1) A survey of 1000 adults found that 480 of them prefer coffee over tea.
What is the proportion of adults who prefer coffee? What is the 95% confidence interval for this proportion?

In [1]:

```
import statsmodels.api as sm
import numpy as np

# Sample size
n = 1000

# Number of adults who prefer coffee
x = 480

# Proportion of adults who prefer coffee
p_hat = x/n

# Standard error
se = np.sqrt(p_hat * (1 - p_hat) / n)

# Margin of error for 95% confidence interval
moe = 1.96 * se

# 95% confidence interval
ci = (p_hat - moe, p_hat + moe)

print(f"Proportion of adults who prefer coffee: {p_hat}")
print(f"95% Confidence Interval:{ci}")
```

```
Proportion of adults who prefer coffee: 0.48
95% Confidence Interval:(0.4490344811120498, 0.5109655188879502)
```

2)A company has four sales representatives, and their monthly sales (in thousands of dollars) are as follows: 15, 20, 25, 30.
  Calculate the mean, median, and mode of the sales.

In [2]:

```
import statistics as stats

sales = [15, 20, 25, 30]

# Mean
mean = np.mean(sales)

# Median
median = np.median(sales)

# Mode
mode = stats.mode(sales)

print(f"  Mean: {mean}")
print(f"Median: {median}")
print(f"  Mode: {mode}")
```

```
  Mean: 22.5
Median: 22.5
  Mode: 15
```

3)A dataset contains the heights (in centimeters) of 1000 individuals.The mean height is 170 cm and the standard deviation is 10 cm.If we assume that the heights are normally distributed, what percentage of individuals have a height between 160 cm and 180 cm?

In [3]:

```
from scipy.stats import norm

# Mean and standard deviation of heights
mu = 170
sigma = 10

# Probability of a height between 160 cm and 180 cm
p = norm.cdf(180, mu, sigma) - norm.cdf(160, mu, sigma)

print(f"Percentage of individuals with height between 160 cm and 180 cm: {p*100}%")
```

```
Percentage of individuals with height between 160 cm and 180 cm: 68.268949
21370858%
```

4)A study compared the effectiveness of two different treatments for a certain medical condition.
Treatment A was given to 100 patients and 70 of them showed improvement.
Treatment B was given to 120 patients and 90 of them showed improvement.
Is there significant evidence that one treatment is better than the other? Use a significance level of 0.05.

In [4]:

```
from statsmodels.stats.proportion import proportions_ztest

# Number of patients and number of successes for each treatment
n1 = 100
x1 = 70
n2 = 120
x2 = 90

# Two-sample proportions test
count = np.array([x1, x2])
nobs = np.array([n1, n2])
z, p_value = proportions_ztest(count, nobs, alternative='two-sided')

if p_value < 0.05:
    print(f"There is significant evidence that one treatment is better than the other.")
else:
    print(f"There is no significant evidence that one treatment is better than the other.
```

```
There is no significant evidence that one treatment is better than the oth
er.
```

5)A random sample of 50 observations from a population has a mean of 60 and a standard deviation of 10.
Construct a 99% confidence interval for the population mean.

In [5]:

```
# Sample mean and standard deviation
x_bar = 60
s = 10

# Sample size
n = 50

# t-value for a 99% confidence interval with n-1 degrees of freedom
t = 2.678

# Margin of error for 99% confidence interval
moe = t * s / np.sqrt(n)

# 99% confidence interval
ci = (x_bar - moe, x_bar + moe)

print(f"99% Confidence Interval: {ci}")
```

```
99% Confidence Interval: (56.21273607996485, 63.78726392003515)
```