Name________________________________

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

A hypothesis test is to be performed. Determine the null and alternative hypotheses.

1) The manufacturer of a refrigerator system for beer kegs produces refrigerators that are supposed to maintain a mean temperature, μ, of 44°F, ideal for a certain type of German pilsner. The owner of the brewery does not agree with the refrigerator manufacturer, and wants to conduct a hypothesis test to determine whether the true mean temperature differs from this value.

A) $H_0: \mu \neq 44°F$, $H_a: \mu = 44°F$
B) $H_0: \mu = 44°F$, $H_a: \mu \neq 44°F$
C) $H_0: \mu \leq 44°F$, $H_a: \mu > 44°F$
D) $H_0: \mu \geq 44°F$, $H_a: \mu < 44°F$

A sample mean, sample size, and population standard deviation are given. Use the P–value appraoch to perform a one–mean z–test about the mean, μ, of the population from which the sample was drawn. Determine the strength of the evidence against the null hypothesis.

2) $\bar{x} = 137$, $n = 20$, $\sigma = 14.2$, $H_0: \mu = 132$, $H_a: \mu \neq 132$, $\alpha = 0.05$

A) $z = 2.57$; P–value = 0.0101; Reject H_0. The evidence against the null hypothesis is strong.
B) $z = 1.57$; P–value = 0.1164; Do not reject H_0. The evidence against the null hypothesis is weak or none.
C) $z = 0.35$; P–value = 0.7263; Do not reject H_0. The evidence against the null hypothesis is weak or none.
D) $z = 1.57$; P–value = 0.0582; Do not reject H_0. The evidence against the null hypothesis is moderate

A one–sample z–test for a population mean is to be performed. The value obtained for the test statistic, $z = \dfrac{\bar{x} - \mu_0}{\sigma/\sqrt{n}}$, is given. The nature of the test (right–tailed, left–tailed, or two–tailed) is also specified. Determine the P–value.

3) A left–tailed test:
$z = -2.65$

A) 0.0040
B) 0.0080
C) 0.9920
D) 0.9960

Provide an appropriate answer.

4) A high school biology student wishes to test the hypothesis that hummingbird feeders can affect the mean mass of ruby-throated hummingbirds in the area surrounding the feeder. She captures and weighs several of the hummingbirds near a science museum where several feeders are located. She obtains the following masses in grams:

4.2	3.9	3.6	3.5	3.9	3.8
3.8	4.1	3.9	3.8	3.2	3.4

The student's hypotheses are:

H_0: $\mu = 3.65$ g

H_a: $\mu > 3.65$ g

Use technology to calculate P, then determine whether the data provide sufficient evidence to conclude that the mean mass of the birds in the area surrounding the feeder is greater than the mean mass of the general population. Test at the 5% significance level and assume that the population standard deviation is 0.35 g. Also, assess the strength of the evidence against the null hypothesis.

A) $P = 0.1418$; since $P > 0.05$, do not reject the null hypothesis.
At the 5% significance level, the data do not provide sufficient evidence to conclude that the mean mass of the birds in the area surrounding the feeder is greater than the mean mass of the general population. The evidence against the null hypothesis is weak or none.

B) $P = 0.745$; since $P > 0.05$, do not reject the null hypothesis.
At the 5% significance level, the data do not provide sufficient evidence to conclude that the mean mass of the birds in the area surrounding the feeder is greater than the mean mass of the general population. The evidence against the null hypothesis is weak or none.

C) $P = 0.255$; since $P > 0.05$, reject the null hypothesis.
At the 5% significance level, the data do provide sufficient evidence to conclude that the mean mass of the birds in the area surrounding the feeder is greater than the mean mass of the general population. The evidence against the null hypothesis is moderate.

D) $P = 0.509$; since $P > 0.05$, reject the null hypothesis.
At the 5% significance level, the data do provide sufficient evidence to conclude that the mean mass of the birds in the area surrounding the feeder is greater than the mean mass of the general population. The evidence against the null hypothesis is strong.

