|  |  |
| --- | --- |
| Activity | Data Type |
| Number of beatings from Wife | Discrete |
| Results of rolling a dice | Discrete |
| Weight of a person | Continuous |
| Weight of Gold | Continuous |
| Distance between two places | Continuous |
| Length of a leaf | Continuous |
| Dog's weight | Continuous |
| Blue Color | Discrete |
| Number of kids | Discrete |
| Number of tickets in Indian railways | Discrete |
| Number of times married | Discrete |
| Gender (Male or Female) | Discrete |

Q1) Identify the Data type for the Following:

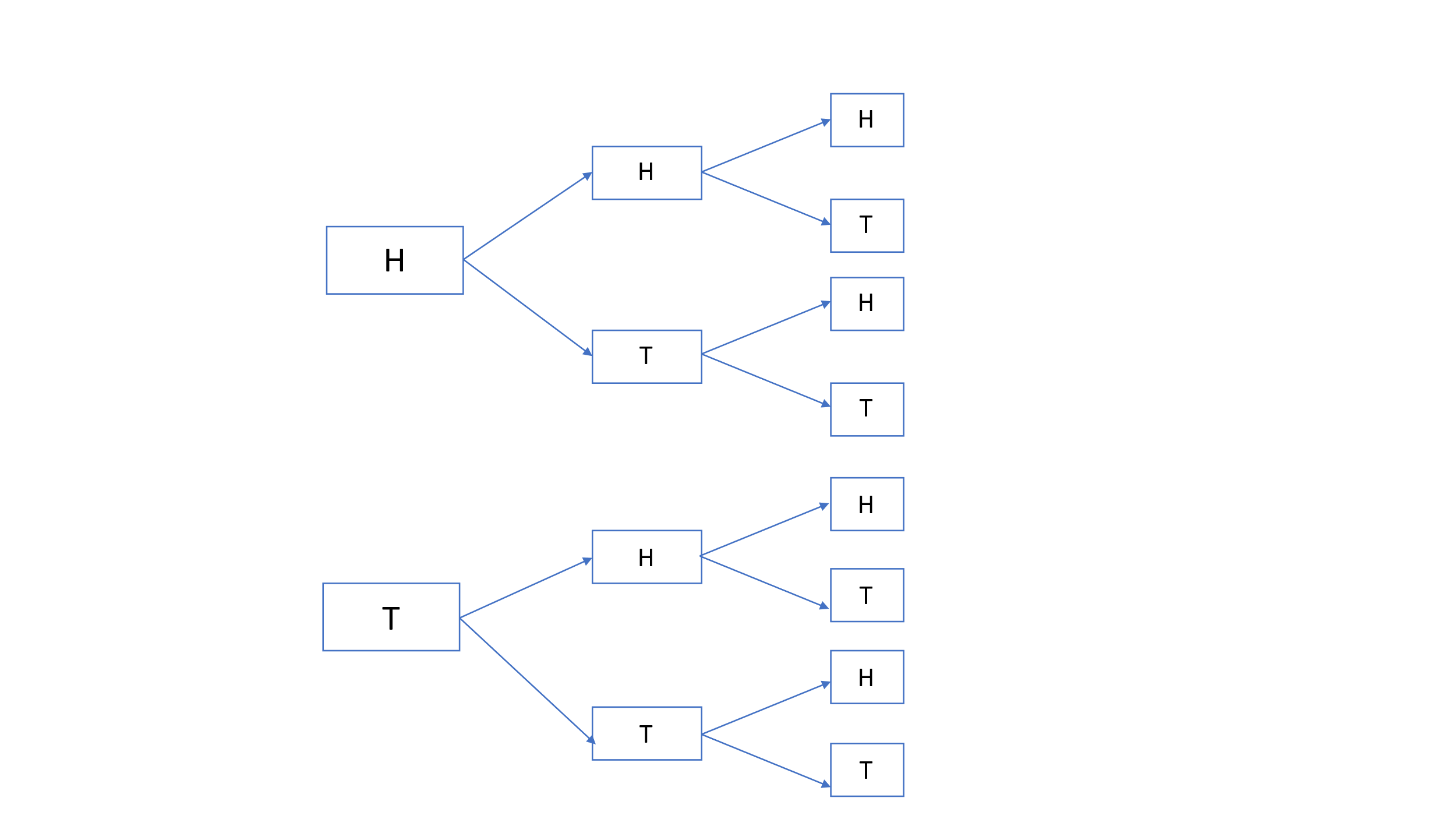
Q2) Identify the Data types, which were among the following

Nominal, Ordinal, Interval, Ratio.

|  |  |
| --- | --- |
| Data | Data Type |
| Gender | Nominal |
| High School Class Ranking | Ordinal |
| Celsius Temperature | Interval |
| Weight | Ratio |
| Hair Color | Nominal |
| Socioeconomic Status | Ordinal |
| Fahrenheit Temperature | Interval |
| Height | Ratio |
| Type of living accommodation | Ordinal |
| Level of Agreement | Ordinal |
| IQ(Intelligence Scale) | Ratio |
| Sales Figures | Nominal |
| Blood Group | Ratio |
| Time Of Day | Interval |
| Time on a Clock with Hands | Interval |
| Number of Children | Nominal |
| Religious Preference | Nominal |
| Barometer Pressure | Interval |
| SAT Scores | Interval |
| Years of Education | Ordinal |

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

From Tree Diagram



Sample Space = {HHH, HHT, HTH, HTT, THH, THT, TTH, TTT}

1. Probability of getting two heads-

Event = n(A) = {HHT, HTH, THH}

P(A) = n(A)/n(s)

