

2000 AP® STATISTICS FREE-RESPONSE QUESTIONS

5. High cholesterol level in people can be reduced by exercise or by drug treatment. A pharmaceutical company has developed a new cholesterol-reducing drug. Researchers would like to compare its effects to the effects of the cholesterol-reducing drug that is currently available on the market. Volunteers who have a history of high cholesterol and who are currently not on medication will be recruited to participate in a study.

(a) Explain how you would carry out a completely randomized experiment for the study.

(b) Describe an experimental design that would improve the design in (a) by incorporating blocking.

(c) Can the experimental design in (b) be carried out in a double blind manner? Explain.

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STATISTICS

SECTION II

Part B

Question 6

Spend about 25 minutes on this part of the exam.

Percent of Section II grade—25

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.

6. A random sample of 400 married couples was selected from a large population of married couples.

- Heights of married men are approximately normally distributed with mean 70 inches and standard deviation 3 inches.
 - Heights of married women are approximately normally distributed with mean 65 inches and standard deviation 2.5 inches.
 - There were 20 couples in which the wife was taller than her husband, and there were 380 couples in which the wife was shorter than her husband.
- (a) Find a 95 percent confidence interval for the proportion of married couples in the population for which the wife is taller than her husband. Interpret your interval in the context of this question.

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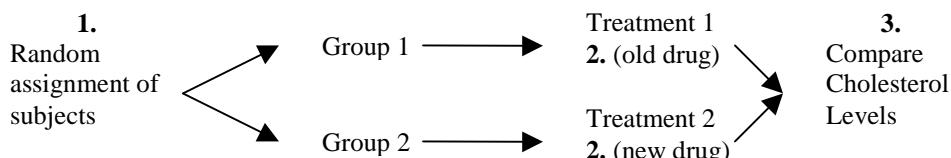
Question 5

Solution

- (a) Describes an experimental design that includes:
1. Random assignment of volunteers to the treatment groups
 2. Identification of treatment groups as old drug and new drug
 3. Indication that a comparison or measurement of cholesterol levels should be made

OR

The student may give a detailed diagram that addresses the three parts:



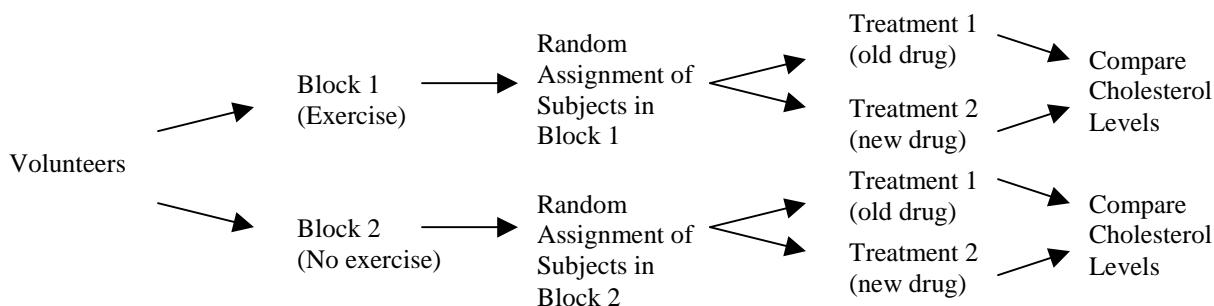
Note: In part (a), it is incorrect to use the terminology “treatment” and “placebo” for the treatment groups. It is considered correct to use “old drug” and “new drug”, and “placebo,” if a third group is used, for the treatment groups.

- (b) Describes an experimental design that includes:

1. Creating blocks based on level of exercise or cholesterol level, or creating blocks using age, diet, gender, or any other factor plausibly related to cholesterol level **with explanation** (i.e., block on gender because males and females may respond differently)
2. Random assignment of subjects to treatments within blocks

OR

The student may give a detailed diagram that addresses the two parts as long as the blocking factor is described.



Note: No credit will be given in part (b) if a student does not use blocking in his/her design even though they randomize correctly.

Note: Crossover designs or matched-pairs designs that incorporate the idea of blocking are acceptable.

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- (c) Clearly explains a double blind experiment—neither the subjects nor those administering the drugs or monitoring results know which of the two drugs is being used.

An answer of yes without explanation receives no credit.

An answer of no could receive credit if the design described in part (b) does not allow for double-blinding.

Scoring:

- Parts (a) and (b) will be scored as either essentially correct (**E**), partially correct (**P**), or incorrect (**I**).
- Part (c) will be scored as either essentially correct (**E**) or incorrect (**I**).

Part (a) is:

Essentially correct if all three of the criteria are met

Partially correct if two of the three of the criteria are met

Incorrect if one or none of the three criteria are met

Part (b) is:

Essentially correct if the two criteria are met

Partially correct if only one of the two criteria is met, given that blocking has been indicated

Incorrect if none of the two criteria are met

Part (c) is:

Essentially correct only if the writer correctly communicates he/she knows what double blind means

Incorrect otherwise

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Scoring

4 Complete Response

Essentially correct on all three parts.

3 Substantial Response

Part (c) is essentially correct, and parts (a) and (b) have exactly one essential and one partial.

OR

Part (c) is incorrect, and parts (a) and (b) are both essentially correct.

2 Developing Response

Part (c) is essentially correct, and parts (a) and (b) have at least one partial or exactly one essential.

OR

Part (c) is incorrect, and parts (a) and (b) have exactly one essential and one partial.

1 Minimal Response

Only part (c) is essentially correct.

OR

Part (c) is incorrect and parts (a) and (b) are both partially correct or have exactly one essential.

0 No credit

Note: Only one partial in parts (a) or (b) and an incorrect in part (c) will be a 0.

Exception: If part (a) includes an excellent explanation of a detailed randomization, a student can get a 1 even if parts (b) and (c) are incorrect.