

CMIS 102 Hands-On Lab

Week 7

Overview

This hands-on lab allows you to follow and experiment with the critical steps of developing a program including the program description, analysis, test plan, design, and implementation with C code. The example provided uses sequential, repetition, selection statements and two user-defined function.

Program Description

This program will provide options for a user to calculate the square or cube of a positive Integer input by a user. The program will prompt the user to enter an Integer and then prompt the user if they want to calculate the square of the cube of the number. Based on the inputs of the user, the program will output the square of the cube of the positive integer. The program will then print the Integer and square or cube of the integer based on the user's original choice. The program will continue to prompt the user for Integers and their calculation choice until the user enters a negative integer. The square and cube calculations should be calculated using a function.

Analysis

I will use sequential, selection, and repetition programming statements and functions for the cube and square calculations.

I will define three Integer numbers: IntValue, MenuSelect, Results to store the Integer value input by the user, the Menu selection (1 for Square, 2 for Cube) of the user, and the results of the Square or Cube functions.

The Square function will take one Integer as input and return one Integer as the output. The calculation within the Square function is: $\text{Results} = \text{IntValue} * \text{IntValue}$

For example, if 10 was entered as the IntValue. $\text{Results} = 10 * 10 = 100$

The Cube function will take one Integer as input and return one Integer as the output. The calculation within the Cube function is: $\text{Results} = \text{IntValue} * \text{IntValue} * \text{IntValue}$

For example, if 10 was entered as the IntValue. $\text{Results} = 10 * 10 * 10 = 1000$

A repetition loop can be used to loop through iterations until a negative is entered:

```
while(intValue > 0) {
```

```
    ...
```

```
End For
```

Test Plan

To verify this program is working properly the input values could be used for testing:

Test Case	Input	Expected Output
1	IntValue=10 MenuSelect=1	Square of 10 is 100
2	IntValue=10 MenuSelect=2	Cube of 10 is 1000
3	intValue=-1 MenuSelect=N/A	Program exits

Pseudocode

```
// This program will provide options for a user to calculate the square
// or cube of a positive Integer input by a user.
// Start Main program
Main

// Declare variables
Declare intValue, menuSelect, Results as Integer

// Set intValue to positive value to start loop
Set intVal = 1;

// Loop While input is a positive number
While intValue > 0

    Print "Enter a positive Integer:"
    Input intValue

    // Only perform menu and function calls is integer is positive
    If intValue > 0 Then
        Print "Enter 1 to calculate Square, 2 to Calculate Cube "
        Input menuSelect

        If menuSelect == 1 Then
            // Call the Square Function
            Set Results = Square(intValue)
            Print intValue, Results
        Else If menuSelect == 2 Then
            // Call the Cube function
            set Results = Cube(intValue)
            Print intValue, Results
        Else
            Print "Invalid menu item, only 1 or 2 is accepted"
        End If
    End If

END While

// End of Main program
End Program
```

```

// Square Function
Function Square(value) as Integer
    Set Square = value*value
End Function

// Cube Function
Function Cube(value) as Integer
    Set Cube = value*value*value
End Function

```

C Code

The following is the C Code that will compile in execute in the online compilers.

```

// C code

// This program will provide options for a user to calculate the square
// or cube of a positive Integer input by a user.
// Developer: Faculty CMIS102
// Date: Jan 31, XXXX

#include <stdio.h>

// Function prototypes
int Square(int value);
int Cube(int value);

int main ()
{
    /* variable definition: */
    int intValue, menuSelect, Results;

    intValue = 1;

    // While a positive number
    while (intValue > 0)
    {
        printf ("Enter a positive Integer\n: ");
        scanf("%d", &intValue);

        if (intValue > 0)
        {
            printf ("Enter 1 to calculate Square, 2 to Calculate Cube \n: ");
            scanf("%d", &menuSelect);

```

```

    if (menuSelect == 1)
    {
        // Call the Square Function
        Results = Square(intValue);
        printf("Square of %d is %d\n",intValue,Results);
    }
    else if (menuSelect == 2)
    {
        // Call the Cube function
        Results = Cube(intValue);
        printf("Cube of %d is %d\n",intValue,Results);
    }
    else
        printf("Invalid menu item, only 1 or 2 is accepted\n");
    }
}

return 0;
}

/* function returning the Square of a number */
int Square(int value)
{
    return value*value;
}

/* function returning the Cube of a number */
int Cube(int value)
{
    return value*value*value;
}

```

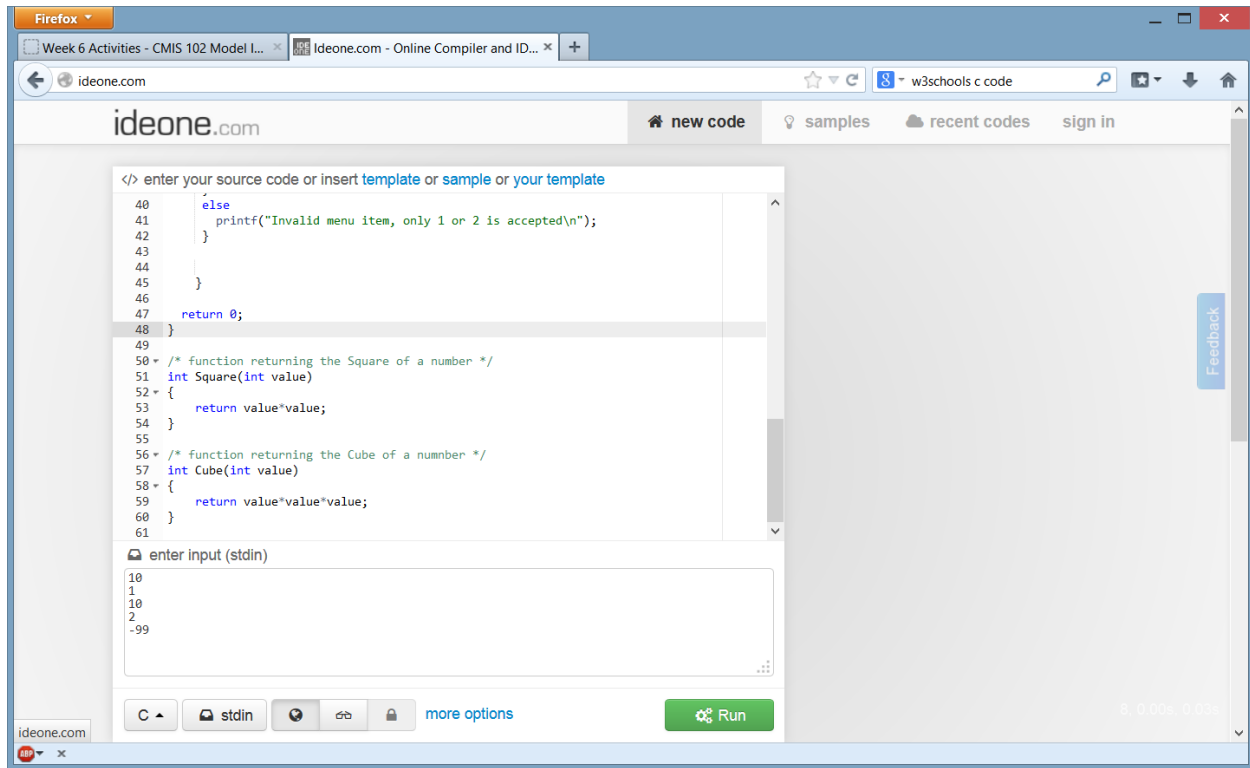
Setting up the code and the input parameters in ideone.com:

Note the Input values for this run were:

10

1
10
2
-99

You can change these values to any valid integer values to match your test cases.



