**The Same but Different**

1. a. Graph the quadratic function f(x) = (x - 2) 2 on a graphing calculator.

b. Find the vertex for this graph.

c. Explain how you can be certain that you have the exact vertex.

1. Go through the steps from Question 1 for each of these functions.
   1. g(x) = (x + 4)2
   2. h(x) = (x - 3) 2 + 2
   3. k(x) = (x + 5) 2 - 7
   4. r(x) = 3(x + 1) 2 + 16
   5. s(x) = -2(x - 4) 2 + 9
2. Explain how you could find the vertices for functions like those in Questions 1 and 2 without graphing.
3. Give some other examples of quadratic functions whose vertices are easy to find. Make your examples as varied as you can.
4. a. Verify that the expression (x - 3) 2 + 2 (from Question 2b) can be written in standard form as   
   x2 - 6x + 11.

b. Which expression is easier to use, (x - 3) 2 + 2 or x 2 - 6x + 11, in looking for the vertex of this function? Explain your answer.

1. How can you tell by looking at the algebraic expression for a quadratic function whether its vertex is a minimum or a maximum?

**Make Your Own Vertices**

In *The Same but Different*, you were given some quadratic functions and asked to find their vertices. In this assignment, you will reverse the process.

1. a. Find an algebraic expression for a quadratic function whose graph has its vertex at (3, 4).

b. Make a partial table of values for your function and use the table to sketch a graph of the function.

c. Does your graph seem to confirm that (3, 4) is the vertex for your function?

1. Repeat steps a through c from Question 1 for the point (3, -4).
2. Repeat steps a through c from Question 1 for the point (0, 0).
3. For each of these points, find a quadratic function whose graph has its vertex at the given point.
   1. (-4, 2)
   2. (-4, -5)
4. Generalize your work from Questions 1 through 4. In other words, consider a general point (h, k) and write an expression for a quadratic function whose vertex is at (h, k). Then justify your answer. That is, explain how you know that your function will have the desired vertex.
5. Find a quadratic function different from the one you used in Question 1 but whose graph also has its vertex at (3, 4). (Hint: Look at Questions 2d and 2e in *The Same but Different*.)

**Vertex Form Begun**

In *Factoring Begun*, you prepared for factoring quadratic expressions by getting a feel for what

happens when you multiply two linear expressions. This activity has a similar first step for learning how to put quadratic expressions into vertex form.

For now, you will consider only quadratic expressions in which the x2- coefficient is equal to 1.

1. Multiply out each of these vertex form expressions to get an equivalent quadratic expression in standard form. In other words, write each of these as an expression of the form x2 + bx + c.
   1. (x + 5) 2 + 9
   2. (x - 3) 2 - 12
   3. (x + 4) 2 - 7
   4. (x - 1) 2 + 8
2. Use what you learned from your work in Question 1 to try to write each of these quadratic expressions in vertex form. In other words, find equivalent expressions of the form (x - h)2 + k.
   1. x2 - 6x + 4
   2. x2 + 12x - 17
   3. x2 - 8x + 5
   4. x2 - 20x
   5. x2 + 11x - 7