For all questions, answer choice "E) NOTA" means none of the above answers is correct.

1. Which of the following is not considered a categorical variable?

A) eye color      B) gender         C) race            D) age             E) NOTA

2. In which of the following distributions would the median be greater than the mean?

A) skewed-right distribution    B) skewed-left distribution    C) symmetric distribution
D) binomial distribution          E) NOTA

3. Find the standard deviation of the following population of data, rounded to the nearest
    thousandth: 5, 6, 7, 11, 15, 16, 17.

A) 4.690          B) 25.667         C) 5.066          D) 22.000         E) NOTA

4. A normal density curve has which of the following properties?

A) it is symmetric            B) it has a peak at the mean of the data
C) the width of the distribution is proportional to its standard deviation
D) all of the above           E) NOTA

5. What is the area, rounded to four decimal places, under the standard normal curve
    corresponding to $-1.4 < z < 1.4$?

A) 0.1615         B) 0.8385         C) 0.0792         D) 0.9208         E) NOTA

6. Scores on a standard IQ test for the age group 20 to 29 are approximately normal with a
    mean of 120 and a standard deviation 20.  What percentage of people aged 20 to 29,
    rounded to the nearest percentage, have an IQ above 130?

A) 50%            B) 31%            C) 69%            D) 42%            E) NOTA

7. Which of the following correlations indicates the weakest linear relationship?

A) $r = -0.99$      B) $r = -0.3$      C) $r = 0$          D) $r = 0.5$        E) NOTA

8. The equation of the least-squares regression line for a certain set of data is
    $y = 1.5 + 0.75x$.  What is the residual for the data point $(3,8)$?

A) 4.25           B) 3.75           C) 8.67           D) 8.00           E) NOTA

9. Which of the following is false concerning a correlation coefficient $r$?

A) if $r$ is negative, an inverse relationship exists.     B) $-1 \le r \le 1$
C) a one-to-one relationship will have $r > 1$     D) all of the above     E) NOTA

10. Which of the following statements is true?
   I) high correlation does not imply causation
   II) correlations based on averages are always too high when applied to individuals
   III) correlation and regression describe only linear relationships.

A) I only          B) III only          C) I & III only     D) I, II, & III     E) NOTA

11. Which of the following statements is true?
   I) a stratum consists of the entire population
   II) a census consists of the entire population
   III) a sample consists of the entire population

A) I only          B) II only          C) I & II only     D) III only     E) NOTA

12. Which of the following is not a method for improving the accuracy of a sample?

A) using larger sample sizes          B) using smaller sample sizes          C) avoiding bias
D) all of the above          E) NOTA

13. Which of the following causes bias in the design of a study?

A) undercoverage     B) nonresponse     C) poorly worded questions     D) all of the above
E) NOTA

14. Valid sampling methods include:

A) selection of participants using procedures that depend on a probability model
B) interviewing an individual from every household
C) a census of the population          D) all of the above                    E) NOTA

15. Suppose you toss a fair coin and roll a fair six-sided die.  Find the probability of tossing
    a tail on the coin and rolling an odd number on the die.

A) 1                    B) $\frac{1}{2}$                    C) $\frac{1}{4}$                    D) $\frac{5}{6}$                    E) NOTA

16. Suppose $A$ and $B$ are independent events such that $P(A)=0.25$ and $P(B)=0.5$.
    Evaluate $P(A \cup B)$.

A) 0.125            B) 0.625            C) 0.75            D) 0.875            E) NOTA

17. Which of the following events $A$ and $B$ are disjoint?

A) $A=\{$all even integers$\}$; $B=\{6\}$        B) $A=\{$all odd integers$\}$; $B=\{$all numbers $x>20\}$
C) $A=\{$all positive numbers$\}$; $B=\{$all even integers$\}$
D) $A=\{$all numbers $x>10\}$; $B=\{$all numbers $x<5\}$            E) NOTA

18. If four fair coins are tossed and the sequence of outcomes is noted, what is the total
    possible number of outcomes?

