3-46. Now consider the system shown below:

$$x^2 + y^2 = 25$$

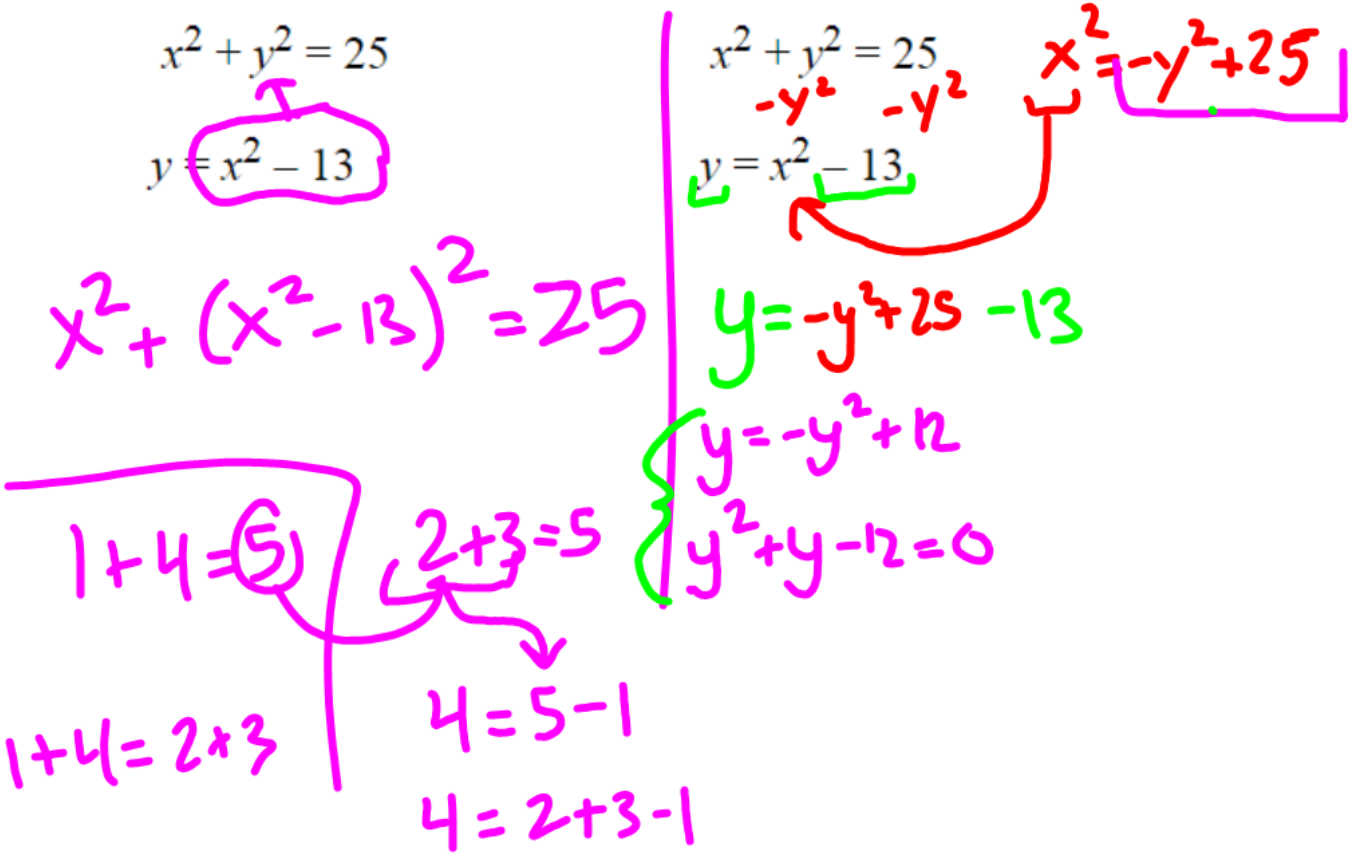
$$y = x^2 - 13$$

a. How many solutions do you expect this system to have? Explain how you made your prediction.

b. Solve this system by graphing. How many solutions do you see? Was your prediction in part (a) correct?

