

Name \_\_\_\_\_

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

**Provide an appropriate response.**

- 1) State the Central Limit theorem. Describe the sampling distribution for a population that is uniform and for a population that is normal.
- 2) Under what conditions can we apply the results of the central limit theorem?
- 3) Explain why a continuity correction factor is necessary when approximating the binomial distribution by the normal distribution. Refer to the terms "discrete" and "continuous", and draw a diagram to support your answer.

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

**If Z is a standard normal variable, find the probability.**

- 4) The probability that Z lies between 0 and 3.01  
A) 0.1217                      B) 0.5013                      C) 0.9987                      D) 0.4987
- 5) The probability that Z is less than 1.13  
A) 0.8907                      B) 0.8485                      C) 0.1292                      D) 0.8708
- 6) The probability that Z lies between -0.55 and 0.55  
A) 0.4176                      B) -0.4176                      C) 0.9000                      D) -0.9000

**Assume that X has a normal distribution, and find the indicated probability.**

- 7) The mean is  $\mu = 137.0$  and the standard deviation is  $\sigma = 5.3$ .  
Find  $P(134.4 < X < 140.1)$ .  
A) 0.6242                      B) 1.0311                      C) 0.8138                      D) 0.4069

**Find the indicated probability.**

- 8) The volumes of soda in quart soda bottles are normally distributed with a mean of 32.3 oz and a standard deviation of 1.2 oz. What is the probability that the volume of soda in a randomly selected bottle will be less than 32 oz?  
A) 0.0987                      B) 0.4013                      C) 0.5987                      D) 0.3821
- 9) The weekly salaries of teachers in one state are normally distributed with a mean of \$490 and a standard deviation of \$45. What is the probability that a randomly selected teacher earns more than \$525 a week?  
A) 0.1003                      B) 0.2177                      C) 0.7823                      D) 0.2823

**Solve the problem.**

10) The scores on a certain test are normally distributed with a mean score of 45 and a standard deviation of 5. What is the probability that a sample of 90 students will have a mean score of at least 45.527?

- A) 0.1587                      B) 0.3413                      C) 0.8413                      D) 0.3174

11) A final exam in Math 160 has a mean of 73 with standard deviation 7.8. If 24 students are randomly selected, find the probability that the mean of their test scores is greater than 71.

- A) 0.0008                      B) 0.5036                      C) 0.9012                      D) 0.8962

**Use the continuity correction and describe the region of the normal curve that corresponds to the indicated binomial probability.**

12) The probability of more than 34 correct answers

- A) The area to the right of 34                      B) The area to the right of 34.5  
C) The area to the left of 34.5                      D) The area to the right of 33.5

**Estimate the indicated probability by using the normal distribution as an approximation to the binomial distribution.**

13) A multiple choice test consists of 60 questions. Each question has 4 possible answers of which one is correct. If all answers are random guesses, estimate the probability of getting at least 20% correct.

- A) 0.1492                      B) 0.8508                      C) 0.3508                      D) 0.0901

**Assume that a computer was used to generate the given confidence interval for the population mean,  $\mu$ . Find the sample mean or margin of error as specified.**

14) (136, 150)

Find the sample mean,  $\bar{x}$ .

- A) 143.5                      B) 136                      C) 143.0                      D) 142.0

**Solve the problem.**

15) Find the critical value  $z_{\alpha/2}$  that corresponds to a degree of confidence of 98%.

- A) 2.575                      B) 2.05                      C) 1.75                      D) 2.33

**Use the given degree of confidence and sample data to construct a confidence interval for the population mean  $\mu$ .**

16) A random sample of 101 light bulbs had a mean life of  $\bar{x} = 481$  hours with a standard deviation of  $s = 30$  hours. Construct a 90 percent confidence interval for the mean life,  $\mu$ , of all light bulbs of this type.

- A) (474, 488)                      B) (475, 487)                      C) (473, 489)                      D) (476, 486)

**Solve the problem.**

17) Evaluate  $t_{\alpha/2}$  for a confidence level of 99% and a sample size of 17.

- A) 2.583                      B) 2.921                      C) 2.898                      D) 2.567

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.

