

Name: _____

Date: _____

MODELING WITH SYSTEMS OF EQUATIONS
COMMON CORE ALGEBRA I



Many real world scenarios can be modeled using systems of equations. In fact, when we have two quantities that are related and two ways in which those quantities are related, then we can often set up and solve a system.

Exercise #1: Jonathan has nine bills in his wallet that are all either five-dollar bills or ten-dollar bills.

(a) Fill out the following table to see the dependence of the two variables and how they then determine how much money Jonathan has.

Number of fives, f	Number of tens, t	Amount of Money, \$
0		
1		
2		
3		

(b) If f represents the number of \$5 bills and t represents the number of \$10 bills, then what does the following expression calculate? Explain.

$$5f + 10t$$

(c) If Jonathan has a total of \$55, set up a system of equations involving f and t that could be used to determine how many of each bill he has. Solve the system. Remember that he has 9 total bills.

(d) Let's say that we were told that Jonathan had seven bills that were all 5's and 20's and we were also told that he had a total of \$120. Set up and solve a system to help evaluate whether we could have been told true information.



There are many different problems that can be modeled with linear systems. Let's try another one where we use information given to determine **unit prices**.

Exercise #2: Samantha went to a concession stand and bought three pretzels and four sodas and paid a total of \$11.25 for them. Raza went to the same stand and bought five pretzels and two sodas and paid a total of \$8.25.

- (a) Could pretzels have cost \$1.75 each and sodas \$1.50 each? How can you evaluate based on the information given?
- (b) Letting x equal the **unit cost** of a pretzel and letting y equal the **unit cost** of a soda, write a system of equations that models the information given.
- (c) Solve the system of equations using the elimination method.
- (d) If Leah went to the same concession stand and bought two sodas, how many pretzels would she need to buy so that she spent the same amount on both?

We can model information given in a geometric form as well. We should feel relatively comfortable working with rectangles and their perimeters. The next question concerns the relationship between the length and width of a rectangle.

Exercise #3: A rectangle has a perimeter of 204 feet. It's length is six feet longer than twice its width. If L stands for the length of the rectangle and W stands for its width, write a system of equations that models the information given in this problem and solve it to find the length and width of this rectangle.



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APPLICATIONS

- A local theater is showing an animated movie. They charge \$5 per ticket for a child and \$12 per ticket for an adult. They sell a total of 342 tickets and make a total of \$2550. We want to try to find out how many of each type of ticket they sold. Let c represent the number of children's tickets sold and a represent the number of adult tickets sold.

(a) Write an equation that represents the fact that 342 total tickets were sold. (b) Write an equation representing the fact that they made a total of \$2550.

(c) Solve the system you created in (a) and (b) by the Method of Elimination.
- A catering company is setting up tables for a big event that will host 764 people. When they set up the tables they need 2 forks for each child and 5 forks for each adult. The company ordered a total of 2992 forks. Set up a system of equations involving the number of adults, a , and the number of children, c , and solve to find out how many of each attended the event.
- Ilida went to Minewaska Sate Park one day this summer. All of the people at the park were either hiking or bike riding. There were 178 more hikers than bike riders. If there were a total of 676 people at the park, how many were hiking and how many were riding their bikes?



4. Juanita and Keenan own a camping supply store and just put in an order for flashlights and sleeping bags. The number of flashlights ordered was five times the number of sleeping bags. The flashlights cost \$12 each and the sleeping bags cost \$45 each. If the total cost for the flashlights and sleeping bags was \$1785, how many flashlights and how many sleeping bags did Juanita and Keenan order?
5. For a concert, there were 206 more tickets sold at the door than were sold in advance. The tickets sold at the door cost \$10 and the tickets sold in advance cost \$6. The total amount of sales for both types of tickets was \$6828. How many of *each* type of ticket was sold?
6. Eldora and Finn went to an office supply store together. Eldora bought 15 boxes of paper clips and 7 packages of index cards for a total cost of \$55.40. Finn bought 12 boxes of paper clips and 10 packages of index cards for a total cost of \$61.70. Find the cost of one box of paper clips and the cost of one package of index cards.

