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  $(\mathbf{a}, \mathbf{b}, \mathbf{c}, \text{ or } \mathbf{d})$  after each question. Each question is 5 points. No partial credit.

## Q1 How the **t-distribution** is different from **z-distribution**?

- (a) The z-curve is taller and wider than the t-curve.
- (b) The t-curve is taller and wider than the z-curve.
- (c) The z-curve is taller, but the t-curve is wider.
- (d) The t-curve is taller, but the z-curve is wider.

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

Q2 When is the **point estimate** at the center of the CI (confidence interval)?

- (a) It is never at the center of the CI.
- (b) It is at the center of the CI when you estimate  $\mu$  but not at the center of the CI when you estimate  $\sigma$ .
- (c) It is at the center of the CI when you estimate  $\sigma$  but not at the center of the CI when you estimate  $\mu$ .
- (d) It is at the center of the CI when you estimate  $\mu$  and when you estimate  $\sigma$ .

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

Q3 In what chapters of the book do we use **chi-square distribution**?

- (a) It was first used in Chapter 6.
- (b) It is used in Chapter 7 but not in Chapter 8.
- (c) It is used in Chapter 8 but not in Chapter 7.
- (d) It is used in both Chapters 7 and 8.

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

Q4 What do we do if the test statistic falls in the **rejection region**?

- (a) We reject  $H_0$ .
- (b) We reject  $H_1$ .
- (c) We reject the original claim.
- (d) We reject the observed data and redo the experiment.

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

Q5 How do you make an initial conclusion based on the **P-value**?

- (a) If it is greater than the critical value, reject the null hypothesis.
- (b) If it is greater than the critical value, reject the alternative hypothesis.
- (c) If it is greater than the significance level, reject the null hypothesis.
- (d) If it is greater than the significance level, reject the alternative 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 researcher wants to estimate the mean great point average of all college students in the USA. How many great point averages does she need to obtain so that the sample mean is within 0.07 from the population mean? Assume that a 95% confidence is desired and the population standard deviation is 0.84.

Q7 Listed below are lengths (in minutes) of 12 randomly selected movies:

 $125 \quad 141 \quad 115 \quad 139 \quad 131 \quad 127 \quad 140 \quad 129 \quad 137 \quad 130 \quad 128 \quad 136.$ 

Assume that the lengths of all movies are normally distributed.

(a) Compute the sample mean and the sample standard deviation. (Round off to **one** decimal place.)

(b) Construct a 98% confidence interval estimate for the mean length of all movies. (If you use a formula, write it down in <u>algebraic form</u> and then <u>fill in the numerical values</u>. If you use a calculator function, <u>name it</u>. Round off to **one** decimal place.)

(c) Give the margin of error. Explain how you computed it.

Q8 In a study of 1400 randomly selected medical malpractice lawsuits, it is found that 967 of them were later dropped or dismissed.

(a) What is the best point estimate of the proportion of medical malpractice lawsuits that are dropped or dismissed? (Round off to **two** decimal places.)

(b) Construct a 90% confidence interval for the proportion of medical malpractice lawsuits that are dropped or dismissed. (If you use a formula, write it down in <u>algebraic form</u> and then <u>fill in the numerical values</u>. If you use a calculator/computer function, <u>name it</u>. Round off to **two** decimal places.)

[Bonus] Construct a 99% confidence interval for the proportion of medical malpractice lawsuits that are dropped or dismissed. Which interval is larger and why?

Q9 A sample of 40 current hit songs results in a mean length of 229.75 sec. Assume that the standard deviation of song lengths is 53.1 sec. Use a 10% significance level to test the claim that the mean song length is less that 240 sec.

(a) State the null and the alternative hypotheses.

(b) Compute the test statistic. (Round off to **three** decimal places.)

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

(d) Make an <u>initial conclusion</u> and a <u>final conclusion</u>.

(e) Find the P-value of the test. (Round off to **four** decimal places.) Make a conclusion by using the P-value.

Q10 A sample of 18 filtered cigarettes is obtained and the tar content in each cigarette is measured. The sample has a standard deviation 2.65mg. Assume that the tar content has a normal distribution. Use a 0.1 significance level to test a claim that the tar content in filtered cigarettes has a standard deviation less than 3.5mg.

(a) State the null and the alternative hypotheses.

(b) Compute the test statistic (round off to **three** decimal places).

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

(d) Make an <u>initial conclusion</u> and a <u>final conclusion</u>.

(e) What is the requirement on the population in this test? How strict is it?

[Bonus] For an extra credit, find an interval for the P-value by using a table or the exact P-value by using technology (name the respective calculator or computer function).