

# STA2023 Test # 3 Study guide

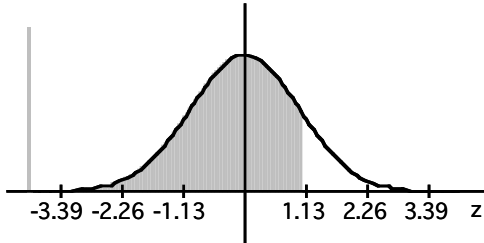
Name \_\_\_\_\_

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

Find the area of the shaded region. The graph depicts the standard normal distribution with mean 0 and standard deviation 1.

1)

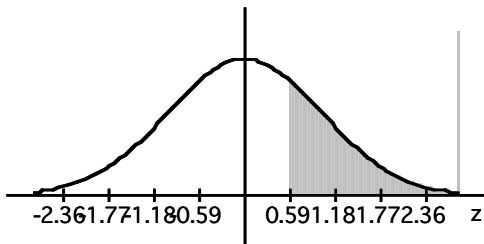
1) \_\_\_\_\_



- A) 0.8708                      B) 0.8907                      C) 0.8485                      D) 0.1292

2)

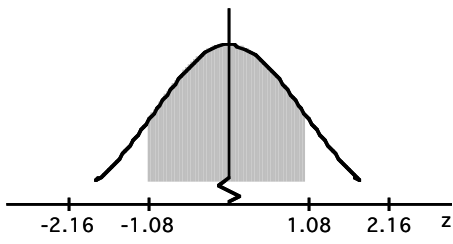
2) \_\_\_\_\_



- A) 0.2776                      B) 0.7224                      C) 0.2224                      D) 0.2190

3)

3) \_\_\_\_\_

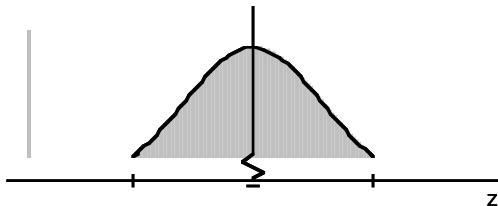


- A) 0.1401                      B) 0.7198                      C) 0.2802                      D) 0.8599

Find the indicated z score. The graph depicts the standard normal distribution with mean 0 and standard deviation 1.

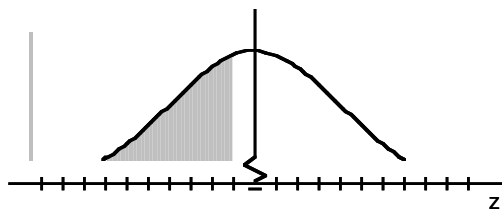
4) Shaded area is 0.9599.

4) \_\_\_\_\_



- A) -1.38                      B) 1.82                      C) 1.75                      D) 1.03

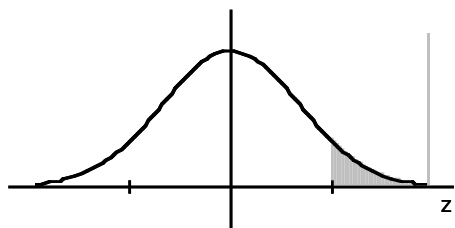
5) Shaded area is 0.4013.



- A) 0.25                      B) -0.57                      C) 0.57                      D) -0.25

5) \_\_\_\_\_

6) Shaded area is 0.0694.



- A) 1.26                      B) 1.48                      C) 1.39                      D) 1.45

6) \_\_\_\_\_

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

7) The probability that z lies between 0 and 3.01

- A) 0.4987                      B) 0.9987                      C) 0.5013                      D) 0.1217

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

8) The probability that z lies between -2.41 and 0

- A) 0.0948                      B) 0.4920                      C) 0.4910                      D) 0.5080

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

9) The probability that z is less than 1.13

- A) 0.8485                      B) 0.8907                      C) 0.8708                      D) 0.1292

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

10) The probability that z is greater than -1.82

- A) -0.0344                      B) 0.9656                      C) 0.0344                      D) 0.4656

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

11)  $P(z < 0.97)$

- A) 0.8340                      B) 0.8315                      C) 0.1660                      D) 0.8078

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

**Find the indicated value.**

12)  $z_{0.005}$

- A) 2.835                      B) 2.575                      C) 2.015                      D) 2.535

12) \_\_\_\_\_

13)  $z_{0.36}$

- A) 1.60                      B) 0.45                      C) 0.36                      D) 1.76

13) \_\_\_\_\_

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

14) The mean is  $\mu = 60.0$  and the standard deviation is  $\sigma = 4.0$ .

