**1. In a linear equation, what is the difference between a dependent variable and an independent variable?**

In a linear equation, the dependent variable is the variable that is being predicted or explained, while the independent variable is the variable that is used to predict or explain the dependent variable.

**2. What is the concept of simple linear regression? Give a specific example.**

Simple linear regression is a statistical method that models the relationship between a dependent variable and a single independent variable using a straight line. For example, predicting a person's weight (dependent variable) based on their height (independent variable).

**3. In a linear regression, define the slope.**

In linear regression, the slope represents the change in the dependent variable for a unit change in the independent variable. It measures the steepness or direction of the linear relationship between the variables.

**4. Determine the graph's slope, where the lower point on the line is represented as (3, 2) and the higher point is represented as (2, 2).**

hTe graph's slope is zero because the y-coordinate remains the same (2) for different x-coordinates (3 and 2).

**5. In linear regression, what are the conditions for a positive slope?**

In linear regression, the conditions for a positive slope are that as the independent variable increases, the dependent variable also increases. The correlation between the variables should be positive.

**6. In linear regression, what are the conditions for a negative slope?**

In linear regression, the conditions for a negative slope are that as the independent variable increases, the dependent variable decreases. The correlation between the variables should be negative.

**7. What is multiple linear regression and how does it work?**

Multiple linear regression is a statistical method that models the relationship between a dependent variable and two or more independent variables. It works by estimating the coefficients of the independent variables to find the best-fitting linear equation.

**8. In multiple linear regression, define the number of squares due to error.**

In multiple linear regression, the sum of squares due to error (SSE) measures the variation in the dependent variable that is not explained by the regression model. It represents the sum of squared differences between the actual and predicted values.

**9. In multiple linear regression, define the number of squares due to regression.**

In multiple linear regression, the sum of squares due to regression (SSR) measures the variation in the dependent variable that is explained by the regression model. It represents the sum of squared differences between the predicted values and the mean of the dependent variable.

**In a regression equation, what is multicollinearity?**

In a regression equation, multicollinearity refers to the presence of high correlation or interdependency among the independent variables. It can cause instability in the regression model and make it difficult to interpret the individual effects of the variables.

**11. What is heteroskedasticity, and what does it mean?**

Heteroskedasticity refers to the unequal spread of residuals (the differences between the actual and predicted values) across the range of the independent variable(s) in a regression model. It indicates that the variability of the dependent variable is not constant, which violates one of the assumptions of linear regression.

**12. Describe the concept of ridge regression.**

Ridge regression is a regularization technique used in linear regression to address multicollinearity and overfitting. It adds a penalty term to the regression equation that discourages large coefficient values, effectively shrinking them towards zero and reducing the impact of multicollinearity.

**13. Describe the concept of lasso regression.**

Lasso regression is another regularization technique used in linear regression. It adds a penalty term to the regression equation that encourages sparsity, meaning it can set some coefficients to exactly zero. This leads to feature selection, as variables with zero coefficients are effectively excluded from the model.

**14. What is polynomial regression and how does it work?**

Polynomial regression is a form of linear regression where the relationship between the dependent variable and the independent variable(s) is modeled using polynomial functions. It allows for curved relationships between the variables by including higher-order terms (such as squared or cubed terms) in the regression equation.

**15. Describe the basis function.**

In polynomial regression, the basis function represents the mathematical functions used to model the relationship between the variables. It can include terms like x, x^2, x^3, and so on, allowing for non-linear relationships to be captured.

**16. Describe how logistic regression works.**

Logistic regression is a statistical method used for binary classification problems where the dependent variable is categorical with two possible outcomes. It models the relationship between the independent variables and the probability of the outcome using the logistic function, which transforms the linear regression equation into a range of probabilities between 0 and 1.