

MULTIPLE CHOICE. (Two Points Each) Choose the one alternative that best completes the statement or answers the question.

Solve the problem.

- 1) What is $z_{\alpha/2}$ when $\alpha = 0.05$? 1) _____
 A) 2.33 B) 1.645 C) 1.96 D) 2.575
- 2) What is the confidence level of the following confidence interval for μ ? 2) _____

$$\bar{x} \pm 1.282 \left(\frac{\sigma}{\sqrt{n}} \right)$$
 A) 128% B) 95% C) 80% D) 90%
- 3) The registrar's office at State University would like to determine a 95% confidence interval for the mean commute time of its students. A member of the staff randomly chooses a parking lot and surveys the first 200 students who park in the chosen lot on a given day. The confidence interval is 3) _____
 A) not meaningful because the sampling distribution of the sample mean is not normal.
 B) meaningful because the sample size exceeds 30 and the Central Limit Theorem ensures normality of the sampling distribution of the sample mean.
 C) not meaningful because of the lack of random sampling.
 D) meaningful because the sample is representative of the population.
- 4) A 95% confidence interval for the average salary of all CEOs in the electronics industry was constructed using the results of a random survey of 45 CEOs. The interval was (\$118,931, \$131,772). To make more useful inferences from the data, it is desired to reduce the width of the confidence interval. Which of the following will result in a reduced interval width? 4) _____
 A) Increase the sample size and increase the confidence level.
 B) Decrease the sample size and increase the confidence level.
 C) Increase the sample size and decrease the confidence level.
 D) Decrease the sample size and decrease the confidence level.
- 5) Explain what the phrase 95% confident means when we interpret a 95% confidence interval for μ . 5) _____
 A) 95% of similarly constructed intervals would contain the value of the sampled mean.
 B) In repeated sampling, 95% of similarly constructed intervals contain the value of the population mean.
 C) 95% of the observations in the population fall within the bounds of the calculated interval.
 D) The probability that the sample mean falls in the calculated interval is 0.95.
- 6) Suppose a large labor union wishes to estimate the mean number of hours per month a union member is absent from work. The union decides to sample 402 of its members at random and monitor the working time of each of them for 1 month. At the end of the month, the total number of hours absent from work is recorded for each employee. If the mean and standard deviation of the sample are $\bar{x} = 7.2$ hours and $s = 3.2$ hours, find a 99% confidence interval for the true mean number of hours a union member is absent per month. 6) _____
 A) $7.2 \pm .158$ B) $7.2 \pm .230$ C) $7.2 \pm .020$ D) $7.2 \pm .411$
- 7) Let t_0 be a specific value of t . Find t_0 such that the following statement is true: 7) _____
 $P(t \geq t_0) = .05$ where $df = 20$.
 A) 1.729 B) 1.725 C) -1.725 D) -1.729