The screenshot shows the Ideone.com online compiler interface in a Firefox browser. The browser tabs include "Week 6 Activities - CMIS 102 Model I..." and "Ideone.com - Online Compiler and ID...". The address bar shows "ideone.com". The page has a navigation bar with "new code", "samples", "recent codes", and "sign in". The main area contains a code editor with the following C code:

```
<> enter your source code or insert template or sample or your template
40
41     else
42         printf("Invalid menu item, only 1 or 2 is accepted\n");
43     }
44
45 }
46
47 return 0;
48 }
49
50 /* function returning the Square of a number */
51 int Square(int value)
52 {
53     return value*value;
54 }
55
56 /* function returning the Cube of a number */
57 int Cube(int value)
58 {
59     return value*value*value;
60 }
61
```

Below the code editor is an input field labeled "enter input (stdin)" containing the test cases:

```
10
1
10
2
-99
```

At the bottom, there are buttons for "C", "stdin", "Run", and "more options". The "Run" button is green and has a gear icon. The status bar at the bottom left shows "ideone.com" and a small red icon.

Results from running the programming at ideone.com:

The screenshot shows a web browser window with the IDEONE online compiler. The code editor contains a C++ function named `Cube` that takes an integer `value` and returns its cube (`value*value*value`). The code is as follows:

```
51. int Cube(int value)
52. {
53.     return value*value*value;
54. }
55.
```

Below the code editor, a green "Success" message indicates that the code compiled and ran without errors. The output is divided into two sections: `stdin` and `stdout`.

stdin:

```
10
1
10
2
-99
```

stdout:

```
Enter a positive Integer
: Enter 1 to calculate Square, 2 to Calculate Cube
: Square of 10 is 100
Enter a positive Integer
: Enter 1 to calculate Square, 2 to Calculate Cube
: Cube of 10 is 1000
Enter a positive Integer
:
:
```

On the right side of the IDEONE interface, the following information is displayed:

- URL: <http://ideone.com/fJHuF3>
- Language: C
- Created: 0 seconds ago
- Visibility: public
- Share or Embed source code: `<script src="http://ideone.com/e.js/fJHuF3" type="text/javascript"></script>`

At the bottom of the IDEONE interface, there is a footer with the text "Sphere Research Labs. Ideone is powered by Sphere Engine™" and links to "home", "terms of use", "api", "language", "faq", "credits", "desktop", and "mobile".

Learning Exercises for you to complete

1. Demonstrate you successfully followed the steps in this lab by preparing screen captures of you running the lab as specified in the Instructions above.
2. Using the Square and Cube functions as models, Create an application that includes a function named "Shrink" that would take an Integer and return the Integer divided by 2? (Hint: your returned value should probably be a double type.) Support your experimentation with screen captures of executing the new code.
3. Prepare a new test table with at least 3 distinct test cases listing input and expected output for the code you created after step 1.
4. What would happen if you removed the following code from our design?

If intValue > 0

Support your argument with screen captures of executing the new code.

5. Modify the original code and add an additional function of your choice. The function should be unique and something you created for this assignment. Support your experimentation with screen captures of executing the new code. Prepare a test table with at least 3 distinct test cases listing input and expected output for your unique function.

Grading guidelines

Submission	Points
Demonstrates the successful execution of this Lab within an online compiler. Provides supporting screen captures.	2
Modifies the code to create an application that includes a function named "Shrink" that would take an Integer and return the Integer divided by 2 Support your experimentation with screen captures of executing the new code.	2
Provides a new test table with at least 3 distinct test cases listing input and expected output for the code you created after step 1.	1
Describes what would happen if you removed the "if intValue > 0" line was removed. Support your argument with screen captures of executing the new code.	1
Modifies the original code and adds an additional unique function of your choice. Supports your experimentation with screen captures of executing the new code. Prepares a test table with at least 3 distinct test cases listing input and expected output for your unique function.	3
Document is well-organized, and contains minimal spelling and grammatical errors.	1
Total	10