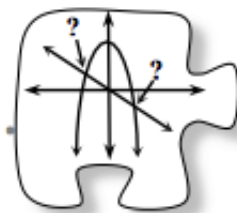# 4.1.4 How can I use systems?

Using Systems of Equations to Solve Problems

You have developed several strategies for solving equations and systems of equations. You have also focused on the meaning of a solution. In this lesson, you will have the opportunity to see how your strategies can be used in everyday contexts. You will expand your understanding of solutions by applying them to these situations. As you work today, use the questions below to help stimulate mathematical conversations:

How can we model this situation with equations?

What does this solution tell us?

How can we solve it?

Are there any other strategies that could be useful?

4-47. HOW TALL IS HAROLD?

Jamal and Dinah were still eating lunch as they came into Algebra 2 class. Someone had left a book on the floor and they both tripped. As they each hit the floor, the food they were carrying went flying across the room directly toward Harold, who was showing off his latest dance moves.

As Jamal and Dinah watched in horror, Jamal's cupcake and Dinah's sandwich splatted right on top of Harold's head! Jamal's cupcake flew on a path that would have landed on the floor 20 feet away from him if it had not hit Harold. Dinah's sandwich flew on a path that would have landed on the floor 24 feet away from her if it had not hit Harold. Jamal's cupcake flew 9 feet high, while Dinah's sandwich reached a height of 6 feet, before hitting Harold.

How tall is Harold? Show your solution in as many ways as you can.

4-48. Write a system of equations to fit the situation below. Then solve the system using as many strategies as you can. How many solutions are possible?

Your math class wants to collect money for a field trip, so it decides to sell two kinds of candy bags. The Chocolate Lovers Bag costs $4.25 for five chocolate truffles and two caramel turtle candies. The Combusting Caramel Bag costs $3.50 for eight caramel turtle candies and two chocolate truffles. How much does each chocolate truffle and caramel turtle candy cost?

4-49. Lucky you! You are a new college graduate and have already been offered two jobs. Each job involves exactly the same tasks, but the salary plans differ, as shown below. can't make bullets show for Jobs below!

- Job A offers a starting salary of $52,000 per year with an annual increase of $3,000.

- Job B starts at $36,000 per year with a raise of 11% each year.

   a. Under what conditions would Job A be a better choice? When would Job B be a better choice? Use graphs, tables, and equations to help you justify your answer.

   b. How could you change this problem slightly so that Job B is always the better choice? How could you change it so that Job A is always better? If it is not possible for Job A or Job B always to be a better choice, explain why not.

4-50. LEARNING LOG

What does the solution to a system of equations mean? Can you find more than one way to answer that question? Create a Learning Log entry that expands on your thinking about the meaning of a solution. Title this entry "The Meaning of Solution, Part 2" and label it with today's date.

—————— Review & Preview ——————

4-51. Gloria is weighing combinations of geometric solids. She found that 4 cylinders and 5 prisms weigh 32 ounces and that 1 cylinder and 8 prisms weigh 35 ounces. Write and solve a system of equations to determine the weight of each cylinder and prism. Help (Html5)⇔Help (Java)

4-52. Is $x = -1$ a solution to the inequality $2x^2 + 5x - 3 \leq x^2 + 4x + 3$? What about $x = 5$? Show how you know. Then find three more solutions. Help (Html5)⇔Help (Java)

4-53. Solve each equation below algebraically. Think about Rewriting, Looking Inside, or Undoing to simplify the process. Help (Html5)⇔Help (Java)

   a. $5 - 3(\frac{1}{2}x + 2) = -7$

   b. $5(\sqrt{x-2} + 1) = 15$

   c. $12 - (\frac{2x}{3} + x) = 2$

   d. $-3(2x + 1)^3 = -192$

4-54. Given the parabola $y = x^2 - 8x + 10$, complete parts (a) through (c) below. Help (Html5)⇔Help (Java)

a. Find the vertex by averaging the x-intercepts.

b. Find the vertex by completing the square.

c. Find the vertex of $y = x^2 - 3x$ using your method of choice.

4-55. Refer back to the graphs you made for problem 4-34. (It was a homework problem from Lesson 4.1.2.) Use those graphs to help you to graph each of the following inequalities. Help (Html5)⇔Help (Java)

a. $y \leq |x|$

b. $|y| \geq x$

4-56. Multiple Choice: Which of the points below is a solution to $y < |x - 3|$? Help (Html5)⇔Help (Java)

a. $(2, 1)$

b. $(-4, 5)$

c. $(-2, 8)$

d. $(0, 3)$

4-57. For the equation $y = -(x + 1)^3 + 2$: Help (Html5)⇔Help (Java)

1. Draw a graph.

2. Use your graph to estimate the solution to $-3 = -(x + 1)^3 + 2$.