

**AP STATISTICS  
REVIEW: FIRST SEMESTER**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**A. Multiple choice.**

1. Cars are grouped into the following classes: Subcompact, compact, midsize, and full-sized. This data is  
  
A. ordinal    B. nominal    C. ratio    D. interval    E. binomial
2. A machine stamps out metal pieces. The machine operator checks every tenth piece to make sure the size is correct. This is an example of  
  
A. random sampling    B. systematic sampling    C. cluster sampling  
D. stratified sampling    E. quota sampling.
3. A package of 10 calculators shipped to a store contains two defective calculators. What is the probability of buying two of the calculators and ending up with exactly one of the defective ones?  
  
A. 20%    B. 25%    C. 33%    D. 36%    E. 50%
4. A school PTA runs a lottery. They sell 5,000 tickets at a \$1.00 per ticket and award prizes of \$1,000, \$500, and \$200 to the lucky winners. What is the expected gain or loss of a person who buys one ticket?  
  
A. Loss of \$1    B. Loss of \$0.66    C. Loss of \$0.50  
D. Loss of \$0.34    E. Gain of \$0.20
5. If one-third of all students applying to Yalvard College are accepted, what is the probability that one of the next three students applying will be accepted?  
  
A. 25%    B. 30%    C. 33%    D. 38%    E. 44%
6. In a study of peoples work habits, 16 federal employees are chosen at random, and the number of days they worked during one month is determined. The average number of days worked per person is 20. If 12 of the people worked 19 days during the month, how many days did the other 4 people work?  
  
A. 20    B. 21    C. 22    D. 23    E. 24

7. In a sample of 12 people in an exercise class, their ages are given as follows:

26 37 20 22 29 31 30 29 24 33 35 28

What is the inter-quartile range of the ages?

- A. 0                      B. 2.5                      C. 5                      D. 7                      E. 8.5
8. A deck of playing cards has 52 total cards of which 12 are face cards. What is the approximate probability of choosing 3 cards in a row without replacement and getting all 3 face cards?
- A. 0.1%                      B. 0.5%                      C. 1%                      D. 2%                      E. 6%
9. If a couple getting married today can be expected to have 0, 1, 2, 3, 4, or 5 children with probabilities of 20%, 20%, 30%, 20%, 8%, and 2% respectively, what is the average number of children, to the nearest tenth, couples getting married today have?
- A. 1.0                      B. 1.8                      C. 2.0                      D. 2.2                      E. 2.8
10. A fire company averages 5 calls a day. What is the probability that they will have only 3 calls today?
- A. 20%                      B. 14%                      C. 12%                      D. 86%                      F. 26.5%
11. A well-balanced coin is flipped 100 times. What is the approximate probability of getting more than 51 heads?
- A. 62%                      B. 46%                      C. 54%                      D. 38%                      E. 50%
12. A tennis player is successful in getting an “ace” on 12% of his serves. If he serves 50 times in his next match, how many aces can he expect to serve?
- A. 12                      B. 2                      C. 20                      D. 14                      E. 6
13. A few weeks before city council elections, a sociologist must conduct a poll to predict potential winners. With a limited budget, she must conduct the poll in a single location and on one day. In which of the following locations is he most likely to obtain the fairest sample?
- A. A supermarket                      B. A church                      C. A golf club
- D. A movie theater                      E. A beauty salon

14. At a party of 10 men and 20 women, 4 of the men and 10 of the women are smokers. If 2 men and 2 women are randomly selected, what is the probability that all 4 of these people are smokers?
- A. 0.312      B. 0.133      C. 0.040      D. 0.032      E. 0.020
15. On a charter flight, the mean weight of all the children aboard the plane was 70 pounds, and their total weight was 1050 pounds. How many children were aboard the plane?
- A. 15      B. 7      C. 10      D. 12      E. 8
16. A population of data has mean of 24 and standard deviation of 4. Using Chebyshev's Theorem, what is the minimum fraction of data whose value lies between 18 and 30?
- A.  $\frac{1}{3}$       B.  $\frac{1}{2}$       C.  $\frac{5}{9}$       D.  $\frac{7}{10}$       E.  $\frac{4}{5}$
17. The coefficient of variation for a sample is 0.40. If the standard deviation is 5, what is the value of the mean?
- A. 12.5      B. 10      C. 7.5      D. 4.5      E. 2
18. A particular population of data is negatively skewed. If the mean is 10 and the mode is 25, what **must** be true about the value of the median?
- A. It must be less than 25.      B. It must be less than 10.  
C. It must be greater than 10.      D. It must lie between 10 and 25.
19. A coach found that about 12% of all hockey games end in overtime. What is the expected number of games ending in overtime if a random sample of 50 hockey games are played?
- A. 3      B. 4      C. 5      D. 6      E. 7
20. A six-sided die is rolled repeatedly. What is the probability that the first 6 rolled will occur on the fourth roll?
- A. 0.080      B. 0.096      C. 0.116      D. 0.005      E. 0.167

