STA2023 Module 11 Test

Name_____

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

Determine the null and alternative hypotheses for the proposed hypothesis test.

1) A researcher is interested in comparing the resting pulse rate of women who exercise regularly and women who do not exercise regularly. She wants to perform a hypothesis test to determine whether the mean resting pulse rate of women who exercise at least 6 hours per week is less than the mean resting pulse rate of women who exercise less than 6 hours per week.
   A) Let μ_1 denote the mean resting pulse rate for women who exercise at least 6 hours per week and let μ_2 denote the mean resting pulse rate for women who exercise less than 6 hours per week. The null and alternative hypotheses are H_0: $\mu_1 < \mu_2$ and H_a: $\mu_1 > \mu_2$.
   B) Let μ_1 denote the mean resting pulse rate for women who exercise at least 6 hours per week and let μ_2 denote the mean resting pulse rate for women who exercise less than 6 hours per week. The null and alternative hypotheses are H_0: $\mu_1 = \mu_2$ and H_a: $\mu_1 < \mu_2$.
   C) Let μ_1 denote the mean resting pulse rate for women who exercise at least 6 hours per week and let μ_2 denote the mean resting pulse rate for women who exercise less than 6 hours per week. The null and alternative hypotheses are H_0: $\mu_1 = \mu_2$ and H_a: $\mu_1 > \mu_2$.
   D) Let $\bar{x}_1$ denote the mean resting pulse rate for women who exercise at least 6 hours per week and let $\bar{x}_2$ denote the mean resting pulse rate for women who exercise less than 6 hours per week. The null and alternative hypotheses are H_0: $\bar{x}_1 = \bar{x}_2$ and H_a: $\bar{x}_1 < \bar{x}_2$.

   Answer: B
   Objective: (10.1) Determine Null and Alternative Hypotheses

Provide an appropriate response.

2) A researcher is interested in comparing the resting pulse rate of women who exercise regularly and women who do not exercise regularly. She wants to perform a hypothesis test to determine whether the mean resting pulse rate of women who exercise at least 6 hours per week is less than the mean resting pulse rate of women who exercise less than 6 hours per week. Identify the two populations for the proposed hypothesis test.
   A) Adults who exercise at least 6 hours per week and adults who exercise less than 6 hours per week
   B) Women with a high resting pulse rate and women with a low resting pulse rate.
   C) Resting pulse rates for women who exercise at least 6 hours per week and resting pulse rates for women who exercise less than 6 hours per week
   D) Women who exercise at least 6 hours per week and women who exercise less than 6 hours per week

   Answer: D
   Objective: (10.1) Identify Variable/ Two Populations

3) Suppose that x is a variable on each of two populations. Independent samples of sizes n_1 and n_2, respectively, are selected from the two populations. True or false? The mean of all possible differences between the two sample means equals the difference between the two population means, regardless of the distributions of the variable on the two populations.

A) True B) False

Answer: A

Objective: (10.1) *Know Concepts: Distribution of Difference between Two Means

Determine the null and alternative hypotheses for the proposed hypothesis test.

4) The forced vital capacity (FVC) is often used by physicians to assess a person's ability to move air in and out of their lungs. It is the maximum amount of air that can be exhaled after a deep breath. A researcher wants to perform a hypothesis test to determine whether the mean forced vital capacity for women is less than the mean forced vital capacity for men.

A) Let μ_1 denote the mean forced vital capacity for women and let μ_2 denote the mean forced vital capacity for men. The null and alternative hypotheses are H_0: $\mu_1 = \mu_2$ and H_a: $\mu_1 < \mu_2$.

B) Let $\bar{x}_1$ denote the mean forced vital capacity for women and let $\bar{x}_2$ denote the mean forced vital capacity for men. The null and alternative hypotheses are H_0: $\bar{x}_1 = \bar{x}_2$ and H_a: $\bar{x}_1 < \bar{x}_2$.

C) Let μ_1 denote the mean forced vital capacity for women and let μ_2 denote the mean forced vital capacity for men. The null and alternative hypotheses are H_0: $\mu_1 < \mu_2$ and H_a: $\mu_1 > \mu_2$.

