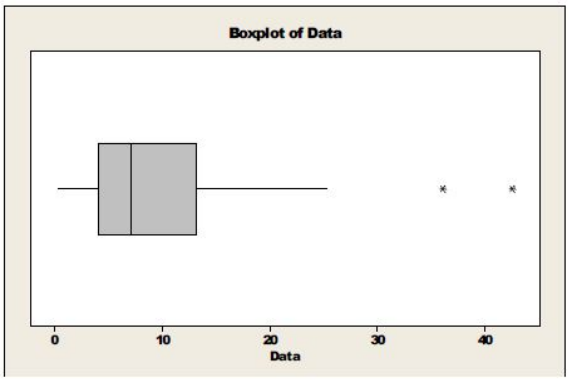
STAT 2507
SAMPLE MIDTERM TEST
FALL 2014

Note: The sample midterm test does NOT predict the size and content of the actual midterm test. Also note some answers are rounded off.

Please circle one answer only.

The first two questions are based on the following boxplot.



1. Which one of the following statements about the distribution above is correct:

   (a) Symmetric and has no outlier.
   (b) Skewed to the left and has outliers(s).
   (c) Skewed to the right and has outlier(s).
   (d) Symmetric but the mean and the median are different.

2. Which one of the following statements is false?

   (a) The mean is larger than the median.
   (b) The median is approximately equal 7.
   (c) The maximum value is approximately 43.
   (d) The maximum value is approximately 25.

3. The following data represent a sample of 10 scores on a statistics quiz:

   21 21 21 21 21 23 23 25 25 25

   After the mean, median, range and variance were calculated for the scores, it was discovered that one of the three 25's should have been a 23. Which of the following will change when the calculations are redone using the correct scores?

   (a) Both mean and range.
   (b) Only the median.
   (c) Both variance and range.
   (d) Both mean and variance.

4. Suppose you roll a pair of fair dice. What is the probability that the number of dots on the two dice sum to either 5 or 10?

(a) 5/36 **(b)** 7/36 **(c)** 11/36 **(d)** 4/36

5. Suppose that $P(A) = 0.4$, $P(B) = 0.3$, and $P(A \cap B) = 0$. Which one of the following statements correctly defines the relationship between the events A and B?

(a) The events A and B are independent, but not mutually exclusive.
(b) The events A and B are mutually exclusive, but not independent.
(c) The events A and B are neither mutually exclusive nor independent.
(d) The events A and B are both mutually exclusive and independent.

6. During a particular period a university's information technology office received 25 service orders for problems with printers, of which 5 were inkjet printers and 20 were laser models. A random sample of 4 of these service orders is selected for inclusion in a customer satisfactory survey. What is the probability that exactly 3 of the selected service orders were for inkjet printers?

(a) $\frac{C_3^5 C_1^{20}}{C_5^{25}}$ **(b)** $\frac{C_3^5 C_2^{20}}{C_5^{25}}$ **(c)** $\frac{C_1^5 C_3^{20}}{C_4^{25}}$ **(d)** $\frac{C_3^5 C_1^{20}}{C_4^{25}}$

7. According to a survey of adults, 64% have money in a regular savings account. If we plan on surveying 50 randomly selected adults, find the mean number of adults who would have regular savings accounts.

(a) 12 **(b)** 22 **(c)** 32 **(d)** 42

8. Suppose an experiment involving five subjects is conducted to determine the relationship between the percentage of a certain drug in the bloodstream and the length of time it takes to react to a stimulus. The results are shown in the table below.

Reaction Time versus Drug Percentage

Subject	Percent x of Drug	Reaction Time y (seconds)
1	1	1
2	2	1
3	3	2
4	4	2
5	5	4

Using the fact that $\sum x_i = 15$, $\sum y_i = 10$, $\sum x_i^2 = 55$, $\sum y_i^2 = 26$, and $\sum x_i y_i = 37$, find the correlation coefficient for the reaction time, y, and the amount of drug in the bloodstream, x, and decide what is the relationship (if any) between x and y.

(a) There is a strong negative linear relationship between x and y.
(b) There is a strong positive linear relationship between x and y.
(c) There is a weak positive linear relationship between x and y.
(d) There is no linear relationship between x and y.

9. Thirty students in a experimental psychology class use various techniques to train a rat to move through a maze. At the end of the course, each student's rat is timed as it negotiates the maze. The sample mean and the sample standard deviation of times of 30 rats running through a maze (in minutes) were found to be $\bar{x} = 3.74$ and $s = 2.20$. Using Chebyshev's inequality, at least how many of the 30 running times will fall in the interval $(-0.66, 8.14)$?

(a) at least 22 **(b)** at least 23 **(c)** at least 8 **(d)** at least 11

10. If 5% of men and 0.25% of women are colour blind, what is the probability that a randomly selected person is colour blind? We assume that it is equally likely that a selected person will be a man or a woman.

