Not all questions below correspond to material covered in the Winter 2009 version of PSYC 2002…

Instructions

• indicate your answer on the scantron answer sheet and on the exam itself

Part I – General: 25 questions

1. In a square-root transformation
   a) moderate numbers become only slightly lower, but high numbers become much lower.
   b) high numbers become lower and low numbers become higher.
   c) low numbers become much lower, but high numbers remain basically unchanged.
   d) moderate numbers remain unchanged, but low numbers become slightly higher.

2. A study has three groups, each with an equal number of participants. The population variance is estimated from the variance within each group, giving three estimates, 54.4, 48.6, and 50.9. What is the within-group estimate of the population variance?
   a) (54.4 + 48.6 + 50.9)/(3 - 1) = 76.95 c) (54.4 + 48.6 + 50.9)/(3 + 2) = 30.78
   b) (54.4 + 48.6 + 50.9)/(3 + 1) = 38.48 d) (54.4 + 48.6 + 50.9)/3 = 51.3

3. The variance of a distribution of differences between means equals
   a) the difference between the two estimated population variances.
   b) the sum of the variances of the two distributions of means.
   c) the difference between the variances of the two distributions of means.
   d) the sum of the two estimated population variances.

4. A consumer researcher is interested in the effects of Annual Income and Motivation to Shop on shopping patterns of consumers. If Annual Income (broken into two levels: High and Moderate) and Motivation to Shop (with three levels: Escape, Necessity, and Socializing) are considered in one study, how many cells will there be?
   a) 2 b) 6 c) 4 d) 3

5. You conduct a *t* test for independent means and reject the null hypothesis. This means that
   a) the samples were from populations that were actually dependent rather than independent.
   b) the mean of one sample is statistically the same as the mean of the other sample, so they probably come from populations with equal means.
   c) the mean of one sample is so far from the mean of the other sample that you decide the samples must come from populations with different means.
   d) the variance of one sample is so much larger than the variance of the other sample that you decide that the variances of the parent populations must not have been the same after all.

6. In the formula $t = (M_1 - M_2)/S_{Difference}$, "$S_{Difference}$" is
   a) the standard deviation of the distribution of differences between means.
   b) the sum of the standard deviations of the distribution of means.
   c) the average standard deviation of the two samples.
   d) the pooled estimate of the populations' standard deviation.

7. When the normal-curve assumption is extremely violated, the ordinary *t* test
   a) resembles an analysis of variance. c) is adequate.
   b) gives an incorrect result. d) is conducted using t^2 instead of *t*.

8. In a two-way factorial design, you are testing
   a) one interaction and one main effect. c) two interactions and one main effect.
   b) one interaction and two main effects. d) two interactions and two main effects.

9. Which of the following is the MOST serious violation of an assumption for the *t* test for independent means?
   a) The populations are both dramatically positively skewed.
   b) The populations are both dramatically negatively skewed.
   c) The populations are dramatically skewed in opposite directions.
   d) The sample size is smaller than 15.

10. What is the goal of path analysis?
    a) To examine the causal structure of a group of variables
    b) To eliminate unnecessary variables
    c) To arrange variables from most to least influential
    d) To group variables

11. When conducting a *t* test for independent means, once the variances are known for each of the distributions of means, the variances can be added together to give the
    a) pooled estimate of the population variance.
    b) power of the study.
    c) *t* score.
    d) variance of the distribution of differences between means.

12. What is the difference between a multivariate analysis of covariance (MANCOVA) and a multivariate analysis of variance (MANOVA)?
    a) With a MANCOVA, variables can be partialled out.
    b) With a MANOVA, variables can be partialled out.
    c) A MANCOVA can have more than one dependent variable, whereas a MANOVA cannot.
    d) A MANCOVA can be done with a computer and a MANOVA cannot.

13. You can identify an interaction effect by
    a) dividing each cell mean by a weighted marginal mean.
    b) comparing the pattern of cell means across one row to the pattern of cell means across another row.
    c) conducting a series of *t* tests.
    d) dividing each cell mean by its marginal mean.

14. Each of the following is part of conducting a *t* test for independent means, EXCEPT
    a) the variance of the distribution of differences between means is figured.
    b) a comparison is made against a *t* distribution.
    c) difference scores are found for each participant.
    d) the population variances are estimated.

