THINKING WRITING

5.C Sequences as Functions

A sequence can be thought of as a function. The input numbers are the natural numbers, and the output numbers are the terms. In this assignment, we will study sequences as functions.

Definition: In a *geometric sequence,* each term is obtained from the previous term by multiplying by a constant amount, the *common ratio.*

Examples: These are geometric sequences.

2, 10, 50, 250, 1250

3, 1, 1/3, 1/9, 1/27

For each of the following:

a. Tell whether the sequence is geometric, arithmetic, or neither.

b. If it is arithmetic, find the common difference. If it is geometric, find the common ratio.

1. 5, 1, -3, -7, -11

2. -7, 2, 11, 20, 29

3. 1, 1, 2, 3, 5, 8

4. 6, 3, 3/2, 3/4, 3/8

5. 25, 5, 1, 1/5, 1/25

6. 1/2, 3/4, 7/8, 5/16, 31/32, 63/64

7. Find the final term of each sequence.

a. a geometric sequence having five terms, common ratio 2, and first term 6

b. an arithmetic sequence having six terms, common difference 9, and first term -4

8. Find the first term of each sequence.

a. an arithmetic sequence having 10 terms, common difference 7, and last term -3

b. a geometric sequence having eight terms, common ratio 1/2, and last term 1/4

9. Graph these arithmetic sequences by graphing the term number (n) on the horizontal axis and the term (t_n) on the vertical axis.

a. 2, -4, -10, -16, -22

b. 2, 8, 14, 20, 26

c. -5, -11, -17, -23, -29

10. Graph these geometric sequences.

a. 2, 6, 12, 24, 48

b. 3, 3/2, 3/4, 3/8, 3/16

c. 1/8, 1/4, 1/2, 1, 2

11. These *mystery sequences* are neither geometric nor arithmetic. Graph them.

a. 5, 8, 13, 20, 29, 40, 53, 68

b. 7, 13, 23, 37, 55

c. -2, 7, 22, 43, 70

12. By looking at the graphs in problem 11, one might think that the sequences are geometric, but it is clear from looking at the numbers that there is no common ratio. However, the numbers do have a special pattern. Find the pattern and describe it.

13. Report Write a report about what you discovered about graphs of arithmetic sequences, geometric sequences, and the mystery sequences in problem 11. Illustrate your report with examples. Your report should include, but not be limited to, answers to the following questions:

- Which sequences have graphs that are straight lines? Which have graphs that are curved? How are the two kinds of curved graphs different?
- For arithmetic sequences, how does the common difference show up in each graph?
- For geometric sequences, what difference does it make in the graph if the common ratio is greater or less than 1?
- What are the graphs of the mystery sequences called?