

5.1 – 5.3 extension

Using linear systems to represent and solve word problems and mixture problems.

Steps to solving word problems:

1. Identify and write down your variables (you should have two).
2. Using these variables, write two equations that represent the information you have been given. (Write a system of equations).
3. Solve the system using one of the methods you have learned in class (graphing, substitution or elimination).
4. Give your answer in a sentence.

Example 1: Many businesses pay website hosting companies to store and maintain the computer files that make up their websites. Internet service providers also offer website hosting. The costs for website hosting offered by a website hosting company and an Internet service provider are shown in the table. Find the number of months after which the total cost for website hosting will be the same for both companies.

Company	Set up fee (dollars)	Cost per month (dollars)
Internet service provider	10	21.95
Website hosting company	none = 0	22.45

1. Identify variables:

$$x = \# \text{ of months}$$

$$y = \text{total cost}$$

2. Write a system of equations.

use $y = mx + b$ b/c $x \rightarrow$ ind. and $y \rightarrow$ dep.

$$y = 21.95x + 10$$

$$y = 22.45x$$

3. Solve the system

$$\begin{array}{r} 22.45x = 21.95x + 10 \\ -21.95x \quad -21.95x \\ \hline .5x = 10 \end{array}$$

$$\frac{.5x}{.5} = \frac{10}{.5}$$

$$x = 20$$

$$(20, 449)$$

$$y = 22.45(20)$$

$$y = 449$$

$$\text{check: } 449 = 21.95(20) + 10$$

$$449 = 439 + 10$$

$$449 = 449 \checkmark$$

$$449 = 22.45(20)$$

$$449 = 449 \checkmark$$

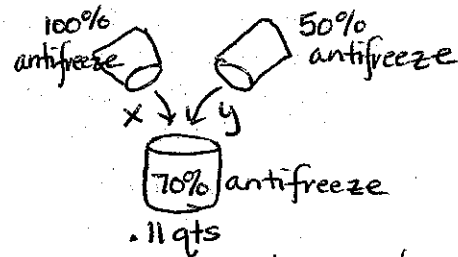
4. Give your answer in a sentence.

After 20 months, the total cost (\$449) will be the same for both companies.

Example 2 (A mixture problem): ← choose 1 component to focus on

For extremely cold temperatures, an automobile manufacturer recommends that a 70% antifreeze and 30% water mix be used in the cooling system of a car. How many quarts of pure (100%) antifreeze and a 50% antifreeze and 50% water mix should be combined to make 11 quarts of a 70% antifreeze and 30% water mix?

1. Identify variables: $x = \text{qts of 100\% antifreeze}$
 $y = \text{qts of 50\% antifreeze}$



2. Write system of equations (remember to change percents to decimals).

$$\begin{aligned} x + y &= 11 \\ 1x + .5y &= 7.7 \end{aligned}$$

← how much is pure antifreeze
 70% of 11
 $.7 \cdot 11$
 7.7 qts of pure antifreeze

3. Solve system of equations.

$$\begin{array}{r} (x+y=11) \cdot -1 \\ x+.5y=7.7 \end{array} + \begin{array}{r} -x+-y=-11 \\ x+.5y=7.7 \\ \hline -.5y=-3.3 \\ \hline -.5 \quad -.5 \\ y=6.6 \end{array}$$

$$\begin{aligned} x + 6.6 &= 11 \\ -6.6 \quad -6.6 & \quad (4.4, 6.6) \\ x &= 4.4 \end{aligned}$$

Check:

$$\begin{aligned} 4.4 + 6.6 &= 11 \\ 11 &= 11 \checkmark \\ 4.4 + .5(6.6) &\stackrel{?}{=} 7.7 \\ 4.4 + 3.3 &\stackrel{?}{=} 7.7 \\ 7.7 &= 7.7 \checkmark \end{aligned}$$

4. Give your answer in a sentence.

You will need ^{to} add 4.4 qts of 100% antifreeze to 6.6 qts. of 50% antifreeze to get 11 qts. of 70% antifreeze.