## Part 3 Free Response Practice

## 2011 Form A Question 3

1. 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 none apartments indicated with an asterisk $\left({ }^{*}\right)$ have children in the apartment.

| $11^{*}$ |  | 12 |
| :---: | :---: | :---: |
|  | 1st Floor |  |
| 14 |  | 13 |


| 21 |  | $22^{*}$ |
| :---: | :---: | :---: |
|  | 2nd Floor |  |
| 24 |  | $23^{*}$ |


| 31 |  | 32 |
| :---: | :---: | :---: |
| 34 | 3rd Floor |  |


| 41 |  | 42 |
| :---: | :---: | :---: |
|  | 4th Floor |  |
| 44 |  | 43 |


| $51 *$ |  | 52 |
| :---: | :---: | :---: |
|  | 5th Floor |  |
| 54 |  | 53 |


| 61 |  | 62 |
| :---: | :---: | :---: |
| 64 | 6th Floor | 63 |


| 71 |  | 72 |
| :---: | :---: | :---: |
|  | 7th Floor |  |
| $74 *$ |  | $73^{*}$ |


| 81 |  | 82 |
| :---: | :---: | :---: |
| $84 *$ | 8th Floor |  |
| 83 |  |  |


| 91 |  | $92^{*}$ |
| :---: | :---: | :---: |
|  | 9th Floor |  |
| 94 |  | $93^{*}$ |

(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 night include two randomly selected apartments ith 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.

## 2009 Form A Question 3

2. Before beginning a unit on frog anatomy, a seventh-grade biology teacher gives each of the 24 students in the class a pretest to assess their knowledge of frog anatomy. The teacher wants to compare the effectiveness of an instructional program in which students physically dissect frogs with the effectiveness of a different program in which students use computer software that only simulates the dissection of a frog. After completing one of the two programs, students will be given a posttest to assess their knowledge of frog anatomy. The teacher will then analyze the changes in the test scores (score on posttest minus score on pretest).
(a) Describe a method for assigning the 24 students to two groups of equal size that allows for a statistically valid comparison of the two instructional programs.
(b) Suppose the teacher decided to allow the students in the class to select which instructional program on the frog anatomy (physically dissection or computer simulation) they prefer to take, and 11 students choose actual dissection and 13 students choose computer simulation. How might that self-selection process jeopardize a statistically valid comparison of the changes in the test scores (score on posttest minus score on pretest for the two instructional programs)? Provide a specific example to support your answer.

## 2007 Form A Question 2

3. 

As dogs age, diminished joint and hip health may lead to joint pain and thus reduce a dog's activity level. Such a reduction in activity can lead to other health concerns such as weight gain and lethargy due to lack of exercise. A study is to be conducted to see which of two dietary supplements, glucosamine or chondroitin, is more effective in promoting joint and hip health and reducing the onset of canine osteoarthritis. Researchers will randomly select a total of 300 dogs from ten different large veterinary practices around the country. All of the dogs are more than 6 years old, and their owners have given consent to participate in the study. Changes in joint and hip health will be evaluated after 6 months of treatment.
(a) What would be an advantage to adding a control group in the design of this study?
(b) Assuming a control group is added to the other two groups in the study, explain how you would assign the 300 dogs to these three groups for a completely randomized design.
(c) Rather than using a completely randomized design, one group of researchers proposes blocking on clinics, and another group of researchers proposes blocking on breed of dog. How would you decide which one of these two variables to use as a blocking variable?

