

Name: _____

Date: _____

Modeling with Linear Functions Algebra 1

We have learned that slope is used to describe real life rates of change. We also know that the y -intercept is where the line begins on the y -axis. The y -intercept always occurs where the independent variable has a value of zero. Using these two quantities, slope and y -intercept, we can model and solve many real life problems.

Exercise #1: The Arlington Freshmen class wants to have a fundraiser. The class wants to buy a number of \$4 flip-flops and \$5 bracelets. The class has a total of \$100 to spend.

- (a) If x represents the number of flip-flops and y represents the number of bracelets, complete the table below.

# of flip-flops, x	0	
# of bracelets, y		0

- (b) Using the two points from part (a), write a linear equation in $y = mx + b$ form that gives the number of bracelets that can be bought as a function of the number of flip-flops bought.

- (c) Using your equation from (b), determine the number of bracelets that can be bought if 10 flip-flops were purchased.

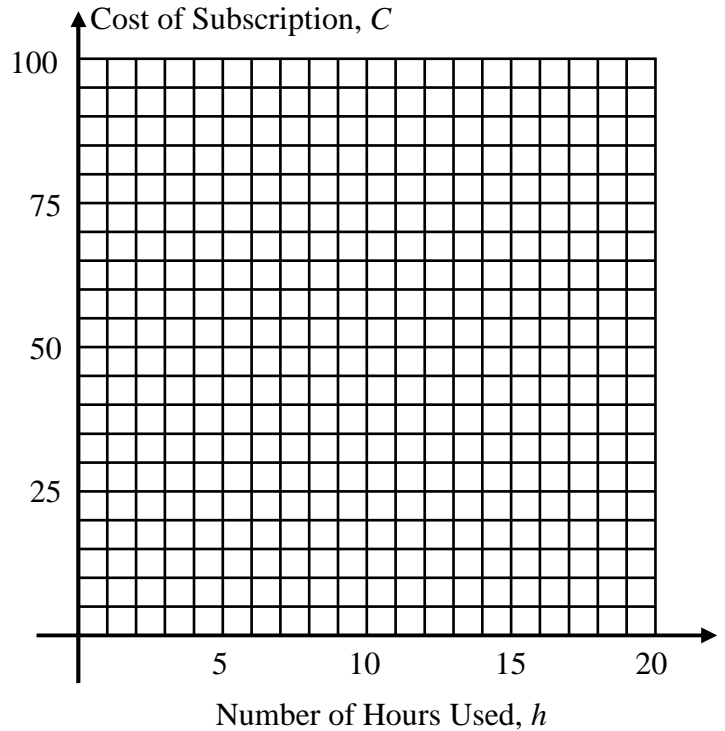
Exercise #2: From 2000 to 2007 the number of coffee shops in a certain country increased by 100 shops per year. In 2002, there were 1100 coffee shops.

- (a) Write a linear equation for the number of coffee shops, y , as a function of time, t , where $t = 0$ represents the year 2000.

- (b) Based on your linear model from part (a), predict the number of coffee shops that will be in that country in 2025.

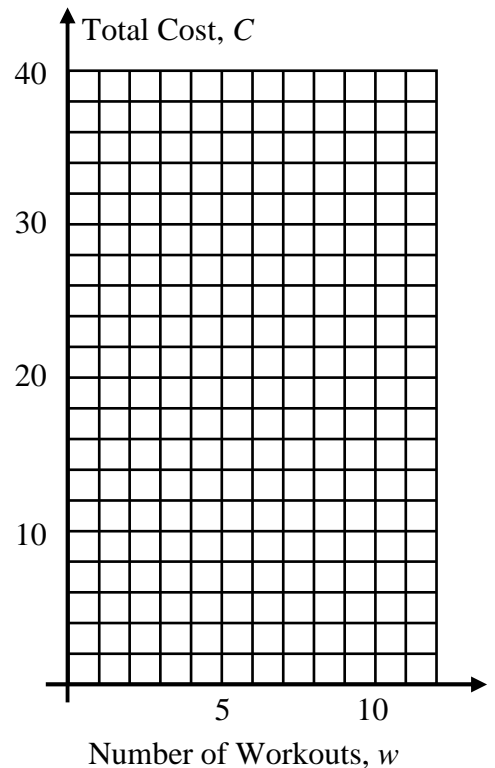
Exercise #3: The cost to subscribe to an online internet service consists of a \$15 per month flat-fee and a \$4.00 per hour additional charge.

- (a) Create a linear model to represent the total cost per month, C , as a function of the number of hours, h , that are used.
- (b) Using your calculator to generate a table of values, graph the model you formed in part (a) on the grid provided.
- (c) Lucy was charged \$75 after signing up and using the service for one month. How many hours did she use? Justify your answer both algebraically and graphically.