15. One way to determine the number of people expected in any one cell of a chi-square contingency table is to
    a) multiply the number of people in the cell's row times the number of people in the cell's column.
    b) divide the number of people in the cell's row by the number of people in the cell's column.
    c) divide the total number of people by the number of people in the cell and multiply this result by a row proportion, figuring its row proportion as the number of people for the cell's row divided by the total number of people.
    d) multiply the number of people for the cell's column by its row proportion, figuring its row proportion as the number of people for the cell's row divided by the total number of people.

16. A "distribution of differences between means" can be thought of as a distribution of
    a) the differences you find when you use several methods, in sequence, of estimating the population mean.
    b) the differences between a single sample from Population 1 and all possible samples from Population 2.
    c) the differences you get when you repeatedly draw a sample mean from one population and a sample mean from another population and subtract one mean from the other.
    d) difference scores, in which the difference scores are found by subtracting a series of sample means from the population mean.

17. In a chi-square test for independence, the null hypothesis is that
    a) the means of the populations are not equal.
    b) the two population variances are independent.
    c) the two variables are independent in the population.
    d) the means of the populations are equal.

18. Suppose you had four populations with equal means and equal variances. You could make an *F* distribution for situations with samples of 10 each by
    a) applying the analysis of variance formula to a set of four samples (one from each of the four populations) of 10 each, figuring the degrees of freedom, and repeating this process a large number of times.
    b) applying the test formula to each pair of samples and squaring, then repeating this process a large number of times.
    c) taking samples of 10 from each of the four populations, figuring an *F* ratio for each set of samples, and repeating this a large number of times.
    d) taking 10 samples from each of the four populations, figuring the *F* ratio, and repeating this a large number of times.

19. In an experiment involving 50 participants, which study would have the most power?
    a) A study with 25 in the experimental group and 25 in the control group
    b) A study with 10 in the experimental group and 40 in the control group
    c) A study with 40 in the experimental group and 10 in the control group
    d) All would have the same power. (Power depends on the total number of participants. How they are divided between groups makes no difference.)

20. A research article presented the results of an analysis of variance as "$F(2,38) = 3.60$, $p < .05$." How many groups were there in the study?
    a) 3 b) 41 c) 2 d) 40

21. A researcher studies the effect of three different teaching programs on students' learning. In analyzing the results, the researcher wants to eliminate the effect of initial differences in learning ability among the students. What procedure should the researcher use?
    a) Analysis of covariance (ANCOVA)
    b) Test-retest reliability
    c) Multivariate analysis of variance (MANOVA)
    d) Analysis of variance (ANOVA)

22. A researcher wants to know the correlation between product recognition and television advertising. The researcher also wants to know how much is added by adding print advertising to the correlation. What procedure should be used?
    a) Factor analysis
    b) Stepwise multiple regression
    c) Multivariate analysis of variance (MANOVA)
    d) Hierarchical multiple regression

23. In a chi-square test of independence, the term "expected frequency" generally refers to
    a) the distribution of people over categories on the measured variables under the assumption of equal numbers of people in all cells.
    b) the spread of the independent variable, to see if it is a truly <u>independent</u> variable.
    c) the expected distribution of people over categories on one variable if the distribution of people over categories on the other variable is completely unrelated to it.
    d) the population's distribution of the scores on the dependent variable, as estimated by the sample data.

24. A researcher wants to determine which of several predictor variables has the highest correlation with the criterion variable; then which of the remaining predictor variables when added to that first predictor variable creates the best overall prediction; then which of the still remaining predictor variables...etc.- continuing this process until either no predictor variables are left or adding the best remaining variable does not make a significant addition. The process to use is called
    a) stepwise multiple regression.
    b) factor analysis.
    c) hierarchical multiple regression.
    d) path analysis.

25. A sample that comes from a normally distributed population
    a) is often approximately normally distributed
    b) is never approximately normally distributed.
    c) is always approximately normally distributed.
    d) might have more members than the population.

