

AP Statistics Practice Test
Unit Six – Random Variable Distributions

Name _____ Period _____ Date _____

Vocabulary:

1. State the Law of Large Numbers.
2. State the four requirements needed for a geometric setting.
3. Define and provide an example of a continuous random variable.

Multiple Choice:

4. The number of sweatshirts a vendor sells daily has the following probability distribution.

Number of Sweatshirts x	0	1	2	3	4	5
$P(x)$	0.3	0.2	0.3	0.1	0.08	0.02

If each sweatshirt sells for \$25, what is the expected daily total dollar amount taken in by the vendor from the sale of sweatshirts?

- (A) \$5.00 (D) \$38.00
(B) \$7.60 (E) \$75.00
(C) \$35.50
5. In a carnival game, a person can win a prize by guessing which one of 5 identical boxes contains the prize. After each guess, if the prize has been won, a new prize is randomly placed in one of the 5 boxes. If the prize has not been won, then the prize is again randomly placed in one of the 5 boxes. If a person makes 4 guesses, what is the probability that the person wins a prize exactly 2 times?

- (A) $\frac{2!}{5!}$ (B) $\frac{(0.2)^2}{(0.8)^2}$ (C) $2(0.2)(0.8)$
(D) $(0.2)^2(0.8)^2$ (E) $\binom{4}{2}(0.2)^2(0.8)^2$

6. Circuit boards are assembled by selecting 4 computer chips at random from a large batch of chips. In this batch of chips, 90 percent of the chips are acceptable. Let X denote the number of acceptable chips out of a sample of 4 chips from this batch. What is the least probable value of X ?
- (A) 0
 (B) 1
 (C) 2
 (D) 3
 (E) 4

7. The number of calories in a one-ounce serving of a certain breakfast cereal is a random variable with mean 110. The number of calories in a full cup of whole milk is a random variable with mean 140. For breakfast you eat one ounce of the cereal with $\frac{1}{2}$ cup of whole milk. Let Z be the random variable that represents the total number of calories in this breakfast. The mean of Z is
- (A) 110
 (B) 250
 (C) 140
 (D) 195
 (E) 180

Short Answer:

8. Let X denote the number of broken eggs in a randomly selected carton of one dozen "Smith's brand" eggs at Smith's Supermarket. Suppose that the probability distribution of X is as follows:

X	0	1	2	3	4
$P(X)$	0.52	0.25	0.13	.06	

- a. What is the $P(4)$? How did you get this number?
- b. What is the probability that the carton contains at most two broken eggs? _____
- c. What is the probability that the carton contains exactly ten unbroken eggs? _____
- d. Find the mean, μ_X , of X .
- e. Find the variance and standard deviation of X .
- f. Suppose that TWO egg cartons are randomly selected. Let Y be the random variable representing the sum of the number of broken eggs in the two cartons ($Y = X + X$). Find the mean and standard deviation of Y .

9. A box contains eight \$1 bills, six \$2 bills, five \$5 bills, three \$10 bills, two \$20 bills, and one \$100 bill. A person can reach into the box (without looking) and select a single bill. A person is charged \$10 to select one bill.
- Identify the random variable (in words). $X =$ _____
 - Construct a probability distribution for this data.
 - Find the expected value of the game.
 - Is the game fair? Explain briefly.
 - If you reach into the box and randomly select one bill, what is the probability you will get more than \$5?
10. The heights of women in the United States has a normal distribution with mean 64.5 inches and standard deviation of 2.5 inches. What is the probability that a woman is taller than 68.8 inches?
11. Amarillo Slim, a professional dart player, has a 64% chance of hitting the bullseye on a dartboard with any throw. Suppose that we are interested in the occurrence of the first bullseye.
- The random variable X is geometric. Define X . $X =$ _____
 - Find the probability that the first bullseye occurs on the third throw.
 - Find the probability that the first bullseye occurs before the sixth throw.
 - What is the probability that it takes more than 4 throws for the first bullseye?
 - How many throws do we expect Amarillo to throw to get a bullseye?

12. *Ladies Home Journal* magazine reported in 1993 that 66% of all dog owners greet their dog before greeting their spouse or children when they return home at the end of the work day. Suppose that 12 dog owners are selected at random.
- Show that the four requirements for a binomial setting are satisfied.
 - Define the random variable: $X =$ _____
 - Find the probability that exactly seven of the 12 dog owners greet their dog first when they arrive home. (Show work below).
 - Find the probability that at least 5 of the 12 dog owners greet their dog first when they arrive home.
 - What is the probability that less than 3 dog owners greet their dog first when they arrive home?
 - What is the expected number of dog owners who greet their dog first when they arrive home?
 - Find the standard deviation for the random variable X in this problem.

Review: Please circle the best answer.

13. There are three children in a room, ages three, four, and five. If a four-year-old child enters the room the
- mean age will stay the same but the variance will increase.
 - mean age will stay the same but the variance will decrease.
 - mean age and variance will stay the same.
 - mean age and variance will increase.
 - mean age and variance will decrease.

14. A study found correlation $r = 0.61$ between the sex of a worker and his or her income. You conclude that
- (a) Women earn more than men on the average.
 - (b) Women earn less than men on average.
 - (c) An arithmetic mistake was made; this is not a possible value of r .
 - (d) This is nonsense because r makes no sense here.
15. Suppose we fit the least squares regression line to a set of data. What do we call any individual points with unusually large values of the residuals?
- (a) Response variables
 - (b) The slope
 - (c) Outliers
 - (d) Correlations
 - (e) None of the above
16. A nutritionist wants to study the effect of storage time (6, 12, and 18 months) on the amount of vitamin C present in freeze dried fruit when stored for these lengths of time. Vitamin C is measured in milligrams per 100 milligrams of fruit. Six fruit packs were randomly assigned to each of the three storage times. The treatment, experimental unit, and response are respectively:
- (a) A specific storage time, amount of vitamin C, a fruit pack
 - (b) A fruit pack, amount of vitamin C, a specific storage time
 - (c) Random assignment, a fruit pack, amount of vitamin C
 - (d) A specific storage time, a fruit pack, amount of vitamin C
 - (e) A specific storage time, the nutritionist, amount of vitamin C
17. You play tennis regularly with a friend, and from past experience, you believe that the outcome of each match is independent. For any given match you have a probability of .6 of winning. The probability that you win the next two matches is
- (a) 0.16
 - (b) 0.36
 - (c) 0.4
 - (d) 0.6
 - (e) 1.2