

Psychology 310
Practice Exam Questions on Material Since Exam 2

Student Name: _____

Instructions: Answer all questions by circling the correct answer on the test paper. There is **no penalty for guessing**. If you believe that an item is incorrect, or has more than one correct answer, indicate your reasoning on the test paper with a brief note. This exam is open book, open note, and calculators may be used. Computers may not be used.

- 1 Suppose you are performing a 2-sample, independent sample t -test, and you use the 2-sided rejection points with $\alpha = .05$. For which of the following situations would the *actual* α be highest when $\sigma_1^2 = 10$, $\sigma_2^2 = 20$?
 - (a) when $N_1 = 20$, $N_2 = 10$
 - (b) when $N_1 = 20$, $N_2 = 20$
 - (c) when $N_1 = 30$, $N_2 = 30$
 - (d) when $N_1 = 10$, $N_2 = 20$

- 2 The 2-sample independent sample t -test makes several statistical assumptions. Which of the following assumptions is most likely to cause severe problems if it is substantially violated?
 - (a) Independence of observations within group
 - (b) Normally distributed populations
 - (c) Homogeneity of variances when sample sizes are equal

- 3 Suppose you somehow knew that the population standard deviations are 10 in two populations, and that the population distributions are normal. You wish to test the null hypothesis that $\mu_1 - \mu_2 = 0$, using the 2-Sample Z -test of the form

$$Z = \frac{\bar{X}_{.1} - \bar{X}_{.2}}{\sqrt{(\frac{1}{N} + \frac{1}{N})\sigma^2}} = \sqrt{N/2} \frac{\bar{X}_{.1} - \bar{X}_{.2}}{\sigma}$$

What minimum sample size N do you need for each group to insure that power is at least 0.95 if $\alpha = .05$ and $\mu_1 - \mu_2 = 5.0$

- (a) 104
- (b) 121
- (c) 115
- (d) 101
- (e) 116
- (f) 106
- (g) 112
- (h) 100

- 4 You wish to test the null hypothesis that the population proportion p is *less than or equal to* .50, using the version of the Z -statistic that incorporates the null hypothesis in the denominator. You obtain a sample proportion of $\hat{p} = 0.65$, based on a sample size of 100. In this case, the obtained value of the Z -statistic is _____, and the statement "the null hypothesis is rejected" is _____.
- (a) 2.7, *true*
 - (b) 2.4, *true*
 - (c) 3.14485, *false*
 - (d) 3.3, *true*
 - (e) 3.0, *true*
 - (f) 2.4, *false*
 - (g) 3.0, *false*
 - (h) 3.14485, *true*
- 5 You wish to perform a 2-sample matched sample t -test of equality of means on a group of $N = 91$ people who were all measured on 2 occasions. Unfortunately, you do not have the raw data, i.e., two columns of scores representing the repeated measurements. However, you do have the mean difference, $\bar{X}_{.1} - \bar{X}_{.2}$. It is equal to 10.0. You also have the variances at time 1 and time 2, and the covariance between the two columns of numbers. These are $s_1^2 = 100$, $s_2^2 = 144$, and $s_{1,2} = 29.0$. Using your knowledge of linear combinations, use this information to compute the variance of the difference scores, s_D^2 , and then compute the matched sample t statistic. In this case, you obtain a t -statistic value of _____, with degrees of freedom equal to _____, and the critical value of the t distribution with $\alpha = .05$ is _____.
- (a) 7.69408; 90; 1.98667
 - (b) 6.99462; 90; 1.66196
 - (c) 0.512871; 90; 1.98667
 - (d) 6.99462; 90; 1.98667
 - (e) 6.50581; 90; 1.98667
 - (f) 5.4893; 90; 1.98667
 - (g) 6.99462; 91; 1.98638
 - (h) 6.29516; 90; 1.98667

