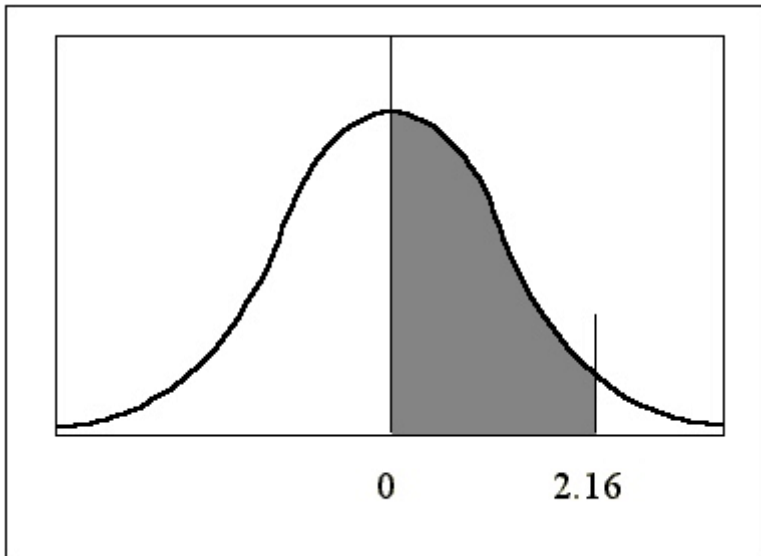Exam

Name_____

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

1) Which of the following properties distinguishes the standard normal distribution from other normal distributions?
   A) The curve is continuous.
   B) The total area under the curve is equal to 1.00.
   C) The mean is located at the center of the distribution.
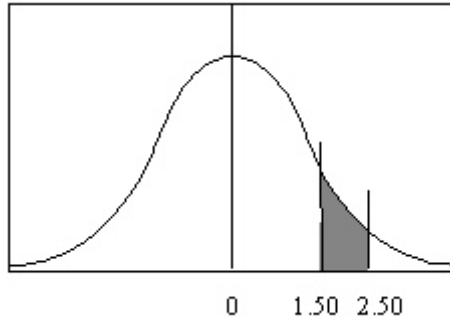   D) The mean is 0 and the standard deviation is 1.

1) _____

2) The area under a normal distribution curve is always positive even if the z value is negative.
   A) True   B) False

2) _____

3) Find the area under the standard normal distribution curve between $z = 0$ and $z = 2.16$.
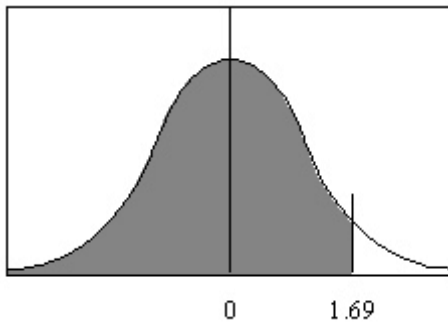
3) _____

   A) 2.1600   B) 0.4846   C) 0.3708   D) 0.9846

4) What is the area under the standard normal distribution curve between $z = 1.50$ and $z = 2.50$?

   0   1.50 2.50

   A) 0.0802   B) 0.0606   C) 1.00   D) 0.0764

4) _____

5) Find the area under the standard normal distribution curve to the left of $z = 1.69$.

   0   1.69

   A) 0.4452   B) 0.9452   C) 0.4545   D) 0.9545

5) _____

6) Find the area under the standard normal curve that lies between $z = -1.9$ and $z = 2.2$.
   A) 0.0426   B) 0.9574   C) 0.5139   D) 0.4861

6) _____

7) The probability $P(0 < z < 0.97)$ is 0.3340.
   A) False   B) True

7) _____

8) Find the area under the standard normal curve to the right of $z = 2$.
   A) 0.9772   B) 0.0228   C) 0.0114   D) 0.4772

8) _____

9) Find the probability $P(z > 0.78)$ using the standard normal distribution.
   A) 0.7823   B) 0.2823   C) 0.7177   D) 0.2177

