CS 410P

ASSIGNMENT 0P

Purpose

The purpose of this assignment is for you to get used to computing results using expressions, and formatting output. **Your program must be called ellipse.py since we are using an automated submission process which expects a specific file name to be submitted.**

Note: While your output may not match with my values exactly (in terms of decimal digits), it should be very close.

Submission

- Submission on Canvas will take you to Mimir, an automated submission tool that also shows you how your program is responding to test cases set up. You need to write a program to perform several approximations for computing the circumference of an ellipse.
- You will notice that there are 3 test cases set up one for each set of inputs. Each test case is worth 20 points (all 6 formulae are checked for results together). The rubric items that will be graded manually are worth 40 points as indicated. Typically your final grading will be done after the due date has passed.

Details

You need to write a program to perform several approximations for computing the circumference of an ellipse.

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:

$$\pi \, (a + b) \, [\, 1 + 3\,h \,/\, (10 + (4 - 3\,h)^{1/2}\,)\,]$$

where $h = (a - b)^2 / (a + b)^2$

- Muir's formula:
  $2 \pi [a^s/2 + b^s/2]^{1/s}$
  where $s = 1.5$

- Hudson's formula:
  $0.25 \pi (a + b) [3 (1 + h/4) + 1 / (1 - h/4)]$
  where $h = (a - b)^2 / (a + b)^2$

- Holder mean:
  $4 [a^s + b^s]^{1/s}$
  where $s = \log(2) / \log(\pi/2)$

- David Cantrell's formula:
  $4 (a + b) - 2 (4 - \pi) a b / [a^s/2 + b^s/2]^{1/s}$
  where $s = 0.825056$

Your program should prompt and read the major axis a and minor axis b 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 correct to six decimal places as indicated in the sample output.

Your program should also use the constant value for

π

as supplied by Python's Math library. Using any other value may run the risk of your results not matching closely with the expected results.

Input

Major Axis, Minor Axis (both numeric, in that order)

Output

Sample output files are available in the public folder for 0P. Your output doesn't have to be exactly like mine but should be reasonably close to make it organized. You cannot use any library functions that might exist to create a table, you need to do your own output formatting.

Also make sure to include the print statements that are specified above for your submission to run against the test cases without errors.

Grade Key

A	Name, comments	**5**
B	Ellipse – correct input order with proper prompts, conversion to numeric values, constant Pi used from imported Math library	**15**
C	Ellipse circumference computation (10 points per formula)	**60**
D	Output formatting reasonable and as per specification (no use of library functions to create tables)	**20**
E	Late Penalty	