CMIS 102 Hands-On Lab

Week 5

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 (using pseudocode), and implementation with C code. The example provided uses sequential, selection and repetition statements.

Program Description

This program will calculate the average of 10 positive integers. The program will ask the user to 10 integers. If any of the values entered is negative, a message will be displayed asking the user to enter a value greater than 0. The program will use a loop to input the data.

Analysis

I will use sequential, selection and repetition programming statements.
I will define two integer numbers: count, value and sum. count will store how many times values are entered. value will store the input. Sum will store the sum of all 10 integers.
I will define one double number: avg. avg will store the average of the ten positive integers input.

The sum will be calculated by this formula:
sum = sum + value
For example, if the first value entered was 4 and second was 10:
sum = sum + value = 0 + 4
sum = 4 + 10 = 14
Values and sum can be input and calculated within a repetition loop:
while count <10
  Input value
  sum = sum + value
End while

Avg can be calculated by:
avg = value/count

A selection statement can be used inside the loop to make sure the input value is positive.

```
If value >= 0 then
    count = count + 1

Else
    input value
End If
```

Test Plan

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

Test Case	Input	Expected Output
1	value=1 value=1 value=1 value=0 value=1 value=2 value=0 value=1 value=3 value=2	Average = 1.2
2	value=100 value=100 value=100 value=100 value=100 value=200 value=200 value=200 value=200 value=200	Average = 150.0
3	value=100 value=100 value=100 value=100 value=-100 value = 100 value=200 value=200 value=200 value=200	Input a positive value average is 140.0

Pseudocode

```
// This program will calculate the average of 10 positive integers.

// Declare variables
Declare count, value, sum as Integer
Declare avg as double

//Initialize value
Set count=0
```

```
Set sum = 0
set avg = 0.0;

// Loop through 10 integers
While count < 10
   Print "Enter a Positive Integer"
   Input value
    if (value >=0)
        sum = sum + value
       count=count+1
  else
      Print ("Value must be positive");
  End if
End While

// Calculate average
avg = sum/count
// Print results
Print "Average is " + avg
```

C Code

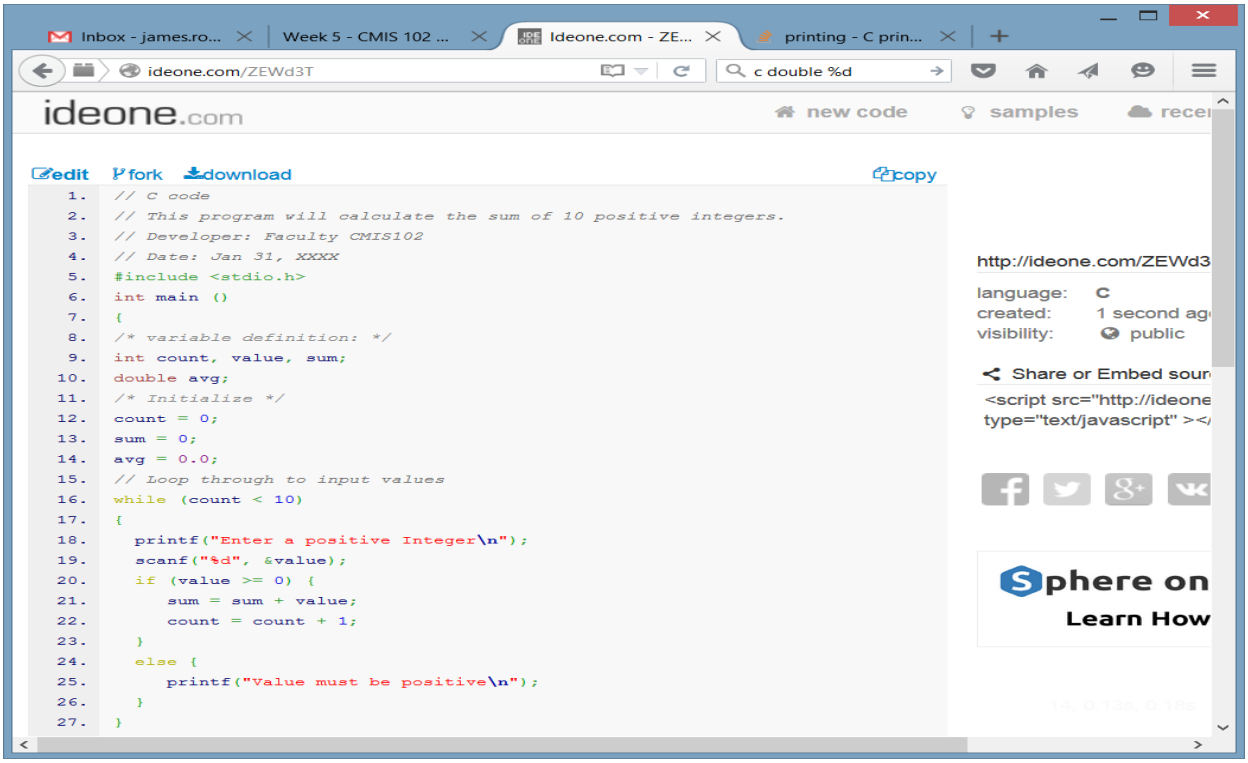
The following is the C Code that will compile in execute in the online compilers.

```
// C code

// This program will calculate the sum of 10 positive integers.

// Developer: Faculty CMIS102

// Date: Jan 31, XXXX

#include <stdio.h>

int main ()

{

/* variable definition: */

int count, value, sum;
double avg;

/* Initialize */

count = 0;

sum = 0;
avg = 0.0;

// Loop through to input values

while (count < 10)

{

  printf("Enter a positive Integer\n");
```

