CP Statistics Practice Free Response Test – Chapter 4

1. Suppose there are 500 students in your school.

   a) What are the two requirements for a Simple Random Sample (SRS)

   b) Using Line **125** of the Random Digit Table (RDT), select the *first 5* students in an SRS of 30 students.

   c) Suppose further, that there are 300 girls and 200 boys at your school. Explain how you might use the RDT to perform a *stratified* random sample so that there are an representative number of girls and boys in your sample of 30 students.

2. Turkeys raised commercially for food are often fed the antibiotic *salinomycin* to prevent infections from spreading among the birds. However, salinomycin can damage the birds' internal organs, especially the pancreas. A researcher believes that a combination of selenium and vitamin E in the birds' diet may prevent injury. He wants to explore the effects of two different dosages of selenium (call them S1, S2) in combination with any of three different dosages of vitamin E (call them E1, E2, E3) added to the turkeys' diets. There are 48 turkeys available for the study. At the end of the study, the birds will be killed and the condition of their pancreas examined with a microscope.

   a) How many treatments are there in this experiment?

   b) Outline in diagram form an appropriate design for this experiment. In your diagram, indicate how many turkeys are assigned to each treatment group.

3. Bias is present in each of the following sample designs. In each case, identify the type of bias involved and state whether you think the sample proportion obtained is higher or lower than the true population proportion.

   a) A political pollster is seeking information on public attitudes toward funding of controversial art by the National Endowment for the Arts (NEA). He asks an SRS of 2000 U.S. adults, "Rather than support government censorship of artistic expression, are you in favor of continuing federal funding of artists whose work may be controversial?" 85% of those surveyed answer "yes."

   b) In 2003, the AARP conducted a survey of their members (people over age 50) on proposed Medicare legislation. One of the questions was: "Even if this plan won't affect you personally either way, do you think it should be passed so that people with low incomes or people with high drug costs can be helped?"

CP Statistics Practice Free Response Test – Chapter 4 – ANSWERS

1. Suppose there are 500 students in your school.

    a) What are the two requirements for a Simple Random Sample (SRS)
        1. Each individual must have an equal chance of being chosen
        2. Each group of *n* individuals must have an equal chance of being chosen (or put another way: each individual is selected independently of all other individuals)

    b) Using Line **125** of the Random Digit Table (RDT), select the *first 5* students in an SRS of 30 students.
        Numbering the students 001-500, we get 461, 214, 235, 119, and 033

    c) Suppose further, that there are 300 girls and 200 boys at your school. Explain how you might use the RDT to perform a *stratified* random sample so that there are a representative number of girls and boys in your sample of 30 students.
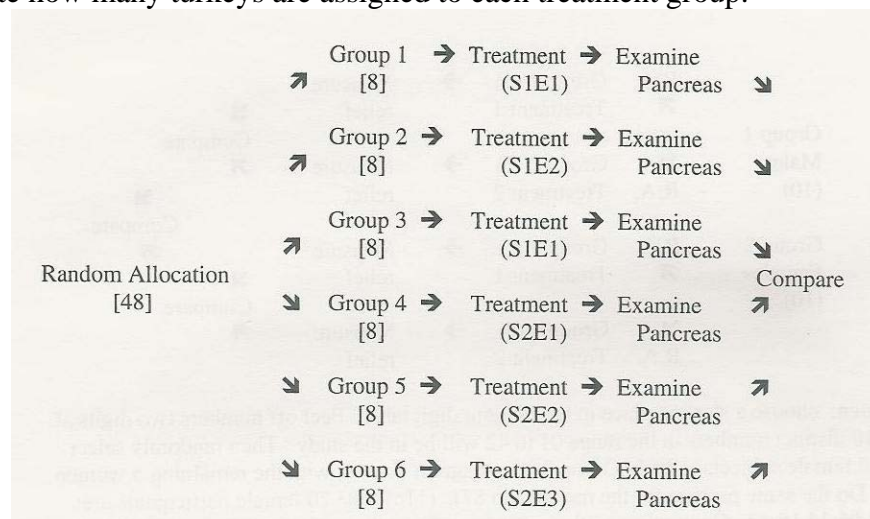   **Since the school population is 60% girls and 40% boys, with a stratified random sample, we could ensure that the sample matches those percentages. So we would want .6(30) = 18 girls and .4(30) = 12 boys in our sample. We would then number the girls 001-300 and select an SRS of 18 using the RDT. Lastly, we number the boys 001-200 and select an SRS of 12 using the RDT.**

2. Turkeys raised commercially for food are often fed the antibiotic *salinomycin* to prevent infections from spreading among the birds. However, salinomycin can damage the birds' internal organs, especially the pancreas. A researcher believes that a combination of selenium and vitamin E in the birds' diet may prevent injury. He wants to explore the effects of two different dosages of selenium (call them S1, S2) in combination with any of three different dosages of vitamin E (call them E1, E2, E3) added to the turkeys' diets. There are 48 turkeys available for the study. At the end of the study, the birds will be killed and the condition of their pancreas examined with a microscope.

    a) How many treatments are there in this experiment?
        There are 6 because we need all combinations of the levels of each variable. Since there are two levels of salinomycin and 3 of vitamin E, we have 3 x 2 = 6 treatments.

    b) Outline in diagram form an appropriate design for this experiment. In your diagram, indicate how many turkeys are assigned to each treatment group.

3. Bias is present in each of the following sample designs. In each case, identify the type of bias involved and state whether you think the sample proportion obtained is higher or lower than the true population proportion.

(a) A political pollster is seeking information on public attitudes toward funding of controversial art by the National Endowment for the Arts (NEA). He asks an SRS of 2000 U.S. adults, "Rather than support government censorship of artistic expression, are you in favor of continuing federal funding of artists whose work may be controversial?" 85% of those surveyed answer "yes."

WORDING BIAS: The wording of the question is poor. Reference to government censorship will result in more respondents in favor of the other position (continuing federal funding for artists whose work is controversial). The sample proportion is higher that the population proportion.

(b) In 2003, the AARP conducted a survey of their members (people over age 50) on proposed Medicare legislation. One of the questions was: "Even if this plan won't affect you personally either way, do you think it should be passed so that people with low incomes or people with high drug costs can be helped?"

UNDERCOVERAGE: Because the survey is only given to people over 50, the questions will not be answered by the young, the unemployed or the homeless. The sample proportion will reflect the views of the retired and those wealthier than average, rather than the true population proportion and therefore will probably be lower than the true proportion.