

## Chapter 6 - Functions

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*The big idea behind this chapter is ....*

---

*It relates to the previous chapter how ...*

---

*The main purpose of this chapter is ...*

---

*The key questions are ...*

---

Why:

When:

How:

*Why is this material at this point in the class?*

---

*You'll know this material when ...*

---

*Main assumptions are ...*

---

*Opening Thoughts.* Write any thoughts or questions you have before reading this material. See if you can find the answers while you read.

*Key Ideas.* Record major points from the chapter.

[illegible]

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```
1 // 6-1.cpp -- Demo of functions
2 #include <iostream>
3 using namespace std;
4
5 // Function Prototype
6 void DisplayMessage();
7
8 int main() {                      // function 1
9     cout << "Hello from main()\n";
10    DisplayMessage();             // call function 2
11    cout << "Hello from main() again\n";
12
13    return 0;
14 }
15
16 void DisplayMessage() {
17     cout << "Hello from DisplayMessage()\n";
18 }
```

Figure 1: §6.2 Function demo. Source file: 6-1.cpp

```

1 // 6-2.cpp -- Function within a loop
2 #include <iostream>
3 using namespace std;
4
5 // Function Prototype
6 void DisplayMessage();
7
8 int main() { // function 1
9     cout << "Hello from main()\n";
10    for (int i = 0; i < 3; i++) {
11        DisplayMessage(); // call function 2
12    }
13    cout << "Hello from main() again\n";
14
15    return 0;
16 }
17
18 void DisplayMessage() {
19     cout << "Hello from DisplayMessage()\n";
20 }

```

Figure 2: §6.2 Demo of function in a loop. Source file: 6-2.cpp

```

1 // 6-4.cpp -- Functions calling functions
2 #include <iostream>
3 using namespace std;
4
5 void Deeper() {
6     cout << "Now inside function Deeper()\n";
7 }
8 void Deep() {
9     cout << "Hello from Deep()\n";
10    Deeper();
11    cout << "Now back in Deep() again\n";
12 }
13
14 int main() { // function 1
15     cout << "Hello from main()\n";
16     Deep();
17     cout << "Hello from main() again\n";
18
19     return 0;
20 }

```

Figure 3: §6.2 Functions calling functions. Source file: 6-4.cpp

```

1 // 6-4.cpp -- Functions calling functions
2 #include <iostream>
3 using namespace std;
4
5 void Deeper() {
6     cout << "Now inside function Deeper()\n";
7 }
8 void Deep() {
9     cout << "Hello from Deep()\n";
10    Deeper();
11    cout << "Now back in Deep() again\n";
12 }
13
14 int main() { // function 1
15     cout << "Hello from main()\n";
16     Deep();
17     cout << "Hello from main() again\n";
18
19     return 0;
20 }

```

Figure 4: §6.3 Functions without function prototypes (BAD). Source file: 6-4.cpp

```

1 // 6-4.cpp -- Functions calling functions
2 #include <iostream>
3 using namespace std;
4
5 // Function Prototype
6 void Deep();
7 void Deeper();
8
9 int main() { // function 1
10     cout << "Hello from main()\n";
11     Deep();
12     cout << "Hello from main() again\n";
13
14     return 0;
15 }
16
17 void Deep() {
18     cout << "Hello from Deep()\n";
19     Deeper();
20     cout << "Now back in Deep() again\n";
21 }
22
23 void Deeper() {
24     cout << "Now inside function Deeper()\n";
25 }

```

Figure 5: §6.3 Functions with function prototypes (GOOD). Source file: 6-4(fp).cpp



```

1 // 6-19.cpp -- Global variables
2 #include <iostream>
3 using namespace std;
4
5 // Function Prototype
6 void Nevada();
7 void California();
8
9 const int BIRDS = 500;
10
11 int main() {
12     cout << "In main() there are " << BIRDS << " birds\n";
13     Nevada();
14     California();
15     return 0;
16 }
17
18 void Nevada() {
19     cout << "In Nevada there are "
20         << BIRDS << " birds.\n";
21 }
22
23 void California() {
24     const int BIRDS = 10000;
25     cout << "In California there are "
26         << BIRDS << " birds.\n";
27 }

```

Figure 6: §6.10 Demo of global variables. Source file: 6-19.cpp

```

1 // 6-7.cpp -- Passing data
2 #include <iostream>
3 using namespace std;
4
5 // Function Prototype
6 void DisplayValue(int);
7
8 int main() {
9     cout << "Passing several arguments to DisplayValue()\n";
10     DisplayValue(5);
11     DisplayValue(10);
12     DisplayValue(2);
13     DisplayValue(16);
14     cout << "Back in main()\n";
15     return 0;
16 }
17
18 void DisplayValue(int parameter) {
19     cout << "The incoming value is " << parameter << endl;
20 }

```

Figure 7: §6.4 Passing data example. Source file: 6-7.cpp

```

2  #include <iostream>
3  using namespace std;
4
5  // Function Prototype
6  void DisplayValue(int, int, int);
7
8  int main() {
9      cout << "Passing several arguments to DisplayValue()\n";
10     DisplayValue(5,4,1);
11     DisplayValue(10, 99, 33);
12     DisplayValue(2, 2, 2);
13     DisplayValue(16, 10, 5);
14     cout << "Back in main()\n";
15     return 0;
16 }
17
18 void DisplayValue(int p1, int p2, int p3) {
19     cout << p1 << " + " << p2 << " + "
20         << p3 << " = " << (p1 + p2 + p3) << endl;
21 }
21 }

```

Figure 8: §6.4 Passing multiple arguments example. Source file: 6-8.cpp