9) _____

10) Find the probability $P(z > -0.54)$ using the standard normal distribution.
    A) 0.7054   B) 0.7946   C) 0.2054   D) 0.2946

10) _____

11) Find the z-scores that bound the middle 74% of the area under the standard normal curve.
    A) -1.07, 1.07   B) -0.99, 0.99   C) -1.24, 1.24   D) -1.13, 1.13

11) _____

2

12) The average length of crocodiles in a swamp is 11.5 feet. If the lengths are normally   12) _____
    distributed with a standard deviation of 1.7 feet, find the probability that a crocodile is
    more than 11 feet long.
        A) 0.12   B) 0.62   C) 0.38   D) 0.88

13) A normal population has a mean μ = 33 and standard deviation σ = 9. What is the   13) _____
    probability that a randomly chosen value will be greater than 44?
        A) 0.8888   B) 0.8554   C) 0.1112   D) 0.6915

14) A bottler of drinking water fills plastic bottles with a mean volume of 999 milliliters   14) _____
    (mL) and standard deviation 5 mL. The fill volumes are normally distributed. What
    proportion of bottles have volumes between 992 mL and 998 mL?
        A) 0.3399   B) 0.0808   C) 0.4207   D) 0.6452

15) A bottler of drinking water fills plastic bottles with a mean volume of 1001 milliliters   15) _____
    (mL) and standard deviation 6 mL. The fill volumes are normally distributed. What
    proportion of bottles have volumes less than 1001 mL?
        A) 0.5438   B) 1.0000   C) 0.9772   D) 0.5000

16) A bottler of drinking water fills plastic bottles with a mean volume of 992 milliliters   16) _____
    (mL) and standard deviation 7 mL. The fill volumes are normally distributed. What
    proportion of bottles have volumes less than 989 mL?
        A) 0.9997   B) 0.3336   C) 0.6293   D) 1.0000

17) A bottler of drinking water fills plastic bottles with a mean volume of 991 milliliters   17) _____
    (mL) and standard deviation 4 mL. The fill volumes are normally distributed. What
    proportion of bottles have volumes less than 994 mL?
        A) 0.9970   B) 0.7734   C) 1.0000   D) 0.8186

18) A sample of size 65 will be drawn from a population with mean 22 and standard   18) _____
    deviation 15. Find the probability that $\bar{x}$ will be between 20 and 25.
        A) 0.8040   B) 0.0537   C) 0.1423   D) 0.7465

19) A sample of size 52 will be drawn from a population with mean 18 and standard   19) _____
    deviation 13. Find the probability that $\bar{x}$ will be less than 21.
        A) 0.0485   B) 0.9633   C) 0.9382   D) 0.9515

20) Of the members of a Boy Scout troop, 15% have received the first aid merit badge. If   20) _____
    40 boy scouts are selected at random, find the probability that four or more will have
    the first aid merit badge?
        A) 31.3%   B) 81.3%   C) 36.6%   D) 86.6%

21) A biologist estimates that 70% of the deer in a region carry a certain type of tick. For a   21) _____
    sample of 300 deer selected at random, what is the chance that 216 or fewer deer have
    this tick?
       A) 0.588   B) 0.864   C) 0.794   D) 0.206

22) Find the level of the confidence interval that has the given critical value.   22) _____
      2.16

       A) 1.54%   B) 98.46%   C) 96.92%   D) 3.08%

23) An economics professor randomly selected 100 millionaires in the United States. The   23) _____
    average age of these millionaires was 54.8 years. If the standard deviation of the entire
    population of millionaires is 7.9 years, find the 95% confidence interval for the mean
    age of all United States millionaires.
       A) $52.8 < \mu < 56.8$ B) $53.3 < \mu < 56.3$
       C) $54.0 < \mu < 55.6$ D) $53.5 < \mu < 56.1$

