

Complete Name: \_\_\_\_\_ ID Number: \_\_\_\_\_

### INSTRUCTIONS

1. The exam contains multiple choice questions that must be answered in the orange code sheet we have provided you with.
2. To select an answer, all you need to do is mark in the orange code sheet, **filling the rectangle over which the selected answer is located appropriately**. Please make sure you know the answer you wish to mark before doing it. Even though you can always erase your mark if you have used a pencil (number 2 or similar), any mark that has not been completely erased could be read by the machine. Therefore, we advice you to first mark your selected answers in the exam and to use only the last ten minutes or so from the time assigned to the multiple choice questions part of the exam to copy them into the code sheet.
3. In the multiple choice questions part of the exam there is always **only one correct answer** for every question. Every question correctly answered is worth 1 point, while each question incorrectly answered will penalize your grade by 0.2 points. Questions that have not been answered do not penalize your grade in any form.
4. The exam has four numbered sheets, going from 0.1 to 0.4. Please make sure that you have all sheets and contact your professor if this is not the case. There are different exam types. This exam is of type 0. Mark a 0 in the column labelled with I in your code sheet, just as it is illustrated in the example.
5. The maximum final grade is 15 points
7. Please fill in your personal information in the appropriate places in the code sheet.

Example:

12545 PEREZ, Ernesto

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**MULTIPLE CHOICE QUESTIONS (Time: 50 minutes)**

1. FREE-QUESTION. The capital of Spain is:

- (A) Paris      (B) Sebastopol      (C) Madrid      (D) London      (E) Pekin

**Questions 2 and 3 refer to the following exercise:**

We have a r.s. of size  $n = 17$  from a population having a normal distribution with unknown mean and variance. The sample mean and variance are equal to 245 and 36, respectively.

2. The 90% confidence interval for the population mean is:

- (A)  $(245 \pm 2.625)$       (B)  $(245 \pm 1.43)$       (C)  $(245 \pm 3.18)$   
(D)  $(245 \pm 2.46)$       (E)  $(245 \pm 1.325)$

3. If in the previous question, we wish to obtain another confidence interval, which is narrower (i.e., with a smaller width) than the one obtained before, it can be obtained for the **same** sample:

- (A) By reordering the sample values  
(B) By increasing the confidence level  
(C) By decreasing the confidence level  
(D) It is not possible. We have to increase the sample size  
(E) All false

**Questions 4 to 6 refer to the following exercise:**

The daily mean electrical consumption (in kWh) in a given neighborhood is a normally distributed r.v. We wish to estimate the mean electrical consumption. In order to do so, a r.s. of 26 individuals have been taken, providing the following results:  $\bar{x} = 24$  and  $s^2 = 16$ .

4. The 95% confidence interval for the mean electrical consumption is:

- (A) (22.632 , 25.368)      (B) (22.432 , 25.568)      (C) (-17.408 , 30.592)  
(D) (20.721 , 27.832)      (E) (22.352 , 25.648)

5. If we wish to test the null hypothesis that the mean electrical consumption is equal to 27 kWh against the alternative hypothesis that it is different from 27, at the 5% significance level, the decision will be:

- (A) More information is needed      (B) -      (C) Do not reject  $H_0$       (D) Reject  $H_0$       (E) -

6. Local representatives in that neighborhood are thinking about allowing for the opening of a new electrical station. After a carrying out a pilot study, they conclude that the new station would be profitable if the mean consumption were of at least 25 kWh. At the 5% significance level, what would the decision be on the opening of this new electrical station?

- (A) The station would not be profitable  
(B) The station would be profitable  
(C) The station would be profitable only if  $\bar{x}$  were larger than 28.54  
(D) We need a larger sample size  
(E) All false

**Questions 7 to 10 refer to the following exercise:**

In a firm manufacturing propelling pencil refills, their diameter (in mm) is a  $N(m, \sigma^2)$  random variable. Twelve refills are independently and randomly selected and their diameters are measured, providing the following result:  $s^2 = 0.012$ .

7. The 99% confidence interval for the population variance is, approximately:

- (A) (0.049, 0.051)                      (B) (0.004, 0.091)                      (C) (0.005, 0.055)  
(D) (0.001, 0.007)                      (E) (0.003, 0.004)

8. The 95% confidence interval for the population variance is, when compared to the previous one:

- (A) More information is needed                      (B) Wider                      (C) -  
(D) Narrower                      (E) The same

9. If we use the information from the same r.s. and, at the 5% significance level, we wish to test the null hypothesis  $H_0 : \sigma^2 = 0.005$  against the alternative hypothesis  $H_1 : \sigma^2 \neq 0.005$ , the decision will be:

- (A) Reject  $H_0$                       (B) -                      (C) We need additional information  
(D) Do not reject  $H_0$                       (E) -

10. Once the firm had carried out the previous computations, the firm realized that the sample variance was actually larger than the one they had previously used. The 99% confidence interval for the population variance is, when compared to the one that have previously computed:

- (A) More information is needed                      (B) Wider                      (C) -  
(D) Narrower                      (E) The same

**Questions 11 and 12 refer to the following exercise:**

A given school is exploring the possibility of organizing summer camps for students. They would be profitable only if at least 20% of the students decide to participate. In order to do so, a random sample of 200 students is taken and 36 of them confirm that they will participate in the summer camp activities.

11. The approximate 95% confidence interval for the proportion of students that will participate in the summer camp activities is:

- (A) (0.1107, 0.2492)                      (B) (0.1528, 0.2072)                      (C) (0.1267, 0.2332)  
(D) (0.0906, 0.2247)                      (E) (0.0416, 0.3184)

12. At the approximate 5% significance level, the decision for testing the null hypothesis that the proportion of students that will participate in the summer camp activities is of at least 20% will be:

- (A) Do not reject  $H_0$                       (B) More information is needed                      (C) -                      (D) -                      (E) Reject  $H_0$

13. An economist wishes to find out if the proportion of unemployed people in two large urban areas is the same. In order to do so, two independent r.s., each of 500 people is taken, and the economist reports that there were 35 unemployed people in one of the areas and 25 in the other area. At the 5% significance level and under the most appropriate hypotheses to be tested, is there enough evidence to reject the economist' null hypothesis?

- (A) Yes                      (B) It cannot be determined                      (C) No                      (D) -                      (E) -

**Questions 14 and 15 refer to the following exercise:**

An investor wishes to compare the risks associated with two different markets he usually works with, say A and B. The risk a given market has is measured by the variance of its daily returns or profits. The investor believes that the risk associated to market B is equal to that of market A. In order to test this hypothesis, r.s. of 16 daily returns or profits are taken for each of the markets being considered, providing the following results:

Market A:  $\bar{x}_A = 0.3$ ,  $s_A^2 = 0.0625$

Market B:  $\bar{x}_B = 0.4$ ,  $s_B^2 = 0.2025$

14. The 90% confidence interval for the ratio of the variance for market A over that for market B is:

- (A) (0.17 , 1.66)                      (B) (0.13 , 0.74)                      (C) (0.66 , 1.66)  
(D) (0 , 0.13)                                      (E) (0.13 , 1.66)

15. At the 10% significance level, is there enough evidence to reject or discard the investor's belief?

- (A) It cannot be determined              (B) -              (C) Yes              (D) -              (E) No

## SOLUTIONS

1: C

6: B

11: C

2: A

7: C

12: A

3: C

8: D

13: C

4: E

9: A

14: B

5: D

10: B

15: C