MA 180/418 Midterm Test 2, Version A Spring 2010

Student Name (PRINT):. . . . . .

Student Signature: . . . . . .

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 What is the meaning of the term **point estimate**?

(a) It is an estimate of an unknown point.

(b) It is a single value used to approximate a population parameter.

(c) It is a characteristic of a one-tailed hypothesis where the inequality sight points to the left or to the right.

(d) It is an estimate of an endpoint of a confidence interval.

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

Q2 What is the meaning of the term **90% confidence interval**?

(a) It is an interval containing 90% of the data.

(b) It means that we are 90% confident that the so constructed interval is correct.

(c) It means that if we repeat the procedure many times, approximately 90% of the intervals so constructed will contain the true population parameter.

(d) It is an interval over which the area under the density curve is 0.90.

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

Q3 What is the meaning of the **significance level** of a hypothesis test?

(a) It is the same as confidence level.

(b) It is the total area under the density curve.

(c) It is one half of the test statistic.

(d) It is the probability that the test statistic will fall in the critical region when the null hypothesis is actually true.

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

Q4 When do you use the **F-distribution** and when do you use the **chi-square distribution**?

(a) We use the F-distribution to test a claim about a population variance, and the chi-square distribution test a claim about the comparison of two population variances.

(b) We use the chi-square distribution to test a claim about a population variance, and use the F-distribution to test a claim about the comparison of two population variances.

(c) We use the chi-square distribution to test a claim about a population variance, and use the F-distribution to test a claim about a population proportion.

(d) We use the F-distribution or the chi-square distribution to test a claim about a population variance. The two give the same result.

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

Q5 How do you use **P-value** to make an initial conclusion in hypothesis testing, assuming α is the significance level?

(a) If P-value $\leq \alpha$, reject H_0. If P-value $> \alpha$, fail to reject H_0.

(b) If P-value $> \alpha$, reject H_0. If P-value $\leq \alpha$, fail to reject H_0.

(c) If P-value $\neq \alpha$, reject H_0. If P-value $= \alpha$, fail to reject H_0.

(d) If P-value $= \alpha$, reject H_0. If P-value $\neq \alpha$, fail to reject H_0.

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. You can use a calculator to compute confidence intervals, test statistics, and P-values. Always assume that the population is normal.

Q6 A random sample of the weights of 18 green M&Ms has a mean of 0.86 g. Assume that σ is known to be 0.04 g. Use a 0.05 significance level to test the claim that the mean weight of all green M&Ms is equal to 0.85 g.

(a) State the null and the alternative hypotheses:

(b) Draw a diagram. Find and mark the critical value(s).

(c) Compute the test statistic. Make an initial conclusion and a final conclusion.

(d) Find the P-value of the test. Make a conclusion by using the P-value.

Q7 When Mendel conducted his famous genetics experiments with peas, one sample of offsprings consisted of 430 green peas and 155 yellow peas. Note: the total number of peas was $430 + 155 = 585$.

(a) Find a 90% confidence interval estimate of the percentage of yellow peas.

(b) Based on his theory of genetics, Mendel expected that 25% of the offspring peas would be yellow. Do the results of the above experiment support Mendel's theory? Why or why not?

Q8 In the course of designing theater seats, the sitting heights (in mm) of a random sample of adult women is obtained:

840 810 820 860 855 870 770 840 810

(a) Compute the sample mean and the sample standard deviation.

(b) Construct a 95% confidence interval estimate of σ, the standard deviation of sitting heights of all women.

Which distribution do you use? Find the number of degrees of freedom.

Q9 A statistician collected a random sample of the cents portion from 61 checks and from 90 credit card charges. The cents portions of the checks have a mean of 24 cents and a standard deviation of 33 cents. The cents portions of the credit card charges have a mean of 35 cents and a standard deviation of 32 cents. Use a 0.01 significance level to test the claim that the cents portions of the checks have a mean that is less than the mean of the cents portions of the credit card charges.

(a) State the null and the alternative hypotheses:

(b) Draw a diagram. Find and mark the critical value(s).

(c) Compute the test statistic. Make an initial conclusion and a final conclusion.

(Bonus) *For an extra credit, find the P-value of the test by calculator (up to 3 significant digits) or find an interval for the P-value by using a table.*

Q10 A random sample of 21 four-cylinder cars is obtained, and the breaking distances are measured and found to have a mean of 133 ft and a standard deviation of 10 ft. A random sample of 16 six-cylinder cars is obtained, and the breaking distances are measured and found to have a mean of 139 ft and a standard deviation of 6.5 ft. Use a 0.05 significance level to test the claim that the breaking distances of four-cylinder cars and six-cylinder cars have the same variance.

(a) State the null and the alternative hypotheses:

(b) Draw a diagram. Mark the critical values, find the larger critical value.

(c) Compute the test statistic. Make an initial conclusion and a final conclusion.

(Bonus) *For an extra credit, find the P-value of the test by calculator (up to 3 significant digits) or find an interval for the P-value by using a table.*