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	Nominal
Number of kids	Discrete
Number of tickets in Indian railways	Discrete
Number of times married	Discrete
Gender (Male or Female)	Nominal

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	Ratio
Weight	Ordinal
Hair Color	Nominal
Socioeconomic Status	Nominal
Fahrenheit Temperature	Ordinal
Height	Ordinal
Type of living accommodation	Nominal
Level of Agreement	Ratio
IQ(Intelligence Scale)	Ratio
Sales Figures	Ordinal
Blood Group	Nominal
Time Of Day	Interval
Time on a Clock with Hands	Interval
Number of Children	Ordinal

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

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

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

2 heads and 1 tail-{ HHT,HTH,THH}

The propbabilty =3/8(0.375)

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

Total possible outcome=6^2=36

(1,1) (1,2) (1,3) (1,4) (1,5) (1,6)
(2,1) (2,2) (2,3) (2,4) (2,5) (2,6)
(3,1) (3,2) (3,3) (3,4) (3,5) (3,6)
(4,1) (4,2) (4,3) (4,4) (4,5) (4,6)
(5,1) (5,2) (5,3) (5,4) (5,5) (5,6)
(6,1) (6,2) (6,3) (6,4) (6,5) (6,6)

a) **Equal to 1**
--- 0 .there is no outcome

b) **Less than or equal to 4**
(1,1),(1,2),(1,3),(2,1),(2,2),(3,1)
Probability= 6/36=0.166

c) **Sum is divisible by 2 and 3**
(1,5),(2,4),(3,3),(4,2),(5,1),(6,6)
Probability=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?

Total No.of Balls=7

n(S)=No.of ways drawing 2 balls = $7C_2$

(7x6)/(2x1)=21

n(E)= noof way dawing balls ,none of which is blue=$5C_2$

(5x4)/(2x1)=10

P(E)=n(E)/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

= 1 * 0.015 + 4*0.20 + 3 *0.65 + 5*0.005 + 6 *0.01 + 2 * 0.12

= 0.015 + 0.8 + 1.95 + 0.025 + 0.06 + 0.24

= 3.090

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.

	Points	Score	Weigh
Mean	3.596563	3.21725	17.84875
Median	3.695	3.325	17,71

Mode	3.92	3.44	17.84875
Variance	0.285881	0.957379	3.193166
Standard Deviation	0.534679	0.978457	1.786943
Range	2.17	3.911	8.39

Use Q7.csv file

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?

Expected value = Sum (X * Probability of X) = (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

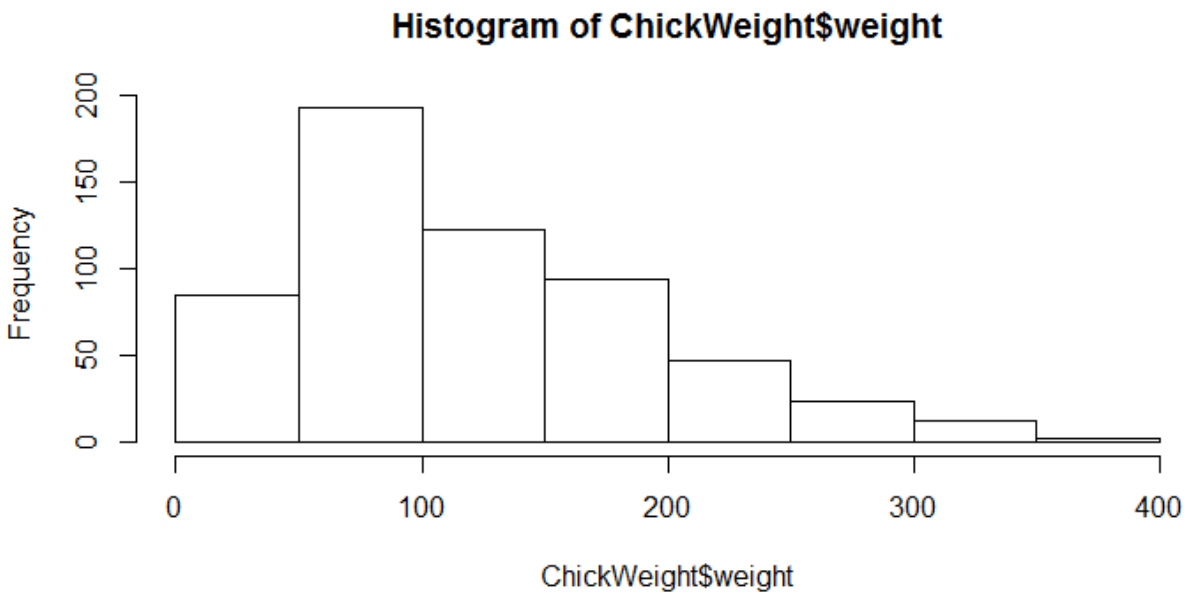
	Car Speed	**Distance**
Skewness	-0.1175	0.8068
Kurtosis	-0.5089	0.405

SP and Weight(WT)

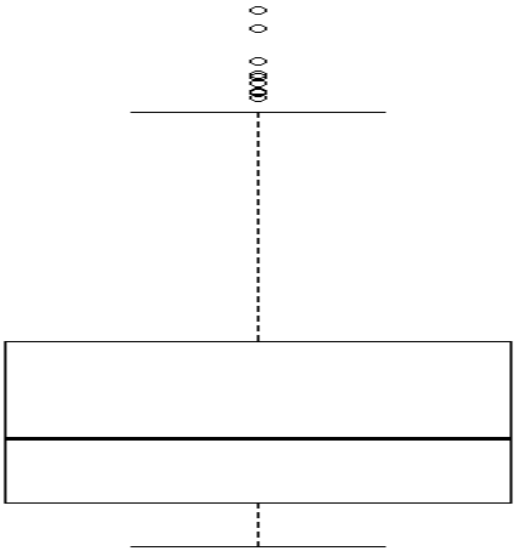
Use Q9_b.csv

	SP	**Weight**
Skewness	1.6114	-0.6147
Kurtosis	2.9773	0.9502

Q10) Draw inferences about the following boxplot & histogram



The histograms peak has right skew and tail is on right. Mean > Median. We have outliers on the higher side.



