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MAKING & USING A STUDY GUIDE

Personal Math Trainer

Study Guide Exam-3: Modeling with Linear Systems



Study Guide: helps you ^①summarize,
^②visualize, and ^③analyze
concepts learned in class

* Warning: simply making a study guide
does not guarantee you an
A+ on the test.

1. A company has to buy computers and printers. Each computer, x , costs \$555 and each printer, y , costs \$355. If the company spends \$5,615 and buys a total of 13 machines, how many of each did it buy?

Enter a system of equations to represent the situation, then solve the system.

buys a total of 13 machines.

computer, x , costs \$555 and each printer, y , costs \$355. If the company spends \$5,615.

The system of equations is $x + y = 13$ and $555x + 355y = 5,615$.

$$555x + 355y = 5,615$$

$$x + y = 13$$

Multiply the second equation by -555 and simplify.

~~$$555x + 355y = 5,615$$~~

~~$$-555x + -555y = -7,215$$~~

$$-200y = -1,600$$

$$y = 8$$

Add the two equations.

$$x + y = 13$$

Original second equation

$$x + 8 = 13$$

Substitute 8 for y .

$$x = 5$$

So, the company bought 5 computers and 8 printers.

2. Molly went shopping to buy jewelry. All of the pairs of earrings, e , cost \$13.25 and the necklaces, n , cost \$39.75. If she spends \$92.75 and buys 5 items, how many necklaces and pairs of earrings did she buy?

Enter a system of equations to represent the situation, then solve the system. Justify your answer.

$$\begin{array}{r} 13.25e + 39.75n = \$92.75 \\ e + n = 5 \end{array} \quad \text{Multiply the second equation by } -13.25.$$

$$\begin{array}{r} \cancel{13.25e} + 39.75n = 92.75 \\ \cancel{-13.25e} + (-13.25)n = -66.25 \\ \hline 26.5n = 26.5 \end{array} \quad \text{Add the two equations.}$$

$$n = 1$$

$$e + n = 5$$

$$e + 1 = 5$$

$$e = 4$$

The answers check. So, Molly bought 4 pairs of earrings and 1 necklaces.

3. Katie is purchasing plates and mugs for her house. She would like to buy at least 7 items. Determine the possibilities if the plates, x , cost \$9 each and the mugs, y , cost \$8 each, and she plans to spend no more than \$76. How many of each item can she purchase?

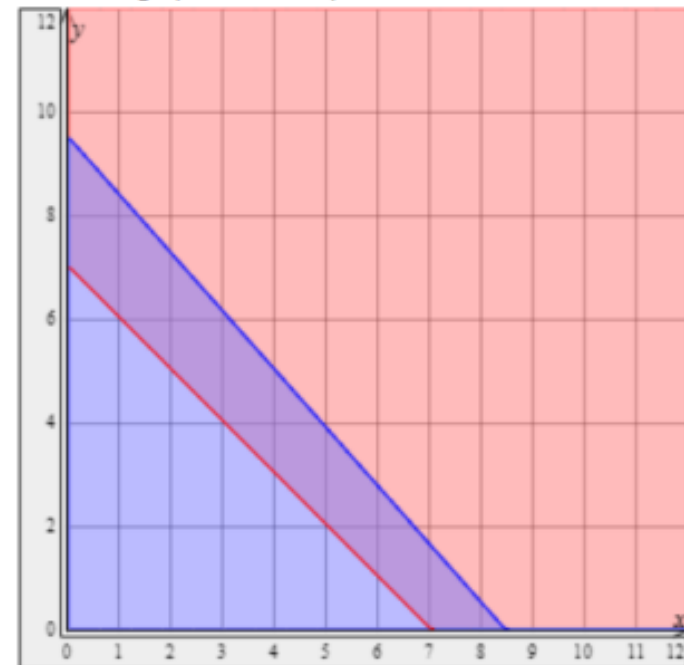
Enter the system of inequalities that represents the situation. Then select the graph of the system and select one possible solution.

Katie may purchase 7 or more items.

$$x + y \geq 7$$

\$76 is the spending limit, so the cost must be less than or equal to it.

$$9x + 8y \leq 76$$



Calculate the cost of 2 plates and 7 mugs to determine if the second inequality is true.

4.

The sum of 7 times one number, x , and 5 times a second number, y , is 176. If the sum of the two numbers is 30, find the two numbers.

Enter a system of equations to represent the situation, then solve the system.

$$7x + 5y = 176$$

$$x + y = 30$$

$$7x + 5y = 176$$

$$-7x + -7y = -210$$

$$-2y = -34$$

$$y = 17$$

$$x + y = 30$$

$$x + 17 = 30$$

$$x = 13$$

Complete the first equation for the sum of the products.

Complete the second equation for the sum of the numbers.

Multiply the second equation by -7 and simplify.

Add the two equations.

