

MATH 2300
Spring 2015 Final Exam

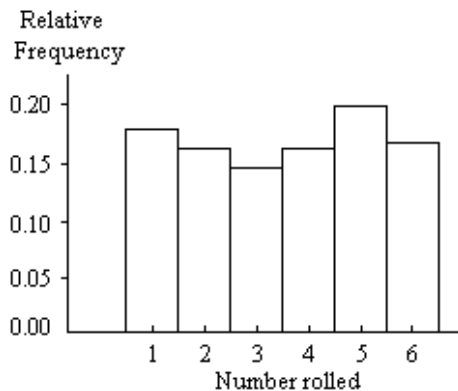
You have 150 minutes to complete this exam. Unless your exam proctor gives you alternative instructions, please observe the following:

- 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.

MULTIPLE CHOICE (40 Questions)

1. _____ In a poll of 50,000 randomly selected college students, 74% answered “yes” when asked “Do you have a television in your dorm room?” Identify the sample and population.
A) Sample: the 50,000 selected college students; population: the 74% who answered “yes”.
B) Sample: the 74% who answered “yes”; population: all college students
C) Sample: the 50,000 selected college students; population: all college students
D) Sample: all college students; population: the 50,000 sampled college students
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. _____ A large record company reported the following sales figures for various music media last year.
- | Media | Sales (\$ Millions) |
|---------------------|----------------------------|
| Digital Download | 1477.3 |
| CD | 256.7 |
| Internet Streaming | 137.5 |
| Internet Video | 532.0 |
| Other (Vinyl, etc.) | 92.1 |
- What kind of data is provided by the information in the second column?
A) Qualitative B) Quantitative
4. _____ The average speed of cars passing a busy intersection between 4:30 PM and 6:30 PM on a Friday is 32.3 mph. 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.
55, 64, 68, 56, 64, 58, 64, 57, 51
A) 59 years B) 58 years C) 58.4 years D) 59.7 years

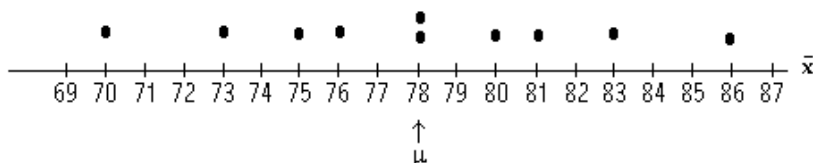
6. _____ A 6-sided die was rolled 200 times and a record was kept of the numbers obtained. The results are shown in the relative frequency histogram below. Identify the overall shape of the distribution.



- 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: 5, 20, 4, 14, 10. Find the range for the given data.
A) 20 B) 16 C) 5 D) 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 \$57 and a standard deviation of \$9. Use the empirical rule to estimate the percentage of her phone bills that are between \$30 and \$84.
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 9 boys from Wilmette, 5 girls from Kenilworth, 10 girls Wilmette, 4 boys from Glencoe, 3 boys from Kenilworth, and 6 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) 0.188 C) 0.135 D) 0.216
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 will not snow 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 6 or 9?
A) 3/2 B) 1/54 C) 1/4 D) 5/12

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 less 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 0.59.
- A) 0.2776 B) 0.2190 C) 0.7224 D) 0.2224
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 0.09 to its left under the standard normal curve.
- A) -1.45 B) -1.34 C) -1.26 D) -1.39
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 106 inches and a standard deviation of 10 inches. Suppose the snowfalls are sampled during randomly picked years. For samples of size 25, determine the mean and standard deviation of \bar{x} , the sample mean snowfall.
- A) $\mu_{\bar{x}} = 2$; $\sigma_{\bar{x}} = 106$ B) $\mu_{\bar{x}} = 106$; $\sigma_{\bar{x}} = 10$ C) $\mu_{\bar{x}} = 106$; $\sigma_{\bar{x}} = 2$ D) $\mu_{\bar{x}} = 10$; $\sigma_{\bar{x}} = 106$
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 95% and a margin of error of 128 dollars.
A) 61 B) 5 C) 70 D) 2
29. _____ For a t-curve with $df=15$, find $t_{0.025}$.
A) 2.120 B) 2.145 C) 1.960 D) 2.131
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) $H_0: \mu > \$1200$ B) $H_0: \mu = \$1200$ C) $H_0: \mu = \$1200$ D) $H_0: \mu = \$1200$
 $H_a: \mu = \$1200$ $H_a: \mu > \$1200$ $H_a: \mu \geq \$1200$ $H_a: \mu < \$1200$
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 less than 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 against 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 right-tailed hypothesis test using significance level $\alpha = 0.05$.
 $\bar{x}_1 = 73.7$, $s_1 = 10.9$, $n_1 = 16$, $\bar{x}_2 = 69.9$, $s_2 = 8.2$, $n_2 = 12$.
- A) Test statistic: $t = 2.635$. Critical value = 1.708. Reject H_0 .
- B) Test statistic: $t = 1.053$. Critical value = 1.706. Do not reject H_0 .
- C) Test statistic: $t = 2.635$. Critical value = 1.706. Reject H_0 .
- D) Test statistic: $t = 1.053$. Critical value = 1.708. 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) -4.23 to 15.78 B) -1.97 to 9.57 C) -3.64 to 11.24 D) -2.70 to 10.30
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	79

43. The distances traveled (in miles) to 7 different swim meets for a family are given below.

20 25 40 41 63 73 88

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 $P(A) = 0.47$, $P(B) = 0.31$, and $P(A \& B) = 0.12$.

Find $P(A \text{ or } B)$:

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.

78 78 71 75 71 73

61 59 78 59 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 36 randomly selected years, a 90% confidence interval for the mean annual precipitation in one city is from 46.8 inches to 49.2 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 $H_0: \mu = 904$ and $H_a: \mu < 904$, give the value of the test statistic and report the P-value for the test. (Preliminary data analyses indicate that the t-test is reasonable for this sample.)

Show work:

50. Use the paired t-interval procedure to determine a 90% confidence interval for $\mu_1 - \mu_2$ given the following summary statistics: $\bar{d} = 3.125$, $s_d = 2.911$, $n = 8$. Show work: