

Friday, November 9, 2018

- Warm-up

- An experiment is being designed to compare relief from hay fever symptoms given by a low dose of a drug, a high dose of the drug, and a placebo. Each study is observed on three separate days, with a different treatment used each day. There are two days between treatments so that a treatment does not have a carryover effect for the next treatment assigned.

- Describe the factor(s) and level(s) of each.

- How many treatments are there?

- What is the response variable?

drug
↗

low dose
↗
high dose

placebo

3

relief from symptoms

- FRAPPY

- Multiple Choice Practice

(a) A randomized block experiment will be used to compare the heat gain for the two types (A and B) of windows. How would you group the window boxes into blocks? (Clearly indicate your blocks using the window box numbers.) Justify your choice of blocks.

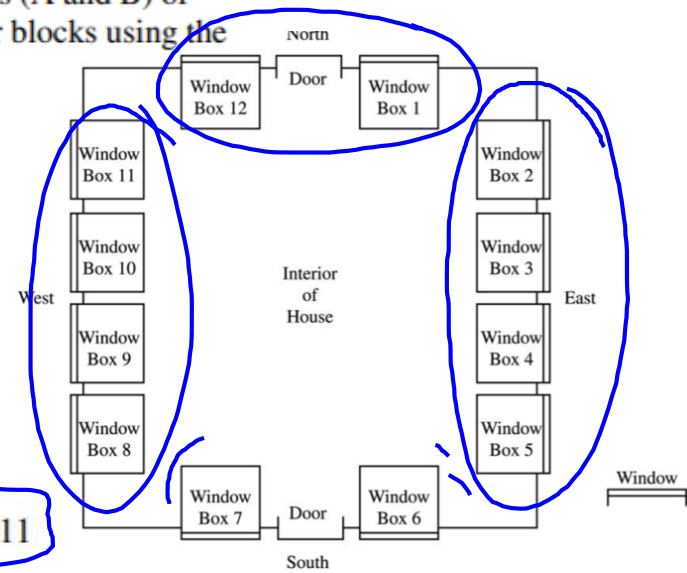
Part (a):

Acceptable blocking schemes:

Blocks: 1 and 12 2 and 3 4 and 5
 6 and 7 8 and 9 10 and 11

Blocks: 1 and 12 2 and 5 3 and 4
 6 and 7 8 and 11 9 and 10

Blocks: 1 and 12 2, 3, 4, and 5 6 and 7 8, 9, 10, and 11



We want to create blocks of homogeneous “units.” Exposure (side of house) would have an effect on heat gain through a window, so the best blocking scheme would take side of house into account when creating blocks.

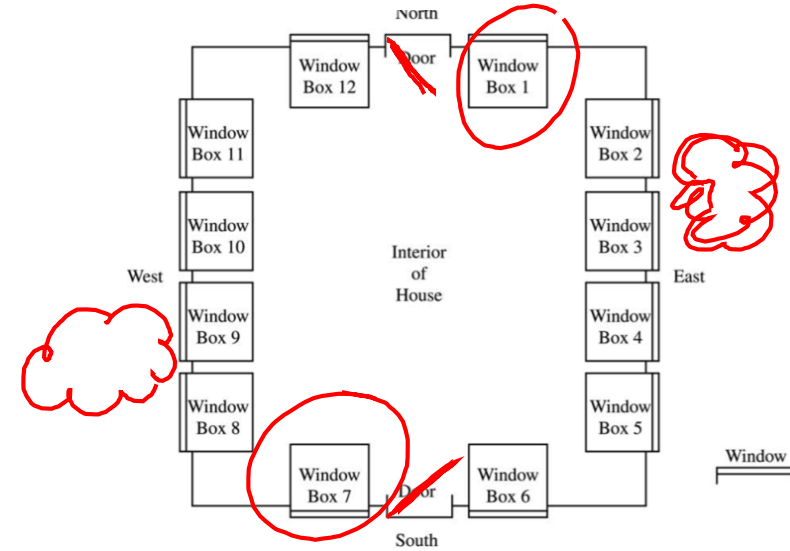
The blocking schemes above create blocks that are similar with respect to exposure (side of house). Since there are two treatments (types of windows), the optimal blocking scheme would create blocks consisting of two window boxes each.

