

Be sure to use your *real* student ID# (I have it on the class list if you don't know yours), because I won't be able to check with you about what identifier you were using. Work through the exam carefully, but with some speed. I will collect all the exams after 3 hours. As before, I think of a point as a minute, so don't spend more than 10 minutes on a 10-pt question, or you may not complete the exam. If you spot a design flaw with a study, be sure to note it. Thanks for all your efforts in the course. Have a wonderful and peace-filled vacation. See you in 2000.

1. Dr. June Bugg was interested in examining the extent to which a person's attention is captured by a problem. She sets up her experiment on the computer so that the participant is presented with a series of problems, one at a time. Participants are told to solve as many problems as they can within a 10-minute period. At the same time, participants are told that when a small dot appears in the bottom left corner of the computer screen, they should hit the space bar. The experiment lasts about an hour, with 5 different types of problems that vary in difficulty (Very Easy, Easy, Moderate, Difficult, and Very Difficult). Dr. Bugg wants to "warm up" the participants for the Very Difficult problems, so she runs every participant through the Very Easy problems first (for 10 minutes), then through the Easy problems (for the next 10 minutes), then through the Moderate problems (10 minutes), then through the Difficult problems (10 minutes), and finally through the Very Difficult problems (10 minutes). [Obviously, in a 10-minute interval people will solve more easy problems than difficult problems, but that's not the dependent variable.] At 10 random times within each 10-minute period, a dot appears in the bottom left corner of the screen. The dependent variable in this experiment is the number of times that the participant detects the dot at the bottom of the screen. Dr. Bugg reasons that as tasks become more difficult, the participant's attention will be more absorbed by the problem, leading the participant to miss the appearance of the dot. Below is a partially completed source table for this experiment. Complete the table and interpret the results as completely as you can. [20 pts]

ANOVA Table for Task Difficulty

	DF	Sum of Squares	Mean Square	F-Value	P-Value	Lambda	Power
Subject		20.7					
Category for Task Difficulty		145.5			<.0001	353.702	1.000
Category for Task Difficulty * Subject		18.1					

Means Table for Task Difficulty

Effect: Category for Task Difficulty

	Count	Mean	Std. Dev.	Std. Err.
Very Easy	12	9.333	.778	.225
Easy	12	9.083	.669	.193
Moderate	12	8.250	.622	.179
Difficult	12	7.500	.522	.151
Very Difficult	12	5.000	1.348	.389

2. Professor Ty Knott was interested in the relationship between the longevity of divorced women's marriages and the longevity of their divorced parent's marriages. To that end, he collected a sample of 25 divorced women whose parents had also been divorced. The StatView analysis of the data is seen below. Interpret these data as completely as you can. If a woman's parents had been married for 10 years prior to their divorce, how long would you predict that the woman's marriage would last before a divorce? If a woman's parents had never been divorced, what prediction could you make about the length of time before the woman's marriage might end in divorce? [10 pts]

Regression Summary

Yrs. Person Married vs. Yrs. Parents Married

Count	25
Num. Missing	0
R	.852
R Squared	.726
Adjusted R Squared	.714
RMS Residual	1.510

ANOVA Table

Yrs. Person Married vs. Yrs. Parents Married

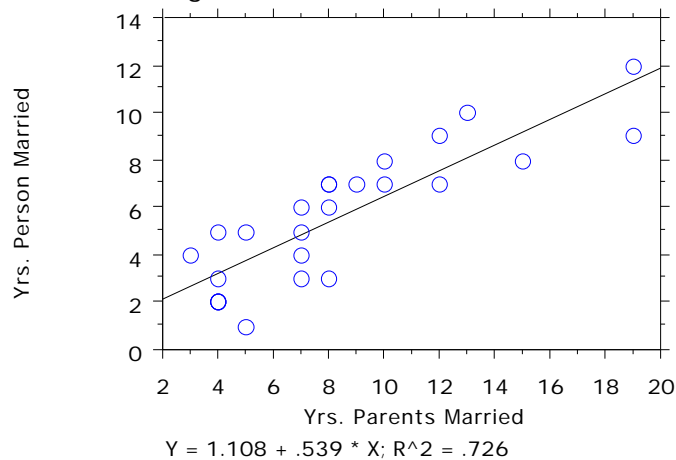
	DF	Sum of Squares	Mean Square	F-Value	P-Value
Regression	1	139.013	139.013	60.985	<.0001
Residual	23	52.427	2.279		
Total	24	191.440			

