|  |  |
| --- | --- |
| 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 | **Categorical** |
| Number of kids | **Discrete** |
| Number of tickets in Indian railways | **Discrete** |
| Number of times married | **Discrete** |
| Gender (Male or Female) | **Categorical** |

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 | **Nominal** |
| Celsius Temperature | **Interval** |
| Weight | **Ratio** |
| Hair Color | **Ratio** |
| Socioeconomic Status | **Ordinal** |
| Fahrenheit Temperature | **Ratio** |
| Height | **Ratio** |
| Type of living accommodation | **Interval** |
| Level of Agreement | **Ordinal** |
| IQ(Intelligence Scale) | **Interval** |
| Sales Figures | **Interval** |
| Blood Group | **Ratio** |
| Time Of Day | **Ordinal** |
| Time on a Clock with Hands | **Interval** |
| Number of Children | **Ratio** |
| Religious Preference | **Ordinal** |
| Barometer Pressure | **Interval** |
| SAT Scores | **Interval** |
| Years of Education | **Ratio** |

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

=>**The probability of getting two heads and one tails in the toss of three coins simultaneously is 3/8 or 0.375.**

**The combinations are (HHH, HHT, HTH, THH, TTH, THT, HTT, TTT)**

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

1. Equal to 1 **=0**

**=>If two dice are rolled, the possible cases are 36. As minimum sum is 2 for outcome is (1,1). So, the probability is 0.**

1. Less than or equal to 4

=>**The possibility of getting number less than or equal to 4 is (1,1), (1,2) (1,3), (2,1), (2,2), (3,1). Hence, the probability is 6/36 = 1/12.**

1. Sum is divisible by 2 and 3

=>**The favorable outcomes for this are (1,5), (2,4), (3,3), (4,2), (5,1), (6,6). Therefore, the outcomes are 6/36.**

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?

* **Total number of events= nCr=7C2=7! /2!\*5! =21**

**Interested events=5C2= 5!/2!\*3!=10**

**Probability that none of the balls is blue=10/21=0.47**

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

* **Expected number=E(x)**

=**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,Weight>

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

**Use Q7.csv file**

* **For Points:**

**Mean=3.59**

**Median=3.69**

**Mode=3.92**

**Variance=0.28**

**Standard Deviation=0.53**

**Range=2.17**

* **For Score:**

**Mean=3.23**

**Median=3.32**

**Mode=3.44**

**Variance=0.96**

**S.D=0.98**

**Range=3.91**

* **For Weight:**

**Mean=17.85**

**Median=17.71**

**Mode=17.02**

**Variance=3.19**

**S.D=1.78**

**Range=8.4**

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?

**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**

* **Speed:**

**Skewness= (-0.7983898)**

**Kurtosis= (-0.2260851)**

* **Distance:**

**Skewness=1.150886**

**Kurtosis=1.466731**

SP and Weight (WT)

Use Q9\_b.csv

* **SP**

**Skewness= (-0.3898407)**

**Kurtosis= (-1.034207)**

* **WT**

**Skewness= (-1.230919)**

**Kurtosis=0.5979244**

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



* **The above boxplot suggests that the distribution has lots of outliers towards upper extreme.**

**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?

* **n=2000**

**=200**

**S= 30**

**Confidence Interval Estimate=±Z s/=> 200 ± Z 30/**

**94% Confidence= 1.88**

**= 200 ± 1.88\*30/**

**= 201.26**

**98% Confidence=2.32**

**=200 ± 2.32\*30/**

**=201.55**

**96% Confidence=205**

**=200 ± 2.05\*30/**

**=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.

**Mean=41**

**Median=40.5**

**Standard deviation=5.05**

1. What can we say about the student marks?

=>**The data is slightly skewed towards right because mean is greater than median.**

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

=>**No skewness is present we get perfect symmetrical distribution.**

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

=>**Skewness and tail are towards Right.**

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

=>**Skewness and tail are towards left.**

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

=>**Positive kurtosis means the curve is more peaked, possesses thick tails and are skewed right side.**

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

=>**Negative kurtosis means the curve will be flatter, broader and are skewed left side.**

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



What can we say about the distribution of the data?

=>**The above boxplot is not normally distributed the median is towards the higher value.**

What is nature of skewness of the data?

=>**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)?

=>**The IQR = 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.

* **The median of the two boxplots is same approximately 260.**
* **The boxplots are not skewed in +ve or -ve direction.**
* **Outliers doesn’t exist in both of the boxplots.**

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

**Mean=34.42208**

* 1. P(MPG>38)
* **S.D=9.131445**
* **Pnorm(38,34.42,9.13)**

**=0.652513**

* 1. P(MPG<40)
* **Pnorm(40,34.42,9.13)**

**=0.7294571**

* 1. P (20<MPG<50)
* **Pnorm(50,34.42,9.13)-pnorm(20,34.42,9.13)**

**=0.8989178**

Q 21) Check whether the data follows normal distribution

1. Check whether the MPG of Cars follows Normal Distribution

Dataset: Cars.csv

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

Dataset: wc-at.csv

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

* **90% = 1.644854**
* **94%=1.880794**
* **60%=0.8416212**

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

* **95%=2.063899**
* **96%=2.171545**
* **99%=2.79694**

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

* µ=**270, =260, S.D=90, n=18**
* **df=n-1=18-1=17**
* **t-score= = = -10/21.23 = -0.47**
* **pt(-0.47,17)**

**=0.3221639**

**Required probability=0.32=32%**