

## Programming Project 1

(Revised 9/3/2012: corrected sample output)

This assignment is worth 20 points (2.0% of the course grade) and must be **completed and turned in before 11:59 on Monday, September 10, 2012.**

### Assignment Overview

This assignment will give you experience on the use of:

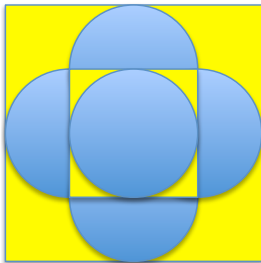
1. Integers and floats
2. Mathematical operations
3. The `float()`, `int()`, `round()`, `print()`, and `input()` functions
4. Importing a Python module

The goal of this project is to gain experience with mathematical manipulation of numeric values. You will calculate areas and volumes to determine materials required for a gardening project.

The basic design consists of prompting the user for information, receiving information, processing that information, and then displaying the result.

### Background

Programs are good at performing routine mathematical calculations. By way of illustration, you will write a program to calculate the materials needed for an ornamental garden according to the design below. In this design, the blue areas represent flowerbeds and the yellow areas are filled with stone, mulch, or other fill material. The garden is a perfect square. The four outer flowerbeds are congruent semicircles and the central flowerbed is a perfect circle.



### Project Description / Specification

Your program should prompt the user for the following information:

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

Next estimate the number of plants and the amount of fill and flowerbed soil needed.

Finally, it should report the following quantities needed for the garden:

1. Number of plants for each type of flowerbed (semicircle and circle) and total number of plants for the garden.
2. Cubic yards of soil for each type of flowerbed (semicircle and circle) 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.

### Deliverables

`proj01.py` – your source code solution (*remember to include your section, the date, project number and comments in this file; but do not include your PID or name*).

1. Be sure to use “`proj01.py`” for the file name (*or handin won't accept it!*)
2. **Save a copy of your file in your CS account disk space** (H drive on CSE computers).  
This is the only way we can check that you completed the project on time in case you have a problem with handin.

3. Electronically submit a copy of the file via `handin`.

### Assignment Notes:

To clarify the problem specifications, we provide at the end of this document a snapshot of interaction with the already written program.

The formula for the area  $A$  of a circle is  $A = \pi r^2$ , where  $r$  denotes the radius. For this calculation, you should use the value of  $\pi$  provided in the Python `math` module. After importing the `math` module, the name `math.pi` returns (a close approximation to) the value of  $\pi$ . (See comments in `example_numeric.py`.)

To estimate the number of plants 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 `float`, convert it to an `int` using the `int` function which implicitly truncates the float (see comments in `example_numeric.py`) or use the `math.trunc()` function. Be careful, the number of plants in a semicircle may not be exactly half of the plants in a full circle.

Look at the program `example_numeric.py` in the `proj01` directory as an example (with explanations in the comments) of the Python features you will use in this program.

Assume that the user only inputs numbers, that is, you don't need to do error checking for bad input.

Remember to convert fill to cubic yards.

Here is an outline of your program:

1. Prompt for input (use `input`)
2. Convert the input strings to numbers (use `float`)
3. Do some mathematical calculations using the input numbers to get results.
4. Print the results (use `print`)

### Getting Started

1. Solve the problem using paper, pencil and calculator so you understand the problem before trying to program it.
2. Using IDLE, create a new program.
3. If you are in a CSE lab, select the H: drive as the location to store your file. (If you are not, be sure to back your file up by copying it to your CSE account periodically.)
4. Save the project under the name: `proj01.py`
5. Using the example from `example_numeric.py`, as a guide write the code to prompt the user, input in the required values, and echo (print) the values that were input.
6. Run the program and track down any errors.
7. Use the `handin` to hand in the program (to make sure you can hand a project in).
8. Now you enter a cycle of edit-run to incrementally develop your program.
9. Hand in your final version.

### Questions for you to consider (not hand in)

1. What happens when the user enters a letter instead of a number at the prompt?
2. What are two ways to get the program to crash (produce an error instead of printing output)?
3. Can you find inputs for which the number of plants required for the center circular flowerbed is not twice that required for a semi-circular bed?

## Sample Interactions:

Calculate Garden requirements

-----  
Enter length of side of garden (feet): 10  
Enter spacing between plants (feet): 0.5  
Enter depth of garden soil (feet): 0.8333  
Enter depth of fill (feet): 0.8333

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Requirements

Plants for each semicircle garden: 39  
Plants for the circle garden: 78  
Total plants for garden: 234  
Soil for each semicircle garden: 0.3 cubic yards  
Soil for the circle garden: 0.6 cubic yards  
Total soil for the garden: 1.8 cubic yards  
Total fill for the garden: 1.3 cubic yards