

MA 180/418 Midterm Test 2 (Sample)

Student Name (PRINT):.....

Student Signature:

Use pencil, so that you can erase and rewrite if necessary.

The test consists of 10 questions.

Questions 1 through 5 are multiple-choice and worth 5 points each.

Questions 6 through 10 are computational and worth 15 points each.

For questions 1 through 5, circle the correct answer (**a**, **b**, **c**, or **d**) after each question. Each question is 5 points. No partial credit.

Q1 Of the following, which is the correct interpretation regarding a **95% confidence interval** for a population proportion?

- (a) The sample proportion \hat{p} will be correct 95% of the time.
- (b) The sample proportion \hat{p} will be the best point estimate 95% of the time.
- (c) If we repeat the procedure many times, approximately 95% of the intervals so constructed will contain the true population proportion.
- (d) The confidence interval contains 95% of the sample data.

Correct answer (circle one): (a) (b) (c) (d)

Q2 How is the **t-distribution** different from the **z-distribution**?

- (a) The t-distribution is not symmetric while the z-distribution is.
- (b) The t-distribution is wider than the z-distribution for samples of the same size.
- (c) The t-distribution is narrower than the z-distribution for samples of the same size.
- (d) The t-distribution is not centered at $t = 0$ while the z-distribution is centered at $z = 0$.

Correct answer (circle one): (a) (b) (c) (d)

Q3 What is a **Type-I error** in hypothesis testing?

- (a) A Type-I error occurs when the test statistic is outside the critical region.
- (b) A Type-I error occurs when the test statistic is negative for a test that is Right-Tailed.
- (c) A Type-I error occurs when the null hypothesis is accepted when, in fact, the null hypothesis is false.
- (d) A Type-I error occurs when the null hypothesis is rejected when, in fact, the null hypothesis is true.

Correct answer (circle one): (a) (b) (c) (d)

Q4 In inferential statistics, what is a **hypothesis**?

- (a) A hypothesis is the value of the test statistic before it is tested.
- (b) A hypothesis is the number of standard deviations that the sample statistic is away from the mean of the sampling distribution.
- (c) A hypothesis is a claim or statement about a property of a population.
- (d) A hypothesis is a conclusion reached after you determine whether or not the test statistic is in the critical region.

Correct answer (circle one): (a) (b) (c) (d)

Q5 Which of the following statements best describes the difference between **independent samples** and **matched-pair (dependent) samples**?

- (a) In independent sampling from two populations, the members of the populations are not related. In matched-pair (dependent) sampling, the members of the populations have some tie-in, one to the other.
- (b) In independent sampling the sample size must be greater than 30. In matched-pair (dependent) sampling the sample size can be less than or equal to 30 as long as the populations have normal distributions.
- (c) For independent samples the degree-of-freedom is $n - 1$. For matched-pair (dependent) samples the degree-of-freedom is $n - 2$.
- (d) For independent samples you construct a confidence interval. For matched-pair (dependent) samples you construct a test of hypothesis.

Correct answer (circle one): (a) (b) (c) (d)

For questions 6 through 10, write your answer in the space provided. Show your work. Each question is worth 15 points.

Q6 A cell phone company manager wants to determine the percentage of adults who live in a household with cell phones and no land-line phones. How many adults must he survey? Assume that he wants to be 95% confident that the sample percentage is within three percentage points of the true population percentage. (Write down the formulas that you use.)

(a) Assume that nothing is known about the percentage of adults who live in a household with cell phones and no land-line phones.

(b) Assume that a recent survey suggests that about 8% of adults live in a household with cell phones and no land-line phones.

Q7 To test the claim that post-1983 pennies have weights with a standard deviation greater than 0.022 g, a random sample of 51 pennies was collected. That sample has a standard deviation of 0.0275 g. Assume that the population has normal distribution. Use a 0.05 significance level.

(a) State hypotheses H_0 and H_1 , draw a diagram, find the critical value(s).

(b) Compute the test statistic. Test the claim by the traditional method. State the final conclusion.

(Bonus) Use Table A-4 to determine an interval for the P-value, or use a calculator to find the exact P-value.

Q8 When 12 different medical students measured the blood pressure of the same person, they obtained the following results:

134 129 141 128 127 135 140 131 139 143 137 134

Assume that the population is normally distributed and its standard deviation is known to be 9.

- (a) Find $\bar{x} =$
- (b) Construct a 90% confidence interval estimate for the population mean.
- (c) Find the margin of error $E =$

Q9 A sample of 61 adults is obtained, and each person's red blood cell count is measured. The sample mean is 5.18 and the sample standard deviation is 0.58. Use a 0.05 significance level to test the claim that the sample is from a population with a mean less than 5.3.

- (a) State hypotheses H_0 and H_1 , draw a diagram, find the critical value(s).
- (b) Compute the test statistic. Test the claim by the traditional method. State the final conclusion.

(Bonus) Use Table A-3 to determine an interval for the P-value, or use a calculator to find the exact P-value.

Q10 In a 1995 survey of 480 college students, 142 said that they used illegal drugs during the previous year. In a recent survey of 680 college students, 185 said that they used illegal drugs during the previous year. Use a 0.01 significance level to test the claim that the proportion of college students using illegal drugs has not changed since 1995:

(a) State hypotheses H_0 and H_1 , draw a diagram, find the critical value(s).

(b) Compute the test statistic. Test the claim by the traditional method. State the final conclusion.

(c) Find the P-value.

(d) Based on the P-value, which hypothesis do you accept? Why?