Give me example from life to every statistical test?

Parametric Tests:
Example: Suppose you want to test whether a new medication is effective in reducing blood pressure compared to a placebo. You randomly assign participants to either receive the medication or the placebo. After a specified period, you measure their blood pressure. You can then use a t-test to compare the mean blood pressure levels between the two groups.

Nonparametric Tests:
Example: You want to compare the performance of two different teaching methods on students' test scores. Instead of assuming that the data follows a normal distribution, you collect ordinal data by ranking students' test scores from each teaching method. You can then use the Mann-Whitney U test to determine if there's a significant difference in the median test scores between the two teaching methods.

Chi-square Test:
Example: A survey is conducted to determine whether there is an association between smoking habits (smoker/non-smoker) and the incidence of lung cancer (developed lung cancer/not developed lung cancer). The data is collected in a contingency table with rows representing smoking habits and columns representing lung cancer incidence. A chi-square test is then used to determine if there is a significant association between smoking habits and the incidence of lung cancer.

Regression Analysis:
Example: A real estate agent wants to predict the selling price of houses based on various factors such as the size of the house, the number of bedrooms, and the neighborhood's median income. They collect data on these variables for a sample of houses and perform a multiple linear regression analysis to determine how well these variables predict the selling price.

Correlation Testing:
Example: A researcher wants to examine the relationship between hours of study and exam scores among a group of students. They collect data on the number of hours each student studied and their corresponding exam scores. By calculating the Pearson correlation coefficient, the researcher can determine if there's a significant linear relationship between the two variables (hours of study and exam scores).

The basic equation for updating weights using gradient descent in the context of machine learning

$$w_{ij}^{(t+1)} = w_{ij}^{(t)} - \eta \cdot \frac{\partial E}{\partial w_{ij}}$$

In this equation:

- $w_{ij}^{(t)}$ represents the weight of the connection between neuron i and neuron j at iteration t.
- η (eta) represents the learning rate, which is a hyperparameter that controls the size of the steps taken during the optimization process.
- E represents the error or loss function, which measures the difference between the predicted output and the actual output.
- $\frac{\partial E}{\partial w_{ij}}$ represents the partial derivative of the error function with respect to the weight w_{ij}. This derivative indicates the rate of change of the error with respect to that particular weight.

The goal of gradient descent is to minimize the error function
E by iteratively adjusting the weights w ij in the direction that decreases the error. The gradient descent algorithm achieves this by computing the gradient (partial derivative) of the error function with respect to each weight and then updating the weights in the direction opposite to the gradient.

This update equation is typically applied to all weights in the neural network during each iteration of the training process, with the goal of converging to a set of weights that minimize the error function and thus improve the model's performance.