Linear Word Problems **Date:_____**

Subject: Pre-Algebra, Algebra I, or Algebra II	**Topic:** Linear Word Problems
Grade: 7, 8, or 10	**Designer:** Jessica Ulcickas

Stage 1 – Desired Results

Lesson Overview: This activity walks students through various real world applications of graphing lines. The activity requires students to access prior knowledge of how to graph a line, as well as to use their close reading skills to identify the important pieces of information from a given word problem. The activity is intended for pre-algebra or algebra I students who are learning to graph lines for the first time, or algebra II students who are reviewing how to graph lines or need extra help with the subject. By the end of the activity, students will be able to write the equation of a line from a given word problem and analyze what a line tells them about a given real world situation.

Standards Addressed:

CCSS.Math.Content.HSA-CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

CCSS.Math.Content.HSA-REI.D.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

CCSS.Math.Content.8.F.B.4 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.

CCSS.Math.Content.8.F.B.5 Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Enduring Understanding:	**Essential Questions**:
Linear relationships are all around us in the world. Many situations where there are two variables present can be represented using a linear equation and a linear graph. Graphs of lines aren't simply mathematical, each number represents something specific about a given situation and the ability to read a given linear graph allows you to interpret a given relationship between two unknown variables.	What types of real world situations can be modeled using a linear equation? How can we read linear graphs in order to gain information about various real world situations? What do ordered pairs represent on a line when a line represents a real world situation?

Students will need to know: At this point, students are expected to understand how to graph ordered pairs, how to graph a line given in slope-intercept form, how to graph a line using x- and y-intercepts, how to re-arrange a linear equation so it is in slope-intercept form, and how to solve equations containing a single variable.	**Students will be able to**: • Identify the independent and dependent variables in a linear word problem. • Write the equation of a line given a linear word problem. • Analyze a real life situation using a linear equation and graph.
Stage 2 – Assessment Evidence	
Performance Tasks: In this activity: • Asking students to identify and define the independent and dependent variable in a given linear situation • Asking students to write the equation of a line from a given linear situation. • Asking students to graph a linear equation in various forms. • Asking students to analyze the meaning of a real life linear relationship by answering a series of questions about the graph of a given linear relationship.	**Other Evidence**: • To be decided by the teacher.
Stage 3 – Learning Plan	
Lesson Procedure: <u>Many Days Before</u>: Students will be introduced to the concept of a linear relationship between two variables. Students will learn about the concept of slope and how it relates to the linear relationship between two variables. Students will also learn how to graph lines in various forms including slope-intercept form, point-slope form, and standard form. <u>Day Of</u>: Students will go to the computer lab in order to complete this activity. For the duration of the activity, the teacher will monitor student progress to ensure that students complete the	Required Materials: • Computers for each student. • Pencil and paper for calculations if necessary.

activity properly and do not simply click to complete. The activity will not take all class period, so the remainder of the class period will be at the discretion of the classroom teacher.	
Possible Discussion Questions for Students: • In this activity you looked at multiple problems which represented a linear relationship of two variables that directly affect one another. Can you think of any other real life linear relationships we could have discussed? • Many of the graphs in this activity were limited to the first quadrant. Why was this? Which graph was not limited to the first quadrant and why? • Why do you think it is important to identify an independent variable and a dependent variable? Are there any situations where either variable could be the independent variable?	**Sample Answers to Discussion Questions**: • Answers may vary. It is likely that most students would come up with a monetary situation given that the example was based on money. For example, a student may say that a cell phone plan is a linear relationship because you pay a certain amount per minute on the phone. • Many real life situations don't include negatives numbers. The only graph that included negative numbers was a graph based on profit and it can be possible to have negative profit in a given situation. • It is important because it allows you to clearly see which variable has a direct effect on the other. An example where it wasn't necessary was the problem with the garden in this activity. The garden's length could act as either the independent variable or the dependent variable.