= 3/8

1. Probability of getting one tail-

Event = n(A) = {HHT, HTH, THH}

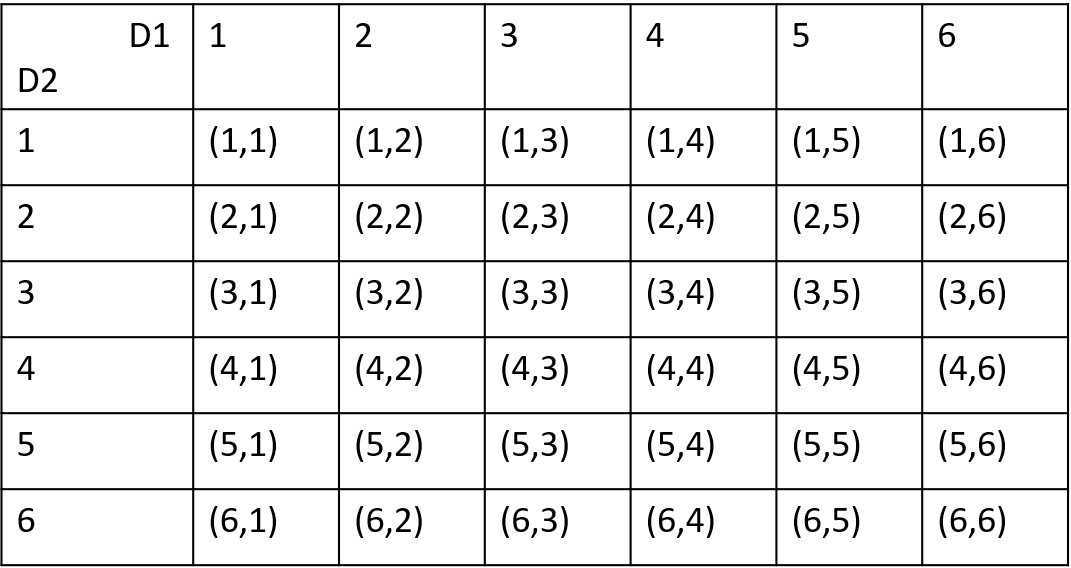
P(A) = n(A)/n(s)

= 3/8

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

1. Equal to 1
2. Less than or equal to 4
3. Sum is divisible by 2 and 3

**Ans.**



Number of possible outcomes for the above event is

N (Event (Two dice rolled)) = 6 \* 6= 36

1. P (sum is Equal to 1) = ‘0’ zero null
2. P (Sum is less than or equal to 4) = N (Event (Sum is less than or equal to

4)) / N (Event (Two dice rolled))

= 6 / 36 = 1/6

1. P (Sum is divisible by 2 and 3) = N (Event (Sum is divisible by 2 and 3)) / N

(Event (Two dice rolled))

= 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?

**Ans.**

Total no. of balls = red + green + blue

= 2 + 3 + 2 = 7

N (Event (2 balls are drawn randomly from bag)

n(s) = 7C2

= 7\*6/2\*1

N (Event (None of the balls drawn is blue)

n(A) = 5C2

= 5\*4/2\*1

P (None of the balls drawn is blue) = N (Event (None of the balls drawn is blue) /

N (Event (2 balls are drawn randomly from

bag)

p(A) = n(A)/n(s)

= 10/21

Q6) Calculate the Expected number of candies for a randomly selected child

Below are the probabilities of count of candies for children (ignoring the nature of the child-Generalized view)

|  |  |  |
| --- | --- | --- |
| CHILD | Candies count | Probability |
| A | 1 | 0.015 |
| B | 4 | 0.20 |
| C | 3 | 0.65 |
| D | 5 | 0.005 |
| E | 6 | 0.01 |
| F | 2 | 0.120 |

Child A – probability of having 1 candy = 0.015.

Child B – probability of having 4 candies = 0.20

**Ans.**

Expected Value E(X) = ∑ XiPi

= 1\*0.015 + 4\*0.20 + 3\*0.65 + 5\*0.005 + 6\*0.01 + 2\*0.120

= 3.09

Q7) Calculate Mean, Median, Mode, Variance, Standard Deviation, Range & comment about the values / draw inferences, for the given dataset

* For Points,Score,Weight

Find Mean, Median, Mode, Variance, Standard Deviation, and Range and also Comment about the values/ Draw some inferences.

**Use Q7.csv file**

**Ans.**

Mean for Points = 3.59, Score = 3.21 and Weigh = 17.84

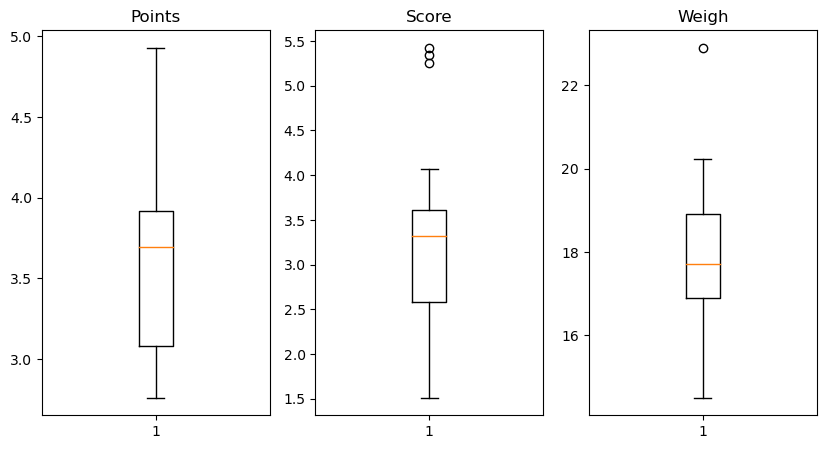
Median for Points = 3.69, Score = 3.32 and Weigh = 17.71

Mode for Points = 3.07, Score = 3.44 and Weigh = 17.02

Variance for Points = 0.28, Score = 0.95, Weigh = 3.19

Standard Deviation for Points = 0.53, Score = 0.97, Weigh = 1.78

Range [Min-Max] for Points [3.59 – 4.93], Score [3.21 – 5.42] and Weigh [17.84 – 22.9]



Q8) Calculate Expected Value for the problem below

1. The weights (X) of patients at a clinic (in pounds), are

108, 110, 123, 134, 135, 145, 167, 187, 199

Assume one of the patients is chosen at random. What is the Expected Value of the Weight of that patient?