```

1  // 6-11.cpp -- Passing data back
2  #include <iostream>
3  using namespace std;
4
5  // Function Prototype
6  int DisplayValue(int, int, int);
7
8  int main() {
9      cout << "Calling DisplayValue() to compute answers\n";
10     cout << DisplayValue(5,4,1) << endl;
11     cout << DisplayValue(10, 99, 33) << endl;
12     cout << DisplayValue(2, 2, 2) << endl;
13     int x = DisplayValue(16, 10, 5);
14     cout << x << endl;
15     return 0;
16 }
17
18 int DisplayValue(int p1, int p2, int p3) {
19     return p1 + p2 + p3;
20 }

```

Figure 9: §6.7 Returning data. Source file: 6-11.cpp

```

1 // pbVpbR.cpp -- Pass by value & pass by reference example
2 #include <iostream>
3 using namespace std;
4
5 void swapThemByVal(int, int);
6 void swapThemByRef(int&, int&);
7
8 int main() {
9     int i = 10, j = 20;
10    cout << "Values i, j in main(): "
11    << i << ", " << j << endl;
12    swapThemByVal(i, j);
13    cout << "Values i, j in main() after swapThemByVal: "
14    << i << ", " << j << endl;
15    swapThemByRef(i, j);
16    cout << "Values i, j in main() after swapThemByRef: "
17    << i << ", " << j << endl;
18
19    return 0;
20 }
21
22 void swapThemByVal(int num1, int num2) {
23     int temp = num1;
24     num1 = num2;
25     num2 = temp;
26     cout << "Values i, j in swapThemByVal(): "
27     << num1 << ", " << num2 << endl;
28 }
29
30 void swapThemByRef(int& num1, int& num2) {
31     int temp = num1;
32     num1 = num2;
33     num2 = temp;
34     cout << "Values i, j in swapThemByRef(): "
35     << num1 << ", " << num2 << endl;
36 }

```

Figure 10: §6.5 Example of pass by value and pass by reference. Source file: pbVpbR.cpp

```

1 //6-22(mod).cpp -- Static Local Variable Demo (modified)
2 // from C++ Brief p.343
3 #include <iostream>
4 using namespace std;
5
6 // Function Prototypes
7 void ShowStatic();
8
9 int main() {
10     for (int i = 0; i < 5; i++)
11         ShowStatic();
12
13     return 0;
14 }
15
16 void ShowStatic() {
17     static int staticNum;
18
19     cout << "StaticNum is " << staticNum << endl;
20     staticNum++;
21 }

```

Figure 11: §6.11 Static local variable demo. Source file: 6-22(mod).cpp

```

1 //6-24(mod).cpp -- Default Argument Demo (modified)
2 // from C++ Brief p.347
3 #include <iostream>
4 using namespace std;
5
6 // Function Prototypes
7 void DisplayStars(int = 10, int = 1);
8 // void DisplayStars( int cols = 10, int rows = 1); //OK, too
9
10 int main() {
11     cout << "Default values\n";
12     DisplayStars();
13     cout << "Use default value for rows\n";
14     DisplayStars(5);
15     cout << "Change both default values\n";
16     DisplayStars(7, 3);
17
18     return 0;
19 }
20
21 // void DisplayStars(int cols = 10, int rows = 1) // Works, not preferred
22 void DisplayStars(int cols, int rows) {
23     for (int down = 0 ; down < rows; down++) {
24         for (int across = 0; across < cols; across++)
25             cout << "*";
26         cout << endl;
27     }
28 }

```

Figure 12: §6.12 Default argument demo. Source file: 6-24(mod).cpp

```

1 //6-26(mod).cpp -- Reference Variable Demo (modified)
2 // from C++ Brief p.351
3 #include <iostream>
4 using namespace std;
5
6 // Function Prototypes
7 void doubleNum(int &);
8 void getNum(int &);
9
10 int main() {
11     int value;
12     getNum(value);
13     doubleNum(value);
14     cout << "Doubling that number is " << value << endl;
15
16     return 0;
17 }
18
19 void getNum(int& userNum) {
20     cout << "Enter a number: ";
21     cin >> userNum;
22 }
23
24 void doubleNum(int& refVar) {
25     refVar *= 2;
26 }

```

Figure 13: §6.13 Reference variable demo. Source file: 6-26(mod).cpp

```

1 // FuncOverDemo.cpp -- C++ Function overloading Demo
2 #include <iostream>
3 using namespace std;
4
5 // Function Prototypes
6 int square(int);
7 double square(double);
8
9 int main() {
10     int userInt = 10;
11     double userFloat = 12.6;
12
13     cout << "The square of " << userInt
14         << " is " << square(userInt) << endl;
15     cout << "The square of " << userFloat
16         << " is " << square(userFloat) << endl;
17
18     return 0;
19 }
20
21 int square(int number) {
22     return number * number;
23 }
24 double square(double number) {
25     return number * number;
26 }

```

Figure 14: §6.14 Function overloading demo. Source file: FuncOverDemo.cpp

```

1 /* exit example */
2 #include <iostream>      /* printf, fopen */
3 #include <cstdlib>      /* exit, EXIT_FAILURE */
4
5 int main ()
6 {
7     FILE * pFile;
8     pFile = fopen ("myfile.txt","r");
9     if (pFile==NULL)
10     {
11         printf ("Error opening file");
12         exit (EXIT_FAILURE);
13     }
14     else
15     {
16         /* file operations here */
17     }
18     return 0;
19 }

```

Figure 15: §6.15 Exit example. Source file: exit.cpp