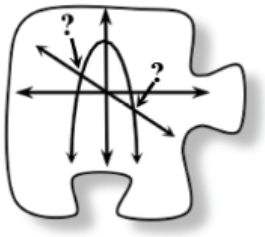
c. Combine these equations to create a new equation so that the only variable is x. Then combine the equations in a different way to create a new equation that contains only the variable y. Which of these equations would be easier to solve? Why?

d. If you have not already done so, solve one of your equations from part (c). If solving becomes too difficult, you may want to switch to the other combined equation.



3.1.4 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 write equations to model situations, and then apply your strategies to find solutions. You will continue to expand your understanding of solutions. As you work today, use the questions below to help stimulate mathematical conversations:

How can we model this situation with equations?

How can we solve it?

What does this solution tell us?

Are there any other strategies that could be useful?

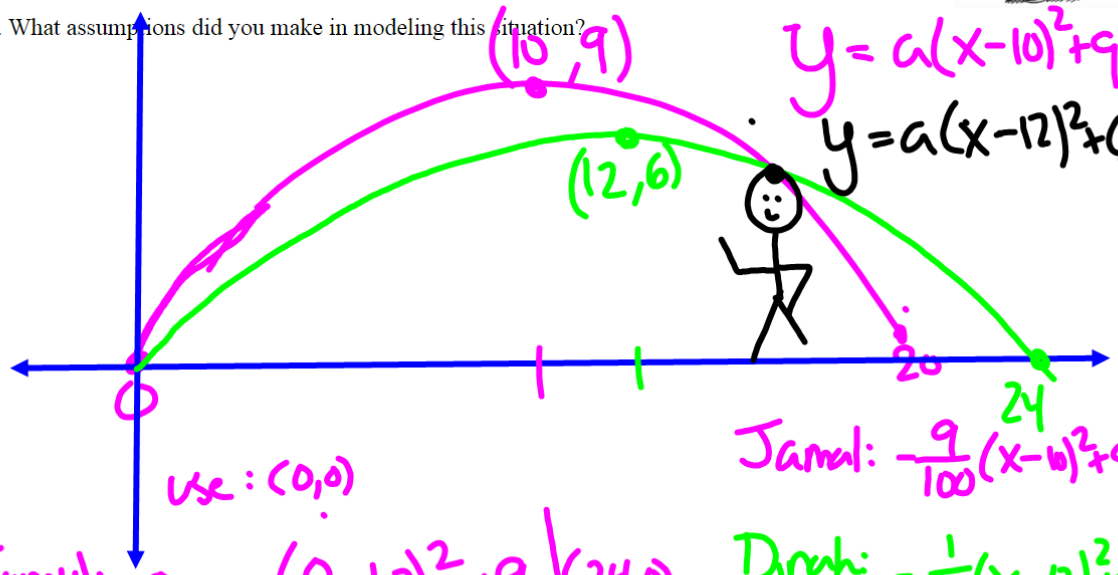
3-56. HOW TALL IS HAROLD?

Jamal and Dinah are still eating lunch as they come into math class. Someone has left a book on the floor and they both trip. As they each hit the floor, the food they are carrying flies across the room directly toward Harold, who is showing off his latest dance moves.

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

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

b. What assumptions did you make in modeling this situation?



$y = a(x-10)^2+9$

$y = a(x-12)^2+6$

Jamal: $-\frac{9}{100}(x-10)^2+9$

Dinah: $-\frac{1}{24}(x-12)^2+6$

$y = a(x-h)^2+k$

use: (0,0)

Jamal: $0 = a(0-10)^2+9$

$0 = a(-10)^2+9$

$0 = 100a+9$

$-9 \quad -9$

$-9 = 100a$

$-\frac{9}{100} = a$

(24,0)