Expected value = ∑ Xi \* Pi

= (1/9)(108)+ (1/9)(110)+ (1/9)(123)+ (1/9)(134)+ (1/9)(145)+ (1/9)(167)+ (1/9)(187)+ (1/9)(199)

= 145.33

**Q9) Calculate Skewness, Kurtosis & draw inferences on the following data**

**Cars speed and distance**

**Use Q9\_a.csv**

**Skewness:**

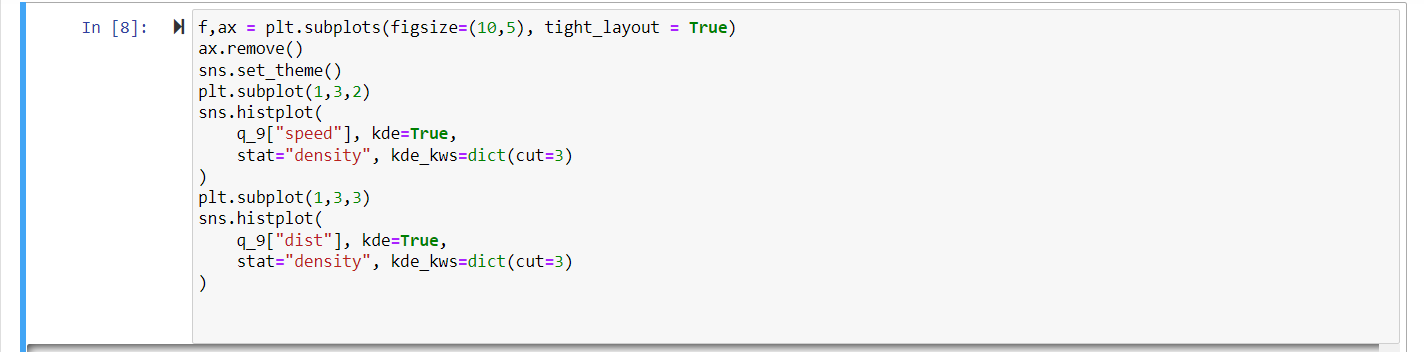
1. **Speed = -0.1139**
2. **Dist = 0.7824**