- 8) A marketing research company is estimating the average total compensation of CEOs in the service industry. Data were randomly collected from 18 CEOs and the 97% confidence interval for the mean was calculated to be (\$2,181,260, \$5,836,180). What additional assumption is necessary for this confidence interval to be valid? 8) _____
- A) None. The Central Limit Theorem applies.
 B) The sample standard deviation is less than the degrees of freedom.
 C) The population of total compensations of CEOs in the service industry is approximately normally distributed.
 D) The distribution of the sample means is approximately normal.
- 9) To help consumers assess the risks they are taking, the Food and Drug Administration (FDA) publishes the amount of nicotine found in all commercial brands of cigarettes. A new cigarette has recently been marketed. The FDA tests on this cigarette yielded mean nicotine content of 28.1 milligrams and standard deviation of 2.1 milligrams for a sample of $n = 9$ cigarettes. Construct a 90% confidence interval for the mean nicotine content of this brand of cigarette. 9) _____
- A) 28.1 ± 1.381 B) 28.1 ± 1.302 C) 28.1 ± 1.361 D) 28.1 ± 1.283
- 10) The director of a hospital wishes to estimate the mean number of people who are admitted to the emergency room during a 24-hour period. The director randomly selects 64 different 24-hour periods and determines the number of admissions for each. For this sample, $\bar{x} = 19.8$ and $s^2 = 16$. If the director wishes to estimate the mean number of admissions per 24-hour period to within 1 admission with 90% reliability, what is the minimum sample size she should use? 10) _____
- A) 693 B) 422 C) 27 D) 44
- 11) In the construction of confidence intervals, if all other quantities are unchanged, an increase in the sample size will lead to a _____ interval. 11) _____
- A) wider B) less significant C) narrower D) biased
- 12) How many tissues should a package of tissues contain? Researchers have determined that a person uses an average of 59 tissues during a cold. Suppose a random sample of 2500 people yielded the following data on the number of tissues used during a cold: $\bar{x} = 52$, $s = 24$. Identify the null and alternative hypothesis for a test to determine if the mean number of tissues used during a cold is less than 59. 12) _____
- A) $H_0: \mu > 59$ vs. $H_a: \mu \leq 59$ B) $H_0: \mu = 59$ vs. $H_a: \mu < 59$
 C) $H_0: \mu = 59$ vs. $H_a: \mu > 59$ D) $H_0: \mu = 59$ vs. $H_a: \mu \neq 59$
- 13) The owner of Get-A-Way Travel has recently surveyed a random sample of 488 customers to determine whether the mean age of the agency's customers is over 27. The appropriate hypotheses are $H_0: \mu = 27$, $H_a: \mu > 27$. If he concludes the mean age is over 27 when it is not, he makes a _____ error. If he concludes the mean age is not over 27 when it is, he makes a _____ error. 13) _____
- A) Type I; Type I B) Type II; Type I C) Type II; Type II D) Type I; Type II
- 14) Suppose we wish to test $H_0: \mu = 33$ vs. $H_a: \mu > 33$. What will result if we conclude that the mean is greater than 33 when its true value is really 41? 14) _____
- A) a Type II error B) a Type I error
 C) a correct decision D) none of the above

- 15) How many tissues should a package of tissues contain? Researchers have determined that a person uses an average of 43 tissues during a cold. Suppose a random sample of 10,000 people yielded the following data on the number of tissues used during a cold: $\bar{x} = 34$, $s = 21$. We want to test the alternative hypothesis $H_a: \mu < 43$. State the correct rejection region for $\alpha = .05$. 15) _____
- A) Reject H_0 if $z < -1.645$.
 B) Reject H_0 if $z > 1.645$.
 C) Reject H_0 if $z < -1.96$.
 D) Reject H_0 if $z > 1.96$ or $z < -1.96$.
- 16) We have created a 99% confidence interval for μ with the result (11, 16). What conclusion will we make if we test $H_0: \mu = 20$ vs. $H_a: \mu \neq 20$ at $\alpha = .01$? 16) _____
- A) Reject H_0 in favor of H_a .
 B) Fail to reject H_0 .
 C) Accept H_0 rather than H_a .
 D) We cannot tell what our decision will be with the information given.
- 17) A national organization has been working with utilities throughout the nation to find sites for large wind machines that generate electricity. Wind speeds must average more than 22 miles per hour (mph) for a site to be acceptable. Recently, the organization conducted wind speed tests at a particular site. Based on a sample of $n = 47$ wind speed recordings (taken at random intervals), the wind speed at the site averaged $\bar{x} = 23.0$ mph, with a standard deviation of $s = 4.5$ mph. To determine whether the site meets the organization's requirements, consider the test, $H_0: \mu = 22$ vs. $H_a: \mu > 22$, where μ is the true mean wind speed at the site and $\alpha = .01$. Suppose the value of the test statistic were computed to be 1.52. State the conclusion. 17) _____
- A) At $\alpha = .01$, there is sufficient evidence to conclude the true mean wind speed at the site exceeds 22 mph.
 B) At $\alpha = .01$, there is insufficient evidence to conclude the true mean wind speed at the site exceeds 22 mph.
 C) We are 99% confident that the site meets the organization's requirements.
 D) We are 99% confident that the site does not meet the organization's requirements.
- 18) A bottling company produces bottles that hold 12 ounces of liquid. Periodically, the company gets complaints that their bottles are not holding enough liquid. To test this claim, the bottling company randomly samples 64 bottles and finds the average amount of liquid held by the bottles is 11.9155 ounces with a standard deviation of 0.40 ounce. Suppose the p -value of this test is 0.0455. State the proper conclusion. 18) _____
- A) At $\alpha = 0.05$, reject the null hypothesis.
 B) At $\alpha = 0.085$, fail to reject the null hypothesis.
 C) At $\alpha = 0.025$, reject the null hypothesis.
 D) At $\alpha = 0.035$, accept the null hypothesis.
- 19) An industrial supplier has shipped a truckload of teflon lubricant cartridges to an aerospace customer. The customer has been assured that the mean weight of these cartridges is in excess of the 14 ounces printed on each cartridge. To check this claim, a sample of $n = 25$ cartridges are randomly selected from the shipment and carefully weighed. Summary statistics for the sample are: $\bar{x} = 14.17$ ounces, $s = .25$ ounce. To determine whether the supplier's claim is true, consider the test, $H_0: \mu = 14$ vs. $H_a: \mu > 14$, where μ is the true mean weight of the cartridges. Calculate the value of the test statistic. 19) _____
- A) 1.700
 B) 17.000
 C) 0.680
 D) 3.400