Find the probability that X is less than 53.0.

- A) 0.0401                      B) 0.5589                      C) 0.9599                      D) 0.0802

14) \_\_\_\_\_

15) The mean is  $\mu = 15.2$  and the standard deviation is  $\sigma = 0.9$ . Find the probability that  $X$  is greater than 15.2. 15) \_\_\_\_\_  
A) 0.0003                      B) 0.9998                      C) 0.5000                      D) 1.0000

16) The mean is  $\mu = 15.2$  and the standard deviation is  $\sigma = 0.9$ . Find the probability that  $X$  is between 14.3 and 16.1. 16) \_\_\_\_\_  
A) 0.3413                      B) 0.1587                      C) 0.8413                      D) 0.6826

**Find the indicated probability.**

17) The diameters of bolts produced by a certain machine are normally distributed with a mean of 0.30 inches and a standard deviation of 0.01 inches. What percentage of bolts will have a diameter greater than 0.32 inches? 17) \_\_\_\_\_  
A) 97.72%                      B) 37.45%                      C) 2.28%                      D) 47.72%

18) The incomes of trainees at a local mill are normally distributed with a mean of \$1100 and a standard deviation of \$150. What percentage of trainees earn less than \$900 a month? 18) \_\_\_\_\_  
A) 9.18%                      B) 35.31%                      C) 40.82%                      D) 90.82%

19) The diameters of pencils produced by a certain machine are normally distributed with a mean of 0.30 inches and a standard deviation of 0.01 inches. What is the probability that the diameter of a randomly selected pencil will be less than 0.285 inches? 19) \_\_\_\_\_  
A) 0.0596                      B) 0.9332                      C) 0.0668                      D) 0.4332

20) 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? 20) \_\_\_\_\_  
A) 0.9834                      B) 0.0179                      C) 0.4834                      D) 0.0166

**Solve the problem.**

21) Scores on a test have a mean of 67 and  $Q_3$  is 83. The scores have a distribution that is approximately normal. Find the standard deviation. Round your answer to the nearest tenth. 21) \_\_\_\_\_  
A) 10.7                      B) 12                      C) 21.3                      D) 23.9

22) The amount of snowfall falling in a certain mountain range is normally distributed with a mean of 70 inches, and a standard deviation of 10 inches. What is the probability that the mean annual snowfall during 25 randomly picked years will exceed 72.8 inches? 22) \_\_\_\_\_  
A) 0.5808                      B) 0.4192                      C) 0.0026                      D) 0.0808

23) The scores on a certain test are normally distributed with a mean score of 60 and a standard deviation of 5. What is the probability that a sample of 90 students will have a mean score of at least 60.527? 23) \_\_\_\_\_  
A) 0.3413                      B) 0.1587                      C) 0.3174                      D) 0.8413

24) The annual precipitation amounts in a certain mountain range are normally distributed with a mean of 109 inches, and a standard deviation of 10 inches. What is the probability that the mean annual precipitation during 25 randomly picked years will be less than 111.8 inches? 24) \_\_\_\_\_  
A) 0.5808                      B) 0.4192                      C) 0.9192                      D) 0.0808

