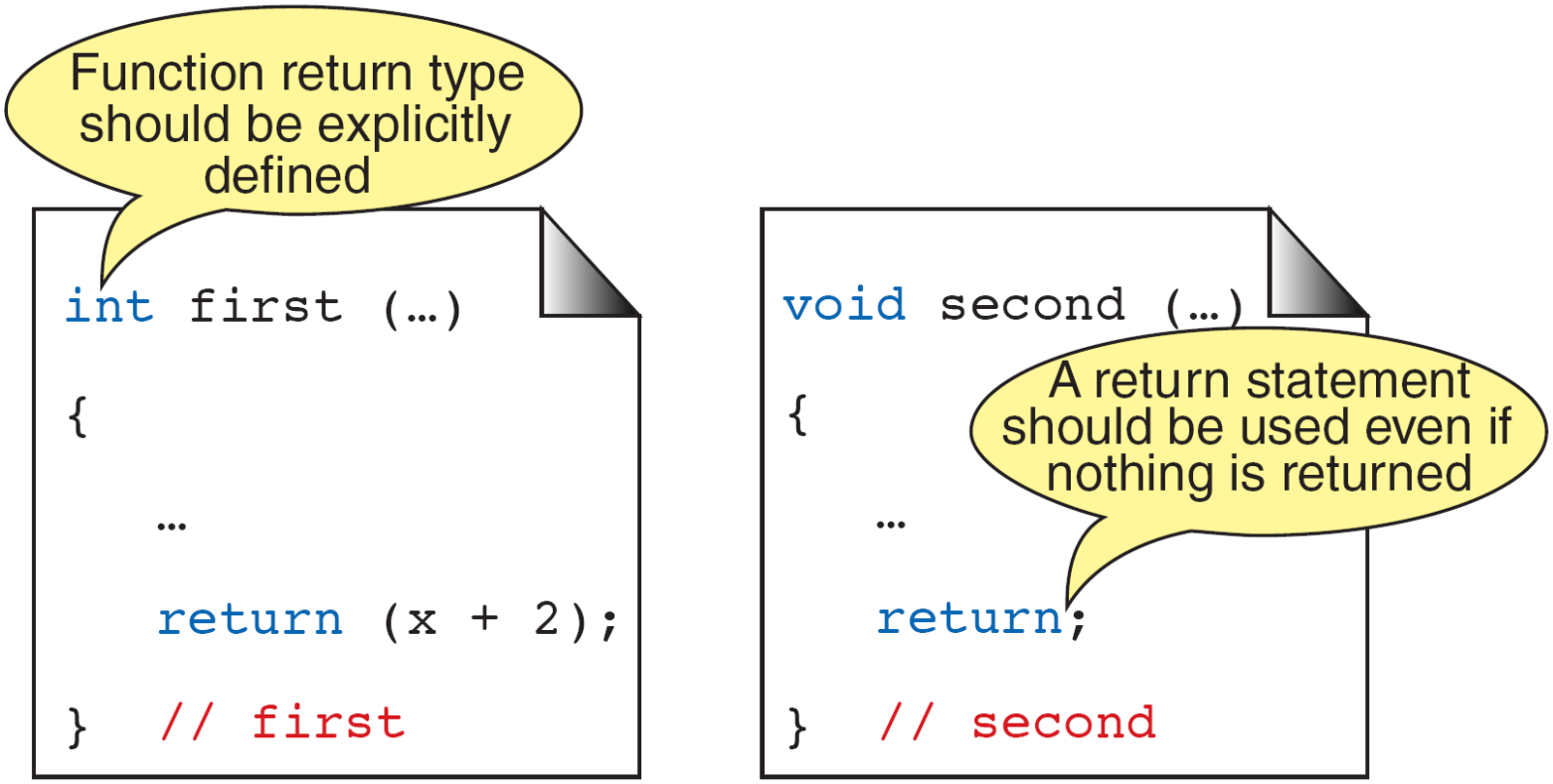

FIGURE 4-10 Function Return Statements

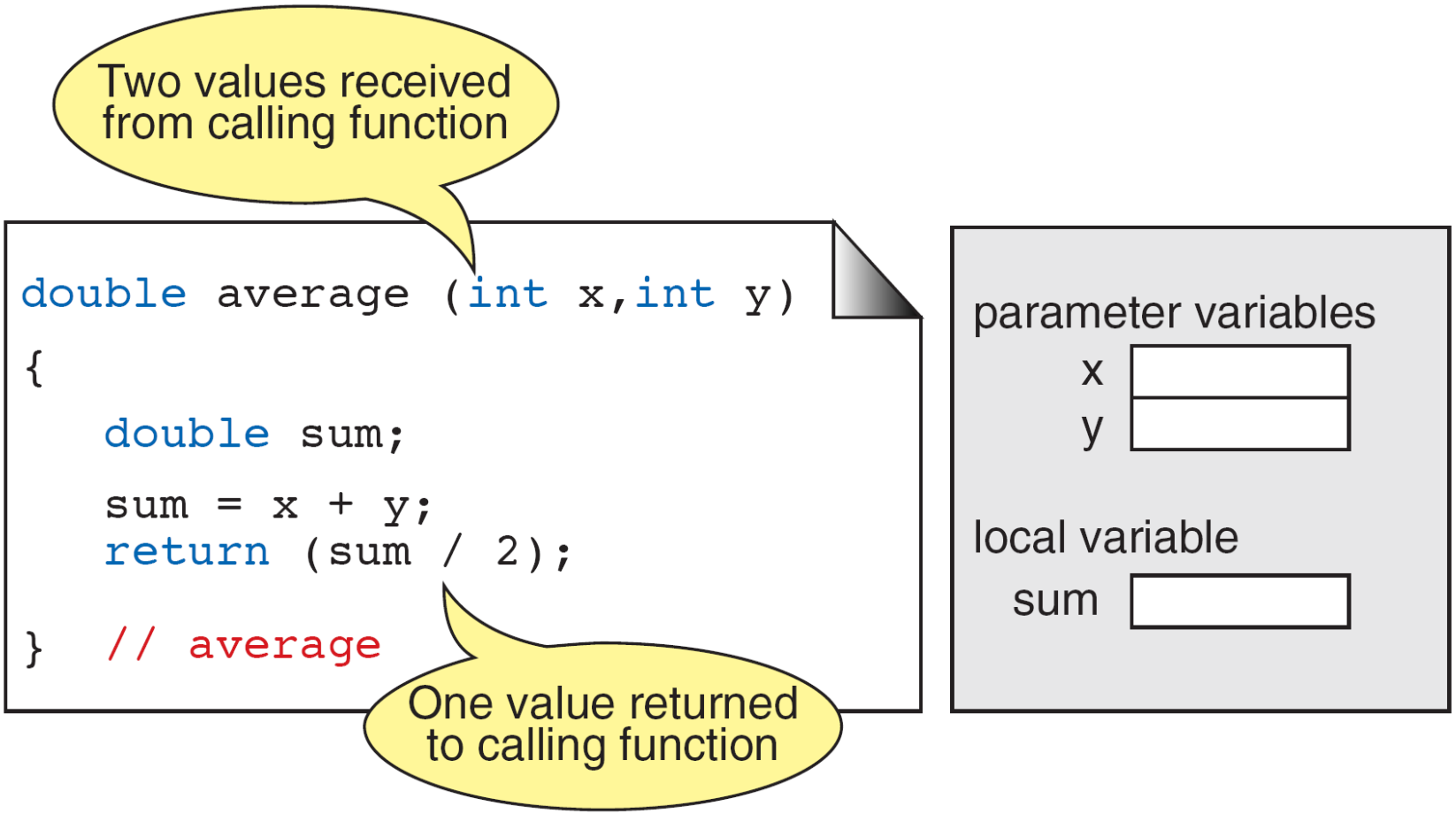

FIGURE 4-11 Function Local Variables

Note

Formal and Actual Parameters

Formal parameters are variables that are declared in the header of the function definition.

Actual parameters are the expressions in the calling statement.

Formal and actual parameters must match exactly in type, order, and number.

Their names, however, do not need to match.

