

Course Code: 207 QUA Second Mid Exam	Name: ID: Serial Number: Section:
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**Question (1)** Which one of the following ways of collecting data would not result in paired data?

- (A) Two independent samples are selected and the same response variable is compared between samples.
- (B) Similar individuals are paired prior to an experiment. Each individual in a pair receives a different treatment
- (C) Two different variables are measured for each person.
- (D) Each person is measured twice.

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**Question (2):** What technique should you use if you have categorical data?

- (A) Paired  $t$  test
- (B) Independent samples  $t$  test
- (C) Chi square test
- (D) ANOVA

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**Question (3):** An increase in alpha, the level of significance, causes:

- (A) An increase in the probability of the type I error to occur.
- (B) A decrease in the probability of type I error to occur.
- (C) No change in any of the type I or type II error.
- (D) A decrease in the probability of type I error to occur and an increase in the probability of type II to occur.

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**Question (4):** Suppose you are testing the following hypothesis pair:  $H_0: \mu \leq 100$  vs.  $H_1: \mu > 100$ . A sample average of less than 100 would sometimes lead to a \_\_\_\_\_ error but would never lead to a \_\_\_\_\_ error.

- (A) p-value; Type II
- (B) Type I; p-value
- (C) Type I; Type II
- (D) Type II; Type I

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**Use the following to answer questions 5-7:**

A process is considered to be performing acceptably if its mean is 200. Because it is expensive to shut down and reconfigure this process, such measures are undertaken only if there is compelling evidence that the process mean is not 200. Experience has shown that the process is normally distributed with a standard deviation of 40.

**Question (5):** What is an appropriate alternate hypothesis in this setting?

- (A)  $H_1: \mu \geq 200$
- (B)  $H_1: \mu \leq 200$
- (C)  $H_1: \mu = 200$
- (D)  $H_1: \mu \neq 200$

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**Question (6):** In this situation, a Type I error would be made when it is concluded that  $\mu$  is \_\_\_\_\_ 200 when in fact  $\mu$  \_\_\_\_\_ 200.

(A) Not equal to; equals	(B) Equals; not equal to
(C) Greater than; less than or equal to	(D) Less than; greater than or equal to

**Question (7):**

Suppose in a random sample of size  $n = 16$  a sample average of 185 is observed. The p-value of this sample statistic is:

(A) 0.0668	(B) 0.3520	(C) 0.1336	(D) 0.7039
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**Question (8):** Conduct a test to determine whether or not the population proportion of voters in favor of proposal A is greater than 50%. In a random sample of 200 voters, 140 said that they were in favor of this proposal. Compute the test statistic.

(A) $z = 7.07$	(B) $z = 19.80$	(C) $z = 5.66$	(D) $z = 6.17$
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**Question (9):**

A quality improvement consultant has promised that his techniques will reduce variance in a particular process. Prior to implementation, the variance in this process was 28. A random sample of 80 observations drawn from this process exhibited a sample variance of 22. If alpha was set at 0.05, a test of  $H_0: \sigma^2 \geq 28$  would imply that the consultant's techniques \_\_\_\_\_ process variance.

(A) Didn't change	(B) Reduced	(C) Increased	(D) None of the above
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**Question (10):** To test  $H_0: \mu_1 = \mu_2$  using a significance level of 0.05, a z-test statistic of 2.06 was computed. Based on the p-value,

(A) Reject the null hypothesis.
(B) Reject the alternative hypothesis.
(C) Accept the null hypothesis.
(D) Fail to reject the null hypothesis.

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A researcher wants to assess if there is a difference in the average life spans between men and women in Japan. A random sample of 10 women showed an average lifespan of 83 years, with a sample standard deviation of 7 years. A random sample of 10 men showed an average lifespan of 77 years, with a sample standard deviation of 6.4 years. Assume that life spans are normally distributed and that the population variances are equal.

**Answer Questions 11-14**

**Question (11):**

What are the appropriate null and alternative hypotheses?

(A) $H_0: \mu_1 - \mu_2 \geq 0$ and $H_a: \mu_1 - \mu_2 < 0$	(B) $H_0: \mu_1 - \mu_2 \leq 0$ and $H_a: \mu_1 - \mu_2 > 0$	(C) $H_0: \mu_1 - \mu_2 = 0$ and $H_a: \mu_1 - \mu_2 \neq 0$	(D) $H_0: \mu_1 - \mu_2 \neq 0$ and $H_a: \mu_1 - \mu_2 = 0$
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**Question (12):**

What is the value of the test statistic?

(A) $t = 1.8$	(B) $t = 1.65$	(C) $t = 2$	(D) None of the above
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**Question (13):**

For a significance level of  $\alpha = 0.05$ , the results are statistically significant when:

(A) $t_c < t_{0.025,18}$	(B) $t_c < t_{0.05,18}$	(C) $t_c > t_{0.025,18}$	(D) $t_c > t_{0.05,18}$
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**Question (14):**

Which of the following is an appropriate conclusion?

(A) There is a statistically significant difference in average life span between men and women.	(B) The difference is not statistically significant so there is not enough evidence to conclude that the life spans are different.	(C) The average life span of women is 6 years longer than the average life span of men.	(D) None of the above.
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**Question (15):**

A major corporation offers a large bonus to all of its employees if at least 80 percent of the corporation's 1,000,000 customers are very satisfied. The company conducts a survey of 100 randomly sampled customers to determine whether or not to pay the bonus. The null hypothesis states that the proportion of very satisfied customers is at least 0.80. If the null hypothesis cannot be rejected, given a significance level of 0.05, the company pays the bonus. Suppose the true proportion of satisfied customers is 0.75. Find the power of the test to reject the null hypothesis. (Hint:  $P_c = 0.734$ .)

(A) 0.64	(B) 0.36	(C) 0.05	(D) 0.95
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**Question (16):** A statistician wishes to determine the difference between two population means. A sample of 10 items from Population #1 yields a mean of 185 with a standard deviation of 20. The sample of 12 items from Population #2 yields a mean of 200 with a standard deviation of 25. If you can assume that the population variances are equal, what is the pooled variance  $S_p$ ?

- (A) 22.75      (B) 22.88      (C) 518      (D) 524

**Question (17):** In a random sample of 50 men, 40% said they preferred to walk up stairs rather than take the elevator. In a random sample of 40 women, 50% said they preferred the stairs. The difference between the two sample proportions (men – women) is to be calculated. What is the standard error for the difference between the two sample proportions?

- (A) 0.0111      (B) 0.0972      (C) 0.116      (D) 0.1051

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Four surgical procedures are currently used to install pacemakers. If the patient does not need to return for follow-up surgery, the operation is called a "clear" operation. A heart center wants to compare the proportion of clear operations for the four procedures (designated here as A, B, C and D). The following data are collected:

	A	B	C	D	Total
Clear	27	41	21	7	96
Returns	11	15	9	11	46
Total	38	56	30	18	142

**Answer questions 18-20**

**Question 18:** For a chi-square test with a level of significance of 0.05, what is the value for the degrees of freedom?

- (A) 2      (B) 3      (C) 6      (D) 8

**Question 19** For a chi-square test with a level of significance of 0.05, what is the value for the degrees of freedom?

- (A) 0.585      (B) 0.676      (C) 0.78      (D) None of the above.

**Question 20**

what is the expected cell frequency for the Procedure D/Return cell?

- (A) 10.78      (B) 26.53      (C) 5.83      (D) None of the above.

**Question 21**

what is the critical value of the chi-square test?

- (A) 7.815      (B) 9.133      (C) 8.108      (D) None of the above.

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With our best wishes