- 25) A study of the amount of time it takes a mechanic to rebuild the transmission for a 2005 Chevrolet Cavalier shows that the mean is 8.4 hours and the standard deviation is 1.8 hours. If 40 mechanics are randomly selected, find the probability that their mean rebuild time exceeds 8.7 hours. 25) \_\_\_\_\_  
 A) 0.1346                      B) 0.1469                      C) 0.1946                      D) 0.1285
- 26) A study of the amount of time it takes a mechanic to rebuild the transmission for a 2005 Chevrolet Cavalier shows that the mean is 8.4 hours and the standard deviation is 1.8 hours. If 40 mechanics are randomly selected, find the probability that their mean rebuild time exceeds 7.7 hours. 26) \_\_\_\_\_  
 A) 0.8531                      B) 0.9931                      C) 0.9634                      D) 0.9712
- 27) A study of the amount of time it takes a mechanic to rebuild the transmission for a 2005 Chevrolet Cavalier shows that the mean is 8.4 hours and the standard deviation is 1.8 hours. If 40 mechanics are randomly selected, find the probability that their mean rebuild time is less than 8.9 hours. 27) \_\_\_\_\_  
 A) 0.9589                      B) 0.9608                      C) 0.9756                      D) 0.4276
- 28) 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 less than 70. 28) \_\_\_\_\_  
 A) 0.9699                      B) 0.0301                      C) 0.1006                      D) 0.0278

**Find the indicated critical z value.**

- 29) Find the critical value  $z_{\alpha/2}$  that corresponds to a 98% confidence level. 29) \_\_\_\_\_  
 A) 2.05                      B) 2.575                      C) 1.75                      D) 2.33
- 30) Find the critical value  $z_{\alpha/2}$  that corresponds to a 93% confidence level. 30) \_\_\_\_\_  
 A) 2.70                      B) 1.81                      C) 1.96                      D) 1.48
- 31) Find  $z_{\alpha/2}$  for  $\alpha = 0.07$ . 31) \_\_\_\_\_  
 A) 1.48                      B) 2.70                      C) 1.81                      D) 1.96

**Express the confidence interval using the indicated format.**

- 32) Express the confidence interval  $0.039 < p < 0.479$  in the form of  $\hat{p} \pm E$ . 32) \_\_\_\_\_  
 A)  $0.22 \pm 0.5$                       B)  $0.259 \pm 0.22$                       C)  $0.259 \pm 0.5$                       D)  $0.259 - 0.22$
- 33) Express the confidence interval (0.432, 0.52) in the form of  $\hat{p} \pm E$ . 33) \_\_\_\_\_  
 A)  $0.476 \pm 0.044$                       B)  $0.476 \pm 0.088$                       C)  $0.432 \pm 0.088$                       D)  $0.432 \pm 0.044$
- 34) Express the confidence interval  $0.491 \pm 0.057$  in the form of  $\hat{p} - E < p < \hat{p} + E$ . 34) \_\_\_\_\_  
 A)  $0.491 < p < 0.548$                       B)  $0.4625 < p < 0.5195$   
 C)  $0.434 < p < 0.491$                       D)  $0.434 < p < 0.548$

**Solve the problem.**

- 35) The following confidence interval is obtained for a population proportion, p: (0.688, 0.724). Use these confidence interval limits to find the point estimate,  $\hat{p}$ . 35) \_\_\_\_\_  
 A) 0.688                      B) 0.708                      C) 0.706                      D) 0.724

- 36) The following confidence interval is obtained for a population proportion,  $p: 0.724 < p < 0.752$ . 36) \_\_\_\_\_  
 Use these confidence interval limits to find the margin of error, E.  
 A) 0.738                      B) 0.014                      C) 0.015                      D) 0.028

**Assume that a sample is used to estimate a population proportion  $p$ . Find the margin of error  $E$  that corresponds to the given statistics and confidence level. Round the margin of error to four decimal places.**

- 37) 95% confidence;  $n = 380, x = 50$  37) \_\_\_\_\_  
 A) 0.0340                      B) 0.0357                      C) 0.0408                      D) 0.0306
- 38) 99% confidence;  $n = 5900, x = 1770$  38) \_\_\_\_\_  
 A) 0.0154                      B) 0.00878                      C) 0.0135                      D) 0.0117
- 39) 98% confidence; the sample size is 800, of which 40% are successes 39) \_\_\_\_\_  
 A) 0.0355                      B) 0.0404                      C) 0.0446                      D) 0.0339
- 40) 90% confidence;  $n = 300, x = 140$  40) \_\_\_\_\_  
 A) 0.0474                      B) 0.0593                      C) 0.0509                      D) 0.0565

