**Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Lab Partners Names \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**![C:\Users\Jenny\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\UC0PGVJE\MCj03641580000[1].wmf]()![C:\Users\Jenny\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\UC0PGVJE\MCj03641580000[1].wmf]()Distance and Displacement Lab**

**Problem:** How will the distance traveled from a reference point affect its displacement distance?

**Background:** Motion is a change in position. So an item moves if it changes position. To be able to say that something changed position, the initial position must be marked. This initial position is a reference point. Movement occurs when an item starts at the reference point and changes to a new position. Everyday changes in position are measured with distance. Distance is only a measurement of length. An item that moves has both distance and direction. Scientists measure changes in position with displacement (displacement is the overall distance with direction). Some objects can have a distance of 50 meters but a displacement of 0 meters. This lab will show you how they differ.

**Hypothesis:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Materials:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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*Follow the instruction below to fill out the data tables as you walk three different paths and measure the distance and displacements.*

**Procedure (Data will be recorded in Procedure):**

**Path #1**

1. Place a piece of tape where you will begin your walk. This tape marks the ***“starting point”.***
2. Walk 10 steps forward and stop (forward is whatever direction you choose!). **This is distance #1.** Using the meter stick, have your partner measure distance #1. Write that distance in the table below. (Don’t forget your units!)
3. Now turn around (180°) and walk 5 steps and stop. **This is distance #2.** Using the meter stick, have your partner measure distance #2. Write that distance in the table below.
4. Now turn around again (180°) and walk 15 steps and stop. **This is distance #3.** Using the meter stick, have your partner measure distance #3. Write that distance in the table below.
5. Finally, have your partner measure how far you are from the *starting point*. **This is your measured displacement.** Write that displacement in the table below.
6. Find your **calculated displacement** by adding distance #1 and #3. Then subtract distance #2. Write that displacement in the table below.

|  |  |
| --- | --- |
| **Measured Distances (m)** | **Measured Displacement (m)** |
| Distance #1 |  | Total Displacement for Path #1 |  |
| Distance #2 |  | **Calculated Displacement (m)** |
| Distance #3 |  | Calc. Displacement for Path #1 |  |
| Total Distance for Path #1 |  |  |

**Path #2**

1. Find your piece of tape again, and walk 5 steps forward and measure how far you walked. This is **distance #1**. Record below.
2. Turn 90° left, walk 10 steps and measure how far you walked. This is **distance #2.** Record below.
3. Turn 90° left, walk 5 steps and measure how far you walked. This is **distance #3**. Record below.
4. Turn 90° left, walk 15 steps and measure how far you walked. This is **distance #4.** Record below.
5. Have your partner measure how far you are form the *starting point*. This is your **measured** **displacement**. Record below.
6. Find your **calculated displacement**. If you walked correctly, you should’ve walked in a square, then walked 5 steps past your *starting point.* To find **calculated displacement** subtract distance #2 from distance #4. Record below

|  |  |
| --- | --- |
| **Measured Distances (m)** | **Measured Displacement (m)** |
| Distance #1 |  | Total Displacement for Path #2 |  |
| Distance #2 |  | **Calculated Displacement (m)** |
| Distance #3 |  | Calc. Displacement for Path #2 |  |
| Distance #4 |  |  |
| Total Distance for Path #2 |  |

**Path #3**

1. Find your piece of tape again, and walk 6 steps forward. This is **distance #1.** Record below.
2. Turn 90° right and walk 8 steps. This is **distance #2.** Record below.
3. Have your partner measure how far you are from the *starting point.*  This is **measured displacement.** Record below.
4. Find your **calculated displacement**. To find calculated displacement we’re going to do some simple trigonometry (by using the Pythagorean Therom).

|  |  |
| --- | --- |
| **Measured Distances (m)** | **Measured Displacement (m)** |
| Distance #1 |  | Total Displacement for Path #3 |  |
| Distance #2 |  | **Calculated Displacement (m)** |
| Total Distance for Path #1 |  | Calc. Displacement for Path #3 |  |

1. On the grid below map out and diagram **path #3** and indicate displacement with an **arrow**. Create a key on the side to show me your scale. (example 1 meter = 1 square)



**Analysis and Critical Thinking (answer on the back of this sheet):**

1. In each path you took did the order of the walker’s steps or direction affect the distance or displacement? Explain.

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1. Did you notice a trend in the total distance of each trial compared to the displacement of each trial? Explain.

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1. Explain the difference between distance and displacement in your OWN words.

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1. What is the difference between scalar and vector?

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1. If you found a treasure map, would you want it to have **scalar** or **vector** directions? Circle one and explain why.

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1. Sam’s mom says: “We’re about to eat dinner! Don’t go more than a few blocks from home!” Is Sam’s mom more worried about Sam’s **distance** or his **displacement**? Circle one and explain why you picked it.

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