MATH 2300
Fall 2017 Final Exam

You have 150 minutes to complete this exam. Unless your exam proctor gives you alternative instructions, please observe the following:

- For the multiple choice questions, select the *best answer* and *write it clearly* in the space preceding the question number. There is *only one* correct answer for each question. If your instructor requires the multiple choice answers on another answer sheet (*e.g.* a Scantron), please place your answers there.
- For the non-multiple choice questions, provide your answers in the space provided. Show your work as appropriate.
- All problems are worth 2 points except #49, which is worth 4 points.

MULTIPLE CHOICE (40 Questions)

1. _____ In a poll of 500 randomly selected adults in Lubbock, 93% answered "yes" when asked "Do you or your family own a vehicle?" Identify the sample and population.
   A) Sample: the 500 selected Lubbock adults; population: the 93% who answered "yes".
   B) Sample: the 93% who answered "yes"; population: all Lubbock adults
   C) Sample: the 500 selected Lubbock adults; population: all Lubbock adults
   D) Sample: all Lubbock adults; population: the 500 sampled Lubbock adults

2. _____ Given a group of students: Allen (A), Brenda (B), Chad (C), Dorothy (D), and Eric (E), list all of the possible samples (without replacement) of size four that can be obtained from the group.
   A) A,B,C,D A,B,C,E A,C,D,E A,D,E,B
   B) A,B,C,D
   C) A,B,C,D A,B,C,E A,C,D,E A,D,E,B B,C,D,E
   D) A,B,C,D A,B,C,E A,C,D,E A,D,E,B B,C,D,E B,C,E,A B,D,E,A C,A,B,D C,E,D,B D,A,C,E

3. _____ In 2014, the number of albums (by music genre) sold in the United States is given as follows:

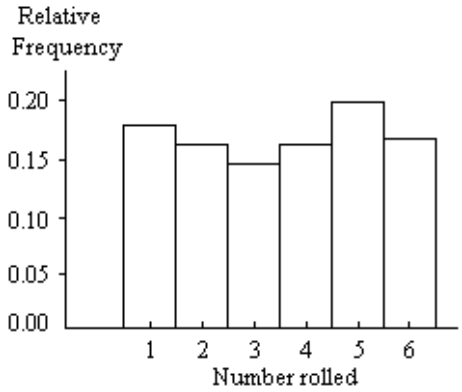
Genre	Num. Albums (in millions)
Rock	85.25
R&B	35.75
Country	30.46
Pop	27.71
Christian/Gospel	17.36

   What kind of data is provided by the information in the second column?
   A) Qualitative B) Quantitative

4. _____ The number of cars passing a busy intersection between 4:30 PM and 6:30 PM on a Friday is 1783. Classify the data as either discrete or continuous.
   A) Discrete B) Continuous

5. _____ Last year, nine employees of an electronics company retired. Their ages at retirement are listed below. Find the mean retirement age.
   56, 64, 67, 70, 64, 60, 53, 57, 51
   A) 59 years B) 60.2 years C) 62 years D) 59.7 years

6. _____ A 6-sided die was rolled 200 times and a record was kept of the numbers obtained. The results are shown in the relative frequency histogram below. Identify the overall shape of the distribution.



A) Uniform B) Left Skewed C) Triangular D) J-shaped

7. _____ Jeanne is currently taking college economics. The instructor often gives quizzes. On the past five quizzes, Jeanne got the following scores: 16, 20, 20, 14, 12. Find the range for the given data.
A) 20 B) 12 C) 8 D) 16.4

8. _____ Jeanne is also taking college astronomy. Her astronomy instructor also often gives quizzes. On the past seven quizzes, Jeanne got the following scores: 52, 15, 48, 27, 12, 42, 68. Find the sample standard deviation for the given data.
A) 20.6 B) 9956.6 C) 12,494 D) 48

9. _____ The amount of Jen's monthly phone bill has a roughly bell-shaped distribution with a mean of $174 and a standard deviation of $12. Use the empirical rule to estimate the percentage of her phone bills that are between $150 and $198.
A) 99.7% B) 68% C) 95% D) 99.99%

