Q1) Identify the Data type for the Following:

|  |  |
| --- | --- |
| 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 |

Q2) Identify the Data types, which were among the following

Nominal, Ordinal, Interval, Ratio.

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

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

ANS:- Total number of events= {hhh, hht, htt, ttt, tth, thh, hth, tht} =8

Interested events=3

Probability=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 2 and 3

Ans:- Total number of outcomes when two dice are rolled=6\*6=36.

(1, 1)(1, 2)(1, 3)(1, 4)(1, 5)(1, 6)

(2, 1)(2, 2)(2, 3)(2, 4)(2, 5)(2, 6)

(3, 1)(3, 2)(3, 3)(3, 4)(3, 5)(3, 6)

(4, 1)(4, 2)(4, 3)(4, 4)(4, 5)(4, 6)

(5, 1)(5, 2)(5, 3)(5, 4)(5, 5)(5, 6)

(6, 1)(6, 2)(6, 3)(6, 4)(6, 5)(6, 6)

a) Equal to 1 = **0% probability**

b) Less than or equal to 4= 6/36 = **1/6**

c) sum is divisible by 2 and 3

{ 2 3 4 5 6 7

3 4 5 6 7 8

4 5 6 7 8 9

5 6 7 8 9 10

6 7 8 9 10 11

7 8 9 10 11 12}

Probability=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:- 10/21 = 0.476

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:-**

The expected value of an event X is given by,

 E ( X ) = μ = ∑ x P ( x )

i.e we would multiply all the values of outcome xi to P(xi) which means we would calculate the x\*P(x) column and find its mean which gives us the expected value E(X). Which in our case would be the expected number of candies for a randomly selected child.

|  |  |  |  |
| --- | --- | --- | --- |
| CHILD | Candies count | Probability | x\*p(x) |
| A | 1 | 0.015 | 0.015 |
| B | 4 | 0.2 | 0.8 |
| C | 3 | 0.65 | 1.95 |
| D | 5 | 0.005 | 0.025 |
| E | 6 | 0.01 | 0.06 |
| F | 2 | 0.12 | 0.24 |

Now, calculating mean of all values in x\*p(x) column,

E(X) = μ = 0.15+0.8+…+0.24 = 0.515

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Thus, the expected number of candies for a randomly selected child is 0.515.

Q7) Calculate Mean, Median, Mode, Variance, Standard Deviation, Range & comment about the values / draw inferences, for the given dataset

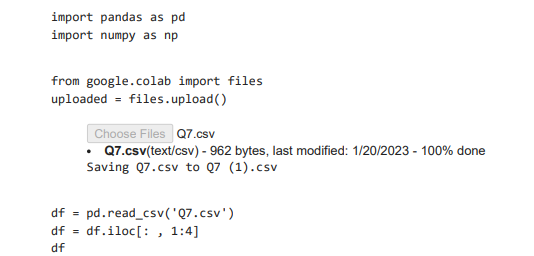
* For Points, Score, Weigh>

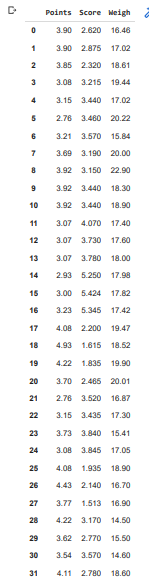
Find Mean, Median, Mode, Variance, Standard Deviation, and Range and also Comment about the values/ Draw some inferences.

**Use Q7.csv file**

**Ans:-**

Code:





|  |  |
| --- | --- |
| # Measures of  central tendency | Points |
| # Mean |  |
| # Mode |  |
| # Median |  |
| # Standard  Deviation |  |
| # Variance |  |
| # Range |  |

|  |  |
| --- | --- |
| # Measures of  central tendency | Score |
| # Mean |  |
| # Mode |  |
| # Median |  |
| # Standard  Deviation |  |
| # Variance |  |
| # Range |  |

|  |  |
| --- | --- |
| # Measures of  central tendency | Weigh |
| # Mean |  |
| # Mode |  |
| # Median |  |
| # Standard  Deviation |  |
| # Variance |  |
| # Range |  |

Inferences:-

* Here in every column mean, median and mode are not equal, thus, there maybe some outliers in the values.
* Here mean>median>mode thus data is positively skewed.

