Chapter 4 Multiple Choice Practice   ~~ANSWER KEY~~

Directions. *Identify the choice that best completes the statement or answers the question. Check your answers and note your performance when you are finished.*

1. A researcher is testing a company's new stain remover. He has contracted with 40 families who have agreed to test the product. He randomly assigns 20 families to the group that will use the new stain remover and 20 to the group that will use the company's current product. The most important reason for this random assignment is that
   (A) randomization makes the analysis easier since the data can be collected and entered into the computer in any order.
   (B) randomization eliminates the impact of any confounding variables.
   (C) randomization is a good way to create two groups of 20 families that are as similar as possible, except for the treatments they receive.
   (D) randomization ensures that the study is double-blind.
   (E) randomization reduces the impact of outliers.

2. A researcher observes that, on average, the number of traffic violations in cities with Major League Baseball teams is larger than in cities without Major League Baseball teams. The most plausible explanation for this observed association is that the
   (A) presence of a Major League Baseball team causes the number of traffic incidents to rise (perhaps due to the large number of people leaving the ballpark).
   (B) high number of traffic incidents is responsible for the presence of Major League Baseball teams (more traffic incidents means more people have cars, making it easier for them to get to the ballpark).
   (C) association is due to the presence of a lurking variable (Major League teams tend to be in large cities with more people, hence a greater number of traffic incidents).
   (D) association makes no sense, since many people take public transit or walk to baseball games.
   (E) observed association is purely coincidental. It is implausible to believe the observed association could be anything other than accidental.

3. A researcher is testing the effect of a new fertilizer on crop growth. He marks 30 plots in a field, splits the plots in half, and randomly assigns the new fertilizer to one half of the plot and the old fertilizer to the other half. After 4 weeks, he measures the crop yield and compares the effects of the two fertilizers. This design is an example of
   (A) matched pairs experiment   *each half plot is paired with the other half.*
   (B) completely randomized comparative experiment
   (C) cluster experiment
   (D) double-blind experiment
   (E) this is not an experiment

4. A large suburban school wants to assess student attitudes towards their mathematics textbook. The administration randomly selects 15 mathematics classes and gives the survey to every student in the class. This is an example of a
   (A) multistage sample
   (B) stratified sample
   (C) cluster sample
   (D) simple random sample
   (E) convenience sample

5. Eighty volunteers who currently use a certain brand of medication to reduce blood pressure are recruited to try a new medication. The volunteers are randomly assigned to one of two groups. One group continues to take their current medication, the other group switches to the new experimental medication. Blood pressure is measured before, during, and after the study. Which of the following best describes a conclusion that can be drawn from this study?

   (A) We can determine whether the new drug reduces blood pressure more than the old drug for anyone who suffers from high blood pressure.
   (B) We can determine whether the new drug reduces blood pressure more than the old drug for individuals like the subjects in the study.
   (C) We can determine whether the blood pressure improved more with the new drug than with the old drug, but we can't establish cause and effect.
   (D) We cannot draw any conclusions, since the all the volunteers were already taking the old drug when the experiment started.
   (E) We cannot draw any conclusions, because there was no control group.

6. To determine employee satisfaction at a large company, the management selects an SRS of 200 workers from the marketing department and a separate SRS of 50 workers from the sales department. This kind of sample is called a

   (A) simple random sample
   (B) simple random sample with blocking
   (C) multistage random sample
   (D) stratified random sample
   (E) random cluster sample

7. For a certain experiment you have 8 subjects, of which 4 are female and 4 are male. The name of the subjects are listed below:

   Males: *Atwater, Bacon, Chu, Diaz.*   **Females:** *Johnson, King, Liu, Moore*

   There are two treatments, A and B. If a randomized block design is used with the subjects blocked by their gender, which of the following is *not* a possible group of subjects who receive treatment A?

   (A) Atwater, Chu, King, Liu
   (B) Bacon, Chu, Liu, Moore
   (C) Atwater, Diaz, Liu, King
   (D) Atwater, Bacon, Chu, Johnson
   (E) Atwater, Bacon, Johnson, King

   you would give treatment A to 2 females and 2 males (same with treatment b) to ensure that gender is not a confounding variable.

8. An article in the student newspaper of a large university had the headline "A's swapped for evaluations?" Results showed that higher grades directly corresponded to a more positive evaluation. Which of the following would be a valid conclusion to draw from the study?

   (A) A teacher can improve his or her teaching evaluations by giving good grades.
   (B) A good teacher, as measured by teaching evaluations, helps students learn better, resulting in higher grades.
   (C) Teachers of courses in which the mean grade is higher apparently tend to have above-average teaching evaluations.
   (D) Teaching evaluations should be conducted before grades are awarded.
   (E) All of the above.

9. A new cough medicine was given to a group of 25 subjects who had a cough due to the common cold. 30 minutes after taking the new medicine, 20 of the subjects reported that their coughs had disappeared. From this information you conclude

   (A) that the remedy is effective for the treatment of coughs.
   (B) nothing, because the sample size is too small.
   (C) nothing, because there is no control group for comparison.
   (D) that the new treatment is better than the old medicine.
   (E) that the remedy is not effective for the treatment of coughs.

10. 100 volunteers who suffer from anxiety take part in a study. 50 are selected at random and assigned to receive a new drug that is thought to be extremely effective in reducing anxiety. The other 50 are given an existing anti-anxiety drug. A doctor evaluates anxiety levels after two months of treatment to determine if there has been an larger reduction in the anxiety levels of those who take the new drug. This would be double blind if

    (A) both drugs looked the same
    (B) neither the subjects nor the doctor knew which treatment any subject had received
    (C) the doctor couldn't see the subjects and the subjects couldn't see the doctor
    (D) there was a third group that received a placebo
    (E) all of the above

1. C
2. C
3. A
4. C
5. B
6. D
7. D
8. C
9. C
10. B

FRAPPY! Free Response AP® Problem, Yay!

The following problem is modeled after actual Advanced Placement Statistics free response questions. Your task is to generate a complete, concise response in 15 minutes. After you generate your response, view two example solutions and determine whether you feel they are "complete", "substantial", "developing" or "minimal". If they are not "complete", what would you suggest to the student who wrote them to increase their score? Finally, you will be provided with a rubric. Score your response and note what, if anything, you would do differently to increase your own score.

A large school district is interested in determining student attitudes about their co-curricular offerings such as athletics and fine arts. The district consists of students attending 4 elementary schools (2000 students total), 1 middle school (1000 students total), and 2 high schools (2000 students total).

The administration is considering two sampling plans. The first consists of taking a simple random sample of students in the district and surveying them. The second consists of taking a stratified random sample of students and surveying them.

(a) Describe how you would select a simple random sample of 200 students in the district.

There are 5000 students in the district so write each student's name on a slip of paper, put them in a hat, and draw out 200 slips of paper; these will be the students in the sample.

(b) Describe how you would select a stratified random sample consisting of 200 students.

Stratify by level (elementary, middle, high)

put all elementary students names in a hat and draw out 80
Do the same with middle and high school students and pull out 40 and 80, respectively. This will ensure that each level is represented proportionally to their student enrollments.

(c) Describe the statistical advantage of using a stratified random sample over the simple random sample in this study.

Since student attitudes will likely differ according to their level of school, this will ensure that each level is equally represented. (If not, it would be possible to choose the entire SRS with one level not represented at all)