Solve for y .

Original second equation

Substitute 17 for y .

Solve for x .

So, the first number is 13 and the second number is 17.

5.

Meaghan goes to the grocery store to buy hot dogs and hamburgers for a cookout. She buys a total of 10 packages for a total of \$46.40. If a package of hot dogs, d , costs \$2.19 and a package of hamburgers, b , costs \$5.69, determine how many packages of each she bought.

Enter a system of equations to represent the situation, then solve the system.

$$2.19d + 5.69b = \$46.40$$

$$d + b = 10$$

$$2.19d + 5.69b = 46.40$$

$$-2.19d + -2.19b = -21.90$$

$$3.50b = 24.50$$

$$b = 7$$

$$d + b = 10$$

$$d + 7 = 10$$

$$d = 3$$

Complete the first equation for the total cost.

Complete the second equation for the total number of packs.

Multiply the second equation by -2.19 and simplify.

Add the two equations.

Solve for b .

Original second equation

Substitute 7 for b .

Solve for d .

So, Meaghan bought 3 packages of hot dogs and 7 packages of hamburgers.

6.

The sum of 3 times one number, x , and 5 times a second number, y , is 53. If the sum of the two numbers is 13, find the two numbers.

Enter a system of equations to represent the situation, then solve the system.

$$3x + 5y = 53$$

$$x + y = 13$$

$$3x + 5y = 53$$

$$-3x + -3y = -39$$

$$2y = 14$$

$$y = 7$$

$$x + y = 13$$

$$x + 7 = 13$$

$$x = 6$$

Complete the first equation for the sum of the products.

Complete the second equation for the sum of the numbers.

Multiply the second equation by -3 and simplify.

Add the two equations.

Solve for y .

Original second equation

Substitute 7 for y .

Solve for x .

So, the first number is 6 and the second number is 7.

7.

Nicole has 15 nickels n and dimes d . If the value of her coins is \$0.95, how many of each coin does she have?

Enter a system of equations to represent the situation, then solve the system.

$$0.05n + 0.10d = \$0.95$$

$$n + d = 15$$

$$0.05n + 0.10d = 0.95$$

$$-0.05n + -0.05d = -0.75$$

$$0.05d = 0.20$$

$$d = 4$$

$$n + d = 15$$

$$n + 4 = 15$$

$$n = 11$$

So, Nicole has 11 nickels and 4 dimes.

Complete the first equation for the total value.

Complete the second equation for the total number of coins.

Multiply the second equation by -0.05 and simplify.

Add the two equations.

Solve for d .

Original second equation

Substitute 4 for d .

Solve for n .

8.

A local fish market is selling fish and lobsters by the pound. The fish, f , costs \$6.50 a pound, while the lobster, l , costs \$7.50 a pound. The fish market sells 22.5 pounds and makes \$156.75. How many pounds of fish and pounds of lobster did the market sell?

Enter a system of equations to represent the situation, then solve the system.

$$6.50f + 7.50l = \$156.75$$

$$f + l = 22.5$$

$$6.50f + 7.50l = 156.75$$

$$-6.5f + (-6.5l) = -146.25$$

$$1l = 10.5$$

$$l = 10.5$$

$$f + l = 22.5$$

$$f + 10.5 = 22.5$$

$$f = 12$$

Complete the first equation for the total revenue.

Complete the second equation for the total number of pounds.

Multiply the second equation by -6.5 and simplify.

Add the two equations.

Solve for l .

Original second equation

Substitute 10.5 for l .

Solve for f .

So, the market sold 12 pounds of fish and 10.5 pounds of lobster.

9.

There are 160 adults and 250 children at a zoo. The zoo makes a total of \$5,970 from the entrance fees, and the cost of an adult and a child to attend is \$30, how much does it cost each for a parent and a child?

Let a represent an adult.

Let c represent a child.

Enter a system of equations to represent the situation, then solve the system.

$$160a + 250c = \$5,970$$

$$a + c = \$30$$

$$160a + 250c = 5,970$$

$$-160a + -160c = -4,800$$

$$90c = 1,170$$

$$c = 13$$

$$a + c = 30$$

$$a + 13 = 30$$

$$a = 17$$

Complete the first equation for the total entrance fees.

Complete the second equation for the cost of 1 adult and 1 child ticket.

Multiply the second equation by -160 and simplify.

Add the two equations.

Solve for c .

Original second equation

Substitute 13 for c .

Solve for a .

So, the adult tickets cost \$17 and the child tickets cost \$13.

10.

John is selling tickets to an event. Attendees can either buy a general admission ticket, x , or a VIP ticket, y . The general admission tickets are \$65 and the VIP tickets are \$80. If he knows he sold a total of 26 tickets and made \$1,915, how many of each type did he sell?