A one-sample z-test for a population mean is to be performed. The value obtained for the test statistic, $z = \dfrac{\bar{x} - \mu_0}{\sigma/\sqrt{n}}$, is given. The nature of the test (right-tailed, left-tailed, or two-tailed) is also specified. Determine the P-value.

5) A left-tailed test:
$z = -0.58$

A) 0.4380 B) 0.7190 C) 0.5620 D) 0.2810

The significance level and P-value of a hypothesis test are given. Decide whether the null hypothesis should be rejected.

6) $\alpha = 0.01$, P-value $= 0.004$

A) Reject the null hypothesis. B) Do not reject the null hypothesis.

A one–sample z–test for a population mean is to be performed. The value obtained for the test statistic, $z = \dfrac{\bar{x} - \mu_0}{\sigma/\sqrt{n}}$, is given. The nature of the test (right–tailed, left–tailed, or two–tailed) is also specified. Determine the P–value.

7) A right–tailed test:
$z = 2.38$

A) 0.9913 B) 0.9826 C) 0.0087 D) 0.0174

Use a table of t–values to estimate the P–value for the specified one–mean t–test.

8) Two–tailed test, $n = 21$, $t = -2.509$

A) $0.005 < P < 0.01$ B) $0.05 < P < 0.10$ C) $0.01 < P < 0.02$ D) $0.02 < P < 0.05$

9) Right–tailed test, $n = 4$, $t = 2.525$

A) $0.005 < P < 0.01$ B) $0.05 < P < 0.10$ C) $0.025 < P < 0.05$ D) $0.01 < P < 0.025$

A hypothesis test is to be performed. Determine the null and alternative hypotheses.

10) At one school, the average amount of time that tenth–graders spend watching television each week is 21.6 hours. The principal introduces a campaign to encourage the students to watch less television. One year later, the principal wants to perform a hypothesis test to determine whether the average amount of time spent watching television per week has decreased.

A) $H_0: \mu < 21.6$ hours
$H_a: \mu > 21.6$ hours

B) $H_0: \mu < 21.6$ hours
$H_a: \mu = 21.6$ hours

C) $H_0: \mu = 21.6$ hours
$H_a: \mu < 21.6$ hours

D) $H_0: \mu = 21.6$ hours
$H_a: \mu \le 21.6$ hours

Classify the hypothesis test as two–tailed, left–tailed, or right–tailed.

11) A psychologist has designed a test to measure stress levels in adults. She has determined that nationwide the mean score on her test is 24. A hypothesis test is to be conducted to determine whether the mean score for trial lawyers exceeds the national mean score.

A) Two–tailed B) Left–tailed C) Right–tailed

A hypothesis test is to be performed. Determine the null and alternative hypotheses.

12) A manufacturer claims that the mean amount of juice in its 16 ounce bottles is 16.1 ounces. A consumer advocacy group wants to perform a hypothesis test to determine whether the mean amount is actually less than this.

A) $H_0: \mu = 16.1$ ounces
$H_a: \mu \le 16.1$ ounces

B) $H_0: \mu < 16.1$ ounces
$H_a: \mu = 16.1$ ounces

C) $H_0: \mu > 16.1$ ounces
$H_a: \mu < 16.1$ ounces

D) $H_0: \mu = 16.1$ ounces
$H_a: \mu < 16.1$ ounces

For the given hypothesis test, explain the meaning of a Type I error, a Type II error, or a correct decision as specified.

13) A psychologist has designed a test to measure stress levels in adults. She has determined that nationwide the mean score on her test is 27. A hypothesis test is to be conducted to determine whether the mean score for trial lawyers exceeds the national mean score. The hypotheses are

$H_0 : \mu = 27$

$H_a : \mu > 27$

where μ is the mean score for all trial lawyers. Explain the meaning of a Type I error.

