PHYSICS IN MOTION
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Unit 1D
Vectors & Scalars
Experiencing Vectors & Scalars Lab

Name:

Date:

In this activity, you will be experiencing, comparing, and contrasting vector and scalar quantities using common examples of each: distance and displacement.

Distance is a scalar quantity and is the total amount traveled with no regard to direction.

Displacement is a vector quantity and is the straight-line distance between an object's starting position and its final position.

Materials:

- meter stick/measuring tape
- masking tape

Procedure:

Find an area with some space for movement, and mark your starting position on the floor with masking tape. Walk along a straight line as you complete each of the following scenarios.

Scenario 1:

Walk 3 m to the right, stop, then walk an additional 2 m to the right.

1. **Draw the vectors that represent each motion.**

2. **Draw a vector from the initial position to the final position.**

3. **Measure the displacement: the distance between the starting position and the final position.**

_____

4. **What was the total distance walked?**

_____

5. **Was the displacement equal to the total distance walked?**

_____

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Scenario 2:

Walk 3 m to the right, stop, then turn around, and walk 2 m to the left.

1. Draw the vectors that represent each motion.

2. Draw a vector from the initial position to the final position.

3. Measure the displacement: the distance between the starting position and the final position.

_____

4. What was the total distance walked?

_____

5. Was the displacement equal to the total distance walked?

_____

Scenario 3:

Walk 6 m to the right, 3 m back to the left, then 1 m again to the right.

1. Draw the vectors that represent each motion.

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2. Draw a vector from the initial position to the final position.

3. Measure the displacement: the distance between the starting position and the final position.

4. What was the total distance walked?

5. Was the displacement equal to the total distance walked?

Scenario 4:

Walk 3 m to the left, 5 m to the right, an additional 5 m to the right, then back 3 m to the left.

1. Draw the vectors that represent each motion.

2. Draw a vector from the initial position to the final position.

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3. Measure the displacement: the distance between the starting position and the final position.

4. What was the total distance walked?

5. Was the displacement equal to the total distance walked?

Scenario 5:

Walk 2.5 m to the right, turn 90° to the left, then walk 6 m forward.

1. Draw the vectors that represent each motion.

2. Draw a vector from the initial position to the final position.

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3. Measure the displacement: the distance between the starting position and the final position.

4. What was the total distance walked?

5. Was the displacement equal to the total distance walked?

Questions to consider:

1. In which scenario was the displacement equal to the distance? How was this scenario different than the others?

2. The distances traveled were the same in scenarios 1 and 2, but the displacements were not. Explain.

3. Scenario 5 is an example of two-dimensional motion.

   a. Was the displacement equal to the sum of the distances in both directions?

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Questions to consider:

3. Scenario 5 is an example of two-dimensional motion.

   b. Calculate what the displacement should have been.

   c. Was the actual displacement similar to your answer in part b?

4. Based on your findings, can the displacement ever be larger than the distance traveled?