

Problem #1 - Jerseys for Sale!

Carolyn gets a job at the Sky Dome selling Jose Bautista baseball jerseys. She is paid a \$10 flat fee plus \$10 for every jersey she sells. Let her total pay be p (\$) and the number of jerseys she sells n .

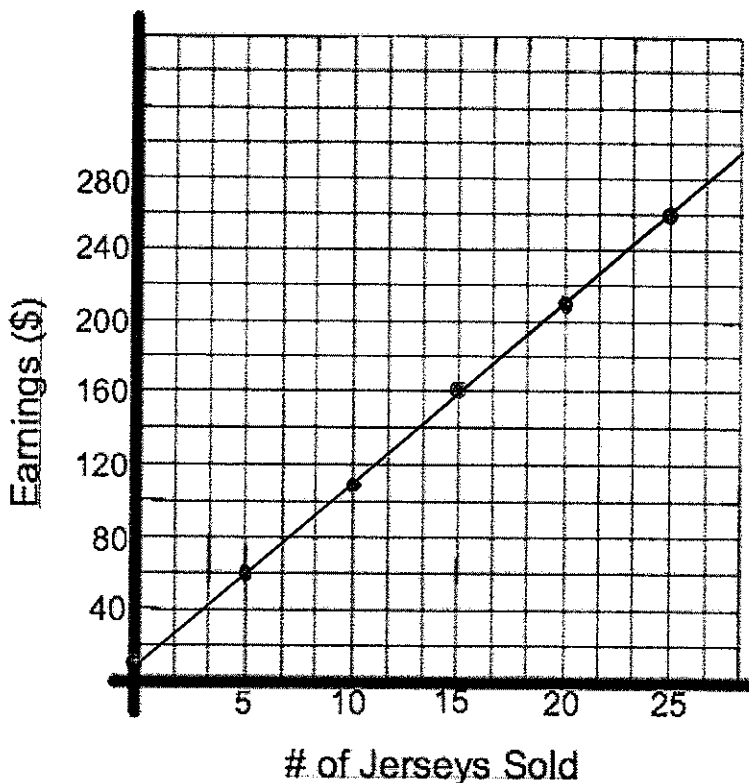
1. Which is the independent variable, and which dependent?

independent = # of jerseys she sells

dependent = total pay

2. Make a table of values and graph showing her pay for various numbers of jerseys sold.

x	y
n	p
0	10
5	60
10	110
15	160
20	210
25	260



3. What is an equation for Carolyn's total pay?

$$P = 10n + 10$$

4. What is Carolyn's pay if she sells 0 jerseys? Where is this on your graph?

\$10. Look at 0 on the x-axis to find this value.

5. Use your equation to find out how much she would be paid if she sold 17 jerseys.

$$\begin{aligned} P &= 10(17) + 10 \\ &= 180 \end{aligned}$$

\$180

6. Use your graph to find how many jerseys she would need to sell to earn \$200.00 for a game.

Approximately 19.

7. Use your equation to answer question #6.

$$\begin{aligned} 200 &= 10n + 10 \\ 190 &= 10n \\ 19 &= n \end{aligned}$$

19 jerseys.

8. What would the equation be if Carolyn were paid:

a. \$15 flat fee, plus \$7.50 per jersey sold?

$$P = 7.50n + 15$$

b. \$10 flat fee, plus \$9 per jersey?

$$P = 9n + 10$$

c. \$15 flat fee, plus \$5 per jersey?

$$P = 5n + 15$$

d. \$20 flat fee only?

$$P = 20$$

e. \$8 per jersey only?

$$P = 8n$$

Problem #2 - Ring It Up!

A phone company charges a flat monthly fee of \$15 for cell phone service, plus an additional fee for every minute you talk. In a given month, you are charged \$36 for the 24 minutes you talked (not including the \$15 flat fee). Let the total cost be c (in \$), and the time you talk be t (in minutes).

