

- A local variable is created within a function and is accessible only from within that function. A global variable is declared outside of all functions and is accessible from any function.
- Data can be passed to functions by value, by reference, or by address. When possible, you should pass by value. Passing by value passes a copy of the data, and the original data cannot be changed from within the function. Data passed by reference brings back changes made to it within a function. Arrays are always passed by address, which means the memory address of the array is passed to the function. Any changes to an array made in a function affect the array throughout the program.
- Functions that come with your compiler are called library functions.

## PROJECTS

### PROJECT 9-1 • SOFTWARE DEVELOPMENT

Write a program source code template that you can use as a starting point for programs you create in the future. Include comments at the top that give your name and provide places for you to fill in the date and description of the program. Set aside a place for **#include** directives, prototypes, constants, and global variables. Create an empty main function. Save the source code file as *NEWPROG.CPP* and close the file.

### PROJECT 9-2 • MATHEMATICS

Write a program that returns the square root of a number as a multiplier and a square root. For example, given the value 45, the program should output that the square root of 45 is equal to 3 times the square root of 5.

### PROJECT 9-3 • POINT-OF-SALE SYSTEM

Use the template you created in Project 9-1 as a starting point to write a program that will function as a point-of-sale system at a rodeo snack bar. The snack bar sells only six different items: a sandwich, chips, pickle, brownie, regular drink, and a large drink. All items are subject to sales tax. Set prices for the products.

The program should repeatedly display the menu below until the sale is totaled. The program should keep a running total of the amount of the sale based on costs that you place in constants for each of the food items. The running total should be displayed somewhere on the screen each time the menu is displayed again.

```
S - Sandwich : 3.00
C - Chips : 1.00
B - Brownie : 1.50
R - Regular Drink : 1.00
L - Large Drink : 2.00
X - Cancel sale and start over
T - Total the sale
```

If the sale is canceled, clear your running total and display the menu again. When the sale is totaled, calculate the sales tax based on your local tax rate (use 6% if you have no sales tax in your area). Print the final total due on the screen.

You can use your own functions to design a solution to the problem. You are required to use a function to calculate the sales tax. Other use of functions is up to you.

### PROJECT 9-4 • TRAFFIC CONTROL

Write a program that simulates the operation of traffic lights at an intersection. Use a *for loop* to create a delay or refer to your compiler's manual for a function such as **sleep()** to create a delay. The program should display information about the traffic lights of all four directions. Include a left-turn arrow, and don't forget the yellow lights.

### PROJECT 9-5 • PHYSICS

Einstein predicted that the length of an object gets smaller as the object moves more quickly. Use the formula  $\text{length} = (\text{length\_at\_zero} * \text{sqrt}(1 - ((\text{velocity} * \text{velocity}) / (C * C))))$ , where  $C$  equals the speed of light ( $3.00 \times 10^8$  m/sec), to calculate the new length when given the velocity and length at zero speed. Declare  $C$  as a constant. Lengths should be entered in meters.