

MATH 2050
TEST 4

NAME _____
FALL 2007

1. A medication is claimed to lower blood pressure. A sample of eight patients was given this medication for two weeks. Their systolic blood pressure was taken before and after using this medication for a two-week period. If a hypothesis test is performed using a test statistic that has a t distribution (under the null hypothesis), what is the value of the test statistic?

Systolic Blood Pressure before Taking Medication	Systolic Blood Pressure after Taking Medication	Difference = Before – After
135	124	
120	118	
155	148	
137	128	
115	112	
187	172	
173	161	
160	151	

If a hypothesis test is performed using a test statistic that has a t distribution (under the null hypothesis), what is the value of the test statistic and what is the conclusion of the test using $\alpha = .05$?

- (a) $t = 4.76$; We conclude that, on average, the medication lowers blood pressure.
- (b) $t = 4.76$; We conclude that there is insufficient evidence to support the claim of lower pressure.
- (c) $t = 5.45$; We conclude that, on average, the medication lowers blood pressure.
- (d) $t = 5.45$; We conclude that there is insufficient evidence to support the claim of lower pressure.
- (e) None of the above.

2. A random sample of 300 Big State University students provided the data in the contingency table below.

	Smoke	Don't Smoke
Men	60	85
Women	55	100

If smoking were independent of gender, what is the expected count for the table cell “men who smoke”?

- (a) 64.706 (b) 55.583 (c) 95.583 (d) 89.417 (e) 57.500

3 A random sample of 300 Big State University students provided the data in the contingency table below.

	Smoke	Don't Smoke
Men	60	85
Women	55	100

If a chi-square test for independence is performed using $\alpha = .10$, what is the test statistic value and the test conclusion?

- (a) The test statistic value is 1.10; we conclude smoking could be independent of gender.
- (b) The test statistic value is 1.10; we conclude smoking is very likely related to gender.
- (c) The test statistic value is 2.83; we conclude smoking could be independent of gender.
- (d) The test statistic value is 2.83; we conclude smoking is very likely related to gender.
- (e) The test statistic value is 1.83; we conclude smoking is very likely related to gender.

4-5 A random sample of 10 students provided the following bivariate data, where x denotes the number of hours a student studied for the final exam and y the student's exam score.

x	8	10	5	7	10	6	3	9	7	6
y	90	95	75	80	97	75	58	90	83	78

4. Find the sample correlation coefficient for x and y .

- (a) .68
- (b) .77
- (c) .83
- (d) .92
- (e) .98

5 Use the least squares regression line to estimate the exam score for a student who studies 4 hours.

- (a) 63
- (b) 64
- (c) 65
- (d) 66
- (e) 67

6. Of 1459 subjects in a study, 734 were randomly chosen to take Viagra while the 725 other subjects were given a placebo. Of the 734 subjects taking Viagra, 117 experienced headaches. Of the 725 taking the placebo, 29 experienced headaches. Construct a 99% confidence interval for the difference $p_1 - p_2$, where p_1 denotes the probability of a headache for a Viagra user and p_2 denotes the probability of a headache for a placebo user.

- (a) (.06, .18)
- (b) (.07, .17)
- (c) (.08, .16)
- (d) (.09, .15)
- (e) (.10, .14)

7-9 Two methods of teaching reading to first graders are being compared. Independent random samples provided the following reading score data.

Method 1	Method 2
$\bar{x}_1 = 69.4$	$\bar{x}_2 = 74.9$
$s_1 = 11.7$	$s_2 = 12.1$
$n_1 = 50$	$n_2 = 45$

Let μ_1 = method 1 population mean reading score and
 μ_2 = method 2 population mean reading score.

7 In testing $H_o : \mu_1 = \mu_2$ versus $H_1 : \mu_1 \neq \mu_2$, using level of significance $\alpha = .05$, which of the following statements is the best conclusion.

