Name: _____

STATISTICS

PART 4 PRACTICE EXAM 2

Time – 1 hour and 30 minutes

Number of multiple choice questions – 20

Number of free response questions - 3

1.

In 2000, women comprised 15.1% of the Army's active duty troops. In a random sample of 100 recent graduates who enlisted in the Army, 20 were women. Construct a 95% confidence interval for the proportion of women who currently enlist in the Army, and determine whether or not this proportion is significantly different from the proportion in 2000 at the $\alpha = 0.05$ level.

(A) $0.151 \pm 1.96\sqrt{\dfrac{(0.151)(0.849)}{100}}$;

since 0.151 is contained in the 95% confidence interval, there is insufficient evidence to show that this proportion is significantly different than in 2000.

(B) $0.20 \pm 1.645\sqrt{\dfrac{(0.20)(0.80)}{100}}$;

since 0.151 is contained in the 95% confidence interval, there is insufficient evidence to show that this proportion is significantly different than in 2000.

(C) $0.20 \pm 1.645\sqrt{\dfrac{(0.20)(0.80)}{100}}$;

since 0.151 is contained in the 95% confidence interval, there is sufficient evidence to show that this proportion is significantly different than in 2000.

(D) $0.20 \pm 1.96\sqrt{\dfrac{(0.20)(0.80)}{100}}$;

since 0.151 is contained in the 95% confidence interval, there is insufficient evidence to show that this proportion is significantly different than in 2000.

(E) $0.20 \pm 1.96\sqrt{\dfrac{(0.20)(0.80)}{100}}$;

since 0.151 is contained in the 95% confidence interval, there is sufficient evidence to show that this proportion is significantly different than in 2000.

2.

The power of a significance test against a particular alternative is 82%.
Which of the following is true?
(A)   The probability of a Type I error is 82%.
(B)   The probability of a Type I error is 18%.
(C)   The probability of a Type II error is 82%.
(D)   The probability of a Type II error is 18%.
(E)   The probability of making either a Type I error or a Type II
       error is 18%.

3

A 95% confidence interval for the proportion of female athletes in college
programs is constructed based on sample data from 30 randomly selected
coeducational colleges. If the confidence interval is (0.38, 0.52), we can say
(A)   95% of the time, colleges have between 38% and 52% female athletes.
(B)   95% of colleges have an average of 45% female athletes.
(C)   95% of the time, the true proportion of female college athletes is
       somewhere between 38% and 52%.
(D)   we are 95% confident that all colleges have between 38% and 52%
       female athletes.
(E)   we are 95% confident that the proportion of female athletes in
       college programs is between 38% and 52%.

4.

A pollster working on an issue of national importance wants to be sure
that the percentage of people with a certain opinion differs by no more
than 3%. What sample size should he use for the poll?
(A)   9
(B)   17
(C)   278
(D)   556
(E)   There is not enough information to determine sample size.

5.

In a random sample of 500 women, 120 are college graduates. With what
confidence can we assert that between 22% and 26% of women are
college graduates?
(A)   2%
(B)   4%
(C)   14.75%
(D)   24%
(E)   70.49%

6.

Which of the following is/are acceptable ways to express your decision at the end of a hypothesis test?

I.   Fail to reject H_0; accept H_a
II. Accept H_0; reject H_a
III. Reject H_0; accept H_a

(A)   I only
(B)   II only
(C)   III only
(D)   All are acceptable.
(E)   None are acceptable.

7.

The American judicial system is based on the assumption that a person is innocent until proved guilty. A defendant is accused of a crime. What is the consequence of a Type II error?

(A)   The jury finds the defendant innocent; he is innocent.
(B)   The jury finds the defendant innocent; he is guilty.
(C)   The jury finds the defendant guilty; he is innocent.
(D)   The jury finds the defendant guilty; he is guilty.
(E)   The jury declares a mistrial because an error has been made.

8.

A recent news program reported that the presidential approval rate was 51% with a margin of error of ±4%.

What is meant by ±4%?

(A)   4% of the respondents were undecided.
(B)   The proportion of Americans who approve of the president is between 49% and 53%.
(C)   The president's approval rating from those sampled was between 47% and 55%.
(D)   The proportion of Americans who approve of the president is between 47% and 55%.
(E)   Unless the true proportion of Americans who approve of the president is between 47% and 55%, it is unlikely we could have obtained these sample results.

9.

