**Final Exam STA 2023 Fall 2023**

Name_____ Score: _____

**Instructions: Answer all questions. Round all answer up to 4 decimal places. For those are multiple choice questions, mark small circle in the correct answer choice and mention it as well on the right blank space given.**

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

**Provide an appropriate response.**

1) In a random sample, 10 students were asked to compute the distance they travel one way to school to the nearest tenth of a mile. The data is listed below. 1) _____

1.1 5.2 3.6 5.0 4.8 1.8 2.2 5.2 1.5 0.8

Compute mean, median, mode, range, standard deviation and variance of the data.

Mean: Median: Mode:

Range: Standard deviation: Variance:

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

2) The mean IQ score of adults is 100, with a standard deviation of 15. Use the Empirical Rule to find the percentage of adults with scores between 70 and 130. (Assume the data set has a bell-shaped distribution.) 2) _____

A) 95% B) 99.7% C) 68% D) 100%

3) Use the data to identify any outliers. 3) _____

16 24 1 33 15
5 18 6 20 14
17 19 16 10 21
29 14 38 18

A) 1, 33, 38 B) 33, 38 C) 1, 38 D) None

4) For the mathematics part of the SAT the mean is 514 with a standard deviation of 113, and for the mathematics part of the ACT the mean is 20.6 with a standard deviation of 5.1. Bob scores a 660 on the SAT and a 27 on the ACT. Use z-scores to determine on which test he performed better. 4) _____

A) SAT B) ACT

5) Given that $P(A \text{ or } B) = \frac{1}{5}$, $P(A) = \frac{1}{6}$, and $P(A \text{ and } B) = \frac{1}{8}$, find P(B). 5) _____

A) $\frac{19}{240}$ B) $\frac{29}{120}$ C) $\frac{19}{120}$ D) $\frac{59}{120}$

6) The table lists the smoking habits of a group of college students. 6) _____

| Sex | Non–smoker | Regular Smoker | Heavy Smoker | Total |
|---|---|---|---|---|
| Man | 135 | 49 | 5 | 189 |
| Woman | 187 | 21 | 14 | 222 |
| Total | 322 | 70 | 19 | 411 |

If a student is chosen at random, find the probability of getting someone who is a man or a non–smoker. Round your answer to three decimal places.

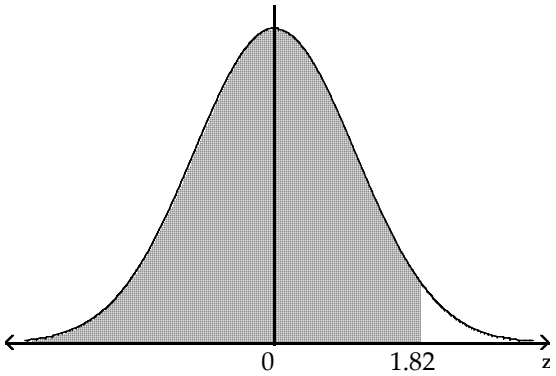
A) 0.942 B) 0.915 C) 0.830 D) 0.947

7) A test consists of 10 multiple choice questions, each with five possible answers, one of which is correct. To pass the test a student must get 60% or better on the test. If a student randomly guesses, what is the probability that the student will pass the test? 7) _____

A) 0.377 B) 0.006 C) 0.205 D) 0.060

**Find the probability of z occurring in the indicated region.**

8) 8) _____




A) 0.9656 B) 0.9772 C) 0.0344 D) 0.4656

**Provide an appropriate response.**

9) Assume that the heights of women are normally distributed with a mean of 63.6 inches and a standard deviation of 2.5 inches. If 100 women are randomly selected, find the probability that they have a mean height greater than 63.0 inches. 9) _____

A) 0.8989 B) 0.2881 C) 0.0082 D) 0.9918

10) Find the margin of error for the given values of c, $\sigma$, and n. 10) _____

$c = 0.98$, $\sigma = 0.78$, $n = 150$

A) 0.08 B) 0.11 C) 0.12 D) 0.15

11) A random sample of 150 students has a grade point average with a mean of 2.86. Assume the population standard deviation is 0.78. Construct the confidence interval for the population mean, $\mu$, if $c = 0.98$. 11) _____

