- The address-of operator (&) returns the address of a variable, rather than the value in the variable.
- The name you give a character array is actually a pointer constant that points to the first character in the array.
- Subscript notation is a method of accessing individual characters in a character array. You can also access individual characters in an array using the dereferencing operator and adding the correct number to the pointer.
- The enum keyword allows you to create custom data types. Internally, the values you include in your enum data types are stored as integers.
- Structures are very useful data structures that allow variables to be grouped to form a new data type.
- The variables within a structure are called members.

PROJECTS

PROJECT 10-1 • REVERSING A STRING

Write a function named **`reverse_string`** that reverses a string. For example, the function would change the string "ABCDEF" to "FEDCBA." The function should not reverse the position of the null terminator. Write a main function to test the **`reverse_string`** function.

PROJECT 10-2 • CRYPTOGRAPHY

Write a program that uses a loop to encrypt a string by adding 1 to the ASCII value of each character in the string. The string "ABCDEF" would become "BCDEFG." The string "apple" would become "bqqmf."

PROJECT 10-3 • CRYPTOGRAPHY

Modify the program from Project 10-2 to decrypt a string that has been encrypted using the method of Project 10-2.

PROJECT 10-4 • GEOMETRY

On a coordinate plane, the length of a line connecting two points can be found using the formula below.

$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Extend the *LNSLOPE.CPP* program you saved in Exercise 10-9 to calculate the length of the line using the formula above.

PROJECT 10-5 • GEOMETRY

Write a program that accepts two points as input. Have the program calculate a third point that, with the other two points in a plane, form a right triangle.

Software Piracy

By Jeff Snyder

The software industry is one of the fastest-growing industries in the United States. Billions of dollars are made from the sale of software at home and abroad. However, profits are falling due to illegal use and duplication of software. Illegal use of software, also know as software piracy, is rising at an astounding rate. One study showed that in some cases three illegal copies exist for every legal copy of software. Some countries, such as China, are mass-producing software and other copyrighted materials illegally. To counter this problem, the U.S. government is taking steps to crack down on offenders.

One of the most convenient aspects of computer software is its ease of duplication. This trait is among the most useful applications of computers. Although users like the ease of copying, software manufacturers find it to be a problem. Just like any publication, producers of software rely on sales to make money and continue their development efforts. If someone buys a program and makes five copies for friends, the company loses money.

In 1993, worldwide software pirating accounted for 7.4 billion dollars of lost revenues. Not only do people trade copied floppies, but they also transfer data over phone lines. As modems get faster, the time required to transfer large quantities of data decreases. Illegal computer bulletin boards are growing in popularity and membership. One bulletin board, which was recently busted by officials, distributed copied software to members who paid the $99 membership fee.

Not only do companies lose money from petty private pirating, they are also affected by illegal mass production. China is an enormous haven for software pirates. For the last few years, hundreds of Chinese factories have been mass-producing American software illegally. The U.S. has insisted the Chinese government crack down on pirating. Although production of illegal software has been curbed, it is by no means eradicated. Many other countries are avid users of illegal software. Almost all software used in Thailand (about 99% according to one study) is pirated. Although it is substantially higher in Asia, pirated software also comprises about 78 percent of French and 69 percent of German software. The widespread abuse of American software in other countries contributes a great deal to our nation's growing trade deficit.

Various groups are working overtime to prevent piracy. The B.S.A. (Business Software Alliance) and the S.P.A. (Software Publishers Association) enforce copyright infringement laws. In 1994, the S.P.A sued 447 organizations and collected 2.5 million in fines. Recently, these and many other groups lobbied successfully to get Congress to join the fight against piracy. Infringements that previously were considered misdemeanors are now classified as felonies. Some software companies have hotlines where disgruntled employees can call to report copying in their places of employment. Companies are looking for inexpensive ways to make duplication difficult for would-be pirates. More research is going into copyright protection and it will hopefully come up with an effective, yet not too obstructive, means of protection.

The illegal duplication of software is a growing problem in the American software industry. Profits are being purged by unknowing citizens and greedy entrepreneurs. While software piracy is rampant, prices of titles will remain high and may even rise in order to alleviate losses. Software piracy affects computer users and the entire software industry.

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