1. Identify the dependent and independent variables.

Independent: time you talk

Dependent: cost

2. What is the "fixed" cost of the phone plan?

\$15

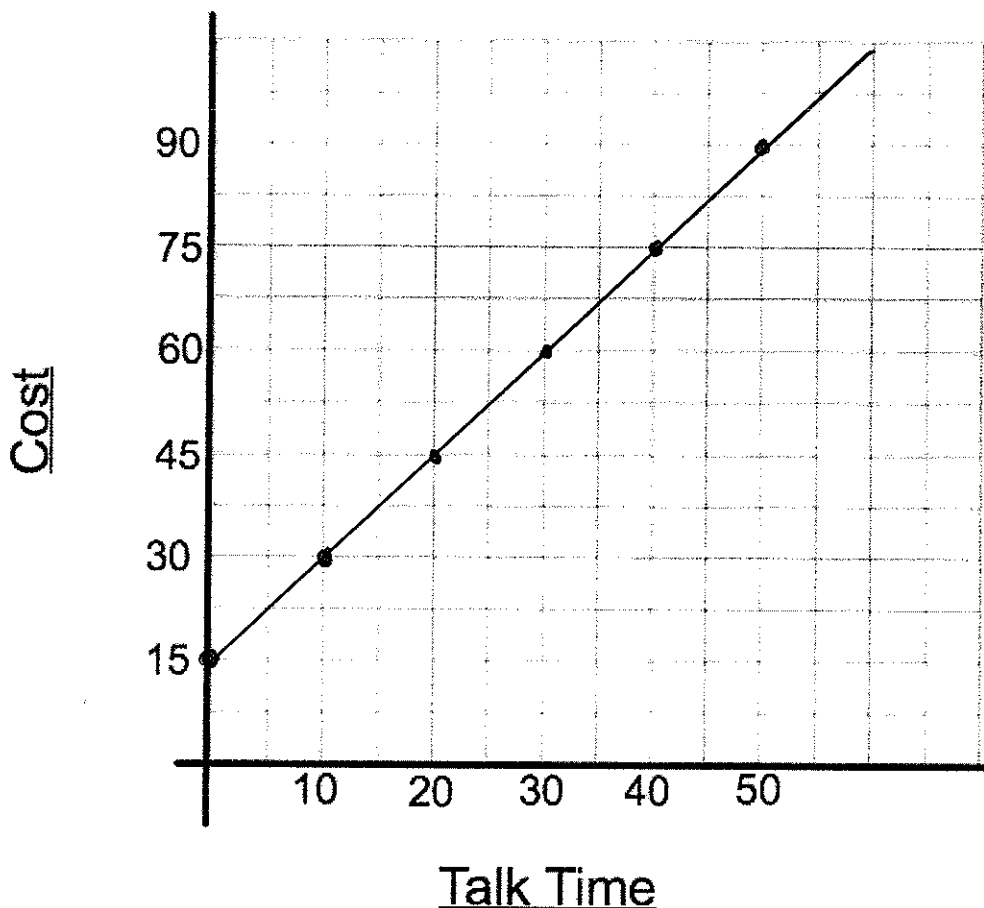
3. What cost do you pay per minute? (this is known as the variable cost or constant of variation)

$$m = \frac{36}{24} = 1.5 \quad \$1.50$$

4. Write an equation relating c and t .

$$C = 1.5t + 15$$

5. Draw a graph showing the total phone bill for one month where the calls vary from 0 to 50 minutes. Use increments of 10 minutes.



6. Use your graph to find the total bill with 45 minutes of talk time.

$$\$82.50$$

7. Use your equation to find the total bill with 45 minutes of talk time.

$$C = 1.5(45) + 15$$

$$= 82.5$$

$$\$82.50$$

8. Use your graph to find the talk time if the total bill was \$52.50.

$$25 \text{ minutes.}$$

9. Use your equation to find the talk time if the total bill was \$52.50.

$$52.5 = 1.5n + 15$$

$$37.5 = 1.5n$$

$$25 = n$$

$$25 \text{ minutes}$$

10. What would the equation be if the company charged

- a. \$20 (instead of \$15) as the basic monthly cost?

$$C = 1.5t + 20$$

- b. A flat fee of \$15 and \$2 per minute of talk time?

$$C = 2t + 15$$

- c. A \$7 flat fee and \$0.75/minute?

$$C = .75t + 7$$

- d. A \$50 flat fee for unlimited minutes?

$$C = 50$$

- e. No flat fee and \$3/minute?

$$C = 3n$$

Problem #3 - Decisions, Decisions, Decisions!

You are helping a friend decide which cellular phone package is best for her to buy.

- Crystal Net charges a basic fee of \$27 for up to 200 minutes (no charge per minute)
- Rover charges a basic fee of \$12 plus \$0.15 per minute
- Ring Mobility charges a basic fee of \$15, plus \$0.10 per minute.

