

Math Grade 8: Unit 6

Linear Models and Tables

Parent Guide

Learning Targets: I can...

- Write an equation/function that matches a linear graph.
- Determine the rate of change (slope) and the initial value (y-intercept) of a linear relationship from either a graph or table.
- Verbally describe the relationship between two variables given the graph, or draw the graph given a verbal description of the function.
- Construct scatter plots of data and analyze the points on the plots for patterns that may indicate a relationship between the variables.

Important Understandings and Concepts

Linear functions occur all the time in real life. For example, a skating rink may charge a \$5 admission fee and then \$2 per hour to skate. The table to the right shows this function where x represents the hours spent skating (the independent variable) and y represents the money charged (the dependent variable). The constant rate of change of \$2 per hour can be seen in the constant difference of the y values. This function can be written as $y = mx + b$ where m is the rate of change (\$2) and b is the initial value of y when $x = 0$ which is also known as the y -intercept (5). So, the equation to find any cost for any number of hours at the skating rink is $y = 2x + 5$. We call this equation the mathematical "model" for this linear relationship.

x	y	First difference
0	5	
1	7	2
2	9	2
3	11	2
4	13	2

Vocabulary

bivariate data: Data that represents two different traits from the same population. For example, we may want to see if there is any relationship between curfew hours for teenagers and their grades

initial value: The value of y when $x = 0$. Also known as the y -intercept.

line of best fit: On a scatter plot, a straight line that best matches the relationship between the two variables.

model: To study data for relationships and patterns and write a mathematical equation that best describes what is happening in the data.

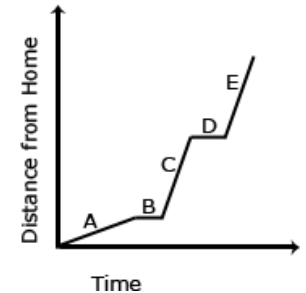
qualitative variable: A variable that is not numerical. Examples are gender, colors, types of birds, etc.

quantitative variable: A variable that is numerical. Examples are temperature, height, grades, etc.

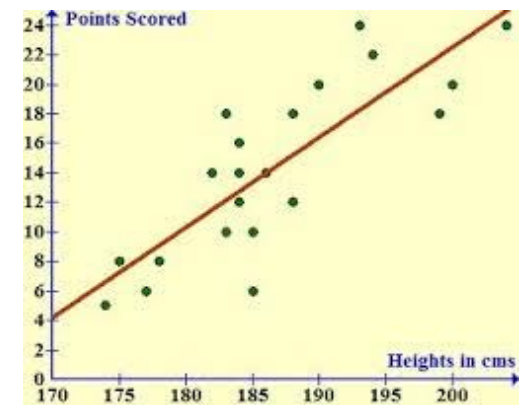
rate of change: The ratio of the change in the y -value to the change in the x -value. This ratio determines the "steepness" of a line, also known as the slope.

scatter plot: A graph of the points/ordered pairs on the coordinate plane that represent two variables in a data set. For example, we might collect data on how much weight a puppy gains each week over a set period of time.

All graphs have a story. The graph to the right shows a student's journey from home to school. The two variables are time and distance. What might have happened along the way? Following is a possible scenario for each segment. A – The student slowly walks to a friend's house to catch the bus. B – The student waits for the bus. C – The student rides the bus to the next stop. D – The bus waits at the stop for more students to get on the bus. E – The student rides the bus which travels at the same speed as it did in C. The student arrives at school at the end of E.



You can analyze two different data sets for any relationships that might exist between them. The scatter plot to the right shows the data for basketball players height (x value) and the average number of points scored per game (y value). We can see that players were between about 174 cm and 205 cm tall and that most players were about 185 cm tall because there is a "cluster" of data at that point. There is a positive relationship between height and points scored. As height increases, number of points increases. We can determine a "line of best fit" for the data and then write the equation for that line.



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Sample Problems

1. The table below shows the cost for renting a car for four days. How much is being charged per day and how do you know? Was there an initial fee to rent the car? Can you write an equation that will predict the cost for any number of days the car is rented? What do the numbers in your equation represent?

Days (d)	Cost (c)
1	\$70
2	\$115
3	\$160
4	\$205

Solution: There is a constant difference of \$45 each day so that must be the charge per day. The initial fee then would be \$70 minus the \$45 for the first day which is \$25. The equation for this situation is $c = \$45d + \25 . If I would graph the line of this function, the slope would be 45 because it is the constant rate of change. The graph would start at the point (0, 25) because that is the initial value or the y-intercept.

2. Here is a graph of the heart rate of a man running on a treadmill. Write a story/verbal description of what is happening in this graph.

How Can You Help Your Student?

- The units before this unit in 8th grade emphasize important concepts for algebra readiness. One of these concepts is joining like terms. The ***Like Terms Stack-N-Pack*** game is available for checkout from your school's Parent Center. There are Stack-N-Pack books for math concepts from Kindergarten through High School. Here is the link for all the books: [Stack-N-Pack Mathematics Games for K-HS](#)

- Following are several videos related to this unit that you can watch with your student:

- ???

- ???

Literature related to this unit to read together at home and discuss:

- ???

