1.(1 pt)
Type I error is:

- A. Deciding null hypothesis is true when it is false
- B. Deciding null hypothesis is false when it is true
- C. Deciding alternative hypothesis is true when it is true
- D. Deciding alternative hypothesis is true when it is false
- E. All of the above
- F. None of the above

Type II error is:

- A. Deciding null hypothesis is true when it is false
- B. Deciding null hypothesis is false when it is true
- C. Deciding alternative hypothesis is true when it is true
- D. Deciding alternative hypothesis is false when it is true
- E. All of the above
- F. None of the above

2.(1 pt) For each statement, express the null hypothesis H_0 and alternative hypothesis H_1 in symbolic form.

1. The mean salary of statistics professors is less than 70,000 dollars.

- A. $H_0 : \mu \geq 70,000, H_1 : \mu < 70,000$
- B. $H_0 : \mu > 70,000, H_1 : \mu \leq 70,000$
- C. $H_0 : \mu < 70,000, H_1 : \mu \geq 70,000$
- D. $H_0 : \mu \leq 70,000, H_1 : \mu > 70,000$

2. Fewer than one-half of all Internet users make on-line purchases.

- A. $H_0 : p \geq 0.5, H_1 : p < 0.5$
- B. $H_0 : \mu \leq 0.5, H_1 : \mu > 0.5$
- C. $H_0 : p \leq 0.5, H_1 : p > 0.5$
- D. $H_0 : \mu \geq 0.5, H_1 : \mu < 0.5$

3. IQ scores of statistics students have a standard deviation at most 15.

- A. $H_0 : \mu < 15, H_1 : \mu \geq 15$
- B. $H_0 : \mu \leq 15, H_1 : \mu > 15$
- C. $H_0 : \sigma \geq 15, H_1 : \sigma < 15$
- D. $H_0 : \sigma \leq 15, H_1 : \sigma > 15$

3.(1 pt) Given the significance level $\alpha = 0.05$ find the following:

(a) lower-tailed z value

$z =$ _____

(b) right-tailed z value

$z =$ _____

(c) two-tailed z value

$|z| =$ _____

4.(1 pt) Find the critical z value for a left-tailed test using a significance level of $\alpha = 0.01$.

_____

5.(1 pt) Find the critical z value using a significance level of $\alpha = 0.02$ if the alternative hypothesis H_0 is $\mu > 34$.

_____

6.(1 pt) A random sample of 100 observations from a population with standard deviation 18.7166493193738 yielded a sample mean of 93.1.

(a) Given that the null hypothesis is $\mu = 90$ and the alternative hypothesis is $\mu > 90$ using $\alpha = .05$, find the following:

(i) critical z score _____

(ii) test statistic = _____

(b) Given that the null hypothesis is $\mu = 90$ and the alternative hypothesis is $\mu \neq 90$ using $\alpha = .05$, find the following:

(i) the positive critical z score _____

(ii) the negative critical z score _____

(iii) test statistic = _____

The conclusion from part (a) is:

- A. There is insufficient evidence to reject the null hypothesis
- B. Reject the null hypothesis
- C. None of the above

The conclusion from part (b) is:

- A. There is insufficient evidence to reject the null hypothesis
- B. Reject the null hypothesis
- C. None of the above

7.(1 pt) It is necessary for an automobile producer to estimate the number of miles per gallon achieved by its cars. Suppose that the sample mean for a random sample of 140 cars is 30.7 miles and assume the standard deviation is 2.7 miles. Now suppose the car producer wants to test the hypothesis that μ, the mean number of miles per gallon, is 33.7 against the alternative hypothesis that it is not 33.7. Conduct a test using $\alpha = .05$ by giving the following:

(a) positive critical z score _____

(b) negative critical z score _____

(c) test statistic _____

The final conclustion is

- A. There is not sufficient evidence to reject the null hypothesis that $\mu = 33.7$.
- B. We can reject the null hypothesis that $\mu = 33.7$ and accept that $\mu \neq 33.7$.