- 6 You perform an experiment design to test whether a persuasive message can effectively change opinion on a political issue. You measure a group of people on two occasions, and use McNemar's Z -test to assess the null hypothesis that $p_1 = p_2$, where p_1 and p_2 are the proportions of people who said "yes" to the pollster on the two occasions. The data are summarized in a 2×2 table, where n_{10} is the number of people who said "yes" at time 1 but "no" at time 2, n_{01} is the number of people who said "no" at time 1 and "yes" at time 2. Suppose we have $n_{01} = 70$ and $n_{10} = 44$. The absolute value of the Z -statistic is
- (a) 2.11271
 - (b) 22.3572
 - (c) 44.7145
 - (d) 2.19161
 - (e) 2.73002
 - (f) 2.67864
 - (g) 0.22807
 - (h) 2.43512
- 7 You observe a sample correlation of 0.46 based on a sample of $N = 60.0$ independent observations from a bivariate normal distribution. You test the hypothesis that $\rho = 0$ using the t -statistic. You calculate the value of t at ____ with ____ degrees of freedom.
- (a) 3.94547, 59
 - (b) 4.34001, 59
 - (c) 3.55092, 58
 - (d) 4.67932, 58
 - (e) 4.34001, 58
 - (f) 3.94547, 58
 - (g) 3.59432, 58
 - (h) 3.94547, 60
- 8 You test the hypothesis that $\rho = .5$ using the Fisher transform. The sample correlation you observe is $r = 0.53$. The sample size is $N = 56$. The Z -statistic value is _____
- (a) 0.31417
 - (b) 0.228247
 - (c) 0.561921
 - (d) 0.165573
 - (e) 0.297313
 - (f) 0.281050
 - (g) 0.442996
 - (h) 0.359748

- 9 Suppose you have two independent groups of size $N = 200$. These groups represent random samples from two populations. If 62 people in group 1 and 149 people in group 2 can perform a behavior, construct a 95% confidence interval on $p_2 - p_1$, the population difference in the proportions of people who can perform the behavior. The endpoints of the interval are
- (a) 0.327913; 0.546562
 - (b) 0.279343; 0.593168
 - (c) 0.314036; 0.5667
 - (d) 0.324614; 0.545386
 - (e) 0.338117; 0.531883
 - (f) 0.334851; 0.551008
 - (g) 0.346924; 0.523076
 - (h) 0.346924; 0.537076
- 10 Suppose you obtain random samples of $N_1 = 70$ males and $N_2 = 51$ females, and obtain a correlation $r_1 = 0.54$ between two variables of for the male participants, and $r_2 = .40$ for the female participants. If you test the null hypothesis with the standard Z-statistic, what value should you obtain?
- (a) 1.80411
 - (b) 0.902344
 - (c) 1.15502
 - (d) 1.42229
 - (e) 0.732814
 - (f) 1.00868
 - (g) 0.531593
 - (h) 0.954558
- 11 Suppose you obtain a random samples of $N = 74$ individuals, and obtain a correlation $r = 0.53$ between two variables. Suppose you construct a 90% confidence interval for the population correlation ρ . What are the endpoints of the confidence interval?
- (a) 0.340001; 0.710460
 - (b) 0.362537; 0.690787
 - (c) 0.375609; 0.655769
 - (d) 0.300487; 0.918076
 - (e) 0.195316; 0.685213
 - (f) 0.357579; 0.685213
 - (g) 0.302440; 0.743642

- 12** The standard F -test for comparing two variances for equality
- (a) is robust to non-normality
 - (b) is a one-tailed test
 - (c) has high power
 - (d) None of the above is correct
- 13** Suppose X has a χ^2_8 distribution. What is the variance of X ?
- (a) 4
 - (b) 16
 - (c) 13
 - (d) 9
- 14** Suppose you take a sample of size 48, and observe a sample variance of 60. The endpoints for the 95% confidence interval on σ^2 are
- (a) 41.5803, 94.1375
 - (b) 50.0, 70.0
 - (c) 42.4649, 96.1404
 - (d) 44.1916, 87.0141
- 15** You obtain samples of size $N_1 = 30$ and $N_2 = 40$, and observe sample variances of 127 and 29. Test the null hypothesis

$$H_0 : \sigma_1^2 = \sigma_2^2$$

using the standard F statistic. You obtain a test statistic value of _____. Degrees of freedom are ____ and _____. The null hypothesis is _____

- (a) 4.37931, 29, 39, not rejected
- (b) 4.37931, 30, 40, not rejected
- (c) 5.37931, 30, 40, not rejected
- (d) 4.37931, 29, 39, rejected
- (e) 4.37931, 30, 40, rejected
- (f) 3.37931, 29, 39, rejected

