PROBLEM SOLVING WORKSHOP
LESSON 10.4

Using ALTERNATIVE METHODS

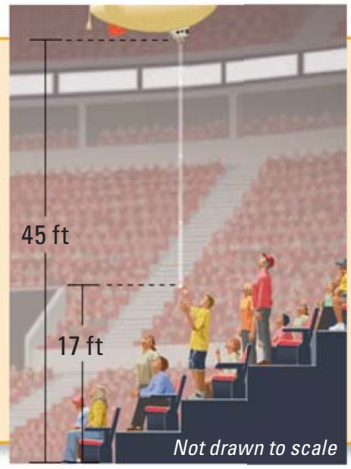
TEKS a.6, A.10.A; 2A.6.B, 2A.8.D

Another Way to Solve Example 5, page 654

MULTIPLE REPRESENTATIONS In Example 5 on page 654, you saw how to solve a problem about a dropped table-tennis ball by using a square root. You can also solve the problem by using factoring or by using a table.

PROBLEM

SPORTS EVENT During an ice hockey game, a remote-controlled blimp flies above the crowd and drops a numbered table-tennis ball. The number on the ball corresponds to a prize. Use the information in the diagram to find the amount of time that the ball is in the air.



METHOD 1

Using Factoring One alternative approach is to use factoring.

STEP 1 **Write** an equation for the height h (in feet) of the ball as a function of time t (in seconds) after it is dropped using the vertical motion model.

$h = -16t^2 + vt + s$ Vertical motion model

$h = -16t^2 + 0t + 45$ Substitute 0 for v and 45 for s.

STEP 2 **Substitute** 17 for h to find the time it takes the ball to reach a height of 17 feet. Then write the equation so that 0 is on one side.

$17 = -16t^2 + 45$ Substitute 17 for h.

$0 = -16t^2 + 28$ Subtract 17 from each side.

STEP 3 **Solve** the equation by factoring. Replace 28 with the closest perfect square, 25, so that the right side of the equation is factorable as a difference of two squares.

USE AN APPROXIMATION
By replacing 28 with 25, you will obtain an answer that is an approximation of the amount of time that the ball is in the air.

$0 = -16t^2 + 25$ Use 25 as an approximation for 28.

$0 = -(16t^2 - 25)$ Factor out -1.

$0 = -(4t - 5)(4t + 5)$ Difference of two squares pattern

$4t - 5 = 0 \quad or \quad 4t + 5 = 0$ Zero-product property

$t = \frac{5}{4} \quad or \quad t = -\frac{5}{4}$ Solve for t.

▶ The ball is in the air about $\frac{5}{4}$, or 1.25, seconds.