|  |  |
| --- | --- |
| 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 | Nominal |
| Level of Agreement | Ordinal |
| IQ(Intelligence Scale) | Interval |
| Sales Figures | Ratio |
| Blood Group | Nominal |
| Time Of Day | Nominal |
| 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?

**Answer:**

No. of possible outcomes= HHH, THH, HTH, HHT, TTT, HTT, THT, TTH.

Total no. of outcomes=8

Probability of getting two heads and one tail=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

**Answer:**

Total no. of possible outcomes = 36

1. Total no. of outcomes = 36

No. of outcomes Equal to 1 = 0

Therefore probability = 0

1. No. of outcomes = 36

Less than or equal to 4 outcomes = (1,1), (1,2), (1,3), (2,1), (2,2), (3,1)

Probability of less than or equal to 4 = 6/36

=1/6

1. Sum is divisible by 2 and 3 outcomes

Consider the outcome divisible by 2= 2, 4, 6, 8, 10, 12

Consider the outcome divisible by 3= 3,6,9,12

Since the probability is 2 and 3

Probability of the outcome divisible by 2 = 6/36

Probability of the outcome divisible by 3 = 3/36

Probability of the sum divisible by 2 and 3 = (6/36)\*(3/36)

= (1/6)\*(1/12)

= (1/72)

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?

**Answer:**

Given, N(R)= 2, N(G) = 3, N(B) = 2

P(R)= 2/7, P(G)= 3/7, P(B)= 2/7

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

**Answer:**

Expected number of candies =(0.015\*1)+(0.20\*4)+(0.65\*3)+(0.005\*5)+(0.01\*6)+(0.120\*2)

=0.015+0.8+1.95+0.025+0.006+0.24

= 3.036

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.

**Answer:**

**Points**

Mean=3.596563, Median=17.7103.695, Variance=0.285881, Standard Deviation=0.534679, Range=2.17

**Score**

Mean =3.217250, Median=3.325, Variance= 0.957379, Standard Deviation=0.978457, Range=3.911

**Weigh**

Mean=17.848750, Median= 17.710, Variance=3.19316, Standard Deviation=1.786943**,** Range=8.4

**Use Q7.csv file**

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?

**Answer:**

Expected value formal **µ=∑(Xi)/N**

Expected value of the weight of that patient

= 108+110+123+134+135+145+167+187+199

= 1309/9

= 145.333

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

**Cars speed and distance**

**Use Q9\_a.csv**

**Answer:**

**Kurtosis:**

speed -0.508994

dist 0.405053

Inference: The negative kurtosis implies wider peak and thinner tails.

**Skewness:**

speed -0.117510

dist 0.806895

Inference: The negative skewness implies that the distribution is concentrated on the right

**SP and Weight(WT)**

**Use Q9\_b.csv**

**Answer:**

**Kurtosis:**

SP 2.977329

WT 0.950291

**Skewness:**

SP 1.611450

WT -0.614753

Inference: The negative skewness implies that the distribution is concentrated on the right.

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



**Inference:** The histogram peak has tail on the right side and it is skewed on right.

Mean>Median. We have outliers on right side.



**Inference:** The boxplot has outliers.

**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?

**Answer:** Sample of mean x = 200

Sample of standard deviation = 30

Sample size n = 2000

Where t is critical value = 2000-1= 1999 , t= 1.8916

**Confidence interval for 94% =** 198.73 & 201.27

**Confidence interval for 96% =** 198.61 & 201.39

**Confidence interval for 98% =** 198.43 & 201.57

**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 =25.529

SD = 5.05

1. What can we say about the student marks?

**Answer:** The performance of the student is less.

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: It is right skewed.

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

Ans: It is left skewed.

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

Ans: The kurtosis value is 0 and the data is normally distributed.

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

Ans: The distribution of data has lighter tails and a flatter peak.

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

What will be the IQR of the data (approximately)?   
Ans: The inner quartile range =

Upper quartile – Lower quartile = 18 -10 = 8

Q19) Comment on the below Boxplot visualizations?



Ans: There are no outliers.

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

Inference: Both the box plot shares the same median that is approximately in 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

1. P(MPG>38) = 0.3475939251582705

b. P(MPG<40) = 0.7293498762151616

c. P (20<MPG<50) = 1.2430968797327613e-05

Q 21) Check whether the data follows normal distribution

1. Check whether the MPG of Cars follows Normal Distribution

Dataset: Cars.csv

Ans: 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

Ans: Does not follow Normal distribution.

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

90% = 1.644853

94% = 1.8807

60% = 0.8416

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

95% = 2.0638985616280205

96% = 2.1715446760080677

99% = 2.796939504772804

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: -0.4714045207910317

0.32167411684460556

0.32167411684460556