



AP[®] Statistics 2001 Sample Student Responses

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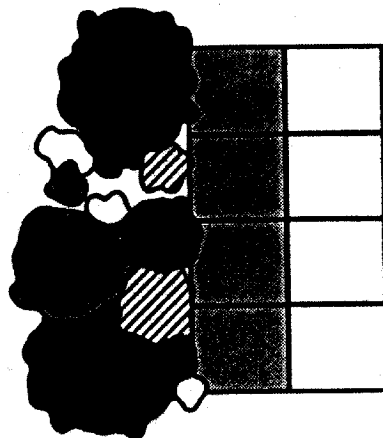
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4. Students are designing an experiment to compare the productivity of two varieties of dwarf fruit trees. The site for the experiment is a field that is bordered by a densely forested area on the west (left) side. The field has been divided into eight plots of approximately the same area. The students have decided that the test plots should be blocked. Four trees, two of each of the two varieties, will be assigned at random to the four plots within each block, with one tree planted in each plot.

The two blocking schemes shown below are under consideration. For each scheme, one block is indicated by the white region and the other block is indicated by the gray region in the figures.

Blocking Scheme A



Forest

Key

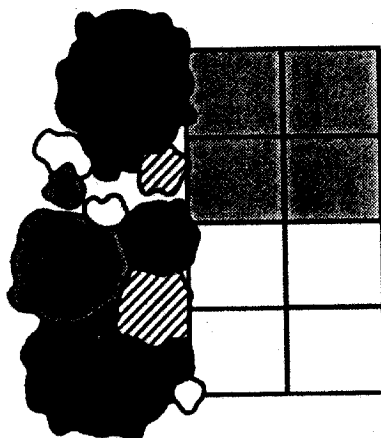


Block 1



Block 2

Blocking Scheme B



Forest

(a) Which of the blocking schemes, A or B, is better for this experiment? Explain your answer.

Blocking Scheme A is more appropriate because it provides for the samples of equal amounts of each tree type in both the forested and non-forested area. If Blocking Scheme B was used, then random assignments of trees could cause two of the same type of trees to be grown in the forested area in both blocks. If all samples of the same variety were in the forested area, then the productivity results could be based on location and not tree variety. In blocking Scheme A, two of each variety of tree would be in each landscape, allowing researchers to compare ~~the~~ the productivity of the two types of trees in both landscapes.

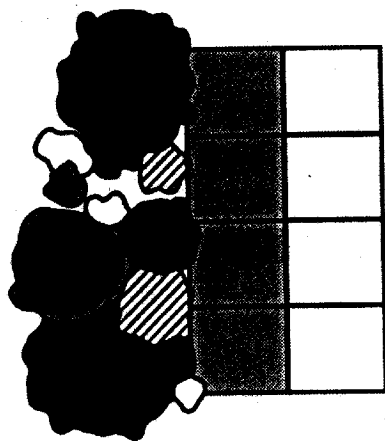
(b) Even though the students have decided to block, they must randomly assign the varieties of trees to the plots within each block. What is the purpose of this randomization in the context of this experiment?

The purpose of the randomization is to ensure that the conditions for each tree are not manipulated by the experimenter. The living conditions for each tree, except for the element of landscape (which has been blocked) must be randomized so that the results are not tainted by the grouping of ~~one~~ one variety of ~~the~~ trees. For example, if all of one variety of trees were to be planted in the top four plots, their successful growth could be based on a variety of things: more direct sunlight, better soil, better sources of water. Randomization evens out these factors and allows for the experiment to be unbiased.

4. Students are designing an experiment to compare the productivity of two varieties of dwarf fruit trees. The site for the experiment is a field that is bordered by a densely forested area on the west (left) side. The field has been divided into eight plots of approximately the same area. The students have decided that the test plots should be blocked. Four trees, two of each of the two varieties, will be assigned at random to the four plots within each block, with one tree planted in each plot.

