

The American University in Cairo
Computer Science & Engineering Department
CSCE 1001 – Fundamentals of Computer Science

Lab Session 12

Modular Programming

Objectives:

- To understand the difference between call-by-value and call-by-reference
- To understand the distinction between input, inout, and output parameters and when to use each kind.

Problems:

1. Write the following modular program in C++:
 - a. Write a function **swap** that takes two integer numbers and swap them (interchange their values).
 - b. Write a function **readPair** that reads two integer numbers each of which should be greater than 0 and if the second integer is less than the first, the function **swap** is called to interchange the values of the two integers.
 - c. Write a function **multiple** that determines for a pair of integers whether the second integer is a multiple of the first. The function should take two integer arguments and return **true** if the second is a multiple of the first, **false** otherwise.
 - d. Write a **main** function that will test **k** pairs of integer numbers. For each pair, the function **readPair** is called first to enter values for the two integer numbers, then the function **multiply** is called to test the two numbers. The program should print out the values of the two integers together with a message notifying whether the second integer is multiple of the first, or not
2. Show the output of the following program segments:

```
void test ( int, int&, int&);
void main()
{
int d = 17; int e = 21; int f = 15; int a = 16; int b = 19;
test (d, e, f);
cout << "In the main program after the first call" << endl;
cout << "the variables are: " << setw(3) << e << setw(3) << d <<
setw(4) << f << endl;
cout << "-----";
test (a, b, f);
cout << "In the main program after the second call" << endl;
cout << "the variables are: " << setw(3) << a << setw(3) << d <<
setw(4) << f << endl;
}
void test(int t, int& s, int& x)
{
s = 4;
s = s +3;
x = x + s + t;
t = 5 * s;
cout << "Function test Output: " << setw(3) << s << setw(3) << t <<
setw(3) << x << endl;
}
```

```
void swap (int&, int&);
void main()
{ int a = 55, b = 77, c = 99;
do
{
if ( b > a)
swap (a, b);
if ( c > b )
swap (b, c);
} while (( b > a ) || ( c > b ));
cout << "The two required values are:" <<
endl;
cout << setw(6) << a << setw(6) << b << endl;
}

void swap (int& X, int& Y)
{ int T = X;
X = Y;
Y = T; }
```

Instructions:

- The TA solves parts a and b of problem 1 (20 minutes)
- The TA asks students to complete problem 1 and submit in Lab.
- The TA asks students to solve problem 2 to be **submitted in next Lab session**.