Regression Coefficients

Yrs. Person Married vs. Yrs. Parents Married

	Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value
Intercept	1.108	.659	1.108	1.682	.1061
Yrs. Parents Married	.539	.069	.852	7.809	<.0001

Regression Plot



3. Hess has done work that suggests that (eye) pupil size is affected by emotional arousal. In order to ascertain if the type of arousal makes a difference, Dr. Bo Ring decides to measure pupil size under three different arousal conditions (Neutral, Pleasant, Aversive). Participants look at pictures that differ according to the condition (neutral = plain brick building, pleasant = young man and woman sharing an ice cream cone, aversive = graphic photograph of an automobile accident). The pupil size after viewing each photograph is measured in millimeters. The data are seen below:

	<u>Neutral</u>	<u>Pleasant</u>	<u>Aversive</u>
	4	8	3
	3	7	7
	2	7	3
	3	8	4
	3	6	7
	5	7	4
	4	8	4
	3	7	6
	5	6	5
	2	7	6
Sum	34	71	49
SS	10.4	4.9	20.9

a. Due to miscommunication between Dr. Ring and her research assistant Igor, she has no idea if the study was run as an independent groups design or as a repeated measures design. Igor has left the lab in a cloud of controversy amidst a whole range of allegations (involving improper use of lab alcohol, monkeys, and videotapes, but that's another story entirely). With no immediate hope of clarifying the way in which the data were collected, Dr. Ring decides that the most reasonable strategy would be to analyze the data as an independent groups design. Her logic should make sense to you, so explain to me why she would be smart to analyze the data as though they were collected in an independent groups design. [5 pts]

b. OK, Dr. Ring asks you to please analyze the data as though they were collected in an independent groups design. Please do so now, analyzing and interpreting the data as completely as you can. [25 pts]

c. As you noodle around the lab, having completed the analyses that Dr. Ring wanted, you stumble across the original data from the study and realize that Igor had actually run the study as a repeated measures design. Now that you know that the data were collected as a repeated measures design, you re-compute the analyses appropriately, using StatView. [Notice that the means, etc., aren't displayed below, because they would not change from the earlier analysis, right? Note, also, that other parts of the source table don't change as you move to a repeated measures analysis.] Once again, analyze these data as completely as you can. Given what you know about the relationship between independent groups analyses and repeated measures analyses, the results might surprise you somewhat. However, you can readily explain the anomaly, right? [10 pts]

ANOVA Table for Arousal

	DF	Sum of Squares	Mean Square	F-Value	P-Value	Lambda	Power
Subject	9	5.467	.607				
Category for Arousal	2	69.267	34.633	20.284	<.0001	40.568	1.000
Category for Arousal * Subject	18	30.733	1.707				

4. Several researchers have investigated the encoding specificity effect. The general finding is that people remember best when the testing situation is as similar as possible to the learning situation. (Thus, because the typical testing situation is a relatively quiet classroom, you'd best study/learn under conditions as similar to the testing situation as possible.) Dr. Julie Ard was interested in the effects of music on studying, as well as the encoding specificity effect. That is, she was interested in the extent to which the similarity of the study and test situations affected performance. To test her hypotheses, she used five acquisition conditions (studying while listening to: heavy metal, rock, classical, jazz, or blues). People in these groups studied written material while listening to a particular type of music. After a brief delay, half of the people in each condition were tested under identical music (same) and half of the people were tested with no music (different). The dependent variable was the percentage score on the test (100 = perfect performance). Complete the analysis and interpret the results below as completely as possible. [20 pts.]