A) A Type I error would occur if, in fact, $\mu = 27$, but the results of the sampling lead to the conclusion that $\mu > 27$.

B) A Type I error would occur if, in fact, $\mu > 27$, but the results of the sampling fail to lead to that conclusion.

C) A Type I error would occur if, in fact, $\mu > 27$, but the results of the sampling lead to rejection of the null hypothesis that $\mu = 27$.

D) A Type I error would occur if, in fact, $\mu = 27$, but the results of the sampling fail to lead to rejection of that fact.

14) A man is on trial accused of murder in the first degree. The prosecutor presents evidence that he hopes will convince the jury to reject the hypothesis that the man is innocent. This situation can be modeled as a hypothesis test with the following hypotheses:

H_0 : The defendant is innocent.

H_a : The defendant is guilty.

Explain the meaning of a Type II error.

A) A Type II error would occur if, in fact, the defendant is innocent and the jury fails to reject the null hypothesis that he is innocent.

B) A Type II error would occur if, in fact, the defendant is guilty but the jury fails to conclude that he is guilty.

C) A Type II error would occur if, in fact, the defendant is guilty and the jury rejects the null hypothesis that he is innocent.

D) A Type II error would occur if, in fact, the defendant is innocent but the jury concludes that he is guilty.

15) In 2000, the average duration of long–distance telephone calls originating in one town was 9.4 minutes. Five years later, in 2005, a long–distance telephone company wants to perform a hypothesis test to determine whether the average duration of long–distance phone calls has changed from the 2000 mean of 9.4 minutes. The hypotheses are:

$H_0: \mu = 9.4$ minutes

$H_a: \mu \neq 9.4$ minutes

where μ is the mean duration, in 2005, of long–distance telephone calls originating in the town. Explain the meaning of a correct decision.

A) A correct decision would occur if, in fact, $\mu = 9.4$ minutes, and the results of the sampling do not lead to rejection of that fact; or if, in fact, $\mu \neq 9.4$ minutes and the results of the sampling lead to that conclusion.

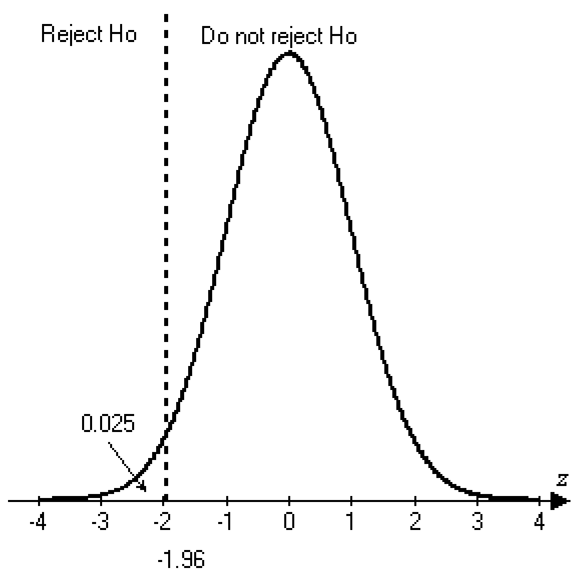
B) A correct decision would occur if, in fact, $\mu \neq 9.4$ minutes and the results of the sampling do not lead to rejection of the null hypothesis that $\mu = 9.4$ minutes.

C) A correct decision would occur if, in fact, $\mu = 9.4$ minutes, and the results of the sampling do not lead to rejection of that fact; or if, in fact, $\mu \neq 9.4$ minutes and the results of the sampling do not lead to rejection of the null hypothesis.

D) A correct decision would occur if, in fact, $\mu = 9.4$ minutes, and the results of the sampling lead to rejection of the null hypothesis; or if, in fact, $\mu \neq 9.4$ minutes and the results of the sampling lead to that conclusion.