A) (2.31, 3.88) B) (2.71, 3.01) C) (2.43, 3.79) D) (2.51, 3.53)

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

12) The numbers of advertisements seen or heard in one week for 30 randomly selected people in the United States are listed below. Construct a 95% confidence interval for the true mean number of advertisements. Assume that $\sigma$ is 159.5. 12) _____

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 598 | 494 | 441 | 595 | 728 | 690 | 684 | 486 | 735 | 808 |
| 481 | 298 | 135 | 846 | 764 | 317 | 649 | 732 | 582 | 677 |
| 734 | 588 | 590 | 540 | 673 | 727 | 545 | 486 | 702 | 703 |

Name of the Confidence Interval (CI):

CI:

If you increase confidence level to 99%, what will likley happen? Explain

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

13) Construct a 90% confidence interval for the population mean, $\mu$. Assume the population has a normal distribution. A sample of 15 randomly selected students has a grade point average of 2.86 with a standard deviation of 0.78. 13) _____

A) (2.51, 3.21) B) (2.28, 3.66) C) (2.41, 3.42) D) (2.37, 3.56)

14) The grade point averages for 10 randomly selected high school students are listed below. Assume the grade point averages are normally distributed. 14) _____

2.0 3.2 1.8 2.9 0.9 4.0 3.3 2.9 3.6 0.8

Find a 98% confidence interval for the true mean.

A) (0.67, 1.81) B) (2.12, 3.14) C) (1.55, 3.53) D) (3.11, 4.35)

15) In a survey of 2480 golfers, 15% said they were left–handed. The survey's margin of error was 3%. Construct a confidence interval for the proportion of left–handed golfers. 15) _____

A) (0.18, 0.21) B) (0.12, 0.18) C) (0.11, 0.19) D) (0.12, 0.15)

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

16) The mean score for all NBA games during a particular season was less than 109 points per game. Identify the type I and type II errors for the hypothesis test of this claim. 16) _____

Type–I error:

Type–II:

17) A fast food outlet claims that the mean waiting time in line is less than 4.6 minutes. A random sample of 20 customers has a mean of 4.4 minutes with a standard deviation of 0.8 minute. If $\alpha = 0.05$, test the fast food outlet's claim using P–values. 17) _____

Ho : $H_1$ :

Test Statistic value:

P–value:

Decision:

Conclusion:

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

18) Test the claim about the population mean $\mu$ at the level of significance $\alpha$. Assume the population is normally distributed. 18) _____

Claim: $\mu \neq 39$; $\alpha = 0.05$; $\sigma = 2.7$
Sample statistics: $\bar{x} = 38.1$, $n = 35$

A) Reject $H_0$. There is enough evidence at the 5% level of significance to support the claim.
B) Not enough information to decide.
C) Fail to reject $H_0$. There is not enough evidence at the 5% level of significance to support the claim.

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

19) A recent study claimed that at least 15% of junior high students are overweight. In a sample of 160 students, 18 were found to be overweight. If $\alpha = 0.05$, test the claim. 19) _____

Ho : H1 :

Critical value:

Test Statistic value:

P–value:

Decision:

Conclusion:

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

20) Suppose you want to test the claim that $\mu_1 = \mu_2$. Two samples are random, independent, and come from populations that are normally distributed. The sample statistics are given below. Assume that $\sigma_1^2 \neq \sigma_2^2$. At a level of significance of $\alpha = 0.01$, test the hypothesis test? 20) _____

$n_1 = 25$ $n_2 = 30$
$\bar{x}_1 = 27$ $\bar{x}_2 = 25$
$s_1 = 1.5$ $s_2 = 1.9$

Ho : H1:

Test Statistic value:

P–value:

Pick up the correct conslusion:

A) Reject $H_0$ if the standardized test statistic is less than –2.492 or greater than 2.492.

B) Reject $H_0$ if the standardized test statistic is less than –1.711 or greater than 1.711.

