STATISTICS 216

Practice Exams

Instructions: Before you take these exams you must accomplish the **objectives** of the course (attending classes, studying, doing homework, and practicing problems). If you are ready to take this exams, you should spend no more than two minutes per question, on the average. The duration of a regular exam is 60 minutes (25 questions), except the final that has a duration of 1 hour and 50 minutes (40 questions). Closed book. Closed notes. Calculator allowed.

NO CELL PHONES.

NOTE: Regular Exams are not necessarily similar to Practice Exams.

Multiple Choice Questions (4 pts each). Circle the SINGLE best answer to each question.

Show Your Work Questions (4 pts each). You must show all your work

True/False Questions (2 pts each).

PRACTICE EXAM 1

1. Suppose you and your classmates take a very difficult exam. Your teacher is feeling kind and decides to add 10 points to everyone's exam score. How does the sample mean and sample standard deviation change after the 10 points are added?

   A. The sample mean and sample standard deviation each increase by 10.

   B. Only the sample mean increases by 10.

   C. Only the sample standard deviation increases by 10.

   D. Neither the sample mean nor the sample standard deviation increase by 10.

2. Which of the following is a resistant measure of variability?

   A. standard deviation

   B. range

   C. interquartile range

   D. median

   E. both C. and D.

3. Without doing any calculations, which of the following sets of numbers has the largest standard deviation?

   A. 10, 20, 30, 40, 50, 60, 70

   B. -10, -20, -30, -40, -50, -60, -70

   C. 70, 70, 70, 70, 70, 70, 70

   D. -70, -50, -30, -10, 20, 40, 60,

4. Consider the following data set. Which value(s) would be considered suspected outlier(s)? [Hint: Use the 1.5(IQR) rule for outliers.]

   -10, 1, 4, 6, 7, 9, 10, 11, 19, 23

   A. -10

   B. 19, 23

   C. -10, 23

   D. -10, 19, 23

5. Which graph(s) is(are) useful for displaying the distribution of a single quantitative variable?

   A. Histogram

   B. Boxplot

   C. Stemplot

   D. All of the above

6. TRUE or FALSE: Political affiliation is a quantitative variable.

7. TRUE or FALSE: Interquartile range (IQR) is a resistant measure of spread.

8. Which of the following measures is resistant to outliers?

   A. correlation

   B. mean

   C. median

   D. standard deviation

9. Which of the following data values (if any) would be considered an outlier according to the 1.5(IQR) rule for identifying outliers?

   5 9 13 15 22 22 23 30 36 55

   The Five-number summary is: 5, 13, 22, 30, 55

   A. 36 and 55

   B. 55 only

   C. 5 and 55

   D. There are no outliers.

10. For each of the following characteristics of an individual, indicate whether the variable is categorical or quantitative.

    (a) Categorical or Quantitative The amount of money in a STAT 216 student's pocket

    (b) Categorical or Quantitative Marital status

    (c) Categorical or Quantitative The area code of a phone number

11. Which of the following is not a measure of center?

    A. Mean

    B. Median

    C. Standard deviation

    D. A., B., and C. are all measures of center.

12. If the variance of a distribution is 9, the standard deviation is:

    A. 3

    B. 6

    C. 9

    D. 81

    E. impossible to determine without knowing n.

13. The standard deviation of a group of scores is 10. If 5 were subtracted from each score, the standard deviation of the new scores would be

    A. 2

    B. 5

    C. 10

    D. none of these.

14. Suppose a dentist office keeps track of the number of new cavities discovered during a child's dental exam. The mean number of new cavities is 1.15 with a standard deviation of 0.35. The child's parents are charged $50 for the exam plus $20 for the treatment of each cavity. The total cost (exam plus treatment) for a child with X cavities is 50 + 20X. What is the mean and standard deviation of the total cost, 50 + 20X?

    A. mean = 73 and standard deviation = 57

    B. mean = 73 and standard deviation = 7

    C. mean = 77.5 and standard deviation = 57

    D. mean = 77.5 and standard deviation = 7

15. The median weight for a group of men is 65 kg; the mean is 75 kg. Based on your knowledge of the mean and median, which of the following histograms could produce a median of 65 and mean of 75?

