

1.5 Exploration: Investigating Ways of Cutting “Vegetables”

Specific Expectations

- FA1.01(U) write terms of a sequence, given the formula for the n th term or given a recursion formula
- FA1.01(U/C) write terms of a sequence, given the formula for the n th term

Evidence of Learning

Student should be able to

- collect data from an activity and express the data as a sequence
- compare linear and nonlinear sequences and identify characteristics of these sequences

Text Page 39

Time Required Functions and Relations or Functions: 30 min

Note that step 6, which refers to recursive sequences, is for Functions and Relations students only.

Materials and Equipment

- scissors and sheets of paper

Overview

- Students use paper to represent vegetables and actually perform the techniques suggested for efficient cutting.
- Allow students time to do the activity and create the tables and general terms.

ASSESSMENT

APPLICATION AND COMMUNICATION

Discuss the patterns that emerge in this section and the answer to the original question at the beginning of the *Exploration*. Why do chefs bundle vegetables for cutting rather than cutting up each individual strip?

Management Options

Groups – Divide the class into groups of three students in each group. One student should act as recorder and set up the chart in step 2 (d). The other students should each select one of the methods, do the cutting, and give the required data to the recorder as they work.

Teacher-Led Demonstration – You could walk the class through the steps and some volunteers could record the data on an overhead acetate as you or another student cut up paper.

Think, Do, Discuss, text page 39

2. (d) *Copy and complete the table.*

Number of Cuts	Number of Pieces Using Method 1	Number of Pieces Using Method 2
1	2	2
2	3	4
3	4	8

3. *Compare the number of pieces created after each cut using both methods. How does the number of pieces change with each cut? Describe the pattern.*

For method 1, the number of pieces grows by one with each cut. The total number of pieces is always one more than the number of cuts. For method 2, the number of pieces doubles with each cut or grows exponentially.

4. For each method, find the next three terms of the sequence of the number of pieces for each cut.

Number of Cuts	Number of Pieces Using Method 1	Number of Pieces Using Method 2
4	5	16
5	6	32
6	7	64

5. Suppose you had to cut over 1000 strips. What is the least number of cuts you would have to make?

Students can find the number of cuts by counting the number of times they multiply by 2 to reach 1000.

Alternatively, they could solve the equation $2^n = 1000$. Ten cuts will be required.

6. Determine a recursive formula for each sequence in step 3.

For method 1, $t_n = t_{n-1} + 1$, $t_1 = 2$

For method 2, $t_n = 2t_{n-1}$, $t_1 = 2$

7. Determine the general term of each sequence.

For method 1, $t_n = n + 1$

For method 2, $t_n = 2^n$

8. Discuss how the sequences are alike and how they are different.

Both sequences can be described using a general term or a recursive expression and both are finite because of the limited amount of paper. In theory, these sequences could continue indefinitely. The terms of the sequence in method 1 increase at a constant rate and describe a linear relation, but the terms of the sequence in method 2 increase at an ever increasing rate and show an exponential relation.