Assignment 1

Q1) Identify the Data type for the Following:

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

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	Interval
Blood Group	Nominal
Time Of Day	Ratio
Time on a Clock with Hands	Ratio
Number of Children	Ordinal

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Religious Preference	Nominal
Barometer Pressure	Ratio
SAT Scores	Ratio
Years of Education	Ordinal

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

Ans:- Total Number of possible Combination :- HHH , **HHT** , **HTH** , HTT , **THH** , THT , TTH , TTT => 8 Combination

two heads and one tail :- HHT , HTH , THH

So the Probablility is => **3/8 = 0.375**

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

a) Equal to 1 **= 0**
b) Less than or equal to 4 =

Probability of getting Sum as 4 = (1,1) , (1,2) , (1,3) , (2,1) , (2,2) , (3,1)

Total number of Combination = 36

probability that sum is = 6 / 36 **= 0.1666**

c) Sum is divisible by 2 and 3
Probability of getting Sum is divisible by 2 and 3 = (1,5) , (2,4) , (3,3) , (4,2) , (5,1) , (6,6)
probability that sum is = 6/36 = **0.166**

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 Number of Balls = (2 +3+2) = 7

Drawing 2 balls out of 7 = 7C2 = (7x6)/(2x1) = 21

Number of ways drawing two balls red and green = (2+3) = 5

Drawing 2 balls out of 5 = 5C2 = (5x4)/(2x1) = 10

= 10 / 21 = **0.4761**

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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:- Probability = 0.015 + 0.20 + 0.65 +0.005 + 0.01 + 0.120 = **3.09**

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

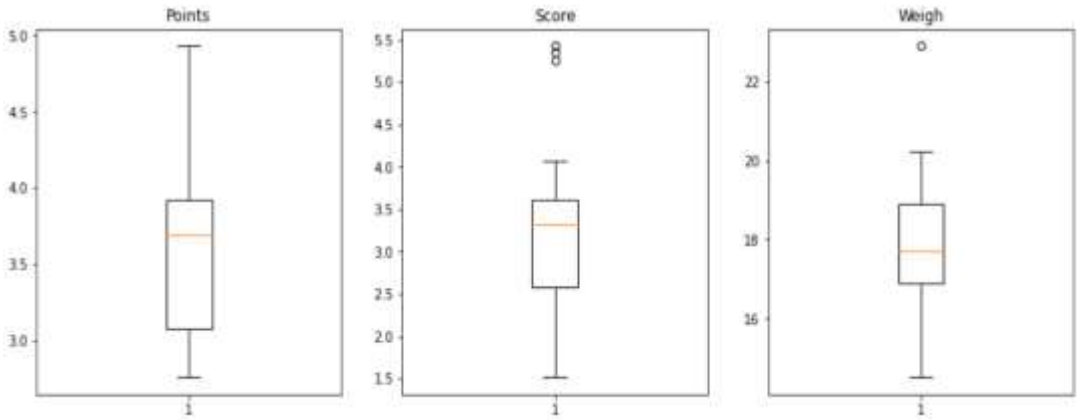
- **For Points,Score,Weigh>**
  Find Mean, Median, Mode, Variance, Standard Deviation, and Range and also Comment about the values/ Draw some inferences.

Ans :- Q7.ipynb

	POINTS	SCORE	WEIGH
MEAN	3.596563	3.217250	17.848750
MEDIAN	3.695	3.325	17.710
MODE	0 3.07 1 3.92	0 3.44	0 17.02 1 18.90
VARIANCE	0.285881	0.957379	3.193166
STANDARD DEVIATION	0.534679	0.978457	1.786943
RANGE	2.17	3.9110000000000005	8.399999999999999

Assignment 1

```
f,ax=plt.subplots(figsize=(15,5))
plt.subplot(1,3,1);plt.boxplot(df.Points);plt.title('Points')
plt.subplot(1,3,2);plt.boxplot(df.Score);plt.title('Score')
plt.subplot(1,3,3);plt.boxplot(df.Weigh);plt.title('Weigh')
plt.show()
```



Q8) Calculate Expected Value for the problem below

a) 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?