A) 2            B) 4            C) 8            D) 16            E) NOTA

19. If $P(X)=0.2$, $P(X \cap Y)=0.15$, and $P(X \cup Y)=0.25$, find the value of $P(Y^C)$.

A) 0.2            B) 0.05            C) 0.8            D) 0.95            E) NOTA

20. A random variable $X$ has the following probability distribution:

| $x$ | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| $P(X=x)$ | $3k$ | $2k$ | $k$ | $4k$ |

Evaluate $P(X>2)$.

A) 0.1            B) 0.2            C) 0.4            D) 0.5            E) NOTA

Use the following table concerning discrete random variable $X$ to answer questions 21-22.

| $x$ | 10 | 20 | 40 | 60 |
|---|---|---|---|---|
| $P(X=x)$ | 0.2 | 0.2 | 0.2 | 0.4 |

21. Find the mean of $X$.

A) 32.5            B) 38            C) 42            D) 48            E) NOTA

22. Find the standard deviation of $X$, rounded to the nearest ten-thousandth.

A) 20.3961          B) 23.4778          C) 17.3056          D) 4.5162          E) NOTA

23. Which of the following statements is true about a binomial distribution?
    I) the distribution is made up of a fixed number of trials
    II) the probability of success is the same for each trial
    III) all trials are independent of one another

A) I only          B) I & II only          C) II only          D) I, II, & III          E) NOTA

24. One hundred people live in an apartment complex, ninety of whom have full-time jobs.
    If each person with a job is assigned the number 1, and if each person without a job is
    assigned the number 0, find the standard deviation of the population data set consisting
    of those numbers.

A) 0.009          B) 0.09          C) 0.03          D) 0.3          E) NOTA

25. Which of the following will increase the width of a confidence interval?
    I) decreasing the confidence level
    II) decreasing the sample size
    III) increasing the standard deviation

A) I only          B) II only          C) II & III only          D) I & II only          E) NOTA

26. A significance test was performed to test the null hypothesis $H_o : \mu = 4$ against the
    alternative hypothesis $H_a : \mu \neq 4$ for a normal distribution. The test statistic is $z = 1.6$.
    The $p$-value for this test has what value, rounded to the nearest ten-thousandth?

A) 0.1096          B) 0.5480          C) 0.8904          D) 0.9452          E) NOTA

27. Given $H_o : \mu \leq 50$ and $H_a : \mu > 50$, you conclude that the mean is more than 50 when the
    mean is actually 62. Which of the following is true?

A) you made a Type I error                       B) you made a Type II error
C) you drew an incorrect conclusion              D) all of the above                    E) NOTA

28. Which of the following statements is true?
    I) the chi-square distribution is not symmetric
    II) a chi-square distribution test on a $2\times2$ table produces the same conclusions based on
        $p$-values as a 2-tailed differences of proportion test
    III) chi-square distributions are always skewed left

A) I only          B) I & II only       C) III only          D) I, II, & III        E) NOTA

29. In a study of how music affects our perception of attractiveness, students rated pictures
    of movie stars on a scale from 1-20, with 1 being the least attractive and 20 being the
    most attractive.  There were two groups with 30 people in each group.  One group had
    slow jazz playing in the background while the other group listened to heavy metal.  The
    results are as follows:

| Group | $n$ | Mean | Stand. Deviation |
|---|---|---|---|
| Slow jazz | 30 | 18.8 | 2.5 |
| Heavy metal | 30 | 16.9 | 2.7 |

If a test of significance is performed in order to find the probability that the slow jazz
group will the movie stars as more attractive, what is the $p$-value, rounded to the
nearest ten-thousandth?

A) 0.0032          B) 0.9968            C) 0.0064            D) 0.9936             E) NOTA

30. Researchers want to cross two yellow-green plants with a genetic make-up.  The
    Punnett square for this genetic experiment is as follows:

|  | G | g |
|---|---|---|
| G | GG | Gg |
| g | Gg | gg |

The expected ratio of green (GG) to yellow-green (Gg) to albino (gg) plants is 1:2:1.
When the experiment is performed, the offspring are 22 green, 50-yellow-green, and 12
albino seedlings, and there were no other types of seedlings.  Using a chi-square
goodness of fit test, what is the $p$-value, rounded to the nearest hundred-thousandth?

A) 0.06625         B) 0.93375           C) 0.14297           D) 0.85703            E) NOTA