The graph portrays the decision criterion for a hypothesis test for a population mean. The null hypothesis is $H_0: \mu = \mu_0$. The curve is the normal curve for the test statistic under the assumption that the null hypothesis is true. Use the graph to solve the problem.

16) A graphical display of the decision criterion follows.



Determine the nonrejection region.

A) $z \geq -1.96$ B) $z \geq 0.025$ C) $z \leq -1.96$ D) $-1.96 \leq z \leq 1.96$

For the given hypothesis test, explain the meaning of a Type I error, a Type II error, or a correct decision as specified.

17) The maximum acceptable level of a certain toxic chemical in vegetables has been set at 0.3 parts per million (ppm). A consumer health group measured the level of the chemical in a random sample of tomatoes obtained from one producer to determine whether the mean level of the chemical in these tomatoes exceeds the recommended limit.
The hypotheses are
$H_0: \mu = 0.3$ ppm
$H_a: \mu > 0.3$ ppm
where μ is the mean level of the chemical in tomatoes from this producer. Explain the meaning of a Type I error.

A) A Type I error would occur if, in fact, $\mu = 0.3$ ppm, but the results of the sampling fail to lead to rejection of that fact.
B) A Type I error would occur if, in fact, $\mu = 0.3$ ppm, but the results of the sampling lead to the conclusion that $\mu > 0.3$ ppm
C) A Type I error would occur if, in fact, $\mu > 0.3$ ppm, and the results of the sampling lead to rejection of the null hypothesis that $\mu = 0.3$ ppm.
D) A Type I error would occur if, in fact, $\mu > 0.3$ ppm, but the results of the sampling fail to lead to that conclusion.

A hypothesis test is to be performed for a population mean with null hypothesis $H_0: \mu = \mu_0$. The test statistic used will be $z = \dfrac{\bar{x} - \mu_0}{\sigma/\sqrt{n}}$. Find the required critical value(s).

18) A right-tailed test with $\alpha = 0.09$.

A) ±1.96
B) 1.96
C) 1.3546
D) ±1.3546

A sample mean, sample size, and population standard deviation are given. Use the one-mean z-test to perform the required hypothesis test about the mean, μ, of the population from which the sample was drawn.

19) $\bar{x} = 21$, $n = 11$, $\sigma = 7.5$, H_0: $\mu = 18.7$; H_a: $\mu \neq 18.7$, $\alpha = 0.01$

A) Reject H_0 if $z < -2.575$ or $z > 2.575$; $z = -1.02$; therefore do not reject H_0. The data do not provide sufficient evidence to support H_a: $\mu \neq 18.7$.
B) Reject H_0 if $-2.575 < z < 2.575$; $z = 1.02$; therefore reject H_0 and conclude that $\mu \neq 18.7$.
C) Reject H_0 if $z < -1.96$ or $z > 1.96$; $z = 1.02$; therefore do not reject H_0. The data do not provide sufficient evidence to support H_a: $\mu \neq 18.7$.
D) Reject H_0 if $z < -2.575$ or $z > 2.575$; $z = 1.02$; therefore do not reject H_0. The data do not provide sufficient evidence to support H_a: $\mu \neq 18.7$.

20) $\bar{x} = 7.3$, $n = 18$, $\sigma = 1.9$, H_0: $\mu = 10$; H_a: $\mu < 10$, $\alpha = 0.01$

A) Reject H_0 if $z > 1.96$; $z = -6.03$; therefore do not reject H_0. The data do not provide sufficient evidence to support H_a: $\mu < 10$.
B) Reject H_0 if $z > -2.33$; $z = -6.03$; therefore do not reject H_0. The data do not provide sufficient evidence to support H_a: $\mu < 10$.
C) Reject H_0 if $z < -1.96$; $z = -6.03$; therefore reject H_0 and conclude that $\mu < 10$.
D) Reject H_0 if $z < -2.33$; $z = -6.03$; therefore reject H_0 and conclude that $\mu < 10$.