Algebra 2 Trigonometry Honors Name:_________________________

Section 2.4

Phoebe Small still has 35 pages of history to be read after she has been reading for 10 minutes, and 5 pages left after she has been reading for 50 minutes. Assume that the number of pages left to read varies linearly with the number of minutes she has been reading.

a) Write the particular equation expressing pages, *p*, in terms of minutes reading, *m*.

(10, 35)
(50, 5)

$\text{slope} = \frac{35-5}{10-50} = \frac{30}{-40} = -\frac{3}{4}$ $\quad p - 35 = -\frac{3}{4}(m-10)$

b) Interpret the slope in words.

For every 4 minutes Phoebe has read, she has 3 fewer pages to read.

c) Calculate the pages-intercept and explain what this number means.

The book is 42.5 pages long.

d) Calculate the minutes-intercept and explain what this number means.

It will take Phoebe $56\frac{2}{3}$ minutes to finish the book.

The rate at which Jiminy Crickets chirps is a linear function of temperature. At 59°F he makes 76 chirps per minute and at 65°F he makes 100 chirps per minute.

a) Write the particular equation expressing chirping rate, *C*, as a function of temperature, *T*.

(59, 76)
(65, 100)

$\text{slope} = \frac{100-76}{65-59} = 4$ $\quad C - 76 = 4(T-59)$

b) Calculate the temperature intercept. What does this number represent?

The crickets don't chirp when the temperature is 40°.

c) Interpret the slope in words.

For every 1° Temperature increase, the chirps per minute increases by 4.

d) How warm is it if you count 120 chirps per minute?

$120 - 76 = 4(T-59)$

$T = 70°$

The number of dollars per month it costs you to own a car is a function of the number of kilometers per month you drive it. The cost varies linearly with the distance and is \$366 per month for 300 km per month and \$510 per month for 1500 km per month.

a) Write the particular equation, relating cost, C, as a function of kilometers driven, K.

(300, 366)
(1500, 510)

$\text{Slope} = \frac{510-366}{1500-300} = \frac{3}{25}$

$C - 510 = \frac{3}{25}(K - 1500)$

b) What is the cost-intercept? Describe what this number represents.

When the car is not driven in a month, it costs \$330.

c) What is the kilometers driven-intercept? Describe what this number represents.

−2,750 km. The car will always cost you!

d) Interpret the slope in words.

For every 25 more km you drive in a month, it costs you \$3 more.

e) How far could you drive in a month without exceeding a monthly cost of \$600?

$600 - 510 = \frac{3}{25}(K - 1500)$

$K = 2{,}250$ km

Assume that the maximum speed your car will go is a linear function of the steepness of the hill it is going up or down. Suppose that the car can go a maximum of 55 mph up a 5° hill and a maximum of 104 mph down a 2° hill. (Going downhill can be thought of as going up a hill of -2°.)

a) Write the particular equation, relating speed, S, as a function of degree of steepness, D.

(5, 55)
(−2, 104)

$\text{Slope} = \frac{55-104}{5--2} = -7$

$S - 55 = -7(D - 5)$

b) What does the speed-intercept equal and what does it represent?

When there is no hill, the speed is 90 mph.

c) What does the degree of steepness-intercept and what does it represent?

When the car stops moving due to steepness, the hill has 12.9° of steepness.

d) Interpret the slope in words.

For every 1° increase in the steepness of the hill, your speed decreases 7 mph.

e) If your top speed is 83 mph, how steep is the hill? Be sure to include whether the direction is up or down.

$83 - 55 = -7(D - 5)$

$D = 1°$ up

f) How fast could you go down a 7° hill?

$S - 55 = -7(7 - 5)$ $S = 139$ mph

So $C \downarrow$ when $T \uparrow$

Data gathered during World War II showed that a person used 30 more calories per day for each 1° drop in Celsius temperature. At 21°C, a working person uses about 3000 calories per day.

a) Write the particular equation for calorie use, *C*, as a function of temperature, *T*.

$C - 3000 = {}^{-}30(T - 21)$

b) What is the calorie use-intercept and what does it represent?

When the temperature is 0°, a person uses 3,630 Calories.

c) How many calories per day would a working person use in Antarctica when the temperature is -50°C?

$C - 3000 = {}^{-}30(-50 - 21)$

$C = 5,130$

d) At what temperature would a working person use no calories at all?

$0 - 3000 = -30(T - 21)$

$T = 121°C$ That's HOT!

Suppose that you fill up your car's gas tank and then drive off down the highway. As you drive, the number of minutes, t, since you had the tank filled, and the number of liters, g, remaining in the tank are related by a linear function. After 40 minutes you have 52 liters left and an hour after you filled the tank you have 40 liters left.

a) Write the equation for liters left, *L*, as a function of minutes driven, *m*.

(40, 52) (60, 40) slope $= \frac{52-40}{40-60} = -\frac{3}{5}$ $L - 40 = {}^{-}\frac{3}{5}(m - 60)$

b) Find the liters left-intercept and explain what it represents.

When you haven't driven, there are 76 L left.

c) Find the minutes driven-intercept and explain what it represents.

It takes $126\frac{2}{3}$ minutes to empty the tank.

d) Explain what the slope represents.

For every 5 more minutes of driving, you use 3 Liters.

Suppose you own a car that is currently 40 months old. From an automobile dealer's "Blue Book" you find that its present trade-in value is $3300. From an old "Blue Book" you find that its trade-in value 10 months ago was $4700. Assume that its trade-in value decreases linearly with time.

a) Write a particular equation describing value, *v*, as a function of months owned, *m*.

$(40, 3300)$

$(30, 4700)$

$$\text{slope} = \frac{3300 - 4700}{40 - 30} = -140$$

$$V - 3300 = -140(m - 40)$$

b) Explain what the slope represents.

The car depreciates $140 in value for every 1 month more that you own it.

c) When do you predict that the car will be worthless? What is a mathematical name for this value?

$$0 - 3300 = -140(m - 40)$$

After 63.6 months. Called the m-intercept!

d) According to your model, what was the trade-in value when the car was new? What is a mathematical name for this value?

$$V - 3300 = -140(0 - 40)$$

$$V = 8{,}900$$

Called the V-intercept!

In order to hunt hippopotami, a hunter must have a hippopotamus hunting license. Since the hunter can sell the hippos he catches, he can use the proceeds to pay for part or all of the cost of the license. If he catches only 3 hippos, he is still in debt by $2050. If he catches 7 hippos, he makes a profit of $1550. The African Game and Wildlife Commission allows a limit of 10 hippos per hunter. Assume that the number of hippos caught, *h*, and profit made, *p*, are linearly related.

a) Write the particular equation for *p* as a function of *h*.

$(3, -2050)$

$(7, 1550)$

$$\text{slope} = \frac{-2050 - 1550}{3 - 7} = 900$$

$$p - 1550 = 900(h - 7)$$

b) Calculate both intercepts and interpret what they mean.

No profit is made when catching ≈ 5 hippos.

A hunter is in debt $4,750 when he hunts 0 hippos.

c) Explain the value of the slope.

A hunter makes $900 for every hippo he hunts.

d) If a hunter has a profit of $3,350, has he committed a crime?

NO. This means he has hunted 9 hippos and is in the legal limits.