Question 4 - Solution

Part (a):

Blocking scheme A is preferable because it creates homogeneous blocks with respect to forest exposure. That is, plots in the same block have similar exposure to the forest.

Part (b):

Randomization of varieties of trees to the plots within each block should reduce any possible bias due to confounding variables, such as fertility or moisture, on the productivity of the two types of dwarf trees.

OR

Randomization of varieties of trees to the plots within each block should even out (or equalize) the effect of other characteristics of the plots that might be related to the productivity of the trees.

Scoring

Part (a) is
Essentially correct if:

A statement that blocking scheme A is preferable

AND

A good explanation that gets at the notion of wanting homogeneous experimental units (plots, not trees) within blocks

Partially correct if

Blocking scheme A is chosen with weak or no explanation

OR

Blocking scheme B is chosen and the student clearly demonstrates an understanding that trees of both varieties should appear in plots bordering the forest, and similarly, trees of both varieties should appear in plots away from the forest.

Note: If a student chooses blocking scheme B and indicates that s/he will create blocks within the blocks to deal with forest exposure as well as north/south exposure, part (a) should be scored as essentially correct.

Note: If a student attempts to describe analysis techniques, these should be considered extraneous and should be ignored.

Question 4 (cont'd.)

Part (b) is

Essentially correct if

The student clearly **explains** why randomization is important in the **context** of the problem.

Partially correct if

The student understands that randomization reduces bias and explains it in context, but does not make it clear that a non-random assignment may favor one **variety** of tree.

OR

The student has a correct explanation but contextual interpretation is poor or inappropriate.

Incorrect if

The student uses the word bias, confounding, or other general statistical terms, but does not explain the term(s) in context of the problem.

Note: If the student thinks of blocks as treatment groups (receiving partial credit in part (a)), then part (b) must be **logically consistent**. For example, if a student thinks of the shaded region as one treatment group, it is not sufficient to randomize within the shaded region. The student must address the randomization between the blocks (e.g., flip a coin to assign one variety of tree to one of the blocks and the other variety of tree to the other block).

4 **Complete Response**
Both parts essentially correct

3 **Substantial Response**
One part essentially correct and one part partially correct

2 **Developing Response**
One part essentially correct and one part incorrect

OR

Both parts partially correct

1 **Minimal Response**
One part partially correct and one part incorrect