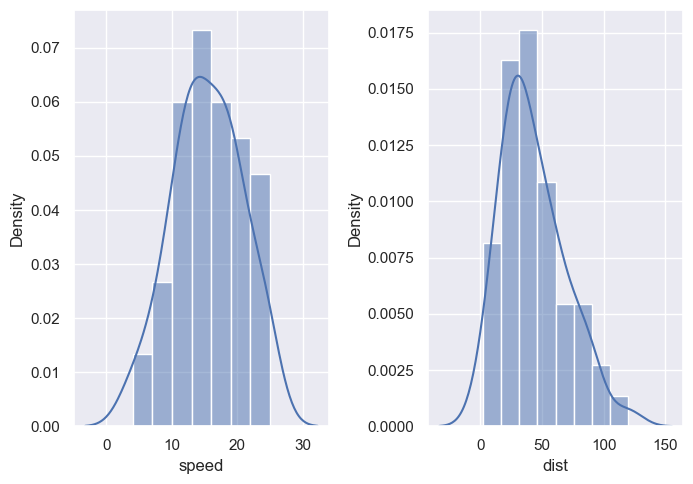
**Kurtosis:**

1. **Speed = - 0.577**
2. **Dist = 0.248**

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****

**SP and Weight(WT)**

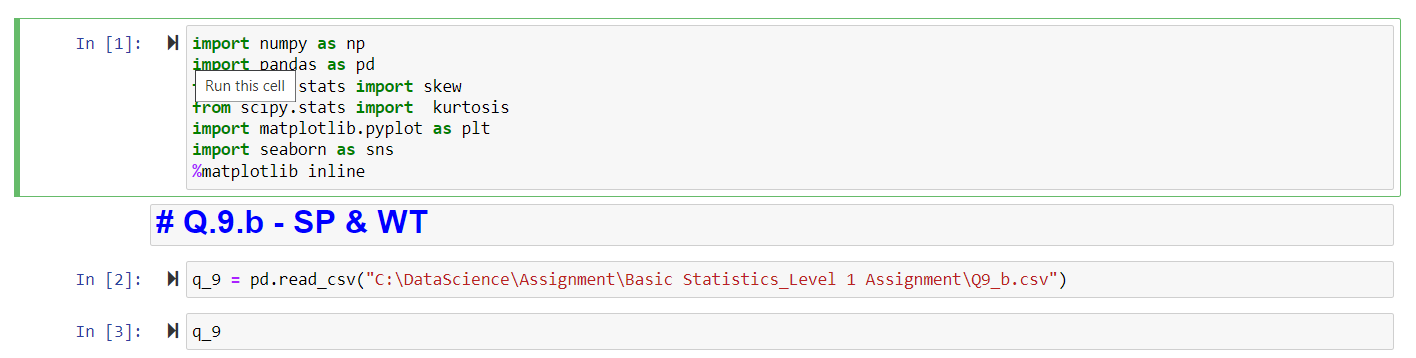
**Use Q9\_b.csv**

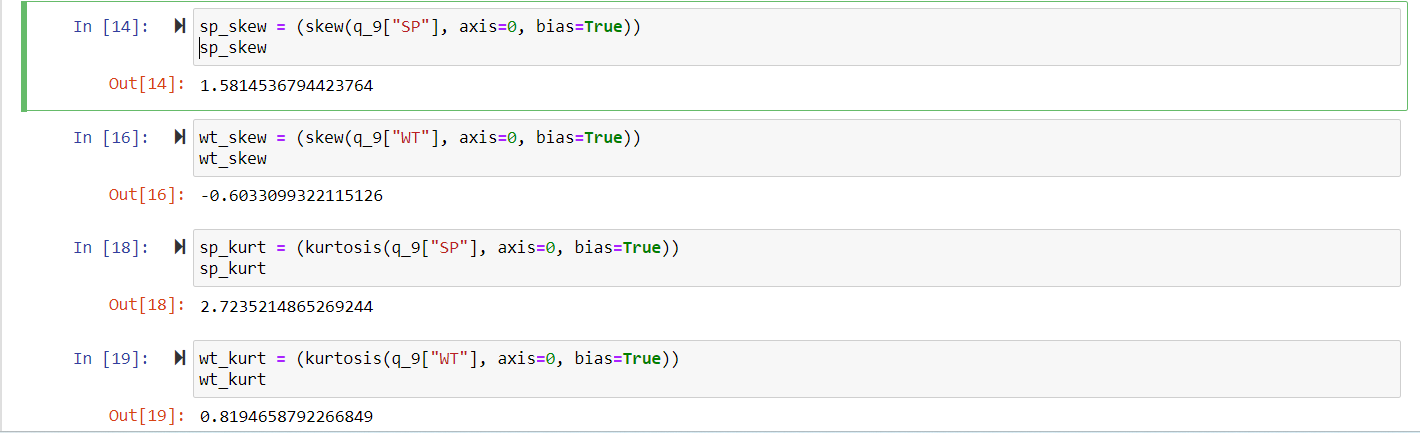
**Skewness:**

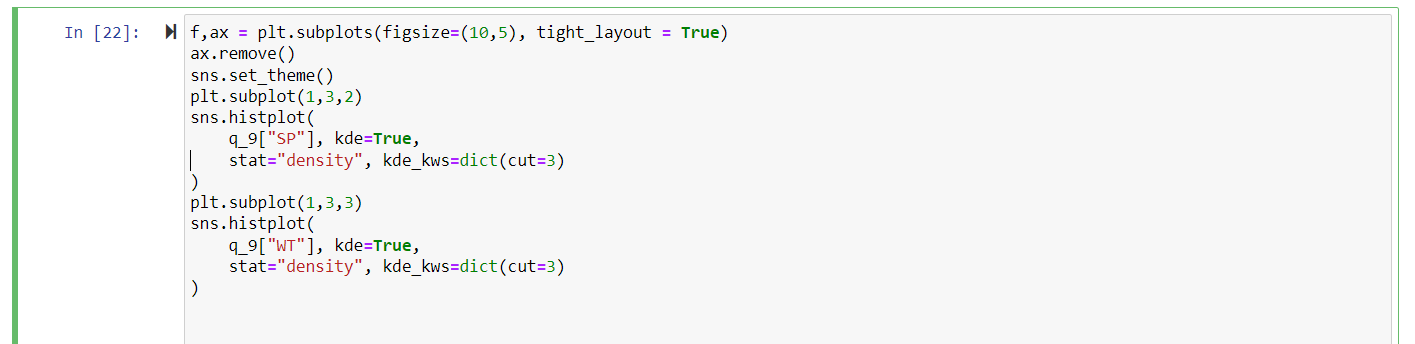
1. **SP = 1.58**
2. **WT = -0.60**

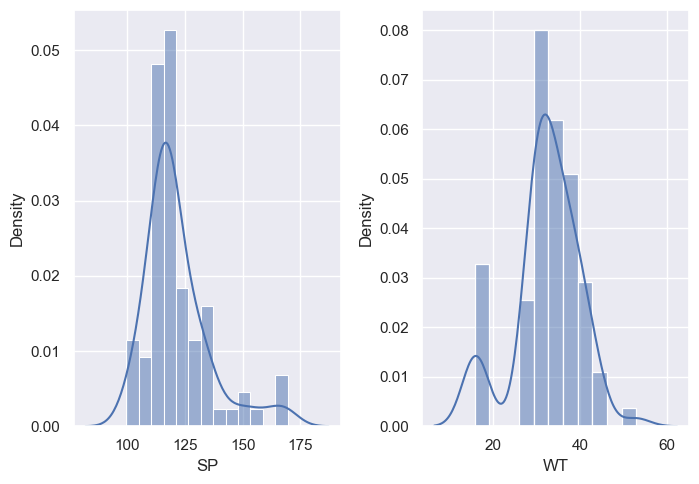
**Kurtosis:**

1. **SP = - 2.72**
2. **WT = 0.81**

****

****

****

****

**Q10) Draw inferences about the following boxplot & histogram**



Ans: The above histogram is showing the long tail is on the right side so it is right skewed (Positively skewed) distribution.



Ans: The boxplot has outliers on the maximum side.

