

1. (3 points) Suppose you have been given a fair coin ($P(\text{head}) = P(\text{tails}) = 0.5$) and you want to find out the odds of getting heads. Which of the following option is true for such a case?
 - (a) Odds will be 0
 - (b) Odds will be 0.5
 - (c) Odds will be 1
 - (d) All of the above
 - (e) None of the above
2. (3 points) Is logistic regression a supervised learning method?
 - (a) True
 - (b) False
 - (c) It depends
 - (d) None of the above
3. (3 points) Is Logistic regression mainly used for Regression?
 - (a) True
 - (b) False
 - (c) It depends
 - (d) None of the above

Consider the `Customer_Churn.csv` datafile. Each row represents a customer, each column contains customer's attributes described on the column Metadata. The data set includes information about:

- Customers who left within the last month, the column is called `Churn`.
- Services that each customer has signed up for phone, multiple lines, internet, online security, online backup, device protection, tech support, and streaming TV and movies.
- Customer account information: how long they've been a customer, contract, payment method, paperless billing, monthly charges, and total charges.
- Demographic info about customers: gender, age range, and if they have partners and dependent

4. **In Python**, answer the following:

- (a) (3 points) Using the `pandas` library, read the csv file and create a data-frame called `churn`.
- (b) (3 points) Using the `numpy` library, create a variable called `Churn_numb` that takes the value of 1 when `Churn = Yes` and 0 when `Churn = No`.
- (c) (5 points) Using the `statsmodels.formula.api` library, build a logistic regression model, in which `Churn_numb` is the target variable, and `tenure` and `MonthlyCharges` are the input variables. Predict the likelihood of churn of a customer with `tenure` equal to 20, and `MonthlyCharges` equal to 80.

5. **In R**, answer the following:

- (a) (3 points) Using the `read.csv` function, read the csv file and create a data-frame called `churn`.

- (b) (3 points) Using the `ifelse` function, create a variable called `Churn_num` that takes the value of 1 when `Churn = Yes` and 0 when `Churn = No`.
- (c) (5 points) Using the `glm` function, build a logistic regression model, in which `Churn_num` is the target variable, and `tenure` and `MonthlyCharges` are the input variables. Predict the likelihood of churn of a customer with `tenure` equal to 12, and `MonthlyCharges` equal to 250.