



Fig. 4

"The Flaring Function's" possible solution;
 $y = (-1/125)x + 4.4$
 $x \text{ scl} = 10, y \text{ scl} = 0.5$

**Pennsylvania Governor's Institute
for Mathematics Educators
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Names of Group Members:

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Topic/Theme: Exploring Linear Data

Level: 7-12

Time Element: 3-5 days

NCTM Standards Addressed:

- Select and use appropriate statistical methods to analyze data
- Use mathematical models to represent and understand quantitative relationships

PA Math Standards Addressed:

- 2.4 Mathematical Reasoning And Connections
- 2.5 Mathematical Problem Solving And Communication
- 2.6 Statistics And Data Analysis
- 2.7 Probability And Predictions
- 2.8 Algebra And Functions
- 2.11 Concepts Of Calculus

Math Assessment Anchors Addressed:

- M11.D.1 Demonstrate an understanding of patterns, relations and functions.
- M11.D.2 Represent and/or analyze mathematical situations using numbers, symbols, words, tables and/or graphs.
- M11.D.3 Analyze change in various contexts.
- M11.D.4 Describe or use models to represent quantitative relationships.
- M11.E.1 Formulate or answer questions that can be addressed with data and/or organize, display, interpret or analyze data.
- M11.E.2 Select and/or use appropriate statistical methods to analyze data.
- M11.E.4 Develop and/or evaluate inferences and predictions or draw conclusions based on data or data displays.

Reading Assessment Anchors Addressed:

- R11.A.2 Demonstrate the ability to understand and interpret nonfiction text, including informational, e.g., textbooks, print media (magazines, brochures, etc.), editorials, public documents; autobiography; biography; and essay appropriate to grade level.

Objectives:

- To construct scatter plots of two-variable data
- To interpret individual data points and make conclusions about trends in data, especially linear relationships
- To estimate and write equations of lines of best fit

Instructional Strategies and Plan (include strategies used to help different types of learners, i.e. auditory, visual, etc.):

1. Review concepts and pre-teach vocabulary (Knowledge Rating Chart with Cue Cards & Oil Changes and Engine Repair - Activity 1).
2. Model the procedure for data analysis (Activity 1).
3. Guided practice of modeled procedures in groups (Bike Weights and Jump Heights – Activity 2).
4. Predict outcomes based on current data.

Materials/Resources:

Activity Sheet 1 - Oil Changes and Engine Repair

Activity Sheet 2 - Bike Weights and Jump Heights

(Activity sheets 1-2 from <http://illuminations.nctm.org/lessonplans/9-12/lineardata/index.html>)

Activity Sheet 3 - Attendance at a Concert

Answers (for the teacher)

Calculators for each student - TI-83

View-screen for TI-83

Overhead copies of activity sheets 1-3

Transparency pens

Interdisciplinary Connections:

- **Reading**
Self analysis of vocabulary used in problem activities and identification of main ideas of problem activities.
- **Technology**
Create scatter plots on TI-83 and determine prediction line.
Alternatively, use Geometer's Sketchpad to do the same.
- **Other**
Auto Theory
Use data from automobile industry to assess engine performance.

Assessment Strategies:

- **Formative Evaluation (checking student understanding during the lesson):**
Teacher will observe and question students as they plot and analyze the data from Activities 1 & 2.
- **Summative Evaluation (how will it be determined that the objectives were achieved?):**
Student will complete Activity 3 requirements on their own.
Teacher will evaluate student work on final project.

Correctives/Remediation:

- Have students measure their height and the height of their waist from the floor. Plot the data and analyze the linear relation.

Extensions/Enrichment:

- Have students write a computer program that generates data to roughly fit a line, say $y = 2x + 1$, by randomly generating y -values between $2x$ and $2x + 2$ for each integer between 1 and 10 inclusive. The result will help them understand the concept of a "best fit" line for real data.
- Have students use data analysis software to create a median-fit line for their own set of data. Analyze this line in terms of slope and intercept. Discuss how well the line "fits" the data.

(NCTM suggestions from <http://illuminations.nctm.org/lessonplans/9-12/lineardata/index.html>)

Special Accommodations (special needs students)

- **Description of the Special Needs Student Selected:**

Case 1:

Margaret is functioning three years below grade level. She is receiving learning support services for language arts and math and has difficulty following direction in all instructional areas. Margaret has difficulties in language comprehension, vocabulary, direction following, event-sequencing and working memory. She can answer literal comprehension questions in all content areas and usually answers 1 out of 5 inferential questions correctly. She tends to jump into reading tasks without previewing material but has success when instructions are broken down and accompanied by modeling. She has difficulty with basic math facts for multiplication and division as well as problems involving multiple steps.

- **Accommodations to Use with this Student:**

1. Pre-teach vocabulary that is found in these activities by using a. "Knowledge Rating Chart" as homework (rather than in-class work) and b. "Cue Card" review of key words found in lesson activities.
2. Use close proximity to assist Margaret in focusing on directions.
3. Remind Margaret to read and re-read problem activities slowly.

4. Present activities in parts by question number.
5. Read instructions as you write them. Use modeling to show how the instructions should be carried out (Activity 1 of lesson).
6. Allow student to work in cooperative group (Activity 2 of lesson).
7. Provide the student with worksheets that are uncluttered and give the student room for answers (see #4).
8. Speak slower and avoid giving directions or speaking when not directly facing the class
9. Provide structure within the group by stating the goal, objectives and tasks, and listing the necessary steps to accomplish this goal