Name _____ Date _____ Class _____

Enrich

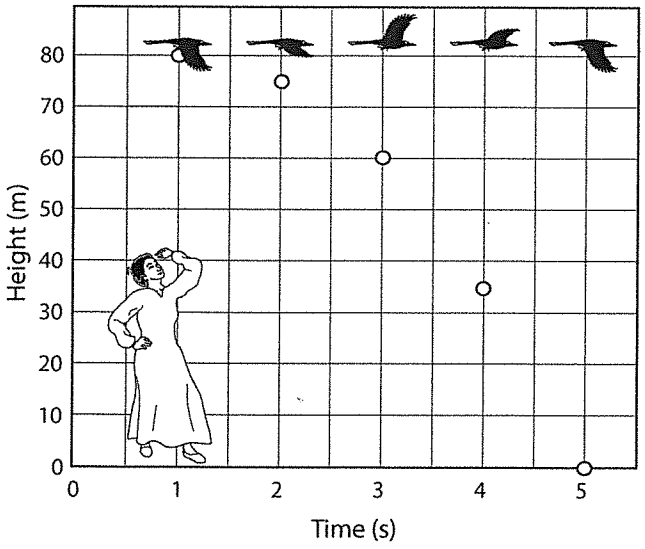
Describing Motion

Read the passage and study the diagram below. Then use a separate sheet of paper to answer the questions that follow.

Exploring Reference Points

Depending on the reference point you choose, the same object can seem to be moving or standing still. Furthermore, even if an object seems to be moving from two different reference points, observers at those points might disagree about its speed and direction.

Here is a simple example: In the diagram below. A crow is flying along at a constant speed, carrying a ball. Suddenly, the crow accidentally drops the ball and watches it fall. The diagram shows the position of the crow and the ball at five points in time, one second apart. A person standing still on the ground also watches the ball fall.



1. From the reference point of the crow, in what direction is the ball falling? Does it appear to follow a curved or straight path? Explain.
2. How many seconds does it take the ball to fall to the ground?
3. The sides of the grid squares in the diagram are 10 meters long. Using this, calculate the average speed of the ball during its fall from the point of view of the crow. About how fast was it traveling during the last second of its fall from this perspective?
4. From the reference point of the person on the ground, does the ball appear to fall in a straight or curved angle?

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Name _____ Date _____ Class _____

Enrich

Speed and Velocity

There are many ways to describe motion. You can write a description of the motion, like the steps shown below. You can make a map to show the path of the motion. And you can make a graph to show how the motion changes over time. Read the description of a walk to a friend's house and complete the activity that follows.

Describing Motion

- Point A to Point B: Walk 200 m north for 3 minutes.
- Point B: Stop to pet a neighbor's dog for 1 minute.
- Point B to Point C: Walk fast to make up for the time you spent with the dog. Walk 100 m east for 1 minute.
- Point C to Point D: Jog 150 m northeast across the park for 1 minute.
- Point D to Point E: Walk east 200 meters for 1 minute.
- Point E: Stop to tie your shoe for 30 seconds.
- Point E to Point F: Walk north 100 m for 30 seconds and meet your friend, who is waiting for you.

1. What is the total distance you traveled?
2. What is the total time you traveled?
3. What is the average speed for your walk?
4. On a sheet of graph paper, make a map of the route that you followed. Label all points and directions. Make sure that all distances are shown to the same scale.
5. On your map, connect Point A to Point F with a straight line. What does this line represent, and how does this distance compare to the distance you walked?
6. Make a graph to show your motion. Show time on the *x*-axis and distance on the *y*-axis.

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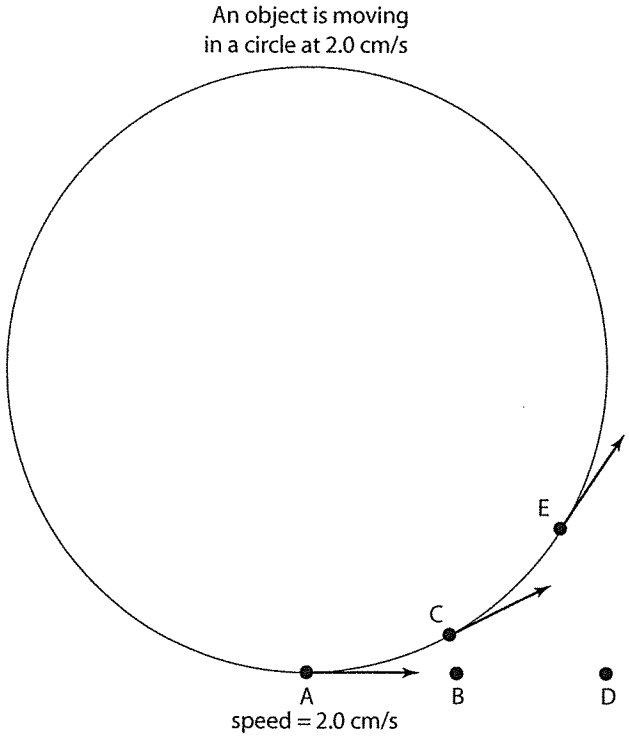
Acceleration

Read the passage and examine the figure. Then use a separate sheet of paper to answer the questions that follow.

Exploring Changing Directions

When an object speeds up or slows down, it is easy to understand that it has accelerated. But when an object moves at a constant speed and changes direction, it is harder to understand why this is also called an acceleration. Look at the figure below. Suppose an object is moving in a circle at a constant speed of 2.0 cm/s. When the object is at point A, it is moving to the right and if it continued to go in a straight line, it would move to point B. Instead, it moves along the circle to point C.



1. Measure the distance in centimeters from point A to point B. How far is it?
2. Measure the distance along the circle in centimeters from point A to point C. How far is it?
3. How far is the object from where it would have been if it had not been accelerated? (How far is it from B to C?)
4. Suppose the object at point A were moving at 4.0 cm/s. If it were not accelerated, where would it be after 1.0 second?
5. If the object moved along the circle at 4.0 cm/s, where would it be after 1.0 second?
6. Measure the distance in centimeters between the two points you indentify in Questions 4 and 5. How does this compare to the distance you measured in Question 3?
7. Suppose the circle has a circumference of 25.1 cm. Compare where the object would have been if it had gone in a straight line at 4.0 cm/s for 6.28 s (no acceleration) to where it is after it has gone around the circle for 6.28 s at 4.0 cm/s.