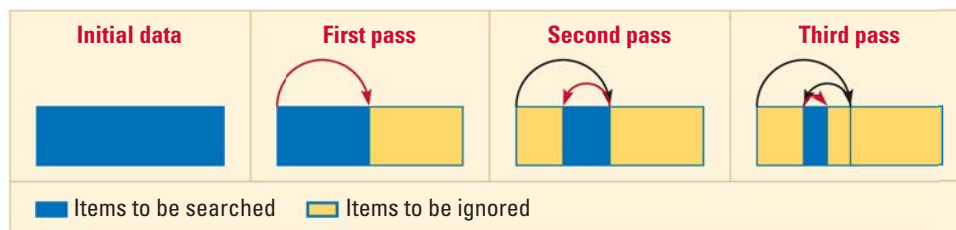
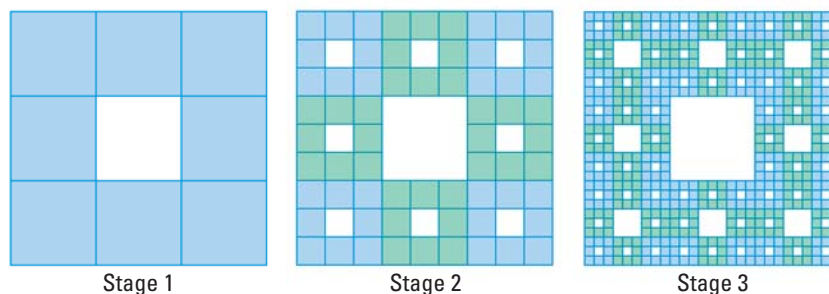


59. **TAKS REASONING** A *binary search* technique used on a computer involves jumping to the middle of an ordered list of data (such as an alphabetical list of names) and deciding whether the item being searched for is there. If not, the computer decides whether the item comes before or after the middle. Half of the list is ignored on the next pass, and the computer jumps to the middle of the remaining list. This is repeated until the item is found.



- Find a rule for the number of items remaining after the  $n$ th pass through an ordered list of 1024 items.
  - In the worst case, the item to be found is the only one left in the list after  $n$  passes through the list. What is the worst-case value of  $n$  for a binary search of a list with 1024 items? *Explain.*
60. **FRACTALS** The *Sierpinski carpet* is a fractal created using squares. The process involves removing smaller squares from larger squares. First, divide a large square into nine congruent squares. Remove the center square. Repeat these steps for each smaller square, as shown below. Assume that each side of the initial square is one unit long.



- Let  $a_n$  be the number of squares removed at the  $n$ th stage. Find a rule for  $a_n$ . Then find the total number of squares removed through stage 8.
  - Let  $b_n$  be the remaining area of the original square after the  $n$ th stage. Find a rule for  $b_n$ . Then find the remaining area of the original square after stage 12.
61. **MULTIPLE REPRESENTATIONS** Two companies, company A and company B, offer the same starting salary of \$20,000 per year. Company A gives a raise of \$1000 each year. Company B gives a raise of 4% each year.
- Writing Rules** Write rules giving the salaries  $a_n$  and  $b_n$  in the  $n$ th year at companies A and B, respectively. Tell whether the sequence represented by each rule is *arithmetic*, *geometric*, or *neither*.
  - Drawing Graphs** Graph each sequence in the same coordinate plane.
  - Finding Sums** For each company, find the sum of wages earned during the first 20 years of employment.
  - Using Technology** Use a graphing calculator or spreadsheet to find after how many years the total amount earned at company B is greater than the total amount earned at company A.