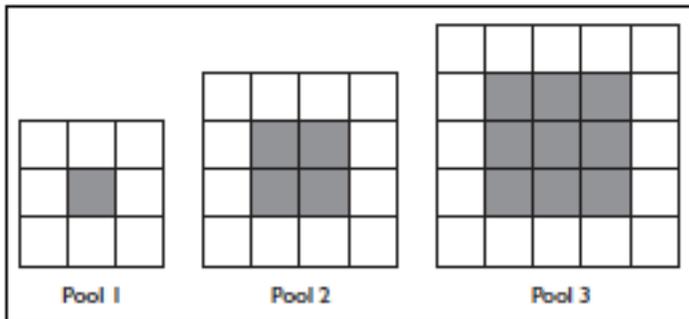


Tiling Pool Problem

Tat Ming is designing square swimming pools. Each pool has a square center that is the area of the water. Tat Ming uses blue tiles to represent the water. Around each pool there is a border of white tiles. Below are pictures of the three smallest pools that he can design with the blue tiles for the interior and white tiles for the border (Ferrini-Mundy, et al., 1997).



Grades K–2

1. For each square pool, sort the tiles into blue tiles for the water and white tiles for the border.
2. Count how many tiles are in each pile. Are there more blue tiles than white tiles?
3. How many tiles are in the next largest pool? Check your answer by building the square.
4. Describe your methods for counting the different tiles. What patterns do you see?

Grades 3–5

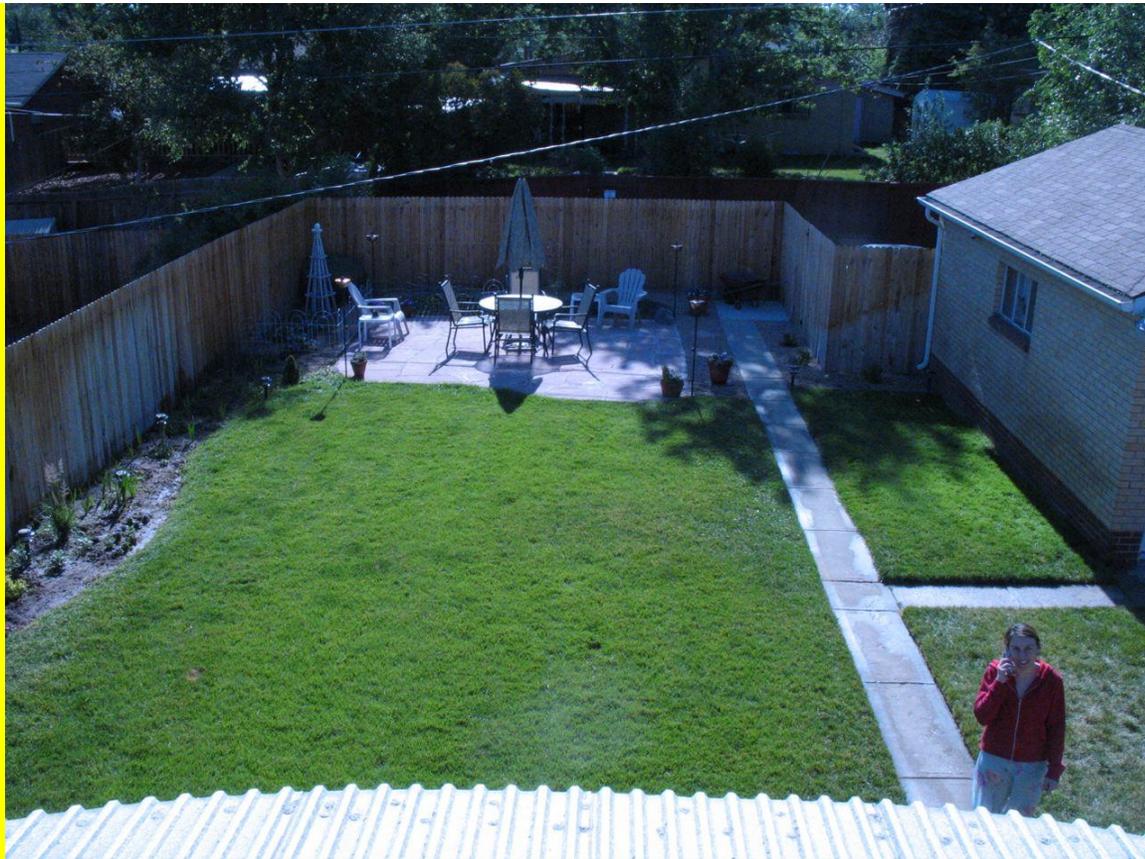
1. Build the first three pools and record the data in a table. Extend the table for the next two pools. How do you know your answers are correct?
2. If there are 32 white tiles in the border, how many blue tiles are there? Explain how you got your answer.
3. If there are 36 blue tiles, how many white tiles are there? Explain how you got your answer.
4. Can you make a pool with 49 blue tiles? Explain why or why not.

5. Can you make a pool with 12 blue tiles? Explain why or why not.
6. In each of the first three pools, decide what fraction of the square's area is blue for the water and what fraction is white for the border? What patterns do you see? What fractions will occur in the next two rows of the table? How do you know that your answers are correct?
7. Below is a picture of Salina's backyard. If each tile has a side length of 10 centimeters, what is the largest pool someone could put in Salina's backyard?



Grades 6–8

1. Make a table showing the numbers of blue tiles for water and white tiles for the border for the first six pools.
2. What are the variables in the problem? How are they related? How can you describe this relationship in words?
3. Make a graph that shows the number of blue tiles in each pool. Make a graph that shows the number of white tiles in each pool.
4. As the number of pool tiles increases, how does the number of white tiles change? How does the number of blue tiles change? How does this relationship show up in the table and in the graph?
5. Use your graph to find the number of blue tiles in the seventh pool.
6. Can there ever be a border for a pool with exactly twenty-five white tiles? Explain why or why not.
7. Below is a picture of Salina's backyard. What is the largest pool Salina can build in her backyard? (Note: This question raises the problem to Level 3 modeling).



Grades 9–12

1. What are the variables in this situation? What quantities are changing?
2. How are the variables related? As one variable increases, what happens to the other variable?
3. How can you represent the relationship between: a) the pool number and the white tiles, b) the pool number and the blue tiles, and c) the pool number and the total number of blue and white tiles, using words, tables, graphs, and symbols?
4. Are any of the relationships in question 3 functions? If so, what types of functions are they (e.g., linear, quadratic, exponential)? How do you know? Explain.
5. What if the pool is a non-square, rectangle? Explain in words, with numbers or tables, visually, graphically, and with symbols, the number of tiles that will be needed for pools of various lengths and widths. (Note: This question raises the problem to Level 3 modeling.)