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?

Using the **t-distribution**, it is found that:

- The **94%** confidence interval is **(198.73, 201.27).**

```
# Avg. weight of Adult in Mexico with 94% CI
stats.norm.interval(0.94,200,30/(2000**0.5))
```

- The **96%** confidence interval is **(198.61, 201.39).**

```
# Avg. weight of Adult in Mexico with 98% CI
stats.norm.interval(0.98,200,30/(2000**0.5))
```

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

```
# Avg. weight of Adult in Mexico with 96% CI
stats.norm.interval(0.96,200,30/(2000**0.5))
```

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.**
   Mean-41
   Median=40.5
   Variance=24.11
   Standard Deviation=4.91

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

Skew=1.54(Then more weight in the left tail of the distribution.) is positive

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

Zero Skewness

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

If the mean is greater than the median, the distribution is positively skewed

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

If the median is greater than the mean, the distribution is negatively skewed

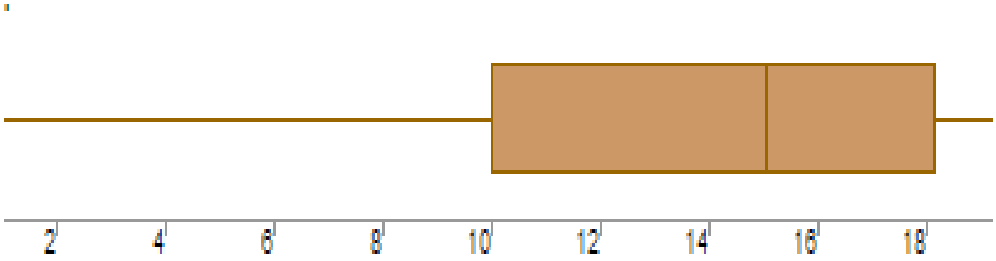
Q16) What does positive kurtosis value indicates for a data ?

If the distribution is light-tailed and the top curve steeper, like pulling up the distribution, it is called Positive Kurtosis.

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

The data can be heavy-tailed, and the peak can be flatter, almost like punching the distribution or squishing it. This is called Negative Kurtosis

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

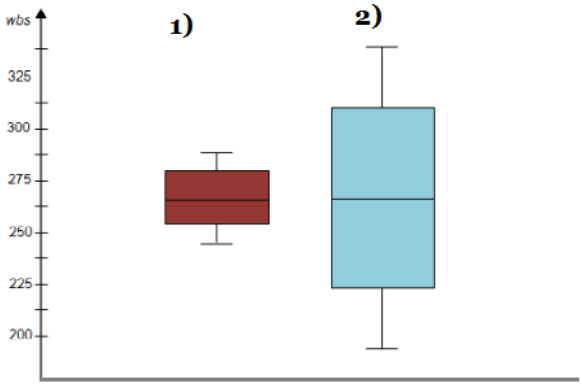


What can we say about the distribution of the data?- Not distributed normally

What is nature of skewness of the data?-Negative skewness

What will be the IQR of the data (approximately)? :10-18

Q19) Comment on the below Boxplot visualizations?



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

Data in Boxplot1 distributed within range of Boxplot 2 data,share same mean and median

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)

```
stats.norm.cdf(38,cars.MPG.mean(),cars.MPG.std())
                                                  :
0.3475939251582705
```

b. P(MPG<40)

```
stats.norm.cdf(40,cars.MPG.mean(),cars.MPG.std())
0.7293498762151616
```

c. P (20<MPG<50)

```
stats.norm.cdf(0.50,cars.MPG.mean(),cars.MPG.std())-
stats.norm.cdf(0.20,cars.MPG.mean(),cars.MPG.std())
0.013000000000000012
```

Q 21) Check whether the data follows normal distribution

a) Check whether the MPG of Cars follows Normal Distribution

Yes,it follow normal Distribution

Dataset: Cars.csv

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

It does not follow normal Distribution

Dataset: wc-at.csv

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

print('Z score for 90% Conifidence Intervla =',*np.round(stats.norm.ppf(.05),4))*

Z score for 60% Conifidence Intervla = -1.6449

print('Z score for 94% Conifidence Intervla =',*np.round(stats.norm.ppf(.03),4))*

Z score for 94% Conifidence Intervla = -1.8808

print('Z score for 60% Conifidence Intervla =',*np.round(stats.norm.ppf(.02),4))*

Z score for 94% Conifidence Intervla = -2.0537

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

print('T score for 95% Confidence Interval =',*np.round(stats.t.ppf(0.025,df=24),4))*

T score for 95% Confidence Interval = -2.0639

print('T score for 94% Confidence Interval =',np.round(stats.t.ppf(0.03,df=24),4))

T score for 94% Confidence Interval = -1.974

print('T score for 99% Confidence Interval =',*np.round(stats.t.ppf(0.053,df=24),4))*

T score for 99% Confidence Interval = -1.6796

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

Using t distribution

(260-270)/(90/sqrt(18))

=-10/21.21

=-0.471

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