KEY

Lesson 7.1 ~ Developing Systems of Linear Equations

Some word problems that involve two unknown quantities can be solved if two equations relating them can be formed. We will learn several different methods to solve linear systems, but for now we just want to be able to write the equations for various word problems.

- Linear system: two linear equations with the same two variables
- Solve a linear system: find a solution (x, y) (works in both equations & lies on both graphs)
- Verify a solution to a linear system: substitute (x, y) into both original equations... should both work.

Steps:
1. **Let** Statement: select two variables to represent the two unknown values.
2. **Then** Statement: write a math sentence (equation) for one kind (unit) of data and a second math sentence (equation) for another kind (unit) of data.

Example #1: Create a linear system to model this situation: A rectangular stage has a perimeter of 158 ft. The width of the stage is 31 ft. less than the length. What are the dimensions of the stage?

Let w = width of the stage
ℓ = length of the stage

Then $2w + 2\ell = 158$
$w = \ell - 31$

Someone has determined that the stage is 55 ft. long and 24 ft. wide. Use the linear system to verify if this is correct.

$2(24) + 2(55) = 158$
$48 + 110 = 158$
$158 = 158$ ✓

$24 = 55 - 31$
$24 = 24$ ✓

Example #2: Create a linear system to model this situation: A school raised $140 by collecting 2000 cans and glass bottles for recycling. The school received 5¢ for a can and 10¢ for a bottle. How many of each type of recyclable did the school collect?

Let c = # of cans collected
b = # of bottles collected

Then $c + b = 2000$
$0.05c + 0.1b = 140$

The school collected 1200 cans and 800 bottles. Use the linear system to verify these numbers.

$1200 + 800 = 2000$
$2000 = 2000$ ✓

$0.05(1200) + 0.1(800) = 140$
$60 + 80 = 140$
$140 = 140$ ✓

Example #3: Create a linear system to model this situation: A tennis club charges an annual fee and an hourly fee for court time. One year, one member played for 39 h and paid $384. Another member played for 51 h and paid $456. What are the annual and hourly fees?

Let a = annual fee ($)
h = hourly fee ($)

Then $a + 39h = 384$
$a + 51h = 456$

Example #4: Create a linear system to model this situation: Tickets for a school play cost $4.00/adult and $2.50/student. Nine hundred tickets were sold for $2820. How many of each kind were sold?

Let a = # of adult tickets
s = # of student tickets

Then $a + s = 900$
$4a + 2.5s = 2820$