

Determine whether the given value is a statistic or a parameter.

- 1) A health and fitness club surveys 40 randomly selected members and found that the average weight of those questioned is 157 lb. 1) \_\_\_\_\_  
 A) Parameter B) **Statistic**

*Parameter is a numerical characteristic of a population; statistic is a numeric characteristic of a sample.*

*A selection is always a sample; therefore this is a statistic.*

Determine whether the given value is from a discrete or continuous data set.

- 2) The weight of Bill's pack as he sets off on a backpacking trip is 48.3 lb. 2) \_\_\_\_\_  
 A) Discrete B) **Continuous**

*Discrete, quantity that can be counted. Continuous, measured. Weight is measured, continuous.*

- 3) The number of stories in a Manhattan building is 22. 3) \_\_\_\_\_  
 A) Continuous B) **Discrete**

*A number of things ... is a countable quantity: discrete.*

Determine which of the four levels of measurement (nominal, ordinal, interval, ratio) is most appropriate.

- 4) The subjects in which college students major. 4) \_\_\_\_\_  
 A) Ordinal B) Ratio C) Interval D) **Nominal**

*Nominal level: variable given by names, labels. This is the case.*

Identify which of these types of sampling is used: random, stratified, systematic, cluster, convenience.

- 5) A market researcher selects 500 drivers under 30 years of age and 500 drivers over 30 years of age. 5) \_\_\_\_\_  
 A) Systematic  
 B) Convenience  
 C) **Stratified**  
 D) Random  
 E) Cluster

*Stratified: population is subdivided into groups, "stratas"; then a random sample of each strata is taken.*

Provide an appropriate response.

- 6) The following frequency distribution analyzes the scores on a math test. Find the class midpoint of scores interval 95-99. 6) \_\_\_\_\_

Scores	Number of students
40-59	2
60-75	4
76-82	6
83-94	15
95-99	5

- A) **97.0** B) 96.5 C) 97.5 D) 98.0

*Midpoint is found adding up both class limits, and dividing by two:  $(95+99)/2 = 97$*

Use the data to create a stemplot.

7) The midterm test scores for the seventh-period typing class are listed below.

85 77 93 91 74 65 68 97 88 59 74 83 85 72 63 79

A)

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5 | 9
6 | 3 5 8
7 | 2 4 4 7 9
8 | 3 5 5 8
9 | 1 3 7
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B)

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5 | 9
6 | 3 5 8
7 | 3 5 5 8
8 | 2 4 4 7 9
9 | 1 3 7
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*Stem-leaf plot: stem, the first digit for a two digit number; leaf, the second digit. B includes two 75, which are not on the given dataset. The correct one is A.*

7) \_\_\_\_\_

Find the mean for the given sample data. Unless indicated otherwise, round your answer to one more decimal place than is present in the original data values.

8) The amount of time (in hours) that Sam studied for an exam on each of the last five days is given below. Find the mean study time.

1.5 8.3 6.9 1.8 5.3

A) 23.80 hr

B) 4.76 hr

C) 4.96 hr

D) 5.45 hr

8) \_\_\_\_\_

*On a calculator, enter data values on List 1. Procedure to find the mean,  $\bar{x}$ , depends on calculator brand/model.*

Find the variance for the given data. Round your answer to one more decimal place than the original data.

9) 18 16 12 2 11

A) 38.2

B) 67.2

C) 38.1

D) 30.6

9) \_\_\_\_\_

*On a calculator, enter data values on List 1. In this case, variance, is not given by calculators. Take the standard deviation, square it. That is the variance.*

Find the standard deviation for the given sample data.

10) 18 18 18 9 15 5 10 5 15

A) 5.4

B) 1.6

C) 5.8

D) 5.1

10) \_\_\_\_\_

*On a calculator, enter data values on List 1. Procedure to find the sample standard deviation, depends on calculator brand/model.*

Find the standard deviation of the data summarized in the given frequency distribution.

