EXPLORATION 7.13 **Area Codes and Phone Numbers**

Earlier in this decade, the telephone companies had to address a serious problem: The United States was running out of area codes. You have the tools at your disposal to determine both the cause of the problem and its solution.

1. What is the theoretical maximum number of phone numbers within an area code? Summarize your work so that the reader can understand how you determined the answer.

2. As you probably realized in Step 1, there are certain phone numbers that are not allowed. Thus, we need to find out what is the actual maximum number of phone numbers within an area code. Summarize your work so that the reader can understand how you determined the answer.

3. Look at the area codes from a 1993 phone book. We know that theoretically there are 1,000 possible area codes. Why is this? Since the actual number of area codes is much less than 1,000, there must be some limitations on area codes, just as there are on phone numbers.

a. Determine the set of possible area codes in 1993. State your answer as succinctly as possible—that is, by a means other than just listing all of them.

b. Describe the set of rules for creating a valid area code number—for example, the second digit must be a 0 or a 1.

4. If we multiply the number of possible area codes by the number of phone numbers within an area code, we get a number far greater than 250 million. Explain why we still needed more area codes in 1993 despite this fact.

5. Devise, explain, and justify a plan for solving this problem.

6. Find out and describe what the solution was to the problem of not enough area codes.

7. Predict the population of the United States when we will again run out of area codes.