(a) 0.731 **(b)** 0.143 **(c)** 0.189 **(d)** 0.026

11. Suppose that in a particular city, airport A handles 40% of all airline traffic, and airports B and C handle 40% and 20%, respectively. The detection rates for weapons at the three airports are 0.9, 0.5, and 0.4, respectively. If a passenger is found to be carrying a weapon, what is the probability that he is using airport A?

(a) 0.64 **(b)** 0.56 **(c)** 0.89 **(d)** 0.67

12. A salesman of small-business computer systems will contact three customers during a week. Each contact can result in either a sale, with probability 0.3, or no sale, with probability 0.7. Assume that customer contacts are independent. If X denotes the number of computer systems sold during the week, then the probability $P(X = 1)$ equals

(a) 0.784 **(b)** 0.441 **(c)** 0.216 **(d)** 0.528

13. Refer to the previous question. What is the value of $E(2X + 1)$?

(a) 2.6 **(b)** 3.8 **(c)** 2.8 **(d)** 4.0

14. For the probability distribution of a discrete random variable X, the probability of any single value of X is always

(a) in the range 0 to 1
(b) equal to 1
(c) less than zero
(d) greater than 1

Midterm Sample Questions

1. If the histogram of some measurements is skewed to the right, then which of the following is the correct order of the first quartile (Q_1), second quartile (Q_2) and the third quartile (Q_3)?

   a. $Q_1 = Q_2 = Q_3$
   b. $Q_1 > Q_2$ and $Q_1 > Q_3$
   c. $Q_3 > Q_2 > Q_1$
   d. $Q_1 > Q_2 > Q_3$

2. See the following stem-and-leaf plot with leaf unit=10.

4	7
5	2 3 3 4
5	5 6 6 8 9 9
6	1 2 2

   which one of the followings is true?
   a. There is exactly one mode in the measurements
   b. The median is half way between the sixth and the seventh lowest observations
   c. There is 18 observations
   d. The third quartile is one-fourths of way between the 11th and the 12th observation

3. In order to determine the quality of a shipment of 20 parts, a sample of 3 items is randomly selected without replacement from the shipment. Four of the 20 items in the shipment are actually defective. Let Y be a random variable representing the total number of defective items in the sample. Then P(Y = 1) is
   a. 0.48 b. 0.60 c. 0.08 d. 0.42 e. 0.92

4. We have three identical Boxes I, II and III. Each box has two drawers. Each drawer of Box I contains a gold coin. One drawer of Box II has a gold coin and the other one contains a silver coin and each drawer of Box III contains a silver coin. We choose one of the boxes in random and we open one of its drawers. If that drawer contains a gold coin then what is the probability that the second rawer contains a gold coin too?

   a. $\frac{1}{2}$ b. $\frac{2}{3}$ c. $\frac{1}{3}$ d. $\frac{1}{6}$

5. The probability that a customer will buy a product given that he or she has seen an advertisement for the product is 0.15. The probability that a consumer will see an ad for this particular product is 0.20. What is the probability that a consumer will both see the ad and buy the product?
   a. 0.75 b. 0.05 c. 0.35 d. 0.03 e. 0.075

6. Consider the following variables:
   (1) A womans favorite TV program.
   (2) The salary of a football players.
   (3) The number of pets owned by a family.
   (4) Total claims paid by 15 auto insurance companies in 2005.
   (5) The colour of a car.
   (6) A persons marital status.
   (7) The length of frogs jump.
   (8) Spring break locations favored by college students.
   (9) A persons ethnic background.
   The categorical or qualitative variables in this list are given by:
   a. (1), (3), (4), (8), and (9). b. (2), (4), and (7).
   c. (2), (5), and (6). d. (1), (5), (6), (8), and (9).

7. If $P(A \cup B) = 0.8$, $P(A) = 0.3$, and $P(B) = 0.6$, what is $P(A \cap B')$?
   a. 0.1 b. 0.2 c. 0.3 d. 0.4 e. 0.6

8. Suppose that X is a random variable with probability distribution: $P(X = k) = 0.02k$, where k takes the values 8 , 12 , 10 , 20 . Find the mean of X .
   a. 12.20 b. 14.16 c. 10.12 d. 12.82

9. Your professor erases the board in class according to a Poisson process with an average of 2 times every 30 minutes. What is the probability that your professor will erase the board exactly 5 times during a 90 minute class?
   a. 0.5420 b. 0.1606 c. 0.0030 d. 0.4124 e. 0.0361

10. A rifleman has a 20% chance of hitting a target, with all attempts being independent of each other. If he shoots at a target 10 times, what is the probability he will hit the target at least once?
    a. 0.8926 b. 0.8000 c. 0.2000 d. 0.2684 e. 0.7316

11. Suppose you roll a pair of fair dice. What is the probability that the number of dots on the two dice sum to a number that is divisible by 3?
    a. 3/36 b. 2/36 c. 18/36 d. 12/36 e. 9/36

12. Five percent of all items sold by a mail-order company are returned by customers for a refund.
    I) The probability that, of two items sold during a given hour by this company, both will be returned for a refund is
    a. 0.05 b. 0.0025 c. 0.9025

II) The probability that, of two items sold during a given hour by this company, exactly one item will be returned for a refund is

a. 0.095 b. 0.0475 c. 0.5

13. Suppose a random variable X has a unknown distribution with a mean of 50 and a standard deviation of 5. Which of the following statements is true?

