Instructor: Prof. Murdock

Duration: 50 minutes: 45 minutes are for writing the quiz and 5 minutes are for the TA's and me to distribute and collect papers while you are silently seated with writing instruments down on your desk.

Format: 15 multiple-choice questions. Record answers on pink SCANTRON form. Correct answers worth 5 points each and incorrect answers worth 0 points. 75 total possible points.

Allowed aids: A non-programmable calculator and attached aid sheets.

Instructions:

→ Do NOT write your answers on these test papers but you MAY do scratch work on them

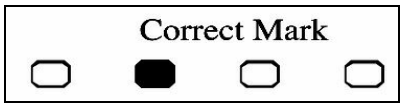
→ Cover your answers: doing something that would facilitate cheating is as bad as cheating

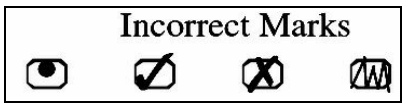
→ ONLY those responses correctly marked on the SCANTRON form can earn marks

- No extra time permitted for filling in the SCANTRON: complete the SCANTRON form before we announce the end of the 45 minutes to write the quiz

→ To fill in your pink SCANTRON form:

- Use only a pencil or blue or black ball point pen
  - **Pencil strongly recommended** because it can be erased if a mistake occurs
- Erase completely any marks you want to change
- Crossing out a marked box is not acceptable and is incorrect
- Make dark solid marks that fill the bubble completely





- Select the one best alternative
- Print your **LAST NAME** and **INITIALS** in the boxes AND darken each letter in the corresponding bracket below each box
  - Use exact name you are officially registered under in ROSI
- Print your 9 digit **STUDENT NUMBER** in the boxes AND darken each number in the corresponding bracket below each box
  - Fill in zeros in front of the number if less than 9 digits
- Print 2 digit **FORM** number in the boxes AND darken each number in the corresponding bracket below each box
  - Your FORM number is **01**
- Sign your name in the **SIGNATURE** box

► **Questions (1) – (4):** A population has a standard deviation of 3. A random sample of size 40 is drawn. The sample mean is 109. These hypotheses are tested:

H_0: $\mu = 110$

H_1: $\mu < 110$

(1) To the nearest tenth, what is the un-standardized rejection region with a 5% significance level?

(A) $(-\infty, 108.0)$
(B) $(-\infty, 108.1)$
(C) $(-\infty, 108.2)$
(D) $(-\infty, 109.1)$
(E) $(-\infty, 109.2)$

(2) To the nearest hundredth, what is the standardized test statistic?

(A) -0.33
(B) -1.65
(C) -1.75
(D) -2.11
(E) -2.33

(3) To the nearest hundredth, what is the p-value?

(A) 0.01
(B) 0.02
(C) 0.04
(D) 0.05
(E) 0.13

(4) In this specific problem what would a Type I error be?

(A) inferring that $\mu < 110$ when $\mu = 110$
(B) inferring that $\mu = 110$ when $\mu < 110$
(C) rejecting that $\mu < 110$ when $\mu < 110$
(D) finding insufficient evidence to infer $\mu < 110$ when $\mu < 110$
(E) finding insufficient evidence to reject $\mu = 110$ when $\mu < 110$

(5) If there is a lot of evidence in favor of the research hypothesis what does this suggest about the magnitude of the p-value?

(A) It equals α
(B) It equals $(1-\alpha)$
(C) It is almost one
(D) It is close to zero
(E) It is greater than α

(6) Suppose a population is bell shaped and has a standard deviation of 2. A random sample of 17 observations is drawn. The sample mean is 6. The 95% confidence interval estimator of the population mean is [5.05, 6.95]. Approximately how many observations in the sample should fall in the interval from [5.05, 6.95]?

(A) 0
(B) 2
(C) 6
(D) 16
(E) 17

► **Questions (7) – (8):** Suppose a population has a standard deviation of 70. A random sample of 100 observations is drawn. The sample mean is 60.

(7) At a 5% significance level, which of the following statements is TRUE?

Statement #1: We can infer that the population mean is not 45

Statement #2: We can infer that the population mean is not 50

Statement #3: We can infer that the population mean is not 55

(A) Only #1
(B) Only #3
(C) Only #1 and #2
(D) Only #2 and #3
(E) All three

(8) What is the 99.44% confidence interval estimator of the population mean?

(A) (40.610, 79.390)
(B) (41.280, 78.720)
(C) (42.255, 77.745)
(D) (46.222, 73.778)
(E) (58.061, 61.939)

► **Questions (9) – (10):** Here are excerpts from "A Problem of the Brain, Not the Hands: Group Urges Phone Ban for Drivers," January 13, 2009 in the New York Times by Tara Parker-Pope.

