MATH 2300
Spring 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 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: all college students
B) Sample: the 50,000 selected college students; population: the 74% who answered "yes"
C) Sample: the 74% who answered "yes"; population: all college students
D) Sample: all college students; population: the 50,000 selected college students

2. _____ True or false? In simple random sampling, each possible sample is equally likely to be the one obtained?
A) True B) False

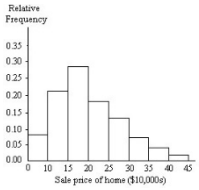
3. _____ The following table shows the average weight of offensive linemen for each given football team. What kind of data is provided in the first column?

Team	Average Weight (pounds)
Gators	303.52
Lakers	326.78
Rams	345.88
Pioneers	321.96

A) Qualitative B) Quantitative

4. _____ Classify the data as either discrete or continuous. The total number of phone calls a sales representative makes in a month is 425.
A) Discrete B) Continuous

5. _____ A relative frequency histogram for the sale prices of homes sold in one city during 2006 is shown below. State whether the distribution is (roughly) symmetric, right skewed, or left skewed.



A) Symmetric B) Right Skewed C) Left Skewed

6. _____ Let $x_1 = 16$, $x_2 = 3$, $x_3 = 9$, $x_4 = 15$, and $x_5 = 8$. Determine $\bar{x}$.
A) 51 B) 12.8 C) 10.2 D) 5

7. _____ A store manager kept track of the number of newspapers sold each week over a seven-week period. The results are shown below. Find the sample median.
76, 29, 222, 152, 284, 247, 244
A) 152 newspapers B) 222 newspapers C) 244 newspapers D) 179 newspapers

8. _____ The manager of an electrical supply store measured the diameters of the rolls of wire (in m) in their inventory each week over a seven-week period. The results are: 0.483, 0.650, 0.151, 0.437, 0.245, 0.116. Find the range.
A) 0.094 m B) 0.116 m C) 0.483 m D) 0.534 m

9. _____ For the following data set, find the sample standard deviation. (Hint: The sample mean is 8.70.)

2, 6, 15, 9, 11, 22, 1, 4, 8, 9

A) 7.1 B) 6.3 C) 6.8 D) 2.1

10. _____ The amount of Jen's monthly phone bill has a roughly bell-shaped distribution with a mean of $62 and a standard deviation of $10. Use the empirical rule to determine what percentage of her phone bills are between $32 and $92.

A) 68% B) 95% C) 99.7% D) 99.99%

11. _____ The weights (in pounds) of 18 randomly selected adults are given below. Find the third quartile, Q_3.

114, 119, 120, 127, 132, 143, 144, 146, 151, 156, 159, 165, 168, 173, 179, 180, 187, 202

A) 173 lb B) 174.5 lb C) 107.5 lb D) 176 lb

12. _____ The mean of a set of data is 0.93 and its standard deviation is 3.51. Find the z-score for a value of 4.13.

A) 1.00 B) 1.21 C) 0.91 D) 0.82

13. _____ The following frequency distribution analyzes the scores on a math test. Find the probability that a score greater than 82 was achieved.

Scores	Number of students
40-59	2
60-75	4
76-82	6
83-94	15
95-99	5

A) 0.188 B) 0.813 C) 0.375 D) 0.625

14. _____ When a quarter is tossed 4 times, 16 outcomes are possible:
HHHH, HHHT, HHTH, HHTT, HTHH, HTHT, HTTH, HTTT, THHH, THHT, THTH, THTT, TTHH, TTHT, TTTH, TTTT
Here, for example, HTTH represents the outcome that the first toss is heads, the next two tosses are tails, and the fourth toss is heads. The events A and B are defined as follows:
A = event exactly two heads are tossed B = event all four tosses come up the same.
Are the events A and B mutually exclusive?
A) Yes B) No

15. _____ The probability that Luis will pass his statistics test is 0.44. Find the probability that he will fail his statistics test.

A) 0.79 B) 0.22 C) 2.27 D) 0.56

16. _____ 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 as shown in the following table. Find the probability that there will be at least three 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) 0.20 D) 0.35

17. _____ Sue Anne owns a medium-sized business. Use the probability distribution below, where X describes the number of employees who call in sick on a given day, to find the expected value of X.

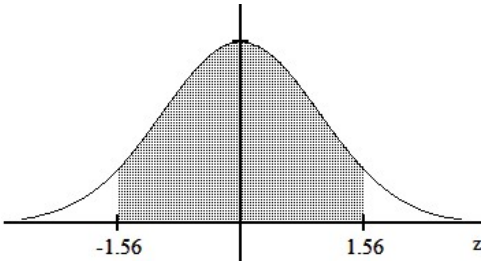
x (# sick employees)	0	1	2	3	4
P(X=x)	0.10	0.45	0.25	0.15	0.05

A) 2.00 B) 1.70 C) 1.60 D) 1.00

18. _____ Determine the binomial probability given the number of trials and the success probability for Bernoulli trials. Let X denote the number of success. n = 6, p = 1/4, P(X = 2) = _____.
A) 0.063 B) 0.386 C) 0.445 D) 0.297

19. _____ Which of the following represents the standardized value of x if μ is the population mean and σ is the population standard deviation?
A) (x-σ)/μ B) (x-μ)*σ C) (x-σ)*μ D) (x-μ)/σ

20. _____ Use a table of normal areas to obtain the shaded area under the standard normal curve.