11) The manager of a bank recorded the amount of time each customer spent waiting in line during peak business hours one Monday. The table below summarizes the results. Find the standard deviation.

Waiting time (minutes)	Number of customer
0-3	13
4-7	13
8-11	10
12-15	11
16-19	0
20-23	3

A) 5.9 min

B) 5.6 min

C) 7.0 min

D) 5.3 min

11) \_\_\_\_\_

*Find midpoints for each class. Enter those midpoints on L1, Frequencies in List 2. Procedure depends on calculator.*

Find the indicated probability.

- 12) A class consists of 27 women and 32 men. If a student is randomly selected, what is the probability that the student is a woman? 12) \_\_\_\_\_
- A)  $\frac{27}{59}$                       B)  $\frac{32}{59}$                       C)  $\frac{1}{59}$                       D)  $\frac{27}{32}$

*Event A, selecting a woman.  $n(T)$  is total = 59.  $P(A)=n(A)/n(T) = 27/59$*

Answer the question.

- 13) Find the odds against correctly guessing the answer to a multiple choice question with 6 possible answers. 13) \_\_\_\_\_
- A) 6 : 5                      B) 5 : 6                      C) 6 : 1                      D) 5 : 1

*There six choices. Only one is correct; therefore, there are 5 against the correct answer. 5 to 1.*

Find the indicated probability.

- 14) A card is drawn from a well-shuffled deck of 52 cards. Find  $P(\text{drawing a face card or a 4})$ . 14) \_\_\_\_\_
- A)  $\frac{4}{13}$                       B)  $\frac{2}{13}$                       C)  $\frac{12}{13}$                       D) 16

*OR follows the addition rule:  $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$  In this case, since no card is "face" and 4 at the same time, the intersection  $P(A \text{ and } B) = 0$ ; therefore:  
 $P(A \text{ or } B) = 12/52 + 4/52 = 16/52 = 4/13$*

- 15) If you pick a card at random from a well shuffled deck, what is the probability that you get a face card or a spade? 15) \_\_\_\_\_
- A)  $\frac{1}{22}$                       B)  $\frac{9}{26}$                       C)  $\frac{11}{26}$                       D)  $\frac{25}{52}$

*Or, again, addition rule:  $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$  This time, there are 3 cards that are "faces" and "spades" at the same time:*

*$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) = 12/52 + 13/52 - 3/52 = 22/52 = 11/26$*

- 16) Find the probability of correctly answering the first 3 questions on a multiple choice test if random guesses are made and each question has 6 possible answers. 16) \_\_\_\_\_
- A)  $\frac{1}{2}$                       B)  $\frac{1}{729}$                       C)  $\frac{1}{216}$                       D) 2

*This is not an OR situation (OR is always explicitly stated), this probability of consecutive events: the first questions correct AND the second correct AND the third correct: multiplication:  
 $P(A \text{ and } B \text{ and } C) = P(A) \cdot P(B) \cdot P(C) = (1/6)(1/6)(1/6) = (1/6)^3 = 1/216$   
Notice that events are independent; that is, the type of answer on one question doesn't change the probability of answering the next one correctly since we assume these are random guesses.*

- 17) In a homicide case 4 different witnesses picked the same man from a line up. The line up contained 5 men. If the identifications were made by random guesses, find the probability that all 4 witnesses would pick the same person. 17) \_\_\_\_\_
- A) 0.0009766                      B) 0.8                      C) 0.0016                      D) 0.008

*Consecutive events: identifying the same person five times. Ok, the first witness chooses someone at random. All other witnesses, three of them, need to coincide with the first witness:  $(1/5)^3 = 0.008$*

- 18) Among the contestants in a competition are 46 women and 23 men. If 5 winners are randomly selected, what is the probability that they are all men? Round to five decimal places. 18) \_\_\_\_\_
- A) 0.00299                      B) 0.13169                      C) 0.03125                      D) 0.02455

*Consecutive events again, but this time events are dependent: every time you select a man, there is one less men, and one less of the total number of men and women (69):*

$P(A).P(B|A).P(C|A \text{ and } B).P(D|A \text{ and } B \text{ and } C).P(E|A \text{ and } B \text{ and } C \text{ and } D) = (23/69)(22/68)(21/67)(20/66)(19/65) = 133/44421 = 0.00299407 \dots$

Find the indicated probability. Round to the nearest thousandth.