B. Free Response.

1. The probability that merchandise stolen from a store will be recovered is 15%. Suppose a random sample of 8 stores, from which merchandise has been stolen, is chosen.
  - a. Find the probability that exactly 2 of these stores will recover their merchandise.
  - b. Find the probability that at most one store will recover their merchandise.
  - c. Find the expected number of stores that will recover their merchandise in this sample.
  - d. Find the standard deviation of the probability distribution.
2. In a certain lottery game, there are ten finalists for the \$100,000 grand prize. One grand prize winner is to be selected at random to receive this prize. If each contestant paid \$5 for their ticket, what is each player's expected value of their ticket?

3. At the Stager School of Nursing, 85% of incoming freshman are female. Recent records indicate that 70% of entering female students will graduate with a BSN degree, while 90% of the male students will obtain a BSN degree. If an incoming freshman nursing student is selected at random, find
- a.  $P(\text{student will graduate, given the student is female})$ .
  - b.  $P(\text{student will graduate and student is a female})$ .
  - c.  $P(\text{student will graduate, given student is male})$ .
  - d.  $P(\text{student will graduate and student is male})$ .
  - e.  $P(\text{student will graduate})$ .
4. In question 3 above, 10 incoming freshman are randomly selected. Find the probability that
- a. exactly 7 will be female students.
  - b. at least 7 will be female students.
  - c. at most 2 will be male students.

5. In Chemistry class, weights are assigned to required activities as follows:

Participation = 15%, Exam 1 = 20%, Exam 2 = 20%, Exam 3 = 20%, Labs = 25%

Each activity is graded on a 100 point scale. Mary earned 70 points on participation, 80 points on exam 1, 64 points on exam 2, 77 points on exam 3, and 96 points on labs. What is Mary's overall average in Chemistry?

6. Identify each of the following samples by naming the sampling technique used (cluster, convenience, simple random, stratified, systematic).
- a. Measure the length of time every fifth person coming into a bank waits for teller service over a period of two days.
  - b. Take a sample of 5 Zip codes from the Chicago metropolitan region and use all the elementary schools from each of the Zip code regions. Determine the number of students enrolled in first grade in each of the schools selected.
  - c. Divide the users of a computer online service into different age groups and then select a random sample from each age group to survey the amount of time they are using the internet each week.
  - d. Survey five friends about their opinion of the student cafeteria.
  - e. Pick a random sample of students enrolled at your school and determine the number of times each has used guidance services.
  - f. Check every 10<sup>th</sup> item on an assembly line for defects.

7. Identify the statistical display ( Time plot, Bar graph, Pareto chart, Ogive, or Circle graph) which is the most appropriate for each situation.
- a. Identify the frequency of events or categories in decreasing order of frequency of occurrence.
  - b. Are useful for both quantitative or qualitative data. With qualitative data, the frequency or percentage of occurrence can be displayed. With quantitative data, the measurement itself can be displayed.
  - c. Display how a total is dispersed into several categories.
  - d. Display how data change over time. It is best if the units of time are consistent.
  - e. Display cumulative frequencies.
8. Find the mean and 10% trimmed mean for the annual snowfalls (in inches) for a city in northern Wisconsin. Which is the most representative of the average annual snowfall? Why?

24      37      28      13      38      29      112      21      40      36

9. The average number of customers entering a store in a 20 minute period is 6 customers.
- What is the probability that, in any 20 minute period, four customers will enter the store?
  - What is the probability that, in any 20 minute period, at most four customers will enter the store?
  - What is the probability that, in a given hour, at least 15 customers will enter the store?
10. Let the random variable  $X$  represent the number of telephone lines in use by a technical support center of a software manufacturer at noon each day. The probability distribution of  $X$  is shown in the table below.

$X$	0	1	2	3	4	5
$P(X)$	0.35	0.20	0.15	0.15	0.10	0.05

- Calculate the expected value of  $X$ .
- Using past records, the staff at technical support randomly selected 20 days and found an average of 1.25 telephone lines were in use at noon on those days. The staff proposes to select another random sample of 1,000 days and compute the average number of telephone lines that were in use at noon on those days. How do you expect the average from this new sample to compare to that of the first sample? Justify your response.



- c. The median of a random variable is defined as any value  $x$  such that  $P(X \leq x) \geq 0.5$  and  $P(X \geq x) \geq 0.5$ . For the probability distribution shown in the table above, determine the median value of  $X$ .
- d. In a sentence or two, comment on the relationship between the mean and the median relative to the shape of this distribution.