

Last Name:

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First Name:

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This test includes 4 written questions with varying point values. There is a total of 40 possible points. You will receive a separate handout with the formula sheet and statistical tables (Standard Normal and Student t). You may use a non-programmable calculator. You have 50 minutes.

Keep these papers face-up and closed on your desk until the start of the test is announced. Put your writing instruments down immediately when the end of the test is announced.

Unless otherwise specified, use the conventional 5 percent significance level.

- Write your answers clearly, concisely, and completely below each question.
- **Make sure to show your work and reasoning. Make sure your graphs are fully labeled.**
- A guide for your response is in brackets: it tells what is expected: a quantitative analysis, a graph, and/or sentences. For example, “What would the least squares intercept be and how should it be interpreted? [Answer with a quantitative analysis & 1 – 2 sentences]” To best demonstrate your understanding, follow the guides and focus on directly answering the questions asked.
 - Make sure to write actual sentences (not short-hand or bullet lists).
 - Apply your skills to the specific situation presented with the question.
 - Reproducing examples or discussion from our course materials is not an effective strategy because these will not address the specific situation asked about.
 - Extraneous analysis does not earn positive marks if it is correct and earns negative marks if incorrect: focus on the question that is asked.
- For questions with multiple parts, attempt each part even if you had trouble with earlier parts.
- Please manage your time. If a question is worth 5 points spend roughly 5 minutes on it.

Student #:

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	Q1	Q2	Q3	Q4	Raw Total	Your Mark (out of 100%)
Point Value:	6	9	7	18	40	
Points Earned:						

iClicker Letter Mark for 1 st Half of Winter Term:
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(1) [6 pts] Provinces that rely on sales tax for revenue to fund education, public safety, and other programs often end up with budget surpluses during economic growth and budget deficits during economic recessions. Fifty small retailers in a province with a growing economy were recently sampled. The sample showed a mean increase of \$3,571 in additional sales tax revenue collected per retailer compared to the previous quarter. The sample standard deviation is \$301. For the following presume that the underlying conditions are met.

(a) [3 pts] Find a 90% confidence interval for the mean increase in sales tax revenue per retailer. [Answer with a quantitative analysis]

(b) [3 pts] Explain what the interval means (i.e. interpret it). [Answer with 1 sentence]

(2) [9 pts] You wish to show that more than half of voters will vote in favor of pension reform. You plan to survey a random sample of 200 voters. Presume that the underlying conditions are met.

(a) [2 pts] Using the notation from our course, write the null and research hypothesis. [Answer by writing the hypotheses]

(b) [4 pts] Draw a fully-labeled graph of the sampling distribution of the sample proportion presuming the null hypothesis is true. [Answer with a quantitative analysis and a graph]

(c) [3 pts] The probability that you will be able to infer that the research hypothesis is true if in fact 55% of voters favor the reform is 0.409. What is the name of this probability and what does its value tell us? [Answer with 1 – 2 sentences]

(3) [7 pts] A researcher wishes to show that more than 40% of patients with an all-metal hip implant have that implant fail within five years. In a random sample of patients 41.2% have the implant fail within five years. A P-value of 0.001 is obtained. Presume the underlying conditions are met.

(a) [3 pts] Is the positive difference between 41.2% and 40% statistically significant? Explain. [Answer with 1 – 2 sentences]

(b) [1 pts] Is the positive difference between 41.2% and 40% significant? Explain. [Answer with 1 sentence]

(c) [3 pts] What do the conflicting answers to parts **(a)** and **(b)** imply about the sample size for this study? Explain. [Answer with 1 – 2 sentences]

(4) [18 pts] Each part below **(a)** – **(d)** is a separate question and is **not** related to the other parts. For all parts to this question presume that the underlying conditions hold.

(a) [5 pts] A researcher believes that the optimal temperature to serve coffee is 75 degrees Celsius and wishes to show that mean temperature of coffee served at Second Cup differs from this optimum. A random sample of 22 cups has an average temperature of 75.6 and standard deviation of 1.3 degrees. Calculate the P-value. [Answer with a quantitative analysis]

(b) [4 pts] You are reading a report that estimates the fraction of customers satisfied with your firm's customer service. It reports a 99% confidence interval estimate of (0.54, 0.63). What was the sample size and how many customers in the sample said they were satisfied? [Answer with a quantitative analysis]

(c) [5 pts] A large university claims that less than one tenth its students prefer online-only classes to face-to-face formats. It asks a random sample of 400 students a yes/no question where “yes” means prefer online-only. Find the range of survey results that would statistically support the university’s claim. What is the name of this range? [Answer with a quantitative analysis and 1 sentence]

(d) [4 pts] In the required reading entitled “Belief in the Law of Small Numbers” what does “the law of small numbers” mean and how does it affect statistical inference? [Answer with 1 – 2 sentences]