- 19) In a blood testing procedure, blood samples from 6 people are combined into one mixture. The mixture will only test negative if all the individual samples are negative. If the probability that an individual sample tests positive is 0.1, what is the probability that the mixture will test positive? 19) \_\_\_\_\_
- A) 0.531                      B) 1.00                      C) 0.00000100                      D) 0.469

$P(\text{no positive}) = P(\text{negative}) = 1 - 0.1 = 0.9$

$P(\text{At least one positive}) = 1 - P(\text{none of them positive}) = 1 - 0.9^6 = 0.468559$

Solve the problem.

- 20) The organizer of a television show must select 5 people to participate in the show. The participants will be selected from a list of 30 people who have written in to the show. If the participants are selected randomly, what is the probability that the 5 youngest people will be selected? 20) \_\_\_\_\_
- A)  $\frac{1}{142,506}$                       B)  $\frac{4}{15}$                       C)  $\frac{1}{120}$                       D)  $\frac{1}{17,100,720}$

*Selecting or choosing 5 among 30 is given by  ${}_{30}C_5$ . Find  ${}_{30}C_5$  on a calculator: 142506; therefore,  $P = 1/142506$  since there is only one combination that includes the 5 youngest people.*

- 21) In a certain lottery, five different numbers between 1 and 20 inclusive are drawn. These are the winning numbers. To win the lottery, a person must select the correct 5 numbers in the same order in which they were drawn. What is the probability of winning? 21) \_\_\_\_\_
- A)  $\frac{1}{120}$                       B)  $\frac{1}{20!}$                       C)  $\frac{120}{1,860,480}$                       D)  $\frac{1}{1,860,480}$

*This time we choose 5 numbers out of 20, the order of the numbers matters. That is  ${}_{20}P_5 = 1860480$   $P = 1/1860480$  since only one selection wins.*

Assume that a procedure yields a binomial distribution with a trial repeated n times. Use the binomial probability formula to find the probability of x successes given the probability p of success on a single trial. Round to three decimal places.

- 22)  $n = 64, x = 3, p = 0.04$  22) \_\_\_\_\_
- A) 0.091                      B) 0.221                      C) 0.139                      D) 0.375

*Binomial distribution, number of trials = 64, probability of success in one individual trial = 0.04, what is the probability of having exactly 3 successes?  $x = 3$ . Use a calculator. Binomial pdf.*

- 23) The probability that a radish seed will germinate is 0.7. Find the probability that of 140 randomly selected seeds, exactly 100 will germinate. 23) \_\_\_\_\_
- A) 0.0769                      B) 0.0679                      C) 0.0695                      D) 0.9331

*Binomial distribution, number of trials = 140, probability of success in one individual trial = 0.7, what is the probability of having exactly 100 successes?  $x = 100$ . Use a calculator. Binomial pdf.*

Find the indicated probability. Round to three decimal places.

- 24) An airline estimates that 94% of people booked on their flights actually show up. If the airline books 73 people on a flight for which the maximum number is 71, what is the probability that the number of people who show up will exceed the capacity of the plane? 24) \_\_\_\_\_
- A) 0.179                      B) 0.051                      C) 0.011                      D) 0.062

*The capacity is exceeded if 72 show up or 73 show up. Find both probabilities, add up. Binomial pdf. For  $P(72)$ , trials,  $n = 73$ ,  $p = 0.94$ ,  $x = 72$ . For  $P(73)$ , trials,  $n = 73$ ,  $p = 0.94$ ,  $x = 73$ . Use a Calculator.*

Find the indicated probability.

