Linear Equations and Problem Solving
Worksheet #1

Name Key

Date ______________ Pd ____

Instructions:

1. Identify all of the given information and assign a variable.
2. Write a verbal model.
3. Write and solve the resulting equation.
4. Check the reasonableness of your solution.
5. Answer the original question in a complete sentence.

1. You made a $35-phone call to Brazil that cost $3 for the first minute and $2 for each additional minute. How long did you talk?

$35 - total cost of the call
$3 - cost of the 1st min.
$2 - cost per min. after 1st
m - length of call (in min.)

Total cost of call = Cost of 1st min + (Cost of additional min.) x (# of min. after 1st)

$35 = 3 + 2(m-1)$

$35 = 3 + 2m - 2$

$35 = 2m + 1$

$34 = 2m$

$17 = m$

The phone call was 17 minutes long.

2. Kayla and Thomas are jogging on a 10-kilometer course. Kayla jogs at 8 km per hour, and Thomas jogs at 12 km per hour. If Kayla has a 3-kilometer head start, can Thomas catch her?

10km - length of course
8 Km/hr - speed (rate) of Kayla
12 Km/hr - speed (rate) of Thomas
3 Km - head start for Kayla

* Hidden questions:
1. How long will it take Thomas to catch Kayla?
2. How far will they have jogged by then?

t - time for Thomas to catch Kayla (in hrs)

For Thomas to catch Kayla, the distance jogged must be the same.

* Note: $d = r \cdot t$

Distance jogged by Thomas = Distance jogged by Kayla

(Speed of Thomas) x (Time to catch-up) = Head start + (Speed of Kayla) x (Time to catch-up)

$12t = 3 + 8t$

$4t = 3$

$t = 3/4$ hrs

How far has Thomas jogged

$d = rt$

$d = (12)(3/4)$

$d = 9$ km

Thomas will catch Kayla before the end of the course.

3. In 1980, the town of Here had a population of 80,000 and the town of There had a population of 96,000. For the next ten years, the towns increased by 5000 people per year and 3000 people per year, respectively. During which year did the towns Here and There have populations of the same size?

80,000 - pop. of Here
96,000 - pop. of there
5,000 - increase per year of Here
3,000 - increase per year of There
y - # of years before the populations are the same

Population of Here = Population of There

$$\begin{pmatrix}\text{Pop. of}\\ \text{Here}\\ \text{in 1980}\end{pmatrix} + \begin{pmatrix}\text{yearly}\\ \text{increase}\\ \text{of Here}\end{pmatrix} \times \begin{pmatrix}\text{\# of}\\ \text{years}\end{pmatrix} = \begin{pmatrix}\text{Pop. of}\\ \text{There}\\ \text{in 1980}\end{pmatrix} + \begin{pmatrix}\text{yearly}\\ \text{increase}\\ \text{of There}\end{pmatrix} \times \begin{pmatrix}\text{\# of}\\ \text{years}\end{pmatrix}$$

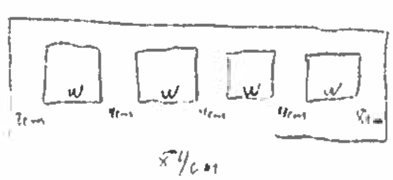
$$80,000 + 5000y = 96,000 + 3000y$$

$$2000y = 16,000$$

$$y = 8 \text{ yrs}$$

It took 8 years for the population to be the same. This would have been in 1988.

4. You need to display four graphs on a sheet of poster board measuring 84 centimeters wide. If you decide to have a uniform boarder of 8 cm around the edge of the poster board and to space the graphs 4 cm apart, how wide should you make each graph in order to fit all four in a row on the poster board? (Draw a picture.)



8cm - width of border
4cm - space between graphs

w = width of each graph (cm)

$$2\,(\text{Boarders}) + 3\,(\text{Space between graphs}) + 4\,(\text{width of graphs}) = \text{width of poster}$$

$$2(8) + 3(4) + 4w = 84$$

$$16 + 12 + 4w = 84$$

$$28 + 4w = 84$$

$$4w = 56$$

$$w = 14$$

The width of each graph should be 14 centimeters.