

Part I consists of 30 multiple-choice questions.

1. A researcher wants to estimate the length of time it takes a resident of Massachusetts to earn a Bachelor's degree from a state college or university. A random sample of 265 recent in-state graduates was taken. Identify the variable.

- a. All graduates in Massachusetts
- b. Random sample of 265 graduates
- c. All Massachusetts residents
- d. Length of time to graduate

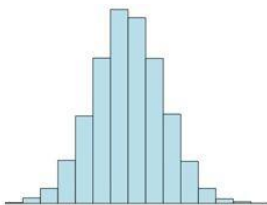
2. Refer to problem 1. Suppose that the researcher calculated that the average time to graduate for the sample of 265 graduates was 4.8 years. The value of 4.8 years is a

- a. Parameter
- b. Sample
- c. Statistic
- d. Population

3. A descriptive measure of a population is a

- a. Statistic
- b. Variable
- c. Qualitative response
- d. Parameter

4. A histogram of a data set with 1,000 observations is as follows.



This distribution is

- a. Left-skewed
- b. Right-skewed
- c. Symmetric
- d. Bimodal

5. For a distribution that is left-skewed, the mean is
- to the left of the median.
 - to the right of the median.
 - equal to the median.
 - to the right of the mode.
6. \bar{X} , \hat{p} and s are examples of
- Parameters
 - Statistics
 - Qualitative variables
 - Quantitative variables
7. For data having a symmetric, bell-shaped distribution, the percentage of data values that are within two standard deviations of the mean is approximately
- 68%
 - 95%
 - 99%
 - 100%
8. A z-score tells how many standard deviations a value is located from the mean.
- True
 - False
9. The 50th percentile of a data set is equal to the
- Median
 - Mean
 - 3rd quartile
 - 1st quartile
10. Suppose you guess on a four-question multiple-choice quiz. The probability of guessing correctly on any one question is 25%. What is the probability that you get all of the questions wrong?
- 0.004
 - 0.035
 - 0.178
 - 0.316

11. Suppose you guess on a four-question multiple-choice quiz. The probability of guessing correctly on any one question is 25%. What is the probability that you get at least one question right?

- a. 0.098
- b. 0.245
- c. 0.684
- d. 0.999

12. A basketball player is shooting free throws. Suppose that his attempts are independent and that he is successful 40% of the time. Let X represent the number of successful baskets in 3 attempts. What type of variable is X ?

- a. Quantitative-Discrete
- b. Quantitative-Continuous
- c. Qualitative

13. Refer to problem 12. Suppose that the probability distribution for X is given below. What is the missing probability?

X	0	1	2	3
$P(X)$	0.216	0.432	?	0.064

- a. 0
- b. 0.288
- c. 0.371
- d. 0.551

14. Refer to problem 13. What is the probability that the player makes 0 or 1 shots in three attempts?

- a. 0.216
- b. 0.432
- c. 0.648
- d. 0.779

15. Refer to problem 13. What is the mean of this probability distribution?

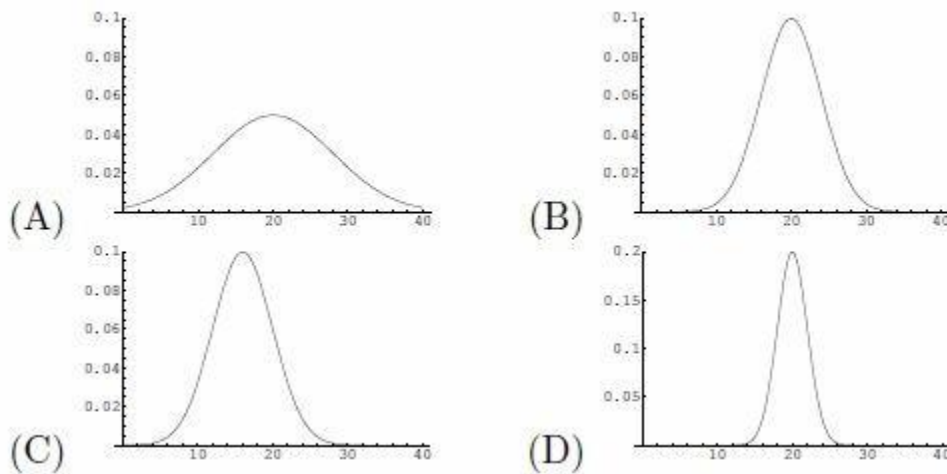
- a. 1
- b. 1.2
- c. 1.7
- d. The answer cannot be determined.

