**inferential Statistics**

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**Batch Id: DSWDMCOSR 22082022 B**

**Topic: Basic Statistics**

Q1) Three Coins are tossed, find the probability that two heads and one tail are obtained?

A) Number of favorable outcome= 3!/2!=3

Total number of outcomes=3\*3\*3=27

Probability= 3/27

Q2) Two Dice are rolled, find the probability that sum is

1. Equal to 1

A) Number of favorable outcomes=0

So, probability is 0

1. Less than or equal to 4

A) Favorable out comes=[(1,1),(1,2),(1,3),(2,1),(2,2),(3,1)]

Total outcomes=6\*6= 36

Probability= 6/36

Probability=1/6

1. Sum is divisible by 2 and 3

A) favorable outcomes = [(1,5),(2,4)(3,3),(4,2)(5,1)(6,6)]

Probability= 6/36

Probability=1/6

Q3) 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?

A) Number of balls that are not blue: 5

Favorable outcomes=5\*4

Total outcomes=7\*6

Probability= 20/42

Probability=10/21

Q4) 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)

i. Child A – probability of having 1 candy is 0.015

ii. Child B – probability of having 4 candies is 0.2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 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 | | 0.12 | | |

A) Expected number=E(x)=(1\*0.015)+(4\*0.20)+(3\*0.65)+(5\*0.005)+(6\*0.01)+(2\*0.12)

E(x)=3.09

Q5) 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 comment about the values/ Draw some inferences.

A picture containing table

Description automatically generated

Dataset: Refer to Hands-on Material in LMS - Data Types EDA assignment snap shot of dataset is given above.

A) **Points**

mean of points=(sum of points)/N

=87.32/25

=3.4928

Median of points:

Sorted points=[2.76, 2.76, 2.93, 3, 3.07, 3.07, 3.07, 3.08, 3.08, 3.15, 3.15, 3.21, 3.23, 3.69, 3.7, 3.73, 3.85, 3.9, 3.9, 3.92, 3.92, 3.92, 4.08, 4.22, 4.93]

Median position = (N+1)/2 = (25+1)/2 =13

Median is in 13th position in the sorted points

Median = 3.23

Mode= 3.07, 3.92

Variance=E(x-m)2=0.2791

Standard deviation= squareroot(Variance)= 0.528

Range=max-min=2.17

**Score:**

mean of score=(sum of score)/N

= 84.871/25

= 3.394

Median of score:

Sorted score= [1.615, 1.815, 2.2, 2.32, 2.465, 2.62, 2.875, 3.15, 3.19, 3.215, 3.435, 3.44, 3.44, 3.44, 3.46, 3.52, 3.57, 3.73, 3.78, 3.84, 3.845, 4.07, 5.242, 5.25, 5.345]

Median is in 13th position in the sorted points

Median =3.44

Mode=3.44

Variance=E(x-m)2= 0.877940

Standard deviation= squareroot(Variance)= 0.9369847

Range=max-min= 3.729

**Weigh:**

mean of weigh=(sum of weigh)/N

= 455.46/25

= 18.2184

Median of Weigh:

Sorted weigh= [15.41, 15.84, 16.46, 16.87, 17.02, 17.02, 17.05, 17.3, 17.4, 17.42, 17.6, 17.82, 17.98, 18, 18.3, 18.52, 18.61, 18.9, 19.44, 19.47, 19.9, 20, 20.01, 20.22, 22.9]

Median is in 13th position in the sorted points

Median =17.98

Mode= 17.02

Variance=E(x-m)2= 2.575

Standard deviation= squareroot(Variance)= 1.604

Range=max-min= 7.489

Q6) 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?

A) Expected value=1308/9=145.33

Q7) Look at the data given below. Plot the data, find the outliers and find out

**Hint:** [Use a plot which shows the data distribution, skewness along with the outliers; also use R/Python code to evaluate measures of centrality and spread]

|  |  |
| --- | --- |
| **Name of company** | **Measure X** |
| Allied Signal | 24.23% |
| Bankers Trust | 25.53% |
| General Mills | 25.41% |
| ITT Industries | 24.14% |
| J.P.Morgan & Co. | 29.62% |
| Lehman Brothers | 28.25% |
| Marriott | 25.81% |
| MCI | 24.39% |
| Merrill Lynch | 40.26% |
| Microsoft | 32.95% |
| Morgan Stanley | 91.36% |
| Sun Microsystems | 25.99% |
| Travelers | 39.42% |
| US Airways | 26.71% |
| Warner-Lambert | 35.00% |

A) Kindly refer to the file Inferential\_Statistics.py

Q8) AT&T was running commercials in 1990 aimed at luring back customers who had switched to one of the other long-distance phone service providers. One such commercial shows a businessman trying to reach Phoenix and mistakenly getting Fiji, where a half-naked native on a beach responds incomprehensibly in Polynesian. When asked about this advertisement, AT&T admitted that the portrayed incident did not actually take place but added that this was an enactment of something that “could happen.” Suppose that one in 200 long-distance telephone calls is misdirected.

What is the probability that at least one in five attempted telephone calls reaches the wrong number? (Assume independence of attempts.)

**Hint:** [Using Probability formula evaluate the probability of one call being wrong out of five attempted calls]

A) one in 200 long-distance telephone calls is misdirected

p = 1/200

q = 199/200

Number of Calls = 5

P(x) = ⁿCₓpˣqⁿ⁻ˣ

n = 5

at least one in five attempted telephone calls reaches the wrong number

= 1  -  none of the call reaches the wrong number

= 1  - P(0)

= 1   -  ⁵C₀(1/200)⁰(199/200)⁵⁻⁰

= 1  -  (199/200)⁵

= 0.02475

Q9) Returns on a certain business venture, to the nearest $1,000, are known to follow the following probability distribution

|  |  |
| --- | --- |
| X | P(x) |
| -2,000 | 0.1 |
| -1,000 | 0.1 |
| 0 | 0.2 |
| 1000 | 0.2 |
| 2000 | 0.3 |
| 3000 | 0.1 |

1. What is the most likely monetary outcome of the business venture?

**Hint:** [The outcome is most likely the expected returns of the venture]

A) most likely outcome is 2000. Because it has maximum probability.

1. Is the venture likely to be successful? Explain.

**Hint:** [Probability of % of venture being a successful one]

A) For venture to be successful p(x>0)

P(x>0)=p(x=1000)+ p(x=2000)+ p(x=3000)

=0.2+0.3+0.1

=0.6

So, there is a 60% chance that the venture to be likely successful

1. What is the long-term average earning of business ventures of this kind? Explain.

**Hint:** [Here, the expected returns to the venture is considered as the

the required average]

A) ∑E(X)P(X) = (-2000)\*(0.1)+ (-1000)\*(0.1)+0+(1000)\*(0.2)+ (2000)\*(0.3)+ (3000)\*(0.1)

∑E(X)P(X) =800

800 is the long-term average earning of business ventures.

1. What is the good measure of the risk involved in a venture of this kind? Compute this measure.

**Hint:** [Risk here stems from the possible variability in the expected returns, therefore, name the risk measure for this venture]

A) P(x=-2000)+P(x=-1000) = 0.1+0.1=0.2

20% risk is involved in the venture.