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

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

H = Heads

T = Tails

When 3 coins are tossed simultaneously, the total possible outcomes are

HHH, HHT, HTH, HTT, THH, THT, TTH, TTT.

The total no. of outcomes = 8

P(two heads and 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 – with 2 dice, there are 6\*6 = 36 possible outcomes.

1. P (sum is equal to1):

The minimum possible sum is (1,1) = (2).

Therefore P (1) = 0/36 =0

1. P (Sum is less than equal to 4):

possible events are (1,2) (2,1) (1,3) (2,2) (3,1)

P (<=4) = 5/36 = 0.138

1. P (Sum is divisible by 2 and 3):

Possible events = (1,5), (3,3), (4,2), (5,1), (6,6)

No. of favorable outcomes are = 5

P (Sum is divisible by 2 and 3) =5/36 = 0.138

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

Let S be the sample space.

Then, n(S) = No. of ways of drawing 2 balls out of 7

7C2=(7\*6)/(2\*1)= 21

Let E= Event of drawing 2 balls, none of which is blue.

n(E)= no. of ways of drawing 2 balls out of 2+3 balls.

5C2= (5\*4)/(2\*1) = 10

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

Ans:

Expected number of candies for a randomly selected child =

=1\*0.015 + 4\*0.20 + 3\*0.06 + 5\*0.005 + 6\*0.01 + 2\*0.12

=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.

**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-Expected value = ∑P(x). E(x)

Total patients = 9

Probability of selecting each patient=1/9

Expected value = ∑P(x). E(x)

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

= (1/9) (1308)

=145.33

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

**Cars speed and distance**

**Use Q9\_a.csv**

**SP and Weight(WT)**

**Use Q9\_b.csv**

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



Ans : chick weight data is concentrated on the left side of the histogram; data is negative skewed.

50 % weight is between 50 to 150, most of the chick weight is between 50-100

Mean>median



Ans:

There are outliers at the upper side of boxplot;

Data is concentrated on the right side of boxplot, right skewed data.

**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: Sample size (n) =2000

standard deviation of the sample (μ) = 30

average = 200

confidence interval = 94

confidence interval (α)= 1- (confidence interval /100) = 1-(94/ 100) = 0.06

critical probability (P) =1 – α =1 – (0.06/2) = 0.97

degree of freedom ( df ) = n-1 = 2000-1 = 1999

here standard deviation of the sample (μ) = 30 is given then no need to go t test

**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?

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

Solution:

Mean=median;

distribution is symmetric.

Skewness is measures of asymmetry,

skewness is zero.

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

Solution:

When Mean > Median,

the distribution is positively skewed.

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

Solution:

Mean < Median,

the distribution is negatively skewed.

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

Solution:

Positive values of kurtosis indicate that distribution is more peaked and possesses thick tails.

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

Solution:

Negative values for the skewness indicate data that are skewed left. Minimum peakedness, and thin tails.

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



What can we say about the distribution of the data?

Ans: data is not normally distributed, median is towards higher value.

What is nature of skewness of the data?

Ans: the data is concentrated on upper side, left skewed data.

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

Ans: IQR (inter quartile range) = upper quartile - 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: In both there are no outliers, in both boxplot shows same median value i.e between 275 to 250 and they are normally distributed.

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)

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

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

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