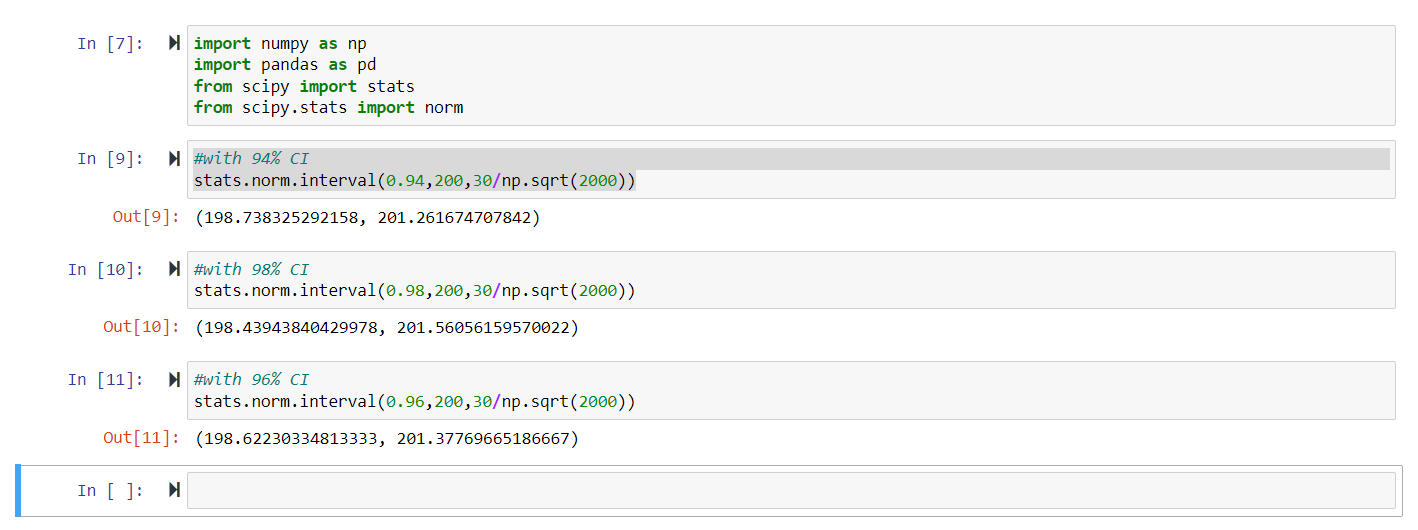
**Q11)** Suppose we want to estimate the average weight of an adult male in Mexico. We draw a random sample of 2,000 men from a population of 3,000,000 men and weigh them. We find that the average person in our sample weighs 200 pounds, and the standard deviation of the sample is 30 pounds. Calculate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

Ans:

For 94% confidence interval Range is [ 198.73 – 201.26]

For 98% confidence interval range is [198.43 – 201.56]

For 96% confidence interval range is [198.62 – 201.37]

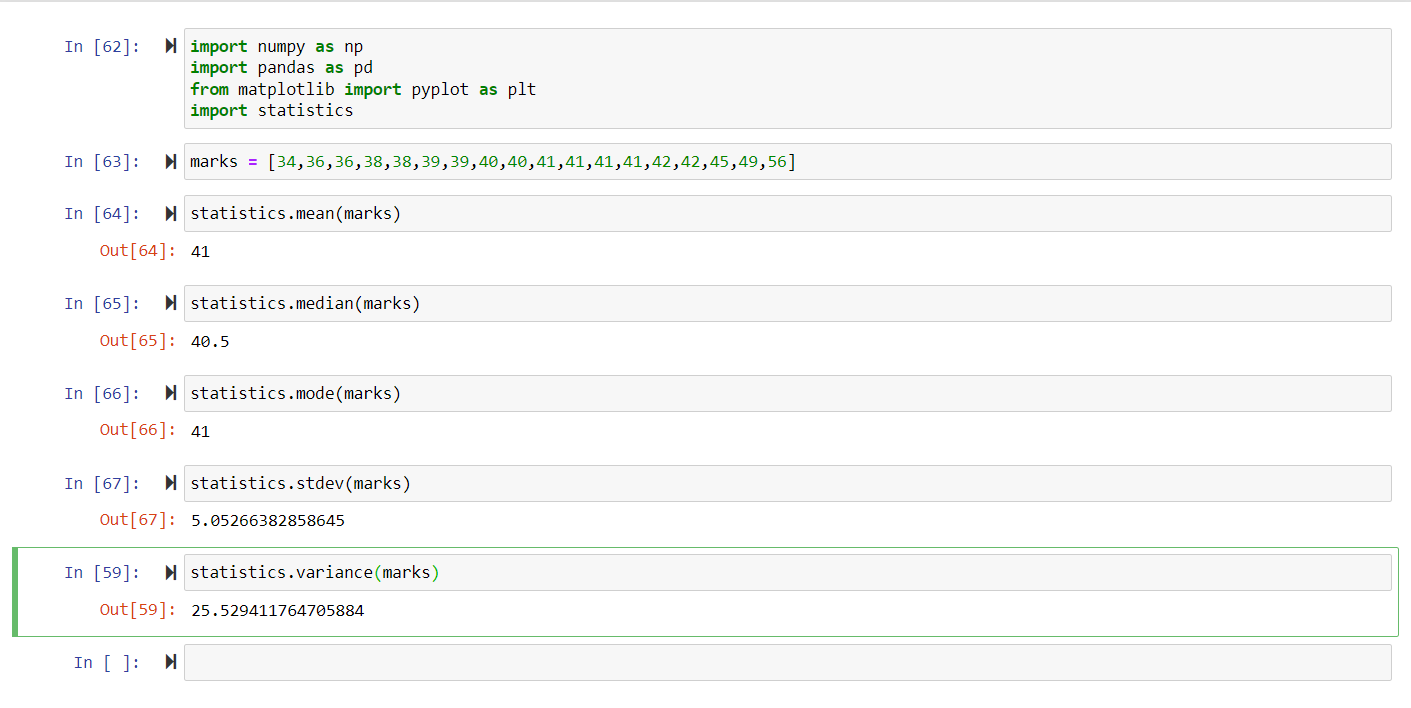


**Q12)** Below are the scores obtained by a student in tests

**34,36,36,38,38,39,39,40,40,41,41,41,41,42,42,45,49,56**

1. Find mean, median, variance, standard deviation.
2. What can we say about the student marks?

Ans: 1. Mean =41, Median =40.5, Variance =25.52 and Standard Deviation =5.05



2. Mean is greater than median, so we can say distribution is slightly right(positively)skewed.

Q13) What is the nature of skewness when mean, median of data are equal?

Ans: The distribution has no skewness, we have Normal distribution.

Q14) What is the nature of skewness when mean > median ?

Ans: The distribution has skewness on right side. We have positive or right skewness

Q15) What is the nature of skewness when median > mean?

