NAME DATE CLASS

Chapter 1

CRITICAL THINKING

The Nature of Science

The Virtual Library

The Internet is changing the way people get information. Not long ago, students like you needed to search through books or magazines to find information about such things as famous scientists or the history of microscopes. Now, you can do research on the Internet. Also, scientists can share their findings via the Internet. They can communicate with experts worldwide without ever leaving their laboratories.

Now, imagine a time when every book, magazine, and newspaper, as well as every picture, graph, and recording is available on your computer and the Internet. Such a collection would make up a "virtual library." It could contain much more than a standard library, because even the largest of standard libraries doesn't have room to keep copies of everything. This is why some libraries are beginning to convert their materials into a form that can be accessed on a computer.

Some of the benefits of the virtual library are that the materials would be available to people worldwide. Using computers and the Internet would be convenient and efficient. Libraries wouldn't have to have so much storage space for books and other printed materials. Also, rare books and special collections would be available to all.

However, along with the advantages are some drawbacks. Scanning all of these materials so they could be put on the Internet would take a huge amount of time. It also would be expensive. The cost of maintaining these electronic files as technology improves would be considerable. Also, there would be copyright issues to think about. If all books were available for free on the Internet, authors might not sell many books and would have a hard time making a living.

Applying Critical Thinking Skills

1. What are some advantages to using books and magazines over using electronic materials?

2. As more materials are available on computers and the Internet, will people ignore books and other materials that are not available in electronic form? Why or why not?

Activity 15

NCTM Standard: Problem Solving

Review

Sometimes a math problem tells you how to solve it—"Multiply the following." Other times, however, you must determine how to solve it. There are many ways to solve a problem. Many problem-solvers follow a four-step plan:

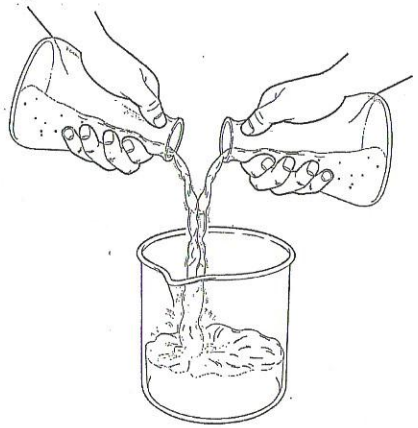
- First, explore the information in the problem. At this point, you should jot down essential information from the problem.
- Second, plan how you will solve it based on the information in the problem. Choose from the following strategies: make a table, make a list, act it out, work backward, use a Venn diagram, look for reasonable answers, look for a pattern, solve a simpler problem, make a model, draw a graph or diagram, guess and check, write an equation, or eliminate possibilities. Sometimes a combination of two or three strategies works best.
- Third, solve the problem.
- Finally, examine the answer. Is it reasonable? Does it come close to your estimated answer? If not, choose a different strategy and approach the problem from a different angle. Compare answers.

Example

Chemists use all kinds of chemical solutions. Normally, chemistry laboratories purchase the solutions that they use in concentrated form. Then, they dilute them with water. If a chemist needs a 10 percent solution of acetic acid (10 parts acid and 90 parts water), how much acid should he or she add to 0.5 L of water to make a 10 percent solution?

Solution This problem can be solved by using a proportion. The proportion of acid to water in the solution should be 10 to 90, or 1 to 9. Write the proportion $\frac{1}{9} = \frac{x}{0.5}$ L, where x = the amount of acid. Solving the proportion for x gives $1 \times 0.5 = 0.5$. The chemist should add $0.5 \div 9 = 0.06$ L of acid or 6 mL of acid to the 0.5 L of water.

Figure 1



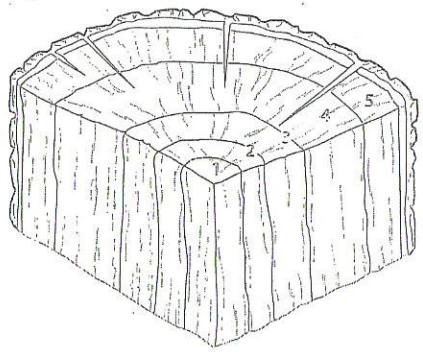
Activity 15 (continued)

Practice

If you look at a tree stump, you will see that it has rings—one ring for each year of its life. Scientists study these rings to learn about climate and to date past climatic events. If a tree has a thick ring, it probably rained a lot that year. If a tree has a thinner ring, there may have been a drought that year.

1. The diameter of this tree stump is 29 cm. What is the approximate circumference of the stump? Use 3.14 for π.
   a. 660 cm
   b. 46 cm
   c. 91 cm
   d. 182 cm

Figure 2



2. If the radius from the center of the stump to the outer edge of ring 2 is 2 cm, and the radius from the center of the stump to the outer edge of ring 4 is 12 cm, about how much bigger around was the tree when it was 4 years old than when it was 2 years old?
   a. 62.8 cm
   b. 87.92 cm
   c. 78.52 cm
   d. 31.4 cm

3. Assume that the diagram of the tree stump is NOT drawn to scale. Based on other information, which of the following is most likely to be true?
   a. There was a drought in the fifth year.
   b. It rained more during the fifth year than during all of the previous years combined.
   c. It rained less during the fifth year than during all of the previous years combined.
   d. It rained the most during the first year.

4. Automobiles typically use gasoline for energy. The Environmental Protection Agency publishes annual reports comparing the fuel efficiency of all commercial vehicles. It uses miles-per-gallon ratings to tell how far an automobile will travel on one gallon of gasoline. If an automobile has a rating of 25 to 28 miles per gallon and its gas tank holds 15.5 gallons, what is the maximum distance that it can travel on a full tank before it needs to be refueled?
   a. 334 miles
   b. 443 miles
   c. 387 miles
   d. 434 miles