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

- 41)  $n = 56, x = 30$ ; 95% confidence 41) \_\_\_\_\_  
 A)  $0.425 < p < 0.647$                       B)  $0.404 < p < 0.668$   
 C)  $0.426 < p < 0.646$                       D)  $0.405 < p < 0.667$
- 42)  $n = 85, x = 49$ ; 98% confidence 42) \_\_\_\_\_  
 A)  $0.450 < p < 0.702$                       B)  $0.470 < p < 0.682$   
 C)  $0.451 < p < 0.701$                       D)  $0.471 < p < 0.681$
- 43)  $n = 109, x = 65$ ; 88% confidence 43) \_\_\_\_\_  
 A)  $0.523 < p < 0.669$                       B)  $0.522 < p < 0.670$   
 C)  $0.519 < p < 0.673$                       D)  $0.518 < p < 0.674$

**Use the given data to find the minimum sample size required to estimate the population proportion.**

- 44) Margin of error: 0.005; confidence level: 96%;  $\hat{p}$  and  $\hat{q}$  unknown 44) \_\_\_\_\_  
 A) 42,018                      B) 42,148                      C) 42,025                      D) 32,024
- 45) Margin of error: 0.028; confidence level: 99%;  $\hat{p}$  and  $\hat{q}$  unknown 45) \_\_\_\_\_  
 A) 1116                      B) 1939                      C) 2223                      D) 2115
- 46) Margin of error: 0.04; confidence level: 99%; from a prior study,  $\hat{p}$  is estimated by 0.12. 46) \_\_\_\_\_  
 A) 438                      B) 526                      C) 18                      D) 254
- 47) Margin of error: 0.07; confidence level: 90%; from a prior study,  $\hat{p}$  is estimated by 0.30. 47) \_\_\_\_\_  
 A) 103                      B) 8                      C) 348                      D) 116

**Solve the problem. Round the point estimate to the nearest thousandth.**

- 48) Find the point estimate of the proportion of people who wear hearing aids if, in a random sample of 898 people, 46 people had hearing aids. 48) \_\_\_\_\_  
A) 0.051                      B) 0.049                      C) 0.050                      D) 0.949
- 49) 445 randomly selected light bulbs were tested in a laboratory, 316 lasted more than 500 hours. Find a point estimate of the proportion of all light bulbs that last more than 500 hours. 49) \_\_\_\_\_  
A) 0.415                      B) 0.290                      C) 0.708                      D) 0.710

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

- 50) A survey of 865 voters in one state reveals that 408 favor approval of an issue before the legislature. Construct the 95% confidence interval for the true proportion of all voters in the state who favor approval. 50) \_\_\_\_\_  
A)  $0.471 < p < 0.472$                       B)  $0.438 < p < 0.505$   
C)  $0.435 < p < 0.508$                       D)  $0.444 < p < 0.500$
- 51) A survey of 300 union members in New York State reveals that 112 favor the Republican candidate for governor. Construct the 98% confidence interval for the true population proportion of all New York State union members who favor the Republican candidate. 51) \_\_\_\_\_  
A)  $0.301 < p < 0.445$                       B)  $0.304 < p < 0.442$   
C)  $0.316 < p < 0.430$                       D)  $0.308 < p < 0.438$
- 52) Of 92 adults selected randomly from one town, 61 have health insurance. Find a 90% confidence interval for the true proportion of all adults in the town who have health insurance. 52) \_\_\_\_\_  
A)  $0.566 < p < 0.760$                       B)  $0.536 < p < 0.790$   
C)  $0.582 < p < 0.744$                       D)  $0.548 < p < 0.778$
- 53) Of 150 adults selected randomly from one town, 30 of them smoke. Construct a 99% confidence interval for the true percentage of all adults in the town that smoke. 53) \_\_\_\_\_  
A)  $14.6\% < p < 25.4\%$                       B)  $12.4\% < p < 27.6\%$   
C)  $13.6\% < p < 26.4\%$                       D)  $11.6\% < p < 28.4\%$