20) An industrial supplier has shipped a truckload of teflon lubricant cartridges to an aerospace customer. The customer has been assured that the mean weight of these cartridges is in excess of the 12 ounces printed on each cartridge. To check this claim, a sample of $n = 15$ cartridges are randomly selected from the shipment and carefully weighed. Summary statistics for the sample are: $\bar{x} = 12.13$ ounces, $s = .30$ ounce. To determine whether the supplier's claim is true, consider the test, $H_0: \mu = 12$ vs. $H_a: \mu > 12$, where μ is the true mean weight of the cartridges. Find the rejection region for the test using $\alpha = .01$.

- A) $|z| > 2.58$
 C) $z > 2.33$

- B) $t > 2.977$, where t depends on 14 df
 D) $t > 2.624$, where t depends on 14 df

EXERCISES. (Five Points Each) Complete the following exercises.

21) State University uses thousands of fluorescent light bulbs each year. The brand of bulb it currently uses has a mean life of 600 hours. A competitor claims that its bulbs, which cost the same as the brand the university currently uses, have a mean life of more than 600 hours. The university has decided to purchase the new brand if, when tested, the evidence supports the manufacturer's claim at the .05 significance level. Suppose 100 bulbs were tested with the following results: $\bar{x} = 625$ hours, $s = 100$ hours. Conduct the test using $\alpha = .05$.

- Set up the null and alternative hypotheses of interest.
- What kind of test (left, right, two tailed)?
- Calculate Test Statistic:
- Determine Rejection Region:
- Determine the p-value:
- Is the null hypothesis rejected?
- State a conclusion written in the context of the experiment.

22) At six different randomly chosen times, a researcher measures the temperature (in degrees Fahrenheit) of a pint of milk from a supermarket's shelf. The measurements are shown below.

36 38 39 39 41 43

- Suppose the researcher is interested in determining whether the median temperature exceeds 40°F . Set up the null and alternative hypotheses of interest.
- How many of the measurements exceed 40°F ?
- Assuming that $p = .5$, find the binomial probability that at least two measurements exceed 40°F .
- What do you conclude about H_0 and H_a ? Use $\alpha = 0.05$.