

ASSIGNMENT 3P

The purpose of this assignment is to give you practice with repetition using for loops, lists, tuples, functions.

Problem

Write a program that computes the values of Sine, Cosine and Tangent of values entered by the user in **degrees**. We want to compute these for a range of values between 0 and 360 (integer values only).

The output must be shown in two different formats: (1) Table of values showing Sine, Cosine and Tangent values in rows. (2) Table of values showing Sine, Cosine and Tangent values in columns.

The program must also print the counts of a) total number of negative Sine values b) total number of Cosine values c) total of indeterminate Tangent values (typically these are infinity values or for the purposes of your program they will be anything outside the -100 to 100 range).

You need to write a total of at least 4 functions besides the main() function:

find_sin_cos_tan(start, end): takes 2 arguments which are integers that indicate the range of values in degrees to compute sine, cosine, tangent values in steps of 5. Returns 3 lists one for each computation.
display_rows(start, end, sinlist, coslist, tanlist): takes 3 arguments which are lists, one for sine, cosine, tangent values that were computed earlier. Displays the values in rows and returns nothing.
display_columns(start, end, sinlist, coslist, tanlist): takes 3 arguments which are lists, one for sine, cosine, tangent values that were computed earlier. Displays the values in columns and returns nothing.
display_totals(sinlist, coslist, tanlist): takes 3 arguments which are lists, one for sine, cosine, tangent values that were computed earlier. Displays the totals within each list indicating negative sine, negative cosine, and indeterminate tangent values. Returns nothing.

- Start loop in the “main function” to prompt the user to enter 2 integers which is the range of values to be computed:
 - Only numbers in the range 0 to 360 (both inclusive) are accepted
 - First number should be less than second
 - Difference between numbers is no greater than 90
 - Any non-integer input will stop the program
 - Both numbers are accepted on the same line (i.e. no new line or carriage return after first number)
 - Hint: `x, y = input("enter two numbers: ").split()` will allow the user to input 2 numbers separated by space, the two input values can then be accessed through variables x and y
 - (This mechanism of capturing input values uses a tuple object).
- Function to compute sine, cosine, tangent values is called
- Call function to print data in row format
- Call function to print data in column format
- Call function to print totals
- Loop continues to accept a pair of values from the user until a non-numeric value is input.

You must conform to the output format as closely as possible. You must not be printing any result as a list object (with square brackets). The best format to use for decimal values is 8.4 (8 total characters, 4 after decimal digit).

Starter files provided

main.py: contains “main” function

sincostan.py: contains all the other functions

(your two files MUST be called by these names)

Program Structure

If your program results are accurate you can still lose up to 10 points if your program structure does not meet the requirements of writing the appropriate functions with the correct arguments, return values, etc.

Sample Output

```
Enter 2 numbers between 0 and 360: 0 90
Sine, Cosine, Tangent values for degrees 0 to 90 in steps of 5
ROW FORMAT:
-----
Degrees:      0      5      10     15     20     25     30     35     40     45     50     55     60     65     70     75     80     85     90
-----
Sine:  0.0000  0.0872  0.1736  0.2588  0.3420  0.4226  0.5000  0.5736  0.6428  0.7071  0.7660  0.8192  0.8660  0.9063  0.9397  0.9659  0.9848  0.9962  1.0000
-----
Cosine: 1.0000  0.9962  0.9848  0.9659  0.9397  0.9063  0.8660  0.8192  0.7660  0.7071  0.6428  0.5736  0.5000  0.4226  0.3420  0.2588  0.1736  0.0872  0.0000
-----
Tangent: 0.0000  0.0875  0.1763  0.2679  0.3640  0.4663  0.5774  0.7002  0.8391  1.0000  1.1918  1.4281  1.7321  2.1445  2.7475  3.7321  5.6713  11.4301  XXX
-----

COLUMN FORMAT:
Degrees:      Sine:      Cosine:      Tangent:
0             0.0000      1.0000      0.0000
5             0.0872      0.9962      0.0875
10            0.1736      0.9848      0.1763
15            0.2588      0.9659      0.2679
20            0.3420      0.9397      0.3640
25            0.4226      0.9063      0.4663
30            0.5000      0.8660      0.5774
35            0.5736      0.8192      0.7002
40            0.6428      0.7660      0.8391
45            0.7071      0.7071      1.0000
50            0.7660      0.6428      1.1918
55            0.8192      0.5736      1.4281
60            0.8660      0.5000      1.7321
65            0.9063      0.4226      2.1445
70            0.9397      0.3420      2.7475
75            0.9659      0.2588      3.7321
80            0.9848      0.1736      5.6713
85            0.9962      0.0872      11.4301
90            1.0000      0.0000      XXX

Number of negative Sine values: 0
Number of negative Cosine values: 0
Number of indeterminate Tangent values: 1
```