A) 0.9406 B) 0.1188 C) 0.8812 D) 0.0594

21. _____ Find the standard normal z-score $z_{0.45}$.
A) 0.3264 B) -0.13 C) 0.6736 D) 0.13

22. _____ 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) 0.5987 B) 0.4013 C) 0.0987 D) 0.3821

23. _____ What generally happens to the sampling error as the sample size is increased?
A) It gets larger. B) It remains the same.
C) It gets smaller. D) It gets less predictable.

24. _____ The mean and the standard deviation of a sampled population are, respectively, 43.5 and 5.2. A random sample of n = 289 observations is taken. Find the mean and standard deviation (standard error) of the sampling distribution of $\bar{x}$.
A) $\mu_{\bar{x}} = 43.5, \sigma_{\bar{x}} = 0.3$ B) $\mu_{\bar{x}} = 15.1, \sigma_{\bar{x}} = 2.0$
C) $\mu_{\bar{x}} = 0.3, \sigma_{\bar{x}} = 43.5$ D) $\mu_{\bar{x}} = 5.2, \sigma_{\bar{x}} = 0.3$

25. _____ 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 samples of size 30 is smaller than the standard deviation, σ, of the population.
A) True B) False

26. _____ Let x represent the number that shows up when a balanced die is rolled. Then x is a random variable with mean 3.5 and standard deviation 1.71. Let $\bar{x}$ denote the mean of the numbers obtained when the die is rolled n = 32 times. Determine the sampling distribution of $\bar{x}$.
A) Normal, mean = 3.5, standard deviation = 0.05
B) Approximately normal, mean = 3.5, standard deviation = 1.71
C) Approximately normal, mean = 3.5, standard deviation = 0.3
D) Normal, mean = 3.5, standard deviation = 0.3

27. _____ Scores on a biology final exam are normally distributed with a mean of 220 and a standard deviation of 24. Determine the percentage of samples of size 9 that will have mean scores within 12 points of the population mean score of 220.
A) 13.36% B) 38.30% C) 93.32% D) 86.64%

28. _____ A long-distance phone company wishes to estimate the mean duration of long-distance calls originating in California. A random sample of 15 long-distance calls originating in California yields the following call durations, in minutes:

2, 5, 4, 1, 2, 28, 32, 21, 16, 15, 1, 19, 12, 2, 37

Use the data to obtain a point estimate of the mean call duration for all long-distance calls originating in California.
A) 13.3 min B) 13.9 min C) 13.6 min D) 13.1 min

29. _____ For a t-curve with df = 18, find the t-value having area 0.05 to its right.
A) 2.878 B) 2.101 C) 1.740 D) 1.734

30. _____ In 1990, the mean duration of long-distance telephone calls originating in one town was 7.2 minutes. A long-distance telephone company wants to perform a hypothesis test to determine whether the mean duration of long-distance calls has changed from the 1990 mean of 7.2 minutes. Determine the appropriate null and alternative hypotheses.
A) H_0: $\mu = 7.2$ minutes vs. H_a: $\mu \leq 7.2$ minutes B) H_0: $\mu < 7.2$ minutes vs. H_a: $\mu > 7.2$ minutes
C) H_0: $\mu = 7.2$ minutes vs. H_a: $\mu \neq 7.2$ minutes D) H_0: $\mu \neq 7.2$ minutes vs. H_a: $\mu = 7.2$ minutes

31. _____ Determine the critical value for a one-mean left-tailed z-test with $\alpha = 0.04$.
A) 2.05 B) -2.05 C) -1.75 D) 1.75

32. _____ The significance level and p-value of a hypothesis test are $\alpha = 0.01$ and p-value = 0.003. Decide whether the null hypothesis should be rejected.
A) Reject the null hypothesis. B) Do not reject the null hypothesis.

33. _____ A one sample t-test for a population mean is to be performed. True or false: The larger the p-value, the stronger the evidence against the null hypothesis.
A) True B) False

34. _____ Use a table of t-values to estimate the p-value for the two-tailed t-test of the population mean with n = 26 and observed test statistic $t_0 = -1.179$.
A) p-value > 0.1 B) p-value > 0.2 C) p-value < 0.2 D) 0.1 < p-value < 0.2

35. _____ A 98% confidence interval (CI) for the difference $\mu_1 - \mu_2$ between two population means is given as -30 to 230. Interpret the confidence interval.
A) We can be 98% confident that $\mu_1 - \mu_2$ lies somewhere between 30 and 230.
B) We can be 98% confident that $\mu_1 - \mu_2$ lies somewhere between -30 and 230.
C) We can be 98% confident that μ_1 and μ_2 both lie somewhere between -30 and 230.
D) We can be 98% confident $\mu_2 - \mu_1$ lies somewhere between 30 and 230.

