Pizza...

(Continued from page 8)

I then gave out a worksheet asking students to make one, two, three, etc. cuts to the pizza and determine the maximum number of pieces produced for each number of cuts.

It took a while to convince the students that the cuts did not have to go through the center and the pieces did not have to be of equal size! The students soon found sketching the cuts to be a clumsy method of counting, so we decided to look for a pattern. I suggested that the students organize their data in a table and then examine it. The students were quick to see a pattern, but it took some discussion to get the students to arrive at a generalized recurrence formula for determining the number of cuts.

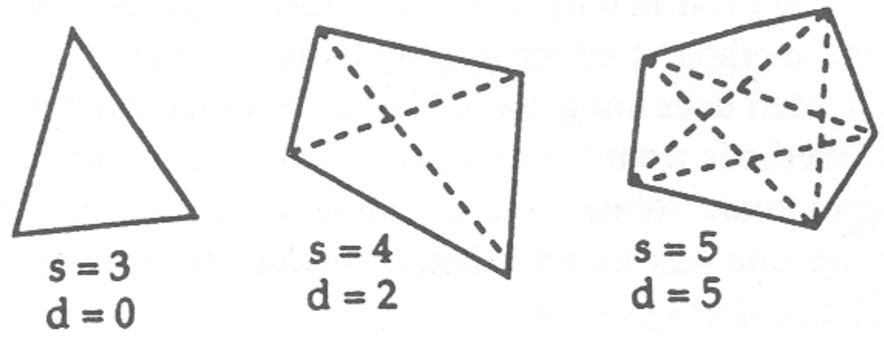
#cuts	1	2	3	4	5
# pieces	2	4	7	11	16

General Pattern: If c is the number of cuts and p(c) is the number of pieces, then p(c) = p(c-1) + c.

More advanced students may be able to find a formula for p(c) without programming. (See solutions, page 6.)

In her article, Prichard suggests having the students write a BASIC program based on the formula to determine the number of pieces given the number of cuts. However, since my students had no programming experience, I adapted Prichard's program to Macintosh TrueBasic (see sidebar) but left out steps of the program for the students to fill in. In class I explained the program commands, and the class discussed what would be needed to fill in the program blanks. The students found it difficult at first to understand the programming concepts, but eventually completed their programs; they then went to the computer lab to determine how many cuts would be needed to provide a piece of pizza for all 620 students in our school.

Next, I asked the students to determine a pattern for the number of diagonals in a polygon (see figure). This time they were asked to determine the number of diagonals in a 100-sided polygon.



The class as a whole wrote a program from scratch to determine this (the program is similar to that for pizza cutting), and again went to the computer lab. Although writing the program for the number of pieces of pizza had seemed very taxing, this time the students had caught on, and wrote the program with ease. I found these activities both worthwhile and rewarding. The students loved it and have frequently asked when they can do more programming (now that they think they're experts!).

Prichard's suggestions were extremely helpful; although I did not have sufficient time to try other similar problems, the article offers suggestions and programs for other good iteration problems such as triangular numbers and Fibonacci numbers.

1. Prichard, Mary Kim, "Mathematical Iteration Through Computer Programming," *Mathematics Teacher,* February, 1993.

TrueBasic Program (Adapted from Reference [1])

```
10 Rem ************************************************
20 Rem Pizza Problem
30 Rem ************************************************
40 Print " Cuts " , " Pieces "
50 Print "____ "  "_____": Rem set up table headings
60 Rem Set initial value for number of cuts and pieces
70 Let c= [1]
80 Let p= [2]
90 Print c, p
100 Let c = [c+1]: Let p = [p + c]: Rem repeat process
110 If p [ < 620]  then  [90]: Rem  check if done
120 Print "It takes at least"  c  "cuts for [Lee] and [Pat]
   to produce [620] pieces of pizza."
130 End
```

Note 1: **Rem** stands for "remark" and tells the computer that this line is a note to the programmer--and that it should ignore the rest of the line.

Note 2: items in [brackets], were left blank on the student worksheet.

Note 3: there are many possible answers for lines 70, 80:
c = 0, p = 1; or c = 2, p = 4.