

## **Assignment #23: Multivariable Comparison Of Quantities**

Labeling is particularly pleasant when we are modeling a problem in more than one variable. We simply name the quantity we are labeling  $x$  or  $y$  or any other letter or combination of letters. (In writing computer programs, it is a good practice to have one's variables be whole words which remind the reader of the quantity they represent.) The only remaining tasks are to generate as many equations as we have variables, and then solve. Often we can reduce the number of equations and variables right away by doing a few simple substitutions. Re-doing a few of the problems in the earlier chapters using two variables will show this reduction.

Example: The difference of two numbers is 546 and twice their sum is 3 less than 5 times the larger number. Find the numbers.

Solution: Let the larger number be  $x$  and the smaller one be  $y$ . Here are the equations:

$$\begin{aligned}x - y &= 546 \\ 2(x+y) &= 5x - 3\end{aligned}$$

The choice of techniques is ours. One possibility is to solve for  $x$  to get  $x = 546 + y$ , and substitute.

Now we have  $2(546 + y + y) = 5(546 + y) - 3$  which we can solve easily.

### Problems

Solve for both variables. Be alert for **inconsistent** or **dependent** equations.

$$\begin{array}{ll}1. & 8x - 8y - 3 = -x + 9y - 75 \\ & 9x - 6y + 2 = -2x + 8y - 25 \\2. & 3x - 6y - 5 = 4x + 6y - 91 \\ & x - 5y + 1 = -4x + y + 101\end{array}$$

Find the values of all variables. Use any method, including Cramer's Rule.

3.  $x+3y+2z=-5$   
 $4x+2y+4z=-4$   
 $7x+5y+7z=-4$
4. Five yawns have 1000 more calories than two snores. Three yawns and two snores have 2500 calories. How many calories are in a snore?
5. The difference between two numbers is 23 less than their sum. Six times the smaller one is 7 more than 3 times the greater one. Find the smaller one.
6. Exactly \$1272 was distributed amongst 47 people. Some got \$24 and the rest got \$30. How many people got \$30 ?
7. The difference of two numbers is 12345 and their sum is 54321. Find the numbers.

(L): You have a barrel lock with 4 wheels, each of which has 6 numbers. If you can try one combination every three seconds, what is the maximum time it will take you to open the lock?

