

Growing Up

Subject: Science, math
Grade: 6-7
Time: 30 minutes

Topic: Rates of change
Designer: Sara Remsen

Stage 1 – Desired Results

Lesson Overview: The goal of this activity is to help students understand how the shape or slope of a line can offer clues about the meaning of real-world data. Students are asked to calculate the rate of growth and to identify places on a graph where a child, Tom, is growing fastest or slowest. They are also asked make inferences and comparisons of the shape of different data sets.

Standards Addressed:

[CCSS.Math.Content.6.RP.A.3](#) Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

[CCSS.Math.Content.6.EE.C.9](#) Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.

[CCSS.Math.Content.7.RP.A.2](#) Recognize and represent proportional relationships between quantities.

[MS-LS1-8](#) Crosscutting Concepts: Cause and effect relationships may be used to predict phenomena in natural systems.

Students will be able to:

- Read a graph of real-world data and make inferences
- Identify different rates of change by observing the graph
- Distinguish between two data sets and their different rates of change

Essential Questions:

- How does the rate of growth change over time?
- How can you compare rates between two different sets of data?

Stage 2 – Lesson Plan

Lesson preparation

- Students should be familiar with plotting points on a graph and with ordered pairs, e.g. (0,0)
 - Students should be able to read and understand graph labels and scales
 - Students should understand the concept of an average
 - Students should be familiar with inches and centimeters and with converting between them
 - Students may or may not have an understanding of slope, but they should understand the concept of rate
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Procedure

1. Students will use computers/tablets and calculators for this activity (20-30 minutes)
 2. Students will be asked to convert a height of 6'8" to cm and to apply a given growth rate to project when that height will be attained. They need calculators and perhaps scrap paper.
 3. As an introduction, you can collect heights from each student. You can then take the average of this height to demonstrate how averages are calculated and to make the connection between averages and individual measurements. (You can also compare the class data to graphs of U.S. averages provided at the end of the activity).
 4. This activity can be followed up with a discussion about rates of change. You can provide them with more data and ask them to graph it, or you can ask them to choose between several graphs that each have different rates of change. You can have students mark the highest and lowest rates of change for both graphs given at the end of the activity.
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Further discussion questions

1. **How did you know *when* Tom was growing fast or growing slowly?**
Students should notice that the line was steeper (higher slope) when he was growing fast, but less steep when he was growing slowly. This is an opportunity to introduce slope if you haven't already.
2. **How did you solve the rate of change problem that asked how long it would take Tom to grow to 6'8"?**
There will be a range of answers, ranging from algebraic equations, to arithmetic, to extending the straight line shown on the graph. You should make sure that students understand that Tom's growth rate does NOT stay constant throughout childhood, which is one reason why Tom will probably not grow to LeBron James' height (his growth rate will get smaller and finally he will stop growing).
3. **What do you notice about heights and rates of growth in this classroom?**
Students may point out that boys and girls have different rates of growth. Girls tend to get taller earlier, but on average don't grow quite as tall as boys. Boys continue to grow into their late teens. Depending on the ages in your classroom, you may see a range of heights. You can compare each student to the average height for their age and see where they line up. Ensure that everyone can participate; you can find an additional height/age chart for girls here: http://www.who.int/growthref/cht_hfa_girls_perc_5_19years.pdf and boys here: http://www.who.int/growthref/cht_hfa_boys_perc_5_19years.pdf.

Resource Graphs