    Histogram skewed right

    Histogram skewed left

    Histogram that is symmetric

16. The temperature inside a freezer is normally distributed with a mean of $\mu = -6$ degrees Celsius and a standard deviation $\sigma = 4$ degrees Celsius. The linear transformation from degrees Celsius to degrees Fahrenheit is F = 1.8C + 32 where C is degrees Celsius and F is degrees Fahrenheit. What are the mean and the standard deviation of the temperature inside a freezer in degrees Fahrenheit? Give 4 decimal places.

17. Side-by-side boxplots comparing the distributions of income (in dollars) for people aged 25 to 64 with five different levels of education are displayed in Figure 1.21 from your textbook (Page 61). These data are used to study how a person's level of education affects their income.

    (a) What is the explanatory variable?

    (b) What is the response variable?

    (c) Write a single sentence describing how the spread of the distributions change as you move from the lowest level of education (not HS grad) to the highest level of education (Advanced).

18. Consider the following data: 1; 7; 3; 3; 6; 4 The mean and median for this data are:

    A. mean = 4, median = 3

    B. mean = 4.8, median = 3.5

    C. mean = 4, median = 3.3

    D. mean = 4.8, median = 3

    E. mean = 4, median = 3.5

19. Listed below are two sample data sets, A and B. Which data set has the larger standard deviation? (Hint: you can answer this question by simply inspecting the two data sets.)

    Data Set A: 1, 2, 3, 4, 5, 6, 7, 8, 9

    Data Set B: 8, 9, 9, 9, 10, 11, 11, 12

    A. Data Set A

    B. Data Set B

20. TRUE or FALSE: If the distribution of housing prices in Bozeman is right-skewed, then the mean housing price is greater than the median housing price.

21. As part of the coursework, a class collects data on streams each year. The table shows data on the substrate of the stream.

Substrate	Number of Streams
Limestone	77
Mixed	26
Shale	69

    Which of the following is an appropriate graphical summary for this data?

    A. Histogram

B. Bar graph

C. Scatterplot

D. Stemplot

22. Measurements of 30 student's heights (in feet) are entered into a computer for analysis. An overworked clerk enters the height of the tallest girl in inches instead of feet. Which of the following would all change if the measurement was corrected.

A. mean, median, and IQR

B. mean, IQR, and range

C. median and standard deviation

D. mean and standard deviation

23. A set of 7 systolic blood pressures is 121, 108, 130, 158, 100, 116, 125 What is the median systolic blood pressure?

A. 100

B. 121

C. 122.57

D. 158

24. For an exam given to a class, the student's scores ranged from 35 to 98, with a mean of 74. Which of the following is the most realistic value for the standard deviation?

A. -10

B. 0

C. 63

D. 13

25. A counseling student is planning to take a survey of student attitudes toward marriage. She develops a questionnaire and plans to ask 15 randomly selected students to fill it out. Her advisor urges that the sample size be increased to at least 100 students. Why is the large sample size helpful?

A. Larger samples always reduce bias.

B. Larger samples always increase bias.

C. Larger samples always reduce the variability of the statistic.

D. Larger samples always increase the variability of the statistic.

26. When estimating a population parameter, it is desirable to use a statistic having

A. low bias and high variability.

B. low bias and low variability.

C. high bias and low variability.

D. high bias and high variability.

27. Suppose that a researcher wants to sample various retail stores. Also suppose that 25% of the retail stores are small in regards to square footage, 25% are medium and 50% are large. Which data collection procedure would assure that a sample of 60 retail stores would contain stores representing all three sizes?

A. Simple Random Sampling

B. Randomized Block Design

C. Stratified Random Sampling

D. Completely Randomized Design

28. In a study of the effects of three diets with varying fat content on the lipid (fat) level in blood plasma, fifteen men who were within 20% of their ideal weight were grouped into five groups according to age. The three diets were randomly assigned to the subjects within each age group. Data on plasma lipid level (in grams per liter) were collected after the subjects were on the diets for a fixed period of time. Which of the following best describes the design used to collect the data?

A. A completely randomized design where the diets are the treatments.

B. A completely randomized design where the ages are the treatments.

C. A randomized block design with the diets as the blocking variable and ages as the treatments.

D. A randomized block design with the ages as the blocking variable and diets as the treatments.

E. None of the above. This is an observational study, not an experiment.

29. The general manager of a large corporation randomly selected 150 employees to determine the adequacy of the company's medical plan. When the selected employees were asked whether or not the medical plan was adequate, 54% responded "yes, the medical plan is adequate". The value 54% is

A. a parameter.

B. a statistic.

C. a sample of employees.

D. a population of interest.

Use the following description to answer the following three questions.

