|  |  |
| --- | --- |
| 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 | Ordinal |
| Level of Agreement | Ordinal |
| IQ(Intelligence Scale) | Interval |
| Sales Figures | Ratio |
| Blood Group | Nominal |
| Time Of Day | Interval |
| Time on a Clock with Hands | Ratio |
| Number of Children | Ratio |
| Religious Preference | Nominal |
| Barometer Pressure | Interval |
| SAT Scores | Ordinal |
| Years of Education | Ordinal |

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

**Ans : {HHH, HHT, HTH, HTT, THH, TTH, THT, TTT}**

**Two heads and one tail : {HHT, THH, HTH)**

**=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) (3,1) (2,2) (2,1) (1,2) (1,1) =6/36=1/6
3. Sum is divisible by 2 and 3 **-** (1,5) (2,4) (3,3) (4,2) (5,1) (6,6) =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 :** Total no. of balls

(2 + 3 + 2) = 7

n(s) = No. of ways of drawing 2 ball out of 7

n(s) = 7C2

= (7\*6)/(2\*1)

= 21

E = Event of 2 balls, none of which is blue

n(E) = Number of ways of drawing 2 balls out of (2+3) balls

n(E) = 5C2

= (5\*4)/(2\*1)

= 10

P(E) = n(E)/n(S) = 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

**Ans –** 1\*0.015 + 4\*0.20 + 3\*0.65 + 5\*0.005 + 6\*0.01 + 2\*0.120

= 0.015 + 0.8 + 1.95 + 0.025 + 0.06 + 0.24

= 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.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **POINTS** | **SCORE** | **WEIGH** |
| MEAN | 3.59 | 3.21 | 17.84 |
| MEDIAN | 3.69 | 3.32 | 17.71 |
| MODE | 3.92 | 3.44 | 17.02 |
| STD | 0.53 | 0.97 | 1.78 |
| VARIANCE | 0.28 | 0.95 | 3.19 |
| RANGE | 2.17 | 3.91 | 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?

**Ans :** Probability of selecting each patient = 1/9

Expected value = (1/9)(108) + (1/9)(110) + (1/9)(123) + (1/90)(134) + (1/9)(135) + (1/9)(145) + (1/9)(167) + (1/9)(187) + (1/9)(199)

=143.88

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

**Cars speed and distance**

**Use Q9\_a.csv**

**Ans : Skewness = 0.117, 0.806**

**Kurtosis = 0.508, 0.405**

**SP and Weight(WT)**

**Use Q9\_b.csv**

**Ans : Skewness = 1.611 , -0.614**

**Kurtosis = 2.977 , 0.950**

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



**Ans :** Histogram is rightly skewed and has positive value.

**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 : n=2000, N=200, s=30**

**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.
2. What can we say about the student marks?

**Ans :** MEAN : 41

MEDIAN : 41

VARIANCE : 25.52

STD : 4.91

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

**Ans :** Perfectly symmetrical and skewness is 0

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

**Ans :** Its rightly skewed and positive

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

Ans : It’s left skewed and has negative value

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

**Ans :** Sharper peak and less variation

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

**Ans :** Flatter peak and more variation

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



What can we say about the distribution of the data?

**Ans :** It is a Normal Distribution.

What is nature of skewness of the data?

**Ans :** Left Skewed.

What will be the IQR of the data (approximately)?

**Ans :** upper quartile – lower quartile / Q3-Q1

=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 :** Median of Boxplot 2 are approax. 260 (i.e between 215-275). Boxplot are not skewed positive or negative.

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)
  3. P (20<MPG<50)

**Ans :** res1=subset(MPG\_DATA,MPG>38)

Length(res1$MPG) #33

Res2 = subset(MPG\_DATA,MPG<40)

Length(res2$MPG) #61

res3=subset(MPG\_DATA, MPG>20 & MPG<50)

length(res3$MPG) #69

Q 21) Check whether the data follows normal distribution

1. Check whether the MPG of Cars follows Normal Distribution

Dataset: Cars.csv

**Ans :** shapiro.test(MPG\_DATA$MPG) : P-Value=0.1764 which is > 0.05. So, 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 : shapiro.test(Waist\_DATA$WAIST) – P\_Value=0.00117<0.05. S0, Waist data is not normally distributed.**

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

**Ans** : Z score of 90% = 1.644

Z score of 94% = 1.880

Z score of 60% = 0.841

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

**Ans : t-score of 95% : qt(0.975,25) = 2.059**

**t\_score of 96% : qt(0.96, 25) = 2.166**

**t\_score of 99% : qt(o.995, 25) = 2.784**

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 : Sample mean, X = 260 days**

**Population mean, U = 270 days**

**Standard Deviation, S = 90**

**Sample size, n = 18**

**T(260-270)/90/root of 18 = -10/90\*3root of 2**

**= -10/30/root of 2**

**= -1 \* root of 2/ 3**

**= -0.417**

**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, t-value obtained with 17 degrees of freedom and a t score of -0.471, the probability of bulbs lasting less than 260 days on average of 0.3218 assuming the mean life of the bulb is 300 days**