Instructor: Prof. Murdock
Duration: 50 minutes. You must stay in the test room for the entire time.
Format: 18 multiple choice questions with answers recorded on SCANTRON form
Point values: Each multiple question worth 5 points. There are 90 total possible points.
Allowed aids: A non-programmable calculator (and attached aid sheets, which you may detach)

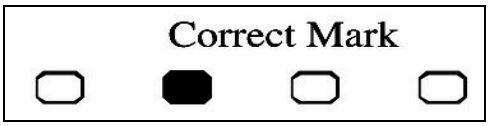
INSTRUCTIONS:

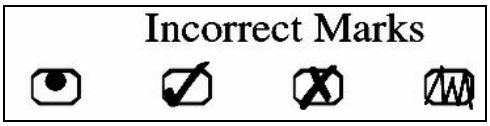
Do NOT write your answers to the multiple choice questions on these test papers
ONLY those answers correctly marked on the SCANTRON form can earn marks
You MAY do scratch work on these pages

SCANTRON INSTRUCTIONS

- Use only a pencil or blue or black ball point pen

- **Pencil strongly recommended**, it can be erased if a mistake is made
- Make dark solid marks that fill the bubble completely





- Erase completely any marks you want to change
  - Crossing out a marked box is not acceptable and is scored as incorrect
- Select the one best alternative
- If you leave a question blank you will be awarded 1.25 points

1st : Print your **LAST NAME** and **INITIALS** in boxes provided
- Use exact name you are officially registered under
- Darken each letter in the corresponding bracket below each box

2nd : Print your 9 digit **STUDENT NUMBER** in the boxes provided
- Fill in zeros in front of the number if less than 9 digits
- Darken each number in the corresponding bracket below each box

3rd : Print 2 digit **FORM** number in the boxes provided
- Your FORM number is **01**
- Darken each number in the corresponding bracket below each box

4th : Sign your name in the **SIGNATURE** box

For the 18 questions, choose the <u>most correct</u> answer and mark it on the SCANTRON form.

(1) When doing hypothesis testing, what is α ?

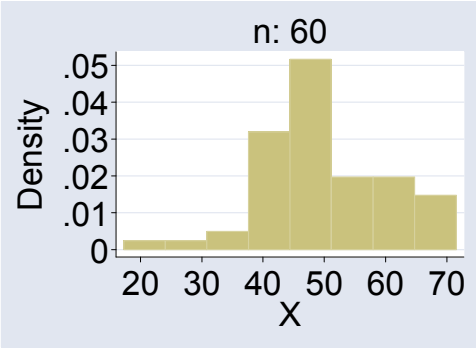
(A) The p-value
(B) The confidence level
(C) The maximum tolerated chance of a Type I error
(D) The probability that sampling error has affected the sample statistics
(E) The parameter value specified in both the null and research hypotheses

(2) Which rely on the Central Limit Theorem?

I.	Interval estimation of the population mean when the population variance is known
II.	Interval estimation of the population proportion
III.	Hypothesis testing of the population mean when the population variance is known
IV.	Laws of Variance and Covariance

(A) I.
(B) I. and II.
(C) I. and III.
(D) I., II. and IV.
(E) IV.

► For Question **(3)**: Consider this description of a random sample for the variable X.



(3) Which is closest to the 95% interval estimate of the population mean?

(A) LCL = 30 and UCL = 70
(B) LCL = 32 and UCL = 65
(C) LCL = 35 and UCL = 64
(D) LCL = 39 and UCL = 62
(E) LCL = 47 and UCL = 53

(4) In hypothesis testing, what does a very small p-value mean?

(A) You should accept the null hypothesis
(B) You should infer the research hypothesis is true
(C) You have a large chance of making a Type I error but a small chance of making a Type II error
(D) You must have chosen a small significance level
(E) You should fail to reject the null hypothesis

(5) What is a Type II error?

(A) Failing to accept a true null hypothesis
(B) Failing to reject a false null hypothesis
(C) Specifying an incorrect research hypothesis
(D) Inferring causation from a mere correlation
(E) Rejecting a true null hypothesis

► For Questions **(6) – (7)**: Suppose you conduct a non-directional (two-sided) hypothesis test of the population mean when the population variance is unknown. You obtain a sample mean that is exactly equal to the value specified in the null hypothesis.

(6) What is the p-value?

(A) 0.00
(B) 0.05
(C) 0.25
(D) 0.50
(E) 1.00

(7) What should you conclude?