- (a) There is sufficient evidence to conclude that $\mu_1 = \mu_2$.
- (b) There is not sufficient evidence to conclude that $\mu_1 = \mu_2$.
- (c) There is sufficient evidence to conclude that $\mu_1 \neq \mu_2$.
- (d) There is not sufficient evidence to conclude that $\mu_1 \neq \mu_2$.
- (e) The difference in means is not statistically significant.

8. Construct a 95% confidence interval for $\mu_2 - \mu_1$. (Round to one decimal place.)

95% CI: _____ to _____

9 Use the sample standard deviations given to determine what sample sizes are needed in order that a 95% confidence interval for $\mu_2 - \mu_1$ has a margin of error equal to 2.

answer: $n_1 = n_2 =$ _____.

10. If \bar{X}_1 and \bar{X}_2 are obtained from two independent random samples, then the variance of $\bar{X}_1 - \bar{X}_2$ equals the variance of \bar{X}_1 plus the variance of \bar{X}_2 .

True False

11 If a large-sample 99% confidence interval for $\mu_1 - \mu_2$ does not contain the value 0, we are fairly certain that μ_1 equals μ_2 .

True False

[12] Ten years ago the distribution of fish at Simple Lake was as follows:

Type of Fish:	Bass	Catfish	Goldfish	Trout
Proportion:	.10	.25	.30	.35

Recently, a random sample of fish from Simple Lake provided the following data:

Type of Fish:	Bass	Catfish	Goldfish	Trout
Number:	10	15	10	25

Find the chi-squared test statistic value and determine if we have sufficient evidence (at the .05 level of significance) to say that the distribution of fish has changed.

Conclusion:

[13-15]. Four different brands of golf balls were tested for distance traveled when hit by a golf club. The analysis of variance results are provided in the ANOVA table below.

Source of Variation	DF	Sum of Squares	Mean Square	F Value	P-value
Brand (treatment)	3	2794.389	931.463	43.99	.0001
Error	36	762.301	21.175		
Total	39	3556.690			

[13] If the null hypothesis of equal means were true, the treatment sum of squares would be relatively. . . (circle the correct word)

small

large

[14] Which number in the ANOVA table above is a measure of the unexplained variation in the total data set?

- (a) 36 (b) .001 (c) 931.463 (d) 3556.690 (e) 21.175

[15]. We have sufficient evidence (using $\alpha = .05$) to conclude that at least two ball brands have different mean distances. (Circle true or false:)

True

False

[16]. The p -value of a test is the probability of the alternative hypothesis being true.

True

False

[17]. By increasing the sample size(s), we increase the power of a test.

True

False

[18 – 20]. An educational psychologist claims that the order in which test questions are asked affects a student's ability to answer correctly. To investigate this assertion, a professor randomly divides a class of 13 students into two groups – 7 in one group and 6 in the other. The professor prepares one set of test questions but arranges the questions in two different orders. On Test A the questions are arranged in order of increasing difficulty (that is, from easiest to most difficult), while on Test B the order is reversed. One group of students is given Test A, the other Test B, and the test score is recorded for each student. The results are as follows:

Test A: 90 71 83 82 75 91 65

Test B: 66 78 50 68 80 60

[18]. Use the Wilcoxon rank sum procedure to find the sum of ranks for Test B scores.

answer: _____

[19]. If Test A population scores and Test B population scores had the same distribution, what is the **expected** sum of ranks for the sample Test B scores?

answer: _____

[20]. Using the Wilcoxon rank sum test, do the data provide sufficient evidence to indicate a difference (a shift in location) in the probability distributions of student scores on the two tests? Test using $\alpha = .05$. [Note that the test is a two-tail test.] Using the Wilcoxon rank sum test our conclusion is . . .

- (a) We have sufficient evidence to conclude that one test tends to do better.
- (b) We have sufficient evidence to conclude that both tests are basically the same.
- (c) We do not have sufficient evidence to conclude that one test tends to do better.
- (d) We do not have sufficient evidence to conclude that both test are basically the same.
- (e) We do not have large enough samples to make any inference.