Ans: The distribution has skewness on left side. We have negative or left skewness

Q16) What does positive kurtosis value indicates for a data ?

Ans: Positive kurtosis means the curve is more peaked and it is Leptokurtic

Q17) What does negative kurtosis value indicates for a data?

Ans: Negative Kurtosis means the curve will be flatter and broader

Q18) Answer the below questions using the below boxplot visualization.



What can we say about the distribution of the data?

Ans: The above Boxplot is not normally distributed the median is towards the higher value

What is nature of skewness of the data?

Ans: The data is a skewed towards left.

What will be the IQR of the data (approximately)?

Ans: The Inter Quantile Range = Q3 Upper quartile – Q1 Lower Quartile

= 18 – 10

=8  
Q19) Comment on the below Boxplot visualizations? 

Draw an Inference from the distribution of data for Boxplot 1 with respect Boxplot 2.

Ans: Both boxplots share the same median that is approximately in a range between 275 to 250 and they are normally distributed with zero to no skewness neither at the minimum or maximum whisker range. There are no outliers.

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

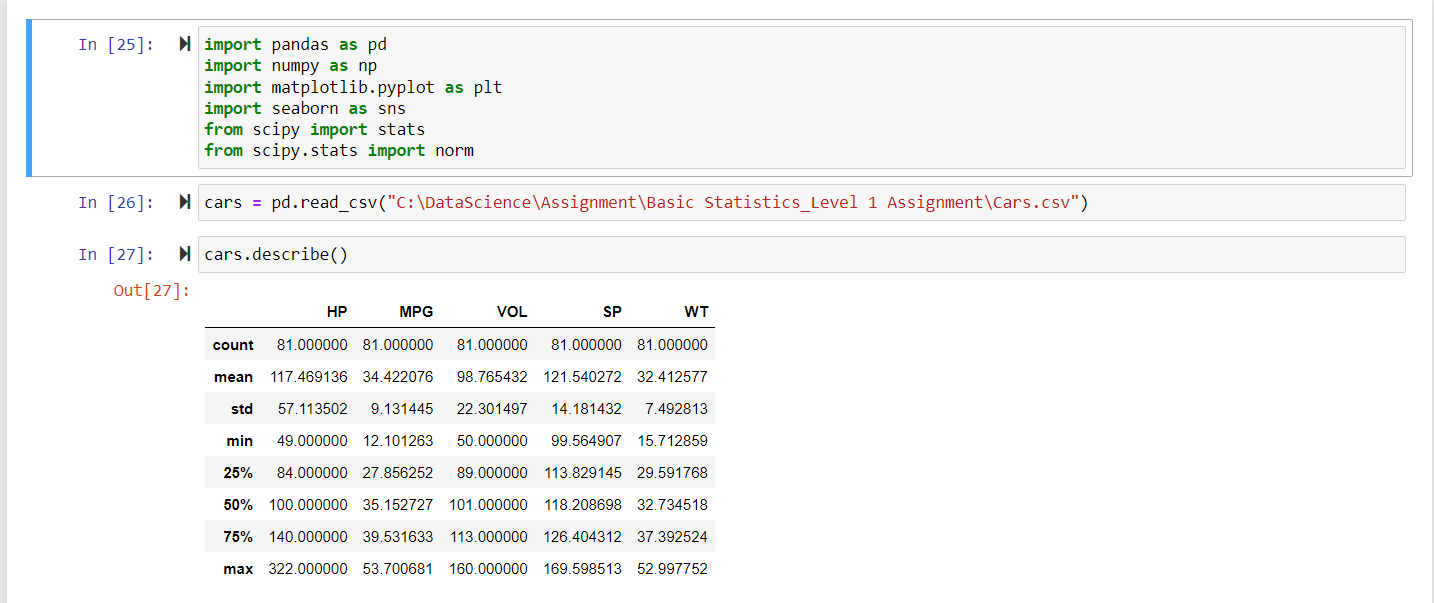
Data \_set: Cars.csv

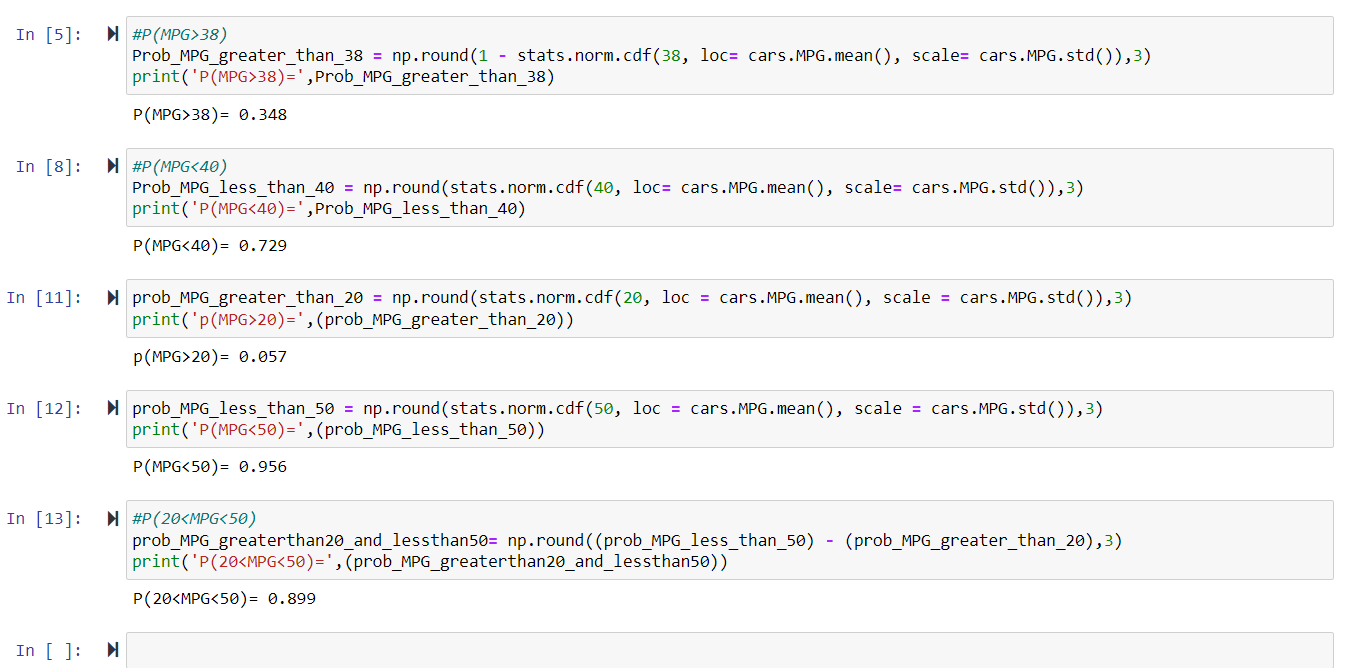
Calculate the probability of MPG of Cars for the below cases.

