

**Lesson Title:** Fence Painting

**Date:** \_\_\_\_\_

**Subject:** Algebra—slope

**Topic:** Rate of Work

**Grade:** 8 and 9

**Designer:** Eli Shaheen

**Stage 1 - Desired Results**

**Lesson Overview**

In this lesson, students will investigate work problems and the effect of a worker’s rate on job completion.

**Standards Addressed**

- Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. ([Common Core Math 8.F.1.](#))
- Compare properties of two functions each represented in a different way—algebraically, graphically, numerically in tables, or by verbal descriptions. ([Common Core Math 8.F.2](#))
- Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. ([Common Core Math 8.F.4](#))
- Describe qualitatively the functional relationship between two quantities by analyzing a graph Sketch a graph that exhibits the qualitative features of a function that has been described verbally. ([Common Core Math 8.F.5](#) and [F-IF.4](#))

<p><b>Enduring Understanding:</b> The slope of a line is equivalent to the rate of work/change. A linear function graph is a conventional way to represent rate of work.</p>	<p><b>Essential Question(s):</b> How is slope of a linear function related to rate of change?</p>
<p><b>Students will need to know:</b></p> <ul style="list-style-type: none"> <li>• <b>Key terms:</b> distance, time, coordinate, point, origin, axes, slope, rate of change, steepness.</li> <li>• Units of measure for distance, time and rate of change.</li> </ul>	<p><b>Students will be able to:</b></p> <ul style="list-style-type: none"> <li>• Describe the graph of the rate of work.</li> <li>• Determine the slope of a straight line.</li> <li>• Determine the rate of work from its relationship to slope.</li> <li>• Determine which graph represents the faster rate of work.</li> </ul>

**Stage 2 - Assessment Evidence**

<p><b>Performance Tasks</b> In this activity, students:</p> <ul style="list-style-type: none"> <li>• Plot points, calculate slope, determine rate of change and qualitatively judge faster and slower rates.</li> </ul>	<p><b>Other Evidence:</b></p> <ul style="list-style-type: none"> <li>• <i>Fence Painting</i> Check-In</li> <li>• (other assessments TBD by teacher)</li> </ul>
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**Stage 3 - Learning Plan**

<p><b>Lesson Procedure</b></p> <p><b>Many days before:</b></p> <ul style="list-style-type: none"> <li>• Discuss work problems in Algebra</li> <li>• Discuss meaning of slope</li> </ul> <p><b>Day of:</b></p> <ul style="list-style-type: none"> <li>• Set up groups, computers</li> <li>• Introduce lesson (method tbd by teacher).</li> <li>• Have students complete <i>Fence Painting</i>.</li> <li>• Conclude lesson (method tbd by teacher).</li> </ul>	<p><b>Required Materials:</b></p> <ul style="list-style-type: none"> <li>• Samples of work problems</li> <li>• Computers</li> <li>• Supported Internet browser with access to SmartGraphs portal</li> <li>• Projection device (LCD, SmartBoard, or large monitor) preferred but not required</li> <li>• Calculators</li> </ul>
<p><b>Possible Discussion Questions for Students:</b></p>	<p><b>Sample Answers to Discussion Questions</b></p>
<p>When more people are added to a work crew, what happens to the time it takes to complete the job?</p>	<p>The time decreases—the job is completed faster.</p>
<p>What does the slope of a line tell us?</p>	<p>The rate of change of one variable in relation to another.</p>
<p>Why is time represented on the x (horizontal) axis and position represented on the y (vertical) axis?</p>	<p>Time is the independent variable, which is usually represented on the x-axis; position is the dependent variable, usually represented on the y-axis.</p>
<p>What units of measure can you use to measure:</p> <p>a. Time?</p> <p>b. Work done?</p>	<p>a. Time units: seconds, minutes, hours, days...</p> <p>b. Amount of job done such as length of fence painted</p>
<p>How is a period of inactivity represented on a straight line graph?</p>	<p>By a flat section somewhere in the graph.</p>
<p>How is stopping represented on a position-time graph?</p>	<p>When you stop, your position does not change with time. A horizontal line results.</p>
<p>How is slow, steady motion away from the sensor represented on a position-time graph?</p>	<p>Slow, steady progress results in a gently sloped straight line tilted up to the right in Quadrant I.</p>
<p>How is fast, steady motion away from the sensor represented on a position-time graph?</p>	<p>Fast, steady progress results in a steep straight line tilted up to the right in Quadrant I.</p>
<p>How can you tell how much time elapsed as you moved from one position to another?</p>	<p>Look at the time data associated with each position. Find the difference of the two times.</p>
<p>How can you tell how far you moved within a certain time interval?</p>	<p>Look at the position data associated with each time. Find the difference of the two positions.</p>
<p>What does the steepness of a straight position-time graph tell you about the motion?</p>	<p>The steepness tells you how fast the object moved. Lines with steeper slopes indicate faster motion</p>