Review for Midterm 1

Contents

Summations

Different Ways of Forming Sums

To calculate $\sum_{j=1}^{n} a_j b_j$:

- using a loop
- using `sum`
- **inner product**

Sequence of Partial Sums

To study the convergence of an infinite series $\sum_{j=1}^{\infty} a_j$, form the sequence of partial sums $\{s_n\}$ where

$$s_n = \sum_{j=1}^{n} a_j = a_1 + \cdots + a_n.$$

- using a loop
- using `cumsum`

Simulations

Biased Coin

Question

Simulate the tossing of a biased coin with

$$P(\mathsf{T}) = p, \quad P(\mathsf{H}) = 1 - p.$$

Biased Coin – Notes

Ideas.

- random number generators
- traditional tools: loops and conditional statements
- the *powerful* `find` function
- one-liner using `ceil` or `floor`

Explore.

- How would you handle similar situations with multiple states with non-uniform probability profile, *e.g.*, a biased dice?

Dice Rolls

Question

Write a script simulating $n = 10,000$ throws of two 6-sided fair dice. What is the probability of obtaining two same numbers? Provide both analytical and numerical answers.

Data Manipulation

Data Manipulation

Download `grades.dat` into your current directory and load it using

```
>> grades = load('grades.dat');
```

To read about how the data are organized, use `type grades.dat`.

Question

1. Determine the number of students.

2. Compute the total grade according to the weights specified in the header. Do this without using a loop.

3. The letter grades are determined by

   - A: $[90, 100]$
   - B: $[80, 90)$
   - C: $[70, 80)$
   - D: $[60, 70)$
   - E: $[0, 60)$

   Find the number of students earning each of the letter grades.