MPG <- Cars$MPG

* 1. P(MPG>38)
  2. P(MPG<40)
  3. P (20<MPG<50)

Ans:

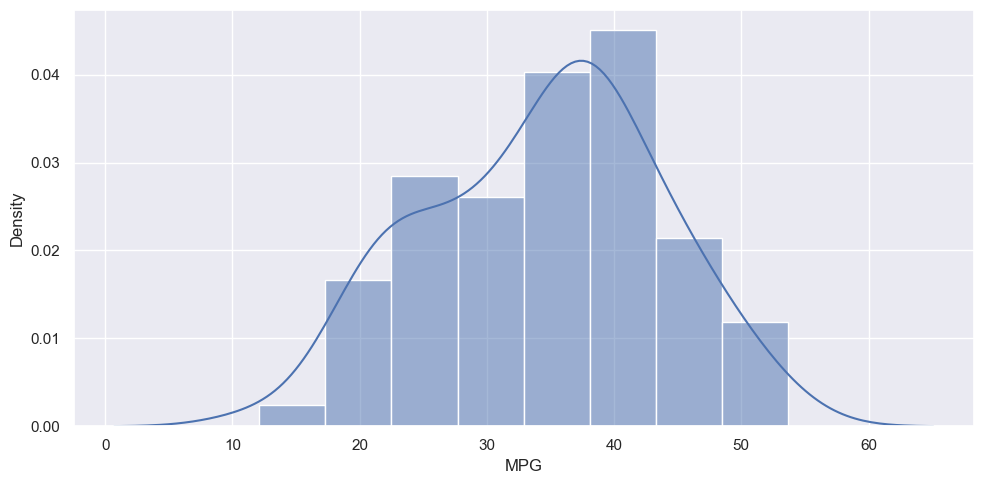




Q 21) Check whether the data follows normal distribution

1. Check whether the MPG of Cars follows Normal Distribution

Dataset: Cars.csv



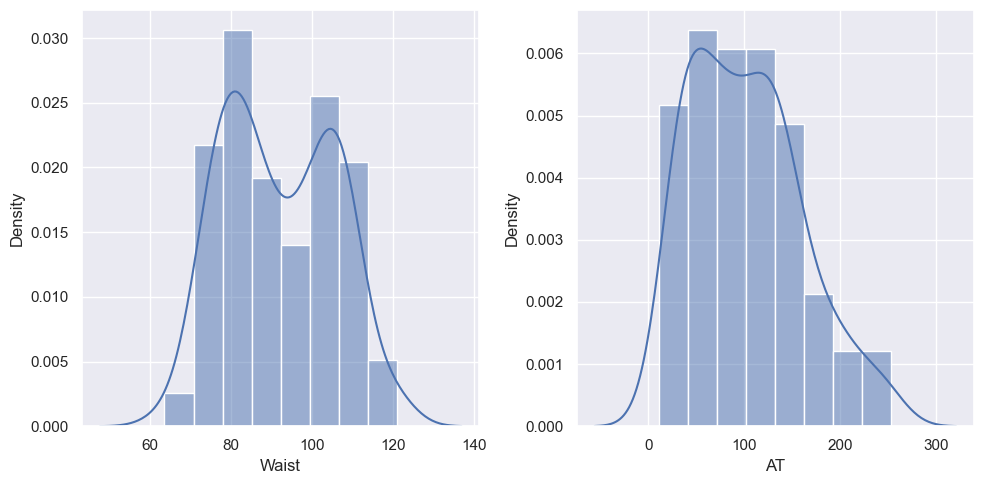
Mean = 34.42

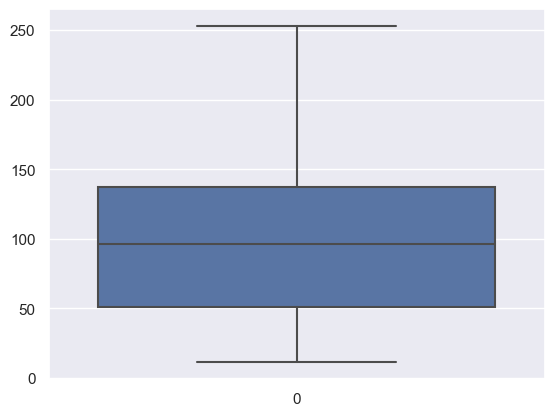
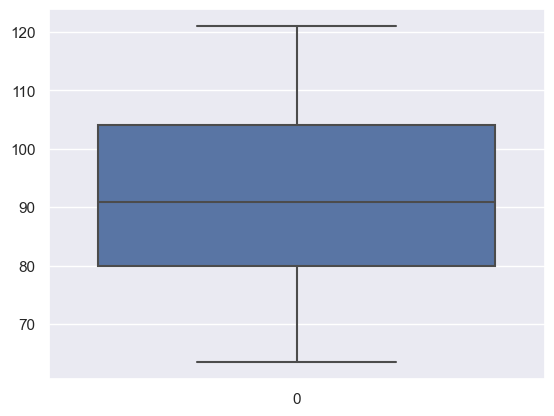
Median = 35.15

As mean and median are approximately same and from above plot and values, we can say that data is symmetrical, therefor it follows normal distribution.