Ans: Expected Value = ∑ (probability * Value)
∑ P(x).E(x) there are 9 patients
Probability of selecting each patient = 1/9
Expected Value = (1/9)(108) + (1/9)110 + (1/9)123 + (1/9)134 + (1/9)135 + (1/9)145 + (1/9(167) + (1/9)187 + (1/9)199
= (1/9) (108 + 110 + 123 + 134 + 135 + 145 + 167 + 187 + 199)
= (1/9)(1308)
= 145.33

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

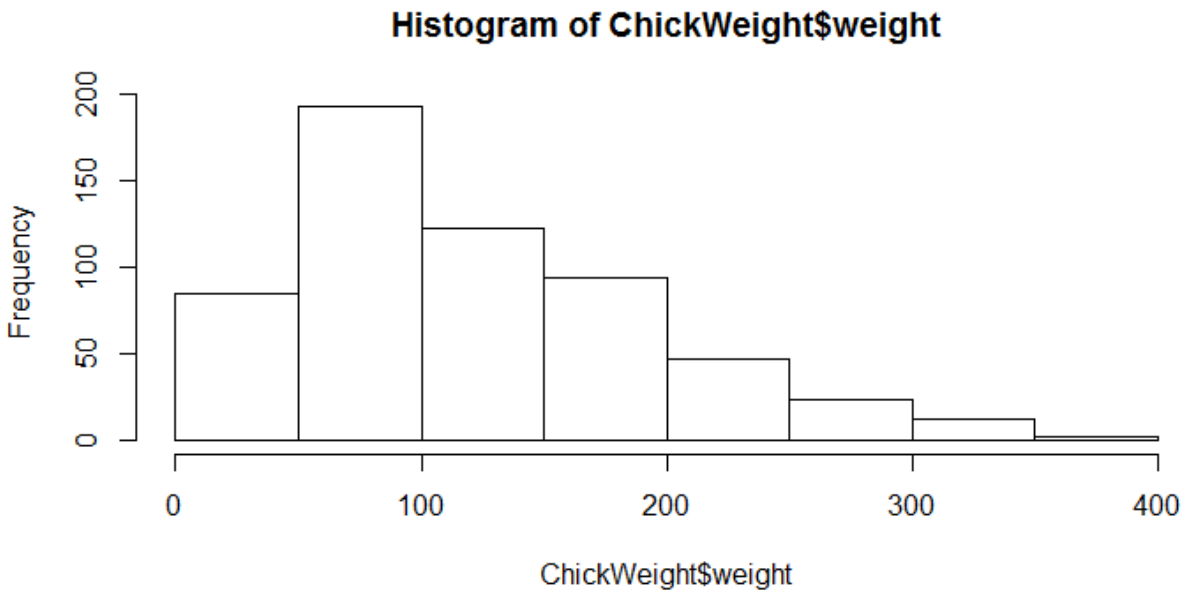
Cars speed and distance Use Q9_a.csv

SP and Weight(WT) Use Q9_b.csv

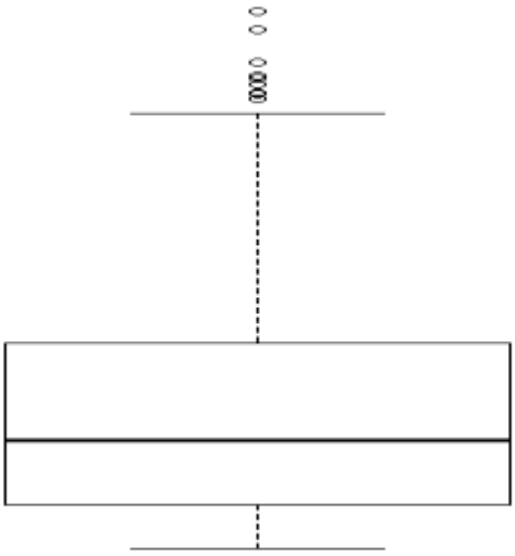
Ans:- Q9.ipynb

Assignment 1

Q10) Draw inferences about the following boxplot & histogram



Ans :- The Histogram peak has right skew and tail is on right . Mean > Median We have outliers on the higher side.