10. _____ The weekly salaries (in dollars) of sixteen government workers are listed below. Find the third quartile Q_3.
450 473 492 506 527 545 579 609 632 663 704 750 773 820 843 890
A) $750 B) $761.50 C) $767.25 D) $632

11. _____ In a certain class of students, there are 10 boys from Wilmette, 6 girls from Kenilworth, 4 girls Wilmette, 3 boys from Glencoe, 3 boys from Kenilworth, and 7 girls from Glencoe. If the teacher calls upon a student to answer a question, what is the probability that the student will be from Kenilworth?
A) 0.308 B) 0.182 C) 0.091 D) 0.273

12. _____ Based on meteorological records, the probability that it will snow in a certain town on January 1st is 0.282. Find the probability that in a given year it <u>will not snow</u> on January 1st in that town.
A) 1.282 B) 3.456 C) 0.718 D) 0.393

13. _____ When two 6-sided dice are rolled, there are 36 possible equally likely outcomes. What is the probability that the sum of the numbers on the dice is 2 or 12?
A) 3/2 B) 1/54 C) 1/18 D) 5/12

14. _____ The table below shows the soft drink preference of people in three age groups.

	Cola	Root Beer	Lemon-Lime
under 21	40	25	20
between 21 and 40	35	20	30
over 40	20	30	35

If one of the 255 subjects is randomly selected, find the probability that the person is over 40 years of age.

A) 1/3 B) 2/5 C) 3/5 D) 1/2

15. _____ The number of loaves of rye bread left on the shelf of a local bakery at closing (denoted by the random variable X) varies from day to day. Past records show that the probability distribution of X is shown in the following table. Find the probability that there will be <u>at least three</u> loaves left over at the end of any given day.

x	0	1	2	3	4	5	6
P(X=x)	0.20	0.25	0.20	0.15	0.10	0.08	0.02

A) 0.15 B) 0.65 C) 0.35 D) 0.20

16. _____ A pet store's past experience has shown them that 95% of goldfish shipped to them survive the shipping process. If a shipment of n=100 goldfish is sent to the store, what is the mean and standard deviation of the number of surviving goldfish? Assume a binomial distribution.

A) $\mu=95, \sigma=4.75$ B) $\mu=5, \sigma=2.18$ C) $\mu=95, \sigma=2.18$ D) $\mu=5, \sigma=4.75$

17. _____ Dave drives to work each morning at about the same time. His commute time is normally distributed with a mean of 35 minutes and a standard deviation of 5 minutes. The percentage of time that his commute time is more than 44 minutes is equal to the area under the standard normal curve that lies to the ____ of ____.

A) right, 1.8 B) right, 1.1 C) left, -1.8 D) left, 1.8

18. _____ For the standard normal curve, find the area that lies to the right of 0.81.

A) 0.8800 B) 0.1200 C) 0.7910 D) 0.2090

19. _____ For the standard normal curve, find the area that lies either to the left of 1.56 or to the right of 2.30.

A) 0.9299 B) 0.0487 C) 0.0701 D) 0.9513

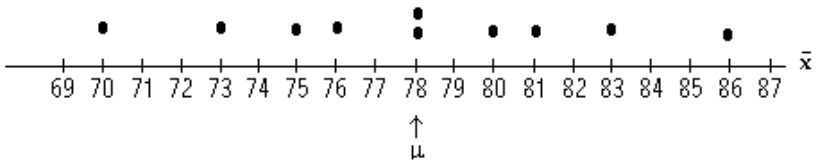
20. _____ Find the z-score having area 0.14 to its left under the standard normal curve.

A) -2.19 B) -1.34 C) -1.08 D) -1.22

21. _____ Find the z-score for having area 0.09 to its right under the standard normal curve; that is, find $z_{0.09}$.

A) 1.45 B) 1.26 C) 1.39 D) 1.34

22. _____ The following is a dotplot for the sampling distribution of the sample mean for samples of size 2 drawn from a population of test scores for 5 students.