- 25) Suppose that 14% of people are left handed. If 9 people are selected at random, what is the probability that exactly 2 of them are left handed? 25) \_\_\_\_\_
- A) 0.491                      B) 0.0933                      C) 0.245                      D) 0.0196

*Binomial distribution, number of trials = 9, probability of success in one individual trial = 0.14, what is the probability of having exactly 2 successes?  $x = 2$ . Use a calculator. Binomial pdf.*

- 26) A slot machine at a hotel is configured so that there is a  $1/1200$  probability of winning the jackpot on any individual trial. If a guest plays the slot machine 6 times, find the probability of exactly 2 jackpots. If a guest told the hotel manager that she had hit two jackpots in 6 plays of the slot machine, would the manager be surprised? 26) \_\_\_\_\_
- A) 0.000000694; Yes, the probability of 2 jackpots in 6 plays is extremely small.  
B) 0.000000692; Yes, the probability of 2 jackpots in 6 plays is extremely small.  
C) 0.0872; No, hitting 2 jackpots in 6 trials is not so unlikely.  
D) 0.0000104; Yes, the probability of 2 jackpots in 6 plays is extremely small.

*Binomial distribution, number of trials = 6, probability of success in one individual trial =  $1/1200$ , what is the probability of having exactly 2 successes?  $x = 2$ . Use a calculator. Binomial pdf. = 0.00001038  
The manager will be surprised, events whose probability of occurrence is very small, we assume do not occur. They still may occur, but there is a cloud of doubt on it.*

- 27) For women aged 18-24, systolic blood pressures are normally distributed with a mean of 114.8 mm Hg and a standard deviation of 13.1 mm Hg. If 23 women aged 18-24 are randomly selected, find the probability that their mean systolic blood pressure is between 119 and 122 mm Hg. 27) \_\_\_\_\_
- A) 0.3343                      B) 0.0579                      C) 0.9341                      D) 0.0833

*Normal distribution. Normal cdf on the graphing calculator. Lower bound, 119; upper bound, 122; mean, 114.8; standard deviation, 13.1. sample size,  $n=23$ . Remember, divide standard deviation by square root of  $n$ .*

Find the indicated probability.

- 28) The lengths of human pregnancies are normally distributed with a mean of 268 days and a standard deviation of 15 days. What is the probability that a pregnancy lasts at least 300 days? 28) \_\_\_\_\_
- A) 0.4834                      B) 0.9834                      C) 0.0179                      D) 0.0164

*Normal distribution. Normal cdf on the graphing calculator. Probability of at least 300, implies 300 or more days. Lower bound, 300; upper bound, positive infinity or 9999; mean, 268; standard deviation, 15.*

- 29) Assume that the weights of quarters are normally distributed with a mean of 5.67 g and a standard deviation 0.070 g. A vending machine will only accept coins weighing between 5.48 g and 5.82 g. What percentage of legal quarters will be rejected? 29) \_\_\_\_\_
- A) 1.62%                      B) 2.48%                      C) 1.94%                      D) 0.0196%

*Probability of accepted coins given by: Normal distribution. Lower bound, 5.48; upper bound, 5.82; mean, 5.67; standard deviation, 0.070. = 0.9806;  $P(\text{rejected}) = 1 - P(\text{accepted}) = 1 - 0.9806 = 0.0194$ . Ans as %.*

- 30) Of 380 randomly selected medical students, 21 said that they planned to work in a rural community. Find a 95% confidence interval for the true proportion of all medical students who plan to work in a rural community. 30) \_\_\_\_\_
- A)  $0.0280 < p < 0.0826$                       B)  $0.0251 < p < 0.0854$   
 C)  $0.0323 < p < 0.0782$                       D)  $0.0360 < p < 0.0745$

*Confidence interval for proportions.  $n = 380$ ,  $x = 21$ . Conf. Level, 0.95  
 Use a graphing calculator.*

- 31) Use the given degree of confidence and sample data to construct a confidence interval for the population mean  $\mu$ . Assume that the population has a normal distribution. 31) \_\_\_\_\_

Thirty randomly selected students took the calculus final. If the sample mean was 95 and the standard deviation was 6.6, construct a 99% confidence interval for the mean score of all students.

