

# Goal 1: Functions & Algebra

## Linear Relationships – Slope-Intercept Form

OBJECTIVE	CORE LEARNING GOALS	
<ul style="list-style-type: none"> <li>The student will use a graphing calculator to examine the association between the data points and equation of a linear relationship.</li> <li>The student will write equations in slope- intercept form.</li> </ul>	1.1.1 The student will recognize, describe and/or extend patterns and functional relationships that are expressed numerically, algebraically, and/or geometrically. 1.1.2 The student will represent patterns and/or functional relationships in a table, as a graph, and/or by mathematical expression. 1.2.1 The student will determine the equation for a line, solve linear equations, and/or describe the solutions using numbers, symbols, and/or graphs.	
DRILL	MATERIALS <ul style="list-style-type: none"> <li>Linear Relationships at <i>Tasty Tacos</i> (Lesson, Student Worksheet, Answer Key, Extra Practice Items)</li> <li>Graphing calculators</li> </ul>	
CALCULATOR SKILLS <ul style="list-style-type: none"> <li>Enter data into a list.</li> <li>Set up an appropriate graphing window.</li> <li>Graph equations and data points.</li> <li>Set up and examine tables.</li> </ul>		
ACTIVITIES <ol style="list-style-type: none"> <li><b>Drill.</b></li> <li><b>Linear Relationships at <i>Tasty Tacos</i></b> – Incorporate group work and class discussions into the <b>Lesson</b> as students complete the <b>Student Worksheet</b>.</li> <li><b>Extra Practice Items</b> – Students work together to complete the problems.</li> </ol>		
ASSESSMENT  Class discussion Group work	HOMEWORK	

## Linear Relationships at *Tasty Tacos*

### Lesson:

Engage students in the content.

You begin working at *Tasty Tacos* with the pay schedule listed in the table below:

Years	Earnings per hour
2	\$6.85
4	\$7.55
6	\$8.25

1. Ask students to describe the pattern found in the table.
2. Enter the data into the list storage of your calculator.

**Teacher Tip:**

Instruct the students on how to enter a list. This includes setting up the number of lists you wish to use. Discuss with students how to name their lists if the calculators have that capability.

3. State an appropriate graphing window, and then graph the data using that window. (CLG: 1.1.2)

**Teacher Tip:**

At this point stop and discuss with your students what makes an appropriate graphing window. Discuss the mathematics behind graphing data just as if you were graphing it on paper. Discuss the domain of the  $x$  values and the range of the  $y$  values. Help students to see the data points in different windows and understand the need for an appropriate window.

4. What type of relationship exists in the data points? Use mathematics to justify your answer. (CLG: 1.1.1)

**Teacher Tip:**

Discuss with the students linear and non-linear relationships.

5. Write an equation that describes the relationship between the years ( $x$ ) and the earnings per hour ( $y$ ). Use mathematics to explain how you determined your equation. Use words, symbols, or both in your explanation.(CLG: 1.2.1)

Teacher Tip:

Discuss with students how to explain the steps they went through to get the equation.

6. Enter your equation into your calculator. Then graph the equations with the data points in the table. Describe the association between the data points and the graph of the line.

Teacher Tip:

Discuss with students how to graph the equation and data points together.

7. What is the slope of the equation and what does it mean in the context of the problem?

Teacher Tip:

Emphasize the concept of slope, as a rate of change, in the context of the problem.  
Students should use the table feature of the calculator to see the connection between the slope and table values.

8. What is the  $y$ -intercept of the equation and what does it mean in the context of the problem?
9. If this pattern continues, what would the earnings per hour be after working 15 years? Use mathematics to explain how you determined your answer. Use words, symbols or both in your explanation.
10. If this pattern continues, after how many years of service would you earn \$9.65 per hour? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.

**A student worksheet “Linear Relationships at the Carnival” is included for a similar activity. In this activity, students will represent a pattern in a table and then by writing an equation.**

**Extra practice items are also included.**

## Linear Relationships at *Tasty Tacos*

### Student Worksheet:

You begin working at *Tasty Tacos* with the pay schedule listed in the table below:

Years of Service	Earnings per hour
2	\$6.85
4	\$7.55
6	\$8.25

1. Describe the pattern found in the table.
2. Enter the data into the list storage of your calculator.
3. State an appropriate graphing window, and then graph the data using that window.
4. What type of relationship exists in the data points? Use mathematics to justify your answer.
5. Write an equation that describes the relationship between the years ( $x$ ) and the earnings per hour ( $y$ ). Use mathematics to explain how you determined your equation. Use words symbols or both in your equation.

Equation: \_\_\_\_\_

6. Enter your equation into your calculator. Then graph the equations with the data points in the table. Describe the association between the data points and the graph of the line.
7. What is the slope of the equation and what does it mean in the context of the problem?

8. What is the  $y$ -intercept of the equation and what does it mean in the context of the problem?
  
9. If this pattern continues, what would the earnings per hour be after working 15 years? Use mathematics to explain how you determined your answer. Use words, symbols or both in your explanation.
  
10. If this pattern continues, after how many years of service would you earn \$9.65 per hour? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.

