

Story problems often involve two equations we need to solve as a system.

Elementary Algebra  
Class Notes

Problem Solving with Systems of Linear Equations (section 4.5)

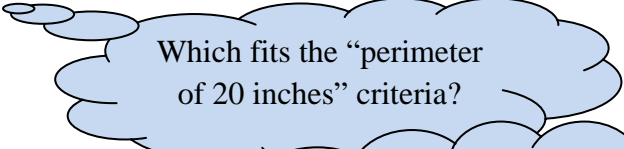
We will solve systems of equations here but will need to write the equations ourselves. We can usually start by defining  $x$  and  $y$  to be the two things we are asked to find. Choose whichever method you like to solve each system.

These problems may look familiar. We solved problems like these earlier but used only one variable. Here, we will use two variables.

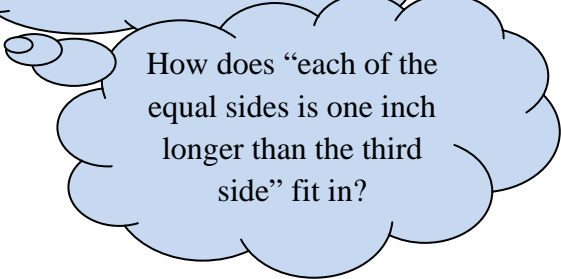
expl 1: Without actually solving the problem, choose the correct solution by deciding which choice satisfies the given criteria.

*An isosceles triangle, a triangle with two equal sides, has a perimeter of 20 inches. Each of the equal sides is one inch longer than the third side. Find the lengths of the three sides.*

- a.) 6 inches, 6 inches, 7 inches
- b.) 7 inches, 7 inches, 6 inches
- c.) 6 inches, 6 inches, 8 inches

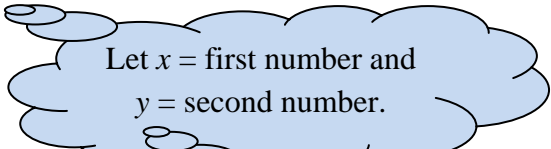


Which fits the “perimeter of 20 inches” criteria?

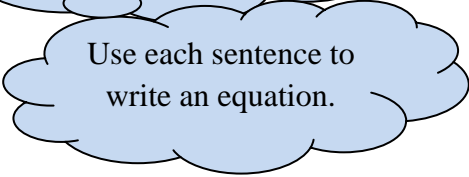


How does “each of the equal sides is one inch longer than the third side” fit in?

expl 2: A first number plus twice a second number is 8. Twice the first number, plus the second number is 25. Find the two numbers.

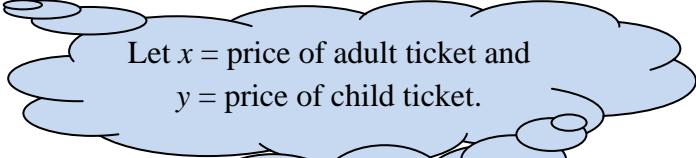


Let  $x$  = first number and  
 $y$  = second number.

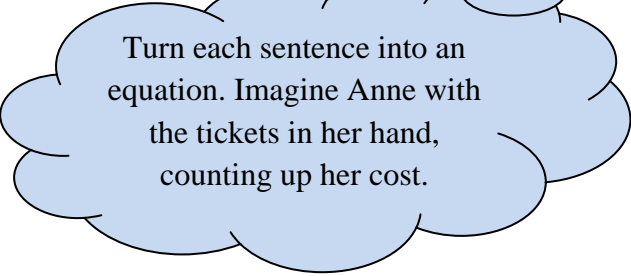


Use each sentence to write an equation.

expl 3: Anne has been pricing Amtrak train fares for a group trip to New York. Three adults and four children must pay \$159. Two adults and three children pay \$112. Find the price of an adult's ticket and the price of a child's ticket.

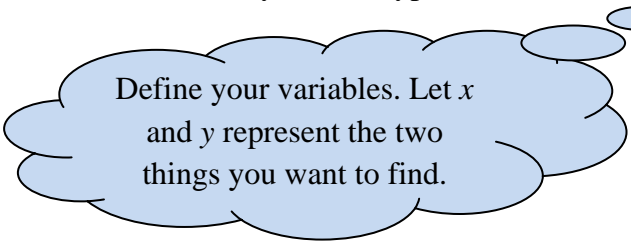


Let  $x$  = price of adult ticket and  
 $y$  = price of child ticket.

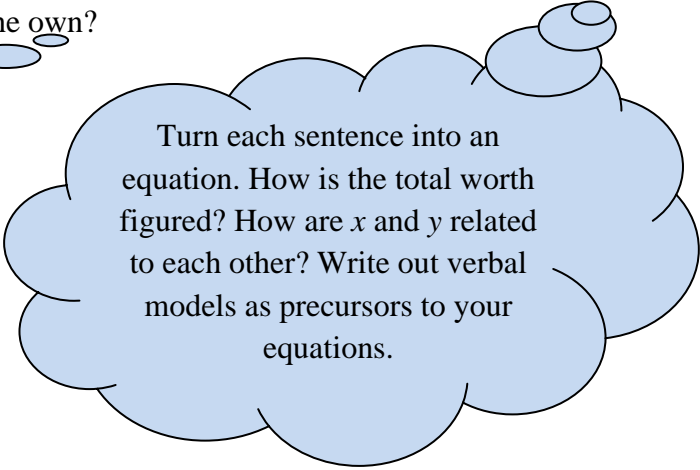


Turn each sentence into an equation. Imagine Anne with the tickets in her hand, counting up her cost.

expl 4: Pho Lin has investments in eBay and Amazon stock. On March 9, 2007, eBay stock closed at \$30.82 per share and Amazon stock closed at \$38.84 per share. Pho's portfolio was worth \$2866.60 at the end of the day. If Pho owns 20 more shares of Amazon stock than eBay stock, how many of each type of stock does he own?



Define your variables. Let  $x$  and  $y$  represent the two things you want to find.



Turn each sentence into an equation. How is the total worth figured? How are  $x$  and  $y$  related to each other? Write out verbal models as precursors to your equations.

expl 5: Jim began a 96 mile bicycle trip. Unfortunately, his chain broke and he had to walk the last part of his trip. The whole trip took a total of 6 hours. If Jim walks at a rate of 4 miles per hour and he bicycles at a rate of 20 miles per hour, find the amount of time he spent on the bicycle.

Define your variables. Let  $x$  represent what you want to find. What will you let  $y$  represent?

Turn each sentence into an equation. The total distance is 96 miles. The total time is 6 hours.

Both are split up between walking and biking. Write out verbal models as precursors to your equations.

$$d = r \cdot t$$

expl 6: Doreen is a chemist with Gemco Pharmaceutical. She needs to prepare 12 ounces of a 9% hydrochloric acid solution. Find the amount of a 4% solution and the amount of a 12% solution she should mix to get the 9% solution she needs.

Define your variables. Let  $x$  and  $y$  represent the two things you want to find.

First equation: The amount of pure acid from the 4% solution **plus** the amount of pure acid from the 12% solution **equals** the amount of pure acid in the final (9%) solution.

Some people find it helpful to complete a table.

	Ounces	*	Concentration	=	Amount of Pure Acid
4% Solution					
12% Solution					
9% (Final) Solution					

Knowing the amount of a particular solution and its concentration, how do you calculate the amount of pure acid present?

What fact forms your second equation?