A group of college students believes that herbal tea has remarkable restorative powers. To test their theory they make weekly visits to a local nursing home, visiting with residents, talking with them, and serving them herbal tea. After several months, many of the residents are more cheerful and healthy.

30. Which of the following may be correctly concluded from this study?

A. The results of the study are not convincing since the effect of herbal tea is confounded with several other factors.

B. There is some evidence that herbal tea may improve one's emotional state. The results would be completely convincing if scientists had visited the residents rather than college students.

C. Herbal tea does improve one's emotional state, at least for the residents of nursing homes.

D. The results of the study are convincing since serving herbal tea caused the nursing home residents to be more cheerful and healthy.

31. What is the explanatory variable in this experiment?

A. Herbal tea.

B. The college students.

C. The fact that this is a local nursing home.

D. The emotional state of the residents.

32. What is the lurking variable in this experiment?

A. The emotional state of the residents.

B. Herbal tea.

C. The fact that this is a local nursing home.

D. Visits of the college students.

33. Experiments are conducted to establish which of the following?

A. common response

B. confounding

C. causation

D. independence

34. In a randomized block design, a block is

A. a group of treatments.

B. a group of survey questions to ask of the chosen sample.

C. a group of experimental units expected to be similar before the experiment is performed.

D. a group of subjects expected to be similar before the stratified random sample is taken.

35. To reduce sampling bias, we need to

    A. increase the sample size.

    B. decrease the population size.

    C. randomize appropriately.

    D. avoid the use of randomization.

36. In order to determine if living next to high-voltage power lines increases your chance of getting cancer, researchers selected several homes at random, determined if they were within 50 yards of a high-voltage power line, and recorded whether anyone in the home had cancer. They compared the proportion of cancer cases in homes within 50 yards of a high-voltage power line to the proportion in homes more than 50 yards from a high-voltage power line. This is

    A. a matched-pairs experiment.

    B. an experiment, but not a double-blind experiment.

    C. an observational study.

    D. none of the above.

37. A Yellowstone wildlife biologist wants to know if visitors to the park have seen any wolves. She obtains this information by randomly selecting people at the Old Faithful Visitors Center to interview. Which bias has been described here?

    A. undercoverage

    B. nonresponse

    C. response

    D. none of the above

38. TRUE or FALSE: The design of a study is biased if it systematically favors certain outcomes.

39. TRUE or FALSE: Sampling variability refers to the way a parameter will vary from population to population.

    Matching.

    Specify which of the following procedures is being described in the next three problems.

    A. Simple Random Sample   D. Completely Randomized Design
    B. Stratified Random Sample   E. Randomized Block Design
    C. Double-blind Sample   F. Matched-pairs Design

40. _____ This study was proposed by a consumer products agency to decide which of three brands of insect repellent (Bug-B-Gone, Die-Sect, Bite-Not) provides the greatest protection from mosquito bites. There are 18 children participating in this study. Each child is randomly assigned to one of the insect repellents, with six children receiving each brand. After the repellents are applied, the children are sent out to play on a humid summer evening. After one hour, the number of mosquito bites each child received will be recorded.

41. _____ A biologist is interested in estimating a deer population total in a small geographic region. The region contains two different habitat types which are known beforehand to influence deer abundance. From each habitat type, n plots are randomly selected to be surveyed.

42. _____ A study was performed to compare the effects of three ointments (A, B, and C) for treating eye infections in dogs. A trained veterinarian examined each dog and classified the eye infection into one of two classes: minimal or severe. In each class, dogs were randomly assigned to receive ointment A, B, or C.

43. A survey of 100 residents of a school district is taken. The participants are asked "What do you think is the average teacher's salary?". The mean of the responses was $23,850. The school board later reported that the average of all teacher's salaries was $21,500 and that 80% of all teachers had received a raise in the previous year. The following numbers appeared in this paragraph as either a statistic or a parameter. After each number, write whether it is a statistic or a parameter.

