|  |  |
| --- | --- |
| 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 | Continuous |
| Number of tickets in Indian railways | Continuous |
| Number of times married | Continuous |
| Gender (Male or Female) | Continuous |
|  |  |

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

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

Solutions: When three coins are tossed the total number of possible combinations are

23 = 8.

These combinations are HHH, HHT, HTH, THH, TTH, THT, HTT, TTT.

The number of combinations which have two heads and one tail are:

HHT, HTH, TTH which makes them 3 in number.

Therefore the Probability of getting two heads and one tails in the toss of

Three coins simultaneously are defined as:

P (Two heads and One Tail) = Number of desired outcomes = 3 = 0.375

Summary: The Probability of getting two heads and one tails in the toss of three

Coins simultaneously are 3/8 or 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

Solutions: If two dice are rolled

Then n(S) = 36

If two dice are rolled then there nothing that we get sum equal 1.

So n(A) = 0

∴ Probability of get sum of 1 = 0/36 = 0

If the sum equal to 4

Then n(A) = 3

∴ Probability = 3/36

If the sum equal to less than 13

Then n(A) = 36

Because the maximum number in dice is six and they rolled the

Maximum time we get 6+6 = 12

Then all are less than 13

∴ Probability of getting sum equal to less than 13 is = 36/36 = 1.

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?

Solution: Total number of balls = (2+3+2)

= 7

Let S be the sample space

Then, n(S) = Number of ways of drawing 2 balls out of 7

n(S) = 7 C2

n(S) = (7 x 6)

(2 x 1)

n(S) = 21

let 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

n (E ) = (5 x 4)

(2 x 1)

n (E ) = 10

∴ P(E ) = n( E) = 10

n(S) 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

Solution: Expected number of candies for randomly selected.

Child = 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, 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?

Solution:

Given : The weights(X) of patients at a clinic (in pounds), are 108, 110, 123, 134, 135, 145, 167, 187, 199.

One of the patients is chosen at random.

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**

[**Q7.ans.ipynb**](Q7.ans.ipynb)

**SP and Weight(WT)**

**Use Q9\_b.csv**

[**Q7.ans.ipynb**](Q7.ans.ipynb)

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



Solution: The most of the data points are concerted in the range 50-100 with frequency 200 and least range of weight is 400 some were around 0-10.

So the expected value the above distribution is 75.

Skewness – we can notice a long tail towards right so it is heavily right 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?

<Q7.ans.ipynb>

**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?

<Q7.ans.ipynb>

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

Solution: If the mean is equal to the median as well as the mode, hence the skewness is zero. If the distribution is symmetric, the mean equals the median, and the skewness of the distribution is zero.

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

Solution: The mean, median and mode can be used to figure out if you have a positively or negatively skewed distribution. So if the mean is greater than the median, the distribution is positively skewed

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

Solution: The mean, median and mode can be used to figure out if you have a positively or negatively skewed distribution. So if the mean is less than the median, the distribution is negatively skewed.

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

Solution: Positive kurtosis value indicate that the distribution has heavier tail than the normal distribution.

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

Solution: Negative kurtosis value indicate that the distribution has flat and has thin tails.

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



What can we say about the distribution of the data?

Solution: Let’s assume above box plot is about age’s of the students in a school. 50% of the people are above 10 yrs old and remainig are less. And students who’s age is above 15 are approx 40%.

What is nature of skewness of the data?

Solution: Left skewed, median is greater than mean.

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

Solution: Approx. = -8

Q19) Comment on the below Boxplot visualizations?



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

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)

<Q7.ans.ipynb>

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

<Q7.ans.ipynb>

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

<Q7.ans.ipynb>

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

<Q7.ans.ipynb>

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

<Q7.ans.ipynb>