Directions: *Work on these sheets.*

Part 1: Multiple Choice. *Circle the letter corresponding to the best answer.*

1. Which of the following is CORRECT?
    (a) We do not need to randomize if our sample size is sufficiently large.
    (b) A large sample size always ensures that our sample is representative of the population.
    (c) If all other things are equal, we need a larger sample size for a larger population.
    (d) In a properly chosen sample, an estimate will be less variable with a large sample size and
        hence more precise.
    (e) In random samples, the randomization ensures that we get precise and accurate estimates.

2. A survey was done in the town of Mechanicsville to estimate the proportion of cars that are red and
    made by companies based in Japan. A random sample of 25 cars from a student parking lot at Lee-
    Davis High School was taken. Which of the following is NOT CORRECT?
    (a) This sample may not be representative of the cars in Mechanicsville because mainly students
        park at Lee-Davis High School.
    (b) If the particular parking space is vacant, we can simply select another parking space at random
        because it is unlikely that a space being vacant is related to the color or manufacturer of the car.
    (c) It would be dangerous to simply select the first 25 parking spaces in the lot closest to the
        auditorium because there are a number of parking spaces there reserved for Drivers Ed
        vehicles, whose primary color is white.
    (d) A different team doing the sampling independently would obtain different answers for their
        sample proportions.
    (e) The results will be the same regardless of the time of day that the sample is taken.

3. The following numbers appear in a table of random digits:
        38683   50279   38224   09844   13578   28251   12708   24684
    A scientist will be measuring the total amount of woody debris in a random sample ($n = 5$) of sites
    selected without replacement from a population of 45 sites. The sites are labeled 01, 02, . . . , 45
    and she starts at the beginning of the line of random digits and takes consecutive pairs of digits.
    Which of the following is correct?
    (a) Her sample is 38, 25, 02, 38, 22
    (b) Her sample is 38, 68, 35, 02, 22
    (c) Her sample is 38, 35, 27, 28, 08
    (d) Her sample is 38, 65, 35, 02, 79
    (e) Her sample is 38, 35, 02, 22, 40

4. A committee on community relations in a college town plans to survey local businesses about the
    importance of students as customers. From telephone book listings, the committee chooses 150
    businesses at random. Of these, 73 return the questionnaire mailed by the committee. The
    population for this study is
    (a) all businesses in the college town.
    (b) all businesses.
    (c) the 150 businesses chosen.
    (d) the 73 businesses that returned the questionnaire.
    (e) the committee on community relations.

5. A new headache remedy was given to a group of 25 subjects who had headaches. Four hours after taking the new remedy, 20 of the subjects reported that their headaches had disappeared. From this information you conclude
(a) that the remedy is effective for the treatment of headaches.
(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 aspirin.
(e) that the remedy is not effective for the treatment of headaches.

6. An experimenter wishes to test whether or not two types of fish food (a standard fish food and a new product) work equally well at producing fish of equal weight after a 2-month feeding program. The experimenter has 2 identical fish tanks (1 and 2) to put fish in and is considering how to assign the 40 tagged fish to the tanks. To properly assign the fish, one step would be to
(a) put all the odd tagged numbered fish in one tank, the even in the other, and give the standard food type to the odd numbered ones.
(b) obtain pairs of fish whose weights are virtually equal at the start of the experiment and randomly assign one to tank 1 and the other to tank 2, with the feed assigned at random to the tanks.
(c) proceed as in (b), but put the heavier of the pair into tank 2.
(d) assign the fish at random to the two tanks and give the standard feed to tank 1.
(e) not proceed as in (b) because using the initial weight in (b) is a nonrandom process. Use the initial length of the fish instead.

7. A student wishes to examine the effect of wing width and wing length on the length of flight of a paper airplane. There are 4 different models of airplanes. Which of the following is NOT correct?
(a) A factor (such as wing width) is an explanatory variable under control of the experimenter.
(b) The order of flights was randomized to remove the influence of any other variables upon the flight distance of each flight.
(c) It would be better to make four copies of each model of plane to give some feel for the plane-to-plane variations.
(d) Flying each model four times would give information about the variation in flight length for each model.
(e) Planned experiments (where randomization can take place) provide some of the strongest evidence in trying to establish a causal relationship.

8. An experiment was conducted where you flew paper airplanes after modifying wing width and wing length. There were four different models of airplane. One design consideration was the choice between flying each plane four times or making four copies of each model, each of which is flown once. Which of the following is NOT correct?
(a) Flying multiple copies of each model (that is, separate planes of each model) could give information on variability in flight due to fabrication effects (that is, how you made the plane).
(b) Flying a single copy of each model four times could give information on variability in flight due to changes in initial launch conditions.
(c) The differences in flight length among the different models give information on the "effects" of the design factors: wing width and wing length.
(d) The response variable is flight length; the explanatory variables are wing width and wing length.
(e) The net effect, whether flying each plane four times or flying four copies of each model once, would be the same.

Part 2: Free Response
Answer completely, but be concise. Write sequentially and show all steps.

9. Do you trust the Internet? You want to ask a sample of college students the question "How much do you trust information about health that you find on the Internet—a great deal, somewhat, not much, or not at all?" You try out this and other questions on a pilot group of 10 students chosen from your class. The class members are

Anderson	Deng	Glaus	Nguyen	Samuels
Arroyo	De Ramos	Helling	Palmiero	Shen
Batista	Drasin	Husain	Percival	Tse
Bell	Eckstein	Johnson	Prince	Velasco
Burke	Fernandez	Kim	Puri	Wallace
Cabrera	Fullmer	Molina	Richards	Washburn
Calloway	Garcia	Morgan	Rider	Zabidi
Delluci	Gandhi	Murphy	Rodriguez	Zhao

Choose an SRS of 10 students. Use Table B, shown below, beginning at line **117**. Explain your method clearly.

117	38167	98532	62183	70632	23417	26185	41448	75532
118	73190	32533	04470	29669	84407	90785	65956	86382
119	95857	07118	87664	92099	58806	66979	98624	84826
120	35476	55972	39421	65850	04266	35435	43742	11937

10. Canada requires that cars be equipped with "daytime running lights," headlights that automatically come on at a low level when the car is started. Many manufacturers are now equipping cars sold in the United States with running lights. Will running lights reduce accidents by making cars more visible?

(a) Describe the design of an experiment to help answer this question. In particular, what response variables will you examine?

(b) What cautions do you see that might apply to an experiment on the effects of running lights?

11. Does ginkgo improve memory? The law allows marketers of herbs and other natural substances to make health claims that are not supported by evidence. Brands of ginkgo extract claim to "improve memory and concentration." A randomized comparative experiment found no evidence for such effects. The subjects were 230 healthy people over 60 years old. They were randomly assigned to ginkgo or a placebo pill (a dummy pill that looks and tastes the same). All the subjects took a battery of tests for learning and memory before treatment started and again after six weeks.

(a) What are the explanatory and response variables in this experiment?

(b) Outline the design of this experiment.

(c) The study was double-blind. What does this mean?

(d) Use Table B, starting at line **103** (below), and choose only the first 5 members of the ginkgo group.

103	45467	71709	77558	00095	32863	29485	82226	90056
104	52711	38889	93074	60227	40011	85848	48767	52573
105	95592	94007	69971	91481	60779	53791	17297	59335
106	68417	35013	15529	72765	85089	57067	50211	47487