- A)  $91.68 < \mu < 98.32$                       B)  $92.95 < \mu < 97.05$   
 C)  $92.03 < \mu < 97.97$                       D)  $91.69 < \mu < 98.31$

*Confidence interval for means.  $\bar{x} = 95$ ,  $n = 30$ . Conf. Level, 0.99 Sample Standard deviation,  $s = 6.6$   
 T interval. Use a graphing calculator.*

- 32) A group of 59 randomly selected students have a mean score of 29.5 with a standard deviation of 5.2 on a placement test. What is the 90% confidence interval for the mean score,  $\mu$ , of all students taking the test? 32) \_\_\_\_\_
- A)  $27.8 < \mu < 31.2$                       B)  $27.9 < \mu < 31.1$   
 C)  $28.2 < \mu < 30.8$                       D)  $28.4 < \mu < 30.6$

*Confidence interval for means.  $\bar{x} = 29.5$ ,  $n = 59$ . Conf. Level, 0.90 Sample Standard deviation,  $s = 5.2$   
 T interval. Use a graphing calculator.*

Find the P-value for the indicated hypothesis test.

- 33) An airline claims that the no-show rate for passengers booked on its flights is less than 6%. Of 380 randomly selected reservations, 18 were no-shows. Find the P-value for a test to support the airline's claim. 33) \_\_\_\_\_
- A) 0.0746                      B) 0.3508                      C) 0.1499                      D) 0.1230

*Claim:  $p < 0.06$      $H_0: p = 0.06$      $H_1: p < 0.06$     1 propZ Test with  $x = 18$ ,  $n = 380$ . Use calculator, find p-value.*

Test the given claim. Identify the final conclusion that addresses the original claim.

- 34) A simple random sample of 15-year old boys from one city is obtained and their weights (in pounds) are listed below. Use a 0.01 significance level to test the claim that these sample weights come from a population with a mean equal to 147 lb.

34) \_\_\_\_\_

146 140 160 151 134 189 157 144 175 127 164

- A) Do not reject  $H_0$ ; At the 1% significance level, there is not sufficient evidence to warrant rejection of the claim that these sample weights come from a population with a mean equal to 147 lb.
- B) Do not reject  $H_0$ ; At the 1% significance level, there is sufficient evidence to warrant rejection of the claim that these sample weights come from a population with a mean equal to 147 lb.
- C) Reject  $H_0$ ; At the 1% significance level, there is sufficient evidence to warrant rejection of the claim that these sample weights come from a population with a mean equal to 147 lb.
- D) Reject  $H_0$ ; At the 1% significance level, there is sufficient evidence to support the claim that these sample weights come from a population with a mean equal to 147 lb.

*T Test (this is raw data for a given sample): enter given data values on L1 of your graphing calculator.*

*Claim: mean = 147,  $H_0: \mu = 147$ ;  $H_1: \mu \neq 147$*

*T Test on calculator yields a p-value = 0.2726 which is greater than significance level ( $\alpha=0.01$ ); therefore, we fail to Reject the Null Hypothesis because the sample data is not sufficient evidence.*

## Answer Key

Testname: FINALREVIEWSTA2023

- 1) B
- 2) B
- 3) B
- 4) D
- 5) C
- 6) A
- 7) A
- 8) B
- 9) A
- 10) A
- 11) B
- 12) A
- 13) D
- 14) A
- 15) C
- 16) C
- 17) D
- 18) A
- 19) D
- 20) A
- 21) D
- 22) B
- 23) C
- 24) D
- 25) C
- 26) D
- 27) B
- 28) D
- 29) C
- 30) C
- 31) A
- 32) D
- 33) C
- 34) A