An aspirin maker claims that 4 out of 5 doctors recommend its product. A consumer advocacy group believes the proportion is lower. To test the claim, a random sample of 50 doctors is selected, and 35 recommend this manufacturer's product. An appropriate test outcome is

(A) $z = -1.768$ and $p = 0.039$

(B) $z = -1.768$ and $p = 0.077$

(C) $z = -1.768$ and $p = 0.961$

(D) $t = -1.768$ and $p = 0.042$

(E) $t = -1.758$ and $p = 0.083$

10.

We are given two sample proportions, $\hat{p}_1 = 0.38$ and $\hat{p}_2 = 0.42$. A 90% confidence interval for the true difference in population proportions if $n_1 = 40$ and $n_2 = 50$ is

(A) $-0.04 \pm 1.645\sqrt{\dfrac{(0.38)(0.62)}{40} + \dfrac{(0.42)(0.58)}{50}}$

(B) $0.04 \pm 1.697\sqrt{\dfrac{(0.38)(0.62)}{40} + \dfrac{(0.42)(0.58)}{50}}$

(C) $-0.04 \pm 1.729\sqrt{\dfrac{(0.38)(0.62)}{40} + \dfrac{(0.42)(0.58)}{50}}$

(D) $0.04 \pm 1.96\sqrt{\dfrac{(0.38)(0.62)}{40} + \dfrac{(0.42)(0.58)}{50}}$

(E) not able to be constructed.

11.

The Department of Health plans to test the lead level in a specific park. Since a high lead level is harmful to children, the park will be closed if the lead level exceeds the allowed limit. The department randomly selects several locations in the park, gets soil samples from those locations, and tests the samples for their lead levels. Which of the following decisions would result from the type I error?

(A) Closing the park when the lead levels are within the allowed limit

(B) Keeping the park open when the lead levels are in excess of the allowed limit

(C) Closing the park when the lead levels are in excess of the allowed limit

(D) Keeping the park open when the lead levels are within the allowed limit

(E) Closing the park because of the increased noise level in the neighborhood

12.

According to the Central Limit Theorem, the sample mean $\bar{X}$ is approximately normally distributed

(A) for a large sample, regardless of the distribution of random variable X
(B) for a large sample, provided the random variable X is normally distributed
(C) regardless of the sample size
(D) for a small sample, regardless of the distribution of random variable X
(E) for a small sample, provided the random variable X is normally distributed

13.

A department store at a large mall claims that over 60 percent of the mall's visitors shop at that store. Let p = the proportion of the mall's visitors that shop at the store. Which of the following pairs of hypotheses should be used to support this claim?

(A) $H_0: p = 0.60$ and $H_a: p > 0.60$
(B) $H_0: p = 0.60$ and $H_a: p \neq 0.60$
(C) $H_0: p = 0.60$ and $H_a: p < 0.60$
(D) $H_0: p > 0.60$ and $H_a: p \leq 0.60$
(E) $H_0: p < 0.60$ and $H_a: p \geq 0.60$

14.

A student organization at a university is interested in estimating the proportion of students in favor of showing movies biweekly instead of monthly. How many students should be sampled to get a 90 percent confidence interval with a width of at most 0.08?

(A) 27
(B) 64
(C) 106
(D) 256
(E) 423

15.

After receiving several complaints from his customers about the store being closed on Sundays, a storekeeper decided to conduct a survey. He randomly selected 100 female customers and 120 male customers, and asked them, "Are you interested in shopping at this store on Sundays?" He counted the number of customers answering "yes" and constructed a 95 percent confidence interval for the difference in the proportions of male and female customers in favor of shopping on Sundays. The resulting interval was (–0.23, –0.18). Which of the following is a correct interpretation of the interval?

(A) We are 95 percent confident that the proportion of women interested in shopping on Sundays exceeds the proportion of men interested in shopping on Sundays.
(B) We are 95 percent confident that the proportion of men interested in shopping on Sundays exceeds the proportion of women interested in shopping on Sundays.
(C) We are 95 percent confident that the proportion of women interested in shopping on Sundays is equal to the proportion of men interested in shopping on Sundays.
(D) Because the interval contains negative values, it is invalid and should not be interpreted.
(E) Because the interval does not contain zero, the interval is invalid, and should not be interpreted.

16.

A skeptic decides to conduct an experiment in ESP in which a blindfolded subject calls out the color of a card dealt from a regular deck of cards (half the cards are red; the other half, black). One hundred cards are dealt from a well-shuffled pack, with each card being replaced after a deal. Using a 5 percent level of significance, what is the lowest number of cards that the subject needs to call out correctly in order to show that he is doing better than he would if he were simply guessing?