D) Let μ_1 denote the mean forced vital capacity for women and let μ_2 denote the mean forced vital capacity for men. The null and alternative hypotheses are H_0: $\mu_1 = \mu_2$ and H_a: $\mu_1 > \mu_2$.

Answer: A

Objective: (10.1) Determine Null and Alternative Hypotheses

Solve the problem.

5) A variable of two populations has a mean of 16 and a standard deviation of 9 for one of the populations and a mean of 20 and a standard deviation of 3 for the other population. For independent samples of sizes 4 and 14, respectively, find the standard deviation of $\bar{x}_1 - \bar{x}_2$. Round your answer to the nearest hundredth.

A) 1.57 B) 4.57 C) 4.43 D) 20.89

Answer: B

Objective: (10.1) Find Mean/Std Dev of Difference Between Two Sample Means

Solve.

6) A variable of two populations has a mean of 40 and a standard deviation of 6 for one of the populations and a mean of 40 and a standard deviation of 8 for the other population. Determine the percentage of all pairs of independent samples of sizes 7 and 6, respectively, from the two populations with the property that the difference $\bar{x}_1 - \bar{x}_2$ between the samples means is between –11.93 and 11.93.

A) 95.44% B) 90.74% C) 99.74% D) 99.87%

Answer: C

Objective: (10.1) Determine Percentage of Pairs with Given Difference

Provide an appropriate response.

7) True or false? In the context of the pooled t–test for two population means, the pooled sample standard deviation, s_p, always lies between the two sample standard deviations, s_1 and s_2.

A) True B) False

Answer: A

Objective: (10.2) *Know Concepts: Two Population Means (Std Deviations Equal)

8) A researcher was interested in comparing the resting pulse rates of people who exercise regularly and people who do not exercise regularly. Independent simple random samples were obtained of 16 people aged 30–40 who do not exercise regularly and 12 people aged 30–40 who do exercise regularly. The resting pulse rate (in beats per minute) of each person was recorded. The summary statistics were as follows.

Do Not Exercise	Do Exercise
$\bar{x}_1 = 73.7$	$\bar{x}_2 = 69.0$
$s_1 = 10.0$	$s_2 = 8.9$
$n_1 = 16$	$n_2 = 12$

The researcher used a pooled t–interval procedure to obtain a 90% confidence interval for the difference between the mean pulse rate of people who do not exercise regularly and the mean pulse rate of people who exercise regularly. The 90% confidence interval was found to be –1.52 to 10.92 beats per minute . Interpret this confidence interval.

A) There is a 90% chance that the difference between the sample mean pulse rate of people who do not exercise regularly and the sample mean pulse rate of people who exercise regularly will lie between –1.52 and 10.92 beats per minute .

B) We can be 90% confident that the difference between the sample mean pulse rate of people who do not exercise regularly and the sample mean pulse rate of people who exercise regularly is somewhere between –1.52 and 10.92 beats per minute .

C) There is a 90% chance that the difference between the mean pulse rate of people who do not exercise regularly and the mean pulse rate of people who exercise regularly will lie between –1.52 and 10.92 beats per minute .

D) We can be 90% confident that the difference between the mean pulse rate of people who do not exercise regularly and the mean pulse rate of people who exercise regularly is somewhere between –1.52 and 10.92 beats per minute .

Answer: D

Objective: (10.2) *Know Concepts: Two Population Means (Std Deviations Equal)

Summary statistics are given for independent simple random samples from two populations. Preliminary data analyses indicate that the variable under consideration is normally distributed on each population. Decide whether use of the pooled t–test and pooled t–interval procedure is reasonable. Explain your answer.

9) $\bar{x}_1 = 143.9$, $s_1 = 43.2$, $n_1 = 13$, $\bar{x}_2 = 212.9$, $s_2 = 153.7$, $n_2 = 15$

A) Not reasonable; the sample means suggest that the two population means differ.
B) Reasonable; the sample standard deviations suggest that the two population standard deviations differ, however since the sample sizes are roughly equal, it is reasonable to use the pooled t–test.
C) Reasonable; the sample standard deviations suggest that the two population standard deviations are equal.
D) Not reasonable; the sample standard deviations suggest that the two population standard deviations differ.

Answer: D
Objective: (10.2) Determine if Pooled t-Test/t-Interval Procedure is Reasonable

Summary statistics are given for independent simple random samples from two populations. Use the pooled t–interval procedure to obtain the specified confidence interval.