Ans:- The boxplot has outliers on the maximum side.

Assignment 1

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.

Q12.ipynb

MEAN	41.0
MEDIAN	40.5
MODE	41
VARIANCE	25.529412
STANDARD DEVIATION	5.052664
RANGE	22

2) What can we say about the student marks? -

Ans:- From above plot we can say that mean of marks of student is 41 which is slightly greater than median.
Most of the students got marks in between 41-42, there are two outlier 49,56.

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

Ans :- If the distribution is symmetric , then the mean is equal to median , and the distribution has zero Skewness

Assignment 1

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

Ans:- If mean is greater than median , the distribution is positively skewed

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

Ans :- If mean is less than median , the distribution is negatively skewed

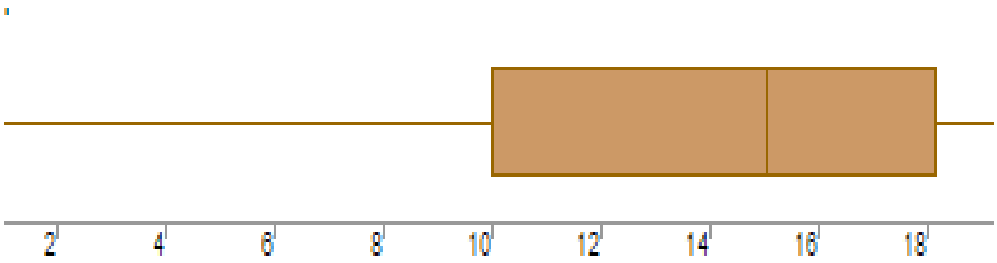
Q16) What does positive kurtosis value indicates for a data ?

Ans:- Positive Kurtosis indicates a distribution where more of the number are located in the tails of the distribution instead of around the mean. (thick tails)

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

Ans:- Negative Kurtosis indicates a distribution is flat and has thin tails

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.

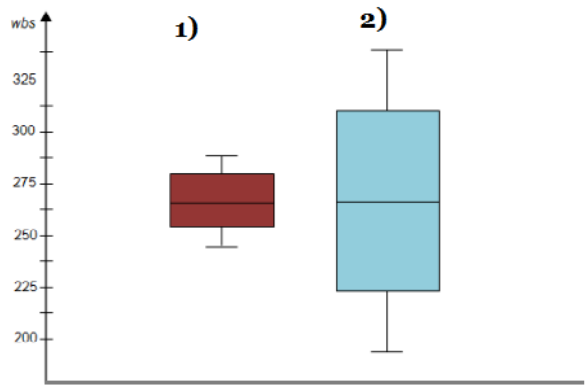
What is nature of skewness of the data?

Ans:- The data is a skewed towards left. The whisker range of minimum value is greater than maximum

What will be the IQR of the data (approximately)?
Ans:- The Inter Quantile Range = Upper Quartile – Lower Quartile = 18 – 10 = 8

Assignment 1

Q19) Comment on the below Boxplot visualizations?



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

Ans:- First there is no Outliers. Second both the box plot shares same median that is approximately in the range between 275 to 250 and they are normally distributed with zero to no skewness neither at the minimum or maximum whisker range.

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

a. P(MPG>38)
b. P(MPG<40)
c. P(20<MPG<50)

Ans:- The Mean of MPG is :- 34.42207572802469 = df.MPG.mean()

Standard Deviation is :- 9.131444731795982 = df.MPG.std()

a. **The probability of MPG of Cars P(MPG>38) :**

1 - stats.norm.cdf(38 , df.MPG.mean(), df.MPG.std()) = 0.34759392515827137

b. **The probability of MPG of Cars P(MPG<40) :**

stats.norm.cdf(40 , df.MPG.mean(), df.MPG.std()) = 0.7293498762151609

c. **The probability of MPG of Cars P(20<MPG<50) :**

stats.norm.cdf(50 , df.MPG.mean(), df.MPG.std()) - (1 - stats.norm.cdf(20 , df.MPG.mean(), df.MPG.std())) = 0.01311646961052304