C) Reject $H_0$ if the standardized test statistic is less than –2.789 or greater than 2.797.

D) Reject $H_0$ if the standardized test statistic is less than –2.797 or greater than 2.797.

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

21) Nine students took the SAT. Their scores are listed below. Later on, they took a test preparation course and retook the SAT. Their new scores are listed below. Test the claim that the test preparation had no effect on their scores. Assume the samples are random and dependent, and the populations are normally distributed. Use $\alpha = 0.05$. 21) _____

| Student | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Scores before course | 720 | 860 | 850 | 880 | 860 | 710 | 850 | 1200 | 950 |
| Scores after course | 740 | 860 | 840 | 920 | 890 | 720 | 840 | 1240 | 970 |

Ho : H1:

What is the type of the samples above:

Test Statistic value:

P–value:

Decision:

Conclusion:

22) To test the effectiveness of a new drug designed to relieve pain, 200 patients were randomly selected and divided into two equal groups. One group of 100 patients was given a pill containing the drug while the other group of 100 was given a placebo. What can we conclude about the effectiveness of the drug if 62 of those actually taking the drug felt a beneficial effect while 41 of the patients taking the placebo felt a beneficial effect? Use $\alpha = 0.05$. 22) _____

Ho : H1:

Test Statistic value:

P–value:

Decision:

Conclusion:

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

23) The data below are the ages and systolic blood pressures (measured in millimeters of mercury) of 9 randomly selected adults. Assume that the variables x and y have a significant correlation. 23) _____

| Age, x | 38 | 41 | 45 | 48 | 51 | 53 | 57 | 61 | 65 |
|---|---|---|---|---|---|---|---|---|---|
| Pressure, y | 116 | 120 | 123 | 131 | 142 | 145 | 148 | 150 | 152 |

Calculate the correlation coefficient:

Explain this above correlation value:

Calculate the fitted regression line for y based on x values:

Explain the solpe coefficient meaning the fitted regression line above:

What is the best predicted value for y given x = 59?

A) 150 B) 146 C) 144 D) 148

24) Find the P–value for the hypothesis test with the standardized test statistic z. Decide whether to reject $H_0$ for the level of significance $\alpha$. 24) _____

Two–tailed test
z = –1.63
$\alpha$ = 0.05

A) 0.0516; reject $H_0$ B) 0.1032; fail to reject $H_0$

C) 0.0516; fail to reject $H_0$ D) 0.9484; fail to reject $H_0$

25) Find the P–value for the hypothesis test with the standardized test statistic z. Decide whether to reject $H_0$ for the level of significance $\alpha$. 25) _____

Left–tailed test
z = –2.05
$\alpha$ = 0.05

The test statistic in a left–tailed test is z = –2.05.

A) 0.4798; fail to reject $H_0$ B) 0.0453 fail to reject $H_0$

C) 0.0404; reject $H_0$ D) 0.0202; reject $H_0$

1) range = 4.4, s = 1.8, $s^2 = 3.324$
2) A
3) A
4) A
5) C
6) B
7) B
8) A
9) D
10) D
11) B
12) (543.8, 658.0)
13) A
14) C
15) B
16) type I: rejecting $H_0$: $\mu \geq 109$ when $\mu \geq 109$
    type II: failing to reject $H_0$: $\mu \geq 109$ when $\mu < 109$
17) Standardized test statistic ≈ –1.118; Therefore, at 19 degrees of freedom, P must lie between 0.10 and 0.25. Since $P > \alpha$, fail to reject $H_0$. There is not sufficient evidence to support the fast food outlet's claim.
18) A
19) Confidence interval (0.071, 0.154); 15% lies in the interval, fail to reject $H_0$; There is not sufficient evidence to reject the study's claim.
20) D
21) claim: $\mu_d = 0$; critical values $t_0 = \pm 2.306$; standardized test statistic $t \approx -2.401$; reject $H_0$; There is sufficient evidence to reject the claim.
22) claim: $p_1 = p_2$; critical values $z_0 = \pm 1.96$; standardized test statistic $t \approx 2.971$; reject $H_0$; The new drug is effective.
23) D
24) B
25) D