(A) 51
(B) 59
(C) 75
(D) 95
(E) 98

17.

According to the Central Limit Theorem, regardless of the population distribution, the sample mean $\overline{X}$ is approximately normally distributed with $\mu_{\overline{X}} = \mu_X$ and $\sigma_{\overline{X}} = \dfrac{\sigma_X}{\sqrt{n}}$,

(A) provided that a large number of random samples of the same size are selected from the population
(B) provided that a large random sample of size n is taken from the population
(C) provided that the population median is equal to the population mean
(D) provided that the sample size does not exceed 30
(E) It is always true. No other condition is required.

18.

A random sample of 300 shoppers was selected to estimate the proportion of customers satisfied with the floor displays of merchandise throughout the store. What is the maximum error in estimation if a 90 percent confidence interval is to be constructed?

(A) 0.0033
(B) 0.0475
(C) 0.0566
(D) 0.0949
(E) 0.1132

19.

A group of scientists wanted to estimate the proportion of geese returning to the same site for the next breeding season. Suppose they decided to increase the sample size from 200 to 2,000. How will this affect the distribution of the sample proportion?

(A) The distribution of the sample proportion will be more spread out.
(B) The distribution of the sample proportion will be less spread out.
(C) The spread of the distribution of the sample proportion will remain unaffected.
(D) The distribution of the sample proportion will more closely resemble the binomial distribution.
(E) The distribution of the sample proportion will more closely resemble the chi-square distribution.

20.

A team of engineers at the research center of a car manufacturer performs crash tests to determine the proportion of times the cars' airbags fail to operate in a crash. With the airbag system's new modified design, the team expected to reduce the failed proportion to below the last year's proportion of 0.08. They decided to test $H_0: p = 0.08$ versus $H_a: p < 0.08$, where p = the proportion of failed airbags during crash tests. If 300 crashes performed in the lab resulted in 18 failures, which of the following is the test statistic for this test?

(A) $TS = \dfrac{0.06 - 0.08}{\sqrt{\dfrac{0.08(1-0.08)}{300}}}$

(B) $TS = \dfrac{0.06 - 0.08}{\sqrt{\dfrac{0.06(1-0.06)}{300}}}$

(C) $TS = \dfrac{0.06 - 0.08}{\sqrt{300(0.08)(1-0.08)}}$

(D) $TS = \dfrac{0.06 - 0.08}{\sqrt{300(0.06)(1-0.06)}}$

(E) $TS = \dfrac{0.06 - 0.08}{\sqrt{\dfrac{0.06(1-0.08)}{300}}}$

1.   2002b #4 – PT 2

Each person in a random sample of 1,026 adults in the United States was asked the following question.

"Based on what you know about the Social Security system today, what would you like Congress and the President to do during this next year?"

The response choices and the percentages selecting them are shown below.

Completely overhaul the system	19%
Make some major changes	39%
Make some minor adjustments	30%
Leave the system the way it is now	11%
No opinion	1%

(a) Find a 95% confidence interval for the proportion of all United States adults who would respond "Make some major changes" to the question. Give an interpretation of the confidence interval and give an interpretation of the confidence level.

(b) An advocate for leaving the system as it is now commented, "Based on this poll, only 39% of adults in the sample responded that they want some major changes made to the system, while 41% responded that they want only minor changes or no changes at all. Therefore, we should not change the system." Explain why this statement, while technically correct, is misleading.

2.   1998 #5 PT 2

A large university provides housing for 10 percent of its graduate students to live on campus. The university's housing office thinks that the percentage of graduate students looking for housing on campus may be more than 10 percent. The housing office decides to survey a random sample of graduate students, and 62 of the 481 respondents say that they are looking for housing on campus.

(a) On the basis of the survey data, would you recommend that the housing office consider increasing the amount of housing on campus available to graduate students? Give appropriate evidence to support your recommendation.

(b) In addition to the 481 graduate students who responded to the survey, there were 19 who did not respond. If these 19 had responded, is it possible that your recommendation would have changed? Explain.

3.   1997 #4 PT 2

A random sample of 415 potential voters was interviewed 3 weeks before the start of a state-wide campaign for governor; 223 of the 415 said they favored the new candidate over the incumbent. However, the new candidate made several unfortunate remarks one week before the election. Subsequently, a new random sample of 630 potential voters showed that 317 voters favored the new candidate.

Do these data support the conclusion that there was a decrease in voter support for the new candidate after the unfortunate remarks were made? Give appropriate statistical evidence to support your answer.