Departmental Final Exam for MATH 2300 - Spring 2011
Version A

Please **Print** Your Name

Please answer all 40 multiple choice questions . Each question is worth 2.5 points . For each question here, only the correct answer matters, and no partial credit will be given. **Please follow the instructions of your teacher as to where to report your final answers.**

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

Identify the population

1) A survey of 1500 American households found that 33% of the households own a computer. Identify the population. 1) _____

A) The 33% of the 1500 households sampled that own a computer
B) The 1500 American households surveyed
C) 33% of American households
D) All American households owning a computer
E) The collection of all American households

A survey was conducted to determine how people rated the quality of programming available on television. Respondents were asked to rate the overall quality from 0 (no quality at all) to 100 (extremely good quality). The stem-and-leaf display of the data is shown below.

Stem	Leaves
3	2 6
4	0 3 4 7 8 9 9 9
5	0 1 1 2 3 4 5
6	1 2 5 6 6
7	1 7
8	
9	3

2) What percentage of the respondents rated overall television quality as very good (regarded as ratings of 80 and above)? 2) _____

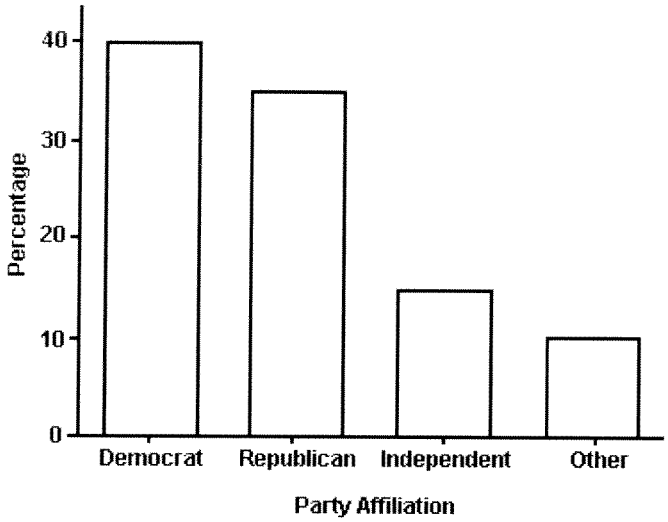
A) 4% B) 1% C) 32% D) 12% E) 3%

Provide an appropriate response.

3) Test scores for a history class had a mean of 79 with a standard deviation of 4.5. Test scores for a physics class had a mean of 69 with a standard deviation of 3.7. Suppose a student gets a 68 on the history test and a 87 on the physics test. Calculate the z-score for each test. On which test did the student perform better? 3) _____

A) physics; -2.44
B) physics; 4.86
C) history; 4.86
D) history; 2.44
E) history; -2.44

The bar graph below shows the political party affiliation of 1000 registered U.S. voters.



4) What percentage of the 1000 registered U.S. voters belongs to one of the two traditional parties (Democratic and Republican)? 4) _____

A) 40% B) 35% C) 75% D) 50% E) 25%

5) Which response represents the mode? 5) _____

A) Independent
B) Republican
C) Democrat
D) 10%
E) 40%

Provide an appropriate response.

6) Using advertised prices for used Ford Escorts a linear model for the relationship between a car's age and its price is found. The regression has an $R^2 = 87.1\%$. Describe the relationship 6) _____

A) No association
B) Positive, strong linear relationship. As the age increases the price goes up.
C) Positive, weak linear relationship. As the age increases the price goes down.
D) Negative, strong linear relationship. As the age increases the price goes down.
E) Negative, weak linear relationship. As the age decreases the price goes down.

Select the most appropriate answer.

7) Which of the following is <u>not</u> a property of r (correlation coefficient)? 7) _____

A) r does not depend on the units of y or x.
B) r measures the strength of any kind of relationship between x and y.
C) The closer r is to zero, the weaker the linear relationship between x and y.
D) r is always between -1 and 1.
E) r does not depend on which variable is treated as the response variable.