The two blocking schemes shown below are under consideration. For each scheme, one block is indicated by the white region and the other block is indicated by the gray region in the figures.

Blocking Scheme A



Forest

Key

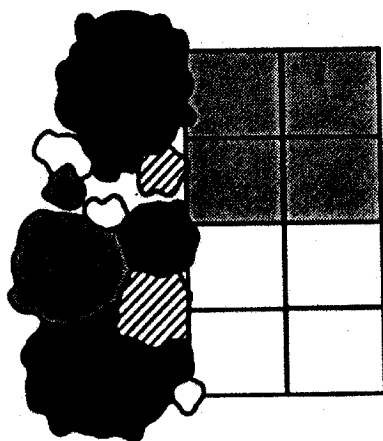


Block 1



Block 2

Blocking Scheme B



Forest

(a) Which of the blocking schemes, A or B, is better for this experiment? Explain your answer.

Scheme A is better.

In B, each block still has a clear gradient in proximity to the forest, which could act as a confounding variable

In A, all the plots in each block have essentially the same proximity to the forest, reducing the variation caused by that factor (allowing students to close in on variation caused by the difference in tree varieties)

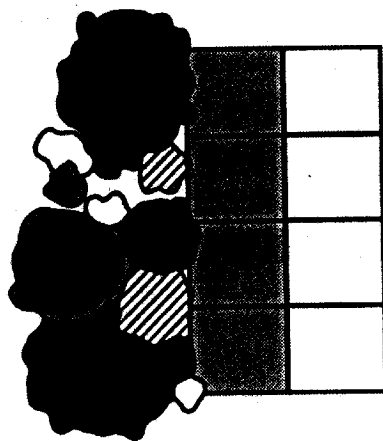
(b) Even though the students have decided to block, they must randomly assign the varieties of trees to the plots within each block. What is the purpose of this randomization in the context of this experiment?

Randomization will decrease the effect of uncontrolled-for differences between the plots. Some plots may generally be better growing sites than others, for a variety of reasons, but if the trees are assigned to their plots randomly these inequities will hopefully be distributed more evenly across the 2 varieties and not confound the experiment's results.

4. Students are designing an experiment to compare the productivity of two varieties of dwarf fruit trees. The site for the experiment is a field that is bordered by a densely forested area on the west (left) side. The field has been divided into eight plots of approximately the same area. The students have decided that the test plots should be blocked. Four trees, two of each of the two varieties, will be assigned at random to the four plots within each block, with one tree planted in each plot.

The two blocking schemes shown below are under consideration. For each scheme, one block is indicated by the white region and the other block is indicated by the gray region in the figures.

Blocking Scheme A



Forest

Key

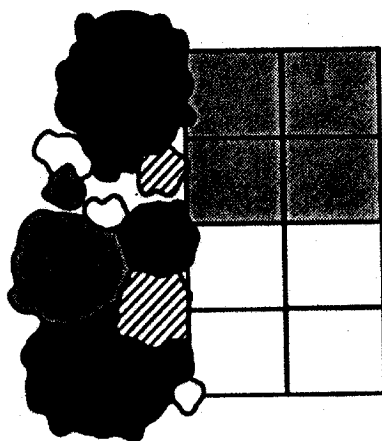


Block 1



Block 2

Blocking Scheme B



Forest

(a) Which of the blocking schemes, A or B, is better for this experiment? Explain your answer.

Blocking Scheme B is better for this experiment because having the forest on the left side of the fields could create an unwanted effect on the growth of the fruit trees (confounding variable). Blocking scheme B provides that both blocks are near the forest & both will be affected/not affected equally.

(b) Even though the students have decided to block, they must randomly assign the varieties of trees to the plots within each block. What is the purpose of this randomization in the context of this experiment?

The purpose of randomization is to ensure that one type of variety of fruit tree is not systematically favored. They must flip a coin to decide which variety of tree will be on the north side (Block 1) and which will be on the south side (Block 2) to ensure that the experiment is unbiased.