STATISTICS

SECTION II

Part A

Questions 1-5

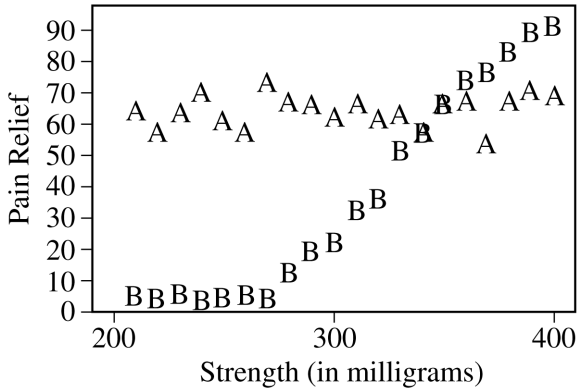
Spend about 65 minutes on this part of the exam.

Percent of Section II grade—75

Show all your work. Indicate clearly the methods you use, because you will be graded on the correctness of your methods as well as on the accuracy of your results and explanation.

1. Two pain relievers, A and B, are being compared for relief of postsurgical pain. Twenty different strengths (doses in milligrams) of each drug were tested. Eight hundred postsurgical patients were randomly divided into 40 different groups. Twenty groups were given drug A. Each group was given a different strength. Similarly, the other twenty groups were given different strengths of drug B. Strengths used ranged from 210 to 400 milligrams. Thirty minutes after receiving the drug, each patient was asked to describe his or her pain relief on a scale of 0 (no decrease in pain) to 100 (pain totally gone).

   The strength of the drug given in milligrams and the average pain rating for each group are shown in the scatterplot below. Drug A is indicated with A's and drug B with B's.



(a) Based on the scatterplot, describe the effect of drug A and how it is related to strength in milligrams.

(b) Based on the scatterplot, describe the effect of drug B and how it is related to strength in milligrams.

(c) Which drug would you give and at what strength, if the goal is to get pain relief of at least 50 at the lowest possible strength? Justify your answer based on the scatterplot.

2. Anthropologists have discovered a prehistoric cave dwelling that contains a large number of adult human footprints. To study the size of the adults who used the cave dwelling, they randomly selected 20 of the footprints from the population of all footprints in the cave and measured the length of those footprints. Some statistics resulting from this random sample are as follows.

Sample size	20	Minimum	15.2 cm
Mean	24.8 cm	First quartile	18.7 cm
Standard deviation	7.5 cm	Median	21.5 cm
		Third quartile	30.0 cm
		Maximum	37.0 cm

The anthropologists would like to construct a 95 percent confidence interval for the mean foot length of the adults who used the cave dwelling.

(a) What assumptions are necessary in order for this confidence interval to be appropriate?

(b) Discuss whether each of the assumptions listed in your response to (a) appears to be satisfied in this situation.

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Question 1

Solution

a. Drug A produced average pain relief in the 55-70 range (or averaging approximately 65) for strengths between 210 and 400. Pain relief doesn't appear to depend on strength over the range 210 to 400.

b. Drug B didn't produce much (if any) pain relief for strengths less than about 270. For strengths between 270 and 400, pain relief increased steadily with dosage.

c. Drug A at strength 210: Choose drug A because the pain relief is about 65 (or in the 55 - 70 range) for all dosage levels whereas drug B needs to be given at 330 mg or higher to achieve pain relief of at least 50. Since the lowest dosage of drug A tested was 210 and all levels are about equally effective, prescribe 210 mg.

Scoring

Part (a) is

Essentially correct if	the answer includes **both** a statement that the pain relief is in the 55-70 range (or approximately 65) **and** that pain relief doesn't depend on strength.
Partially correct if	the answer includes only one of the two required statements.

Part (b) is

Essentially correct if	the answer includes **both** a statement that there is no pain relief for strengths below approximately 270 **and** that pain relief increases with strength above 270.
Partially correct if	the answer includes only one of the two required statements.