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, E(X) = μ = Σx/n

= 108+110+123+….+187+199 = 1308/9 = 145.33

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

**Cars speed and distance**

**Use Q9\_a.csv**

**Ans:-**

|  |  |  |
| --- | --- | --- |
|  | Skewness | Kurtosis |
| speed | -0.11 | 2.42 |
| dist | 0.76 | 3.25 |

* “dist” is positively skewed where as “speed” is negatively skewed
  + Thus dist has distribution of data concentrated on the left whereas speed has distribution on the right. As seen in the graph
* Both dist and speed has positive Kurtosis

**SP and Weight(WT)**

**Use Q9\_b.csv**

**Ans:-**

|  |  |  |
| --- | --- | --- |
|  | Skewness | Kurtosis |
| SP | 1.55 | 5.72 |
| WT | -0.59 | 3.82 |

* “SP” is positively skewed where as “WT” is negatively skewed
  + Thus SP has distribution of data concentrated on the left whereas WT has distribution on the right. As seen in the graph
* Both WT and SP has positive Kurtosis

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



**Ans:-**

* The histogram is right skewed or positively skewed i.e. the most frequency of data is found at left-hand side of the histogram and this frequency decreases moving towards the tail.
* Most of chickens have weight between 50 to 100.
* Very rare chickens have weight more than 300.
* The frequency rises with weigh within range 0 to 100, and starts to drop after the weight 100 is reached.



Ans:-

* The boxplot is positively skewed or right skewed.
* The data has a few outliers.

**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:-

|  |  |  |  |
| --- | --- | --- | --- |
|  | 94% | 98% | 96% |
| Upper | 201.04 | 201.38 | 201.17 |
| Lower | 198.96 | 198.62 | 198.83 |

**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.

Ans:-

|  |  |
| --- | --- |
| Mean | 41 |
| Median | 40.50 |
| Variance | 25.53 |
| Std Deviation | 5.05 |

1. What can we say about the student marks?

Ans:-

1. Not normally distributed
2. Data has outlier
3. Majority of the students scored between 35 – 45 Marks

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

Ans:- Skewness = 0. Perfectly symmetric bell shaped curve

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

Ans:- Skewness = Positive. Data is distributed more on left

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

Ans:- Skewness = Negative. Data is distributed more on right

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

ANS:- High and narrow peak on central part of the data

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

ANS:- wider peak on central part of the data

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



What can we say about the distribution of the data?

Ans:- The data is not symmetric. Data is more concentrated towards right side

What is nature of skewness of the data?

Ans:- Skewness = Negative

What will be the IQR of the data (approximately)?   
  
Ans:- IQR data is 8 (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:-

1. Data is Normally Distributed. No Outliers. Center around 262.5. Comparatively, first graph has less range
2. Data is Normally Distributed. No Outliers. Center around 262.5

Comparatively, second graph has more range

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)

ANS:- 0.4074074

* 1. P(MPG<40)

ANS:- 0.7530864

* 1. P (20<MPG<50)

ANS:- 0.8518519

Q 21) Check whether the data follows normal distribution

1. Check whether the MPG of Cars follows Normal Distribution

Dataset: Cars.csv

ANS:- MPG is 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:- Both AT and Waist doesn’t follow Normal Distribution

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

Ans:-

|  |  |
| --- | --- |
| 90% | ± 1.711 |
| 94% | ± 1.828 |
| 60% | ± 2.492 |

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

Ans:-

|  |  |
| --- | --- |
| 95% | ± 2.060 |
| 96% | ± 2.167 |
| 99% | ± 2.787 |

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:-

t-score = -0.4714,  
Degree of freedom = 17   
P(t) = 0.3216725