- 16** When $N = 12$, and the sample is independent and random from a normal distribution with standard deviation 41.0, the sample standard deviation S has an expected value of 40.0889. We know that the expected value of S^2 is σ^2 , i.e., 1681.0. Using this information, and a well known formula for the variance of a random variable, compute the sampling variance of S .
- (a) 82.9683
 - (b) 59.1048
 - (c) 56.8884
 - (d) 73.8810
 - (e) 104.320
- 17** Suppose you know the population variance, and it is $\sigma^2 = 182$. You take 3 samples from the (normally distributed) populations, and all of them are of size $N = 11$. The sample means are 18.63, 21.82, and 33.27. Compute a chi-square statistic for testing the null hypothesis that all 3 populations have the same mean. The value of the statistic is $\chi^2 = \underline{\hspace{2cm}}$, with $\underline{\hspace{1cm}}$ degrees of freedom.
- (a) 7.16427; 2
 - (b) 35.8213; 3
 - (c) 35.8213; 2
 - (d) 7.16427; 3
 - (e) 7.16427; 30
- 18** Suppose you sample $N = 43$ independent observations from a normal distribution, and observe a sample variance of $S^2 = 220.2$. You test the null hypothesis that $\sigma^2 = 100$ with $\alpha = .05$. The observed value of the χ^2 statistic is $\underline{\hspace{2cm}}$ and the degrees of freedom are $\underline{\hspace{1cm}}$. The critical value of the test statistic is $\underline{\hspace{2cm}}$.
- (a) 94.686; 42.0; 58.124
 - (b) 92.484; 42.0; 61.7768
 - (c) 101.732; 42.0; 61.7768
 - (d) 92.484; 42.0; 59.3035
 - (e) 92.484; 43.0; 61.7768
 - (f) 184.968; 42.0; 61.7768

19 You have the following data from 3 groups:

	Group 1	Group 2	Group 3
Mean	11	37	48
Variance	257	287	299
Sample Size (N)	18	18	18

You perform a 1-Way Analysis of variance. You obtain the following results: The F -statistic is _____. The degrees of freedom are _____ (numerator) and _____ (denominator). The critical value from the F distribution with $\alpha = .05$ is _____

- (a) 23. 1246; 2, 51; 3. 17880
- (b) 23. 1246; 2, 51; 2. 78623
- (c) 23. 1246; 3, 51; 3. 17880
- (d) 27. 9807; 2, 51; 3. 17880
- (e) 34. 6868; 2, 51; 3. 17880
- (f) 20. 8121; 3, 51; 3. 17880
- (g) 34. 6868; 3, 51; 3. 17880
- (h) 25. 437; 2, 51; 3. 17880

20 You observe the following results for 3 independent groups. You compute the 1-Way ANOVA for unequal N . The test is performed with $\alpha = .05$.

Group 1	Group 2	Group 3
4	1	5
11	7	12
7	3	15
	3	9
		16

The results are: $SS_{between} =$ _____; $SS_{within} =$ _____; $df_{between} =$ _____; $df_{within} =$ _____;

$SS_{between} =$ _____; $SS_{within} =$ _____; $F_{observed} =$ _____ $F_{critical} =$ _____

- (a) 139. 383; 124. 867; 2; 9; 69. 6917; 13. 8741; 5. 02316; 4. 25649
- (b) 139. 383; 129. 867; 2; 9; 69. 6917; 13. 8741; 5. 52547; 4. 25649
- (c) 135. 383; 124. 867; 2; 9; 69. 6917; 13. 8741; 5. 02316; 4. 25649
- (d) 139. 383; 124. 867; 2; 9; 69. 6917; 13. 8741; 5. 02316; 5. 71471
- (e) 139. 383; 124. 867; 2; 9; 69. 6917; 8. 91905; 5. 02316; 4. 25649
- (f) 139. 383; 124. 867; 2; 9; 69. 6917; 13. 8741; 5. 02316; 8. 02152
- (g) 139. 383; 124. 867; 2; 9; 46. 4611; 13. 8741; 5. 02316; 4. 25649
- (h) 139. 383; 124. 867; 2; 9; 69. 6917; 13. 8741; 1. 11626; 4. 25649

21. Suppose statistic A has a χ^2 distribution with 90 degrees of freedom, and statistic B has a χ^2 distribution with 93 degrees of freedom. If A and B are independent, then what is the distribution of A/B ?
- (a) A χ^2 with 183 degrees of freedom
 - (b) 8370 times an $F_{90,93}$ distribution
 - (c) $\frac{30}{31}$ times an $F_{93,90}$ distribution
 - (d) $\frac{30}{31}$ times an $F_{90,93}$ distribution
 - (e) $(\frac{31}{30})$ times an $F_{90,93}$ distribution