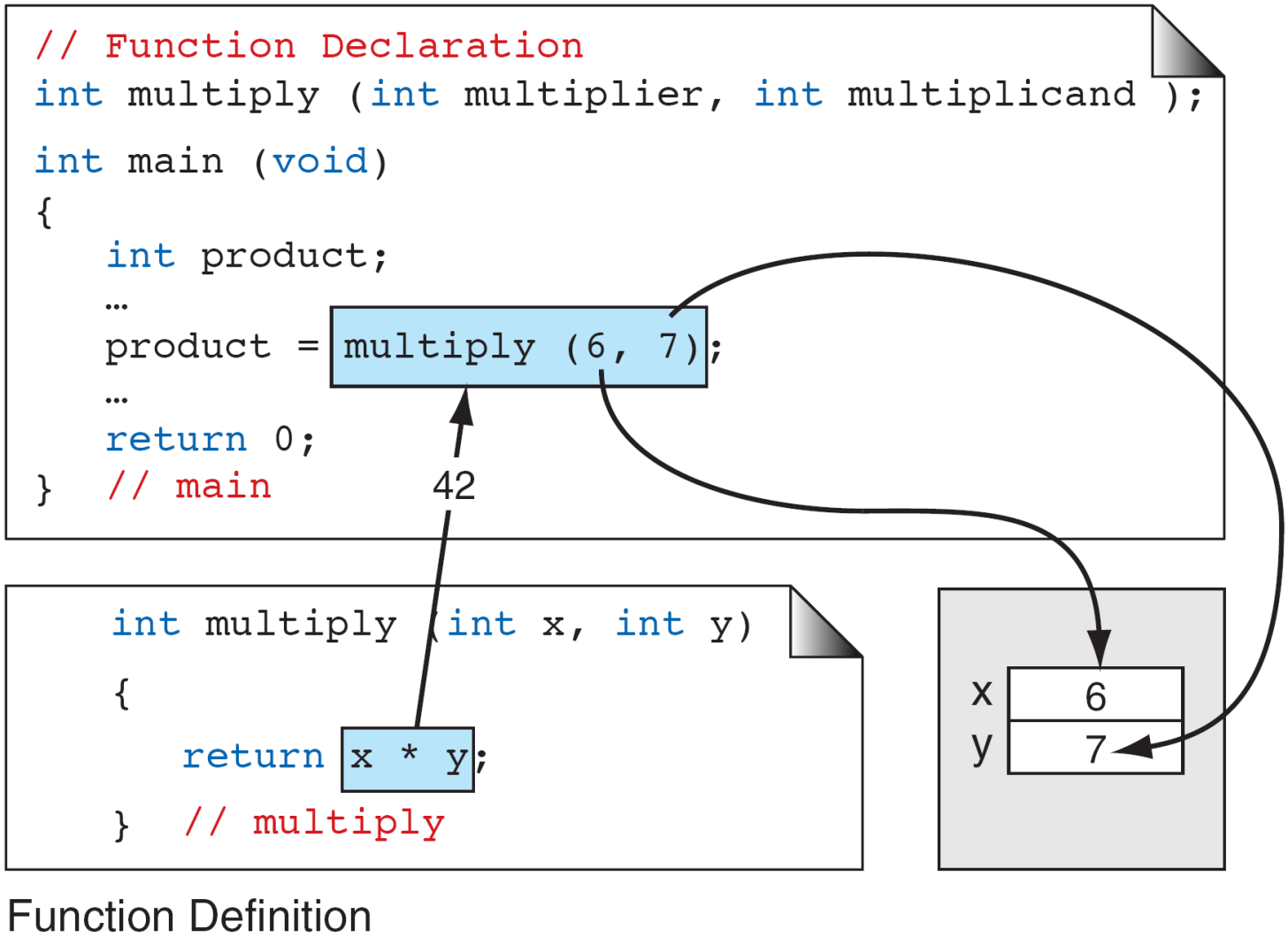

FIGURE 4-12 Parts of a Function Call

```
multiply ( 6, 7 )
multiply ( 6, b )
multiply ( multiply ( a, b ), 7 )
```

```
multiply ( a, 7 )
multiply ( a + 6, 7 )
multiply ( … ,  … )
```

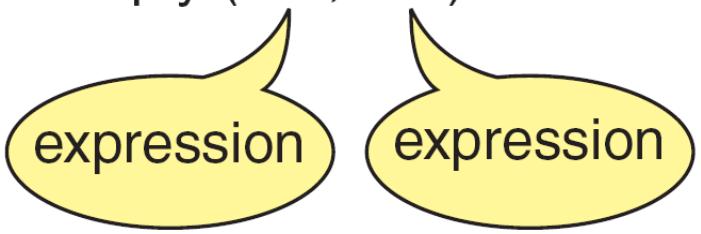

FIGURE 4-13 Examples of Function Calls

PROGRAM 4-4 Print Least Significant Digit

```
 1  /* This program prints the first digits of an integer
 2     read from the keyboard
 3        Written by:
 4        Date:
 5  */
 6  #include <stdio.h>
 7
 8  // Function Declarations
 9  int firstDigit (int num);
10
11  int main (void)
12  {
13  // Local Declarations
14     int number;
15     int digit;
16
17  // Statements
18     printf("Enter an integer: ");
19     scanf ("%d", &number);
```