## Linear Relationships at *Tasty Tacos* *Answer Key*

1. As the years increase by 2 the earnings per hour increase by \$.70.
4. The relationship is linear since there is a constant rate of change of .35.
5. Equation:  $y = .35x + 6.15$

Example explanation: 
$$m = \frac{7.55 - 6.85}{4 - 2} = .35$$

$$\begin{aligned}y &= .35x + b \\6.85 &= .35(2) + b \\6.15 &= b\end{aligned}$$

6. The graph of the line goes through all of the points from the table.
7. The slope of the equation is .35. This represents an increase of \$.35 per year.
8. The y-intercept of the equation is 6.15. This represents a starting pay of \$6.15 per hour.
9. The earnings per hour after 15 years of service would be \$11.40.

$$\begin{aligned}y &= .35(15) + 6.15 \\y &= 5.25 + 6.15 \\y &= 11.40\end{aligned}$$

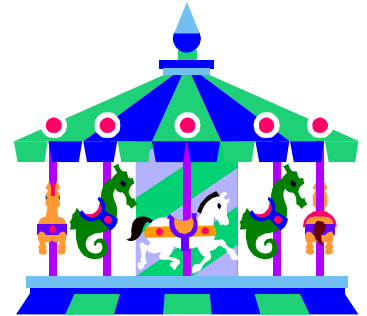
10. You would earn \$9.65 after 10 years of service.

$$\begin{aligned}9.65 &= .35x + 6.15 \\3.50 &= .35x \\10 &= x\end{aligned}$$

## Linear Relationships at the Carnival

### Student Worksheet:

Mark is going to a carnival. He is anxiously looking forward to riding as many rides as possible. In order to enter the park each person is charged a \$3 admission fee. The tickets for the rides are \$0.75 each.



1. Make a table that shows the number of rides ( $x$ ) and the total cost with admission ( $y$ ) for Mark's trip to the carnival for 0 to 4 rides.

Rides ( $x$ )	Cost ( $y$ )
0	
1	
2	
3	
4	

2. Enter the rides and cost data into the list storage of your calculator.
3. Set up an appropriate graphing window, and then graph the data.
4. What type of relationship exists in the data points? Use mathematics to justify your answer.
  
5. Write an equation that describes the relationship between the number of rides ( $x$ ) and the total cost ( $y$ ). Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.

6. Enter the equation into your calculator. Graph the equation with the data points. Describe the association between the data points and the graph of the line.

7. Use the equation in question 3, to determine the cost of 100 tickets.

Cost of 100 tickets: \_\_\_\_\_

8. If Mark's grandmother gave him \$50, how many rides could he ride? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.



## Linear Relationships at the Carnival

### Answer Key:

1.

Rides (x)	Cost (y)
0	\$ 3.00
1	\$ 3.75
2	\$ 4.50
3	\$ 5.25
4	\$ 6.00

4. A linear relationship exists because the points fall along a straight path where a constant rate of change can be found.

5.  $Y = 0.75x + 3$

Example explanation:

Slope =  $(3.75 - 3.00) / (1 - 0) = .75$  and the y-intercept is 3

These values were substituted in the equation  $y = mx + b$

6. The graph of the line goes straight through the data points because of the linear relationship between them.

7. \$78

8. 62 rides

Example explanations:

$$50 = .75x + 3$$

$$47 = .75x$$

$$62.67 = x \quad x = 62 \text{ rides}$$

or

I traced my graph to find x when y = 50.

## Linear Relationships

### Extra Practice Items:

1. The following data was taken from a chart in a doctor's office. It lists the weight of a human body and the corresponding volume of blood in the body.

Blood in the Body

Weight (pounds)	90	120	150
Volume of blood (pints)	6	8	10

- Find the volume of blood in a person weighing 195 pounds.
  - Find the weight of a person with 18 pints of blood.
  - Use mathematics to explain how you determined your answers. Use words, symbols, or both in your explanation.
2. The cost of renting a car from A-Plus Rentals is listed in the table below.

A-Plus Rentals

Miles driven	50	100	150
Cost	\$57.50	\$75.00	\$92.50

- Write an equation that represents the relationship between the mile driven and the cost of renting a car.
  - What is the cost of driving 315 miles? Use mathematics to explain how you determined your answers. Use words, symbols, or both in your explanation.
3. The Adams family attends the Parksville Elementary School's Family Fun Day. An admission's fee of \$2 is required from each family entering the school. It will cost \$0.60 to play each game at the Family Fun Day. Write an equation that can be used to determine the total cost the Adams family will spend at the Family Fun Day. Determine the cost that the Adams family will spend if they play 50 games. Use mathematics to explain how you determined your answers. Use words, symbols, or both in your explanation.
4. The senior class needs to rent a punch fountain for a school dance. A rental company charges a flat rate of \$25 plus \$15 per hour. The senior class has \$100 to spend on the punch fountain. How many hours can they rent the punch fountain for? Use mathematics to justify your answer.
5. A sales clerk receives a base salary of \$950 a month plus 6% commission. What are the total sales required for a monthly salary of \$1,310? Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.