

## *Pick a Pattern or Two*

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### **Pre-Activity**

The usual first-step when attempting to identify a numerical pattern is to look at the differences between the numbers. However, in some cases a pattern is developed by summing the digits of the number and then operating on the result to create the next number. For example, in the sequence 8, 16, 14, 10...each succeeding number is double the sum of the digits of the previous number:

$$2 \cdot 8 = 16$$

$$2 \cdot (1+6) = 14$$

$$2 \cdot (1+4) = 10$$

Another possibility is to operate on the digits individually first, and then sum the results.

Using equations such as those shown above, how would you describe the next two numbers in the sequence 8, 16, 14, 10..... ?

### **Task**

1. Here is an interesting sequence of numbers that uses the sum of the digits in a different way:

**4    16    49    169    256**

- a. What are the next five numbers in this sequence?
- b. Describe in words how this sequence is formed.

2. Here is a different sequence of numbers:

**4   16   37   58   89   145   42   20**

- a. What could be the next number?
  
- b. Using the notation that  $u$  stands for the units digit,  $t$  for the tens digit, and  $h$  for the hundreds digit, write an algebraic expression for how you formed this sequence.
  
- c. What will happen to this sequence if it is continued indefinitely?

### **Extension**

Draw a graphic representation of the pattern exhibited by the sequence in question 2.