

CS118 Programming Assignments

Exam 3 Array Demos

1. Below are two formulas for calculating π :

(1)
$$\sum_{k=0}^{\infty} \frac{4(-1)^k}{2k+1}$$

(2)
$$\sum_{k=0}^{\infty} \frac{1}{16^k} \left(\frac{4}{8k+1} - \frac{2}{8k+4} - \frac{1}{8k+5} - \frac{1}{8k+6} \right)$$

Write a Python program that gets a limit, N , from the user for how many summation terms are used. (Everything inside the sigma notation is considered one summation term.) Validate the value provided by the user – N should be an integer that is at least 5. As long as either condition is not met, collect a new value of N from the user. You may assume only that the user will provide a number – you must validate that the number is a positive integer.

Create two lists. In the first list, using Equation (1) store the result of calculating π after each of the N terms is included. In the second list, using Equation (2) store the result of calculating π after each of the N terms is included.

For each element in the lists, compute CORRECTLY the percentage difference of the second equation from the first equation and store it in a new list. Using a single slice, extract from this new list the last five columns as a separate matrix and use that slice to display the columns in the shell using the format shown below:

	TERM				
Source	996	997	998	999	1000
Eqn 1:	3.140589	3.142596	3.140591	3.142594	3.140593
Eqn 2:	3.141593	3.141593	3.141593	3.141593	3.141593
% Diff:	0.031969	-0.031917	0.031905	-0.031853	0.031841

2. Given the formulas / definitions below, write a Python program that will compute and display the statistical data of mean, median, mode for any finite data set. Hardcode your test data as a single tuple. In all cases, N represents the number of values in the data set.

$$mean = \frac{1}{N} \sum_{i=1}^N x_i$$

median: The value for which half of the data set is larger and half of the data set is smaller.

For a sorted data set $x_1 \dots x_N$

N odd: the median is at position $(N+1)/2$

N even: the median is midway between positions $N/2$ and $N/2+1$

mode: The value(s) that appear(s) most often in a data set

Note: There may be more than one value for mode

