The answer choice E. NOTA denotes that "None of These Answers" are correct. The domain and range of functions are assumed to be either the real numbers or the appropriate subset of the real numbers.

1. Consider the sample data set $\{3,1,4,1,5,9,2,6,5,3,5\}$. Let the standard deviation of this set, rounded to the nearest tenth, be *k*. Let the mode be *m*, and the median be *n*. What is the area of the triangle with sides of lengths *k*, *m*, and *n*, to 2 decimal places?

A. 3.59 B. 4.44 C. 4.73 D. 6.69 E. NOTA

2. Bored, Ari decides to predict the number of arguments Anna and Nancy get into over a 12-day period. Since their personalities vary each day, and he has no accurate way of predicting the number of arguments, he decides to make his prediction using the digits of π, as shown below:

Day	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Predicted	3	1	4	1	5	9	2	6	5	3	5	8
Actual	2	7	1	8	2	8	1	8	2	8	4	5

What is the *p*-value of the hypothesis test $H_0: \text{Predicted=Actual}$ vs. $H_a: \text{Predicted} < \text{Actual}$? Round your answer to three decimal places.

A. 0.378 B. 0.381 C. 0.757 D. 0.762 E. NOTA

Questions 3 and 4 deal with the following scenario:
In a survey conducted amongst 100 sophisticated cannibals to determine their preference of seasoning, 62 said they liked paprika, 46 said they liked oregano, and 22 said they liked thyme. In addition, 24 claimed to like both paprika and oregano, 6 liked both oregano and thyme, and 16 liked both paprika and thyme. Immediately afterward, the surveyor was eaten.

3. What is the maximum possible number of cannibals that like either only paprika or only oregano?

A. 38 B. 44 C. 50 D. 60 E. NOTA

4. If, unbeknownst to these cannibals, any cannibal who likes either zero seasonings or all three seasonings is eaten at dinnertime, what is the maximum possible percentage of living cannibals who like paprika after dinner, to the nearest percent?

A. 62% B. 67% C. 71% D. 74% E. NOTA

5. Grant is throwing darts at a dartboard. Since he lacks common sense and takes a swig of liquor after each throw, the probability of him hitting the dartboard at all on the k^{th} throw is $\frac{1}{k+1}$. If he throws 10 darts before becoming too inebriated to continue, what is the probability, to 5 decimal places, that he will hit the dartboard on the 3^{rd}, 4^{th}, and 8^{th} trials and miss on all the others?

A. 0.00051 B. 0.00095 C. 0.00104 D. 0.00217 E. NOTA

6. In FAMAT, sweepstakes results are calculated by standardizing the results from each division and giving everyone a "T-score" for that division; this T-score is ten times the z-score of the competitor plus fifty. If I had a T-score of 92 on a test I took, and the mean of this test was 8 with a standard deviation of 16.2, then what was my score to the nearest integer (since all FAMAT scores are integral)?

A. 68 B. 72 C. 76 D. 80 E. NOTA

7. Let *p* the probability that Cho turns in his 1^{st} period homework on any given day, let X represent this random variable, and let σ_X be the standard deviation of this variable. Let *q* be the probability that Cho goes to 2^{nd} period, let Y represent this random variable, and let σ_Y be the standard deviation of this variable. If these events are independent, and $q > 0.8$, what's the maximum possible value of the standard deviation σ_{X+Y} if there are 100 total days? Round to the nearest tenth.

A. 2.6 B. 3 C. 5 D. 9 E. NOTA

Use the following information for questions 8 and 9.
Gerardo decides to study the (useless) relationship between a country's life expectancy (in years) and amount of bread eaten (in kilograms) per year per capita. He uses data from 100 countries, and finds the coefficient of determination to be exactly 0.01787569. Given that this (admittedly weak) relationship is positive, that the standard error of the life expectancy is $3b + 1$, where b is the standard error of the bread eaten, and that the slope ε of the least-squares regression line (Life Expectancy) $= \varepsilon$(Bread Eaten) + φ is also b, then:

8. Find the sum of the possible values of ε. Round to 4 decimal places.
A. 0.0536 B. 0.1632 C. 0.4011 D. 0.6176 E. NOTA

9. In terms of a number j, the mean life expectancy is given by $6j^2+5$ and the mean amount of bread eaten is given by j^4. Find the sum of the positive values of j such that $\varphi = 0$. Round your final answer to 2 decimal places. If you need to use the value(s) of ε you got from question 8, then round that/those to four decimal places **before** use in this problem.
A. 3.24 B. 3.96 C. 6.13 D. 10.49 E. NOTA