Enter 2 numbers between 0 and 360: 170 200
 Sine, Cosine, Tangent values for degrees 170 to 200 in steps of 5
 ROW FORMAT:

Degrees:	170	175	180	185	190	195	200
Sine:	0.1736	0.0872	0.0000	-0.0872	-0.1736	-0.2588	-0.3420
Cosine:	-0.9848	-0.9962	-1.0000	-0.9962	-0.9848	-0.9659	-0.9397
Tangent:	-0.1763	-0.0875	-0.0000	0.0875	0.1763	0.2679	0.3640

COLUMN FORMAT:

Degrees:	Sine:	Cosine:	Tangent:
170	0.1736	-0.9848	-0.1763
175	0.0872	-0.9962	-0.0875
180	0.0000	-1.0000	-0.0000
185	-0.0872	-0.9962	0.0875
190	-0.1736	-0.9848	0.1763
195	-0.2588	-0.9659	0.2679
200	-0.3420	-0.9397	0.3640

Number of negative Sine values: 4
 Number of negative Cosine values: 7
 Number of indeterminate Tangent values: 0

Enter 2 numbers between 0 and 360: 200 350
 Invalid Input, please try again (difference should be no more than 90)

Enter 2 numbers between 0 and 360: 260 350
 Sine, Cosine, Tangent values for degrees 260 to 350 in steps of 5
 ROW FORMAT:

Degrees:	260	265	270	275	280	285	290	295	300	305	310	315	320	325	330	335	340	345	350
Sine:	-0.9848	-0.9962	-1.0000	-0.9962	-0.9848	-0.9659	-0.9397	-0.9063	-0.8660	-0.8192	-0.7660	-0.7071	-0.6428	-0.5736	-0.5000	-0.4226	-0.3420	-0.2588	-0.1736
Cosine:	-0.1736	-0.0872	-0.0000	0.0872	0.1736	0.2588	0.3420	0.4226	0.5000	0.5736	0.6428	0.7071	0.7660	0.8192	0.8660	0.9063	0.9397	0.9659	0.9848
Tangent:	5.6713	11.4301	XXX	-11.4301	-5.6713	-3.7321	-2.7475	-2.1445	-1.7321	-1.4281	-1.1918	-1.0000	-0.8391	-0.7002	-0.5774	-0.4663	-0.3640	-0.2679	-0.1763

COLUMN FORMAT:

Degrees:	Sine:	Cosine:	Tangent:
260	-0.9848	-0.1736	5.6713
265	-0.9962	-0.0872	11.4301
270	-1.0000	-0.0000	XXX
275	-0.9962	0.0872	-11.4301
280	-0.9848	0.1736	-5.6713
285	-0.9659	0.2588	-3.7321
290	-0.9397	0.3420	-2.7475
295	-0.9063	0.4226	-2.1445
300	-0.8660	0.5000	-1.7321
305	-0.8192	0.5736	-1.4281
310	-0.7660	0.6428	-1.1918
315	-0.7071	0.7071	-1.0000
320	-0.6428	0.7660	-0.8391
325	-0.5736	0.8192	-0.7002
330	-0.5000	0.8660	-0.5774
335	-0.4226	0.9063	-0.4663
340	-0.3420	0.9397	-0.3640
345	-0.2588	0.9659	-0.2679
350	-0.1736	0.9848	-0.1763

Number of negative Sine values: 19
 Number of negative Cosine values: 2
 Number of indeterminate Tangent values: 1

Enter 2 numbers between 0 and 360:

Grade Key:

A	Input validation, Exception handler	10
B	Program loops until a non-numeric value is entered	6
C	Accuracy of computed Sine values	15
D	Accuracy of computed Cosine values	15
E	Accuracy of computed Tangent values	15
F	Accuracy of Negative Sine count, Negative Cosine count, Indeterminate Tangent count	12
G	Display Row Format	15
H	Display Column Format	15
I	Program Structure (functions, arguments, return values, program flow)	-10