Laboratory 06B

CS-102

Spring 2022

Laboratory 6B - Part1
Using Reference Variables

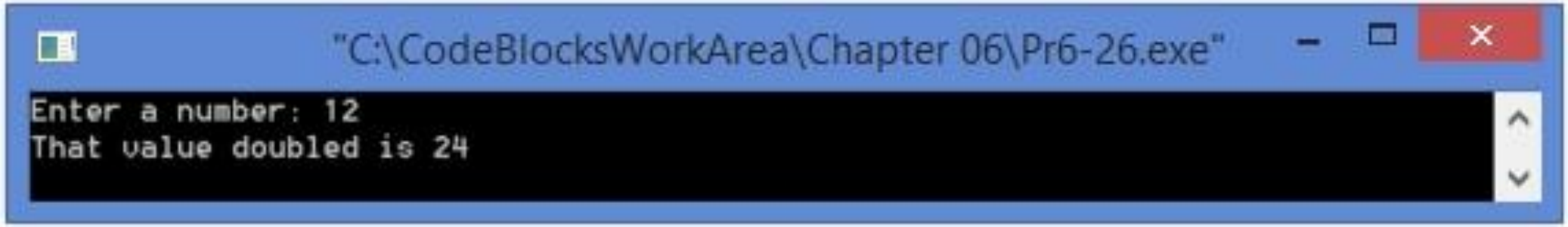
- The purpose of this Lab is to take a close look at passing variables by Value and passing variables by Reference, and when to make use of each of these two methods.
- Since we have been already passing variables by Value, we'll begin by looking at passing values by Reference.
- Program 6-26 shows an example of passing variables by Reference.
- Pay close attention to the use of the & in passing variables by Reference. Note that it is used in the Prototype as well as in the function definition, but not in the function call.
- Get Program 6-26 up and running.

Program 6-26 Using Reference Variables as function parameters

```
// This program uses reference variables as function parameters.
#include <iostream>
using namespace std;
// Function prototypes. Both functions use reference variables
// as parameters.
void doubleNum(int &);
void getNum(int &);

int main()
{
  int value;

  // Get a number and store it in value.
  getNum(value);

  // Double the number stored in value.
  doubleNum(value);

  // Display the resulting number.
  cout << "That value doubled is " << value << endl;
  return 0;
}
```

```
//*********************************************************
// Definition of getNum.                                  *
// The parameter userNum is a reference variable. The user is *
// asked to enter a number, which is stored in userNum.   *
//*********************************************************
void getNum(int &userNum)
{
  cout << "Enter a number: ";
  cin >> userNum;
}
//*********************************************************
// Definition of doubleNum.                               *
// The parameter refVar is a reference variable. The value *
// in refVar is doubled.                                  *
//*********************************************************
void doubleNum (int &refVar)
{
  refVar *= 2;
}
```

Program6-26 Concluded: Functions using Reference Variables



Laboratory 6B – Part 2
Using Reference Variables

- In Part 2, you are to re-write Program 6-26 so that instead of passing the variable by reference, it will pass the variable using a Value Returning function.
  - So your main() function will need to receive those values.
- Call your program: *YourName*-Lab06B-2.cpp
- When you have your updated Value Returning version of Lab06B, and have it running:
  - If you are doing Lab06B synchronously, please call the instructor so that you can be given proper credit for your work.
  - If you are doing Lab06B asynchronously, please submit your work to Canvas.

Laboratory 6B – Part 3
Using Reference Variables

- When a function is returning only one value, the Value Returning function usually is a better choice than the function that returns a Reference Variable.
- However, the value returning function can only return one value. If what you are wanting to do is to return more than one value, then the function that returns Reference Variables is the more likely choice, as it can return as many Reference Variables as desired.
- In Part 3, you are going to use a function that returns Reference Variables to return the result of having thrown two dice.
- The value of each die will be returned to main() and displayed.