10. Suppose I want to compare the growth patterns of the values of two distinct stocks in the New York Stock Exchange. I know the market as a whole has been following a downward tendency. What test should I use?
A. 2-sample t test B. Matched-pairs t test C. 2-sample z test
D. Only pick this answer choice when thoroughly inebriated on a Thursday E. NOTA

Use the following for questions 11 and 12.
Rohit conducts an experiment and finds that in the dark, people overestimate the distance of an object from them, in the light they underestimate it, and at sunrise and sunset they estimate it perfectly. Assume sunrise and sunset are at 6AM and 6PM, respectively. Let t be time of day in hours (note: 6 PM is t = 18, not t = 6), let a represent the actual distance away of an object, and let d represent the estimated distance.

11. If Rohit were to perform a hypothesis test for midnight, what would the appropriate null and alternative hypotheses be?
A. $H_0: \frac{a}{d}=1;\ H_a: \frac{a}{d}>1$ B. $H_0: \frac{a}{d}>1;\ H_a: \frac{a}{d}=1$ C. $H_0: \frac{d}{a}=1;\ H_a: \frac{d}{a}>1$
D. $H_0: \frac{d}{a}>1;\ H_a: \frac{d}{a}=1$ E. NOTA

12. Suppose that the regression equations are of the form $d=\left[f(t)\right]a$. Could $f(t)$ be a quadratic polynomial with the constant term and the coefficient of the t term both integers, such that it satisfies Rohit's findings?
A. Yes B. NOTA

Use the following for questions 13 and 14:
Let k be an even integer where $10 < k \leq 100$. Svetlana, addicted to gambling, has a k% chance of winning her first game of poker. Whenever she wins the probability of her winning her next game decreases by 2%. If she's smart and stops gambling immediately when her percentage of winning becomes less than 10%, then:

13. What is the probability that she wins every **other** game she plays, in terms of k?
A. $\prod_{i=0}^{\left[\frac{k-10}{4}\right]} \frac{(k-4i)}{100}$ B. $\frac{k}{100}\prod_{i=1}^{\frac{k-10}{2}} \frac{(k-2i)(100-k+2i)}{100}$ C. $\left(\frac{100-k}{100}\right)\prod_{i=1}^{\frac{k-10}{2}} \frac{(k-2i)(100-k+2i)}{100}$
D. $\left(\frac{200k-k^2}{10000}\right)\prod_{i=1}^{\frac{k-10}{2}} \frac{(k-2i)(100-k+2i)}{100}$ E. NOTA

(Remember—question 14 deals with the scenario presented on the previous page!)

14. If she gains \$20 when she wins and loses \$10 otherwise, what will be her expected winnings given that she wins every **other** game, and that she has a 50% chance of winning the 1st game, in dollars?
A. \$200 B. \$215 C. \$230 D. \$240 E. NOTA

15. Trumbull, a residential college at Yale University, has 98 freshmen. Suppose 15 of them are asked whether they like to make fun of Harvard. What's the largest possible standard deviation of the sampling distribution, to 2 decimal places? (Ignore the fact that one who says no isn't a true Yale student)
A. 0.13 B. 0.18 C. 1.94 D. 2.74 E. NOTA

16. I want to construct a 95% confidence interval for the mean of a normal population. I use a sample size n, and I know that the population standard deviation is $2n + 4$. If the margin of error is $\frac{49}{25}\sqrt{n+65}$, then what is n? Round the critical z value to 2 decimal places **before** use in this problem.
A. 16 B. 29 C. 35 D. 56 E. NOTA

17. Consider the following data points (t, y): (1, 2), (2, 7), (3, 28), (4, 63), (5, 126). Which transformation, if plotted, would give the highest correlation coefficient? Choose E if there is a tie.
A. t vs. $\sqrt[3]{y}$ B. y vs. $3t^2$ C. y vs. 3^t D. t vs. ln(y) E. NOTA

18. Robert wants to see if a higher proportion of Veronica's jokes are 'your mom' jokes on weekends. On Thursday, she makes 26 (lame) jokes, including 9 'your mom' jokes. On Saturday, she makes 33 jokes (again, none of which are funny), including 12 'your mom' jokes. Let p be the p-value of the appropriate test; let n be the greatest integer less than $100p$. Find $LCM(n, 2n-4) \cdot GCF(n, 2n-4)$.
A. 928 B. 3696 C. 3870 D. 15136 E. NOTA

