UNIT 4: Modeling Real-World Situations with Equations •

~~ Unit 4, Page 14 ~~

I can create a math model for a real life situation using system of equations in slope intercept form and a graph.

Graphs of Linear Systems (slope-intercept form; $y = mx + b$)

Suppose the managers of a shopping center want to upgrade their security system. Two providers bid for the job.

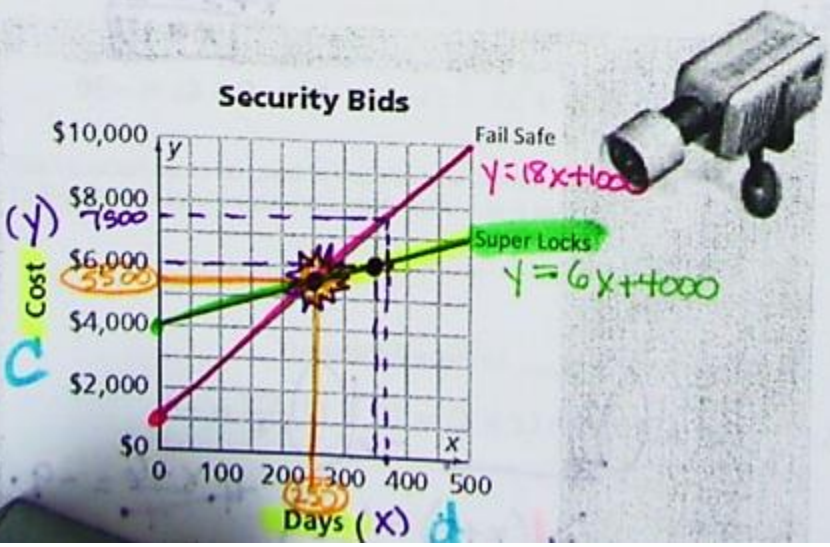
- Super Locks will charge $3,975 to install the equipment and then $6.00 per day to monitor the system and respond to alerts.
- Fail Safe will charge $995 to install the equipment and then $17.95 per day to monitor the system and respond to alerts.

Both companies are reliable and capable, so the choice comes down to cost.

Super Locks
$3975 ≈ $4000
$y = 6x + 4000$

$995 ≈ 1000$ $17.95 ≈ 18$
$y = 18x + 1000$

The cost of the security services from Super Locks and Fail Safe depends on the number of days the company provides service. The graph below shows the bids for both companies.



~~ Unit 4, Page 15 ~~

A. Use the graphs to estimate the answers to these questions.

1. For what number of days will the costs for the two companies be the same? 250 What is the cost? ≈ $5500
2. For what number of days will Super Locks cost less than Fail Safe? more than 250 days
3. For what number of days will Superlocks cost more than Fail Safe? less than 250 days
4. For what number of days will Super Locks cost less than $6000? less than 350 days
5. What is the cost of one year of service from Fail Safe? ≈ $7500

1 yr = 365 days

B. For each company, write an equation for the cost, *c*, for *d* days of security services.

Super Locks: $C = 6d + 4000$ $C = 6d + 3975$ Fail Safe: $C = 18d + 1000$ $C = 17.95d + 995$

Sometimes it is easier to graph equations of lines using two points. The following problem asks you to fill in the first and last values for x and find the y-values.

Sam needs to rent a car for a one-week trip in Oregon. He is considering two companies. A+ Auto Rental charges $160 plus $0.10 per mile. Zippy Auto Rental charges $80 plus $0.20 per mile.