Part (a) is essentially correct (E) if:

1. one of the sets of blocks given in the solution is identified;
2. the justification for the blocking scheme demonstrates an understanding that windows of both types should be used in equal numbers on each side of the house because of differing exposure to sun, light, heat, etc.

Part (a) is partially correct (P) if it includes one of the two elements above.

(b) For the design in part (a), describe how you would assign window types (A and B) to the numbered window boxes.



Part (b):

For each block we could select one of the window boxes and then flip a coin to determine which type of window would be installed in that window box. For example, if the coin lands face up, install type A; otherwise install type B. Continue this process until half of the windows in the block are assigned to one type, then install the remaining window type in the other boxes.

Part (b) is essentially correct (E) if it:

1. assigns window types at random to the window boxes in each block in a way that is consistent with the blocks the student identifies in part (a) and that ensures an equal number of each type of window within each block;
2. describes a mechanism for random assignment, such as a coin toss, roll of a die, use of random number table, etc.

Part (b) is partially correct (P) if it includes only one of the two elements above.

NOTES:

- If students confuse treatments with blocks in part (a), they receive credit for the first element above *only* if they are logically consistent. It is consistent if they use a scheme that randomly assigns half of each type of window to go on each wall.
- By itself, “at random” is not sufficient as an answer and should be scored as incorrect.
- By itself, “at random within each block” is not sufficient for an essentially correct answer but can be scored as partially correct.

4 Complete Response

Both parts essentially correct

3 Substantial Response

One part essentially correct and the other part partially correct

2 Developing Response

One part essentially correct and the other part incorrect

OR

Both parts partially correct

1 Minimal Response

One part partially correct

FRAPPY



Grading 2011 #3

An apartment building has nine floors and each floor has four apartments. The building owner wants to install new carpeting in eight apartments to see how well it wears before she decides whether to replace the carpet in the entire building.

The figure below shows the floors of apartments in the building with their apartment numbers. Only the nine apartments indicated with an asterisk (*) have children in the apartment.

11* 1st Floor 14	12 13	21 2nd Floor 24	22* 23*	31 3rd Floor 34	32 33	* = Children in the apartment
41 4th Floor 44	42 43	51* 5th Floor 54	52 53	61 6th Floor 64	62 63	
71 7th Floor 74*	72 73*	81 8th Floor 84*	82 83	91 9th Floor 94	92* 93*	

The primary goals of this question were to assess your ability to (1) describe a process for implementing cluster sampling and (2) describe a statistical advantage of stratified sampling over cluster sampling in a particular situation.

- (a) For convenience, the apartment building owner wants to use a cluster sampling method, in which the floors are clusters, to select the eight apartments. Describe a process for randomly selecting eight different apartments using this method.
- (b) An alternative sampling method would be to select a stratified random sample of eight apartments, where the strata are apartments with children and apartments with no children. A stratified random sample of size eight might include two randomly selected apartments with children and six randomly selected apartments with no children. In the context of this situation, give one statistical advantage of selecting such a stratified sample as opposed to a cluster sample of eight apartments using the floors as clusters.

Grading 2011 #3

Part A:

2 step process

1. Generate a random integer between 1 and 9. Select all 4 apartments on the floor corresponding to the integer.
2. Generate another random integer between 1 and 9. If the generated integer is the same as step 1, continue generating until a different integer appears. Again, select all 4 apartments corresponding to the second selected integer.

The cluster sample consists of the eight apartments on the two selected floors.

E

Two floors are randomly selected with all four apartments on each forming the sample

AND

Description of a sampling procedure that could be implemented after reading the response

P

One of the above two

!

Neither of the components

OR

No use of randomness in choosing 2 of the 9

Grading 2011 #3

Part B:

Because the wear on the carpets in apartment with children could be different from the wear on the carpets in apartments without children...

- Cluster could produce a sample with no children in selected apartments
- Strata with children, no children would guarantee a sample with each.

E

They state that carpet wear would be different for apartments with and without children

AND

Stratified random sample would ensure that both are included

P

One of the above two

I

Neither of the components

Grading 2011 #3

- 4 Complete Response
both parts essentially correct (EE)

- 3 Substantial Response
one part essentially correct and one part
partially correct (EP or PE)

- 2 Developing Response
one part essentially correct and one part incorrect (EI
or IE)
OR
two parts partially correct (PP)

- 1 Minimal Response
one part partially correct and one part incorrect (PI or
IP)

MC Practice



New Assignment

- page 290 (31-34)