16. If X is a continuous random variable with mean $\mu = 100$, is the following statement true? Explain why or why not.

$$P(X = 100) = 0.5$$

- a. Yes, the probability of the mean is always 0.5.
- b. Yes, according to the Central Limit Theorem.
- c. No, the probability should be 0 because the “area” of a line is 0.
- d. No, since we don’t know n , we can’t compute the probability.

17. Let X be a normal random variable with a mean of 20 and a standard deviation of 4, which of the following could be the graph of the distribution of X ?



18. For a random variable z which has a standard normal distribution, $P(Z < 2.10) =$

- a. 0.4821
- b. 0.0179
- c. 0.9821
- d. None of these.

19. A random sample of 100 observations is drawn from a population with a mean of 40 and a standard deviation of 25. Suppose the sample mean of the 100 observations is computed. This procedure is repeated over and over again. What does the Central Limit Theorem say about the distribution of the sample means.?

- a. The distribution of sample means will be normal with a mean of 40 and a standard deviation of 2.5.
- b. The distribution of sample means will be normal with a mean of 40 and a standard deviation of 0.25.
- c. The distribution of sample means will be normal with a mean of 40 and a standard deviation of 25.

20. If we repeatedly sample from a population samples of size n , and calculate the sample proportion for each sample, the accumulation of these sample proportions would result in

- a. a confidence interval for the population proportion
- b. the sampling distribution of the population proportion
- c. an estimate of the sample proportion
- d. the sampling distribution of the sample proportion

21. In the construction of confidence intervals, if all other quantities are unchanged, an increase in the sample size will lead to a _____ interval.

- a. narrower
- b. wider
- c. less significant
- d. biased

22. Suppose that a 95% confidence interval for a population proportion was calculated to be (0.55, 0.65). What was the point estimate used to create the interval?

- a. $\hat{p} = 0.60$
- b. $p = 0.60$
- c. $\mu = 0.60$
- d. The answer cannot be determined.

23. Suppose that a 95% confidence interval for a population proportion was calculated to be (0.55, 0.65). What is the correct interpretation of this interval?

- a. 95% of sample proportions will be between 0.55 and 0.65.
- b. There is a 95% probability that the true population proportion is between 0.55 and 0.65.
- c. If this sampling procedure were repeated many times and many intervals were computed, 95% of those intervals would contain the population proportion.

24. When conducting a hypothesis test, which of the following statements is correct?

- a. the larger the p-value, the stronger the evidence against the null hypothesis
- b. a large p-value indicates that the data is consistent with the alternative hypothesis
- c. the p-value measures the probability that the alternative hypothesis is true
- d. an extremely small p-value indicates that the sample data differ significantly from that expected if the null hypothesis were true

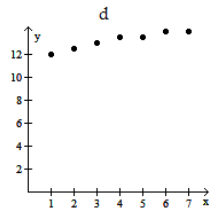
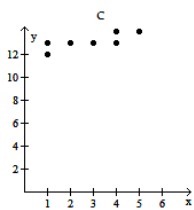
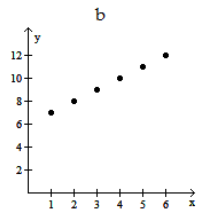
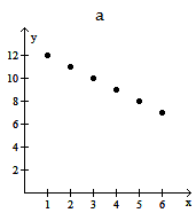
25. The correlation coefficient provides

- a. a measure of the strength of the linear association between two qualitative random variables.
- b. a measure of the strength of the linear association between two quantitative random variables.
- c. a measure of the strength of the linear association between a qualitative and a quantitative random variable.

26. If the correlation between body weight and annual income were close to one, we could conclude that

- a. high incomes cause people to eat more food.
- b. low incomes cause people to eat less food.
- c. high income people tend to be heavier than low income people, on average.
- d. high incomes cause people to gain weight.

27. In which scatterplot is $r = -1$?



- a. a
- b. b
- c. c
- d. d

28. A value of a linear correlation coefficient r that is close to 0 indicates that there no relationship between two variables.