24) A study of 65 bolts of carpet showed that their average length was 74.2 yards. The   24) _____
    standard deviation of the population is 3.6 yards. Which of the following is the 98%
    confidence interval for the mean length per bolt of carpet?
       A) $73.3 < \mu < 75.1$ B) $73.7 < \mu < 74.7$
       C) $73.2 < \mu < 75.2$ D) $72.1 < \mu < 76.3$

25) A population has a standard deviation $\sigma = 19.8$. How large a sample must be drawn so   25) _____
    that a 99% confidence interval for μ will have a margin of error equal to 4.7?
       A) 118   B) 215   C) 7   D) 11

26) A sample of size $n = 21$ is drawn from a normal population. Find the critical value $t_{\alpha/2}$ 26) _____
    needed to construct a 90% confidence interval.
       A) 1.725   B) 1.645   C) 1.721   D) 1.325

27) A sample of size $n = 11$ has a sample mean $\bar{x} = 15.6$ and sample standard deviation   27) _____
    $s = 2.4$. Construct a 95% confidence interval for the population mean μ.
       A) $14.3 < \mu < 16.9$ B) $14.6 < \mu < 16.6$
       C) $15.1 < \mu < 16.1$ D) $14.0 < \mu < 17.2$

28) 7 squirrels were found to have an average weight of 8.7 ounces with a sample standard   28) _____
    deviation is 1.1. Find the 95% confidence interval of the true mean weight.
       A) $8.3 < \mu < 9.1$ B) $6.0 < \mu < 11.4$
       C) $7.7 < \mu < 9.7$ D) $7.9 < \mu < 9.5$

29) In a study of 100 new cars, 29 are white. Find $\hat{p}$ and $\hat{q}$, where $\hat{p}$ is the proportion of new cars that are white.

A) $\hat{p} = 0.29$, $\hat{q} = 0.71$ B) $\hat{p} = 0.71$, $\hat{q} = 0.71$

C) $\hat{p} = 0.71$, $\hat{q} = 0.29$ D) $\hat{p} = 0.29$, $\hat{q} = 0.29$

29) _____

30) In a survey of 305 registered voters, 130 of them wished to see Mayor Waffleskate lose her next election. Construct a 95% confidence interval for the proportion of registered voter who want to see Mayor Waffleskate defeated.

A) $0.380 < p < 0.473$ B) $0.398 < p < 0.455$

C) $0.371 < p < 0.482$ D) $0.317 < p < 0.535$

30) _____

31) A recent poll of 700 people who work indoors found that 278 smoke. If the researchers want to be 98% confident of their results to within 3.5 percentage points, how large a sample is necessary?

A) 751   B) 1062   C) 532   D) 33

31) _____

32) A chi-square distribution is negatively skewed.

A) False   B) True

32) _____

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

33) The area under each chi-square distribution is equal to _____.

33) _____

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

34) Find χ^2_{left} and χ^2_{right} for a 90% confidence interval using the chi-square distribution with 15 degrees of freedom.

A) 6.571, 23.685   B) 7.790, 21.064

C) 7.261, 24.996   D) 8.547, 22.307

34) _____

35) Find the values for χ^2_{left} and χ^2_{right} when $\alpha = .05$ and $n = 27$.

A) 16.151 and 40.113   B) 13.844 and 41.923

C) 15.379 and 38.885   D) 14.573 and 43.194

35) _____

36) What is the 90% confidence interval for the variance of exam scores for 28 algebra students, if the standard deviation of their last exam was 12.7?

A) $10.4 < \sigma^2 < 16.4$ B) $108.6 < \sigma^2 < 269.6$

C) $123.7 < \sigma^2 < 312.7$ D) $122.8 < \sigma^2 < 316.5$

36) _____

37) Construct a 99% confidence interval for the population standard deviation σ if a sample   37) _____
of size 11 has standard deviation $s = 15$.
   A) $9.45 < \sigma < 32.31$ B) $9.85 < \sigma < 29.66$
   C) $9.62 < \sigma < 30.83$ D) $9.17 < \sigma < 29.40$

38) A new-car dealer is leasing various brand-new randomly selected models for the   38) _____
monthly rates (in dollars) listed below. Estimate the true population variance (and
standard deviation) in leasing rates with 90% confidence. Assume the variable is
normally distributed.