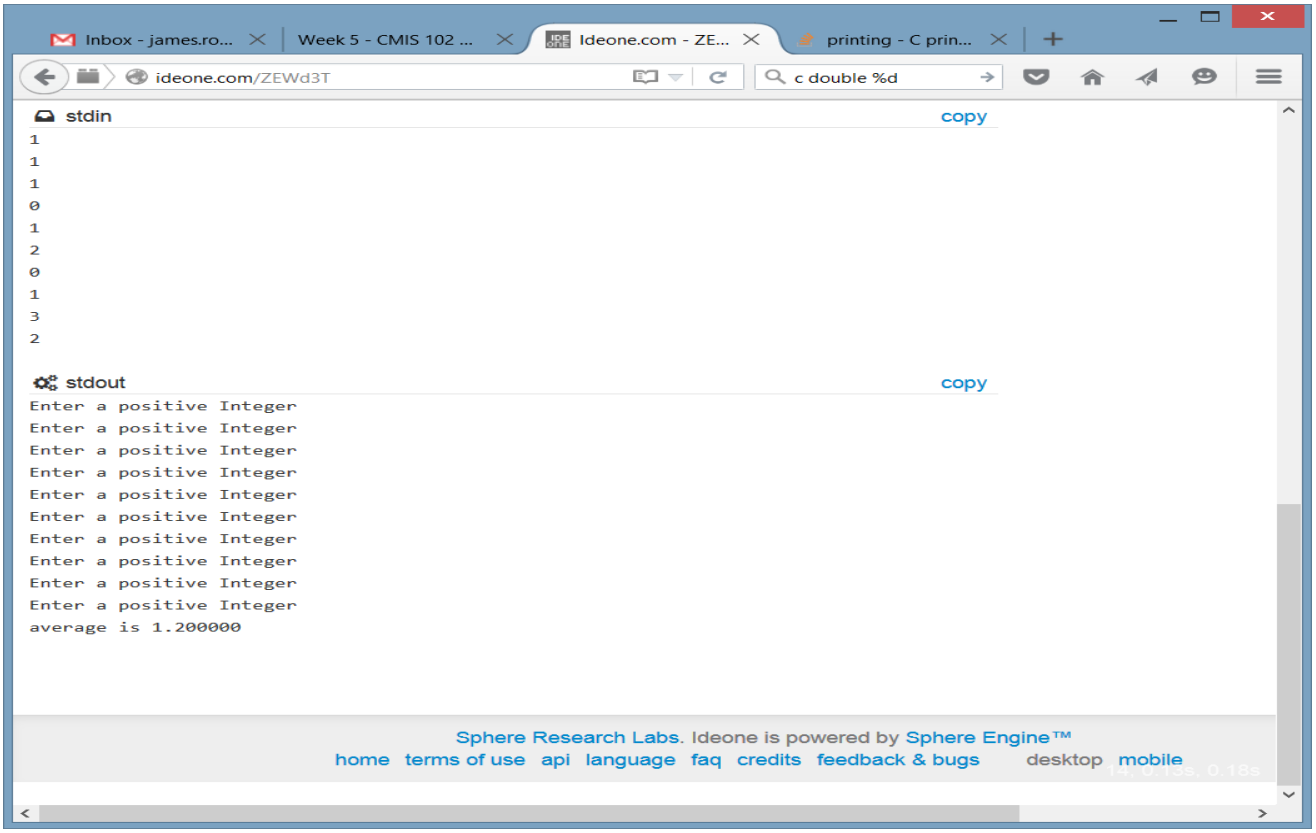
```
   scanf("%d", &value);
   if (value >= 0) {
      sum = sum + value;
      count = count + 1;
   }
   else {
      printf("Value must be positive\n");
   }
}
// Calculate avg. Need to type cast since two integers will yield an integer
avg = (double) sum/count;
printf("average is %lf\n " , avg );
return 0;
}
```

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

Note the input integer values are 1, 1, 1, 0, 1, 2, 0, 1, 3, 2 for this test case. You can change these values to any valid integer values to match your test cases. You should also test with a negative number to make sure the positive integer logic works properly.



Results from running the programming at ideone.com



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. Change the code to average 20 integers as opposed to 10. 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 happens if you entered a value other than an integer? (For example a float or even a string). Support your experimentation with screen captures of executing the code.

5. Modify the code to allow the user to enter any number of positive integers and calculate the average. In other words, the user could enter any number of positive integers. (Hint: You can prompt the user for how many they want to enter. Or; you could use a sentinel value to trigger when the user has completed entering values). Prepare a new test table with at least 3 distinct test cases listing input and expected output for the code you created. Support your experimentation with screen captures of executing the new code.

Grading guidelines

Submission	Points
Demonstrates the successful execution of this Lab within an online compiler. Provides supporting screen captures.	2
Modifies the C code average 20 integers as opposed to 10. 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 happens if you entered a value other than an integer? Support your experimentation with screen captures of executing the code.	1
Modifies the C code to allow the user to enter any number of positive integers and calculate the average. Provides a new test table with at least 3 distinct test cases listing input and expected output for the code you created. Support your experimentation with screen captures of executing the new code.	3
Document is well-organized, and contains minimal spelling and grammatical errors.	1
Total	**10**