10) $\bar{x}_1 = 71.7$, $s_1 = 3.1$, $n_1 = 11$, $\bar{x}_2 = 68.3$, $s_2 = 3.4$, $n_2 = 9$

Determine a 99% confidence interval.

A) –1.46 to 8.26
B) –0.79 to 7.59
C) 0.49 to 6.31
D) –0.31 to 7.11

Answer: B
Objective: (10.2) Find Confidence Interval Given Statistics

Summary statistics are given for independent simple random samples from two populations. Use the pooled t–test to conduct the required hypothesis test.

11) $\bar{x}_1 = 20$, $s_1 = 8$, $n_1 = 12$, $\bar{x}_2 = 17.5$, $s_2 = 9$, $n_2 = 15$

Perform a right–tailed hypothesis test using a significance level of $\alpha = 0.05$.

A) Test statistic: t = 6.920
Critical value = 1.708
P–value < 0.0050.005
Reject H_0

B) Test statistic: t = 0.753
Critical value = 2.060
P–value > 0.10
Do not reject H_0

C) Test statistic: t = 6.920
Critical value = 2.060
P–value < 0.0050.005
Reject H_0

D) Test statistic: t = 0.753
Critical value = 1.708
P–value > 0.10
Do not reject H_0

Answer: D
Objective: (10.2) Perform Pooled t-Test Given Statistics

Summary statistics are given for independent simple random samples from two populations. Preliminary data analyses indicate that the variable under consideration is normally distributed on each population. Decide whether use of the pooled t–test and pooled t–interval procedure is reasonable. Explain your answer.

12) $\bar{x}_1 = 566.9$, $s_1 = 81.2$, $n_1 = 37$, $\bar{x}_2 = 480.2$, $s_2 = 83.5$, $n_2 = 42$

A) Not reasonable; the sample means suggest that the two population means differ.
B) Reasonable; the sample means are close to being equal suggesting that the assumption of equal population means is reasonable. Also both sample sizes are large.
C) Reasonable; the sample standard deviations are close to being equal suggesting that the assumption of equal population standard deviations is reasonable. Also both sample sizes are large.
D) Not reasonable; the sample standard deviations suggest that the two population standard deviations differ.

Answer: C
Objective: (10.2) Determine if Pooled t-Test/t-Interval Procedure is Reasonable

Apply the pooled t–interval procedure to obtain the required confidence interval. You may assume that the assumptions for using the procedure are satisfied.

13) A researcher was interested in comparing the amount of time spent watching television by women and by men. Independent simple random samples of 14 women and 17 men were selected and each person was asked how many hours he or she had watched television during the previous week. The summary statistics are as follows.

Women	Men
$\bar{x}_1 = 12.8$	$\bar{x}_2 = 16.6$
$s_1 = 4.1$	$s_2 = 4.7$
$n_1 = 14$	$n_2 = 17$

Determine a 95% confidence interval for the difference between the mean weekly television watching times of women and men.

A) –7.20 to –0.40 hours
B) –6.52 to –1.08 hours
C) –7.08 to –0.52 hours
D) –7.35 to –0.25 hours

Answer: C
Objective: (10.2) *Solve Apps: Find Confidence Interval Using Pooled t-Interval Procedure

Apply the nonpooled t–interval procedure to obtain the required confidence interval. You may assume that the assumptions for using the procedure are satisfied.

14) A researcher was interested in comparing the GPAs of students at two different colleges. Independent simple random samples of 8 students from college A and 13 students from college B yielded the following GPAs.

College A	College B	
3.7	3.8	2.8
3.2	3.2	4.0
3.0	3.0	3.6
2.5	3.9	2.6
2.7	3.8	4.0
3.6	2.5	3.6
2.8	3.9	
3.4		

Determine a 95% confidence interval for the difference, $\mu_1 - \mu_2$, between the mean GPA of college A students and the mean GPA of college B students.

(Note: $\bar{x}_1 = 3.1125$, $\bar{x}_2 = 3.4385$, $s_1 = 0.4357$, $s_2 = 0.5485$.)