(A) There is no evidence to support the research hypothesis
(B) The null hypothesis is true with certainty
(C) Reject the null hypothesis
(D) Nothing
(E) The data prove the null hypothesis is true beyond a reasonable doubt

(8) Suppose you are testing the difference between two population means to answer a research question about whether prices are higher in Population 1 compared to Population 2. You obtain the following: X1-bar = $25.55, X2-bar = $18.03 and p-value = 0.0047. What can you conclude about the economic and statistical significance of the difference?

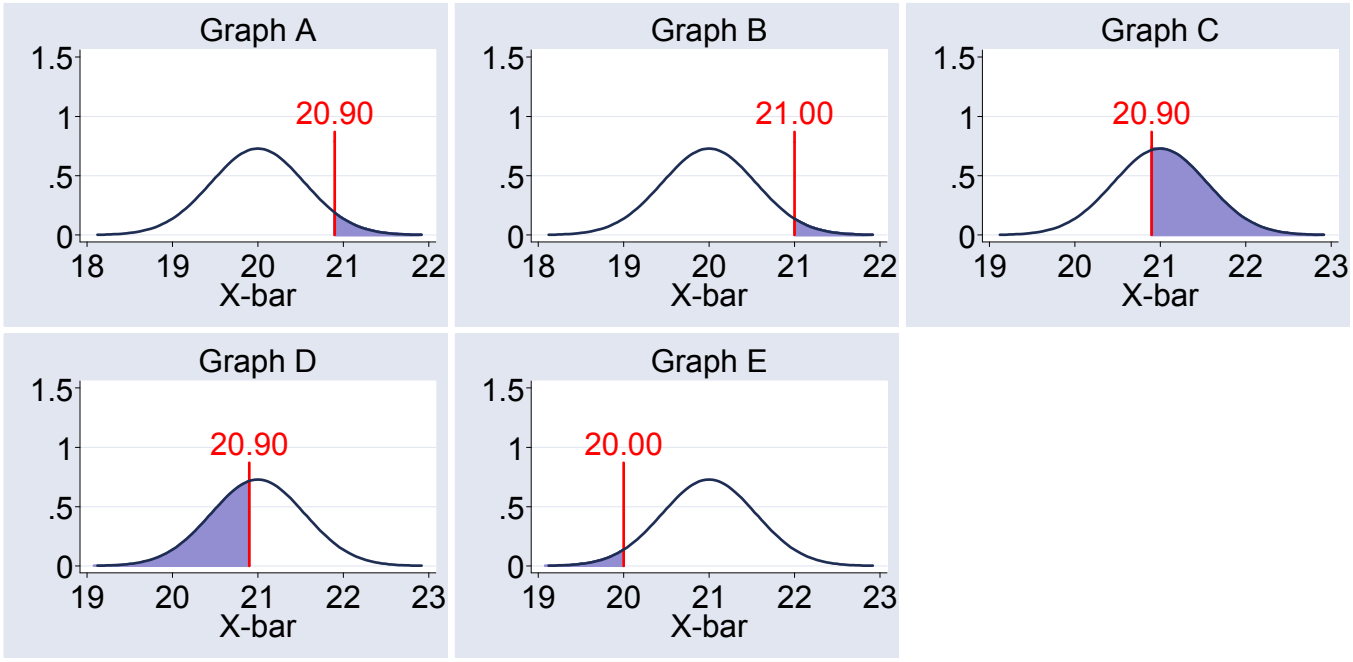
(A) It is economically significant but not statistically significant
(B) It is statistically significant but not economically significant
(C) It is both economically and statistically significant
(D) It is neither economically nor statistically significant
(E) Insufficient information for any conclusion about statistical significance

► For Question **(9)**: Consider the following hypothesis test:

H_0: $\mu = 20$
H_1: $\mu > 20$

Suppose that μ is 21, σ^2 is 30, n is 100, and the significance level is 0.05.

(9) Which of the following graphs shows the probability of making a Type II error (shaded area)?



(A) Graph A
(B) Graph B
(C) Graph C
(D) Graph D
(E) Graph E

► For Questions **(10) – (11)**: Suppose you wish to conduct the following hypothesis test using a conventional significance level of 5%:

H_0: $\mu = 0$
H_1: $\mu < 0$

You obtain a random sample and the following descriptive statistics.

```
. summarize X, detail;

                            X
-------------------------------------------------------------
      Percentiles      Smallest
 1%    -1.660653      -1.660653
 5%    -1.660653      -1.570677
10%    -1.570677      -1.415345       Obs                  18
25%    -1.205727      -1.216623       Sum of Wgt.          18

50%    -.3176674                      Mean           -.2697211
                      Largest         Std. Dev.       1.080199
75%     .7724015      .7833181
90%     1.474401      .8524897        Variance        1.166829
95%      1.59356      1.474401        Skewness        .2841913
99%      1.59356       1.59356        Kurtosis        1.703359
```

(10) What is the rejection region?

