**Equivalent Graphs Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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| **Subject:** Science, math **Topic:** Reading Graphs**Grade:** 6-8 **Designer:** Sara Remsen**Time**: 30 minutes |
| **Stage 1 – Desired Results** |
| **Lesson Overview**: The goal of this activity is to help students learn how to interpret graphs. We start with graphs with numerical data on both axes but no units on either. Some graphs have similar datasets while others have different datasets and students must distinguish between the two. Some graphs can look different but represent the same datasets while other graphs look alike and represent different datasets. Note that the graphs (except on page 8) do not have measurement units, like miles or seconds, on the axes; the variables are referred to as x and y. This forces the student to attend to the mathematical relationships described by the graphs, rather than relying on their prior knowledge of a real situation.**Standards Addressed**:

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| [CCSS.Math.Content.6.NS.C.8](http://www.corestandards.org/Math/Content/6/NS/C/8)  | Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate. |
| [CCSS.Math.Content.6.EE.C.9](http://www.corestandards.org/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](http://www.corestandards.org/Math/Content/7/RP/A/2)  | Recognize and represent proportional relationships between quantities. |

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| **Students will be able to**:* Read graph axes
* Match the same dataset with different axes
* Interpret graphs and data despite apparent differences
 | **Essential Questions**: * How does a graph’s appearance change based on the scale of the axes?
* How can you tell a dataset is the same as another dataset if they look different?
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| **Stage 2 – Lesson Plan** |
| **Lesson preparation** |
| * Students should be familiar with plotting points on a graph and with ordered pairs, i.e. (0,0).
* Students should be able to read graph axes and understand x and y variables
* Students should understand that scales on axes are arbitrary and can be changed at will
* No knowledge of slope is necessary

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| **Procedure** |
| 1. Students will use computers/tablets for this activity (20-30 minutes)
2. As an extension, you can print out the graphs on the last pages of this lesson plan (pp. 3-7) and give each student one or two of them. These graphs are similar but not identical to the graphs the students saw on the computer activity. You can continue the activity by having students see which of their graphs are the same as other students’ and which are different. The questions from the activity are also listed if you want them to answer by hand and turn them in. (10-20 minutes)

*Note: the graphs Random Data 1, 2, 6, and 7 are of the same data; the graphs Random Data 3, 4, 5, and 8 are of different data that are linear functions of the data for the first group, so the graphs look the same.*1. You can also give students some sample data and graph paper and instruct them to make the best graph to represent the data, using what they learned from the activity. They should have to think about their axes and how often they should have tick marks, etc.
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| **Further discussion questions** |
| 1. **Which graphs do you think are the easiest to read?**

Students should observe graphs where the data is centered and takes up most of the space are the easiest to read. It also helps if there are frequent tick marks at easy-to-read intervals (such as 5 and 10), but not so many tick marks that the data are obscured. 1. **Where did you get tripped up when you were trying to identify graphs?**

Students may say they ignored one axis by mistake or it was confusing because the data had the same shape. 1. **How did this activity change the way you look at graphs?**

Students should say that they won’t get distracted by the shape of the graph, but instead interpret them based on the actual data and the axes. 1. **How are equivalent graphs like an image on two different TV sets?**

If a TV is not calibrated correctly, the image can get distorted in the x or y direction even if it displays correctly on a different TV. This is very similar to how data can be distorted depending on the axes of the graph. |

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| **Resource Graphs and Questions** |

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_

1. What was the number of your graph?

2. Which graphs (by number) were equivalent to your graph?

3. How did you know?