$0 = a(24-12)^2+6$

$0 = a(+12)^2+6$

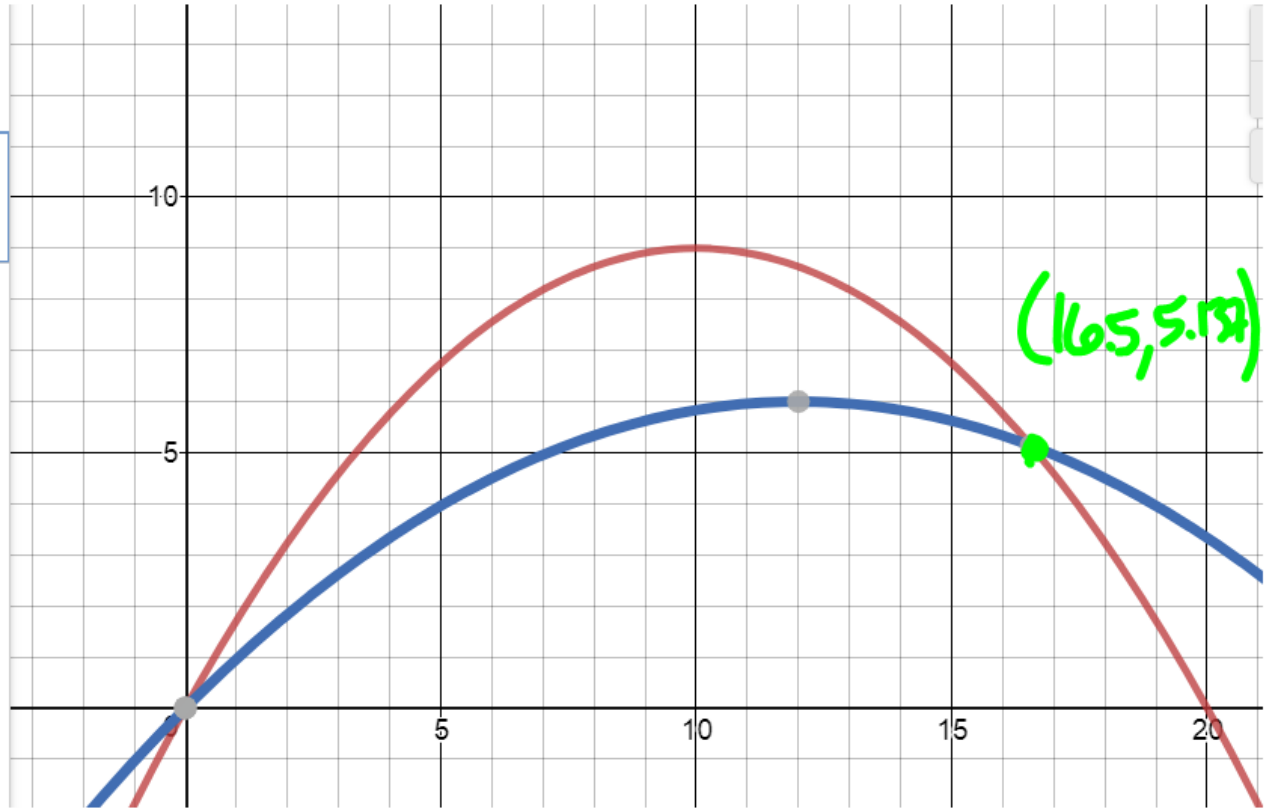
$0 = 144a+6$

$-\frac{6}{144} = a$

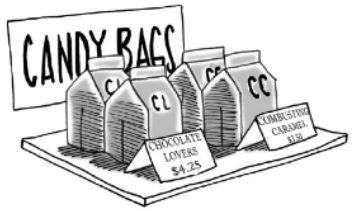
1 $y = -\frac{9}{100}(x-10)^2 + 9$

2 $y = -\frac{1}{24}(x-12)^2 + 6$

3



3-58. Write a system of equations to represent 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 bags of candy. The Chocolate Lover's 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?

Let c be the cost of a chocolate truffle

Let t be the cost of a caramel turtle.

$4.25 = 5c + 2t$

$3.50 = 8t + 2c$

$4.25 = 5x + 2y$

$3.50 = 8y + 2x$

$-8y \quad -8y$

$2x = -8y + 3.50$

$x = -4y + 1.75$

$4.25 = 5(-4y + 1.75) + 2y$

$4.25 = -20y + 8.75 + 2y$

$4.25 = -18y + 8.75$

$-8.75 \quad -8.75$

$\frac{-4.50}{-18} = \frac{-18y}{-18}$

$0.25 = y$

$-4(4.25) = (5x + 2y)(-4)$

$3.50 = 8y + 2x$

$3.50 = 2x + 8y$

$+ \; -17 = -20x - 8y$

$\frac{-13.50}{-18} = \frac{-18x + 0}{-18}$

$.75 = x$