Find the probability, expressed as a percent, that the sample mean will be within 1 point of the population mean.

A) 10% B) 5% C) 22% D) 20%

23. _____ The National Weather Service keeps records of snowfall in mountain ranges. Records indicate that in a certain range, the annual snowfall has a mean of 98 inches and a standard deviation of 10 inches. Suppose the snowfalls are sampled during randomly picked years. For samples of size 36, determine the mean and standard deviation of $\bar{x}$, the sample mean snowfall.
A) $\mu_{\bar{x}} = 1.67;\ \sigma_{\bar{x}} = 98$ B) $\mu_{\bar{x}} = 98;\ \sigma_{\bar{x}} = 10$ C) $\mu_{\bar{x}} = 98;\ \sigma_{\bar{x}} = 1.67$ D) $\mu_{\bar{x}} = 10;\ \sigma_{\bar{x}} = 98$

24. _____ The mean height for a population is 65 inches. Let $\bar{x}$ denote the mean height for a sample of people picked randomly from the population. True or false, the standard deviation of $\bar{x}$ for sample of size 30 is smaller than the standard deviation, σ, of the population?
A) True B) False

25. _____ The weights of people in a certain population are normally distributed with a mean of 152 lb and a standard deviation of 22 lb. Determine the sampling distribution of the mean for samples of size 2.
A) Approximately normal, mean = 152 lb, standard deviation = 11 lb
B) Exactly normal, mean = 152 lb, standard deviation = 15.56 lb
C) Exactly normal, mean = 152 lb, standard deviation = 22 lb
D) Approximately normal, mean = 152 lb, standard deviation = 15.56 lb

26. _____ In stating a confidence-interval estimate of a population mean, the level of confidence increases as the width of the interval _____.
A) increases B) decreases

27. _____ The distribution of weekly salaries at a large company is reverse J-shaped with a mean of $1000 and a standard deviation of $370. What is the probability that the sampling error made in estimating the mean weekly salary for all employees of the company by the mean of a random sample of weekly salaries of 7 employees will be at most $75?
A) 0.4649 B) 0.0702 C) 0.9298 D) Cannot be determined because the distribution of the population is not normal and n is small.

28. _____ The monthly earnings of a group of business students are normally distributed with a standard deviation of 545 dollars. A researcher wants to estimate the mean monthly earnings of all business students. Find the sample size needed to have a confidence level of 90% and a margin of error of 128 dollars.
A) 50 B) 5 C) 70 D) 2

29. _____ For a t-curve with df=20, find $t_{0.05}$.
A) 2.086 B) 1.677 C) 1.645 D) 1.725

30. _____ A health insurer has determined that the "reasonable and customary" fee for a certain medical procedure is $1200. They suspect that the average fee charged by one particular clinic for this procedure is higher than $1200. The insurer wants to perform a hypothesis test to determine whether their suspicion is correct. Determine the appropriate null and alternative hypotheses.
A) H_0: μ > $1200 H_a: μ = $1200
B) H_0: μ = $1200 H_a: μ > $1200
C) H_0: μ = $1200 H_a: μ ≥ $1200
D) H_0: μ = $1200 H_a: μ < $1200

31. _____ The mean credit card debt among household in one state is $8400. A hypothesis test is to be performed to decide whether the mean credit card debt for household in the formerly affluent town of Rich-No-More differs from the mean credit card debt for the state. Classify the hypothesis test appropriately.
A) Two-Tailed B) Left-Tailed C) Right-Tailed

32. _____ A manufacturer claims that the mean amount of juice in its 16 ounce bottles is 16.1 ounces. A consumer advocacy group wants to perform a hypothesis test to determine whether the mean amount is actually less than this. The hypotheses are:

H_0: $\mu = 16.1$ ounces versus H_a: $\mu < 16.1$ ounces

where μ is the mean amount of juice in the manufacturer's 16 ounce bottles. Suppose that the results of the sampling lead to rejection of the null hypothesis. If, in fact, the mean amount of juice, μ, is equal to 16.1 ounces, classify the conclusion appropriately.

