Name: _____   Date: _____

Student Exploration: Distance-Time Graphs

Procedure:

1. Launch Internet Explorer
2. Go to www.explorelearning.com
3. Click on Login.
4. Enter the Username: orange1011 Password: black1011
5. Search for Distance-Time Graphs
6. Click on the 4th Gizmo on the list called ***Distance-Time Graphs***.
7. Be patient for it to load.

Vocabulary: speed, *y*-intercept

Prior Knowledge Questions (Do these BEFORE using the Gizmo.)
Max ran 50 meters in 10 seconds. Molly ran 30 meters in 5 seconds.

1. Who ran farther, Max or Molly? _____

2. Who ran faster? _____ Explain: _____

    _____

Gizmo Warm-up
The *Distance-Time Graphs* Gizmo™ shows a graph and a runner on a track. You can control the motion of the runner by manipulating the graph (drag the red dots).

Check that **Number of points** is 2, and that under **Runner 1** both **Show graph** and **Show animation** are turned on.

The graph should look like the one shown to the right – one point at (0, 0) and the other point at (4, 40).

1. Click the green **Start** button on the stopwatch.

   What happens? _____

    _____
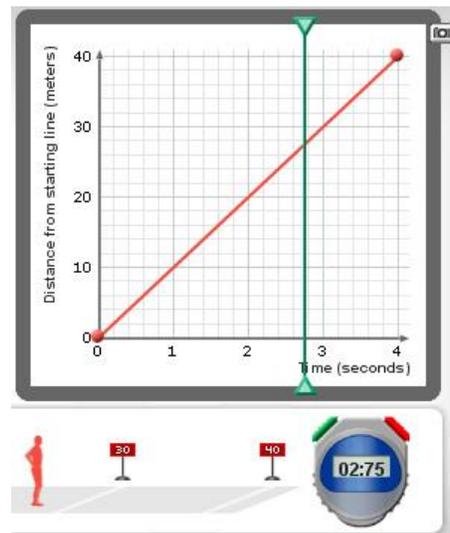
2. Click the red **Reset** button on the stopwatch. The vertical green **probe** on the graph allows you to see a snapshot of the runner at any point in time. Drag it back and forth. As you do, watch the runner and the stopwatch.

   A. What was the position of the runner at 1 second? _____

   B. What are the coordinates of the point on the graph that tells you this? _____

   C. When was the runner on the 30-meter line? _____

   D. What are the coordinates of the point on the graph that tells you this? _____

Activity A: Runner position	Get the Gizmo ready: • Click the red **Reset** button on the stopwatch. • Be sure the **Number of Points** is 2.	

In the Gizmo, run the "race" many times with a variety of different graphs. (The red points on the graph can be dragged vertically.) Pay attention to what the graph tells you about the runner.

1. If a distance-time graph contains the point (4, 15), what does that tell you about the runner?

   (Be specific, and answer in a complete sentence.) _____

   _____

2. Look at the graph to the right. Notice where the green probe is. If you could see the runner and the stopwatch at this moment, what would you see?

   _____

   _____

   _____
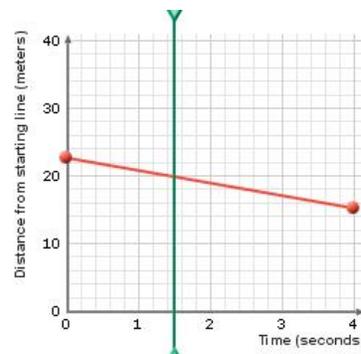
3. Look at the image below, from the Gizmo. What must be true about this runner's graph?

   _____

   _____

4. The point on the graph that lies on the *y*-axis (vertical axis) is called the **y-intercept**. What does the *y*-intercept tell you about the runner?

_____

5. In the Gizmo, set the **Number of Points** to 3. Then create a graph of a runner who starts at the 20-meter line, runs to the 40-meter line, and finishes at the 30-meter line.

    A. Sketch your graph to the right.

    B. What is the *y*-intercept of your graph? _____
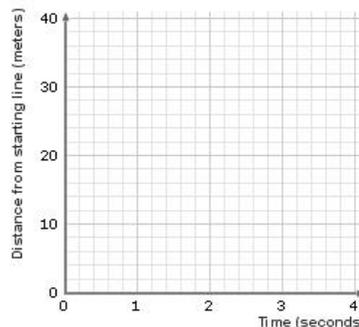
Activity B: **Runner direction and speed**	Get the Gizmo ready: • Click the red **Reset** button on the stopwatch.	

