

## Enrichment 5-4

### *Analyzing a Number Trick*

Several times, Amy gave Jill the following sequence of instructions.

- Step 1** Choose a number.
- Step 2** Multiply it by itself.
- Step 3** Subtract twice the number you originally chose.
- Step 4** Add 1.
- Step 5** Announce the result.

Each time, Amy was able to tell Jill what number she started with. Let's see why these steps work.

1. Let  $x$  represent the number Jill chose in Step 1. What is the result announced in Step 5 as a function of  $x$ ?
2. Factor the function in Question 1. What do you notice?
3. Based on your answer in Question 2, what must be true about the result that is given in Step 5?
4. If the result given in Step 5 is 9, what was the starting number?
5. Is there another possible starting number that gives the result 9? If so, what is it?
6. If Amy was always able to guess Jill's starting number, she assumed something about Jill's choice of numbers. What did Amy assume?
7. How could Amy change her instructions so that she could be sure to guess the correct starting number?
8. What did Amy do to the resulting number to determine the starting number?