1. Check Whether the Adipose Tissue (AT) and Waist Circumference(Waist) from wc-at data set follows Normal Distribution

Dataset: wc-at.csv



AT Waist

For AT:

Mean= 101.89

Median= 96.540000

mean> median, right whisker is larger than left whisker, data is positively skewed.

For Waist:

Mean= 91.901835

Median=90.80

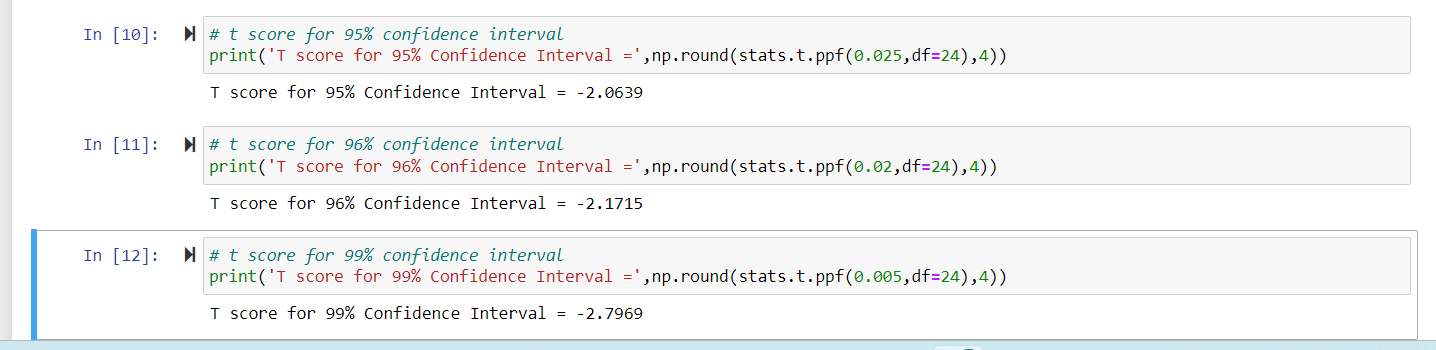
mean> median, both the whisker has same length, median is slightly shifted towards left. Data is close to normal.

Q 22) Calculate the Z scores of 90% confidence interval,94% confidence interval, 60% confidence interval



Q 23) Calculate the t scores of 95% confidence interval, 96% confidence interval, 99% confidence interval for sample size of 25

Ans:



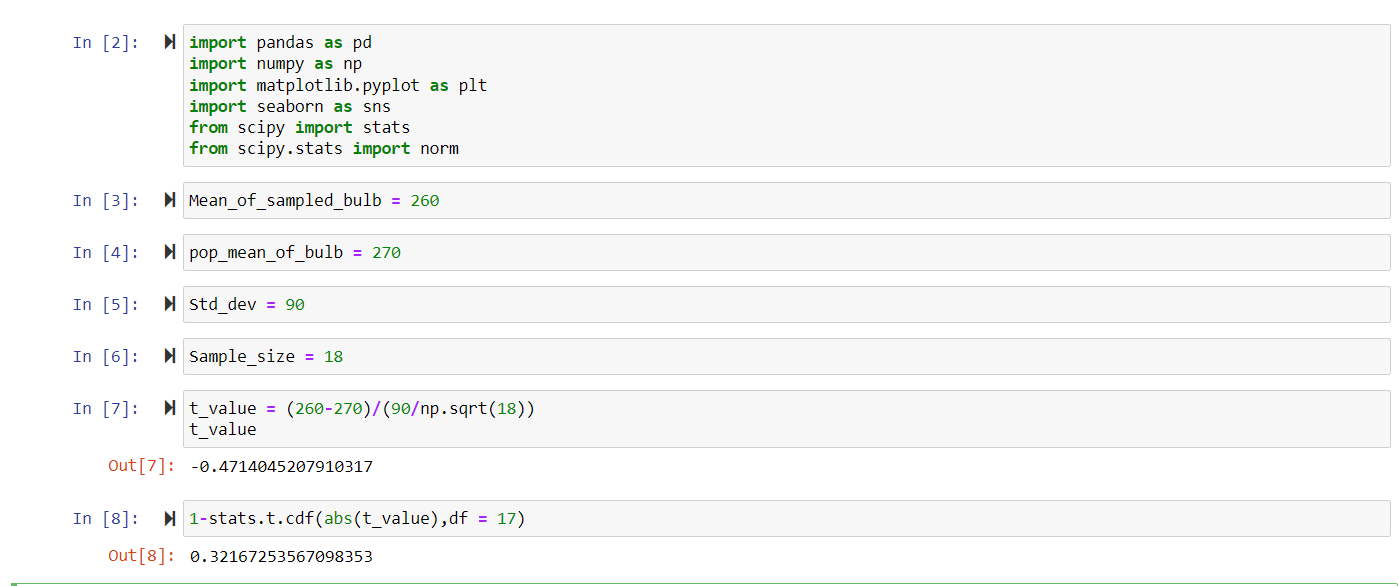
Q 24**)** A Government company claims that an average light bulb lasts 270 days. A researcher randomly selects 18 bulbs for testing. The sampled bulbs last an average of 260 days, with a standard deviation of 90 days. If the CEO's claim were true, what is the probability that 18 randomly selected bulbs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

Hint:

rcode 🡪 pt(tscore,df)

df 🡪 degrees of free dom

Ans:



The probability that 18 randomly selected bulbs would have an average life of no more than 260 days is = 0.32 = 32%