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

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 | Nominal |
| Level of Agreement | Ordinal |
| IQ(Intelligence Scale) | Interval |
| Sales Figures | Ratio |
| Blood Group | Nominal |
| Time Of Day | Ordinal |
| Time on a Clock with Hands | Interval |
| Number of Children | Ordinal |
| 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?

1. = 3/8

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

1. Equal to 1 = 0
2. Less than or equal to 4 = (1,3),(2,2),(3,1 n(b)= 3/36=1/12
3. Sum is divisible by 2 and 3 = 11/36

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?

A)= 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. Expected number of candies for a randomly selected child = 3.095

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.

**Use Q7.csv file**

**ANS)** df.describe().T

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **index** | **count** | **mean** | **std** | **min** | **25%** | **50%** | **75%** | **max** | range | variance |
| **Points** | 32 | 3.596563 | 0.534679 | 2.76 | 3.08 | 3.695 | 3.92 | 4.93 | 2.17 | 0.2858 |
| **Score** | 32 | 3.21725 | 0.978457 | 1.513 | 2.58125 | 3.325 | 3.61 | 5.424 | 3.911 | 0.9573 |
| **Weigh** | 32 | 17.84875 | 1.786943 | 14.5 | 16.8925 | 17.71 | 18.9 | 22.9 | 8.4 | 3.1931 |

Point: it is left skewed data, much of the data elements lied to left side of mean point.

Score: it is left skewed data, much of the data elements lied to left side of mean point

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?

Ans:

Expected Value  =  ∑ ( probability  \* Value )=> ∑ P(x).E(x)

there are 9 patients

Probability of selecting each patient = 1/9

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

P(x)   : 1/9  1/9   1/9  1/9   1/9   1/9   1/9   1/9  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

Expected Value of the Weight of that patient = 145.33

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

**Cars speed and distance**

**Use Q9\_a.csv**

**ANS) df\_nineA.skew(): speed -0.117510 ,dist 0.806895**

**df\_nineB.kurt(): speed -0.508994 dist 0.405053**

**SP and Weight(WT)**

**Use Q9\_b.csv**

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



This is the right skewed right.

The 50% of the chick weight is between 50 to 150.

Most of the chick weight between 50 to 100.



This is the right skewed data

Most of the data is lying on Q3.

So we can observe here the outliers are at upper side of the box plot.

**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) standard error = standard deviation / sqrt(sample size)

Standard error=30/sqrt2000

Standard error=0.671

or a 94% confidence level with 1999 degrees of freedom, the critical value is ± 1.88.

For a 98% confidence level with 1999 degrees of freedom, the critical value is ± 2.33.

For a 96% confidence level with 1999 degrees of freedom, the critical value is ± 1.96

94% confidence interval:  
CI = 200 ± (1.88 x 0.671)  
CI = 198.26 to 201.74

98% confidence interval:  
CI = 200 ± (2.33 x 0.671)  
CI = 197.40 to 202.60

96% confidence interval:  
CI = 200 ± (1.96 x 0.671)  
CI = 198.68 to 201.32

We can observe that the average weight of adult male in Mexico.

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

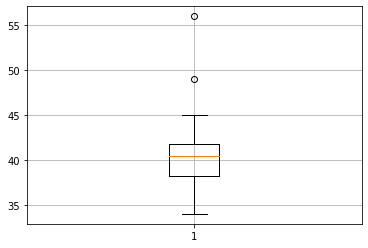
**34,36,36,38,38,39,39,40,40,41,41,41,41,42,42,45,49,56**

1. Find mean, median, variance, standard deviation.

Mean=41 Median=41.5 Variance=25.24 Standard deviation=5.02

1. What can we say about the student marks?

From the above calculation mean>median. This is right skewed data Data is lying on 39 to 42 We have wo out liers 49,56



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

When mean = median The nature of the graph will be symmetric and skew =0

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

When mean > median the nature of skewness will be right skewed and have tail towards right.

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

When mean < median the nature of skewness will be left skewed and have tail towards left.

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

Positive kurtosis value indicates that the curve is more picked and thicker tail.

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

A distribution with a negative kurtosis value indicates that the distribution has lighter tails than the normal distribution.

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



What can we say about the distribution of the data?

From the above boxplot median is lying towards higher value, most of the data are between 10 to 18 and the data is not normally distributed.

What is nature of skewness of the data?

The data is left skewed. The whisker range of minimum value is greater than maximum

What will be the IQR of the data (approximately)?   
IQR =Q3-Q1 IQR=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.

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

1.From the above plot it seems as they both share same median in range (250,275).

2.the plot is showing no outliers and normally distributed with skewness ~0 at minimum and maximum whisker range

Data \_set: Cars.csv

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

MPG <- Cars$MPG

* 1. P(MPG>38)

round((1-stats.norm.cdf(38,loc=cars\_mpg.mean(),scale=cars\_mpg.std())),4)

=0.3476

* 1. P(MPG<40)

round((1-stats.norm.cdf(40,loc=cars\_mpg.mean(),scale=cars\_mpg.std())),4)

= 0.2707

* 1. P (20<MPG<50)

round(stats.norm.cdf(50,loc=cars\_mpg.mean(),scale=cars\_mpg.std()),4)

= 0.956

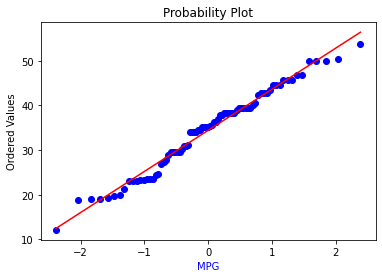
Q 21) Check whether the data follows normal distribution

1. Check whether the MPG of Cars follows Normal Distribution

Dataset: Cars.csv

stats.probplot(cars\_mpg,dist='norm',plot=plt)

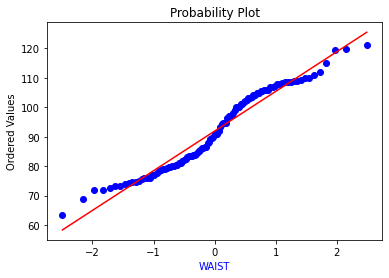
MPG of cars follows normal distribution

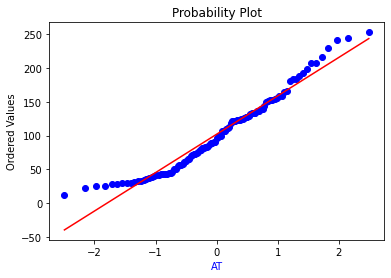


1. Check Whether the Adipose Tissue (AT) and Waist Circumference(Waist) from wc-at data set follows Normal Distribution

Dataset: wc-at.csv

Nethier AT nor Waist from wc-at data follows normal distribution.





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

Z scores of 90% confidence interval: round(stats.norm.ppf(1-0.1/2),4) 1.6449

Z scores of 94% confidence interval: round(stats.norm.ppf(1-0.06/2),4)

1.8808

Z scores of 60% confidence interval: round(stats.norm.ppf(1-0.4/2),4)

0.8416

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

t scores of 95% confidence interval: round(stats.t.ppf(1-0.05,df=24),3)

1.711

t scores of 96% confidence interval: round(stats.t.ppf(1-0.04,df=24),3)

1.828

t scores of 99% confidence interval: round(stats.t.ppf(1-0.01,df=24),3)

2.492

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

n=18

X\_bar=260

Std =90

Mu=270

t\_score=(x\_bar-mu)/(std/sqrt(n))

(260-270)/(90/sqrt(18))= -0.4714

stats.t.cdf(t\_score,df=17)

= 0.3216

32%