

CSCE 1030 – Homework 3

Due: 11:59 PM on Thursday, March 12, 2015 CDT

Problem Statement:

The purpose of this programming project is to write a C++ program that uses programmer-defined functions to validate user input, calculate some results, and then print out a diamond patterned shape to the screen based on input from the user.

Your program's output should initially display the department and course number, your name, your EUID, and your e-mail address.

You will first prompt the user to enter an odd integer between 1 and 19, inclusively. You will validate the user's input by creating a programmer-defined function to ensure that the integer is an odd integer in the range 1 to 19, inclusively. The integer entered by the user should be passed as a parameter to this function. If the number is not valid, you will display a meaningful error message before re-prompting the user to enter the integer again. The return type of this function should be a boolean data type and you are to use this boolean result in determining whether or not the user input is valid. You may assume that the user enters an integer, though it may be out of range.

Once validated, you will calculate and return the sum of the integers from 1 to the integer entered by the user using another programmer-defined function. Again, the integer entered by the user should be passed as a parameter to this function. The return type of this function should be an integer data type and you are to use this integer result and print it to the screen in a meaningful message.

You will then prompt the user for and read in a printable character that will be used to draw the diamond. You may assume that the user enters a printable character.

Finally, you will draw the diamond using a programmer-defined function that accepts both the integer and the printable character entered by the user as parameters. The integer entered by the user will specify the number of rows in the diamond. You may only use `cout` statements that print a single character (i.e., that passed in by the user), a single space, or a single new-line character (such as `'\n'` or `endl`). Maximize your use of repetition with nested `for` loops and minimize the number of `cout` statements. This function should be a void-function that does not return a value. It should print a diamond of the appropriate size using the printable character entered by the user. See the sample program run for an example of what should be output.

Design:

On a piece of paper (or word processor), write down the algorithm, or sequence of steps, you will use to solve the problem. You may think of this as a "recipe" for someone else to follow. Continue to refine your "recipe" until it is clear and deterministically solves the problem. Be sure to include the steps for prompting for input, performing calculations, and displaying output.

Type these steps into a document (Word, txt, PDF, etc.). Note that this should be done before you start coding as completing it afterwards does not help you in learning the design process.

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Implementation:

Now that you have a working design, your next step is to translate these steps into C++ code. Use the algorithm development techniques discussed in class to implement your solution to the problem above. Add your C++ code a little at a time, and compile and test as you go.

Remember to add your comments to your code to explain your program. Do this before/during programming instead of waiting until the end. At a minimum, you should comment the header (e.g., name, class, date, brief description of the program, etc.), all variables (i.e., what they are used for), and specific “blocks” of code. For example, use comments to describe the inputs, the formulas used, and any other important steps, such as loops, in your code.

Your program will be graded based largely upon whether it works correctly on a CSE Department machine, so you should make sure your program compiles and runs on a CSE machine.

Your program will also be graded based upon your programming style. At the very least, your program should include:

- A consistent indentation style as recommended in the textbook and in class;
- Meaningful variable names;
- A block header comment section that includes: your name, e-mail address, and a brief description of the program.

Testing:

Test your program to check that it operates as desired with a variety of inputs to make sure that all “paths” through your code are correct. Sample input and output appears below (with input shown in **bold**):

```
+-----+
|      Computer Science and Engineering      |
|      CSCE 1030 – Computer Science I       |
| Student Name      EUID      euid@my.unt.edu |
+-----+
```

Please enter an ODD number in range 1 – 19: **8**

Invalid Entry – Please enter an ODD number in range 1 – 19: **21**

Invalid Entry – Please enter an ODD number in range 1 – 19: **7**

The sum of integers from 1 to 7 is 28.

Please enter a printable character to draw diamond: *****

```
  *
 ***
*****
*****
*****
 ***
  *
```

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Documentation:

When you have completed your C++ program, write a short report (2 – 3 paragraphs) describing what the objectives were, what you did to solve the problem, and the status of the program. Does it work properly for all test cases? Are there any known problems? Also include a reflection in what you learned by completing this program that you anticipate taking forward as your knowledge in C++ programming grows.

Save this report in a separate file to be submitted electronically. You should also include any specific instructions required to compile or execute your code.

Homework Submission:

In this class, we will be using electronic homework submission to make sure that all students hand their programming projects (and labs) on time. You will submit your program source file to the class website through the “**Homework 3**” drop box by the due date and time.

Note that this project must be done individually. The program will be checked using a code plagiarism tool against other solutions, so please ensure that all work submitted is your own.

Note that the dates on your electronic submission will be used to verify that you met the due date above. All homework up to 24 hours late will receive a 50% grade penalty. Later submissions will receive zero credit, so hand in your best effort on the due date.

Summary:

- You will design an algorithm (or steps used) to solve the problem.
- You will implement your program on the CSE machines using C++. You will make sure to use good style, good variable names, indentation, etc. You will compile, run, and test your code.
- You will write a brief report describing what your code does and how well it works.
- You will submit electronically your C++ code, your design, and your brief report.

General Guidelines (for ALL of your programming assignments):

- Your program’s output should initially display the department and course number, your name, your EUID, and your e-mail address.
- Use meaningful variable names.
- Use appropriate indentation.
- Use comments, including a program header. Example program header:

```
/*  
=====
```

Name	: homework2.cpp
Author	: Mark A. Thompson
Version	:
Copyright	: 2015

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Description : The program performs simple arithmetic operations based on input from the user.

```
=====
*/
```

- Add a header to each function. Example function header:

```
/*
=====
Function      : deposit
Parameters    : a double representing account balance and a double representing the deposit amount
Return        : a double representing account balance after the deposit
Description   : This function computes the account balance after a deposit.
=====
*/
```