Writing Linear Equations from a Context

Word problems in Slope-intercept form
When a word problem involves a constant rate or speed and a beginning amount, it can be written in slope-intercept form: $y = mx + b$. To do this, recognize which number will represent m, the rate, and which number will represent b, the y-intercept.

1. An airplane 30,000 feet above the ground begins descending at the rate of 2000 feet per minute. Assume the plane continues at the same rate of descent. The plane's height and minutes above the ground are related to each other.

   Identify the variables in this situation: x= **minutes**   y= **height above ground**

   What is the given information in this problem (find all that apply)?
   y-intercept **30,000** slope **-2000**

   a. Write an equation to model the situation.
   $y = -2000x + 30,000$

   b. Use your equation to find the altitude of the plane after 5 minutes.
   20,000 feet

2. Suppose you receive $100 for a graduation present, and you deposit it in a savings account. Then each week thereafter, you add $5 to the account but no interest is earned. The amount in the account is a function of the number of weeks that have passed.

   Identify the variables in this situation: x= **weeks**   y= **money in account**

   What is the given information in this problem (find all that apply)?
   y-intercept **100** slope **5**

   a. Find an equation for the amount y you have after x weeks.
   $y = 5x + 100$

   b. Use your equation to find when you will have $310 in the account.
   42 weeks

Word Problems in Point-Slope Form

When a word problem involves a constant rate or speed and gives a relationship at some point in time between each variable, an equation can be written in point-slope form to model the relationship.

1. Marty is spending money at the average rate of $3 per day. After 14 days he has $68 left. The amount left depends on the number of days that have passed.

Identify the variables in this situation: x= ___**# of days**___   y= _**money**_____

What is the given information in this problem (find all that apply)?
y-intercept ___**110**_____   slope _**-3**____

a. Write an equation for the situation.
(y – 68) = -3(x – 14)
y = -3x + 110

b. <u>Use your equation</u> to find the amount of money he began with.
110

2. Suppose a 5-minute overseas call costs $5.91 and a 10-minute call costs $10.86. The cost of the call and the length of the call are related.

Identify the variables in this situation: x= ___**minutes**_____   y= __**cost**_____

What is the given information in this problem (find all that apply)?
y-intercept ____**0.96**_____   slope __**0.99**____

a. What is the cost y of a call of x minutes duration? (Assume this is a constant-increase situation)
(y – 5.91) = 0.99(x – 5)
y = 0.99x + 0.96

b. How long can you talk on the phone if you have $12 to spend?
11 minutes

3. Biologists have found that the number of chirps some crickets make per minute is related to temperature. The relationship if very close to being linear. When crickets chirp 124 times a minute, it is about 68 degrees Fahrenheit. When they chirp 172 times a minute, it is about 80 degrees Farenheit.

   Identify the variables in this situation: x= **temperature**   y= **# of chirps per minute**

   What is the given information in this problem (find all that apply)?
   y-intercept **-148**   slope **4**

a. Find an equation for the line that models this situation.
  $(y – 124) = 4(x – 68)$
  $y = 4x - 148$

b. How warm is it when the crickets are chirping 150 times a minute?
  74.5 degrees Fahrenheit

MORE WORD PROBLEM PRACTICE:

1. Nick is given $50 to spend on a vacation . He decides to spend $5 a day. The amount Nick has left and the number of days are related.

   Identify the variables in this situation: x= **days**   y= **money**

   What is the given information in this problem (find all that apply)?
   y-intercept **50**   slope **-5**

a. Write an equation relating *x* and *y*.
  $y = -5x + 50$

b. Use your equation to find out when Nick will have $15 left.
  7 days

2. Julio plans a diet to gain 0.2 kg a day. After 14 days he weighs 40 kg. The number days he diets and his weight are related.

      Identify the variables in this situation: x= __**days**__   y= __**weight**__

      What is the given information in this problem (find all that apply)?
      y-intercept __**37.2**__   slope __**0.2**__

a. Write an equation relating Julio's weight , w, to the number of days, d, on his diet.
     $y = 0.2x + 37.2$

b. How long will it take Julio to reach his goal weight of 50 kg?

     64 days