

function's parameters, to specify the function's return type and to declare variables within the body of the function definition.

Section 6.19 Recursion

- A recursive function (p. 239) calls itself, either directly or indirectly.
- A recursive function knows how to solve only the simplest case(s), or so-called base case(s). If the function is called with a base case (p. 239), the function simply returns a result.
- If the function is called with a more complex problem, the function typically divides the problem into two conceptual pieces—a piece that the function knows how to do and a piece that it does not know how to do. To make recursion feasible, the latter piece must resemble the original problem, but be a slightly simpler or slightly smaller version of it.
- For recursion to terminate, the sequence of recursive calls (p. 239) must converge on the base case.

Section 6.20 Example Using Recursion: Fibonacci Series

- The ratio of successive Fibonacci numbers converges on a constant value of 1.618.... This number frequently occurs in nature and has been called the golden ratio or the golden mean (p. 242).

Section 6.21 Recursion vs. Iteration

- Iteration (p. 240) and recursion are similar: both are based on a control statement, involve repetition, involve a termination test, gradually approach termination and can occur infinitely.
- Recursion repeatedly invokes the mechanism, and overhead, of function calls. This can be expensive in both processor time and memory space. Each recursive call (p. 239) causes another copy of the function's variables to be created; this can consume considerable memory.

Self-Review Exercises

6.1 Answer each of the following:

- Program components in C++ are called _____ and _____.
- A function is invoked with a(n) _____.
- A variable known only within the function in which it's defined is called a(n) _____.
- The _____ statement in a called function passes the value of an expression back to the calling function.
- The keyword _____ is used in a function header to indicate that a function does not return a value or to indicate that a function contains no parameters.
- An identifier's _____ is the portion of the program in which the identifier can be used.
- The three ways to return control from a called function to a caller are _____, _____ and _____.
- A(n) _____ allows the compiler to check the number, types and order of the arguments passed to a function.
- Function _____ is used to produce random numbers.
- Function _____ is used to set the random number seed to randomize the number sequence generated by function rand.
- The storage-class specifiers are mutable, _____, _____, _____ and _____.
- Variables declared in a block or in the parameter list of a function are assumed to be of storage class _____ unless specified otherwise.
- Storage-class specifier _____ is a recommendation to the compiler to store a variable in one of the computer's registers.
- A variable declared outside any block or function is a(n) _____ variable.
- For a local variable in a function to retain its value between calls to the function, it must be declared with the _____ storage-class specifier.