NAME: ..... YOU MUST RETURN YOUR COPY OF THIS EXAM WITH YOUR NAME ON IT.
(100 points are possible. Points are shown in parentheses.)

1) Suppose you have developed a new training program (Stress Handler) for elite athletes based on your study of psychology. You believe that the psychological principles underlying your program will make athletes who use the program able to perform better under stress than athletes receiving training programs (Normal Training) overall. Consequently you think that the effects of your new Stress Handler program will not show up in Practice where stress if low but rather during Competition when stress is high.

You randomly assign two groups to Stress Handler or to Normal-Train training programs. Both groups receive two months of training (either with Stress Handler or with Normal Training). Then you randomly assign half of each training group to be tested either during their next Practice or during their next Competition. You expect that all athletes will perform better in competition than in practice, but the hypothesis of real interest in the study is that the effectiveness of Type of Training (Stress Handler versus Normal Training) will depend upon Context (Practice versus Competition). Specifically, you hypothesize that Stress Handler will produce superior performance during competition but not during practice.

Your study has two IV's: Type of Training (IV1) and Context (IV2). The DV is a measure of performance (with higher scores indicating better performance). Type of Training has two levels–Stress Handler and Normal Training. Context has two levels–Practice and Competition. A table of means is given below: Higher scores indicate better outcome for the athlete.

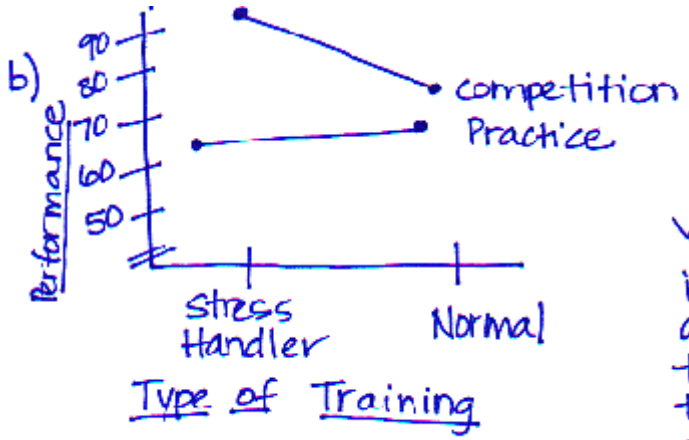
	Type of Training	
Context	Stress Handler	Normal Training
Practice	66	67
Competition	92	74

A) (15 points) **Hypothesis**: Write out the verbal definition of an interaction. In terms of that definition, tell how your scientific hypothesis is an interaction hypothesis.

a) verbal definition of an interaction: Two independent variables, IV1 & IV2, are said to interact if the effect of IV1 upon the dependent variable depends on the level of IV2.

The effect of training type on performance depends on the level of context - practice vs. competition.

B) (15 points) **Results**: Draw a graph of the results (the four cell means). Tell how the results (that is, the graph) tell you that there is or is not an interaction. That is, do the results support your interaction hypothesis?



Yes, there is an interaction. The lines are not parallel indicating that the effect of training type on performance depends on the context.

2) The following set of scores were sampled from a Normal Distribution:

7, 4, 5, 4, 1, 9, 3, 2, 9, 0

A. (5) Find the mean and the mode of the sample.

a) $M = \frac{44}{10} = 4.4$

Mode = 4, 9

B. (10) Find the range, variance, and standard deviation of the sample.

b) Range = $9 - 0 = 9$

$$\text{Variance} = \frac{\Sigma (X_i - M)^2}{n} = S^2$$

$(7 - 4.4)^2 = 6.76$
$(4 - 4.4)^2 = .16$
$(5 - 4.4)^2 = .36$
$(4 - 4.4)^2 = .16$
$(1 - 4.4)^2 = 11.56$
$(9 - 4.4)^2 = 21.16$
$(3 - 4.4)^2 = 1.96$
$(2 - 4.4)^2 = 5.76$
$(9 - 4.4)^2 = 21.16$
$(0 - 4.4)^2 = 19.36$

$\Sigma = 88.4$

$$\text{Variance} = \frac{88.4}{10} = 8.84$$

$$\text{Standard deviation} = \sqrt{S^2} = \sqrt{8.84} = 2.97$$

C. (15) Given that the POPULATION from which the scores were sampled is a Normal Population with unknown ? and ? , estimate ? and ? from the sample data. Estimate the standard error of the mean (SEM).

c) $\mu = 4.4 = M$

$$\sigma = s\sqrt{\frac{n}{n-1}} = 2.97\sqrt{\frac{10}{9}} = 3.13$$

$$SEM = \frac{\sigma}{\sqrt{n}} = \frac{3.13}{\sqrt{10}} = .99$$

D. (10) This question has only to do with samples (not populations, do not use population parameters). What is the z score of a raw score of 2?

d) $Z = \frac{X - M}{SD} = \frac{2 - 4.4}{2.97} = \frac{-2.4}{2.97} = -.8080$

3) A simple correlational study with 25 participants (N = 25) examined the relationship between two variables, X and Y. The Mean of X was 23.5 and the Mean of Y was 10. The Standard Deviation (S) of X was 6 and the Standard Deviation of Y was 3. The correlation ($\mathbf{r_{xy}}$) between X and Y was .66.

A. (10) Find (and write out clearly) the **regression equation** for predicting Y from X.

a) $\hat{Y} = a_y + b_y X$

$b_y = r_{xy}\left(\frac{S_y}{S_x}\right) = .66\left(\frac{3}{6}\right) = .33$

$a_y = M_y - b_y M_x = 10 - (.33)(23.5) = 2.245$

$\hat{Y} = 2.245 + .33X$

B. (10) Find the prediction **error variance**. (The formula for this is simple; remember the difference between standard deviation and variance.)

b) error variance $= (1 - r^2)(S_y^2) = [1 - (.66)^2][3^2] = (.56)(9) = 5.0796$

C. (10) What **proportion of the variance** in Y is accounted for by X?

c) $r^2 = (.66)^2 = .4356$