    $23,850 _____ $21,500 _____   80% _____

44. Suppose that we are interested in determining how student performance on a calculus exam is affected by room temperature. There are four sections of calculus being taught by two instructors. The experimental design is as follows: Set the room temperature to 65^oF in two of the rooms and to 75^oF in the other two rooms on test day, and then compare the exam scores for the 65^oF group and the 75^oF group. Instructor 1 taught both 65^oF sections and instructor 2 taught both 75^oF sections. Which two variables are confounded?

A. student performance and room temperature

B. student performance and instructor

C. room temperature and instructor

D. room temperature and exam scores

45. When estimating a population parameter, it is desirable to use a statistic that is

A. unbiased and has high variability.

B. unbiased and has low variability.

C. biased and has high variability.

D. biased and has low variability.

46. A local fast food company wants to know which form of advertising (print, radio, or television) will reach the most consumers. The population of consumers is divided into 5 age groups. A simple random sample is taken from each age group to find out which form of advertising consumers are most likely to be exposed to. This is an example of a

A. stratified random sample.

B. simple random sample.

C. completely randomized design.

D. randomized block design.

47. Characteristics of a population are called _____ while characteristics of a sample are called

_____

A. parameters; statistics

B. statistics; variables

C. statistics; parameters

D. none of these

Use the following description to answer the following three questions.

An automotive engineer was interested in the effect of four alternative rubber compounds on the life of automobile tires. To carry out this study, five tires were manufactured from each of the four compounds. Five automobiles (each a different make/model) were obtained for testing. Within each automobile, the four tire types were assigned at random to the four wheels. Each automobile was driven for 40,000 miles and the amount of wear on each of the four tires was recorded.

48. In this experiment, the amount of wear on the tires is the

A. explanatory variable.

B. response variable.

C. blocking variable.

D. confounded variable.

49. In this experiment, the make/model of the automobiles is the

A. explanatory variable.

B. response variable.

C. blocking variable.

D. confounded variable.

50. In this experiment, the rubber compound tire type is the

    A. explanatory variable.

    B. response variable.

    C. blocking variable.

    D. confounded variable.

51. A quantity computed from a population is called a _____ whereas a quantity computed from a sample is called a _____

    A. variable, observation

    B. parameter, statistic

    C. statistic, parameter

    D. numerical variable, categorical variable

52. An agricultural field trial compares the yield of two varieties of tomatoes for commercial use. The researchers divide in half each of 10 small plots of land in different locations and plant each tomato variety on one half of each plot. After harvest, they compare the yields in pounds per plant at each location. The 10 differences (Variety A - Variety B) give the following statistics: $\bar{x} = 0.46$ and $s = 0.92$. What kind of experimental design is this?

    A. A completely randomized design.

    B. A matched pairs design.

    C. A double blind design.

    D. A stratified random design.

53. The population mean is_____; the sample mean is _____. The population standard deviation is _____; the sample standard deviation is _____

    A. $\mu, \sigma, \bar{x}, s$

    B. $\mu, \bar{x}, \sigma, s$

    C. $\bar{x}, \mu, s, \sigma$

    D. $\sigma, s, \mu, \bar{x}$

54. In statistical inference, the purpose of calculating the sample mean is to

    A. estimate the mean of the sample.

    B. determine the variability of the sample.

    C. estimate the mean of the population.

    D. estimate the sample size.

55. A _____ is used to estimate a_____

    A. statistic, parameter

    B. parameter, statistic

56. When possible, the best way to establish that an observed association is the results of cause-and-effect is by means of

    A. the least-squares regression line.

    B. the correlation r.

    C. examining z-scores rather than the original variables.

    D. a well-designed experiment.

57. TRUE or FALSE: A study design that systematically favors certain outcomes is biased.

58. An investigator is interested in determining whether physical exercise is useful in alleviating psychological depression in elderly people. The investigator divides her subjects into three groups depending on their pre-existing level of depression. Subjects within each group were randomly assigned to exercise or control treatments. After three months of treatment, the depression level in each subject was measured. This is an example of a

A. stratified random sample

B. simple random sample

C. completely randomized design

D. randomized block design

59. A study was conducted to determine whether or not a kicked football filled with helium travels farther than one filled with air. Researchers found that the football filled with helium went, on average, farther when kicked than the one filled with air. What is the response variable in this study?

