

Unit 3 & 4 Assignment

1. The University of Manitoba Student Union is planning to conduct a survey in order to gauge students' opinions on a proposed tuition fee increase. UMSU would like feedback from students from a variety of faculties and departments. For each of the following proposed sampling schemes (a) through (e), identify (i) the type of sample that is obtained and (ii) any types of bias that may be present.
 - (a) A student union representative obtains a list of all students at the university. She randomly selects 500 students and contacts them by telephone to administer the survey.
 - (b) The survey is published in *The Manitoban* (the student newspaper). There is a website listed where students can go to fill out the survey.
 - (c) A student union representative selects a random sample of five faculties at the university. Within each selected faculty, he randomly selects three departments. In each of those departments, he randomly selects two classes. With the professors' permission, he goes to each of these classes and distributes the survey to all of the students in the class.
 - (d) A student union representative stands in University Center during lunch hour and administers the survey verbally to 300 students who are passing by.
 - (e) A student union representative randomly selects 50 students from each department at the university. She contacts each of the selected students to administer the survey.
 - (f) Which of the sampling schemes described above is the most realistic and appropriate? Explain.
2. The National Halothane Study was a major investigation of the safety of anaesthetics used in surgery. Records of over 850,000 operations performed in 34 major hospitals showed the following death rates for operations in which four common anaesthetics were used:

Anaesthetic	A	B	C	D
Death Rate	1.7%	1.7%	3.4%	1.9%

- (a) Your friend is scheduled for surgery and, based on these results, has asked her surgeon not to use Anaesthetic C. Explain to your friend why her worries are likely unfounded.
- (b) Suggest at least three possible lurking variables that could account for the higher death rate for Anaesthetic C.

3. You have been asked to develop an experiment to meet the objectives for each of the following scenarios. For each of the studies, answer the following questions:
- (i) What is the appropriate type of experimental design that should be used?
 - (ii) What are the experimental units?
 - (iii) What is/are the factor(s) under investigation?
 - (iv) What are the factor levels?
 - (v) What are the treatments to be applied?
 - (vi) Is there a blocking variable? If so, what is it?
 - (vii) Draw a chart to outline the proposed design of the experiment.
- (a) An engineer would like to investigate the surface charge on a silicon wafer. Specifically, she would like to determine how the surface charge varies, depending on the cleaning method (rinse dry or spin dry) and the position on the wafer where the charge was measured (left, center or right). She has 30 wafers available for the experiment.
- (b) A scientist would like to determine how the temperature (high or low) and pressure (high or low) affect the yield of a chemical process. The scientist mixes three batches of a chemical solution and divides each batch into eight samples. It is expected that the three batches will react differently with respect to the different temperatures and pressures.
4. A sportswear manufacturer would like to conduct a matched pairs experiment to compare two new models of running shoes to determine which is better for track and field athletes running the 1500-meter race. Twenty elite runners volunteer to participate in the experiment, which is to be conducted in one day on an outdoor track.

Explain how the experiment should be conducted. Be sure to explain the role of randomization, and why it is important in this experiment.