Assignment Overview
This assignment focuses on the design, implementation and testing of a C program to help plan an ornamental garden (see below).

It is worth 10% of the course grade and must be completed and turned in no later than 11:59 on Sunday, October 11, 2015.

You can do this project in groups of maximum two or you can do it individually. Honor section students should either do it individually or work with another honor section student as a group.

This project will also be graded on a one on one presentation where the students will have answer questions pertaining to their process.

Assignment Specifications (100 points)
You will write a program that calculates the amount of materials needed for an ornamental garden according to the design shown on the right.

In the design, the green areas represent flowerbeds and the gray areas contain fill material (such as stone or mulch). The garden is a perfect square. The four outer flowerbeds are congruent isosceles triangles. The central flowerbed is a circle which is centered in the square; its diameter is half the side-length of the square.

Your program will prompt the user for the following information:

1. The length of one side of the garden (in feet).
2. The recommended spacing between plants (in inches).
3. The depth of the flowerbeds (in feet).
4. The depth of the fill areas (in feet).

Your program must prompt the user (and accept input) in the exact order shown above.

Your program will then calculate and report the following quantities needed for the garden:

1. Number of plants for each type of flowerbed and total number of plants for the garden.
2. Cubic yards of soil for each type of flowerbed and total cubic yards of soil for the garden, rounded to one decimal place.
3. Total cubic yards of fill material for the garden, rounded to one decimal place.
Extra Credits (10 points)

To get extra credits for your project, you should check the user’s input to see if she has entered acceptable inputs or not. For example, the length cannot be a negative number. You should also set an upper bound for each of the variables that user should enter. For example, the length of one side of the garden cannot be negative and cannot be greater than 1000 feet. For each variable you should set your own upper bound and also let the user know about your lower and upper bounds before entering the inputs. If the user enters an unacceptable input, you should display user an error message and finish the program.

Honor Section Students

Before displaying the results, you should ask users the format in which they want each variable to displayed. For example, you should ask user what format she wants to see the total number of plants in. She should be able to ask for either ‘fixed decimal’ or ‘exponential’ format. She also should be able to specify the width space of the output and the number of decimal places. User should also be able to specify if she want the results to be left-justified or right-justified. You should read chapter 3 of the text book (formatted input/output).

Assignment Deliverable

The deliverable for this assignment is the following file:

proj1.c – the source code for your C program

Be sure to use the specified file name (“proj1.c”) and to submit it for grading via the handin system before the project deadline.

Assignment Notes

❖ To clarify the project specifications, sample output is provided at the end of this document.

❖ The inputs that a user provides to your program can be either integers or float numbers.

❖ To estimate the number of plants needed for a flowerbed, divide the area of the flowerbed by the area needed per plant (the square of the recommended distance between plants) and then truncate this result. To truncate a value of type float, convert it to a value of type int.

❖ It is important and mandatory that you put as many comments as possible in your code. For each line or a block of code you should put comments (you will loose credits for not having comments).
The variables that you are defining should be readable and meaningful. Do not use variable names such as ‘a’, ‘b’ or ‘c’; pick meaningful names. For example, name the length of one side of the garden variable

- length of one side of the garden: ‘length_garden’ or ‘side_length’ (not ‘a’ or ‘b’).

Your code should follow the coding standard on the course website:
http://www.cse.msu.edu/~cse220/coding/default.html
Remember that it is important to start with a good habit.

**Suggested Procedure**

- **Solve the problem using pencil and paper first.** You cannot write a program until you have figured out how to solve the problem. This first step is best done collaboratively with another student. However, once the discussion turns to C specifics and the subsequent writing of C statements, you must work on your own.

- Write a simple version of the program. Compile and run the program and track down any errors.

- Use the **handin** system to turn in the first version of your program.

- Cycle through the steps to incrementally develop your program:
  - Edit your program to add new capabilities.
  - Run the program and fix any errors.

- Use the **handin** system to submit your final version.

- Be sure to log out when you leave the room, if you’re working in a public lab.

(see the next page for sample outputs)
Sample Output 1

<arctic:~ > a.out
This program will help you plan your garden.
First, we need some information about the dimensions you want.

Please enter the side of length for your garden (in feet): 12
Please enter the distance between plants (in inches): 6
Please enter the depth for the flower beds (in feet): 3
Please enter the depth for the fill (in feet): 2

Summary of your plant needs.
Each outer triangular bed: 71 plants.
The center circular bed: 113 plants.
Total: 397 plants.

Summary of your soil needs.
Each outer triangular bed: 2.0 cu. yd.
The center circular bed: 3.1 cu. yd.
Total: 11.1 cu. yd.
Summary of your fill needs.
Total: 3.2 cu. yd.

Sample Output 2

<arctic:~ > a.out
This program will help you plan your garden.
First, we need some information about the dimensions you want.

Please enter the side of length for your garden (in feet): 4
Please enter the distance between plants (in inches): 9
Please enter the depth for the flower beds (in feet): 1.5
Please enter the depth for the fill (in feet): 1.5

Summary of your plant needs.
Each outer triangular bed: 3 plants.
The center circular bed: 5 plants.
Total: 17 plants.

Summary of your soil needs.
Each outer triangular bed: 0.1 cu. yd.
The center circular bed: 0.2 cu. yd.
Total: 0.6 cu. yd.
Summary of your fill needs.
Total: 0.3 cu. yd.