**Q 25: Discuss the 4 differences between correlation and regression.**

Differences between correlation and regression on the basis of:-

---------------Purpose and Objective:-------------------------

**Correlation**:

Purpose: The primary purpose of correlation is to measure the strength and direction of the linear relationship between two variables. It provides a single value that quantifies how closely two variables are related.

Objective: Correlation does not distinguish between dependent and independent variables; it simply measures the degree to which two variables move together.

**Regression:**

Purpose: Regression is used to model the relationship between a dependent variable (also called the outcome or response variable) and one or more independent variables (predictors or explanatory variables). It aims to establish a mathematical equation that describes this relationship.

Objective: The objective of regression is to predict the value of the dependent variable based on the values of the independent variable(s).

**------------------------------Nature of Analysis:---------------------------------------**

**Correlation:**

Nature: Correlation analysis is symmetric, meaning it treats both variables equally. The correlation coefficient remains the same regardless of which variable is considered X or Y.

Type of Relationship: It measures the strength and direction of a linear relationship between two variables but does not imply causation.

**Regression:**

Nature: Regression analysis is asymmetric; it distinguishes between dependent and independent variables. The independent variable(s) are used to predict the dependent variable.

Type of Relationship: Regression provides a specific form of the relationship (often linear) between the dependent and independent variables, showing how changes in the independent variable affect the dependent variable.

**---------------------------------Output:---------------------------**

**Correlation:**

Output: The primary output of correlation analysis is the correlation coefficient, which is a single number that summarizes the linear relationship between two variables.

Graphical Representation: A scatter plot with a line indicating the correlation can visually represent the strength and direction of the relationship.

**Regression:**

Output: Regression analysis provides multiple outputs, including the regression coefficients (intercept and slope for simple linear regression), R-squared value (which indicates the proportion of variance in the dependent variable explained by the independent variable), and p-values for testing the significance of the relationship.

Graphical Representation: A scatter plot with a fitted regression line shows how well the model fits the data and can indicate the direction and strength of the relationship.