   165   173   200   241   241   245

   A) $19.75 < \sigma^2 < 190.92$ B) $719.44 < \sigma^2 < 6955.64$
      $4.44 < \sigma < 13.82$ $26.82 < \sigma < 83.40$
   C) $599.53 < \sigma^2 < 5796.37$ D) $16.46 < \sigma^2 < 159.10$
      $24.49 < \sigma < 76.13$ $4.06 < \sigma < 12.61$

39) Is the statement $H_0 : \mu = 6$ a valid null hypothesis?   39) _____
   A) Yes, this is a statement that compares two parameters.
   B) No, there is no parameter contained in this statement.
   C) No, equalities are not permitted in a null hypothesis.
   D) Yes, this is a statement that compares a parameter to a value.

40) Are the following statements $H_0 : \lambda = 11$ and $H_1 : \lambda < 11$ a valid pair of null and   40) _____
alternative hypothesis?
   A) No, λ cannot be a parameter
   B) Yes, the alternative hypothesis specifies an equality and the null hypothesis
      specifies a difference.
   C) No, the null hypothesis should not state an equality.
   D) Yes, the null hypothesis specifies an equality and the alternative specifies a
      difference.

41) Are the following statements $H_0 : = 12$ and $H_1 : \neq 12$ valid null and alternative   41) _____
hypotheses?
   A) No, there are no parameters contained in these statements.
   B) Yes, these statements are two non-overlapping hypotheses and compare a
      parameter to a value.
   C) No, the alternative hypothesis cannot contain numeric values.
   D) Yes, these statements are two non-overlapping hypotheses and compare two
      parameters.

42) Determine whether the outcome is a Type I error, a Type II error, or a correct decision.   42) _____
      A test is made of $H_0: \mu = 40$ versus $H_1: \mu \neq 40$. The true value of μ is 40 and H_0
   is rejected.
      A) Type II error   B) Correct decision   C) Type I error

43) Determine whether the alternative hypothesis is left-tailed, right-tailed, or two-tailed.　　43) _____
$H_0: \mu = 71$　　　$H_1: \mu < 71$
　　A) left-tailed　　　　　　　B) right-tailed　　　　　　　C) two-tailed

44) Using the z table, find the critical value (or values) for an $\alpha = 0.03$ two-tailed test.　　44) _____
　　A) ±1.88　　　　　B) ±2.17　　　　　C) 1.88　　　　　D) 2.17

45) Using the z table, find the critical value (or values) for an $\alpha = 0.015$ left-tailed test.　　45) _____
　　A) -2.43　　　　　B) -1.22　　　　　C) -1.09　　　　　D) -2.17

46) A garbage collector believes that he averages picking up more than four tons of garbage　　46) _____
per day. What is the null hypothesis for his statement?
　　A) $H_0 : \mu = 4$　　　　B) $H_0 : \mu \neq 4$　　　　C) $H_0 : \mu \geq 4$　　　　D) $H_0 : \mu < 4$

47) A test is made of $H_0: \mu = 55$ versus $H_1: \mu > 55$. A sample of size $n = 68$ is drawn, and　　47) _____
$\bar{x} = 56$. The population standard deviation is $\sigma = 27$. Compute the value of the test
statistic z.
　　A) 1.59　　　　　B) 0.31　　　　　C) 0.62　　　　　D) 0.04

48) The Eagle Ridge Contractors Association claims the average price of a home in their　　48) _____
subdivision is $125,150 with a standard deviation of $7,350. A sample of 36 homes for
sale in this subdivision had an average selling price of $123,550. The Eagle Ridge
Home Owners Association is interested in knowing if the costs of homes for sale in this
subdivision are actually lower than claimed? What is the p-value for this left-tailed
test?
　　A) 0.1327　　　　　B) 0.0036　　　　　C) 0.0853　　　　　D) 0.0951

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

49) Dr. Christina Cuttleman, a nutritionist, claims that the average number of　　　49) _____
calories in a serving of popcorn is 75 with a standard deviation of 7. A sample
of 50 servings of popcorn was found to have an average of 78 calories. Check
Dr. Cuttleman's claim at $\alpha = 0.05$.