Provide an appropriate response.

8) The regression equation relating dexterity scores (x) and productivity scores (y) for the employees of a company is $\hat{y} = 5.50 + 1.91x$. Ten pairs of data were used to obtain the equation. What is the best predicted productivity score for a person whose dexterity score is 20? 8) _____

A) 38.20 B) 111.91 C) 58.20 D) 56.30 E) 43.7

Find the indicated probability.

9) If two balanced die are rolled, the possible outcomes can be represented as follows. 9) _____

(1, 1) (2, 1) (3, 1) (4, 1) (5, 1) (6, 1)
(1, 2) (2, 2) (3, 2) (4, 2) (5, 2) (6, 2)
(1, 3) (2, 3) (3, 3) (4, 3) (5, 3) (6, 3)
(1, 4) (2, 4) (3, 4) (4, 4) (5, 4) (6, 4)
(1, 5) (2, 5) (3, 5) (4, 5) (5, 5) (6, 5)
(1, 6) (2, 6) (3, 6) (4, 6) (5, 6) (6, 6)

Determine the probability that the sum of the dice is 4 or 12.

A) $\frac{1}{6}$ B) $\frac{1}{12}$ C) $\frac{5}{36}$ D) $\frac{1}{9}$ E) $\frac{7}{36}$

Suppose P(C) =0 .4, P(M and C) = 0.3, and P(M) = 0.5. Find the indicated probability.

10) P(M or C) 10) _____

A) 0.6 B) 0.4 C) 0.7 D) 0.5 E) 0.2

Find the probability using complements.

11) A percentage distribution is given below for the size of families in one U.S. city. 11) _____

Size	Percentage
2	45.1
3	22.2
4	19.7
5	8.0
6	3.1
7+	1.9

A family is selected at random. Find the probability that the size of the family is less than 6. Round your result to three decimal places.

A) 0.031 B) 0.050 C) 0.950 D) 0.981 E) 0.019

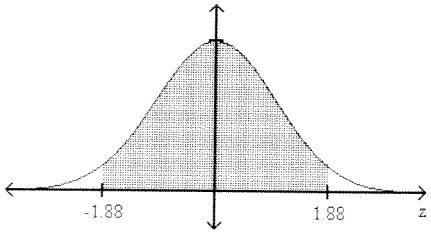
Find the indicated probability.

12) A group of volunteers for a clinical trial consists of 81 women and 77 men. 18 of the women and 19 of the men have high blood pressure. If one of the volunteers is selected at random find the probability that the person has high blood pressure given that it is a woman. 12) _____

A) 0.114 B) 0.234 C) 0.486 D) 0.356 E) 0.222

Use a table of areas to find the specified area under the standard normal curve.

13) The shaded area shown 13) _____



A) 0.9699 B) 0.9398 C) 0.4699 D) 0.0602 E) 0.9412

Obtain the probability distribution of the random variable.

14) When a coin is tossed four times, sixteen equally likely outcomes are possible as shown below: 14) _____

HHHH HHHT HHTH HHTT
HTHH HTHT HTTH HTTT
THHH THHT THTH THTT
TTHH TTHT TTTH TTTT

Let X denote the total number of tails obtained in the four tosses. Find the probability distribution of the random variable X. Leave your probabilities in fraction form.

A)

x	P(X = x)
0	1/16
1	1/4
2	3/8
3	1/4
4	1/16

B)

x	P(X = x)
0	1/16
1	3/16
2	1/2
3	3/16
4	1/16

C)

x	P(X = x)
0	1/16
1	1/8
2	3/8
3	1/8
4	1/16

D)

x	P(X = x)
1	1/4
2	7/16
3	1/4
4	1/16

Find the standard deviation of the binomial random variable.

