PHYSICS IN MOTION
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Unit 2A
Distance and Displacement
As The Crow Flies Lab

Name:

Date:

As Sam drove home from baseball practice, he began to wonder just how far he lived from the field. It typically took him 45 minutes to make it home. His mind began to tick, and Sam determined that the distance he drove along roads from the baseball field to his driveway was not representative of the actual distance between the two locations. What did his grandfather used to say? It was something about "as the crow flies" and displacement. He would have to look it up, or maybe even call his grandfather.

How could Sam determine the distance he drove and the true displacement between the two locations? Be sure to explain fully, as well as solve mathematically.

Essential Question:

- **What information do you need in order to determine the total distance Sam drives versus the actual displacement between his starting and ending points?**

Vocabulary:

- **vectors, direction, displacement, distance**

Requirements:

- **Diagram your directions on graph paper using a ruler and a protractor. Estimate the displacement from the initial to final positions by measuring the distance on your graph with a ruler.**
- **Explain your directions mathematically, using a component chart.**

Level One

Directions 1:

- 4 km due east
- 3 km due south
- 10 km due west
- 5 km due north
- 4 km due west
- 2 km due north

Directions 2:

- 7 km due west
- 2 km due north
- 10 km due east
- 6 km due south
- 7 km due east
- 12 km due north

Level Two

Directions 3:

- 8 km due west
- 4 km 30° south of west
- 5 km due south
- 10 km 45° north of west
- 9 km due south
- 4 km 60° south of west

Directions 4:

- 15 km due south
- 5 km 45° south of west
- 6 km due west
- 10 km 30° north of west
- 12 km due north
- 6 km 45° north of east

questions continued on next page

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Level Three

Directions 5:

- 4 km due south
- 7 km due east
- 5 km 30° south of east
- 12 km 45° south of east
- 9 km due east
- 5 km 60° north of east

Directions 6:

- 10 km 30° south of west
- 12 km due east
- 8 km 45° south of east
- 2 km 60° north of west
- 11 km due north
- 5 km due west

Questions to consider:

1. How does total distance traveled compare to displacement?

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2. How would an object need to move in order for total distance traveled and displacement to be equal?

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