AP Review Assignment #2

Name: _____

## Topic II. Sampling and Experimentation: Planning and Conducting a Study

1. Define these terms:
   a. Census

   b. Population

   c. Sample

   d. Survey

   e. Simple Random Sample (SRS)

   f. Bias in a sample

   g. Confounding

   h. Stratified random sample

   i. Cluster Sample

   j. Block design

   k. Experiment

   l. Observational study

2. The Ministry of Health in the Canadian Province of Ontario wants to know whether the national health care system is achieving its goals in the province. Much information about health care comes from patient records but that source doesn't allow us to compare people who use health services with those who don't. So the Ministry of Health conducted the Ontario Health Survey, which interviewed a random sample of 61,239 people who in the Province of Ontario.

   a. What is the population for this sample survey? What is the sample?

   b. The survey found the 76% of males and 86% of females in the sample had visited a general practitioner at least once in the past year. Do you think these estimates are close to the truth about the entire population? Why or why not?

   c. Is this an experiment or an observation study? How can you tell?

3. What are the characteristics of a well-designed and well-conducted study?

4. Elaine is enrolled in a self-paced course that allows three attempts to pass an examination on the material. She does not study and has 2 out of 10 chances of passing on any one attempt by pure luck. What is Elaine's likelihood of passing on at least one of the three attempts? (Assume the attempts are independent because she takes a different exam at each attempt.)

   a. Explain how you would use random digits to simulate one attempt at the exam. Elaine will of course stop taking the exam as soon as she passes.

   b. Simulate 20 repetitions. What is your estimate of Elaine's likelihood of passing the course?

   c. A more realistic model for Elaine's attempts to pass an exam would be as follows: On the first try she has a probability 0.2 of passing. If she fails on the first try, her probability on the second try increases to 0.3 because she learned something from the first try. If she fails on the first 2 attempts, the probability of passing on the third attempt is 0.4. She will stop as soon as she passes. The course rules force her to stop after three attempts. Explain how to simulate one repetition of Elaine's tries on the exam with this new approach.

   d. Simulate 20 repetitions and estimate the probability that Elaine eventually passes the exam with the approach in part c.

5. Can aspirin help prevent heart attacks? The Physicians' Health Study, a large medical experiment involving 22,000 male physicians, attempted to answer this question. One group of about 11,000 physicians took an aspirin every second day, while the rest took a placebo. After several years the study found that subjects in the aspirin group had significantly fewer heart attacks than the subjects in the placebo group.

   a. Identify the experimental subjects, the factor and its levels, and the response variable in the health study.

   b. Explain how you would design a completely randomized experiment for the health study.

6. The makers of Frumpies, "the breakfast of rug rats" want to improve their marketing, so they consult you:

   a. They first want to know what fraction of children ages 10 to 13, like their celery-flavored cereal. What kind of study should they perform?

   b. They are thinking of introducing a new flavor, maple-marshmallow Frumpies, and want to know whether children will prefer the new flavor to the old one. Design a completely randomized experiment to investigate this question.

   c. They suspect that children who regularly watch the Saturday morning cartoon show starring Frump, the flying teenage warrior rabbit who eats Frumpies in every episode, may respond differently to the new flavor. How would you take that into account in your design?