Section 5.6 Confidence Intervals

Imagine this . . .

You ask 10 friends their favorite ice cream flavour. How confident would you be that their choice reflects the favorite ice cream flavour of all Canadians? Would you use this to predict what flavour Brookfield should increase producing?

When the population is too large, a representative portion of the population can be collected. This is called a sample.
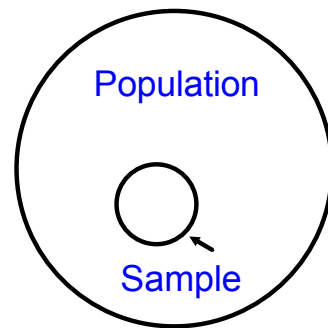
The sample should represent the population! If a sample is truly representative, then the statistics calculated from the sample can be applied to the whole population.

However, it is unlikely that a truly representative sample will be selected. Therefore, we need to be able to make predictions on how confident we are that the statistics from the sample can represent the entire population.

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Example 1

A light bulb company wants to test the number of hours that a light bulb will burn before failing.

a) What is the population?

b) Should they test all the light bulbs? Why or why not?

c) Propose a method that the company could use to determine the longevity of its light bulbs.

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How well a sample represents the larger population depends on two things:

- confidence level

- margin of error

Example 2:   **Consider this study**

From the Globe and Mail on Thursday, March 7, 2013:

"The Nanos Research survey, which was conducted in February, puts the Conservatives at 31.5 per cent support at the national level."

A random telephone survey of 1,000 adult Canadians was conducted between Feb.19 - 24. The responses of 717 people who said they are committed voters are considered to accurately reflect the views of the Canadian public within 3.7 percentage points, 19 times out of 20.

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a)   What does "within 3.7 percentage points" mean?

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b)   What does "19 times out of 20" mean?

What is the difference between a 90%, 95% or 99% confidence interval?

c)   What is a confidence interval?

A Rent-A Car-company surveys customers and finds that 50% of the respondents say its customer service is "very good." The confidence level is cited as 95% and the margin of error is ± 3%.

What is the confidence interval?

A brand of battery has a mean life expectancy of 12.6 hours with a margin of error of 0.7 hours. What is the confidence interval?

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The expiration time of milk is said to occur between 13.5 and 14.7 days.

a) What is the mean expiration time?

> Note
> The mean expiration time would be the midpoint of the interval

b) Calculate the margin of error.

Example 6

A botanist collects a sample of 50 iris petals and measures the length of each. It is found that the mean is 5.55 cm and the standard deviation is 0.57 cm. He then reports that he is 95% confident the average petal length is between 5.39 cm and 5.71 cm.

a) Identify the:

   ▪ Margin of error

   ▪ Confidence interval

   ▪ Confidence level

b) Explain what information the confidence interval gives about the population of iris petal length.

c) How would the length of a 99% confidence interval be different from that of a 95% confidence interval?

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Example 7

A recent study reports that 61% of students at Lewisporte Intermediate own a cell phone. The results of the study are reported to be accurate, 19 times out of 20, with a margin of errror of 3.6 percent.

a) What is the confidence level?

b)   What is the confidence interval?

c)   According to the study, if there are 258 students at Lewisporte Intermediate School, what is the range of students who could own a cell phone?

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Example 8

In a national survey of 400 Canadians from the ages of 20 to 35, 37.5% of those interviewed claimed they exercise for at least four hours a week. The results were considered accurate within 4%, 9 times out of 10.

a) Are you dealing with a 90%, 95%, or 99% confidence interval? How do you know?

b) How many people in the survey claimed to exercise at least four hours a week?

c) What is the margin of error?

d) What is the confidence interval?   Explain its meaning.

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e) What are some limitations of this survey?

f) If the writers of the article created a 99% confidence interval based on this data, how would it be different? How would it be the same?

g) How would the confidence interval change if the sample size was increased to 1000 but the sample proportion remained the same?

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Example 9

The city of St. John's is trying to determine whether or not to continue the curb side recycling program. A survey indicted that 50% of residents wanted the program to continue. The survey was reported to be accurate, 9 times out of 10, with a margin of error of 16.7%.

a) Based on these results, what course of action should the city take with respect to the curb side recycling program? Explain your answer.