Algebra I Clarifying Lessons: Linear Functions

OLD Resources. These resources have NOT yet been updated to align with the revised secondary mathematics TEKS. These revised TEKS were adopted by the Texas State Board of Education in 2005, with full implementation scheduled for 2006–07. These resources align with the original TEKS that were adopted in 1998 and should be used as a starting point only.

What is a Clarifying Lesson?

A model lesson teachers can implement in their classroom. Clarifying Lessons combine multiple TEKS statements and may use several Clarifying Activities in one lesson. Clarifying Lessons help to answer the question "What does a complete lesson look like that addresses a set of related TEKS statements, and how can these TEKS statements be connected to other parts of the TEKS?"

TEKS Addressed in This Lesson

Foundations for functions: b.1.A, B, C, D, E; b.2.B

Linear functions: c.1.B, C; c.2.A, B, D, E, F

Materials

- Graphing calculator
- Student Worksheet A and Worksheet B

Lesson Overview

Students use functions to analyze the rates of a car-rental agency.

Mathematics Overview

Students use data sets to analyze functional situations in which one quantity (the dependent quantity) depends upon another (the independent quantity), describe the functions in a variety of ways, and interpret and make inferences from the functional relationships. In their analysis, students identify appropriate domains and ranges, translate between different forms of representation, and explore the effects of changes in the slopes and y-intercepts of linear functions.

Set-up (to set the stage and motivate the students to participate)

1. Work through Worksheet A with students, discussing the role of the slope and y-intercept in each problem.

2. Then, have students work through Worksheet B individually or together in small groups.

Teacher Notes (to personalize the lesson for your classroom)

Guiding Questions (to engage students in mathematical thinking during the lesson)

- How can you distinguish between the independent quantity and the dependent quantity? (b.1.A) (Miles driven is the independent quantity because that is the one you have direct control over; cost is the dependent quantity because the cost is dependent upon the miles you drive.)

- How do you know the relationship shown in the data is a function? (b.1.B) (Because there is exactly one cost associated with each of the numbers of miles driven.)

- What makes you think this might be a linear function? (c.1.A, C) (The graph appears to be a line; there is a constant change in cost for each change of 1 mile driven.)

- What information do you need to determine the function that describes the relationship between miles driven and cost? (b.1.C, c.1.C) (For example, slope and y-intercept)

- How does the graph you sketched from the data compare to the graph that the graphing calculator created from the function you entered? (b.1.C, c.1.C)

Teacher Notes (to personalize the lesson for your classroom)

Summary Questions (to direct students' attention to the key mathematics in the lesson)

- How did you complete the data chart? (b.1.B, D) (using information from the problem and the example in the chart)

- How did you determine a reasonable domain and range for the function? (b.2.B, c.1.B) (using information from the situation, e.g. you cannot have a negative number of miles, so $x \geq 0$.)

- How did you determine the slope of the linear function? (c.2.A) (m = 0.2, because an increase in 1 mile driven causes an increase in cost of $0.20.)

- How did you determine the y-intercept of the linear function? (c.2.B, E) (The y-intercept is (0,25) because you are charged $25 before you ever drive any miles.)

- How did you use the slope and y-intercept to find the linear function that describes the set of data? (c.2.D) (y = mx + b)

- How did the graph you made on the graphing calculator using this linear function compare to the graph you sketched from the data? (c.2.E) (For example, the slopes are the same, the y-intercepts are the same, the data points from the chart are all on the graph, etc.)

- How did changing the base rate charged by the agency affect the linear function? (c.2.F) (The y-intercept changed.)

- How did changing the rate per mile charged by the agency affect the linear function? (c.2.F) (The slope changed.)

Teacher Notes (to personalize the lesson for your classroom)

Assessment Task(s) (to identify the mathematics students have learned in the lesson)

Worksheet B may be used as an evaluation.

Teacher Notes (to personalize the lesson for your classroom)

Extension(s) (to lead students to connect the mathematics learned to other situations, both within and outside the classroom)

Have students draw on butcher paper the graphs they created on Worksheet B and present them to the class for discussion.

Teacher Notes (to personalize the lesson for your classroom)