PROGRAM 4-4 Print Least Significant Digit

```
20
21      digit = firstDigit (number);
22      printf("\nLeast significant digit is: %d\n", digit);
23
24      return 0;
25  }   // main
26
27  /* ================= firstDigit ==================
28      This function extracts the least significant digit
29      of an integer.
30         Pre   num contains an integer
31         Post  Returns least significant digit.
32  */
33  int firstDigit (int num)
34  {
35  // Statements
36      return (num % 10);
37  }   // firstDigit
```

PROGRAM 4-4 Print Least Significant Digit

```
Results:
Enter an integer: 27

Least significant digit is: 7
```

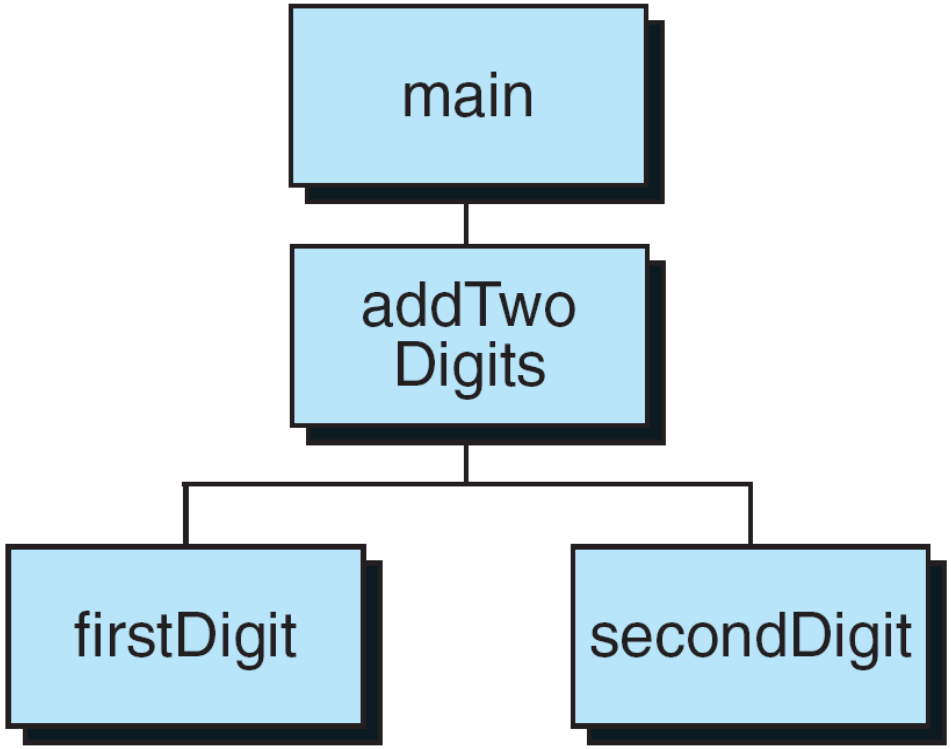

FIGURE 4-14 **Design for Add Two Digits**

PROGRAM 4-5 Add Two Digits

```
 1  /* This program extracts and adds the two least
 2     significant digits of an integer.
 3        Written by:
 4        Date:
 5  */
 6  #include <stdio.h>
 7
 8  //  Function Declarations
 9  int addTwoDigits (int num);
10  int firstDigit   (int num);
11  int secondDigit  (int num);
12
13  int main (void)
14  {
15  // Local Declarations
16     int  number;
17     int  sum;
18
```

PROGRAM 4-5 Add Two Digits

```
19  // Statements
20     printf("Enter an integer: ");
21     scanf ("%d", &number);
22
23     sum = addTwoDigits (number);
24     printf ("\nSum of last two digits is: %d", sum);
25
26     return 0;
27  }  // main
28
29  /* ================== addTwoDigits ==================
30       Adds the first two digits of an integer.
31          Pre  num contains an integer
32          Post returns sum of least significant digits
33  */
34  int addTwoDigits (int number)
35  {
36  // Local Declarations
37     int result;
38
```

