Q1. Define Covariance and explain how it differs from Correlation

Covariance is a statistical measure that shows how two variables change together.
If both variables increase or decrease together, the covariance is positive. If
one increases while the other decreases, the covariance is negative.

Correlation, on the other hand, measures both the **direction** and **strength** of the relationship between two variables.

Difference:
Covariance does not have a fixed range and depends on the units of data, while correlation is unit-free and always lies between **–1 and +1**, which
makes it easier to interpret.

Q2. What does positive, negative, and zero covariance indicate?

- **Positive covariance:**
  Both variables move in the same direction.

- **Negative covariance:**
  One variable increases while the other decreases.

- **Zero covariance:**
  There is no relationship between the variables.

Q3. Limitations of Covariance and why Correlation is preferred

Covariance has some limitations:

1. It does not have a standard scale.

2. Its value depends on the units of measurement.

3. It is difficult to interpret.

Correlation is preferred because it provides a standardized value between **–1 and +1**, which clearly shows the strength and direction of the relationship.

Q4. Difference between Pearson and Spearman Correlation

Pearson correlation measures the **linear relationship** between two variables using their actual values. Spearman correlation measures the relationship using **ranks** instead of actual values.

Spearman correlation is preferred when the data is not normally distributed, contains outliers, or is in ranking form.

Q5. If r = 0.85, interpret the value and comment on causation

A correlation coefficient of **0.85** shows a **strong positive relationship** between variables X and Y. This means that as X increases, Y also increases.

However, correlation does **not** imply causation.
It only shows a relationship, not a cause-and-effect connection.

https://docs.google.com/spreadsheets/d/19T1CG2yJnsFC8sssGJuAx8iVWaj-v-t/edit?usp=sharing&ouid=102004471913052174087&rtpof=true&sd=true

I have attempted remaining questions on excel sheet.

Data analytics assignment (Covariance and correlation).