1. Identify your dependent and independent variables.

Independent: minutes

Dependent: cost

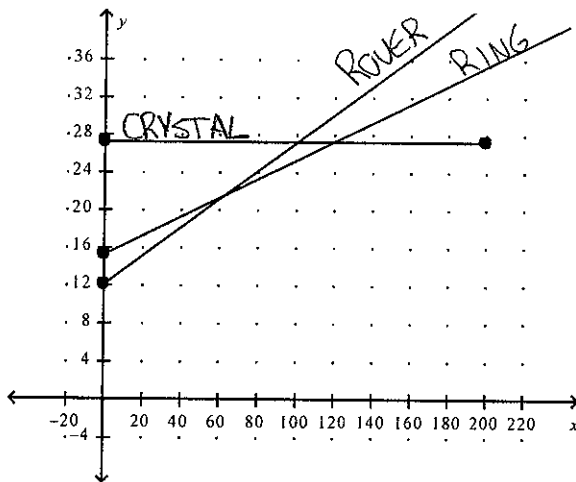
2. Write an equation showing the cost for each of the three cell phone companies (3 equations)

Crystal Net: $C = 27$

Rover: $C = 0.15t + 12$

Ring: $C = 0.10t + 15$

3. The graphs of the 3 equations from #2 look like this. Which lines match which equations from #2? How do you know?



I used the initial values to determine which lines matched each equation

4. When are the costs the same for the Rover and Crystal Net options?

100 minutes

5. When are the costs the same for the Rover and Ring Mobility options?

60 minutes

6. When is Ring Mobility a better deal than both Rover and Crystal Net?

Between 60 and 120 minutes

7. When is Crystal Net the best option?

After 120 minutes

8. If your friend expects to use her cell phone between 40 and 100 minutes per month, explain which service you think she should choose.

Ring because it is cheaper for the most amount of time between 40 and 100.

Problem #4

A mobile phone company charges a flat fee of \$20 and a cost per minute. When your phone bill comes, you discover that you talked for 150 minutes, and your total bill was \$72.50 including the flat fee. Determine:

a) the cost per minute of talk time

$$m = \frac{52.50}{150} = 0.35$$

b) an equation showing the relationship (partial variation equation: $y=mx+b$)

$$y = 0.35x + 20$$

c) how much it will cost (including the flat fee) to talk for 275 minutes (use your equation)

$$\begin{aligned} y &= 0.35(275) + 20 \\ &= 116.25 \end{aligned} \quad \$116.25$$

d) how long you talked for if your total bill came to \$51.15 (use your equation)

$$\begin{aligned} 51.15 &= 0.35x + 20 \\ 31.15 &= 0.35x && 89 \text{ minutes} \\ 89 &= x \end{aligned}$$

Problem #5

An airplane traveling at an altitude of 5000 m begins descending (going downwards) at a constant rate. After 15 seconds, the airplane has descended 72 m. Determine:

a) the constant of variation for this situation

$$m = \frac{-72}{15} = -4.8$$

b) an equation showing the relationship

$$y = -4.8x + 5000$$

c) the altitude of the plane after 75 seconds (use the equation)

$$\begin{aligned} y &= -4.8(75) + 5000 \\ &= 4640 \end{aligned}$$

d) how long it will take the plane to land.

$$\begin{aligned} 0 &= -4.8(x) + 5000 \\ \frac{-5000}{-4.8} &= x && x = 1041.7 \\ &&& \text{It will take 1041.7 seconds.} \end{aligned}$$

Problem #6 (bonus)

You plant a small tree which begins growing at a constant rate. You measure the height of the tree after 3 weeks, and its height is 33 cm. You measure the height of the tree again after 7 weeks and its height is 38.2 cm. Determine:

a) the constant of variation for this situation

$$m = \frac{\Delta y}{\Delta x} = \frac{38.2 - 33}{7 - 3} = \frac{5.2}{4} = 1.3$$

b) how tall the tree was when you planted it (the "initial value")

$$\begin{aligned} \text{initial height} &= 33 - 3(1.3) \\ &= 33 - 3.9 \\ &= 29.1 \end{aligned}$$

c) an equation showing the relationship

$$y = 1.3x + 29.1$$

d) after how many weeks the plant will be 45 cm tall

$$45 = 1.3x + 29.1$$

$$15.9 = 1.3x$$

$$\frac{15.9}{1.3} = x$$

$$x = 12.2$$

After 12.2 weeks.

e) how much time has gone by when the plant is 51.3 cm tall

$$51.3 = 1.3x + 29.1$$

$$22.2 = 1.3x$$

$$\frac{22.2}{1.3} = x$$

17.1 weeks.

$$x = 17.1$$