(1) At least 75% of all values fall between 40 and 60.

(2) At least 88.89% of all values fall between 35 and 65.

(3) At most 25% of all values fall below 40 or above 60.

a. 1, 2, and 3 b. 1 and 2 c. 1 and 3 d. 2 only

e. We cannot say anything unless we know the actual distribution.

14. The value of the middle term in a ranked (ordered) data set is called the

a. mean b. median c. mode

15. Which of the following summary measures is influenced by outliers (extreme values)?

a. mean b. median c. mode

16. The values of the variance and standard deviation are

a. never negative b. always positive c. never zero

17. A summary measure calculated for the population data is called

a. a population parameter b. a statistic c. an outlier

18. Chebyshevs Theorem can be applied to

a. any distribution b. bell-shaped distributions only c. skewed distributions only

19. The Empirical Rule can be applied to

a. any distribution b. bell-shaped distributions only c. skewed distributions only

20. The first quartile is a value in a ranked (ordered) data set such that

a. At least 75% of the values are at or below this value and at least 25% are at or above this value

b. At least 50% of the values are at or below this value and at least 50% are at or above this value

c. At least 25% of the values are at or below this value and at least 75% are at or above this value

21. The collection of all outcomes for an experiment is called
a. a sample space b. the intersection of events c. joint probability

22. The probability of an event is always
a. less than 0 b. in the range 0 to 1 c. greater than 1

23. Two mutually exclusive (disjoint) events
a. have the same probability b. cannot occur together c. have no effect on the occurrence of each other

24. Two independent events A and B such that $0 < P(A) < 1$ and $0 < P(B) < 1$ are
a. always mutually exclusive b. never mutually exclusive c. always complementary

25. Let X be the number of errors that appear on a randomly selected page of a book. The following table gives the probability distribution of X.

x	0	1	2	3	4
$p(x)$	0.73	?	0.06	0.04	0.01

The $E(X)$ is
a. 0.44 b. 0.28 c. 0.35

26. Suppose that for two events A and B we have P(A) = 0.5 and P(B) = 0.3. If A and B are mutually exclusive, then the values of $P(A \cap B)$ and $P(A \cup B)$ are, respectively,

a. 0 and 0.15, b. 0.15 and 0.8 c. 0.2 and 0.8, d. 0 and 0.8.

27. A sample of 99 durations has a mean of 38 seconds and a median of 42 seconds. Unfortunately, it has just been discovered that an observation which was incorrectly recorded as 35 actually had a value of 25. If we correct this mistake in the data, which of the following things will happen?

(a) The median remains the same, but the mean is increased
(b) The mean and median both remain the same.
(c) The median remains the same, but the mean is decreased.
(d) We do not know how the mean and median are effected without knowing all the data measurements, but we know that the variance is increased.

28. Let X be a random variable with mean μ and standard deviationσ. Based on the empirical rule, the probability that X will fall in the interval $\mu \pm \sigma$ is at least

a. 0.5 b. 0.25 c. 0.95 d. 0.68

29. Consider the following set of data 4 5 2 8 4 3 8 9. The mean and the variance for this set are

    a. 5.37 and 34.87 b. 43 and 34.87 c. 5.37 and 6.84 d. 5.37 and 5.98

30. The probability that a customer will buy a product given that he or she has seen an advertisement for the product is 0.15. The probability that a consumer will see an ad for this particular product is 0.20. What is the probability that a consumer will both see the ad and buy the product?

    a. 0.75 b. 0.05 c. 0.35 d. 0.03

31. In order to determine the quality of a shipment of 20 parts, a sample of 3 items is randomly selected without replacement from the shipment. Four of the 20 items in the shipment are actually defective. Let Y be a random variable representing the total number of defective items in the sample. Then $P(Y = 1)$ is

    a. 0.48 b. 0.60 c. 0.08 d. 0.42

32. A city planner claims that 20% of all apartment dwellers move from their apartments within a year from the time they first moved in. In a particular city, 7 apartment dwellers who had given notice of termination to their landlords are to be interviewed. What is the probability that at least 6 will have lived in their apartment for more than a year?

    a. 0.00037 b. 0.36700 c. 0.57617 d. 0.4233