Part II – Hypothesis testing: 40 questions

• assume $\alpha = .05$ unless otherwise indicated

For questions 26 – 31, assume the following scenario: A sociologist interested in cultural differences compared women of two ethnic groups on a Role Approval Index (high scores mean high degrees of approval of one's social role). The results were as follows:

Ethnic Group A: $N = 15$, $M = 55$, $s^2 = 6.5$

Ethnic Group B: $N = 23$, $M = 51$, $s^2 = 4.5$

26. What is the null hypothesis in this research?
    a) $\mu_A - \mu_B = 0$ c) $\mu_A - \mu_B < 0$
    b) $\mu_A - \mu_B \neq 0$ d) $\mu_A - \mu_B > 0$

27. What is the research hypothesis in this research?
    a) $\mu_A - \mu_B = 0$ c) $\mu_A - \mu_B < 0$
    b) $\mu_A - \mu_B \neq 0$ d) $\mu_A - \mu_B > 0$

28. If the standard deviation of the distribution of the difference between means is .76, what is the *t* score?
    a) [(6.5 + 4.5)/2][.76] = 4.18 c) (.76)(15 - 23) = -8.00
    b) (15 - 23)/.76 = -10.53 d) (55 - 51)/.76 = 5.26

29. If you conduct a *t* test for independent means, how many degrees of freedom are there in the *t* distribution?
    a) 15 + 23 = 38 c) (15 - 1) + (23 - 1) = 36
    b) (15 + 23) - 1 = 37 d) (15 + 23)/2 = 19

30. What is the pooled estimate of the population variance?
    a) [(14/36)(6.5)] + [(22/36)(4.5)] = 5.28 c) [(15/23)(6.5)] + [(23/15)(4.5)] = 11.14
    b) [(15/38)(6.5)] + [(23/38)(4.5)] = 5.29 d) [(14/22)(6.5)] + [(22/14)(4.5)] = 11.21

31. Can the researcher reject the null hypothesis?
    a) yes b) no

For questions 32 – 40, assume the following scenario: A psychologist tested 20 volunteers on the effect of a memory enhancement drug. Four groups were evaluated based on drug dosage: no drug (control), 1 ml dose, 2 ml dose, and 3 ml dose. The results were analyzed using an ANOVA. Supply the missing values in the ANOVA summary table below. Note that the order of the questions does not necessarily correspond to the order in which the values can be calculated. The numbers in parentheses correspond to question numbers.

Source	SS	df	MS	F	p (probability)
Between treatments	(32)	(33)	(34)	(35)	(36)
Within treatments	64	(37)	(38)		
Total	349	(39)			

32. a) 32 b) 413 c) 285 d) 302

33. a) 2 b) 3 c) 4 d) 5

34. a) 20 b) 95 c) 74 d) 34

35. a) 25.81 b) 33.34 c) 38.45 d) 23.75

36. a) $p < 0.05$ b) ns

37. a) 10 b) 16 c) 20 d) 18

38. a) 4 b) 16 c) 38 d) 19

39. a) 20 b) 21 c) 19 d) 16

40. The critical value of F is
    a) 33.34 b) 2.85 c) 5.01 d) 3.24

For questions 41 – 51, assume the following scenario: An industrial psychologist examined levels of absenteeism (measured in terms of days absent per year) of 14 workers in three different work environments: morning shift, afternoon shift, & night shift. The results of the study are summarized below:

	Morning shift	Afternoon shift	Night shift
	3	6	5
	4	4	6
	3	5	4
	5	4	3
	7		5
M =	4.40	4.75	4.60
s =	1.67	0.96	1.14

