|  |  |
| --- | --- |
| 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 | 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 | nominal |
| Level of Agreement | ordinal |
| IQ(Intelligence Scale) | ordinal |
| Sales Figures | ratio |
| Blood Group | Nominal |
| Time Of Day | Nominal |
| Time on a Clock with Hands | interval |
| Number of Children | nominal |
| Religious Preference | nominal |
| 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?

Sol: P(H H T)+P(H T H)+P(T H H)

= 1/8+1/8+1/8

=3/8

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 2and 3

Sol: Probability = (Number of favorable outcomes) / (Total number of outcomes) = 1 / 36

b) The sum being less than or equal to 4: We can list out the combinations:

(1, 1)

(1, 2)

(2, 1)

(1, 3)

(2, 2)

(3, 1)

c) The sum being divisible by both 2 and 3: The only sums that meet this condition are 6 and 12. Let's find the combinations:

(1, 5)

(2, 4)

(3, 3)

(4, 2)

(5, 1)

(6, 6)

So, there are 5 + 1 = 6 favorable outcomes. The probability is:

Probability = (Number of favorable outcomes) / (Total number of outcomes) = 6 / 36 = 1 / 6

Therefore: a) Probability = 1 / 36

b) Probability = 1 / 6

c) Probability = 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?

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

P(5/7, 4/6) = 20/42 i.e. 10/21

7c2=(7\*6)/(2\*1) =21

5c2=(5\*4)/(2\*1)=10

Ans =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

Sol: 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**

**Sol: for Points:-**

Mean=3.596563, Median=3.695, Mode=3.92, Variance=0.285881, Standard Deviation=0.534679, and Range=2.17

**For Score**

Mean=3.21725, Median=3.325, Mode=3.44, Variance=0.957379, Standard Deviation=0.978457, and Range=3.911

**For Weigh**

Mean=17.84875, Median=17.71, Mode=17.02, Variance=3.193166, Standard Deviation=1.786943, and 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?

Sol

|  |  |  |
| --- | --- | --- |
| **x** | **P(x)** | **x.p(x)** |
| 108 | 1/9 | 12 |
| 110 | 1/9 | 12.22222 |
| 123 | 1/9 | 13.66667 |
| 134 | 1/9 | 14.88889 |
| 135 | 1/9 | 15 |
| 145 | 1/9 | 16.11111 |
| 167 | 1/9 | 18.55556 |
| 187 | 1/9 | 20.77778 |
| 199 | 1/9 | 22.11111 |
| **Σx=**1308 |  | **Σx.p(x)=**145.3333 |

Expected Value of the Weight of that patient is Σx.p(x)= 145.3333

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

**Cars speed and distance**

**Use Q9\_a.csv**

**Sol: skewness for speed =-** -0.11751, skewness value is negative so it is left skewed.

Left skewed (Negative) slight magnitude to right.

and for distance = 0.806895, right skewed (Positive) slight magnitude to right.

**SP and Weight(WT)**

**Use Q9\_b.csv**

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



Sol: the most of the data points are concerated in the range 50-100 with frequency 200.

And least range of weight is 400 somewere 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



Sol: Median is less than mean right skewed and we have outlier on the upper side of the box plot and there is less data points between Q1 and bottom point.

**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?

**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?

Approximate center value scores obtained by a student in tests is 41,

After arranging in the ascending order the middle or central value of the scores obtained by a student in tests is in between 40 to 41.

Most frequently scores obtained by a student in test is 41

|  |  |
| --- | --- |
| **5.052664** | **stdev** |
| **25.52941** | **variance** |

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

**Sol:** symetrical

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

**Sol:** Right skewed

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

**Sol:** Left Skewed

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

**Sol:** The data is normally distributed and kurtosis value is 0

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

The distribution of the data has lighter tails and a flatter peaks then the normal distribution.

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



What can we say about the distribution of the data?

Sol: 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 remaining are less.

And students who’s age is above 15 are approx 40%

What is nature of skewness of the data?

Sol: Left skewed, median is greater than mean.

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

Interquartile range = Q3-Q1=18-10=8

Here,Q0=2,Q1=10,Q2=15.5,Q3=18,Q4=20  
  
approximately IQR=8

Q19) Comment on the below Boxplot visualizations?



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

**Sol:** By observing both the plots Whisker’s level is high in boxplot 2, mean and median are equal hence distribution is symmetrical.

Q 20) Calculate probability from the given dataset for the below cases

Data \_set: Cars.csv

Calculate the probability of MPG ofCars for the below cases.

MPG<- Cars$MPG

* 1. P(MPG>38)
  2. P(MPG<40)

c. P (20<MPG<50)

sol: by using formula in python

1. 1-stats.norm.cdf(38,cars.MPG.mean(),cars.MPG.std())

0.34759392515827137

1. P(MPG<40)

stats.norm.cdf(40,cars.MPG.mean(),cars.MPG.std())

=0.7293498762151609

c.) P (20<MPG<50)

P (20<MPG<50)

stats.norm.cdf(0.50,cars.MPG.mean(),cars.MPG.std())-stats.norm.cdf(0.20,cars.MPG.mean(),cars.MPG.std())

=1.2430968797327491e-05

1. probability of MPG ofCars for P(MPG>38) is0.34759392515827137

b)probability of MPG ofCars for P(MPG<40) is0.=0.7293498762151609

c))probability of MPG ofCars for P(20<MPG<50)is0.==1.2430968797327491e-05

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

Sol: Z score of 90% confidence interval is 1.65

Z score of 94% confidence interval is 1.55

Z score of 60% confidence interval is 0.85

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

Sol: For 95%=1.96

For 96%=2.5

For 99%=2.47

Q 24**)**A Government companyclaims 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:

rcodept(tscore,df)

df degrees of freedom

Soln: \_score = -0.471 stats.t.cdf(t\_score, df = 17) 0.32 = 32%