(A) (-∞, -0.270)
(B) (-∞, -1.645)
(C) (-∞, -1.740)
(D) (-∞, -1.960)
(E) (-∞, -2.110)

(11) What is the test statistic to compare with the rejection region?

(A) -0.25
(B) -0.27
(C) -0.54
(D) -1.06
(E) -4.50

► For Questions **(12) – (14)**: The research question is: How much does the use of cellular telephones while driving affect the number of traffic accidents? You survey a random sample of automobile drivers and ask about their driving behavior and accident record. You separate the sample into two groups: those who use their cellular telephone while driving and those that do not. The following summarizes the number of accidents reported by each group.

```
-> cell = DO use cell while driving

  accidents |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |      1,982       64.12       64.12
          1 |        860       27.82       91.94
          2 |        225        7.28       99.22
          3 |         23        0.74       99.97
          4 |          1        0.03      100.00
------------+-----------------------------------
      Total |      3,091      100.00

-> cell = Do NOT use cell while driving

  accidents |      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |      1,191       81.19       81.19
          1 |        220       15.00       96.18
          2 |         52        3.54       99.73
          3 |          4        0.27      100.00
------------+-----------------------------------
      Total |      1,467      100.00
```

(12) What is the point estimate of the average number of accidents for those who do NOT use their cell while driving?

(A) 0.23
(B) 0.33
(C) 0.43
(D) 0.53
(E) 0.63

(13) Consider the difference in the fraction that have been in one or more accidents between these two groups. What is the 95% interval estimate of the difference?

(A) (0.135, 0.207)
(B) (0.145, 0.197)
(C) (0.155, 0.187)
(D) (0.160, 0.182)
(E) (0.170, 0.180)

(14) Which conclusion can be drawn?

(A) Using cellular telephones while driving increases the number of traffic accidents
(B) Using cellular telephones while driving has no effect on the number of traffic accidents
(C) On average people who use cellular telephones while driving are more likely to have a traffic accident
(D) Cellular telephone do not cause a change in the number of traffic accidents
(E) There is no statistically significant difference in chance of an accident when comparing people who use cellular telephone with those that do not

► For Questions **(15) – (16)**: In 1992 the United States Postal Service (USPS) offered a new service called Priority Mail that promised 2-day delivery. It cost $3.00 to send a letter by Priority Mail. Sending a letter via ordinary mail cost only $0.29. A spokesperson for USPS makes two claims:

(1) Of letters sent by ordinary mail, less than 70% arrive within 2-days

(2) Of the letters sent by Priority Mail, more than 95% are delivered within the 2-day deadline

A radio station decided to conduct an experiment to determine whether the $3.00 cost is worthwhile. Letters were sent by Priority Mail and by ordinary mail from New York City to Cleveland, Ohio. Letters that arrive within the two day deadline are recorded with a 2; letters that are late are recorded with a 1; letters sent by Priority Mail are recorded with “PM”; letters sent by ordinary mail are recorded with “OM.” Here is a cross-tabulation of these data.

	arrival		
mail_type	1	2	Total
OM	38	53	91
PM	2	42	44
Total	40	95	135

(15) What are the point estimates of the proportion of ordinary mail that arrives within 2-days and the proportion of Priority Mail that arrives within 2-days?

(A) 0.2963 and 0.7037
(B) 0.4176 and 0.0455
(C) 0.5579 and 0.9500
(D) 0.5824 and 0.9545
(E) 0.6741 and 0.3259

(16) At a 5% significance level, do these data support the claims of the spokesperson?

(A) Only Claim (1) is supported by the data
(B) Only Claim (2) is supported by the data
(C) Both Claim (1) and Claim (2) are supported by the data
(D) Neither Claim (1) nor Claim (2) are supported by the data
(E) Cannot draw a valid conclusion because these data are observational

(17) You are asked to investigate salary discrepancies between male and female workers. In which of the following circumstances would a matched pair approach be recommended?

I.	Aside from gender, there are no other factors that can explain differences in salary across workers
II.	Aside from gender, years of experience is an important factor that can explain differences in salary across workers
III.	Aside from gender, geographic location is an important factor that can explain differences in salary across workers

(A) I.
(B) II.
(C) I. and II.
(D) II. and III.
(E) I., II. and III.

(18) Suppose you are conducting the following hypothesis test and you obtain a z test statistic 2.10.

H_0: $p = 0.2$
H_1: $p \neq 0.2$

What is the p-value?

(A) -2
(B) 0.0179
(C) 0.0358
(D) 0.4821
(E) 0.9642