Q3) Three Coins are tossed, find the probability that two heads and one tail are obtained?

= When three coins are tossed, The total number of possible combinations are 2^3 = 8.

These combinations are HHH, HHT, HTH, THH, TTH, THT, HTT, TTT.

The number of combinations which have two heads and one tail are: HHT, HTH, TTH =3 .

Therefore, the probability of getting two heads and one tails is: P (Two heads and One Tail) = Number of desired outcomes/ Number of Total Outcomes = 3/8 = 0.375

Q4) Two Dice are rolled, find the probability that sum is

a) Equal to 1

The set of possible outcomes when we roll a die are {1, 2, 3, 4, 5, 6} So, when we roll two dice there are 6 × 6 = 36 outcomes.

There is no any moment when the sum of dice is 1 Therefore, the P(sum is equal to 1)= 0/36=0

b) Less than or equal to 4

The set of possible outcomes when we roll a die are {1, 2, 3, 4, 5, 6} So, when we roll two dice there are 6 × 6 = 36 outcomes.

When we roll two dice, the possibility of getting number 4 is (1, 3), (2, 2), and (3, 1). So, The number of favorable outcomes = 3 Total number of outcomes = 36

Therefore, P(sum is Less than or equal to 4)=The number of favorable outcomes / Total number of possibilities = 3 / 36 = 1/12.

c) Sum is divisible by 2 and 3

The set of possible outcomes when we roll a die are {1, 2, 3, 4, 5, 6}

So, when we roll two dice there are 6 × 6 = 36 outcomes.

When we roll two dice, the possibility of getting Sum should be divisible by both 2 and 3 is (1, 5), (2, 4), (3, 3), (4, 2), (5, 1), and (6, 6).

So, The number of favorable outcomes = 6 Total number of outcomes = 36

Therefore, P(Sum is divisible by 2 and 3)=The number of favorable outcomes / Total number of possibilities = 6 / 36 = 1/6.

Q5) A bag contains 2 red, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?

Total number of balls = (2 + 3 + 2) = 7

Let S be the sample space. Then, n(S) = Number of ways of drawing 2 balls out of 7 =7C2 =(7×6)/(2×1) =21

Let E = Event of drawing 2 balls, none of which is blue. So, n(E)= Number of ways of drawing 2 balls out of (2 + 3) balls. =5C2 =(5×4)/ (2×1) =10

Therefore, P(E)=n(E)/ n(S)=10/21

Q11) Suppose we want to estimate the average weight of an adult male in Mexico. We draw a random sample of 2,000 men from a population of 3,000,000 men and weigh them. We find that the average person in our sample weighs 200 pounds, and the standard deviation of the sample is 30 pounds. Calculate 94%,98%,96% confidence interval?

Considering a 94% confidence level, using a calculator, with 200 - 1 = 199 df, the critical value is t = 1.8916, hence:

The 94% confidence interval is (198.73, 201.27). Considering a 96% confidence level, using a calculator, with 200 - 1 = 199 df, the critical value is t = 2.0673, hence:

The 96% confidence interval is (198.61, 201.39). Considering a 98% confidence level, using a calculator, with 200 - 1 = 199 df, the critical value is t = 2.3452, hence:

The 98% confidence interval is (198.43, 201.57).

Q 20) Calculate probability from the given dataset for the below cases

Data \_set: Cars.csv

Calculate the probability of MPG of Cars for the below cases.

MPG <- Cars$MPG

* 1. P(MPG>38)
  2. P(MPG<40)

c. P (20<MPG<50)

Prob\_MPG\_greater\_than\_38 = np.round(1 - stats.norm.cdf(38, loc= q20.MPG.mean(), scale= q20.MPG.std()),3) print('P(MPG>38)=',Prob\_MPG\_greater\_than\_38)

P(MPG>38)= 0.348

b. P(MPG<40) Ans: prob\_MPG\_less\_than\_40 = np.round(stats.norm.cdf(40, loc = q20.MPG.mean(), scale = q20.MPG.std()),3) print('P(MPG<40)=',prob\_MPG\_less\_than\_40)

P(MPG<40)= 0.729

c. P (20<MPG<50) Ans: prob\_MPG\_greater\_than\_20 = np.round(1-stats.norm.cdf(20, loc = q20.MPG.mean(), scale = q20.MPG.std()),3) print('p(MPG>20)=',(prob\_MPG\_greater\_than\_20)) p(MPG>20)= 0.943

prob\_MPG\_less\_than\_50 = np.round(stats.norm.cdf(50, loc = q20.MPG.mean(), scale = q20.MPG.std()),3) print('P(MPG<50)=',(prob\_MPG\_less\_than\_50)) P(MPG<50)= 0.956

prob\_MPG\_greaterthan20\_and\_lessthan50= (prob\_MPG\_less\_than\_50) - (prob\_MPG\_greater\_than\_20) print('P(20<MPG<50)=',(prob\_MPG\_greaterthan20\_and\_lessthan50)) P(20<MPG<50)= 0.013000000000000012

Q 24**)** A Government company claims that an average light bulb lasts 270 days. A researcher randomly selects 18 bulbs for testing. The sampled bulbs last an average of 260 days, with a standard deviation of 90 days. If the CEO's claim were true, what is the probability that 18 randomly selected bulbs would have an average life of no more than 260 days

t - statistics for the data is given as follows:



x = mean of the sample of bulbs =  260

μ = population mean = 270

s = standard deviation of the sample = 90

n = number of items in the sample = 18









t = - 0.471

For probability calculations, the number of degrees of freedom is n - 1, so here you need the t-distribution with 17 degrees of freedom.

The probability that **t < - 0.471 with 17 degrees of freedom** assuming the population mean is true, the t-value is less than the t-value obtained With 17 degrees of freedom and a t score of - 0.471, the probability of the bulbs lasting less than 260 days on average of **0.3218** assuming the mean life of the bulbs is 300 days.