**Do one of the following, as appropriate: (a) Find the critical value  $z_{\alpha/2}$ , (b) find the critical value  $t_{\alpha/2}$ , (c) state that neither the normal nor the t distribution applies.**

- 54) 98%;  $n = 7$ ;  $\sigma = 27$ ; population appears to be normally distributed. 54) \_\_\_\_\_  
A)  $z_{\alpha/2} = 2.05$                       B)  $t_{\alpha/2} = 2.575$                       C)  $z_{\alpha/2} = 2.33$                       D)  $t_{\alpha/2} = 1.96$
- 55) 99%;  $n = 17$ ;  $\sigma$  is unknown; population appears to be normally distributed. 55) \_\_\_\_\_  
A)  $z_{\alpha/2} = 2.567$                       B)  $t_{\alpha/2} = 2.921$                       C)  $z_{\alpha/2} = 2.583$                       D)  $t_{\alpha/2} = 2.898$
- 56) 95%;  $n = 11$ ;  $\sigma$  is known; population appears to be very skewed. 56) \_\_\_\_\_  
A)  $t_{\alpha/2} = 2.228$   
B)  $z_{\alpha/2} = 1.96$   
C)  $z_{\alpha/2} = 1.812$   
D) Neither the normal nor the t distribution applies.

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.

- 57)  $n = 10, \bar{x} = 8.1, s = 4.8, 95\%$  confidence 57) \_\_\_\_\_  
 A)  $5.32 < \mu < 10.88$  B)  $4.68 < \mu < 11.52$   
 C)  $4.67 < \mu < 11.53$  D)  $4.72 < \mu < 11.48$

- 58)  $n = 12, \bar{x} = 23.6, s = 6.6, 99\%$  confidence 58) \_\_\_\_\_  
 A)  $17.70 < \mu < 29.50$  B)  $18.42 < \mu < 28.78$   
 C)  $17.68 < \mu < 29.52$  D)  $17.56 < \mu < 29.64$

- 59) A savings and loan association needs information concerning the checking account balances of its local customers. A random sample of 14 accounts was checked and yielded a mean balance of \$664.14 and a standard deviation of \$297.29. Find a 98% confidence interval for the true mean checking account balance for local customers. 59) \_\_\_\_\_  
 A)  $\$453.59 < \mu < \$874.69$  B)  $\$492.52 < \mu < \$835.76$   
 C)  $\$493.71 < \mu < \$834.57$  D)  $\$455.65 < \mu < \$872.63$

- 60) The principal randomly selected six students to take an aptitude test. Their scores were: 88.0 84.1 74.9 83.2 83.7 85.5 60) \_\_\_\_\_  
 Determine a 90% confidence interval for the mean score for all students.  
 A)  $79.49 < \mu < 86.98$  B)  $86.98 < \mu < 79.49$   
 C)  $79.59 < \mu < 86.88$  D)  $86.88 < \mu < 79.59$

- 61) The football coach randomly selected ten players and timed how long each player took to perform a certain drill. The times (in minutes) were: 7.0 10.8 9.5 8.0 11.5 7.5 6.4 11.3 10.2 12.6 61) \_\_\_\_\_  
 Determine a 95% confidence interval for the mean time for all players.  
 A)  $11.03 \text{ min} < \mu < 7.93 \text{ min}$  B)  $10.93 \text{ min} < \mu < 8.03 \text{ min}$   
 C)  $8.03 \text{ min} < \mu < 10.93 \text{ min}$  D)  $7.93 \text{ min} < \mu < 11.03 \text{ min}$

Use the given information to find the minimum sample size required to estimate an unknown population mean  $\mu$ .

