Instructions:

- Select the best answer for each question.
- Use only #2 pencil.
- You must print your name and fill student ID number (nine digits).
- Mark **B** in Test Form field.
- Completely fill in each circle.
- Do not fold the answer sheet.
- Do not make random marks anywhere on exam sheet.
- If you are erasing a mistake, then completely remove all pencil marks from the incorrect answer. Do not put X through it.

---

1. Which is a numeric variable below?

    (a) time required to finish an exam

    (b) country of origin of a teacher

    (c) marital status of a Statistics professor

    (d) manufacturer of a car parked in a parking lot

2. The frequency table of the weights (in lbs.) of n trouts caught from a lake is given below.

Class (in lbs.)	Frequency	Relative Frequency
6.5 to less than 7.0	6	0.12
7.0 to less than 7.5	8	0.16
7.5 to less than 8.0	13	0.26
8.0 to less than 8.5	a	b
8.5 to less than 9.0	7	0.14
9.0 to less than 9.5	5	0.1

    What is the value of a/b?

    (a) 48 (b) 45 (c) 50 (d) 52

3. The standard deviation of a data set is 4. If each measurement is multiplied by 2, the standard deviation of the resulting data set is

    (a) 2 (b) 4 (c) 6 (d) 8

4. A fair die is tossed twice and event E_1 = the sum of two tosses equals to 7, event E_2 = the first toss is 6. Which of the following is true?

   (a) E_1 and E_2 are disjoint.

   (b) E_1 is a subset of E_2.

   (c) E_1^C and E_2 are independent.

   (d) None of the above.

5. Let Y be a discrete random variable given by the pmf:
   $P(Y = 0) = 0.3, P(Y = 1) = 0.7$. Calculate the variance σ_Y^2.

   (a) 1.0 (b) 0.21 (c) 0.6 (d) 0.24

6. Suppose $X \sim B(4, \frac{2}{3})$. What is $P(X = 2)$?

   (a) $\frac{24}{81}$ (b) $\frac{12}{81}$ (c) $\frac{54}{81}$ (d) $\frac{36}{81}$

7. Suppose you flip a fair coin twice. Let Y denote the number of heads you get. Find $P(Y = 1|Y \geq 1)$.

   (a) 1/3 (b) 1/4 (c) 2/3 (d) 3/4

8. Let Y be a continuous random variable and c be a constant. Which of the following statements is **NOT** always true?

   (a) The probability that Y assumes a value in the interval (y_1, y_2) (where $y_1 < y_2$) is the area under the probability density function between y_1 and y_2.

   (b) $P(Y = c) = 0$.

   (c) $P(Y > c) = P(Y < -c)$.

   (d) $P(Y > c) = 1 - P(Y < c)$.

9. The Z-score representing the third quartile of the standard normal distribution is approximately (choose the closest answer)

   (a) 0.67 (b) -0.67 (c) 1.28 (d) -1.28

10. Suppose $Y \sim N(0, 4)$. Find $P(-.20 \leq Y \leq -.04)$.

    (a) .0159 (b) .0318 (c) .4920 (d) .4960

Questions 11.-13. refer to the following situation.

There are 100 voters in total and the probability/proportion of voters who are female is 0.5. Let the random variable Y be the number of voters who are female among the 100 voters. Assume each voter is independent of all other voters.

11. The distribution of Y is:

(a) discrete, but does not have a special name.

(b) discrete, and is called a Binomial distribution.

(c) continuous, but does not have a special name.

(d) continuous, and is called a Binomial distribution.

12. Which of the following probability statements is true?

(a) $P(Y \leq 30) = P(Y < 30)$.

(b) $P(Y \leq 40) = 1 - P(Y \geq 40)$.

(c) $P(Y < 50) = P(Y > 50)$.

(d) $P(Y \leq 60) = 1 - P(Y \geq 60)$.

13. The probability distribution of Y is:

(a) right-skewed

(b) left-skewed

(c) symmetric

(d) bimodal

14. If $X \sim N(1, 25)$, and $f(x)$ is the pdf of X, then:

(a) $P(X = 0) > 0$.

(b) the dispersion of the distribution of X is larger than the dispersion of the standard normal distribution.

(c) $f(0) > f(1)$.

(d) the variance of X is smaller than the standard deviation of X.

15. A scientist observes the following dataset and calculates the mean, median, mode, variance, and standard deviation:

$$11, 11, 12, 12, 13, 13, 13, 13, 14, 14, 15, 15$$

After calculating her statistics, she realizes that she forgot one last data point. You do not see the exact value but she tells you it is greater than 16. She adds it to the dataset and recalculates. How will her statistics change?

(a) The median and the standard deviation will increase.

(b) The mode will increase and variance will decrease.

(c) The variance will decrease and the median will stay the same.

(d) The mean will now be greater than the mode.

16. Let A represent the event that I wear a hat and B represent the event that I eat breakfast. Suppose that the probability of me wearing a hat does not change based on whether or not I eat breakfast. This implies that:

(a) Events A and B are disjoint.

(b) Events A and B are independent.

(c) Events A and B are complements.

(d) Events A and B are intersected.

17. Which of the following is **NOT** a measure of dispersion?

(a) $\frac{1}{n-1} \sum_{i=1}^{n} (y_i - \bar{y})$

(b) Range

(c) IQR

(d) $\frac{1}{n-1} \sum_{i=1}^{n} (y_i - \bar{y})^2$

18. Which of the following statements is true?

(a) The standard deviation must always be smaller than the mean.

(b) If two events A and B are independent, then the following is true: $P(A \cup B) = P(A) + P(B)$.

(c) The intersection of two events A and B cannot be larger than the union of the same two events A and B.

(d) In general, if the distribution is skewed to the left then one of the following transformations should be considered: $\sqrt{Y}, \log Y, 1/\sqrt{Y}, 1/Y$.

19. For a particular department, suppose the type of phone call received is either a request for information (with probability 0.7) or a complaint. Assume all phone calls are independent of each other. Suppose the department receives 10 phone calls. What is the probability that at most 8 of the phone calls are requests for information?

(a) 0.149 (b) 0.121 (c) 0.851 (d) 0.028

20. If a woman takes an early pregnancy test, she will either test positive or negative. Suppose that if a woman is really pregnant, there is a 98% chance that she will test positive. If a woman is not really pregnant, there is a 99% chance that she will test

negative. Lastly, the probability that a women is pregnant is in general 0.10. What is the probability that a woman tests negative?

(a) 0.107 (b) 0.893 (c) 0.109 (d) 0.002