GENE 121 **Assignment 2** **Fall 2016**

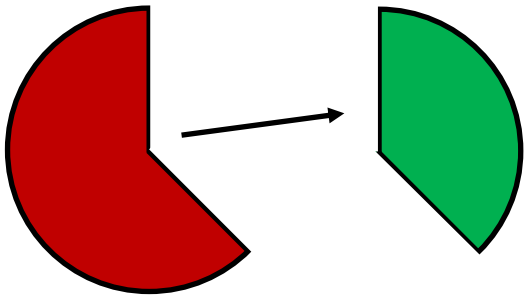
This assignment will be **completed in pairs**. You have been matched automatically with a partner. To see who your partner is for each week, check the lists posted on Learn. The lists also indicate the TA who will be marking your assignments for the term.

In this assignment you will be using the mathematical operators, if statements, and for loops, to write programs.

Don't forget to include a signed header for your assignment, and to make sure that both students in the group have an electronic copy of all of the code when it is complete. **Remember, you should both be contributing significantly on all questions on this, and all, assignments.**

Question 1

When a piece is cut out of a paper circle, the section that has been removed can be used to construct a cone.



Write a program that:

- Prompts the user for an angle in degrees that specifies how much paper is removed
- Prompts the user for the radius of the paper circle
- Use an if statement to verify that radius and angle are greater than 0, and if not, output a suitable message
- Calculates the volume of the resulting cone from the removed paper.
    - Recall $V=\frac{1}{3}\pi r^2 h$, where *r* and *h* are the radius and height of the cone

Define appropriate test cases. Test and debug your program, and then submit your code with output for the test cases that you have chosen.

Question 2

a) Write a program that receives an **integer** (in the thousands), and outputs it using commas. Your program must verify that the number is in the thousands. Examples of the program output are below:

```
Enter a number 425981
The number is 425,981

Enter a number -11028
The number is -11,028
```

b) For the program described above, and working with your partner, develop a set of test cases to test the program's functionality.

c) Add a *for loop* to your program in (a) to run your tests from (b).

d) Test and debug your program, and then submit your code with output for the test cases that you have chosen.

Question 3

There are four possible shapes for paving stones.

Square Rectangle Rhombus Parallelogram

a) Write a program that:
- Prompts for the length of 2 adjacent sides (in cm) and the contained angle (in degrees). Check that the side lengths are greater than zero and that $0 < \text{angle} < 180$
- Outputs **to a file**:
  - The length of the sides and the contained angle, and
  - Which of the paving stone shapes is represented by the information.

Use a tolerance of 1mm for side lengths and 0.5 degrees for angles.

Note: you should be testing your program as you develop it.

b) For the program described above, and working with your partner, develop a set of test cases to test the program's functionality. Create a text file (.txt) containing these test cases called "**`stones.txt`**".

c) Modify the program developed in step (a) to read the "**`stones.txt`**" file created in step (b) (this is in place of user input from the console). You may assume you know the length of the file.

Submit your code with output for the modified program which reads the input file.