A) Type I error B) Correct decision C) Type II error

33. _____ For a two-tailed one-mean z-test with $\alpha = 0.1$, determine the critical value for the test.

A) ± 2.052 B) ±1.645 C) ±2.33 D) ±1.4805

34. _____ The P-value for a hypothesis test is P = 0.71. Describe the strength of the evidence <u>against</u> the null hypothesis based on this P-value.

A) Weak or none B) Strong C) Very Strong D) Moderate

35. _____ A one-mean t-test is to be performed using the following sample summary statistics, null and alternative hypotheses, and α value: $\bar{x} = 3.26, s = 0.55, n = 9$, H_0: $\mu = 2.85$, H_a: $\mu > 2.85$, $\alpha = 0.01$. Using the critical-value approach, which of the following correctly outlines the appropriate decision?

A) Test statistic: t = 2.24. Critical value: t = 2.33. Do not reject H_0.
B) Test statistic: t = 2.24. Critical value: t = 2.281. Do not reject H_0.
C) Test statistic: t = 2.24. Critical value: t = 2.896. Do not reject H_0.
D) Test statistic: t = 2.24. Critical value: t = 2.896. Reject H_0.

36. _____ A researcher is interested in comparing the resting pulse rate of women who exercise regularly and women who do not exercise regularly. She wants to perform a hypothesis test to determine whether the mean resting pulse rate of women who exercise at least 6 hours per week is less than the mean resting pulse rate of women who exercise less than 6 hours per week. Select the appropriate null and alternative hypothesis for the proposed hypothesis test.

A) Let $\bar{x}_1$ denote the mean resting pulse rate for women who exercise at least 6 hours per week and let $\bar{x}_2$ denote the mean resting pulse rate for women who exercise less than 6 hours per week. The hypotheses are H_0: $\bar{x}_1 = \bar{x}_2$ and H_a: $\bar{x}_1 < \bar{x}_2$.
B) Let μ_1 denote the mean resting pulse rate for women who exercise at least 6 hours per week and let μ_2 denote the mean resting pulse rate for women who exercise less than 6 hours per week. The hypotheses are H_0: $\mu_1 = \mu_2$ and H_a: $\mu_1 < \mu_2$.
C) Let μ_1 denote the mean resting pulse rate for women who exercise at least 6 hours per week and let μ_2 denote the mean resting pulse rate for women who exercise less than 6 hours per week. The hypotheses are H_0: $\mu_1 < \mu_2$ and H_a: $\mu_1 > \mu_2$.
D) Let μ_1 denote the mean resting pulse rate for women who exercise at least 6 hours per week and let μ_2 denote the mean resting pulse rate for women who exercise less than 6 hours per week. The hypotheses are H_0: $\mu_1 = \mu_2$ and H_a: $\mu_1 > \mu_2$.

37. _____ Summary statistics are given for independent random samples from two populations. Use the nonpooled t-test to perform a left-tailed hypothesis test using significance level $\alpha = 0.05$.
$\bar{x}_1 = 50.6$, $s_1 = 18.3$, $n_1 = 12$, $\bar{x}_2 = 69.9$, $s_2 = 8.2$, $n_2 = 12$.
A) Test statistic: t = 3.334. Critical value = -1.753. Reject H_0.
B) Test statistic: t = -3.334. Critical value = -1.717. Do not reject H_0.
C) Test statistic: t = -3.334. Critical value = -1.753. Reject H_0.
D) Test statistic: t = 3.334. Critical value = -1.717. Do not reject H_0.