15) On a multiple choice test with 16 questions, each question has four possible answers, one of which is correct. For students who guess at all answers, find the standard deviation for the random variable X, the number of correct answers. 15) _____

A) 2 B) 3 C) 1.746 D) 1.732 E) 1.677

Find the mean of the given probability distribution.

16) The random variable X is the number that shows up when a loaded die is rolled. Its probability distribution is given in the table below. 16) _____

x	P(X = x)
1	0.14
2	0.12
3	0.12
4	0.10
5	0.13
6	0.39

A) 4.00 B) 3.50 C) 4.13 D) 0.17

Find the indicated probability for the normally distributed variable.

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) 2.28% C) 47.72% D) 4.56% E) 37.45%

Find the mean/standard error of the sampling distribution of the proportion.

18) Based on past experience, a bank believes that 8% of the people who receive loans will not make payments on time. The bank has recently approved 600 loans. Describe the sampling distribution model of the percentage of clients in this group who may not make timely payments. 18) _____

A) mean = 8%; standard error = 0.3%
B) mean = 92%; standard error = 0.3%
C) mean = 8%; standard error = 1.1%
D) mean = 92%; standard error = 1.1%

Is the observed sample proportion unusual?

19) Assume that 20% of students at a university wear contact lenses. We randomly pick 200 students. Would it be unusual to obtain a sample proportion of 22%? Answer by calculating the appropriate z-score. 19) _____

A) No, z = 25 B) Yes, z = 0.71 C) No, z = 0.71 D) Yes, z = 25

Find the mean and statndard error of sampling distribution of sample mean

20) A standard IQ test has population mean 77.4 and populationvariance 16.0. If a sample of 225 test scores are selected what are the mean and statndard error of sampling distribution of sample mean score? 20) _____

A) mean = 20.6; standard error = 0.30
B) mean = 77.4; standard error = 0.02
C) mean =0.3; standard error =77.4
D) mean = 77.4; standard error = 0.267
E) mean = 20.6; standard error = 0.8

Provide an appropriate response.

21) In one region, the September energy consumption levels for single-family homes had a mean of 1050 kWh and a standard deviation of 218 kWh. If 50 different homes are randomly selected, find the probability that their mean energy consumption level for September is less than 1075 kWh. 21) _____

A) 0.2910 B) 0.0438 C) 0.4180 D) 0.2090 E) 0.7910

Select the most appropriate answer.

22) In a survey of 500 residents, 300 were opposed to the use of the photo-cop for issuing traffic tickets. What is the best point estimate for the percentage of all residents opposed to the photo-cop use? 22) _____

A) 300 B) 50% C) 500 D) 40% E) 60%

Find the point estimate

23) 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. 23) _____

71 62 65 60 69 72
78 79 73 65 60 63

Use the data to obtain a point estimate of the mean resting heart rate for all long distance runners.

A) 69.8 beats per minute
B) 66.4 beats per minute
C) 64.8 beats per minute
D) 70.1 beats per minute
E) 68.1 beats per minute

Find the margin of error

24) A poll of 163 voters resulted in 110 favorable responses. Find the margin of error for the 95% confidence interval used to estimate the population proportion. 24) _____

A) 0.180 B) 0.0649 C) 0.0719 D) 0.0865 E) 0.1442

Construct the requested confidence interval from the supplied information.

25) A sociologist develops a test to measure attitudes about 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. 25) _____

A) (67.7, 84.7) B) (74.6, 77.8) C) (67.7, 88.2) D) (69.2, 83.2) E) (64.2, 88.2)

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

26) A survey of 865 voters in one state reveals that 408 favor approval of an issue before the legislature. Construct a 95% confidence interval for the proportion of all voters in the state who favor approval. 26) _____

A) (0.438, 0.505)
B) (0.444, 0.500)
C) (0.431, 0.512)
D) (0.423, 0.520)
E) (0.469, 0.475)

Interpret the confidence interval.

