7.3 Quadratic Patterns
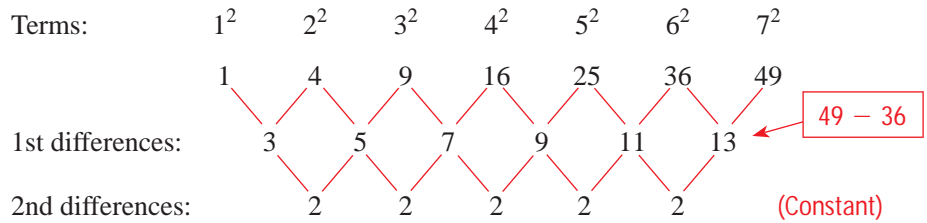
▶ Recognize and describe a quadratic pattern.

▶ Use a quadratic pattern to predict a future event.

▶ Compare linear, quadratic, and exponential growth.

Recognizing a Quadratic Pattern

Study Tip

The word *quadratic* refers to terms of the second degree (or squared). You might remember from Algebra 1 that the quadratic formula is a formula for solving second degree equations.

A sequence of numbers has a **quadratic pattern** when its sequence of second differences is constant. Here is an example.

Terms: 1^2 2^2 3^2 4^2 5^2 6^2 7^2

                1   4   9   16   25   36   49

1st differences: 3   5   7   9   11   13 $\boxed{49 - 36}$

2nd differences: 2   2   2   2   2   (Constant)

EXAMPLE 1   **Recognizing a Quadratic Pattern**

The distance a hit baseball travels depends on the angle at which it is hit and on the speed of the baseball. The table shows the distances a baseball hit at an angle of 40° travels at various speeds. Describe the pattern of the distances.

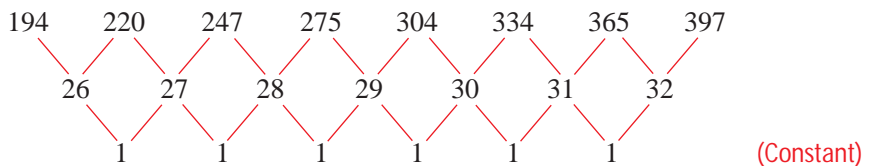| Speed (mph)	80	85	90	95	100	105	110	115
Distance (ft)	194	220	247	275	304	334	365	397
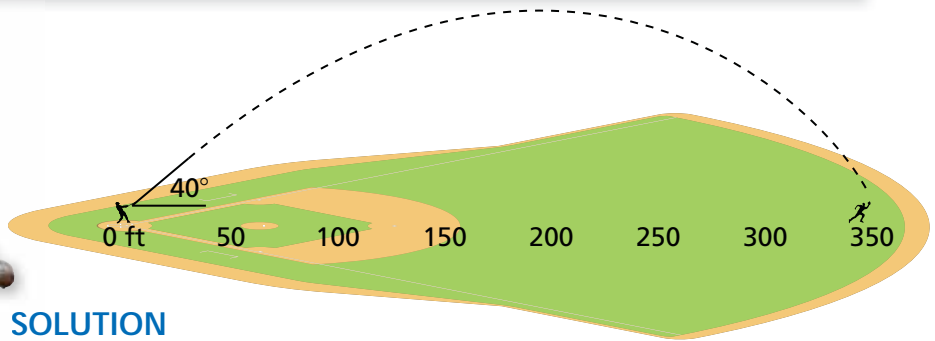
The distance a batter needs to hit a baseball to get a home run depends on the stadium. In many stadiums, the ball needs to travel 350 or more feet to be a home run.

SOLUTION

One way is to find the second differences of the distances.

194   220   247   275   304   334   365   397

   26   27   28   29   30   31   32

      1   1   1   1   1   1   (Constant)

Because the second differences are constant, the pattern is quadratic.

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In Example 1, extend the pattern to find the distance the baseball travels when hit at an angle of 40° and a speed of 125 miles per hour.