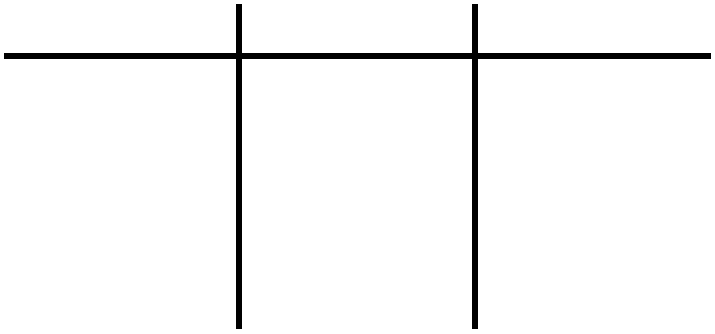
38. _____ For the same summary statistics given in #37 above, use the nonpooled t-interval procedure to obtain a 95% confidence interval for $\mu_1 - \mu_2$. (Hint: The degrees of freedom will be the same as calculated in #37.)
A) 6.96 to 31.64 B) -31.64 to -6.96 C) -31.31 to -7.29 D) 7.29 to 31.31

39. _____ The number of successes in a sample and the sample size are given, respectively, as x = 17 and n = 200. Determine the sample proportion, $\hat{p}$.
A) $\hat{p} = 0.096$ B) $\hat{p} = 0.045$ C) $\hat{p} = 0.085$ D) $\hat{p} = 0.076$

40. _____ The number of successes in a sample and the sample size are given, respectively, as x = 79 and n = 250. Decide whether using the one-proportion z-interval procedure to calculate a confidence interval for the population proportion (p) is appropriate.
A) Not Appropriate B) Appropriate

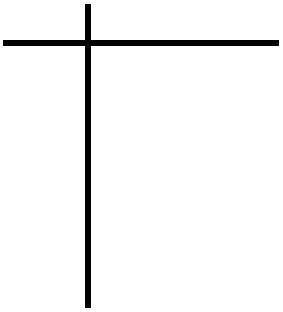
SHORT ANSWER (10 Questions)

41. The preschool children at Elmwood Elementary School were asked to name their favorite color. The results are listed below. Construct a frequency distribution and a relative frequency distribution in the table provided.



blue	blue	red	green	purple
purple	purple	blue	purple	red
purple	red	green	green	green
red	purple	green	purple	yellow

42. The midterm test scores for the seventh-period typing class at a local high school are listed below. Construct a stem-and-leaf diagram for the scores. Be sure it is labeled appropriately.



85 77 93 91 74 65 68 97
88 59 74 83 85 72 63 37

43. The distances traveled (in miles) to 7 different swim meets for a family are given below.
26 29 53 55 68 75 109
Find the median: Show work:

44. For a person selected randomly from a certain population, events A and B are defined as follows:
A = event the person is male
B = event the person is a smoker
For this particular population, it is known that P(A) = 0.20, P(B) = 0.35, and P(A & B) = 0.12.
Find P(A or B): Show work:

45. 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? Show work:

46. A researcher wishes to estimate the mean resting heart rate for long-distance runners. A random sample of 12 long-distance runners yields the following heart rates, in beats per minute.
79 78 73 62 71 73
61 59 78 81 60 63
Use the data to obtain a point estimate of the mean resting heart rate for all long distance runners.

Show work:

47. Based on a sample of 15 randomly selected years, a 95% confidence interval for the mean annual precipitation in one city is from 45.2 inches to 50.9 inches. Find the margin of error.

Show work:

48. The principal of a high school asked six randomly selected students to take an aptitude test. Their scores were:
87.4 86.9 89.9 78.3 75.1 70.6 ($\bar{x}$ = 81.367 and s = 7.803)
Determine a 90% confidence interval for the mean score for all students in the high school assuming the population is normally distributed. Show work:

49. DuraBurn claims that the mean lifetime of its SuperGlo light bulbs is 904 hours. A researcher wants to perform a hypothesis test to determine whether the mean lifetime is actually less than this. A random sample of 10 DuraBurn SuperGlo bulbs exhibited an average lifetime $\bar{x}$ = 810 hours with a standard deviation s = 158 hours. Using the hypotheses H_0: μ = 904 and H_a: μ < 904, give the value of the test statistic, report the P-value for the test, and give an appropriate conclusion. (Preliminary data analyses indicate that the t-test is reasonable for this sample.)

Test Stat:

P-value:

Conclusion:

Show work: