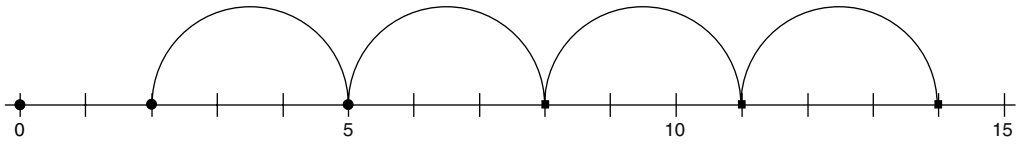
Generating Arithmetic and Geometric Sequences Numerically

In this activity, you'll build and explore arithmetic and geometric sequences by using Sketchpad's iteration feature.

ARITHMETIC SEQUENCES

Open **Sequences.gsp** in the **8 Sequences and Series** folder. This sketch includes a start value of 2 and a *difference* of 3. With these two values, you can generate an arithmetic sequence.

Q1 Look at the number line on the sketch. What arithmetic sequence is shown? How do the numbers in the sequence relate to the *start* and *difference* values?



Now you'll create a table of values that corresponds to the arithmetic sequence on the number line.

1. Choose **Measure | Calculate** to display the Calculator. Click on *start* in the sketch, the **+** sign on the keypad, and *difference* in the sketch to compute *start* + *difference*.

The beginning value for an iteration is often called the *seed,* or the *pre-image,* of the iteration.

2. Select *start,* and choose **Transform | Iterate.** Map *start* to *start* + *difference* by clicking on *start* + *difference*. Then click Iterate to confirm the mapping.

3. A table appears with the 2nd through 5th terms in your arithmetic sequence. To increase the number of terms in your sequence, select the table and press the **+** key on your keyboard several times. You can decrease the number of terms by pressing the **−** key.

To change the value of a parameter, double-click it with the **Arrow** tool and enter a new number.

Q2 Your sequence does not include the term 24. Find two ways to change the sequence so that it includes 24.

Q3 Below are several arithmetic sequences. For each one, find the *start* and *difference* values that generate them.

a. 3, 6, 9, 12, 15, . . .

b. −10, −14, −18, −22, −26, . . .

c. 1, 1, 1, 1, 1, . . .

d. 0.5, 0.75. 1.0, 1.25, 1.5, . . .

Answer this question without creating the sequence.

Q4 Suppose the *start* value of your sequence is 4 and the *difference* is 6. Will there be a term in your sequence between 2000 and 2010?

GEOMETRIC SEQUENCES

Page 2 of **Sequences.gsp** includes a *start* value of 1 and a *ratio* of 3. With these two values, you can generate a geometric sequence.

4. Using the directions for creating an arithmetic sequence as a guide, create a table that corresponds to the geometric sequence shown on the number line.

Q5 Your sequence does not include the term 24. Describe two ways to change the sequence so that it includes 24.

Q6 Below are several geometric sequences. For each one, find the *start* and *ratio* values that generate them.

a. 2, 8, 32, 128, 512, . . .

b. 32, −16, 8, −4, 2, . . .

c. 1, 1, 1, 1, 1, . . .

d. 1, −1, 1, −1, 1, . . .

Q7 Change your sequence so that *start* = 1 and *ratio* = 3. How many copies of the 2nd arc (between 3 and 9) can fit into the 3rd arc? How many copies of the 3rd arc can fit into the 4th arc? Does this pattern continue?

EXPLORE MORE

Hint: Your iteration requires using two pre-image parameters.

Q8 The Fibonacci sequence begins 0, 1, 1, 2, 3, 5, 8, 13, 21, . . . , where each term is the sum of the preceding two terms. Use the seed values on page 3 of the sketch to generate an iterated table of Fibonacci values.