

Applications of Systems of Linear Equations

Example:

a) Define your variables and write a linear system to model this situation:

Alexia invested \$1800, part at an annual interest rate of 3.5% and the rest at an annual interest rate of 4.5%. After one year, the total interest was \$73.

let x = amount invested at 3.5% $x + y = 1800$
 y = amount invested at 4.5% $0.035x + 0.045y = 73$

b) Solve this problem. How much money did Alexia invest at each rate?

$$\begin{aligned} x + y &= 1800 & 0.035x + 0.045y &= 73 \\ y &= 1800 - x & & \\ & & 0.035x + 0.045(1800 - x) &= 73 \\ & & 0.035x + 81 - 0.045x &= 73 \\ & & 81 - 0.01x &= 73 \\ & & -0.01x &= -8 \\ & & x &= 800 \end{aligned}$$

$y = 1800 - 800$
 $y = 1000$
 \$800 at 3.5% and \$1000 at 4.5%

Example:

a) Define your variables and write a linear system to model this situation:

At a campground, 5 large tanks and 5 small tanks contained 3200L of drinking water. When one of the small tanks was replaced with a large tank, there was 3400L of drinking water.

let L = capacity of large tank $5L + 5S = 3200$
 S = capacity of small tank $6L + 4S = 3400$

b) Solve this problem. What volume of water does each tank hold?

$$\begin{aligned} & 6 \times (5L + 5S = 3200) \\ & - 5 \times (6L + 4S = 3400) \\ \hline & 30L + 30S = 19200 \\ + & -30L - 20S = -17000 \\ \hline & 10S = 2200 \\ & S = 220 \end{aligned}$$

$$\begin{aligned} & 5L + 5S = 3200 \\ & 5L + 5(220) = 3200 \\ & 5L + 1100 = 3200 \\ & 5L = 2100 \\ & L = 420 \end{aligned}$$

Small tank: 220L Large tank: 420L

Example:

- a) Define your variables and write a linear system to model this situation:

Each time Trisha went to the school cafeteria, she bought either a bowl of soup for \$1.75 or a main course for \$4.75. During the school year, she spent \$490 and bought 160 food items.

let S = number of bowls of soup $1.75S + 4.75M = 490$
 m = number of main courses $S + M = 160$

- b) Solve this problem. How many times did Trisha buy soup How many times did she buy a main course?

$$\begin{aligned} S + M &= 160 \\ S &= 160 - M \\ 1.75S + 4.75M &= 490 \\ 1.75(160 - M) + 4.75M &= 490 \\ 280 - 1.75M + 4.75M &= 490 \\ 280 + 3M &= 490 \\ 3M &= 210 \\ M &= 70 \\ S &= 160 - 70 \\ &= 90 \end{aligned}$$

90 bowls of soup and 70 main courses.