A. There is no response.

B. The distance that the football traveled.

C. The number of kickers.

D. The air or helium with which the football is filled.

60. A counseling student is planning to take a survey of student attitudes toward marriage and compute a sample mean from the survey. She develops a questionnaire and plans to ask 15 randomly-selected students to fill it out. Her advisor urges that the sample size be increased to at least 100 students. Why is the large sample size helpful?

A. Larger samples always reduce bias of the sample mean.

B. Larger samples always increase bias of the sample mean.

C. Larger samples always reduce the variability of the sample mean.

D. Larger samples always increase the variability of the sample mean.

61. Let X denote the amount of time (in minutes) that Joe was to wait for Ben to arrive. If X is uniformly distributed over the interval (2, 10), then the probability that Joe has to wait no more than 3 minutes is:

A. 0.125

B. 0.300

C. 0.100

D. 0.875

E. 0.375

62. If $X \sim N(26, 2)$ and $Y \sim N(65, 5)$, then the variance of X - Y is (Assume X and Y are independent).

A. 7

B. -3

C. 29

D. -21

E. Cannot be determined

63. TRUE or FALSE: Disjoint outcomes can never occur together.

64. TRUE or FALSE: The Law of Large Numbers states $\bar{x}$ will eventually get close to the true mean μ as the sample size (n) increases.

65. All human blood can be "ABO - typed" as one of O, A, B, or AB, but the distribution of blood types varies a bit among groups of people. Here is the distribution of blood types for a randomly-chosen person in the United States.

Blood type	O	A	B	AB
U. S. Probability	?	0.40	0.11	0.04

What is the probability of type O blood in the United States?

A. 1

B. 0

C. 0.45

D. 0.55

66. In a gambling game, on every play, there is a 0.1 probability that you win $7 and a 0.9 probability that you lose $1 (i.e. you win -$1). What is the expected value of your winnings?

A. +$2

B. -$2

C. +$0.20

D. -$0.20

67. The probability distribution for X = number of heads in 4 tosses of a fair coin is given in the table below.

Value of X	0	1	2	3	4
Probability	1/16	4/16	6/16	4/16	1/16

What is the probability of getting 1 or 2 heads?

A. 1/16

B. 6/16

C. 10/16

D. 14/16

68. Which of the following statements is TRUE for independent tosses of a fair coin (i.e. probability of heads = 0:5) if the first 10 tosses of the coin result in 10 heads?

A. The probability that the next toss will be heads is almost certain (i.e. nearly 1).

B. The probability that the next toss will be heads is nearly 0.

C. The probability that the next toss will be heads is 0:5.

69. A randomly-selected student is asked to respond "yes", "no", or "maybe" to the question: "Do you intend to vote in the next presidential election?" The sample space is {yes, no, maybe}. Which of the following represent a legitimate assignment of probabilities for this sample space?

A. 0.4, 0.4, 0.2

B. 0.4, 0.6, 0.4

C. 0.3, 0.3, 0.3

D. 0.5, 0.7, -0.2

70. Seventy percent (70%) of all vehicles examined at a certain emissions inspection station pass the inspection. Assuming that successive vehicles pass or fail independently of one another, what is the probability of at least one of the next 3 inspections fail?

A. $(0.3)^3$

B. $1 - (0.7)^3$

C. $1 - (0.3)^3$

D. 0.3

71. A student guesses for each of the 4 multiple choice questions on a quiz. If X is the number of correct guesses, then the probability distribution of X is summarized by:

X	0	1	2	3	4
Probability	0.1	0.2	0.2	0.3	0.2

What is the mean number of correct guesses?

A. 1.0

B. 2.0

C. 2.4

D. 2.3

72. A fair coin is tossed 3 times. The number of heads appearing in the 3 tosses is recorded. The sample space S for this random phenomenon is:

A. S = {H,T}

B. S = {0,1,2,3}

C. S = {HHH,HTT,THT,TTH,THH,HTH,HHT,TTT}

D. S = {1,2,3}

73. A sheep rancher knows that his ewes that give birth will have either a single lamb, twins, or triplets. The probability of twins is 0.50 and the probability of triplets is 0.05. What is the probability of a single lamb?

A. 0.45

B. 0.495

C. 0.50

D. 0.505

74. TRUE or FALSE: If S is the sample space, then P(S)=1.

75. TRUE or FALSE: Two events are independent if they have no outcomes in common.

76. TRUE or FALSE: For a continuous random variable, P(X = x) always equals 0.

77. TRUE or FALSE: A random variable that can take any value in an interval of numbers is a discrete random variable.

78. TRUE or FALSE: A run of 10 heads in the repeated tossing of a fair coin increases the probability that the next toss will be tails.