- a. True
- b. False

29. For the following data set, find r , the linear correlation coefficient.

X	10	14	16	19	25	39
Y	35	38	47	52	77	70

- a. -0.835
- b. -0.174
- c. 0.174
- d. 0.835

30. Refer to problem 29. Assume that a scatterplot indicated that there was a linear relationship between X and Y. What is the regression equation for the data set?

- a. $y = 25.039 + 1.372x$
- b. $y = 25.039x + 1.372$
- c. $y = 25.039 + 1.372$

Part II consists of open-response questions.

Normal Distribution and Sampling Distributions

1. Weights of white-tailed deer are normally distributed with a mean of 205 pounds and a standard deviation of 35 pounds.

a. If one white-tailed deer is selected, find the probability that its weight is between 180 and 230 pounds. Include a sketch of the distribution and z-score calculations.

b. If nine white-tailed deer are selected, find the probability that the mean weight is between 180 and 230 pounds. Include a sketch of the sampling distribution and z-score calculations.

c. Find the 80th percentile of weights of white-tailed deer.

2. In a survey of 1011 U.S. adults, 293 said that their favorite sport to watch is football.

a. What is a point estimate of the proportion of U.S. adults who say their favorite sport to watch is football?

b. Construct a 95% confidence interval for the proportion of adults in the United States who say that their favorite sport to watch is football. Show the formula and your calculations for full credit.

3. Consumer credit ratings are given below for a sample of applicants for car loans. Assume the population distribution of credit ratings is approximately normal.

661 595 548 763 791 750 725 630 601

Find a 95% confidence interval for the population mean credit rating of applicants for car loans. Show the formula and your calculations for full credit.

4. Noise levels at various area urban hospitals were measured in decibels. A sample of 84 hospital corridors resulted in a sample mean of 61.2 decibels. Suppose the standard deviation of the population is known to be 7.9 decibels. Find a 99% confidence interval for the population mean noise level. Show the formula and your calculations for full credit.

5. A magazine is considering the launch of an online edition. The magazine plans to go ahead only if it is convinced that more than 25% of current readers would subscribe. The magazine contacts a simple random sample of 500 current subscribers, and 137 of those surveyed expressed interest. Is there evidence to support the claim that more than 25% of all current subscribers would sign up for the online edition? Use $\alpha = 0.10$.

a. State the null and alternative hypotheses.

b. Find the value of the test statistic. Show the formula and your calculations.

c. Sketch the distribution of the test statistic (standard normal or Student's t) and shade the area corresponding to the p -value. Find the p -value.

d. Should you reject or fail to reject the null hypothesis?

e. State the conclusion in terms of the problem. (You may want to use the flowchart from the lecture notes.)

6. According to one source, the average annual miles driven per vehicle in the United States is 11,100 miles. A researcher believed that the average miles driven per vehicle in Chicago differs from the national average. To test this claim, he took a random sample of 36 vehicles owned by residents of Chicago and found that the average mileage driven last year was 10,800 miles. Is there sufficient evidence to support the researcher's claim that the population mean number of miles driven for vehicles in Chicago differs from the national average? Use a 5% level of significance and assume that the population standard deviation of miles driven is known to be 600 miles.

a. State the null and alternative hypotheses.

b. Find the value of the test statistic. Show the formula and your calculations.

c. Sketch the distribution of the test statistic (standard normal or Student's t) and shade the area corresponding to the p -value. Find the p -value.

d. Should you reject or fail to reject the null hypothesis?

e. State the conclusion in terms of the problem. (You may want to use the flowchart from the lecture notes.)

7. At a certain hospital, the average time spent in the emergency department, including wait time and time spent with a doctor, was 247 minutes. The hospital decides to implement a new triage system designed to reduce wait times. A random sample of 81 wait times resulted in a sample mean of 230 minutes and a sample standard deviation of 75 minutes. Is there sufficient evidence to conclude that the average wait time has decreased? Use a 5% level of significance.

a. State the null and alternative hypotheses.

b. Find the value of the test statistic. Show the formula and your calculations.

c. Sketch the distribution of the test statistic (standard normal or Student's t) and shade the area corresponding to the p -value. Find the p -value.

d. Should you reject or fail to reject the null hypothesis?

e. State the conclusion in terms of the problem. (You may want to use the flowchart from the lecture notes.)