

# **CSc 30100**

## **Assignment due October 4, 2021**

Calculate  $S_N = \sum_{i=1}^N [\sqrt{23}]$ .

You should use `math.sqrt(23.0)` for the value of  $\sqrt{23}$ .

Calculate  $S_N$  using the two methods we discussed in class, naive summation and compensated summation. Perform the summations for  $N = 10^3, 10^4, 10^5, 10^6, 10^7$ , and  $10^8$ . If the summations for  $10^8$  take more than an hour, you can skip them.

Calculate the time of each summation using code such as

```
start_time = time.time()
```

```
end_time = time.time()
```

```
elapsed_time = end_time - start_time
```

Calculate the "exact" value of the sum using the expression

$$\tilde{S}_N = N * \text{math.sqrt}(23.0)$$

For each of the  $S_N$  that you calculate, determine the absolute and relative errors of the results. Present your results (including the timing of your calculations) in a table.

Analyse your results as thoroughly as you can and discuss them. Are these errors consistent with the expressions for errors that we discussed in class and that are in the posted classroom presentations? How do the speeds of the two methods compare?

Include all of your analysis and discussion in your .ipynb file and submit the file through Blackboard. The name of the file you submit should be  
lastname\_firstname\_AS03.ipynb.

Do not clear your results after your last run so that I will be able to see your results without rerunning your file.

If you collaborate with anyone on this assignment, be sure to follow the collaboration guidelines in the syllabus.