27) A researcher wants to estimate the mean cholesterol level of people in his city.A random sample of 21 people yields an average cholesterol level of 219, with a margin of error of ±12. Assume the researcher used a confidence level of 90%. 27) _____

A) 90% of the people sampled have cholesterol levels between 207 and 231.
B) If we took many random samples of people in the city, about 9 out of 10 of them could produce a confidence interval of (207,231).
C) The researcher can be 90% confident that the mean cholesterol level for people in his city is between 207 and 231.
D) About 9 out of 10 people in the researcher's city have cholesterol levels between 207 and 231.
E) The researcher can be 90% confident that the mean cholesterol level for people in his city is 219.

Using the t-tables, report the t-score for the given confidence interval and degrees of freedom.

28) A 90% confidence interval from a sample of size 20. 28) _____

A) 1.645 B) 1.729 C) 1.734 D) 1.725 E) 2.093

Determine the null and alternative hypotheses.

29) In the past, the mean running time for a certain type of radio battery has been 9.6 hours. The manufacturer has introduced a change in the production method and wants to perform a hypothesis test to determine whether the mean running time has changed as a result. 29) _____

A) H_0: $\mu > 9.6$hours
H_a: $\mu > 9.6$ hours

B) H_0: $\mu \neq 9.6$ hours
H_a: $\mu = 9.6$hours

C) H_0: $\mu = 9.6$hours
H_a: $\mu > 9.6$ hours

D) H_0: $\mu = 9.6$ hours
H_a: $\mu \neq 9.6$ hours

Select the most appropriate answer.

30) Which P-value provides the strongest evidence against the null hypothesis? 30) _____

A) 0.05 B) 1 C) 0.001 D) -0.05 E) 0.99

Find the P-value for the indicated hypothesis test.

31) A medical school claims that more than 28% of its students plan to go into general practice. It is found that among a random sample of 130 of the school's students, 39% of them plan to go into general practice. Find the P-Value for testing the school's claim. 31) _____

A) 0.1635 B) 0.0026 C) 0.0280 D) 0.3461 E) 0.3078

Assume that a simple random sample has been selected from a normally distributed population. Find the test statistic t.

32) Test the claim that for the adult population of a certain town, the mean annual salary is given by μ = \$30,000. Sample data are summarized as n = 17, $\bar{x}$ = \$22,298, and s = \$14,200. Use a significance level of α = 0.05. 32) _____

Find the test statistic t.

A) 1.57 B) -9.22 C) -1.57 D) -2.24 E) 2.24

State conclusion to significance test in terms of the null hypothesis

33) A journal article reports that 34% of American fathers take no responsibility for child care. A researcher claims that the figure is higher for fathers in a particular town. A random sample of 233 fathers from this town yielded 96 who did not help with child care. Do the data provide sufficient evidence to conclude that in this town the proportion is higher than 0.34? Use a 0.05 significance level. 33) _____

H_0: $p = 0.34$ H_a: $p > 0.34$.

$\alpha = 0.05$

Test statistic: $z = 2.32$. P-Value = 0.0102

State your conclusion in terms of the H_0.

A) Since the P-value < α, we can conclude that the proportion of fathers who take no responsibility for childcare is 41%.

B) Since the P-value < α, we can conclude that the proportion of fathers who take no responsibility for childcare is higher than 34% in this town.

C) Since the P-value < 0.34, we are unable to conclude that the proportion of fathers who take no responsibility for childcare is higher than 34% in this town.

D) Since the P-value < 0.34, we can conclude that the proportion of fathers who take no responsibility for childcare is higher than 34% in this town.

E) Since the P-value < α, we are unable to conclude that the proportion of fathers who take no responsibility for childcare is higher than 34% in this town.

Assume that a simple random sample has been selected from a normally distributed population. State the final conclusion.

34) Test the claim that the mean age of the prison population at a certain facility is less than 26 years. 34) _____

Sample data are summarized as $n = 25$, $\bar{x} = 24.4$ years, and $s = 9.2$ years. Use a significance level of $\alpha = 0.05$.

