University of Waterloo   STAT 220 – W. H. Cherry
Assignment 5

A3 – 1. Text Exercise 5.1 (page 390): *For each of the following situations, indicate whether a binomial distribution is an appropriate probability model .....*

A3 – 2. Text Exercise 5.12 (page 393): *A university that is better known for its basketball program than for .....*

A3 – 3. Text Exercise 5.13 (pages 393-394): *Children inherit their blood type from their parents, with .....*

A3 – 4. Text Exercise 5.11 (page 393): *According to government data, 25% of employed women have never been married. .....*

A3 – 5. Text Exercise 5.64 (page 428): *High school dropouts make up up 12.1% of all Americans aged 18 to 24. .....*

A3 – 6. Text Exercise 5.68 (page 429): *According to a market research firm, 52% of all residential telephone .....*

A3 – 7. Text Exercise 5.70 (page 429): *An opinion poll asks a sample of 500 adults whether they favour ....*

A5 – 8. Suppose that 10% of Ontario residents live in rural areas.
  (a) Find the approximate probability that 5,000 Ontario residents selected equiprobably ('simple random selecting') will contain between 475 and 525 rural residents; between 450 and 550 rural residents.
  (b) Approximately how large a sample of Ontario residents selected equiprobably would it be necessary to choose to be 95% certain that the percentage of rural residents in the sample would lie between 9.5 and 10.5%?

A5 – 9. Text Exercise 3.35 (page 263): *For each of the following situations, identify the population .....*

A5 – 10. Text Exercise 3.47 (page 266): *A newspaper advertisement for* USA Today: The Television Show, *said: .....*
  (a) Explain why this opinion poll is almost certainly biased.
  (b) Is the *actual* percentage of the population who *oppose* tougher handgun control likely to be higher or lower than the figure the poll would find? Explain briefly.

A5 – 11. Inaccuracy is likely to be present in both of the following cases. Identify the category and source of the inaccuracy and specify its likely sign – that is, whether the sample attribute point estimate is likely to be systematically *above* or *below* the value of the population attribute.
  (a) A flour company wants to know what fraction of Vancouver residents bake their own bread. Five hundred residential addresses are obtained by equiprobable selecting and interviewers are sent to these addresses, but only during normal working hours of 8.30 a.m. to 4.30 p.m. on weekdays.
  (b) The Metro Toronto police department wants to know if black residents of Metro are satisfied with police service in their neighbourhoods. Three hundred addresses in a predominantly black neighbourhood are obtained by equiprobable selecting, and a uniformed police officer is sent to each address to interview an adult resident.

A5 – 12. Text Exercise 3.49 (page 266-267): *Here are two wordings for the same question. The first .....*

A5 – 13. Text Exercise 3.50 (page 267): *Comment on each of the following as a potential sample survey question. .....*

A5 – 14. In an audit of industrial accounts, 200 accounts were obtained by equiprobable selecting (EPS) from a total of 5,000 accounts outstanding, and the amount overdue (*i.e.*, owing for more than 30 days) was recorded. The sample average was found to be $105.00 and the the sample s.d. was $47.33. Find an approximate 90% confidence interval for the total amount owing on overdue accounts.

A5 – 15. Using equiprobable selecting, n=2,070 farms were obtained from a population of N farms, and information was collected on the number of cattle (Y) on each farm. The data were as given at the right. $\sum_{j=1}^{n} y_j = 25,881$; $\sum_{j=1}^{n} y_j^2 = 599,486.$
  (a) Estimate the average number of cattle per farm, and the total number of cattle in the population; find the estimated standard deviations of each of these estimates.
  (b) Give approximate 95% confidence intervals for the average and total in (a).
  (c) Comment briefly on the appropriateness of using equiprobable selecting in such a survey.

(continued overleaf)

A5 – 16. Using equiprobable selecting, two non-overlapping samples of respective sizes 200 and 450 were obtained successively without replacement from a study population of 2,400 students in a non-residential college. Each tudent in the samples was asked the distance (in km) that he or she lived from the college; the respective averages and standard deviations were as shown at the right. Find an approximate 99% confidence interval for the average distance from the college that its students live.

$$\bar{y}_1 = 5.14, \qquad s_1 = 1.90;$$
$$\bar{y}_2 = 4.90, \qquad s_2 = 2.20.$$

A5 – 17. A company auditor needed to estimate the total number of travel vouchers that were incorrectly filed. In a sample of 50 vouchers selected equiprobably from a group of 250, 20 were found to be filed incorrectly.

    (a) Give an approximate 95% confidence interval for the *proportion* of incorrectly filed vouchers in the group.

    (b) Give an approximate 95% confidence interval for the *total number* of incorrectly filed vouchers in the group.

A5 – 18. One hundred households, obtained by equiprobable selecting rom a village containing $N = 850$ households, showed 30 households possessing transistor radios; further, a record of the number of members (Y) in these 30 households gave the data shown at the right above.

$$\sum_{j=1}^{n} y_j = 140 \qquad ; \qquad \sum_{j=1}^{n} y_j^2 = 976.$$

    (a) Estimate both the proportion and number of households in the village which possess transistor radios, and give an approximate 99% confidence interval for each corresponding population attribute.

    (b) Estimate both the average size, and its estimated standard deviation of households in the village possessing transistor radios. What assumption about one of the estimates from (a) is needed in the calculations in (b)?

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Assignment 6 (continued)

*A6 - 17.
(cont.) Meanwhile, ministry officials who have been monitoring the fox population are still anticipating a high risk of rabies in the southwestern part of the province this winter.

MacInnes said there's "a 75 per cent or better" chance of a rabies outbreak in Wellington, Waterloo, Perth, Huron and Lambton counties.

Rabies affects the central nervous system, leading to paralysis and death. It is spread through the saliva of infected animals such as foxes or skunks. Humans often come into contact with the disease if they are treating a household pet which has been bitten by a wild animal.

MacInnes said pet owners should make a point of having their animals innoculated before a full-blown outbreak occurs.

*A6 - 18. In the scientific journals in the University Libraries, find **EITHER**:

    (a) one example of a *prospective* investigation – indicate whether it has an experimentl or an observational Plan; **OR**

    (b) one example of a *case-control* investigation.

Describe concisely the purpose of the investigation, the method of selecting its participants, and if the investigation was single blind or double blind. Indicate the confounders the investigators were trying to manage for in the Plan for their investigation. Your answer must give a complete reference to the investigation you choose, using the following format:

Placebo, P.U. The relationship between STAT 220 and nausea. *Journal of Morning Sickness* **12**: 830-920 (1989).

[The items in this citation are: Author(s). Title of article. *Journal name* **Volume**: pages (year).]

Some journals you may wish to look at, and their call numbers in the E.M.S. Library, are:	*British Medical Journal*, PER R31.B93
	Canadian Medical Association Journal, PER R11.C3
	International Journal of Cancer, PER RC261.A34
	Journal of the American Medical Association, PER R15.A48
	Journal of the National Cancer Institute, PER RC261.U47
	Lancet, PER R31.L3
	New England Journal of Medicine, PER R11.B7

1995-04-20   *Optional problem for enrichment