A) –0.75 to 0.10 B) –0.70 to 0.05 C) –0.78 to 0.13 D) –0.81 to 0.15

Answer: C

Objective: (10.3) Solve Apps: Find Confidence Interval Using Nonpooled t-Interval Procedure

Summary statistics are given for independent simple random samples from two populations. Use the nonpooled t–interval procedure to obtain the specified confidence interval.

15) $\bar{x}_1 = 72.4$, $s_1 = 10.9$, $n_1 = 16$, $\bar{x}_2 = 68.1$, $s_2 = 8.2$, $n_2 = 12$

95% confidence interval

A) –3.43 to 12.03 B) –3.45 to 12.05 C) –3.14 to 11.74 D) –3.12 to 11.72

Answer: C

Objective: (10.3) Find Confidence Interval Given Summary Statistics

Provide an appropriate response.

16) Suppose that you want to perform a nonpooled t–test based on independent simple random samples to compare the means of two populations . Further suppose that the variable under consideration is normally distributed on each of the two populations. Given the summary statistics below, what degrees of freedom would you use to obtain the critical value?

Sample 1	Sample 2
$s_1^2 = 16.8$	$s_2^2 = 19.3$
$n_1 = 14$	$n_2 = 12$

A) 24 B) 25 C) 23 D) 22

Answer: D

Objective: (10.3) *Know Concepts: Two Pop Means (Std Devs Not Assumed Equal)

Summary statistics are given for independent simple random samples from two populations. Use the nonpooled t–interval procedure to obtain the specified confidence interval.

17) $\bar{x}_1 = 77.0$, $s_1 = 4.5$, $n_1 = 11$, $\bar{x}_2 = 65.1$, $s_2 = 5.1$, $n_2 = 9$

98% confidence interval

A) 6.28 to 17.52 B) 6.42 to 17.38 C) 6.58 to 17.22 D) 6.35 to 17.45

Answer: A

Objective: (10.3) Find Confidence Interval Given Summary Statistics

Apply the nonpooled t–interval procedure to obtain the required confidence interval. You may assume that the assumptions for using the procedure are satisfied.

18) A researcher was interested in comparing the heights of women in two different countries. Independent simple random samples of 9 women from country A and 9 women from country B yielded the following heights (in inches).

Country A	Country B
64.1	65.3
66.4	60.2
61.7	61.7
62.0	65.8
67.3	61.0
64.9	64.6
64.7	60.0
68.0	65.4
63.6	59.0

Determine a 90% confidence interval for the difference, $\mu_1 - \mu_2$, between the mean height of women in country A and the mean height of women in country B.

(Note: $\bar{x}_1 = 64.744$, $\bar{x}_2 = 62.556$, $s_1 = 2.192$, $s_2 = 2.697$.)

A) 0.17 to 4.21 inches B) 0.16 to 4.22 inches

C) 0.15 to 4.23 inches D) 0.14 to 4.24 inches

Answer: B

Objective: (10.3) Solve Apps: Find Confidence Interval Using Nonpooled t-Interval Procedure

Summary statistics are given for independent simple random samples from two populations. Use the nonpooled t–test to conduct the required hypothesis test.

19) $\bar{x}_1 = 12.7$, $s_1 = 3.9$, $n_1 = 14$, $\bar{x}_2 = 14.1$, $s_2 = 5.2$, $n_2 = 17$

Perform a left–tailed hypothesis test using a significance level of $\alpha = 0.05$.

A) Test statistic: $t = -2.211$
Critical value = –1.699
Reject H_0

B) Test statistic: $t = -2.211$
Critical value = –1.701
Reject H_0

C) Test statistic: $t = -0.856$
Critical value = –1.699
Do not reject H_0

D) Test statistic: $t = -0.856$
Critical value = –1.701
Do not reject H_0

Answer: D

Objective: (10.3) Perform Nonpooled t-Test Given Summary Statistics

Provide an appropriate response.

20) Suppose that you want to perform a hypothesis test based on independent simple random samples to compare the means of two populations. Further suppose that either the variable under consideration is normally distributed on each of the two populations or the sample sizes are large. True or false? If you are reasonably sure that the populations have nearly equal standard deviations, then you should use a pooled t–procedure.

A) True B) False

Answer: A

Objective: (10.3) *Know Concepts: Two Pop Means (Std Devs Not Assumed Equal)