H_0: $\mu = 26$ H_a: $\mu < 26$

State your conclusion about H_0.

A) $t = -0.87$, do not reject H_0.

B) $t = 12.9$, reject H_0

C) $z = -2.69$, reject H_0

D) $t = -2.69$, reject H_0

E) $t = 0.87$, do not reject H_0

Provide an appropriate response.

35) A study uses a random sample of size 9. The test statistic for testing H_0: $\mu = 12$ versus H_a: $\mu > 12$ is $t = 1.8$. Find the approximate P-value. 35) _____

A) 0.10 B) 0.025 C) 0.05 D) 0.95

From the sample statistics, find the value of $\hat{p}_1 - \hat{p}_2$, the point estimate of the difference of proportions.

36) $n_1 = 100$ $n_2 = 100$ 36) _____

$x_1 = 34$ $x_2 = 30$

A) -0.04 B) 0.040 C) 0.02 D) -0.02

From the sample statistics, find the value of the pooled estimate $\hat{p}$ used.

37) $n_1 = 100$ $n_2 = 100$ 37) _____

$\hat{p}_1 = 0.1$ $\hat{p}_2 = 0.12$

A) 0.33 B) 0.0022 C) 0.22 D) 0.11

Find the appropriate test statistic/p-value.

38) A researcher was interested in comparing the resting heart rate of people who exercise regularly and people who do not exercise regularly. Independent simple random samples of 16 people ages 30-40 who do not exercise regularly and 12 people ages 30-40 who do exercise regularly were selected and the resting heart rate of each person was measured. The summary statistics are as follows. 38) _____

Do Not Exercise	Do Exercise
$\bar{x}_1 = 73.5$	$\bar{x}_2 = 69.3$
$s_1 = 10.2$	$s_2 = 8.7$
$n_1 = 16$	$n_2 = 12$

Find the test statistic t to be used for testing that the mean resting pulse rate of people who do not exercise regularly is greater than the mean resting pulse rate of people who exercise regularly?

A) -1.17 B) -1.15 C) 1.17 D) 1.15

Construct the indicated confidence interval for the difference between the two population means. Assume that the assumptions and conditions for inference have been met.

39) The table below contains information pertaining to the gasoline mileage for random samples of trucks of two different types. Find a 95% confidence interval for the difference in the means $\mu_X - \mu_Y$. 39) _____

	Brand X	Brand Y
Number of Trucks	50	50
Mean mileage	20.1	24.3
Standard Deviation	2.3	1.8

A) (3.38, 5.02)
B) (-4.7, -3.7)
C) (20.1, 24.3)
D) (-5.02, -3.38)
E) (3.7, 4.7)

Use the paired t-interval procedure to obtain the required confidence interval for the mean difference. Assume that the conditions and assumptions for inference are satisfied.

40) A test for abstract reasoning is given to a random sample of students before and after they complete a formal course in logic. Calculate the test statistic for testing that the course improves the test scores assuming that d=after-before, $\bar{x}_d = -3.7$ and $s_d = 4.945$, $n = 10$ and $\alpha = 0.05$. State your conclusion in terms of the problem. 40) _____

A) t = 0.75; Fail to reject the null hypothesis. There is not enough evidence to conclude that the course improves the average score on the abstract reasoning test.
B) t = 2.37; Fail to reject the null hypothesis. There is not enough evidence to conclude that the course improves the average score on the abstract reasoning test.
C) t = 2.37; Fail to reject the null hypothesis and conclude that the average scores on the abstract reasoning test are the same before and after the course in logic.
D) t = 0.75; Fail to reject the null hypothesis and conclude that the average scores on the abstract reasoning test are the same before and after the course in logic.
E) t = 2.37; Reject the null hypothesis and conclude that the course does improve the average score on the abstract reasoning test.