Define your variables: rental cost: y Miles driven: x

Equation for A+ Auto Rental: $y = .10x + 160$

Equation for Zippy Auto Rental: $y = .20x + 80$

b. Complete the missing values in the table and then graph the equations. (include titles)

A+ Auto Rental $y = .10x + 160$

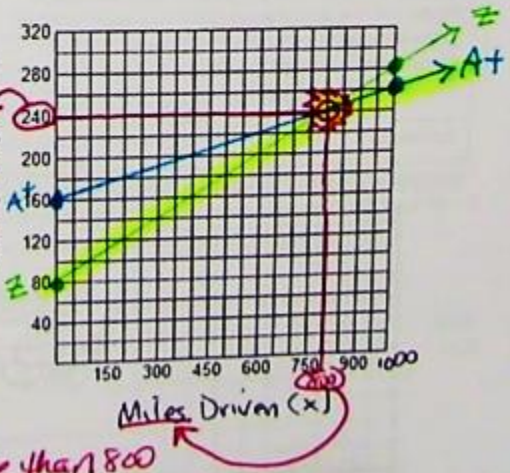
Miles	Cost
0	160
1000	260

$.10(1000) + 160$ (y)
$100 + 160$

Zippy Auto Rental $y = .20x + 80$

Miles	Cost
0	80
1000	280

$.20(1000) + 80$
$200 + 80$



1) Approximate the point of intersection: (800, 240)
2) What does the point of intersection mean to the situation? (Include what each value means, what it means if more miles are travelled and what it means if fewer miles are traveled.)

For 800 miles, the cost is $240 for both companies. For more than 800 miles, A+ is less expensive. For less than 800 miles, Zippy costs less.

~~ Unit 4, Page 16 ~~

Example 1:

Taxi Company A

You are visiting Baltimore MD, and Taxi Company A charges a flat fee of $3.00 for using the taxi and an additional $0.75 per mile. Write an equation that you could use to find the cost of a taxi ride in Baltimore, MD.

x = the # of miles y = the cost.

Equation: $y = .75x + 3$

x	y
0	3
8	9

.75(8) 6

Taxi Company B

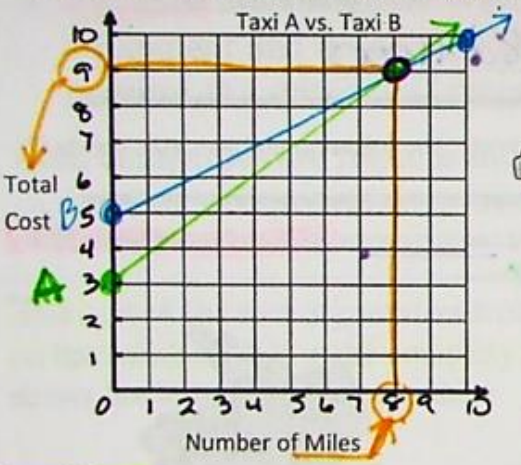
You are visiting Baltimore MD, and Taxi Company B charges a flat fee of $5 for using the taxi and an additional $0.50 per mile. Write an equation that you could use to find the cost of a taxi ride in Baltimore, MD.

x = the # of miles and y = the cost.

Equation: $y = .50x + 5$

x	y
0	5
10	10

Graph both equations on the following grid. Use an interval of 1 on both axes.



1) Name the point of intersection: (8, 9)
2) What does the point of intersection mean to the situation? (Include what each value means, what it means if more miles are travelled and what it means if less miles are traveled.)

For both companies, the total cost is $9 for 8 miles. Company A is less expensive for less than 8 miles, but company B costs less for over 8 miles.

Example 2:

Brady the Plumber

Brady, a plumber, charges a fee of $120 to make a house call. He also charges $10.00 an hour for labor. Write an equation that you could use to find the amount Brady charges for a house call based on the number of hours of labor.

x = # of hours y = the cost.

Equation: $y = 10x + 120$ (40 + 120)

x	y
0	120
4	160

Valeria the Plumber

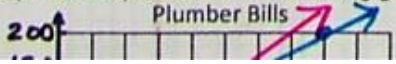
Valeria, a plumber, charges a fee of $100 to make a house call. She also charges $15.00 an hour for labor. Write a equation that you could use to find the amount Valeria charges for a house call based on the number of hours of labor.

x = # of hours y = the cost.

Equation: $y = 15x + 100$ (75 + 100)

x	y
0	100
5	175

Graph both equations on the following grid. Use an interval of 1 on the x-axis and 20 on the y-axis.



1) Name the point of intersection: (4, 160)