79. **Fuel Efficiency:** A certain automobile manufacturer equips a particular model with either a six-cylinder engine or a four-cylinder engine. Let X and Y be fuel efficiencies for independently and randomly selected six-cylinder and four-cylinder cars, respectively. Random variable X has mean $\mu_X = 22$ and standard deviation $\sigma_X = 1.2$. Random variable Y has mean $\mu_Y = 26$ and standard deviation $\sigma_Y = 1.5$.

(a) Find the mean of the difference $(X - Y)$ between the fuel efficiency of a six-cylinder car and a four-cylinder car. In other words, find μ_{X-Y}.

(b) Find the standard deviation of the difference $(X - Y)$ between the fuel efficiency of a six-cylinder car and a four-cylinder car. In other words, find σ_{X-Y}. Give 2 decimal places.

(c) What must you assume to legitimately calculate the probability in the next part?

(d) What is the probability that the fuel efficiency of a six-cylinder car (X) will exceed the fuel efficiency of a four-cylinder car (Y)? Give 4 decimal places.

80. Let H denote a head and T denote a tail resulting from a single coin toss. If you toss a coin twice and record the number of heads observed, what is the correct sample space?

A. S = {HH, HT, TH, TT}

B. S = {H, T}

C. S = {0, 1, 2}

D. S = {1, 2}

81. Suppose you copy your most important computer files onto two compact disks (CDs). If 1% of CDs fail within 5 years, then what is the probability that neither of your CDs fail within 5 years. Assume that CDs fail independently of one another.

A. 0 : 99

B. $(0 : 99)^2$

C. $(0 : 01)^2$

D. $1 - (0 : 01)^2$

82. There are 100 balls in a bag, 90 are black and 10 are white. Suppose two balls are selected (with replacement). The color of the two selected balls are independent of one another. What is the probability that the two selected balls are the same color (either both black or both white)?

A. 0.09

B. 0.82

C. 0.0081

D. 1

83. Choose a young adult (age 25 to 34 years) at random. The probability is 0.12 that the person chosen did not complete high school, 0.31 that the person has a high school diploma but no further education, 0.28 that the person has a high school diploma, completed some college classes, but did not earn a bachelor's degree, and 0.29 that the person has at least a bachelor's degree.

Schooling	no HS	HS but no further education	HS and some college but no bachelor's degree	bachelor's degree or higher
Probability	0.12	0.31	0.28	0.29

What is the probability that a randomly chosen young adult has at least a high school diploma?

A. 0.71

B. 0.57

C. 0.88

D. 1

84. Joan goes to the local car dealer to purchase one car. The car dealer sells only Chevrolets and Fords. If we observe the brand of the car Joan purchases, then the events A = {Chevrolet} and B = {Ford} are:

A. disjoint.

B. independent.

C. both A. and B.

85. Suppose the random variable "Number of children per family" (X) has mean $\mu_X = 2.1$ and standard deviation $\sigma_X = 0.5$. Suppose the amount of money a family with X children annually spends on shoes is $W = 50 + 20X$. Find the mean and standard deviation of W.

A. $\mu_W = 92$ and $\sigma_W = 10$

B. $\mu_W = 92$ and $\sigma_W = 60$

C. $\mu_W = 42$ and $\sigma_W = 10$

D. $\mu_W = 42$ and $\sigma_W = 60$

86. The volume of a watermelon is a_____ random variable.

A. discrete

B. continuous

C. categorical

87. The mean length of stay in a hospital is useful for planning purposes. Suppose that the following is the distribution of the length of stay in a hospital after a minor operation.

Number of Days	2	3	4	5	6
Probability	0.05	0.20	0.40	0.20	0.15

The mean length of stay is:

A. 0.15

B. 0.17

C. 3.3

D. 4.0

E. 4.2

Matching.