8.(1 pt) The contents of 32 cans of Coke have a mean of $\bar{x} = 12.25$ and a standard deviation of $s = 0.1$. Find the value of the test statistic z for the claim that the population mean is $\mu = 12$.

_____

9.(1 pt) Golf-course designers have become concerned that old courses are becoming obsolete since new technology has

given golfers the ability to hit the ball so far. Designers, therefore, have proposed that new golf courses need to be built expecting that the average golfer can hit the ball more than 245 yards on average. Suppose a random sample of 157 golfers be chosen so that their mean driving distance is 246.8 yards, with a standard deviation of 40.7.

Conduct a hypothesis test where $H_0 : \mu \leq 245$ and $H_1 : \mu > 245$ by computing the following:

(a) test statistic _____

(b) p-value $p =$ _____

(c) If this was a two-tailed test, then the p-value is _____

10.(1 pt) Golf-course designers have become concerned that old courses are becoming obsolete since new technology has given golfers the ability to hit the ball so far. Designers, therefore, have proposed that new golf courses need to be built expecting that the average golfer can hit the ball more than 255 yards on average. Suppose a random sample of 153 golfers be chosen so that their mean driving distance is 260.6 yards, with a standard deviation of 45.4.

Conduct a hypothesis test where $H_0 : \mu = 255$ and $H_1 : \mu > 255$ by computing the following:

(a) test statistic _____

(b) p-value $p =$ _____

(c) If this was a two-tailed test, then the p-value is _____

11.(1 pt) Assume you are using a significance level of $\alpha = 0.05$ to test the claim that $\mu < 14$ and that your sample is a random sample of 50 values. Find β, the probability of making a type II error (failing to reject a false null hypothesis), given that the population actually has a normal distribution with $\mu = 8$ and $\sigma = 8$.

$\beta =$ _____

12.(1 pt) Physicians at a clinic gave what they thought were drugs to 810 asthma, ulcer, and herpes patients. Although the doctors later learned that the drugs were really placebos, 57 % of the patients reported an improved condition. Assume that if the placebo is ineffective, the probability of a patients condition improving is 0.53. For the hypotheses that the proportion of improving is 0.53 against that it is > 0.53, find the p-value.

$p =$ _____

13.(1 pt) Test the claim that the population of sophomore college students has a mean grade point average greater than 2.15. Sample statistics include $n = 110$, $\overline{x} = 2.5$, and $s = 0.5$. Use a significance level of $\alpha = 0.05$.

The test statistic is _____

The critical value is _____

The P-Value is _____

The final conclustion is

- A. There is not sufficient evidence to support the claim that the mean grade point average is greater than 2.15.
- B. There is sufficient evidence to support the claim that the mean grade point average is greater than 2.15.

14.(1 pt) 50 people are randomly selected and the accuracy of their wristwatches is checked, with positive errors representing watches that are ahead of the correct time and negative errors representing watches that are behind the correct time. The 50 values have a mean of 110sec and a standard deviation of 186sec. Use a 0.01 significance level to test the claim that the population of all watches has a mean of 0sec.

The test statistic is _____

The P-Value is _____

The final conclustion is

- A. There is sufficient evidence to warrant rejection of the claim that the mean is equal to 0
- B. There is not sufficient evidence to warrant rejection of the claim that the mean is equal to 0

15.(1 pt) A sample of 8 measurments, randomly selected from a normally distributed population, resulted in a sample mean, $\overline{x} = 9.2$ and sample standard deviation $s = 1.57$. Using $\alpha = 0.05$, test the null hypothesis that the mean of the population is 8.4 against the alternative hypothesis that the mean of the population, $\mu < 8.4$ by giving the following:

(a) the degree of freedom _____

(b) the critical t value _____

(c) the test statistic _____

The final conclustion is

- A. There is not sufficient evidence to reject the null hypothesis that $\mu = 8.4$.
- B. We can reject the null hypothesis that $\mu = 8.4$ and accept that $\mu < 8.4$.