PROGRAM 4-5 Add Two Digits

```
39  // Statements
40     result = firstDigit(number) + secondDigit(number);
41     return result;
42  }  // addTwoDigits
43
44  /* ================== firstDigit =================
45     Extract the least significant digit of an integer.
46        Pre   num contains an integer
47        Post  Returns least significant digit.
48  */
49  int firstDigit (int num)
50  {
51  // Statements
52     return (num % 10);
53  }  // firstDigit
54
55  /* ================= secondDigit ================
56     Extract second least significant (10s) digit
57        Pre   num is an integer
58        Post  Returns digit in 10s position
59  */
```

PROGRAM 4-5 Add Two Digits

```
60  int secondDigit (int num)
61  {
62  // Local Declarations
63     int  result;
64
65  // Statements
66     result = (num / 10) % 10;
67     return result;
68  }  // secondDigit
```

```
Results:
Run 1
   Enter an integer: 23
   Sum of last two digits is: 5

Run 2
   Enter an integer: 8
   Sum of last two digits is: 8
```

PROGRAM 4-6 Print Six Digits with Comma

```
1  /* This program reads long integers from the keyboard
2     and prints them with leading zeros in the form
3     123,456 with a comma between 3rd & 4th digit.
4        Written by:
5        Date:
6  */
7  #include <stdio.h>
8  // Function Declarations
9  void printWithComma (long num);
10
11 int main (void)
12 {
13 // Local Declarations
14    long  number;
15
16 // Statements
17    printf("\nEnter a number with up to 6 digits: ");
18    scanf ("%ld", &number);
```

PROGRAM 4-6 Print Six Digits with Comma

```
19      printWithComma (number);
20
21      return 0;
22  }   // main
23
24  /* ================ printWithComma ================
25      This function divides num into two three-digit
26      numbers and prints them with a comma inserted.
27         Pre   num is a six digit number
28         Post  num has been printed with a comma inserted
29  */
30  void printWithComma (long num)
31  {
32  // Local Declarations
33      int  thousands;
34      int  hundreds;
35
```

PROGRAM 4-6 Print Six Digits with Comma

```
36  // Statements
37     thousands  = num / 1000;
38     hundreds   = num % 1000;
39
40     printf("\nThe number you entered is \t%03d,%03d",
41               thousands, hundreds);
42     return;
43  }  // printWithComma
```

```
Results:
Run 1
   Enter a number with up to 6 digits: 123456

   The number you entered is       123,456
Run 2
   Enter a number with up to 6 digits: 12

   The number you entered is       000,012
```

