

MODEL & DISCUSS

An architect is designing an archway for a building that has a 9 ft ceiling. She is working with the constraints shown.



- A. Find a quadratic model for the arches if the highest point of the arch touches the ceiling.
- B. **Use Structure** Describe how to change the model so that the highest point of the arch does not touch the ceiling. © MP.7

HABITS OF MIND

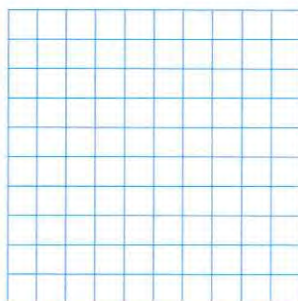
Look for Relationships How is finding the model above like solving a system of linear equations? How is it different. © MP.5

**EXAMPLE 1** **Try It!** Understand Linear-Quadratic Systems of Equations

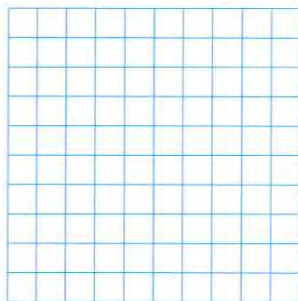
1. How many solutions does the system of equations at the right have? Explain.
- $$y = x$$
- $$y = x^2$$

EXAMPLE 2 **Try It!** Solve a Linear-Quadratic Equation by Graphing

2. What are the solutions of each of the equations? Rewrite each as a system of equations and graph to solve.
- a. $x^2 + 1 = x + 3$



b. $5 - 0.5x^2 = -0.5x + 2$

**HABITS OF MIND**

Communicate Precisely How could you use a table to solve a system of linear and quadratic equations? When does it make sense to use this method? Explain. © MP.6



**EXAMPLE 3** **Try It!** Solve Systems of Equations Using Elimination

3. Use elimination to solve each system of equations.

a. $y = -x + 4$
 $y = x^2 - 2$

b. $y = -x^2 + 4x + 2$
 $y = 2 - x$

EXAMPLE 4 **Try It!** Solve Systems Using Substitution

4. Could you have used elimination or graphing to solve this linear-quadratic system of equations? Explain.

HABITS OF MIND

Construct Arguments Explain when a solution to a linear-quadratic system of equations is not included as part of the solution to a problem. © MP.3



Do You UNDERSTAND?

1. **ESSENTIAL QUESTION** How is solving linear-quadratic systems of equations similar to and different from solving systems of linear equations?

2. **Error Analysis** A student claims that a linear-quadratic system of equations has three solutions. Explain the error the student made. © MP.3

3. **Vocabulary** What are the characteristics of a *linear-quadratic system of equations*?

4. **Reason** What system of equations could you use to solve the equation $x^2 - 3 = 7$? Explain. © MP.2

Do You KNOW HOW?

Rewrite each equation as a system of equations.

5. $3 = x^2 + 2x$

6. $x = x^2 - 5$

7. $2x^2 - 5 = x + 7$

8. $x^2 - 2x + 3 = x + 4$

Find the solution of each system of equations.

9.
$$\begin{cases} y = x^2 + 3x + 1 \\ y = -x + 1 \end{cases}$$

10.
$$\begin{cases} y = x^2 + 1 \\ y = -2x \end{cases}$$