In half a dozen states and many cities and counties, it is illegal to use a hand-held cellphone while driving — but perfectly all right to talk on a hands-free device.

The theory is that it's distracting to hold a phone and drive with just one hand. But a large body of research now shows that a hands-free phone poses no less danger than a hand-held one — that the problem is not your hands but your brain.

At the University of Utah, Dr. Strayer and his colleagues use driving simulators to study the effects of cellphone conversations. A simulator's interior looks like that of a Ford Crown Victoria, and a computer allows researchers to control driving conditions. Study participants are asked to drive under a variety of conditions: while talking on a hand-held phone or a hands-free one, while chatting with a friend in the next seat, and even after consuming enough alcohol to make them legally drunk.

While in the simulator, drivers are asked to complete simple tasks, like driving for several miles along a highway and finding a particular exit, or navigating local streets where they must brake for traffic lights, change lanes and watch for pedestrians. How fast they drive, how well they stay in their lane, driving speed and eye movement are closely monitored.

The studies show that cellphone conversations are highly distracting compared with other speaking and listening activities in the car. Despite the overwhelming body of evidence that cellphone use while driving is risky, the idea of a total ban is sure to be controversial.

A politician is more concerned about safety than controversy. He would consider a total ban even if modest evidence shows that driving while talking on a hands-free phone is dangerous. Dangerous means a score of less than 50 on a simulated driving test. A random sample of 250 drivers completes a simulated driving test while using hands-free phones. The average score is 49.

(9) For the politician what is an appropriate hypothesis test and significance level?

(A) H_0: $\mu = 49$; H_1: $\mu < 49$; $\alpha = 0.01$
(B) H_0: $\mu = 49$; H_1: $\mu < 49$; $\alpha = 0.05$
(C) H_0: $\mu = 49$; H_1: $\mu < 49$; $\alpha = 0.10$
(D) H_0: $\mu = 50$; H_1: $\mu < 50$; $\alpha = 0.01$
(E) H_0: $\mu = 50$; H_1: $\mu < 50$; $\alpha = 0.10$

(10) You have not been given enough information to complete the hypothesis test. Using the information you do have, which of the following could be a correct conclusion?

#1: Driving while talking on a hands-free cellphone is safe
#2: Driving while talking on a hands-free cellphone is dangerous
#3: Driving while talking on a hands-free cellphone is probably dangerous but we cannot rule out the possibility that it is safe

(A) only #1
(B) only #1 and #2
(C) only #2
(D) only #2 and #3
(E) only #3

(11) If a minimum sample size of 100 is required to obtain a 95% confidence interval estimator of the population mean that is $\overline{X} \pm 4$, the researcher is assuming that the population standard deviation is about _____.

(A) 12
(B) 14
(C) 16
(D) 18
(E) 20

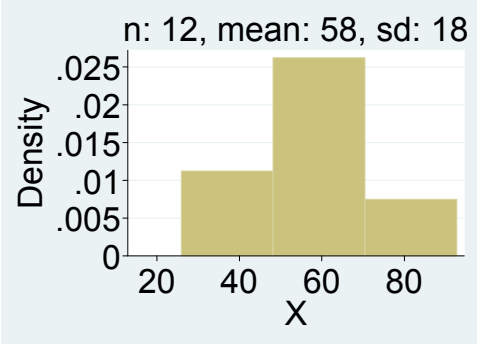
(12) For 10 degrees of freedom, P(t > 2) is in the range from _____.

(A) 0.025 to 0.050
(B) 0.050 to 0.100
(C) 0.900 to 0.950
(D) 0.950 to 0.975
(E) 0.950 to 0.990

(13) For a one-tailed test what does it mean if the test statistic equals the critical value?

(A) The rejection region is correct
(B) The rejection region is incorrect
(C) The p-value is equal to the significance level
(D) The chance of making a Type I error is near one
(E) The hypothesis test should be changed to a two-tailed test

► **Question (14):** Consider this density histogram and descriptive statistics for a random sample.



(14) What is the 95% confidence interval estimator of μ?

(A) [22.72, 93.28]
(B) [46.56, 69.44]
(C) [47.81, 68.19]
(D) [48.67, 67.33]
(E) [49.45, 66.55]

(15) A random sample of size 4 is drawn from a negatively skewed population with σ = 1. You compute the confidence interval estimator of the mean using the formula: $\overline{X} \pm z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$. What can you say about the center of your estimate and its width?

(A) It is centered at the right place and has the right width
(B) It is centered at the right place but has the wrong width
(C) It is centered at the wrong place but has the right width
(D) It is centered at too low of a value and has the wrong width
(E) It is centered at too high of a value and has the wrong width

Your form number is **01**. Complete the FORM box at the top right of your pink SCANTRON form.