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 | Ratio |
| Blood Group | Nominal |
| Time Of Day | Interval |
| Time on a Clock with Hands | Interval |
| Number of Children | Ratio |
| Religious Preference | Nominal |
| Barometer Pressure | Interval |
| SAT Scores | Ratio |
| Years of Education | Ratio |

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

Ans:

sample space = { hhh, hht , hth , htt , thh , tth , ttt , tht }

P (two heads one tail) = 3/8

= 0.375

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:

a) 0/36. Probability is 0.

b) (1,1),(1,2),(2,1),(1,3),(2,2) (3,1) = 6 outcomes, 6/36 i.e. 1/6

c) 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:

Probability = (Number of favorable outcomes) / (Total number of possible outcomes)

Number of favorable outcomes = Number of ways to choose 2 non-blue balls = 5C2 = 5! / (2! \* (5-2)!) = 10

Total number of possible outcomes = Number of ways to choose 2 balls from 7 = 7C2 = 7! / (2! \* (7-2)!) = 21

Probability = 10 / 21 = 0.4762

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:

Child A – probability of having 1 candy = 0.015

Child B – probability of having 4 candies = 0.20

Sol: Expected number of candies for randomly selected child = 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,Weigh>

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

**Use Q7.csv file**

Ans:

**Points**: Mean =3.596563, Median= 3.695, Mode= “numeric”,

Variance= 0.2858814, Standard deviation= 0.5346787.

**Score:** Mean= 3.21725, Median= 3.325, Mode= “numeric”,

Variance= 0.957379, Standard deviation= 0.9784574

Note: Mean value are closer for both ‘Point’ and ‘Score’.

**Weight:** Mean= 17.84875, Median= 17.71, Mode= “numeric”,

Variance= 3.193166, Standard deviation= 1.786943

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**

**Skewness:-**

speed -0.117510

dist 0.806895

**Kurtosis:-**

speed -0.508994

dist 0.405053

**SP and Weight(WT)**

**Use Q9\_b.csv**

**Skewness:-**

SP 1.611450

WT -0.614753

**Kurtosis:-**

SP 2.977329

WT 0.950291

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



Ans: The most of the data points are concerated in the range 50-100 with frequency 200.

And least range of weight is 400 somewere around 0-10.

So the expected value the above distribution is 75.

Skewness- we can notice a long tail towards right so it is heavily right skewed.



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:

conf\_94 =stats.t.interval(alpha = 0.94, df=1999, loc=200, scale=30/np.sqrt(2000))

print(np.round(conf\_94,0))

print(conf\_94)

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.

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

1. What can we say about the student marks?

Ans: we don’t have outliers and the data is slightly skewed towards right because mean > median.

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

Ans: No skewness is present we have a perfect symmetrical distribution

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

Ans: Right Skewed

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

Ans: Left Skewed

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

Ans: The data is notmally distributed and kurtosis value is 0.

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

Ans: The distribution of the data has lighter tails and a flatter peaks than the normal distribution.

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



What can we say about the distribution of the data?

Ans: Let’s assume above box plot is about age’s of the students in a school.

50% of the people are above 10 yrs old and remainig are less.

And students who’s age is above 15 are approx 40%.

What is nature of skewness of the data?

Ans: Left skewed, median is greater than mean.

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: By observing both the plots whisker’s level is high in boxplot 2, mean and median are equal hence distribution is symetrical.

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)

Ans: By using filter command and installing the dplyr package into the ‘R’.

a) There are 33 observations in MPG which are greater than 38 (33/81)

b) 67 observations in MPG which are lesser than 40 (67/81)

c) 69/81

Q 21) Check whether the data follows normal distribution

1. Check whether the MPG of Cars follows Normal Distribution

Dataset: Cars.csv

Attached ipynb file

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

Dataset: wc-at.csv

Attached ipynb file

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

Ans:

Z score of 90% confidence interval is 1.65

Z score of 94% confidence interval is 1.55

Z score of 60% confidence interval is 0.85

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

Ans:

For 95%= 1.96

For 96%= 2.5

For 99% = 2.47

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

Ans: t - statistics for the data is given as follows:

t-scores at x=260; t=(s\_mean-p\_mean)/s\_SD/sqrt(n)

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=(260-270)/(90/18\*\*0.5)

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.