Lab 10

1. Write a program for flipping two fair dice in 10,000 times, calling X is the summation of both dice that appear on each roll.

(a) Save the results of flipping dices into the variable x (list type).

(b) Find the values of random variable X and save to variable X.

(c) Calculate the probability distribution function of the random variable X and store it in variable P (list type).

(d) Calculate the characteristic parameters of random variable X including: expectation, variance, standard deviation.

2. The probability density function of the normal distribution is determined by the formula:

$$p(x) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp^{-\frac{(x-\mu)^2}{2\sigma^2}} \tag{2}$$

The cumulative distribution function of the normal distribution is determined by the formula:

$$\varphi(x) = \frac{1}{2}\left[1 + erf\left(\frac{x-\mu}{\sigma\sqrt{2}}\right)\right] \tag{3}$$

Where μ is the mean (expected) and σ is the standard deviation.

Write the probability density function and the cumulative distribution function of the normal distribution:

```
import math
def pmf_normal(x, mu, sigma):
    # your code

def cdf_normal(x, mu, sigma):
    # your code
```

(a) Draw a graph representing the relationship between the random variable X and the function pmf_normal.

(b) Draw a graph representing the relationship between the random variable X and the function cdf_normal.

(c) For X is a normal random variable with mean $\mu=3$ and variance $\sigma^2 = 16$, using tưo previous to find $P\{2<X<7\}$

3. Read dataset population from file company-sales_data.csv

Read all month of toothpaste, shampoo, facecream and show them using line chart.

4. Find the frequency of each word in a given text (at least 300 words), and draw a histogram of the frequency of word with parameter bin = 30.