16.(1 pt) The effectiveness of a new bug repellent is tested on 10 subjects for a 10 hour period. Based on the number and location of the bug bites, the percentage of surface area exposed protected from bites was calculated for each of the subjects. The results were as follows:

$\overline{x} = 82\ \%,\ s = 8\%$

The new repellent is considered effective if it provides a percent repellency of at least 93. Using $\alpha = 0.05$, construct a hypothesis test with null hypothesis $\mu = 0.93$ and alternative hypothesis $\mu > 0.93$ to determine whether the mean repellency of the new bug relellent is greater than 93 by computing the following:

(a) the degree of freedom _____

(b) the critical t value _____

(c) the test statistics _____

The final conclustion is

- A. There is not sufficient evidence to reject the null hypothesis that $\mu = 0.93$.
- B. We can reject the null hypothesis that $\mu = 0.93$ and accept that $\mu > 0.93$, that is, the bug repellent is effective.

17.(1 pt) Test the claim that for the population of statistics final exams, the mean score is $\mu = 79$. Sample statistics include $n = 28$, $\overline{x} = 80$, and $s = 17$. Use a significance level of $\alpha = 0.05$.

The test statistic is _____

The positive critical value is _____
The negative critical value is _____
The conclustion is

- A. There is sufficient evidence to warrant rejection of the claim that the mean score is equal to 79
- B. There is not sufficient evidence to warrant rejection of the claim that the mean score is equal to 79

18.(1 pt) When a poultry farmer uses his regular feed, the newborn checkens have normally distributed weights with a mean of 62.5 oz. In an experiment with an enriched feed mixture, ten chickens are born with the following weights (in ounces).

63.2, 67, 64.6, 66.7, 64.8, 66.3, 65.8, 66, 65.3, 65.5

Use the $\alpha = 0.05$ significance level to test the claim that the mean weight is higher with the enriched feed.
The sample mean is $\overline{x} =$ _____
The sample standard deviation is $s =$ _____
The test statistic is $t =$ _____
The critical value is $t =$ _____
The conclusion is

- A. There is not sufficient evidence to support the claim that with the enriched feed, the mean weight is greater than 62.5.
- B. There is sufficient evidence to support the claim that with the enriched feed, the mean weight is greater than 62.5.

19.(1 pt) One of the most feared predators in the ocean is the great white shark. It is known that the white shark grows to a mean length of 22 feet; however, one marine biologist believes that great white sharks off the Bermuda coast grow much longer. To test this claim, full-grown white sharks were captured, measured, and then set free. However, this was a difficult, costly and very dangerous task, so only four sharks were actually sampled. Their lengths were 24, 24, 26, and 22 feet. Do the data provide sufficient evidence to support the claim? Use $\alpha = 0.01$
test statistic $t =$ _____
rejection region $t >$ _____
The final conclustion is

- A. There is not sufficient evidence to reject the null hypothesis that the average length of the shark is 22.
- B. We can reject the null hypothesis that the average length of the shark is 22, and accept that the average length of the shark is greater than 22.

20.(1 pt) A random sample of 140 observations is selected from a binomial population with unknown probability of success p. The computed value of $\hat{p}$ is 0.77.
(1) Test $H_0 : p \leq 0.65$ against $H_1 : p > 0.65$. Use $\alpha = 0.05$.
test statistic $z =$ _____
critical z score _____
The final conclustion is

- A. We can reject the null hypothesis that $p \leq 0.65$ and accept that $p > 0.65$.
- B. There is not sufficient evidence to reject the null hypothesis that $p \leq 0.65$.

