

Algebra 2

Unit 0 - Lesson 6: System Word Problems

- Solve word problems using systems of equations
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Review: Write the following sentences as algebraic expressions.

Ex: Two numbers sum to 45.

$$x + y = 45$$

Ex: Seven **less than** 4 times a number is 16.

$$4x - 7 = 16$$

Disclaimer: The problems we are doing for today's lesson are very similar to the problems you will get on your worksheet, as well as the problems you will get on your quiz & test over unit 0. Make sure to take notes so you can refer back to these examples when you need help on the worksheet.

Word problems are all about expressing the problem as math expressions and equations. It's recommended that you read the problem and write down only the important bits for the examples this lesson.

Ex: Tom and Jerry are each selling dairy products to repair the house damage caused by Tom in his endless pursuit of Jerry... Tom sold 5 gallons of milk and 3 packs of cheese for \$16.66. Jerry sold 6 packs of cheese and 2 gallons of milk for \$16.12. What is the price of each individual product.

Cheese pack : $z = \$1.97$

gallon of milk : $a = \$2.15$

$$\left. \begin{array}{l} -2(5a + 3z = 16.66) \\ 2a + 6z = 16.12 \end{array} \right\} \text{system of equations}$$

$$\rightarrow -10a - 6z = -33.32$$

$$\frac{-8a}{-8} = \frac{-17.20}{-8}$$

$$a = \$2.15$$

Finding z : $2(2.15) + 6z = 16.12$

$$z = \$1.97$$

$$4.30 + 6z = 16.12$$

$$-4.30 \quad -4.30$$

$$\frac{6z}{6} = \frac{11.82}{6}$$

Now you try to work on problem number 1 on the worksheet.

Chelsea and Roberto each sell baked goods for their club's fundraiser. Chelsea sells 13 cookies and 7 brownies and collects a total of \$11.75. Roberto sells 10 cookies and 14 brownies and collects a total of \$15.50. How much did they charge for the cookies and the brownies?

c: cookies b: brownies

$$\begin{array}{r} -2(13c + 7b = 11.75) \\ 10c + 14b = 15.50 \\ \hline -26c - 14b = -23.50 \end{array}$$

$$-16c = -8$$

$$c = \$0.50$$

$$\begin{array}{r} 13(0.5) + 7b = 11.75 \\ 6.5 + 7b = 11.75 \\ -6.5 \\ \hline 7b = 5.25 \\ \frac{7b}{7} = \frac{5.25}{7} \end{array}$$

$$b = \$0.75$$

Ex: You take a trip to Sprouts for some granola and buy one pound of two different types. The first type has 60% corn flakes and 40% strawberry granola and costs \$2.75. The second type has 100% strawberry granola and costs \$4.90. Assuming the price is constant for the ingredients, how much would a bag of 70% granola and 30% corn flakes cost?

c : corn flakes s : strawberry granola

Convert % to Decimals

$$60\% = 0.6$$

$$0.6c + 0.4s = 2.75$$

$$1s = 4.90$$

$$0.6c + .4(4.90) = 2.75$$

$$0.6c + 1.96 = 2.75$$

$$\begin{array}{r} -1.96 \\ \hline \end{array}$$

$$\begin{array}{r} 0.6c = 0.79 \\ \hline .6 \end{array}$$

$$| c = \$1.32$$

Now let's try number 3 on the worksheet:

A one pound mix consisting of 30% cashews and 70% pistachios sells for \$6.25. A one pound mix consisting of 80% cashews and 20% pistachios sells for \$7.50. How much would a mix consisting of 50% of each type of nut sell for?

$$\begin{array}{l} -.8 \left(.3c + .7p = 6.25 \right) \\ .3 \left(.8c + .2p = 7.50 \right) \end{array}$$

$$\begin{array}{r} - .24c - .56p = -5 \\ .24c + .06p = 2.25 \end{array}$$

$$-.5p = -2.75$$

$$p = 5.5$$

Systems of equations that are best to graph:

When word problems ask for things like "At what point does doing X become cheaper than doing Y", your best bet is to graph the equations and look at the graph.

Rental car company A charges \$30 per day plus \$0.51 per mile driven. A second car rental company B charges \$25 per day plus \$0.57 per mile driven. For small distances, company B is cheaper. **At what amount of miles driven does company A become the better deal?**

For problems where you are adding things up to make a total price, and you don't have separate goods, you should almost always make Y represent your total cost.

$$y = 0.51x + 30$$

$$y = 0.57x + 25$$