- 18) A laboratory tested twelve chicken eggs and found that the mean amount of cholesterol was 239 milligrams with  $s = 13.3$  milligrams. Construct a 95 percent confidence interval for the true mean cholesterol content of all such eggs.

A) (230.6, 247.4)                      B) (230.4, 247.6)                      C) (232.1, 245.9)                      D) (230.5, 247.5)

Find the necessary sample size.

- 19) Scores on a certain test are normally distributed with a variance of 59. A researcher wishes to estimate the mean score achieved by all adults on the test. Find the sample size needed to assure with 95.44 percent confidence that the sample mean will not differ from the population mean by more than 4 units.

A) 59    B) 871    C) 15    D) 23

Use the given degree of confidence and sample data to construct a confidence interval for the population proportion  $p$ .

- 20) When 291 college students are randomly selected and surveyed, it is found that 100 own a car. Find a 99% confidence interval for the true proportion of all college students who own a car.

A)  $0.272 < p < 0.415$                       B)  $0.298 < p < 0.389$                       C)  $0.289 < p < 0.398$                       D)  $0.279 < p < 0.409$

Find the minimum sample size you should use to assure that your estimate,  $\hat{p}$ , will be within the required margin of error around the population  $p$ .

- 21) A university's administrator proposes to do an analysis of the proportion of graduates who have not found employment in their major field one year after graduation. In previous years, the percentage averaged 0.13. He wants the margin of error to be within 0.04 at a 99% confidence level.

A) 19    B) 563    C) 272    D) 469

Use the given degree of confidence and sample data to find a confidence interval for the population standard deviation  $\sigma$ . Assume that the population has a normal distribution.

- 22) To find the standard deviation of the diameter of wooden dowels, the manufacturer measures 19 randomly selected dowels and finds the standard deviation of the sample to be  $s = 0.16$ . Find the 95% confidence interval for the population standard deviation  $\sigma$ .

A)  $0.15 < \sigma < 0.21$                       B)  $0.12 < \sigma < 0.24$                       C)  $0.11 < \sigma < 0.25$                       D)  $0.13 < \sigma < 0.22$

- 23) The daily intakes of milk (in ounces) for ten randomly selected people were:

17.7 13.3 27.0 23.5 26.7  
15.4 14.3 20.6 22.1 29.2

Find a 99 percent confidence interval for the population standard deviation  $\sigma$ .

A) (3.50, 11.61)                      B) (3.50, 12.92)                      C) (3.39, 11.61)                      D) (0.85, 3.32)

Provide an appropriate response.

- 24) In stating a confidence-interval estimate of a population mean, the level of confidence decreases as the size of the interval \_\_\_\_\_.

A) decreases    B) increases

## Answer Key

### Testname: STAT REVIEW 3

- 1) Assume that the random variable  $x$  has a distribution (which may or may not be normal) with mean  $\mu$  and standard deviation  $\sigma$ . Samples of size  $n$  are randomly selected from this population.
  - 1) The distribution of sample means  $\bar{x}$  will, as the sample size increases, approach a normal distribution.
  - 2) The mean of the sample means will be the population mean  $\mu$ .
  - 3) The standard deviation of the sample means will be  $\frac{\sigma}{\sqrt{n}}$ .

For both the uniform and the normal distribution, the distribution of the sample means is bell-shaped. As  $n$  gets larger, the distribution approaches the normal distribution. In the case where the original population is uniform, the distribution of the sample means is approximately normal for  $n > 30$ .

- 2) Either the sample size must be greater than 30, or if the sample is not greater than thirty, then the original population must have a normal distribution.
- 3) The binomial distribution is a discrete distribution with a probability histogram made up of bars. Each bar is one value, for example  $x = 6$ , but the bar actually runs from 5.5 to 6.5. Depending on the requested probability, the actual value is either 5.5 or 6.5. The student should draw a normal distribution with a bar  $x = 6$  showing the boundary values of 5.5 and 6.5.
- 4) D
- 5) D
- 6) A
- 7) D
- 8) B
- 9) B
- 10) A
- 11) D
- 12) B
- 13) B
- 14) C
- 15) D
- 16) D
- 17) B
- 18) D
- 19) C
- 20) A
- 21) D
- 22) B
- 23) B
- 24) A