36. _____ Assuming a normal population, use the paired t-interval procedure to obtain a 99% confidence interval for $\mu_1 - \mu_2$ with the following summary statistics: n = 8, $\bar{d} = 3.125$, $s_d = 2.911$.
A) 1.851 to 6.726 B) 0.215 to 6.035 C) -0.476 to 6.726 D) 1.851 to 4.399

37. _____ Summary statistics are given for independent simple random samples from two population. Use the non-pooled t-interval procedure to obtain a 95% confidence interval for $\mu_1 - \mu_2$ given the following summary statistics: $\bar{x}_1 = 72.6$, $s_1 = 10.9$, $n_1 = 16$, $\bar{x}_2 = 68.9$, $s_2 = 8.2$, $n_2 = 12$.
A) -4.03 to 11.43 B) -3.74 to 11.14 C) -5.27 to 12.67 D) -2.72 to 10.12

38. _____ The number of successes is x = 33 and the sample size is n = 35. Decide whether using the one-proportion z-test is appropriate.
A) Not appropriate B) Appropriate

39. _____ A radio show producer believes that a new proposed format would be preferred by only 15% of their current listeners. In a random sample of n = 100 current listeners, 22% favored the new format. She wishes to test the null hypothesis H_0 : p = 0.15. Compute the value of the test statistic $z_0 = \frac{\hat{p} - p_0}{\sqrt{p_0(1-p_0)/n}}$.
A) 1.215 B) 6.076 C) 1.960 D) 2.587

40. _____ A two-proportions z-test of H_o: $p_1 = p_2$ vs. H_a: $p_1 > p_2$ at $\alpha = 0.10$ is to be performed. Use the given sample data to find the p-value for the hypothesis test: $x_1 = 41$, $n_1 = 100$, $x_2 = 35$, $n_2 = 140$.
A) 0.4211 B) 0.0043 C) 0.0512 D) 0.0086

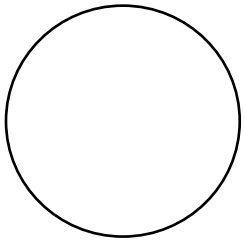
SHORT ANSWER (9 Questions)

41. Scott Tarnowski owns a pet grooming shop. His prices for grooming dogs are based on the size of the dog. His records from last year are summarized below. Complete the relative frequency distribution

Class	Frequency	Relative Frequency
Large	345	0.190
Medium	830	
Small	645	

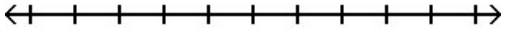
Show work:

42. The data below represent the results of a poll in which the following question was asked: "To what degree are you satisfied with your current health insurance?" Construct a well-labeled pie-chart.

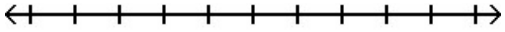


Very	15%
Somewhat	25%
Not at all	35%
No opinion	25%

43. A store manager counts the number of customers who purchase in his store each day. The data are as follows: 5, 6, 3, 9, 2, 5, 5, 6, 3, 2
Construct a well-labeled dotplot.



44. A quality control engineer monitors the number of rejected circuit boards during each day's production run. For the past year's data, she calculates the five number summary as:
Min = 1 $Q_1 = 3.2$ $Q_2 = 5.7$ $Q_3 = 9.1$ Max = 17
Draw a well-labeled boxplot for this five-number summary.



45. A lottery game has balls numbered 1 through 19. What is the probability of selecting an even numbered ball or the number 4 ball?

Show work:

Probability = ☐

46. At one college, GPAs are normally distributed with a mean of 2.9 and a standard deviation of 0.6. What percentage of students at the college have a GPA between 2.3 and 3.5?

Show work:

Percent = ☐

47. A football coach randomly selected ten players and timed how long each player took to perform a certain drill. The times (in minutes) were: 11.4, 12.8, 12.7, 10.7, 14.6, 14.1, 6.9, 12.6, 10.9, 13.5 (mean = 12.02, sd = 2.216). Assuming the population is normally distributed, find a 95% confidence interval for the mean time for all players.

CI = [ ] Show work:

48. For the following summary statistics for independent random samples from two normal populations, calculate the degrees-of-freedom that is appropriate for the nonpooled t-test for H_0: $\mu_1 - \mu_2 = 0$:
$\bar{x}_1 = 12.5$, $s_1 = 3.9$, $n_1 = 14$, $\bar{x}_2 = 13.5$, $s_2 = 5.2$, $n_2 = 17$

df = [ ] Show work:

49. A large software company gives job applicants a test of programming ability and the mean for that test has been 160 in the past. Twenty-five job applicants are randomly selected from a large university and they produce a mean score of 183 with a standard deviation of 12. Use a 0.05 level of significance to test whether the mean score for students from this university is greater than 160. (4 points)

Hypotheses: [ ] Conclusion: [ ]

Test statistic: [ ]

P-value: [ ]

Show work: