Note: NOTA stands for “none of the above answers is correct.” (i.e., none of the answers given are correct). Good luck and have a joyful time!

1. Let the sample set P be the first 9 digits of pi. Let , F, and G be the median, mean, IQR. standard deviation, variance, minimum mode, and range, respectively. Find the product of all the roots of .

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A) 1 | B) 2 | C) -1 | D) 0 | E) NOTA |

1. The sample set S contains all the various 4 digit number permutations of 1234 (i.e., 1234, 1243, 2314, …). Find the mean of S (if you get an infinite decimal, round to 3 decimal places).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A) 1234 | B) 2777.5 | C) 2083.125 | D) 1851.667 | E) NOTA |

1. Dr. Golam is researching machine learning and wrote a computer program which outputs 5 random numbers such that . However, when he ran the program, the computer got a mind of its own; rather than giving out 5 random numbers, it gave out the following information:
2. The median of the numbers 15.
3. The mode of the numbers occurs twice and is greater than the median.
4. The mean, IQR, and Range of the numbers are 12.8, 17.5, and 19, respectively.

What is the product of the numbers in R?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A) Not Enough Information | B) 99225 | C) -620999.4727 | D) 66150 | E) NOTA |

1. If and , what is ?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A) 13 | B) 169 | C) 12 | D) 5 | E) NOTA |

1. The two quantities x (horizontal axis) and y (vertical axis) are related via the following data:

Which of the following transformations will linearize the data?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A)  | B)  | C)  | D)  | E) NOTA |

1. A 95% confidence interval of the average GPA of students in Florida was calculated to be (a,b) (through a large enough sample). Which of the following is the correct interpretation of this confidence interval?
2. If this process was repeated many times, 95% of the confidence intervals will contain the true mean GPA.
3. There is a 95% chance the true mean GPA is within (a,b).
4. 95% of the sample GPA recorded are within (a,b).
5. 95% of Florida students have a GPA within (a,b).
6. NOTA
7. How many of the following statements are true?
8. In a regression model, if the correlation coefficient is 1, then there is causality between the independent and dependent variable.
9. In a linear regression model, if the correlation coefficient is 1, then there is no association between the independent and dependent variable.
10. The median, mode, and IQR are considered resistant measures.
11. If , then the median is 2014.
12. If all the numbers in a set are negative, then the mean will be negative.
13. If all the numbers in a set are negative, then the standard deviation will be negative.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A) 2 | B) 3 | C) 4 | D) 5 | E) NOTA |

1. Dr. Snow and Mr. Scales are in a boxing fight. The probability that Mr. Scales can knock out Dr. Snow in any given punch is 0.6. The probability that Dr. Snow can knock out Mr. Scales in any given punch is 0.1 (come on Snow, you can do better than that). These probabilities are constant and independent for the entire fight (and are not affected by fatigue and tiredness). Dr. Snow and Mr. Scales keep exchanging punches (one-by-one) until one of them gets knocked out. If Dr. Snow throws the first punch, what is the probability that Dr. Snow will knock out Mr. Scales in the fight first?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A)  | B)  | C)  | D)  | E) NOTA |

1. The element Joy-ium has isotopes with varying masses, ; the probabilities, , of these masses as they show up in world are described in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 00 | 105 | 145 |  |  |
|  |  |  | 0.2 | 0.4 | 0.1 |

Given that the average mass is 120.5, find the variance.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A) 10.98 | B) 15.72 | C) 247.25 | D)271.83 | E) NOTA |

For questions 10 and 11, use the following information.

There are 4 main clubs at DBHS: Key Club (K), MAO (M), NHS (N), and Cross Country (C). MAO has 162 total members; NHS has 117 total members; Cross Country has 116 total members, and Key Club has 71 total members. The Venn Diagram below represents the members in the clubs:

30

a

15

4

20

7

d

37

8

10

M

N

K

C

1. Find a.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A) 100 | B) 301 | C) 256 | D) 311 | E) NOTA |

1. Given that a student is chosen at random, find .

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A)  | B)  | C)  | D)  | E) NOTA |

1. In a uniform distribution, the median is \_\_\_\_\_\_\_\_ equal to the mean.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A) Always | B) Sometimes | C) Never | D)Need More Info | E) NOTA |

1. Let on the interval . What value of makes a probability density function?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A)  | B)  | C)  | D)  | E) NOTA |

1. Let A and B be two events. Which of the following is not a sufficient enough condition for A and B to be independent?
2. in no way affects .
3. NOTA
4. A dartboard is bounded by the region on the interval . If a dart is thrown randomly, the probability that it lands in the region bound by is , with relatively prime. What is ?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A) 5 | B) 2 | C) 4 | D) 7 | E) NOTA |

1. How many of the following statements are true?
2. A sample is a superset of the population.
3. Causation can only be proven through a controlled experiment.
4. A Chi-Squared Distribution is always left-skewed.
5. When doing a two-sample proportion test, the value of the test statistic is calculated via

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A) 1 | B) 2 | C) 3 | D) 4 | E) NOTA |

1. Gautam is writing a computer program to simulate random numbers given weighted probabilities. The program only outputs 0, 1 and 2. In his program, he inputs a number as a key and the program outputs a 0, 1, or 2 such that the probability of each digit being output is the number of times the digit appears in the base 3 representation of the key divided by the total number of digits in the base 3 representation of the key. Gautam uses 2014 as his key (which has a base 3 representation of 2202121), runs the program 300 times, and gets the following output:

|  |  |
| --- | --- |
| Digit | Frequency |
| 0 | 57 |
| 1 | 79 |
| 2 | 164 |

Gautam uses a Goodness of Fit test to determine whether his program is working properly. What is the test statistic (to 3 decimal places)?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A) 4.255 | B) 2.352 | C) 3.141 | D) 5.515 | E) NOTA |

1. The average GPA of the 1500 students at MAO University is 2.1. If the standard deviation of the GPA is approximately normal with standard deviation 0.3, the 95% confidence interval for the mean GPA of the students is approximated to:

|  |  |  |
| --- | --- | --- |
| A) (2.085, 2.115) | B) (2.080, 2.120) | C)(2.087, 2.113) |
| D)(-1,1) | E) NOTA |  |

1. Which of the following statements are true?
2. In a binomial probability situation, you are looking for the first success.
3. In a geometric probability situation, you are looking for k number of successes out of a fixed n number of trials.
4. In a geometric probability situation, you are looking for the first occurrence of k number of successes.
5. In a binomial probability situation, there are no fixed number of trials.
6. NOTA
7. Bernie is in a fun house with 3n levels. Each level has 4n doors and behind one door is a prize. Bernie goes through all the levels. Let P(n) be the probability that Bernie gets none of prizes for some n. . Find .

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A) 701 | B) 1098 | C) 1099 | D) 1100 | E) NOTA |

1. Compute:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A) 407.8 | B) 342.24 | C) 427.8 | D) 2014 | E) NOTA |

1. Dr. Snow is building a snow ball machine. The machine is supposed to make snowballs of grams. However, Dr. Snow thinks that the machine is flawed and produces snowballs that have a mass not equal to 500 grams. Using a sample size of and standard deviation of grams, find the power of the test against the alternative 503 grams at the 5% signifiance level(assume a normal distribution, use z- procedures, and round to 4 decimal places).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A) 0.1701 | B) 0.3371 | C) 0.1685 | D) 0.3745 | E) NOTA |

1. Dr. Andres is kicking field goals. The probability of him making a field goal is 0.15. His aim is to make 4 field goals. What is the probability that he achieves his aim on the 9th free throw attempt (to 4 decimals)?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A) 0.0283 | B) 0.0157 | C) 0.0189 | D) 0.0126 | E) NOTA |

1. Dr. Patel thinks he has the drug to increase the IQ of students. However, to make sure of the validity of his drug, he runs a controlled experiment and gets the following results:

|  |  |  |
| --- | --- | --- |
|  | Increase in IQ | No Effect on IQ |
| Did Received Drug | 9 | 3 |
| Did Not Receive Drug | 4 | 7 |

: The proportion of students who’s IQ increased is independent of drug.

: The proportion of students who’s IQ increased has a relationship with the drug.

At a 5% significance level, the test yields:

|  |  |  |
| --- | --- | --- |
| A) | B) | C) NOTA |

For 25 and 26, use the following information about quantitative variables x and y:

|  |  |  |  |
| --- | --- | --- | --- |
| x | 2 | 0 | 1 |
| y | 5 | 2 | 4 |

The sum of the squared distances for a set of points is .

1. If , find the sum of the values of a and b which minimizes D.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A)  | B)  | C)  | D)  | E) NOTA |

1. If , find the value of k which minimizes D.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A)  | B)  | C)  | D)  | E) NOTA |

1. A linear regression is run to model some data. If the coefficient of determination for the data is 0.64, find the sum of all the possible values of the correlation coefficient for that data?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A) 0 | B) 1 | C) 0.8 | D) 0.64 | E) NOTA |

1. Joy is playing a dice game with a weighted 6-sided dice (number 1 to 6 on the faces). He has to roll the dice 20 times and wins if he rolls a 6 at least once. He rigged the dice so that the probability of him winning is ? What is the probability of rolling a 6?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A)  | B)  | C)  | D)  | E) NOTA |

1. In gathering information, a researcher surveys every 5th person who enters a store. What type of sampling method is this?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A) Systematic | B) Multistage | C) Stratified | D) Cluster | E) NOTA |

1. On Joy’s Quidditch Team, chasers are given prime jersey numbers, keepers are given the negative jersey numbers, beaters are given perfect square jersey numbers, and seekers are given imaginary jersey numbers. What type of variables are the jersey numbers?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A) p-value | B) Quantitative | C) Probability | D) Qualitative | E) NOTA |