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

50) In a particular city, the average annual salary for secretaries is $28,000. A sample of 50　　50) _____
secretaries from Company A shows an average annual salary of $24,500 with a
population standard deviation of $4500. Secretaries at Company A claim they are paid
less than the city average. What is the test value for this claim?
　　A) 5.50　　　　　B) 0.78　　　　　C) -5.50　　　　　D) -0.78

51) The average greyhound can reach a top speed of 18.8 meters per second. A particular   51) _____
greyhound breeder claims her dogs are faster than the average greyhound. A sample of
50 of her dogs ran, on average, 19.2 meters per second with a population standard
deviation of 1.4 meters per second. With $\alpha = 0.05$, is her claim correct?
   A) No, because the test value 0.04 falls in the critical region.
   B) Yes, because the test value 0.04 falls in the noncritical region.
   C) Yes, because the test value 2.02 falls in the critical region.
   D) No, because the test value 0.40 falls in the critical region.

52) State whether the null hypothesis should be rejected on the basis of the given P-value.   52) _____
   P-value = 0.001, $\alpha = 0.05$, one-tailed test
   A) Reject   B) Do not reject

53) What is the critical value for a two-tailed t test when $\alpha = 0.02$ and $n = 19$?   53) _____
   A) 2.567   B) 2.878   C) 2.552   D) 2.110

54) A sample of 46 students enroll in a program that claims to improve scores on the   54) _____
quantitative reasoning portion of the Graduate Record Examination (GRE). The
participants take a mock GRE test before the program begins and again at the end to
measure their improvement.

The mean number of points improved was $\bar{x} = 16$. Assume the standard deviation is
$\sigma = 53$ and let μ be the population mean number of points improved. To determine
whether the program is effective, a test is made of the hypotheses $H_0: \mu = 0$ versus
$H_1: \mu > 0$.

Compute the value of the test statistic.
   A) 14.91   B) 2.05   C) 0.0202   D) 0.30

55) A sample of 35 students enroll in a program that claims to improve scores on the   55) _____
quantitative reasoning portion of the Graduate Record Examination (GRE). The
participants take a mock GRE test before the program begins and again at the end to
measure their improvement.

The mean number of points improved was $\bar{x} = 10$. Assume the standard deviation is
$\sigma = 46$ and let μ be the population mean number of points improved. To determine
whether the program is effective, a test is made of the hypotheses $H_0: \mu = 0$ versus
$H_1: \mu > 0$.

Compute the P-value.
   A) 0.0496   B) 1.2861   C) 0.0248   D) 0.0992

56) The mean annual tuition and fees for a sample of 12 private colleges was $27,900 with   56) _____
a standard deviation of $4400. A dotplot shows that it is reasonable to assume that the
population is approximately normal. You wish to test whether the mean tuition and fees
for private colleges is different from $31,500.

State the null and alternate hypotheses.
  A) $H_0: \mu = 31{,}500, H_1: \mu \neq 31{,}500$
  B) $H_0: \mu = 27{,}900, H_1: \mu \neq 27{,}900$
  C) $H_0: \mu = 31{,}500, H_1: \mu = 27{,}900$
  D) $H_0: \mu \neq 31{,}500, H_1: \mu = 31{,}500$

57) The mean annual tuition and fees for a sample of 12 private colleges was $36,800 with   57) _____
a standard deviation of $5000. A dotplot shows that it is reasonable to assume that the
population is approximately normal. You wish to test whether the mean tuition and fees
for private colleges is different from $33,700.