Exercise #4: Shirley's Workout Shack charges \$6 to sign up and \$3 each time a person works out.

- (a) Write an equation representing the cost, C_1 , to workout at Shirley's as a function of the number of workouts a person has worked out, w .
- (b) Tommy's Pump Up Center charges \$14 to sign up and \$2 for each workout. Create another linear function, as in part (a), for the cost, C_2 , of attending Tommy's Center.
- (c) Graph both equations on the grid to the right. What number of workouts will result in the same cost for both gyms?



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Modeling with Linear Functions Algebra 1 Homework

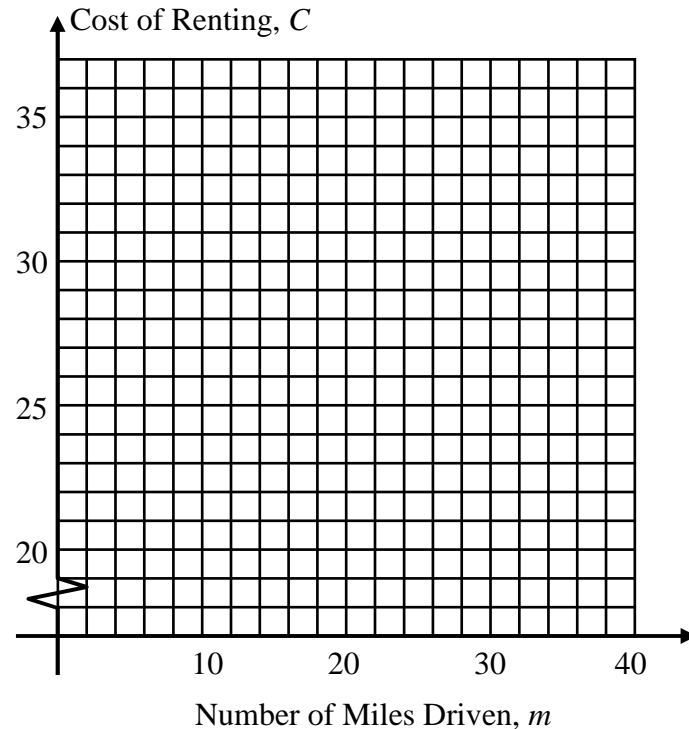
Applications

1. Hamal Rental Cars charges a flat-fee of \$25 per day to rent a new Chevy Impala, plus a mileage charge of \$0.25 per mile.

(a) Write a linear equation to represent the cost, C_1 , of renting an Impala as a function of the number of miles driven, m .

(b) On the grid to the right, graph and label the linear function you created in part (a).

(c) Ike's Rentals charges a flat fee of \$20 per day to rent an Impala plus a mileage charge of \$0.50 per mile. As in (a), write a linear equation to represent the cost, C_2 , of renting an Impala from Ike's and graph this function on the grid at the right.



(d) For what number of miles, m , will the rental costs be equal for the two places?

2. Kael wants to install a new toilet. Luigi the plumber charges \$100 for the cost of the toilet plus an additional \$75 per hour.

(a) Write an linear equation that gives the cost, C_1 , as a function of the hours, h , that Luigi works.

(b) Being very exact with his hours, Luigi charges Kael \$750. Determine, to the nearest *tenth of an hour*, how long Luigi worked on this job. Justify your answer using algebra or tables in your calculator. If you justify using a table, write at least three rows from your table.

3. Javier is trying to find a linear equation for the cost of his cell-phone plan. The first month he talks for only 32 minutes and is charged \$14.10. The second month he talks for 420 minutes and is charged \$33.50.

(a) Write two ordered pairs, where the minutes are the independent variable and the charge is the dependent variable, that model the information given in the problem.

(b) Using these two points, write a linear equation that gives Javier's charge, C , as a function of the number of minutes, m , that he talks.

(c) What does the slope of this linear function represent?

4. Miguel is driving towards New York City at a constant rate of speed. After 2 hours he notices that he is 127 miles away and after 3 hours he notices that he is 69 miles away.

(a) Write the information above as two ordered pairs, with time being the independent variable and the distance from New York City being the dependent variable.

(b) Using your ordered pairs from part (a), write a linear equation in which the distance Miguel is away, D , as a function of the time he has been driving, t .

(c) Why is the slope of your linear equation from part (b) negative? Explain in terms of the real-life scenario that the linear equation is modeling.

(d) How far from NYC was Miguel when he started his trip at $t = 0$ hours? Justify.