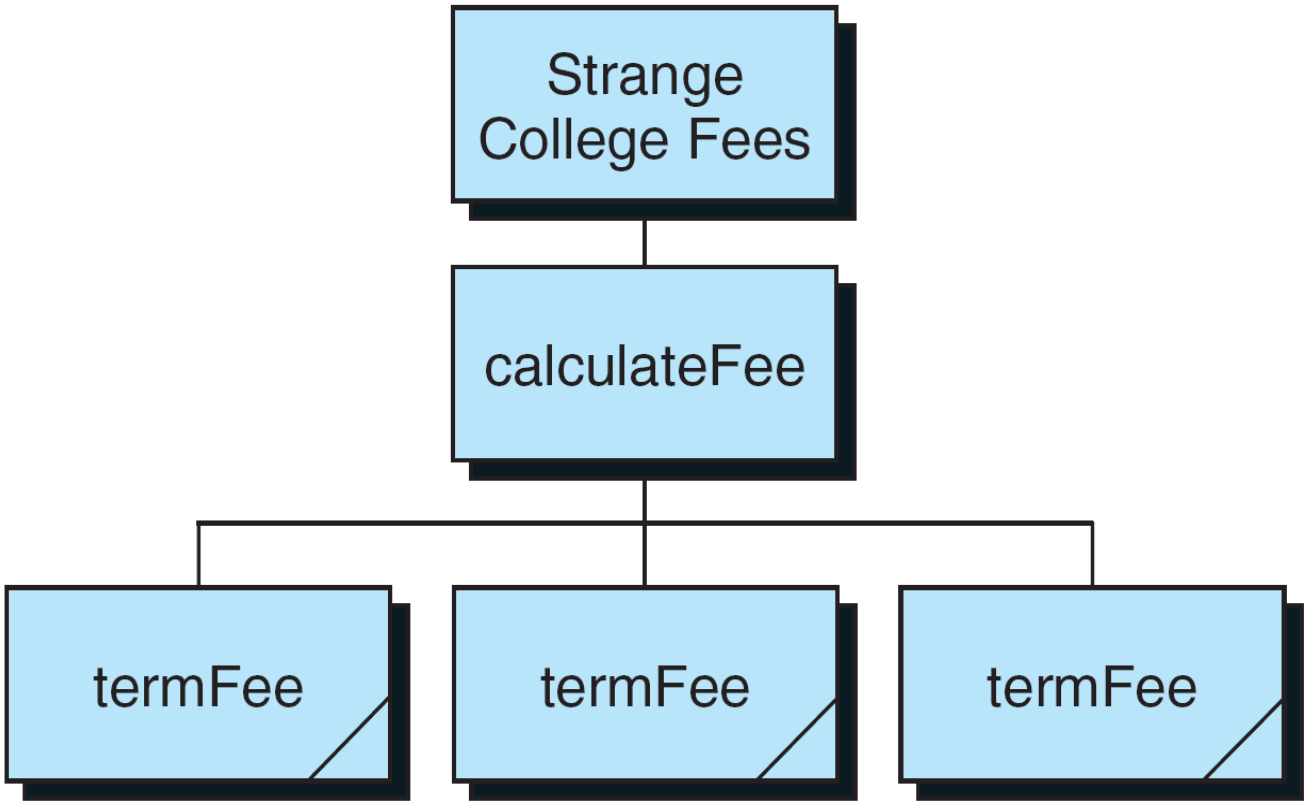

FIGURE 4-15 **Design for Strange College fees**

PROGRAM 4-7 Strange College Fees

```
1  /* This program prints the tuition at Strange College.
2     Strange charges $10 for registration, plus $10 per
3     unit and a penalty of $50 for each 12 units, or
4     fraction of 12, over 12.
5        Written by:
6        Date:
7  */
8  #include <stdio.h>
9
10 #define REG_FEE    10
11 #define UNIT_FEE   10
12 #define EXCESS_FEE 50
13
14 // Function Declarations
15 int calculateFee (int firstTerm, int secondTerm,
16                   int thirdTerm);
17 int termFee      (int units);
18
```

PROGRAM 4-7 Strange College Fees

```
19  int main (void)
20  {
21  // Local Declarations
22     int  firstTerm;
23     int  secondTerm;
24     int  thirdTerm;
25     int  totalFee;
26
27  // Statements
28     printf("Enter units for first term:  ");
29     scanf ("%d", &firstTerm);
30
31     printf("Enter units for second term: ");
32     scanf ("%d", &secondTerm);
33
34     printf("Enter units for third term:  ");
35     scanf ("%d", &thirdTerm);
36
```

PROGRAM 4-7 Strange College Fees

```
37      totalFee = calculateFee
38                 (firstTerm, secondTerm, thirdTerm);
39      printf("\nThe total tuition is : %8d\n", totalFee);
40
41      return 0;
42  }   // main
43
44  /* ================ calculateFee ================
45      Calculate the total fees for the year.
46         Pre   The number of units to be taken each term.
47         Post  Returns the annual fees.
48  */
49  int calculateFee (int firstTerm, int secondTerm,
50                    int thirdTerm)
51  {
52  // Local Declarations
53      int  fee;
54
```

PROGRAM 4-7 Strange College Fees

```
55  // Statements
56     fee = termFee   (firstTerm)
57           + termFee (secondTerm)
58           + termFee (thirdTerm);
59     return fee;
60  }  // calculateFee
61
62  /* ===================== termFee ====================
63     Calculate the tuition for one term
64        Pre   units contains units for the term
65        Post  The fee is calculated and returned
66  */
67  int termFee (int units)
68  {
69  // Local Declarations
70     int  totalFees;
71
```

PROGRAM 4-7 Strange College Fees

```
72  // Statements
73     totalFees = REG_FEE
74                 + ((units - 1)/12 * EXCESS_FEE)
75                 + (units * UNIT_FEE);
76     return (totalFees);
77  }  // termFee
```

```
Results:
Enter units for first term:  10
Enter units for second term: 20
Enter units for third term:  30

The total tuition is :      780
```