CS 420
PROGRAM 0P

Purpose

The purpose of this assignment is to give you practice with writing more expressions for evaluation, some formatting and using Math library functions.

File to be submitted: ellipse.c

Problem

The area of an ellipse with major axis **a** and minor axis **b** is given by $\pi ab.$ The circumference is harder to compute and we have many approximations, so we will use several of them:

- Ramanujan's formula, first approxmiation:
  $\pi \left[3(a+b) - \sqrt{(3a+b)(a+3b)}\right]$
- Ramanujan's formula, second approximation:
  π (a + b) [1 + 3 h / (10 + (4 - 3 h)$^{1/2}$)]
  where h = (a - b)^2 / (a + b)^2
- Muir's formula:
  2 π [a^s/2 + b^s/2]$^{1/s}$
  where s = 1.5
- Hudson's formula:
  0.25 π (a + b) [3 (1 + h/4) + 1 / (1 - h/4)]
  where h = (a - b)^2 / (a + b)^2
- Holder mean:
  4 [a^s + b^s]$^{1/s}$
  where s = log(2) / log(π /2)
- David Cantrell's formula:
  4 (a + b) - 2 (4 - π) a b / [a^s/2 + b^s/2]$^{1/s}$
  where s = 0.825056

All variables in your program must be of the "float" data type, they are real numbers (if you use double the precision of your computation will change. While your results need not match the expected results exactly in terms of decimal values they should be close enough).

Your program should prompt and read the major axis "a", accept input from the user, prompt for minor axis "b", accept input from the user and then calculate and display the circumference of an ellipse using each of the above formula and tabulate the results. Your program needs to accept just one set of inputs and print the results. Sample input and output files are available. If you have difficulty aligning the textual description in the first column of the table (these are all called "character strings") use %s format specifier if that helps.

Please read the Output section below carefully to understand how to print your results.

Use a constant for the value of PI and set it exactly to 3.14159 if you want your results close to mine. Use any functions from the library file math.h that are appropriate.

Since you will be using functions from the math library, on the agate (and most Linux) platform you will need to specify the -lm qualifier with the gcc command as follows:
gcc ellipse.c -o ellipse -lm

(the -lm qualifier will include the math library while compiling your file as long as you have also specified the #include <math.h> preprocessor statement in your source file).

Input

The input will come from standard input, that is, from a user at the keyboard. Input prompts must be accurate. You will test input redirected from an input file.

Output

The output is to be done neatly using a tabular format. You don't have to match my output for this set exactly but keep in mind that it has to be neatly formatted. The grading for this output is handled separately from the accuracy of the results.

Testing

On all your assignments, including this one, it is crucial that you test your program thoroughly. Sample files provided help your testing and verifying your program output.

Programs that have compile errors and do not run receive 0 points. Do not add additional features that are not being asked for (and don't change the order of inputs), since your program may not run against test inputs that I have created.

Details & Comments

Generally, you must follow all the coding style rules as specified below. In particular:

- You must put your name enclosed in a comment box at the top along with a brief description of what the program does, and add any other comments that are appropriate throughout the program.
- Keep lines to a maximum length that's easy to read.
- You must use good names for any variables you create (a full word that describes what it is there for).

- Details that you do not follow are penalized after other scored items are added up, so even if you got full points for the functionality of your program, you can still get a lower score because you did not follow all the other requirements for the assignment.

Grade Key

Name, comments, constant definition for pi, names of variables (1 point for each)	**4**
Correctly computes ellipse circumference (6.5 points for each formula)	**39**
Output formatting	**7**