

## Linear Systems: Applications, Part I

Mathematical equations are used to model or *represent* situations in the real world.

If we can model a situation that happens in the real world with one or more equations, and then solve the equations, well, then we have done something truly useful with mathematics.

**Example 1** In mathematics, how do we represent the following words?

sum, plus, total

difference, subtract

times

**Example 2** Write the words below as mathematical expressions.

- Let  $x$  represent the larger of two numbers, and  $y$ , the smaller. Write expressions for:
  - the sum of the two numbers
  - the smaller subtracted from the larger
  - the sum of six times the larger and two times the smaller
- A plane flies at  $x$  kilometers per hour in still air. The wind speed is  $y$  kilometres per hour. Write expressions for the speed of the plane when it is flying:
  - into the wind
  - with the wind
- A fitness centre charges an initiation fee of  $\$x$  plus a monthly charge of  $\$y$ . Write expressions to show how much it costs to be a member for:
  - 7 months
  - 15 months
- Tickets to a college swim meet cost \$10 for general admission and \$5 for students. There were  $x$  general admission tickets and  $y$  student tickets sold. Write expressions for:
  - the total number of tickets sold
  - revenue (money made), in dollars, from general admission tickets  $10x$
  - the revenue, in dollars, from student tickets
  - the total revenue from all the tickets

5. Traci invested \$ $x$  at 7% and \$ $y$  at 6%.
- write 7% as a decimal
  - write 6% as a decimal
  - write an expression for
    - the total amount of money Traci invested
    - the interest Traci earned at 7% in one year
    - the interest Traci earned at 6% in one year
    - the total interest Traci earned in one year

### **Solving Real World Problems Modeled by Linear Systems**

To solve these types of problems:

- read the problem carefully, underline what you are being asked to find, and assign variables to these "unknowns" (write "let" statements)
- write two equations that describe the relationship between the unknowns
- solve the system of equations

**Example 3** Solve the problem described below.

At a banquet hall to be used for a wedding, there will be two possible dishes served to guests: a chicken dish that costs \$16 and a beef dish that costs \$18. For the 300 guests attending the wedding, the total cost of preparing the food is \$5256. How many chicken dishes will need to be prepared and how many beef dishes will need to be prepared?