

ERIC AND ESTHER THE ELECTRICIANS H.O.T. LESSON

Grade Level and Course: 9th grade Algebra 1

Time Frame: Two periods or 94 minutes

Content Objectives:

- Given a word problem, students will be able to represent the mathematical data by either using a table, a graph, an algebraic equation, or any other appropriate method.
- Students will be able to graph and analyze functions rule using the TI-84.
- Students will be able to identify specific parts of a graph such as the y-axis, x-axis, and intersection.
- Students will be able to interpret what the intersection of the two lines means in reference to the context of the problem.

Language Objectives:

- Students must make sense of specific vocabulary words in order to complete the exercises: fixed fee, competitor, intersection, rates, and quadrant I.
- Students will continue to build an idea of what makes a good explanation by using a language frame: Esther is correct/incorrect because _____.
- Students will continue to work on writing complete mathematical explanations, using the Complete Math Solution Handout as a guide.

Higher Order Thinking:

- Students will develop explanations to justify their results for the Graphic Design Charges Prompt.
 - Key mathematics: students need to think *globally* about all possibilities and not just use 2 points to make a claim.
 - Students should be able to make sense of the idea that, even though the competitor starts lower, because his per hour rate is higher, the competitor is eventually more expensive.
- Students will be able to compare and contrast different ways to represent mathematical information (algebraic equation, graph, and table).
- Students must, in writing, interpret the meaning for the intersection of the two lines.
- Students will explain why we are only concerned with the data found in the first quadrant of the graph.

Materials:

- Eric and Esther the Electricians Prompt
- Eric the Electrician Task Cards
- TI-84
- Exit Slip
- Complete Math Solution Handout

Begin lesson: (~5 minutes) (Ralph and Linda)

- Introduce the activity to students. Write out an agenda so that students know what to expect for the two class periods. (Individual Work, Pair Work, TI-84, Worksheet, Exit Slip)

Individual Work: (~15 minutes) (Ralph, Linda, Ms. Yonamine)

- Hand out prompts to each student. Give students time to work individually. Let students know that the teacher cannot answer many questions and that they should just try on their own. Tell students to stay put and quiet so that others get the chance to work on the problem.
- Circulate to manage the classroom and encourage students to work on the prompt.
- At this time, pass out the TI-84s to students. They can leave these on the side.

Pair-Work: (~15 minutes) (Ralph, Linda, Ms. Yonamine)

- Pair students up before hand. Let students take turns explaining how they tried solving the prompt. When each person is done sharing, then each pair can work together in order to complete the prompt.
 - If both pairs already know how to solve the problem and did so using the same method, get students thinking about how to write a function rule for the data. These ideas can be shared with the whole class later.
 - If both pairs do not know how to start solving the problem, ask some follow up questions to get students started.
 - Talk about ways to represent mathematical information such as tables and graphs.
 - Remind them about what the problem doesn't tell us and what it does tell us. We know how much each person charges, but we don't know for how many hours.
- Circulate to manage the classroom and encourage students to work on the prompt and discuss methods with each other.

Whole-Class Discussion on Prompt: (~15 minutes)

- **(Linda)**
Let pairs share their work with the rest of the class. Let students come up to the board to write their different methods (tables, algebraic equations, graphs, etc). While students are writing on the board, have other students start thinking about how their method was similar and/or different to the methods shown on the board. Let students share their thoughts.
- **(Ralph)**
Using a table representing the data (it is assumed that at least one pair will have used this method), work with the class to come up with function rules for the table. If this was already on the board, then discuss how to get these function rules to help those students who did not know.
- **(Ralph)**
If no one made a graph, ask students what other methods they can use to represent math information. This will lead into the activity with the TI-84 and how you can use the calculator to graph a function rule.

TI-84 Activity: (~20 minutes) (Ralph)(Linda and Ms. Livermore can circulate to help students use the calculator)

- Pass out calculators to students (one for each student).
- Work with students to graph the function rules on the calculator.
- Guide students into exploring functions of the TI-84 such as graphing and tables. The discussion could include the following.
 - Mention the different quadrants so that students have access to answer the question on the worksheet.
 - What does the y-intersection represent?
 - What is the domain and the range?
 - Be sure not to tell students what the intersection of the two lines represents and why we are only concerned with data from Quadrant I as these are questions students are to answer in a worksheet following the activity.

Pair Work: (~10 minutes) (Ralph, Linda, and Ms. Livermore)

- After graphing the function rules on the calculator, students will work with their partners to answer questions getting at students reasoning about the prompt. (Encourage students to use the Complete Math Solutions Handout while writing their answers.)
- Question 1:
 - Possible follow-up questions:
 - At the point of intersection, how much do Esther and Eric both charge?
 - Looking at the graph, how do you know that Eric is eventually cheaper?
- Question 2:
 - Possible follow-up questions:
 - What does the graph in Quadrant III tell us about Eric and Esther's charges?

Closure: (~5 minutes) (Linda)

- Pass out Exit Slip to students. This Exit Slip is used to assess students individually on the prompt.