Compute the value of the test statistic and state the number of degrees of freedom.
  A) 0.620; 11 degrees of freedom
  B) 2.148; 11 degrees of freedom
  C) 2.148; 12 degrees of freedom
  D) 0.620; 12 degrees of freedom

58) The mean annual tuition and fees for a sample of 11 private colleges was $34,100 with   58) _____
a standard deviation of $5400 A dotplot shows that it is reasonable to assume that the
population is approximately normal. You wish to test whether the mean tuition and fees
for private colleges is different from $35,700.

State a conclusion regarding H_0. Use the $\alpha = 0.10$ level of significance.
  A) Reject H_0.
     The mean annual tuition and fees appears to be different from $35,700.
  B) There is not enough information to draw a conclusion.
  C) Do not reject H_0.

     There is insufficient evidence to conclude that the mean annual tuition and fees is
     different from $35,700.

59) Doctors nationally believe that 70% of a certain type of operation are successful. In a   59) _____
particular hospital, 42 of these operations were observed and 32 of them were
successful. At $\alpha = 0.05$ is this hospital's success rate different from the national
average?
  A) No, because the test value 0.52 is in the noncritical region.
  B) Yes, because the test value 0.52 is in the critical region.
  C) Yes, because the test value 0.88 is in the noncritical region.
  D) No, because the test value 0.88 is in the noncritical region.

9

60) State the appropriate null and alternative hypothesis and find the critical value for a right-tailed test with $\alpha = 0.05$ and $n = 18$. Use $\sigma^2 = 256$.

    A) $H_{0:}\ \sigma^2 = 256$

       $H_{1:}\ \sigma^2 < 256$

       C. V. = 27.587

    C) $H_{0:}\ \sigma^2 = 256$

       $H_{1:}\ \sigma^2 > 256$

       C. V. = 28.869

    B) $H_{0:}\ \sigma^2 \neq 256$

       $H_{1:}\ \sigma^2 < 256$

       C. V. = 28.869

    D) $H_{0:}\ \sigma^2 = 256$

       $H_{1:}\ \sigma^2 > 256$

       C. V. = 27.587

60) _____

61) A lab technician is tested for her consistency by making multiple measurements of the cholesterol level in one blood sample. The target precision is a standard deviation of 1.2 mg/dL or less. If 12 measurements are taken and the standard deviation is 2.1 mg/dL, is there enough evidence to support the claim that her standard deviation is greater than the target, at $\alpha = 0.01$?

    A) No, since the χ^2 test value 19.25 is less than the critical value 24.725.

    B) No, since the χ^2 test value 19.25 is less than the critical value 26.217.

    C) Yes, since the χ^2 test value 33.688 is greater than the critical value 26.217.

    D) Yes, since the χ^2 test value 33.688 is greater than the critical value 24.725.

61) _____

62) Using Table G, find the P-value interval for the χ^2 test value.

    $\chi^2 = 2.809$, $n = 12$, left-tailed

    A) $0.01 < P\text{-value} < 0.02$

    C) $0.99 < P\text{-value} < 0.995$

    B) $0.005 < P\text{-value} < 0.01$

    D) $0.0025 < P\text{-value} < 0.005$

62) _____

1) D
2) A
3) B
4) B
5) D
6) B
7) B
8) B
9) D
10) A
11) D
12) B
13) C
14) A
15) D
16) B
17) B
18) A
19) D
20) D
21) C
22) C
23) B
24) C
25) A
26) A
27) D
28) C
29) A
30) C
31) B
32) A
33) 1.00
34) C
35) B
36) B
37) A
38) C
39) D
40) D
41) A
42) C
43) A
44) B
45) D

46) A
47) B
48) D
49) $H_0 : \mu = 75$ (the claim) and $H_1 : \mu \neq 75$
   Critical values: ± 1.96
   Test value: 3.03
   Reject the null hypothesis.
   There is not enough evidence to support the claim that the average number of calories
   in a serving of popcorn is 75.
50) C
51) C
52) A
53) C
54) B
55) D
56) A
57) B
58) C
59) D
60) D
61) D
62) B