41. What is the SS_{total}?
    a) 17.34 c) 23.54
    b) 33.12 d) 19.43

42. What is the $SS_{between}$?
    a) 0.279 c) 17.34
    b) 11.41 d) 5.33

43. What is the SS_{within}?
    a) 2.12 c) 19.15
    b) 4.17 d) 25.56

44. What is the $df_{between}$?
    a) 4 c) 2
    b) 3 d) 1

45. What is the df_{within}?
    a) 14 c) 13
    b) 12 d) 11

46. What is the critical value?
    a) 3.98 c) 7.21
    b) 3.81 d) 2.86

47. What is the $MS_{between}$?
    a) 0.299 c) 12.34
    b) 5.43 d) 0.139

48. What is the MS_{within}?
    a) 1.74 c) 7.32
    b) 4.78 d) 2.91

49. What is the $F_{obtained}$?
    a) 14.12 c) 1.24
    b) 0.80 d) 3.92

50. Can the psychologist reject the null hypothesis?
    a) yes b) no

51. If you calculated the HSD value (q = 3.82), it would be
    a) 0.23 c) 2.53
    b) 1.88 d) 0.12

For questions 52 – 56, assume the following scenario: A researcher wanted to know if the respondents in his survey were representative of the distribution of registered voters according to different locations in an urban area. He surveyed 200 individuals and asked each whether they lived in the north, central, or southern part of the area. According to census data, 40% of the area residents lived in the northern part of the area, 35% in the central area, and 25% in the southern area. 75 of the respondents indicated they lived in the northern area, 65 lived in the central area, and 60 lived in the southern area. Was the researcher's sample geographically representative of the local area?

52. What is the null hypothesis in this research?
    a) $\mu_{\text{census distribution}} - \mu_{\text{respondents distribution}} = 0$
    b) $\mu_{\text{census distribution}} - \mu_{\text{respondents distribution}} \neq 0$
    c) the geographical distribution of respondents is representative of the census data
    d) the geographical distribution of respondents is not representative of the census data

53. What is the research hypothesis in this research?
    a) $\mu_{\text{census distribution}} - \mu_{\text{respondents distribution}} = 0$
    b) $\mu_{\text{census distribution}} - \mu_{\text{respondents distribution}} \neq 0$
    c) the geographical distribution of respondents is representative of the census data
    d) the geographical distribution of respondents is not representative of the census data

54. What is the critical value for rejecting the null hypothesis?
    a) 5.99 c) 7.82
    b) 3.84 d) 6.252

55. What is the value of the test statistic?
    a) 1.33 c) 7.82
    b) 3.84 d) 2.67

56. Can the null hypothesis be rejected?
    a) yes b) no

For questions 57 – 61, assume the following scenario: A researcher is interested in whether there is any association between gender and perception of movie plots. A movie that contains both action and love themes is shown to a group of 150 participants, with the following results:

		Perception of movie plot	
		Love	Action
Gender	Female	60	45
	Male	15	30

57. What is the null hypothesis in this research?
    a) $\mu_{\text{love plot}} - \mu_{\text{action plot}} = 0$
    b) $\mu_{\text{love plot}} - \mu_{\text{action plot}} \neq 0$
    c) the perception of movie plots depends on gender
    d) the perception of movie plots is independent of gender

58. What is the research hypothesis in this research?
    a) $\mu_{\text{love plot}} - \mu_{\text{action plot}} = 0$
    b) $\mu_{\text{love plot}} - \mu_{\text{action plot}} \neq 0$
    c) the perception of movie plots depends on gender
    d) the perception of movie plots is independent of gender

59. What is the critical value for rejecting the null hypothesis?
    a) 5.99 c) 7.82
    b) 3.84 d) 6.252

60. What is the value of the test statistic?
    a) 0.73 c) 7.14
    b) 20.44 d) 5.23

61. Can the null hypothesis be rejected?
    a) yes b) no

For questions 62 – 65, assume the following scenario: A person tosses a coin 300 times (he had nothing better to do…) and came up with 170 heads. He thought his coin was biased. Evaluate whether the coin was biased.

62. What is the null hypothesis in this scenario?
    a) $\mu_{heads} - \mu_{tails} = 0$
    b) $\mu_{heads} - \mu_{tails} \neq 0$
    c) the number of heads is no different from chance
    d) the number of heads is different from chance

63. What is the critical value for rejecting the null hypothesis?
    a) 5.99 c) 7.82
    b) 3.84 d) 6.22

64. What is the value of the test statistic?
    a) 5.45 c) 7.96
    b) 9.77 d) 5.34

65. Can the null hypothesis be rejected?
    a) yes b) no

Part III – Statistical test identification (10 questions)

Instructions

• indicate the most appropriate statistical test for each of the following situations. Be as specific as possible (e.g., differentiate between a single sample, related sample or independent sample t-test, or 1-way independent groups, 2-way mixed ANOVA, 1-way repeated measures ANOVA, etc.). It is possible that more than procedure may be appropriate in at least one question.

