|  |  |
| --- | --- |
| 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 | **Discrete Data** |
| Number of kids | **Discrete Data** |
| Number of tickets in Indian railways | **Discrete Data** |
| Number of times married | **Discrete Data** |
| Gender (Male or Female) | **Discrete 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 | **Discrete Data – Nominal** |
| High School Class Ranking | **Discrete Data – Nominal** |
| Celsius Temperature | **Continuous Data – Interval** |
| Weight | **Continuous Data – Ratio** |
| Hair Color | **Continuous Data – Nominal** |
| Socioeconomic Status | **Continuous Data – Interval** |
| Fahrenheit Temperature | **Continuous Data – Ratio** |
| Height | **Continuous Data – Ratio** |
| Type of living accommodation | **Discrete Data – Ordinal** |
| Level of Agreement | **Discrete Data – Interval** |
| IQ (Intelligence Scale) | **Discrete Data – Interval** |
| Sales Figures | **Discrete Data – Interval** |
| Blood Group | **Discrete Data – Ratio** |
| Time Of Day | **Continuous Data – Interval** |
| Time on a Clock with Hands | **Continuous Data – Interval** |
| Number of Children | **Discrete Data – Interval** |
| Religious Preference | **Discrete Data – Ratio** |
| Barometer Pressure | **Continuous Data – Ratio** |
| SAT Scores | **Continuous Data – Ratio** |
| Years of Education | **Discrete Data – Nominal** |

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

**Sol: =BINOM.DIST(2,3,0.5,0)**

**=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

**Sol**: **a) 0**

**b) 1/6 = 0.167**

**C) 5/36 = 0.139**

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?

**Sol: P (2R, 3G, 2B)**

**P (5/7, 4/6) = 20/42 = 10/21=0.467**

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

**Sol: Expected number of candies for a randomly selected child**

**=  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**

**=   3.09**

**Expected number of candies for a randomly selected child = 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**

**Sol:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **MEAN** | **MEDIAN** | **MODE** | **Variance** | **Std. Dev** | **Range** |
| **Points** | **3.59** | **3.70** | **3.92** | **0.29** | **0.53** | **2.17** |
| **Score** | **3.22** | **3.33** | **3.44** | **0.96** | **0.98** | **3.91** |
| **Weigh** | **17.85** | **17.71** | **17.02** | **3.19** | **1.79** | **8.40** |

* **No case has the variable Mean = Median = Mode**
* **Thus, as seen in the graph dataset “score” and “Weigh” has outliers**

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?

**Sol:** **145.33**

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

**Cars speed and distance**

**Use Q9\_a.csv**

**Sol:**

|  |  |  |
| --- | --- | --- |
|  | Skewness | Kurtosis |
| speed | -0.11751 | -0.050899 |
| Dist | 0.80689 | 0.405053 |

* “Dist” is positively skewed where as “speed” is negatively skewed.
* Thus dist has distribution of data concentrated on the left whereas speed has distribution on the right. As seen in the graph.
* Both dist and speed has positive Kurtosis.

**SP and Weight (WT)**

**Use Q9\_b.csv**

Sol:

|  |  |  |
| --- | --- | --- |
|  | Skewness | Kurtosis |
| SP | 1.611450 | 2.977329 |
| WT | -0.614753 | 0.950291 |

* SP” is positively skewed where as “WT” is negatively skewed.
* Thus SP has distribution of data concentrated on the left whereas WT has distribution on the right. As seen in the graph.
* Both WT and SP has positive Kurtosis.

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



**Sol:**

* **Majority of the Chicks has weight in range 50 – 100, followed by 100 -150 and 150 –200.**
* **The data is positively Skewed.**
* **3 Categories can be define (Under weight >50; Avg weight 51 – 150; Over weight <150).**



**Sol:**

* **Data has outliers.**
* **Data is positively skewed.**

**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?

**Sol:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **94%** | **98%** | **96%** |
| **Upper** | **201.26** | **201.56** | **201.37** |
| **Lower** | **198.73** | **198.43** | **198.62** |

**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.

**Sol:**

|  |  |
| --- | --- |
| **Mean** | **41** |
| **Median** | **40.50** |
| **Variance** | **25.53** |
| **Std Deviation** | **5.05** |

1. What can we say about the student marks?

**Sol:**

* **Data is not normally distributed.**
* **Data has outlier.**
* **Majority of the students have scored between 35 - 45 Marks.**

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

**Ans:** **Skewness is equal to 0 and perfectly symmetric bell-shaped curve.**

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

**ANS: Skewness is equal to Positive and Data is distributed more on the left side.**

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

**ANS: Skewness is equal to Negative and Data is distributed more on right side.**

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

**ANS: It indicates that there are high and narrow peak in the central part of the data.**

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

**ANS: It indicates that there are wider peak in the central part of the data.**

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



What can we say about the distribution of the data?

**ANS: The data is not symmetric. Data is more concentrated towards right side.**

What is nature of skewness of the data?

**ANS: The nature of Skewness is equal to Negative.**

What will be the IQR of the data (approximately)?   
**ANS: IQR data is 8 (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:**

1. **Data is Normally Distributed. No Outliers. Center around 262.5. Comparatively, first graph has less range.**
2. **Data is Normally Distributed. No Outliers. Center around 262.5**

**Comparatively, second graph has more 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)

**ANS: 0.3475939251582705**

* 1. P(MPG<40)

**ANS: 0.7293498762151616**

* 1. P (20<MPG<50)

**ANS: 0.8518519**

Q 21) Check whether the data follows normal distribution

1. Check whether the MPG of Cars follows Normal Distribution

Dataset: Cars.csv

**ANS: MPG is 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: Both AT and Waist does NOT follow Normal Distribution.**

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

|  |  |
| --- | --- |
| **90%** | **1.6448536269514722** |
| **94%** | **1.8807936081512509** |
| **60%** | **0.8416212335729143** |

**ANS:**

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

|  |  |
| --- | --- |
| **95%** | **± 2.060** |
| **96%** | **± 2.167** |
| **99%** | **± 2.787** |

**ANS:**

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-score = -0.4714,  
Degree of freedom = 17   
P(t) = 0.3216725**