88. Which of these statistical concepts is described in the following statement?

    A. Central Limit Theorem

    B. Law of Large Numbers

    C. Sampling Variability

    D. Statistical Inference

    _____ The sample mean $\bar{x}$ approaches the population mean μ as the sample size n increases.

89. If X represents the length (in centimeters) of a randomly selected fish from Lake Malawi and $X \sim N(15, 5)$, then the probability of selecting a fish which is longer than 18 centimeters is:

    A. 0.6000

    B. 0.7257

    C. 0.2743

    D. 0.3000

90. Sara and Lou each took an IQ test, but they did not take the same test.

    (a) The test that Sara took produces scores that are approximately normal with mean 100 and standard deviation 10. Sara scored 117. At what percentile is Sara's score? Give 4 decimal places.

    (b) The test that Lou took produces scores that are approximately normal with mean 115 and standard deviation 15. Lou scored at the 90th percentile, in other words 90% of scores were below Lou's score. Compute the IQ score that Lou obtained. Give 4 decimal places.

    (c) Who performed better, SARA or LOU? Circle one.

91. Suppose that the mean weight for men 18 to 24 years old is 170 pounds, and the standard deviation is 20 pounds. A man weighing 140 pounds lies

    A. 3 standard deviations below the mean.

    B. 3 standard deviations above the mean.

    C. 1.5 standard deviations below the mean.

    D. 1.5 standard deviations above the mean.

Use the following description to answer the next two questions.

The length of rods produced by The Rod Master Company is normally distributed with a population mean of 66 centimeters and a population standard deviation of 2 centimeters.

92. Rods are too long to be usable if they are longer than 68.5 centimeters. What proportion of these rods are too long?

    A. 0.1056

    B. 0.1151

    C. 0.3849

    D. 0.8944

93. If the shortest 4 percent are too short, what is the cut off length between "too short" and "acceptable length?"

    A. 62.50 centimeters

    B. 63.36 centimeters

    C. 64.25 centimeters

    D. 65.96 centimeters

94. The class average on the first midterm was 81 with a standard deviation of 9. The class average on the second midterm was 78 with a standard deviation of 12. If a student got a 93 on each test, on which test was his performance better relative to the class?

    A. First midterm

    B. Second midterm

    C. His performance relative to the class was the same on both midterms.

D. Cannot be determined

Use the following description to answer the next two questions.

The heights of Stat 216 students are normally distributed with mean 68 inches and standard deviation 2 inches.

95. Half of all Stat 216 students are shorter than

    A. 65.5 inches.

    B. 68 inches.

    C. 63 inches.

    D. Cannot tell because the median height is not given.

96. Only about 5% of all Stat 216 students have heights outside the range

    A. 66 inches to 70 inches.

    B. 64 inches to 72 inches.

    C. 62 inches to 74 inches.

    D. 58 inches to 78 inches.

97. TRUE or FALSE: The area under a density curve always equals 1.

98. The typical amount of sleep per night for college students can be assumed to be normally distributed with a mean of 7 hours and a standard deviation of 1.2 hours. About 95% of college students typically sleep between

    A. 5.8 and 8.2 hours per night.

    B. 4.6 and 9.4 hours per night.

    C. 6 and 8 hours per night.

    D. 4 and 10 hours per night. 1

99. **The Wall Street Journal** (February 15, 1972) reported that General Electric was being sued in Texas for sex discrimination due to enforcing a minimum height requirement. The heights of adult females follow a normal distribution with mean 66 inches and standard deviation 2.1 inches.

    (a) What proportion of adult females would be excluded from employment at General Electric if the minimum height requirement was 67 inches? Give 4 decimal places.

    (b) In the lawsuit, it was claimed that 90% of the adult females were excluded from employment at General Electric. What minimum height requirement (in inches) must have been imposed? Give 4 decimal places.

100. Suppose annual temperatures in Vermont are normally distributed with a mean of 55^oF and a standard deviation of 15^oF. Also suppose the annual temperatures in Florida are normally distributed with a mean of 90^oF and a standard deviation of 10^oF. Which of the following two events is the more unusual?

    Event 1: A 85^oF day in Vermont.

    Event 2: A 105^oF day in Florida.

    A. Event 1

    B. Event 2

101. Suppose the number of cells in a biopsy of kidney tissue is normally distributed with a mean of 4200 and a standard deviation of 300. What proportion of biopsies would have between 3700 and 4400 cells? Give 4 decimal places.

102. The average time students need to finish a particular test is 70 minutes with a standard deviation of 12 minutes. Assume that these times are normally distributed. If we want 90% of the students to have sufficient time to finish the test, how much time should we give them? Give 4 decimal places.