Laboratory 6B – Part 3
Using Reference Variables

- In your main() function you will start by declaring two dice:

  int die1, die2;

- You will take Program 3-26, and rewrite it as a function called throwDice(arg1,arg2) where arg1 and arg2 are the variables that you are passing by Reference.
- After having called the function, throwDice(arg1,arg2), the values of arg1 and arg2 should be the values of the two dices after they have passed through the randomize function which is contained in Program 3-26.
- Call your program *YourName*-Lab06B-3.cpp
  - If you are doing Lab06B synchronously, please call the instructor so that you can be given proper credit for your work.
  - If you are doing Lab06B asynchronously, please submit your work to Canvas.

Program 3-26

```
1  // This program simulates rolling dice.
2  #include <iostream>
3  #include <cstdlib>   // For rand and srand
4  #include <ctime>     // For the time function
5  using namespace std;
6
7  int main()
8  {
9       // Constants
10      const int MIN_VALUE = 1;  // Minimum die value
11      const int MAX_VALUE = 6;  // Maximum die value
12
13      // Variables
14      int die1;  // To hold the value of die #1
15      int die2;  // To hold the value of die #2
16
17      // Get the system time.
18      unsigned seed = time(0);
19
20      // Seed the random number generator.
21      srand(seed);
22
23      cout << "Rolling the dice…\n";
24      die1 = (rand() % (MAX_VALUE - MIN_VALUE + 1)) + MIN_VALUE;
25      die2 = (rand() % (MAX_VALUE - MIN_VALUE + 1)) + MIN_VALUE;
26      cout << die1 << endl;
27      cout << die2 << endl;
28      return 0;
29 }
```

Laboratory 6B – Part 4

- Re-do the program that follows called BMI.cpp and make it a function which passes by reference and receives as input:
  - the weight (could be decimal, like 150.5 pounds)
  - height in feet (will always be an integer, like 5 feet)
  - height in inches (could be decimal, like 2.5 inches)
- The function calculates and returns the BMI based on the formula below:
  - (weight in pounds * 703) / (height in inches)^2
- Remember that the height in feet and inches must be converted to all inches. This happens in the function. Use pow to calculate the square. To square a value in a variable called num you would use:
  - pow(num, 2)

Laboratory 6B – Part 4

- The user input is received in the function bmiCalc() when it is called. The result (the BMI) is returned to main by reference and printed in main. Display the result with 2 decimal places. Make sure it works with just one set of data first (NO LOOP).
- THEN add a do-while loop so that you can process multiple test cases.
- **Here is a sample run: Sample Output: (test case 1)**

```
Enter weight: 180
Enter height (feet): 5
Enter height (inches): 8
Your BMI is  27.37

You might consider losing reducing your caloric intake.
Another? (y/n)
```

Laboratory 6B – Part 4

- **Here are two more test cases to run in your demo:**

weight(pounds)	**height(feet)**	**height(inches)**
200.5	6	0
140	5	4.5

- Call your program *YourName*-Lab06B-4.cpp
  - If you are doing Lab06B synchronously, please connect with the instructor so that you can be given proper credit for your work.
  - If you are doing Lab06B asynchronously, please submit your work to Canvas.

```
#include<iostream>
#include <cmath>
using namespace std;

int main()
{
	double weight, height, BMI;
	cout << "\n++++++++++++++++++++++++++++++++++++\n"
	<< "          Body Mass Index"
	<< "\n++++++++++++++++++++++++++++++++++++\n";
	cout << "Enter your weight (in pounds): ";
	cin >> weight;
	cout << "\nEnter your height (in inches): ";
	cin >> height;
	BMI = (weight * 703) / (height * height);
	if(BMI < 18.5)
	cout << "You could eat more than you are currently doing!! \n\n";
	if(BMI >= 18.5 && BMI <= 25)
	cout << "You are in optimal shape!! Good Work! \n\n";
	if(BMI > 25)
	cout << "You might consider reducing Caloric Intake!! \n\n";
	system("pause");
	return 0;
}
```

BMI.cpp This is a program that computes Body Mass Index and comments on it.