(2) Test $H_0 : p \geq 0.5$ against $H_1 : p < 0.5$. Use $\alpha = 0.01$.
test statistic $z =$ _____
critical z score _____
The final conclustion is

- A. There is not sufficient evidence to reject the null hypothesis that $p \geq 0.5$.
- B. We can reject the null hypothesis that $p \geq 0.5$ and accept that $p < 0.5$.

(3) Test $H_0 : p = 0.6$ against $H_1 : p \neq 0.6$. Use $\alpha = 0.05$.
test statistic $z =$ _____
positive critical z score _____
negative critical z score _____
The final conclustion is

- A. We can reject the null hypothesis that $p = 0.6$ and accept that $p \neq 0.6$.
- B. There is not sufficient evidence to reject the null hypothesis that $p = 0.6$.

21.(1 pt) According to a recent marketing campaign, 130 drinkers of either Diet Coke or Diet Pepsi participated in a blind taste test to see which of the drinks was their favorite. In one Pepsi television commercial, an anouncer states that "in recent blind taste tests, more than one half of the surveyed preferred Diet Pepsi over Diet Coke." Suppose that out of those 130, 40 preferred Diet Pepsi. Test the hypothesis, using $\alpha = 0.01$ that more than half of all participants will select Diet Pepsi in a blind taste test by giving the following:
(a) the test statistic _____
(b) the critical z score _____
The final conclustion is

- A. There is not sufficient evidence to reject the null hypothesis that $p \leq 0.5$.
- B. We can reject the null hypothesis that $p \leq 0.5$ and accept that $p > 0.5$.

22.(1 pt) A survey of 1665 people who took trips revealed that 132 of them included a visit to a theme park. Based on those survery results, a management consultant claims that less than 9 % of trips include a theme park visit. Test this claim using the $\alpha = 0.05$ significance level.
The test statistic is _____
The critical value is _____
The conclusion is

- A. There is not sufficient evidence to support the claim that less than 9 % of trips include a theme park visit.
- B. There is sufficient evidence to support the claim that less than 9 % of trips include a theme park visit.

23.(1 pt) A new cream that advertises that it can reduce wrinkles and improve skin was subject to a recent study. A sample of 69 women over the age of 50 used the new cream for 6 months.

Of those 69 women, 43 of them reported skin improvement(as judged by a dermatologist). Is this evidence that the cream will improve the skin of more than 70% of women over the age of 50? Test using $\alpha = 0.01$.

test statistics $z =$ _____

rejection region $z >$ _____

The final conclustion is

- A. We can reject the null hypothesis that $p = 0.7$ and accept that $p > 0.7$. That is, the cream can improve the skin of more than 70% of women over 50.
- B. There is not sufficient evidence to reject the null hypothesis that $p = 0.7$. That is, there is not sufficient evidence to reject that the cream can improve the skin of more than 70% of women over 50.

24.(1 pt) A random sample of $n = 5$ observations from a normal population produced the following measurements:

0 7 1 6 2

Do the data provide sufficient evidence to indicate that $\sigma^2 < 0.5$? Use $\alpha = 0.01$, and compute the following:

(a) sample standard deviation $s =$ _____

(b) test statistic $\chi^2 =$ _____

(c) critical $\chi^2_\alpha =$ _____

The final conclustion is

- A. We can reject the null hypothesis that $\sigma^2 = 0.5$ and accept that $\sigma^2 < 0.5$.
- B. There is not sufficient evidence to reject the null hypothesis that $\sigma^2 = 0.5$.

25.(1 pt) Use a $\alpha = 0.01$ significance level to test the claim that $\sigma = 20$ if the sample statistics include $n = 18$, $\bar{x} = 107$, and $s = 28$.

The test statistic is _____

The smaller critical number is _____

The bigger critical number is _____

What is your conclusion?

- A. There is not sufficient evidence to warrant the rejection of the claim that the population standard deviation is equal to 20
- B. There is sufficient evidence to warrant the rejection of the claim that the population standard deviation is equal to 20