Assignment 6: Loops

Task 1: Tossing a Dice

A student wants to understand the probability of obtaining a sum of 4 or 10 when tossing two six-sided dice by using a sufficiently large sample size (1,000 trials).

According to the student calculation:

$$\begin{aligned} P[\text{sum } = 4 \text{ or } 10] &= P[x = \{1,3\}] + P[x = \{2,2\}] + P[x = \{4,6\}] + P[x = \{5,5\}] \\ &= \frac{2}{36} + \frac{1}{36} + \frac{2}{36} + \frac{1}{36} \\ \therefore\ P[\text{sum } = 4 \text{ or } 10] &= \frac{1}{6} \end{aligned}$$

Construct a Python program to check the student's hypothesis. (Hint: using `random` library.)

Answer

Task 2: Taylor's Series

By using Taylor's series, A function can be expressed in series of the function derivatives. The following equations are example of Taylor's series:

$$e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!}, \quad \sin(x) = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{(2n+1)!}, \quad \cos(x) = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n}}{(2n)!}$$

Generally, the series converges as n approaches infinity. However, for this assignment, please approximate $\sin(x)$ and $\cos(x)$ when $x = 30^\circ$ and $n = 10$, and check their trigonometric identity ($\sin^2(x) + \cos^2(x) = 1$.)

Answer