TRIGONOMETRIC AND LOGARITHMIC FUNCTIONS

Included with many C++ compilers are also trigonometric and logarithmic library functions. These functions, shown in Table 9-2, also require that **`math.h`** be included in the calling program.

Note

The trigonometric functions work with angles in radians rather than degrees.

FUNCTION	PROTOTYPE	DESCRIPTION
cos	double cos(double x);	Calculates the cosine of x
sin	double sin(double x);	Calculates the sine of x
tan	double tan(double x);	Calculates the tangent of x
acos	double acos(double x);	Calculates the arc cosine of x
asin	double asin(double x);	Calculates the arc sine of x
atan	double atan(double x);	Calculates the arc tangent of x
atan2	double atan2(double y, double x);	Calculates the arc tangent of y/x
cosh	double cosh(double x);	Calculates the hyperbolic cosine of x
sinh	double sinh(double x);	Calculates the hyperbolic sine of x
tanh	double tanh(double x);	Calculates the hyperbolic tangent of x
exp	double exp(double x);	Calculates the exponential function e^x
log	double log(double x);	Calculates the natural logarithm of x
log10	double log10(double x);	Calculates the base 10 logarithm of x

TABLE 9-2

EXERCISE 9-11 TRIG AND LOG FUNCTIONS

1. Write a program that prompts the user for a variable of type double and returns the cosine, sine, tangent, and natural logarithm of the value entered.
2. Save the source code as *TRIGLOG.CPP* and close.

FUNCTIONS FOR WORKING WITH CHARACTERS

C++ compilers also include many functions for analyzing and changing characters. The header file **`ctype.h`** must be included for a calling program to use the functions listed in Table 9-3. The conditional functions in the table return a non-zero integer if the condition is true and zero if the condition is false.

FUNCTION	PROTOTYPE	DESCRIPTION
`isupper`	`int isupper(int c);`	Determines if a character is upper case
`islower`	`int islower(int c);`	Determines if a character is lower case
`isalpha`	`int isalpha(int c);`	Determines if a character is a letter (a–z, A–Z)
`isdigit`	`int isdigit(int c);`	Determines if a character is a digit (0 – 9)
`toupper`	`int toupper(int c);`	Convert a character to uppercase
`tolower`	`int tolower(int c);`	Convert a character to lowercase

TABLE 9-3

EXERCISE 9-12 CHARACTER FUNCTIONS

1. Write a program that accepts a single character as input and uses the character functions to report back to the user the following information:
   a. Whether the character is a letter, a digit, or some other type of character.
   b. If the character is a letter, tell the user whether the letter is uppercase or lowercase.
2. Save the source code as *CHARFUN.CPP* and close.

SECTION 9.3 QUESTIONS

1. What is the term for functions that come with your compiler?
2. What do you do to provide prototypes for functions that come with your compiler?
3. What does the **`pow10`** function do?
4. What type of variable is passed to the **`sqrt`** function?
5. Write a function call that returns the tangent of 1.0.
6. What library function can be used to convert a character to uppercase?

KEY TERMS

argument
automatic variable
bottom-up design
encapsulation
external variable
global variable
header file
library functions
local variable
parameter
pass
passing by address
passing by reference
passing by value
prototype
scope
top-down design
Visual Table of Contents (VTOC)

SUMMARY

- Designing a program that consists of functions results in code that is better organized, reusable, and easier to debug.
- The syntax of functions you create is very similar to that of the main function. The parentheses after the function name tell the compiler that you are defining a function.
- You must create a prototype for your functions to let the compiler know your function exists. Prototypes are placed at the top of the program.