66. An audiologist wanted to know if a new noise reduction system was effective in hearing aids. She tested two groups of participants (moderate & severe hearing loss) in four noise conditions (no noise, low, moderate, & high noise), with the noise reduction system activated and with the system deactivated.
    a) 4 X 2 repeated measures ANOVA
    b) 4 X 2 independent groups ANOVA
    c) 2 X 4 X 2 repeated measures ANOVA
    d) 2 X 4 X 2 mixed ANOVA

67. A musicologist was curious about which of the Beatles was most popular. He asked 87 participants "Who is your favourite Beatle?". 32 participants voted for John, 31 for Paul, 14 for George, and 10 for Ringo.
    a) 1-way independent groups ANOVA
    b) χ^2 goodness of fit test
    c) bivariate correlation
    d) bivariate regression

68. Social psychology theory suggests that situational variables dominate personality variables. A researcher decided to test the theory by testing participants who were classified as introverts and extraverts. Each group was broken into two subgroups, one in which participants filled out a questionnaire in a quiet room, and the other in which participants began filling out a questionnaire but were interrupted by the smell of smoke and hearing a fire alarm. The dependent variable was the number of utterances produced by the participants in each situation.
    a) 1-way independent groups ANOVA
    b) χ^2 goodness of fit test
    c) χ^2 test of independence
    d) 2 X 2 independent groups ANOVA

69. A psycholinguist wanted to test the hypothesis that people who use the word "like" a lot do not use other "filler" words, like "um". She randomly selected 25 participants and counted the number of times each person said "like" and other filler words, such as "um".
    a) independent samples t-test
    b) χ^2 goodness of fit test
    c) bivariate correlation
    d) related samples t-test

70. Some researchers have argued that listening to an excerpt of classical music can enhance performance on spatial tasks for a brief period afterwards. To test this hypothesis, a psychologist played a short piece of Mozart to one group of listeners and a mellow Led Zeppelin concerto to another group of listeners as a control condition. Both groups completed a spatial task prior to listening to the music and again after listening to the music.
    a) 2 X 2 mixed ANOVA
    b) related samples t-test
    c) χ^2 test of independence
    d) bivariate correlation

71. An aviation psychologist wanted to know if a new cockpit display was easier to read than an existing display. Long-term data from testing many users of the existing display showed an average of 3.56 errors per 24-hour period of use ($\sigma = 0.34$). She tested a sample of users with the new display and found an average of 2.97 errors.
    a) related samples t-test
    b) Z-test
    c) bivariate regression
    d) single sample t-test

72. An educational psychologist tracked the reading performance of 60 children as they moved from 9th grade through 12th grade. She used scores on a standardized reading test to see if reading ability improved during secondary education.
    a) 1-way repeated groups ANOVA
    b) 1-way independent groups ANOVA
    c) χ^2 goodness of fit test
    d) bivariate correlaton

73. Some listeners argue that music encoded in MP3 format is indistinguishable from music in CD format when played in noisy environments. A psychophysicist tests a group of listeners in which half are presented music encoded in MP3 format and the other half are presented the same music in CD format. Both groups are tested with the music presented in the same level of background noise. He measures an overall quality rating for each listener on a scale from 1 – 7, where 1 is "poor" and 7 is "excellent".
    a) 1-way independent groups ANOVA
    b) independent groups t-test
    c) χ^2 test of independence
    d) 2 X 2 independent groups ANOVA

74. An industrial psychologist wanted to know if playing fast-tempo background music would enhance office productivity in the late afternoon when people typically complain of fatigue. She selected two different but comparable locations within the same company and played fast tempo music in one location during the afternoon and slow-tempo music in the other location. The music was played for three hours from 1:00 PM to 4:00 PM for seven consecutive weeks. She measured productivity at the end of seven-week period by counting the reports completed at each location during week number 7.
    a) 1-way independent groups ANOVA
    b) independent groups t-test
    c) χ^2 test of independence
    d) bivariate regression

75. A psychologist wanted to see if individuals who continue to participate in social activities as they age are more satisfied with their lives than individuals who are not socially active. He selected 30 70-year-olds and divided them into two groups, High Social Activity and Low Social Activity, based on scores they obtained from a Life Satisfaction questionnaire. The participants were matched in terms of IQ, general health, and socio-economic status.
    a) 1-way independent groups ANOVA
    b) χ^2 goodness of fit test
    c) related samples t-test
    d) independent samples t-test