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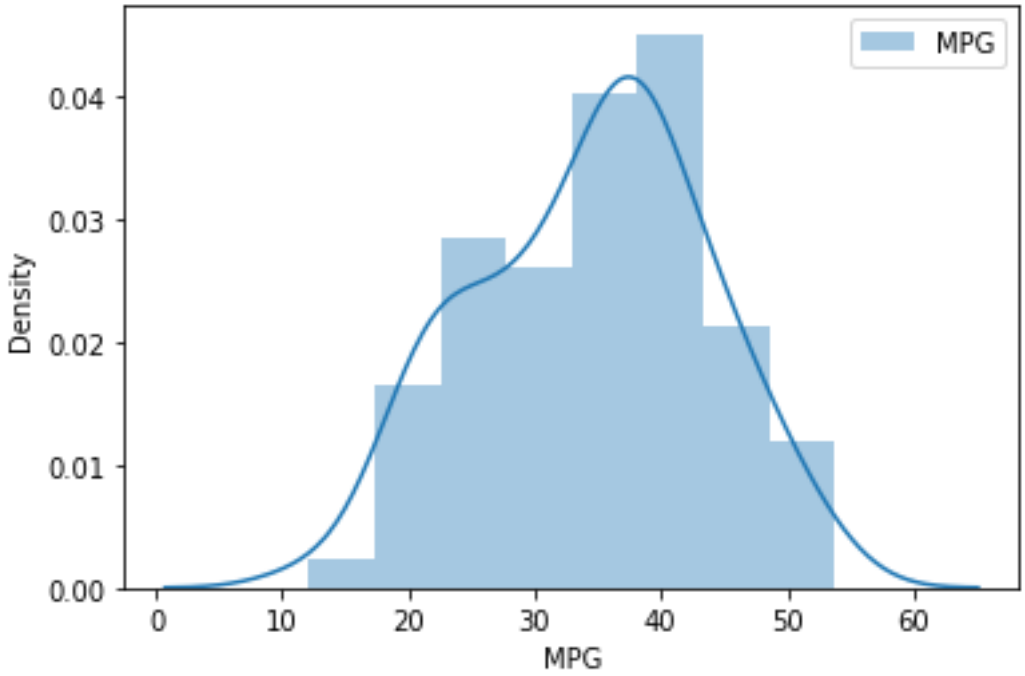
Q 21) Check whether the data follows normal distribution

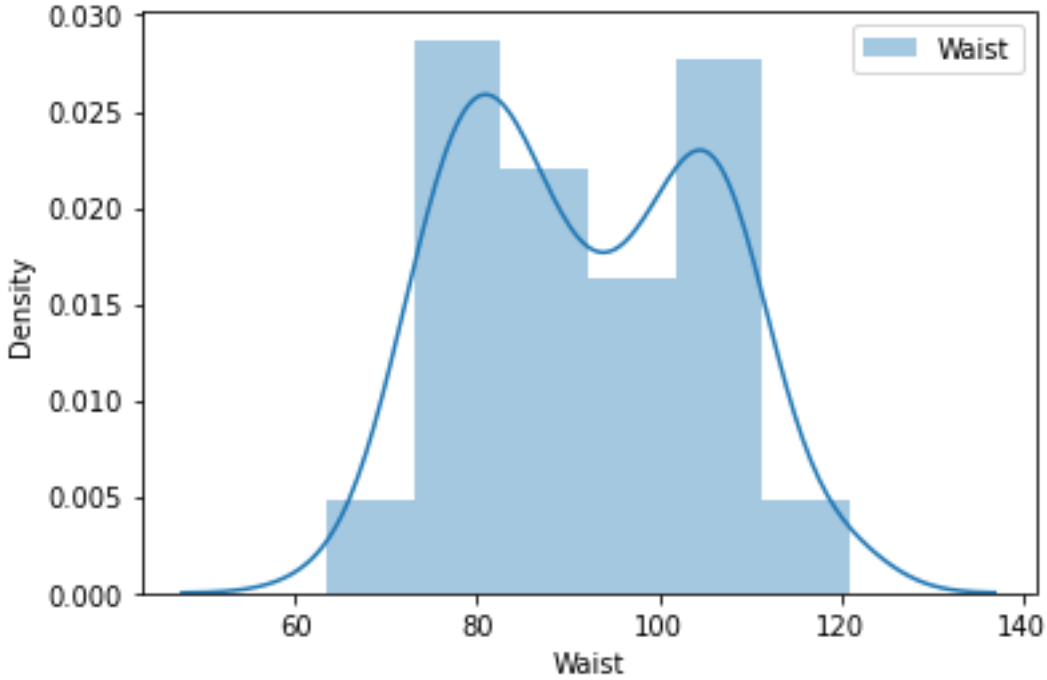
a) Check whether the MPG of Cars follows Normal Distribution
Dataset: Cars.csv