Run the Gizmo several times with different types of graphs. (Remember, the red points on the graph can be dragged vertically.) Pay attention to the speed and direction of the runner.
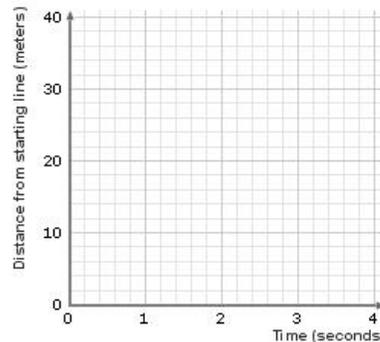
1. Create a graph of a runner that is running forward (from left to right) in the Gizmo. Sketch your graph to the right.

   If the runner is moving from left to right in the Gizmo, how does the graph always look?

   _____

   _____
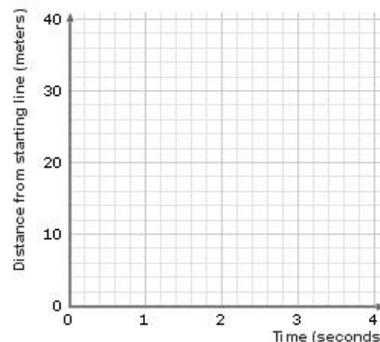
2. Click the red **Reset** button. Create a graph of a runner that is running from right to left. Sketch it to the right.

   How does the graph always look if the runner is moving from right to left in the Gizmo?

   _____

   _____

3. Change the **Number of Points** to 5. Create a graph of a runner that runs left-to-right for one second, rests for two seconds, and then continues running in the same direction. Sketch the graph to the right.

How does a graph show a runner at rest? _____

_____
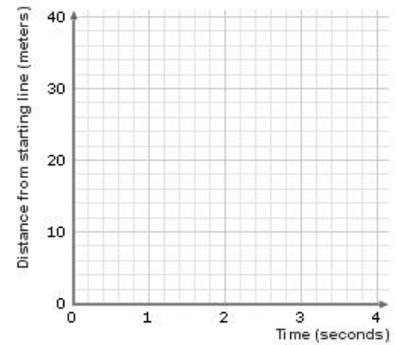
4. In general, how does a distance-time graph show you which direction the runner is moving?

_____

_____

_____

5. With **Number of Points** set to 3, create the graph shown at right. Your graph should include (0, 0), (2, 10), and (4, 40).

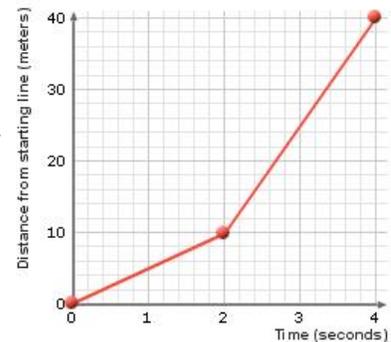   A. Where does the runner start? _____

   B. Where will he be after 2 seconds? _____

   C. Where will he be after 4 seconds? _____

   D. In which time interval do you think the runner will be moving most quickly? (Circle your answer below.)

      0 to 2 seconds   2 to 4 seconds

6. Click the **Start** button and watch the animation. What about the runner changed after 2

seconds of running? _____

_____

7. **Speed** is a measure of how fast something is moving. To calculate speed, divide the distance by the time. In the Gizmo, the units of speed are meters per second (m/s).

   A. In the first 2 seconds, how far did the runner go? _____

   B. In this time interval, how far did the runner go each second? _____

   C. In this time interval, what was the runner's speed? _____

8. Now look at the last two seconds represented on the graph.

    A. In the last 2 seconds, how far did the runner go? _____

    B. In this time interval, how far did the runner go each second? _____

    C. In this time interval, what was the runner's speed? _____

9. Click the **Reset** button. Experiment with a variety of graphs, focusing on the speed of the runner. In general, how can you estimate the speed of the runner by looking at a graph?

_____

_____

_____