ANOVA Table for Score

	DF	Sum of Squares	Mean Square	F-Value	P-Value	Lambda	Power
Music		1738.900			<.0001	322.682	1.000
Test		529.000			<.0001	98.165	1.000
Music * Test		207.100			<.0001	38.431	1.000
Residual		485.000					

Means Table for Score
Effect: Music * Test

	Count	Mean	Std. Dev.	Std. Err.
Blues, Different	10	82.700	1.252	.396
Blues, Same	10	88.100	2.132	.674
Classical, Different	10	88.300	3.529	1.116
Classical, Same	10	94.800	2.150	.680
Heavy Metal, Different	10	79.200	3.011	.952
Heavy Metal, Same	10	80.200	2.394	.757
Jazz, Different	10	85.800	3.048	.964
Jazz, Same	10	94.300	1.889	.597
Rock, Different	10	84.500	1.179	.373
Rock, Same	10	86.100	1.287	.407

5. Dr. Mai Ayes was interested in studying the effects of task difficulty and sleep deprivation on performance, using a completely between (independent groups) design. The amounts of sleep deprivation that she decided to use are: 24, 36, 48, 60, and 72 hours. That is, participants were awake without sleep for one of those periods before being tested on either an easy, a moderate, or a difficult task. She measured performance on a 9-point scale (1 = lousy performance <-> 9 = excellent performance). Analyze these data as completely as you can. [20 pts]

ANOVA Table for Score

	DF	Sum of Squares	Mean Square	F-Value	P-Value	Lambda	Power
Hours Deprived	4	65.813	16.453	43.298	<.0001	173.193	1.000
Task Difficulty	2	120.027	60.013	157.930	<.0001	315.860	1.000
Hours Deprived * Task Difficulty	8	.107	.013	.035	>.9999	.281	.058
Residual	60	22.800	.380				

Means Table for Score

Effect: Hours Deprived * Task Difficulty

	Count	Mean	Std. Dev.	Std. Err.
24 Hours, Difficult	5	4.000	.707	.316
24 Hours, Easy	5	7.200	.447	.200
24 Hours, Moderate	5	6.200	.447	.200
36 Hours, Difficult	5	2.600	.548	.245
36 Hours, Easy	5	5.600	.548	.245
36 Hours, Moderate	5	4.600	.548	.245
48 Hours, Difficult	5	2.600	.548	.245
48 Hours, Easy	5	5.600	.548	.245
48 Hours, Moderate	5	4.600	.548	.245
60 Hours, Difficult	5	1.800	.837	.374
60 Hours, Easy	5	4.800	.837	.374
60 Hours, Moderate	5	3.800	.837	.374
72 Hours, Difficult	5	1.400	.548	.245
72 Hours, Easy	5	4.400	.548	.245
72 Hours, Moderate	5	3.400	.548	.245

6. [10 pts]

a. What is the general definition of a standard score?

b. How does a t differ from a z ?

c. What is the purpose (use for) a z -score?

d. What role does a z -score play in a correlation coefficient?

e. What is the relationship between a t and an F ?

f. Increasing power would do what to a t score? Why?

g. What is the impact on r of adding a constant to each score in the analysis?

7. On a standardized spatial skills task, normative data reveal that people typically get $\mu = 15$ correct solutions. A psychologist tests $n = 7$ individuals who have brain injuries in the right cerebral hemisphere. For the following data, determine whether or not right-hemisphere damage results in significantly reduced performance on the spatial skills task. [10 pts]

Participant 1	12
Participant 2	16
Participant 3	09
Participant 4	08
Participant 5	10
Participant 6	17
Participant 7	10

8. A psychologist suspects that LSD affects the speech center in the brain. Specifically, he believes that repeated use of LSD reduces a person's ability to retrieve verbal information. To see if he can obtain any evidence regarding the relationship between LSD and retrieval of verbal information, the psychologist advertises for people who have taken LSD at least once. Nine people of comparable IQ and education are selected from the applicants. All participants are given a 50-item test. Each item consists of a definition of a low-frequency English word; the participant's task is to produce the target word. Sample items might be:

<u>Definition</u>	<u>Target Word</u>
To make things thinner or weaker by the addition of water	dilute
Patronage bestowed in consideration of family relationship and not merit	nepotism

Here are the relevant data. Analyze these data as completely as you can. [20 pts]

	Number of reported LSD trips	Number of failures to produce the target word (errors)
Participant 1	2	2
Participant 2	3	2
Participant 3	1	2
Participant 4	2	0
Participant 5	10	13
Participant 6	1	2
Participant 7	3	1
Participant 8	3	4
Participant 9	2	3
Sum	27	29
SS	60	117.56