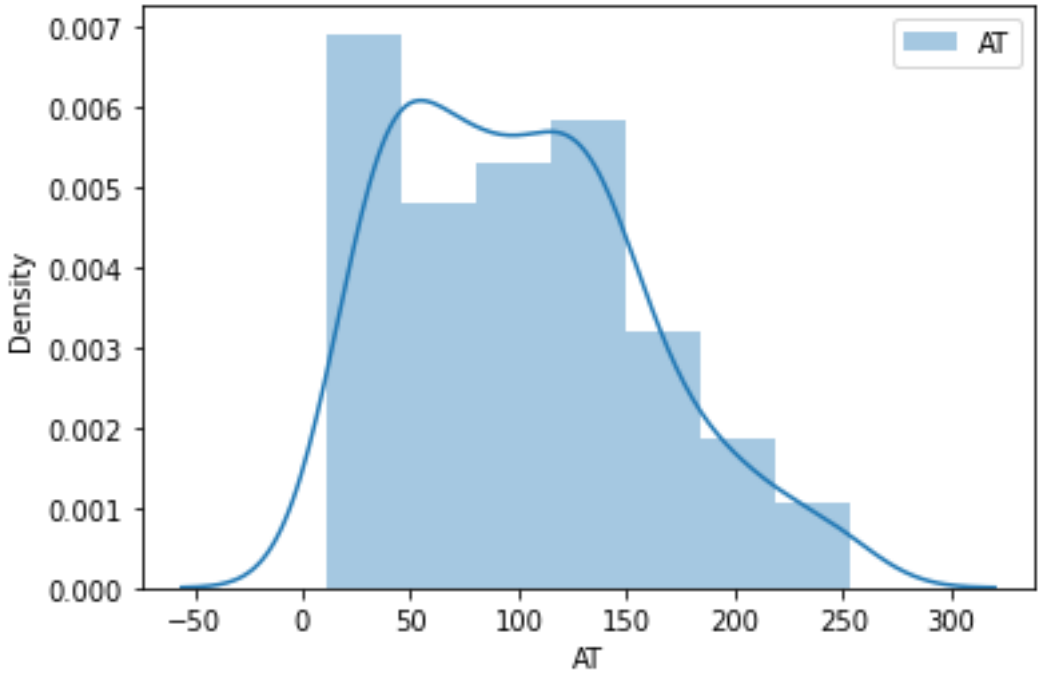
Ans :- The MPG of Cars is distributed Normally

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

Assignment 1



Waist Circumference(Waist) is distributed Normally



Adipose Tissue (AT) is distributed Normally

Assignment 1

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

confidence interval	Z score
90%	1.645
94%	1.88
60%	0.841

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

confidence interval	t score
95%	2.060
96%	2.1715
99%	2.7874

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 freedom

t=(260-270)/(90/18**0.5) = -0.4714045207910317

p_value=1-stats.t.cdf(abs(-0.4714),df=17) = 0.32167411684460556

p_value=stats.t.sf(abs(-0.4714),df=17) = 0.32167411684460556