was her instantaneous velocity at:

1.5 s? _____

2 s?   _____

2.5 ?   _____

<u>More Practice</u>

Match each term on the left with the most appropriate description on the right.

___ vector   A. the rate of change in the position of an object over an interval of time

___ displacement   B. a quantity that has magnitude and direction

___ average velocity   C. the change in position of an object

___ instantaneous velocity   D. the time elapsed between two selected instants

___ time interval   E. the rate of change in the position of an object at a given time

1.   Which of the following quantities is a vector?

       A. distance travelled   B. speed
       C. time   D. velocity

2.   2.0 m [left] is a measure of:

       A. distance travelled   B. displacement
       C. speed   D. velocity

3.   What is your displacement if you walk 24 m [East] and then 15 m [West]?

       A. 9 m [East]   B. 9 m [West]   C. 39 m [East]   D. 39 m [West]

4.   A jogger runs 5.0 km in 0.5 h. Her average velocity is:

       A. 1 km/h   B. 5 km/h   C. 10 km/h   D. impossible to determine

1. Ms. Rosebery walked around a lecture table as shown in the diagram at right. Explain why the question, "How far did she go?" is ambiguous.
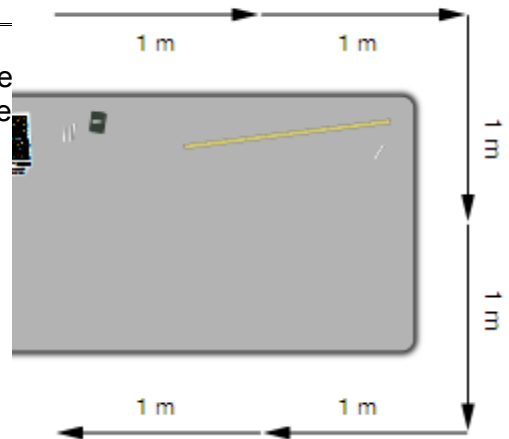
2. You just got your license and are taking the car out for a drive. At the end of your trip, you determine that you had an average speed of 80 km/h but an average velocity of 0 km/h. Explain how this is possible.