19. How many of the following regions bound legitimate probability density curves in the Cartesian plane?
I. $a(x) = \frac{2}{3}(x-1)$, $x = 0$, $x = 3$, the x-axis
II. $\psi(x) = \sqrt{x}$, $x = 0$, $x = 1$, the x-axis
III. $z(x) = |2x|$, $x = -1$, $x = 1$, the x-axis
IV. $\vartheta(x) = 1 - x^2$, $x = 0$, $x = 1$, the x-axis
V. $r(x) = x - 2$, $x = 1$, $x = 3$, the x-axis
VI. $\zeta(x) = \sqrt{\frac{4}{\pi} - x^2}$, $x = 0$, $x = \frac{2}{\sqrt{\pi}}$, the x-axis
A. 1 B.2 C. 3 D. 4 E. NOTA

20. The weights of giant squids are normally distributed with a mean of 669 lbs and standard deviation of 69 lbs. Aneesh's pet giant squid weighs 750 lbs. If Gabor randomly buys a giant squid, what is the probability that its weight will be greater than that of Aneesh's? Round your answer to 3 decimal places.
A. 0.120 B. 0.121 C. 0.240 D. 0.241 E. NOTA

21. Ever the accurate weatherman, Leo predicts that the amount it will snow, in inches, on any given winter day is normally distributed with a mean of 0.25 and a standard deviation of 0.08. If he is always between the 35th and 65th percentiles, then let A be the minimum possible total snowfall for 3 days and let B be the maximum possible total snowfall for this period. Find B – A, to 2 decimal places.
A. 0.04 B. 0.05 C. 0.06 D. 0.07 E. NOTA

Use the following for questions 22 and 23: Mr. Farmer, poker extraordinaire, decides to rig a standard 52-card deck to make things interesting. He rigs the deck by removing one of each number (ace, 2, 3…, king), in the process removing a total of 3 clubs, 3 diamonds, 3 hearts, and 4 spades.

22. What is the new probability of obtaining a full house (3 of one number and 2 of another) in a five-card hand? Round your answer to 6 decimal places.
A. 0.000007 B.0.000271 C. 0.000813 D. 0.000881 E. NOTA

(Remember—question 23 deals with the scenario presented on the previous page!)

23. To 5 decimal places, what is the probability of getting a flush (5 of the same suit) in a five-card hand?

A. 0.00001 B. 0.00153 C. 0.00175 D. 0.00550 E. NOTA

24. On the statistics final exam, the mean score is a 67 with a standard deviation of 9. Somehow, Giulio gets a 98 on the final, and Aneesh gets a 47. Mr. Farmer wishes for there to be no A's on the final, so he curves the grades such that Giulio gets exactly an 89.4 but everyone keeps the same standardized z-score. If he doesn't change the mean, what is Aneesh's new grade, to the nearest hundredth?

A. 38.40 B. 51.35 C. 52.55 D. 55.60 E. NOTA

25. How many distinct circular arrangements are there of the letters in RAGHUNANDAN?

A. 100800 B. 302400 C. 362880 D. 1108800 E. NOTA

26. Let p be the probability of rolling a 1 on a fair, standard, six-sided die. Evaluate: $\sum_{k=1}^{10}\binom{10}{k}p^k(1-p)^{10-k}$

A. 0 B. $\frac{35}{7776}$ C. $\frac{1}{6}$ D. 1 E. NOTA

Use the following for questions 27 and 28:
Mark and Richard keep track of their shots in each half of their pickup 3-on-3 games. In the first half of all games played, Mark hits 24 out of 40 shots, and in the second half of all games played, Mark hits 26 out of 40 shots. Richard takes 100 total shots, and hits at least 1 in each half. Suppose this situation illustrates Simpson's Paradox, with Richard's overall percentage of shots made being higher than Mark's.

27. What is the maximum total number of shots Richard could hit?

A. 63 B. 64 C. 65 D. 66 E. NOTA

28. Let a be the number of shots Richard hits in the second half. Let b be the number of shots Richard attempts in the second half. Let P be the maximum value of $a + b$ and let Q be the minimum value of $a + b$. What is P + Q?

A. 174 B. 283 C. 329 D. 430 E. NOTA

29. On average, Shawn makes nine puns per day. If the number of puns he makes in a day is normally distributed with a standard deviation of 2.3, what is the probability, to 2 decimal places, that he makes more than 12 puns on a given day? Assume that he can, for some odd reason, make partial puns (i.e. that this is a continuous variable rather than discrete)

A. 0.09 B. 0.10 C. 0.11 D. 0.12 E. NOTA

30. I flip a fair coin and get ten straight heads. What is the probability of getting 11 tails in a row?

A.0 B. $1/2$ C. $1/1024$ D. $1/4096$ E. NOTA