- 62) Margin of error: \$126, confidence level: 99%,  $\sigma = \$512$  62) \_\_\_\_\_  
 A) 56 B) 63 C) 45 D) 110

- 63) How many business students must be randomly selected to estimate the mean monthly earnings of business students at one college? We want 95% confidence that the sample mean is within \$135 of the population mean, and the population standard deviation is known to be \$538. 63) \_\_\_\_\_  
 A) 54 B) 43 C) 86 D) 62

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.

- 64) A sociologist develops a test to measure attitudes towards public transportation, and 27 randomly selected subjects are given the test. Their mean score is 76.2 and their standard deviation is 21.4. Construct the 95% confidence interval for the mean score of all such subjects. 64) \_\_\_\_\_  
 A)  $69.2 < \mu < 83.2$  B)  $64.2 < \mu < 88.2$   
 C)  $67.7 < \mu < 84.7$  D)  $74.6 < \mu < 77.8$

Use the confidence level and sample data to find a confidence interval for estimating the population  $\mu$ . Round your answer to the same number of decimal places as the sample mean.

- 65) Test scores:  $n = 104$ ,  $\bar{x} = 95.3$ ,  $\sigma = 6.5$ ; 99% confidence 65) \_\_\_\_\_  
A)  $93.8 < \mu < 96.8$  B)  $93.7 < \mu < 96.9$   
C)  $94.2 < \mu < 96.4$  D)  $94.1 < \mu < 96.5$
- 66) Test scores:  $n = 72$ ,  $\bar{x} = 58.1$ ,  $\sigma = 6.2$ ; 98% confidence 66) \_\_\_\_\_  
A)  $56.7 < \mu < 59.5$  B)  $56.4 < \mu < 59.8$   
C)  $56.9 < \mu < 59.3$  D)  $56.2 < \mu < 60.0$
- 67) A random sample of 104 light bulbs had a mean life of  $\bar{x} = 543$  hours with a standard deviation of  $\sigma = 26$  hours. Construct a 90% confidence interval for the mean life,  $\mu$ , of all light bulbs of this type. 67) \_\_\_\_\_  
A)  $537 \text{ hr} < \mu < 549 \text{ hr}$  B)  $539 \text{ hr} < \mu < 547 \text{ hr}$   
C)  $538 \text{ hr} < \mu < 548 \text{ hr}$  D)  $536 \text{ hr} < \mu < 550 \text{ hr}$
- 68) A laboratory tested 82 chicken eggs and found that the mean amount of cholesterol was 228 milligrams with  $\sigma = 19.0$  milligrams. Construct a 95% confidence interval for the true mean cholesterol content,  $\mu$ , of all such eggs. 68) \_\_\_\_\_  
A)  $224 \text{ mg} < \mu < 232 \text{ mg}$  B)  $225 \text{ mg} < \mu < 233 \text{ mg}$   
C)  $223 \text{ mg} < \mu < 232 \text{ mg}$  D)  $223 \text{ mg} < \mu < 231 \text{ mg}$



Answer Key

Testname: STA2013 TEST# 2 STUDY GUIDE

- 1) A
- 2) A
- 3) B
- 4) C
- 5) D
- 6) B
- 7) A
- 8) B
- 9) C
- 10) B
- 11) A
- 12) B
- 13) C
- 14) A
- 15) C
- 16) D
- 17) C
- 18) A
- 19) C
- 20) D
- 21) D
- 22) D
- 23) B
- 24) C
- 25) B
- 26) B
- 27) B
- 28) B
- 29) D
- 30) B
- 31) C
- 32) B
- 33) A
- 34) D
- 35) C
- 36) B
- 37) A
- 38) A
- 39) B
- 40) A
- 41) D
- 42) C
- 43) A
- 44) C
- 45) D
- 46) A
- 47) D
- 48) A
- 49) D

Answer Key

Testname: STA2013 TEST# 2 STUDY GUIDE

- 50) B
- 51) D
- 52) C
- 53) D
- 54) C
- 55) B
- 56) D
- 57) C
- 58) C
- 59) A
- 60) C
- 61) C
- 62) D
- 63) D
- 64) C
- 65) B
- 66) B
- 67) B
- 68) A