Enter a system of equations to represent the situation, then solve the system.

$$65x + 80y = \$1,915$$

$$x + y = 26$$

$$65x + 80y = 1,915$$

$$-65x + -65y = -1,690$$

$$15y = 225$$

$$y = 15$$

$$x + y = 26$$

$$x + 15 = 26$$

$$x = 11$$

Complete the first equation for the total sales.

Complete the second equation for the total number of tickets.

Multiply the second equation by -65 and simplify.

Add the two equations.

Solve for y .

Original second equation

Substitute 15 for y .

Solve for x .

So, John sold 11 general admission tickets and 15 VIP tickets.

11.

Jan spends part of her year as a member of a gym. She then finds a better deal at another gym, so she cancels her membership with the first gym after x months and spends the rest of the year, y months, with the second gym. The membership to the first gym costs \$70 per month, while the membership for the second gym costs \$45 per month. If she ended up spending a total of \$790 over the course of the year, how much time did she spend at each gym?

Enter a system of equations to represent the situation, then solve the system.

$$70x + 45y = \$790$$

$$x + y = 12$$

$$70x + 45y = 790$$

$$-70x + -70y = -840$$

$$-25y = -50$$

$$y = 2$$

$$x + y = 12$$

$$x + 2 = 12$$

$$x = 10$$

Complete the first equation for the total cost of membership.

Complete the second equation for the total number of months.

Multiply the second equation by -70 and simplify.

Add the two equations.

Solve for y .

Original second equation

Substitute 2 for y .

Solve for x .

So, Jan spent 10 months at the first gym and 2 months at the second gym.

12.

A jar contains n nickels and d dimes. There are 30 coins in the jar, and the total value of the coins is \$2.00.

Set up and solve a system of equations to find how many nickels and how many dimes are in the jar.

Set up the system of equations.

$$\begin{cases} 0.05n + 0.10d = 2.00 \\ n + d = 30 \end{cases}$$

Solve the second equation for d .

$$\begin{aligned} n + d &= 30 \\ d &= 30 - n \end{aligned}$$

Substitute $(30 - n)$ in for d in the first equation.

$$\begin{aligned} 0.05n + 0.10d &= 2.00 \\ 0.05n + 0.10(30 - n) &= 2.00 \\ 0.05n + 3.00 - 0.10n &= 2.00 \\ 3.00 - 0.05n &= 2.00 \\ -0.05n &= -1.00 \\ n &= 20 \end{aligned}$$

Solve for n .

Substitute 20 for n in the second equation to find d .

$$\begin{aligned} d &= 30 - n \\ d &= 30 - 20 \\ d &= 10 \end{aligned}$$

Therefore, there are 20 nickles and 10 dimes.

13.

Nathan buys coffee and hot chocolate for his co-workers. Each cup of coffee costs \$1.50 and each cup of hot chocolate costs \$1.05. If he pays a total of \$12.15 for 9 cups, how many of each does he buy?

Create a table to organize the information.

	Coffee	Hot Chocolate	Total
Number of cups	c	h	9
Cost	$\$1.50c$	$\$1.05h$	$\$12.15$

Use the information to write a system of equations.

$$1.50c + 1.05h = 12.15$$

Total amount spent on c cups of coffee and h cups of hot chocolate.

$$c + h = 9$$

Total number of cups bought.

Multiply the second equation by -1.50 to get opposite coefficients for c .

$$-1.50(c + h = 9)$$

$$-1.50c - 1.50h = -13.50$$

Add the new equation to the first equation.

$$\begin{array}{r} 1.50c + 1.05h = 12.15 \\ +(-1.50c - 1.50h = -13.50) \\ \hline -0.45h = -1.35 \end{array}$$

Solve for h .

$$-0.45h = -1.35$$

$$h = 3$$

Substitute the value found for h back into one of the original equations and solve for

$$c + h = 9$$

$$c + 3 = 9$$

$$c = 6$$

Nathan buys 6 cups of coffee and 3 cups of hot chocolate.

14.

The sum of 4 times one number and 3 times a second number is 65. The sum of the two numbers is 18. What is the larger of the two numbers?

The larger of the two numbers is .

$$4x + 3y = 65$$

$$x + y = 18 \quad \text{*multiply by -4}$$

$$\begin{array}{r} \cancel{4x} + 3y = 65 \\ \cancel{-4x} - 4y = 72 \\ \hline \end{array}$$

$$-y = -7$$

$$y = 7 \text{ and } 18 - 7 = 11$$

15.

Steven wants to buy a couch that costs \$475. He has already saved \$120. He plans to save \$25 a week. Enter a function to represent the amount Steven will have saved in x weeks. Will he have enough to buy the couch in 10 weeks? Complete the explanation.

The function is $f(x) = 25x + 120$. In 10 weeks, he will not have saved enough to buy the couch. I found $f(10)$, which is 370. This means that he will have saved \$370 in 10 weeks. The couch costs \$475, which is more than \$370.