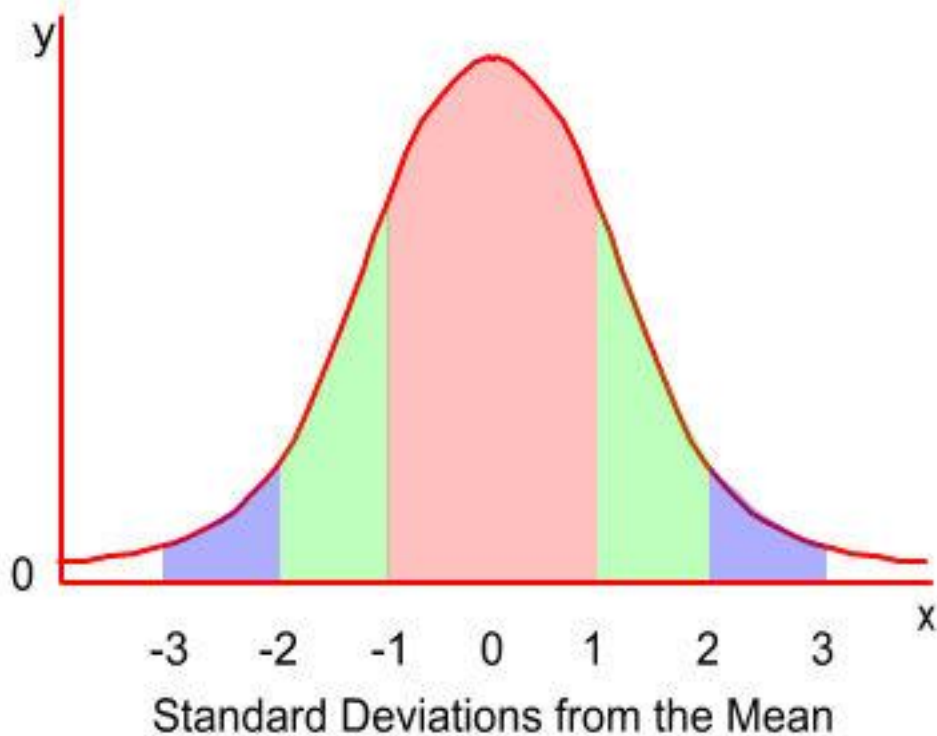# Chapter 5: Statistics

5.6 Confidence Intervals

Example: read the fine print at the bottom:
http://www.angus-reid.com/polls/43895/conservatives-and-ndp-gain-in-canada-as-liberals-fall-below-20-mark/

When you do a survey of the general population, how likely is it that your result is accurate?

Example #1: A telephone survey of 600 randomly selected people was conducted in an urban area. The survey determined that 76% of people, from 18 to 34 years of age, have a social networking account. The results are accurate within plus or minus 4 percent points, 19 times out of 20.

   a) What is the confidence interval?

   b) What is the confidence level?

Example #2: A poll was conducted to ask voters the following question: If an election were held today, whom would you vote for? The results indicated that 53% would vote for Smith and 47% would vote for Jones. The results were stated as being accurate within 3.8 percentage points, 19 times out of 20.

   a) What is the confidence interval?

   b) What is the confidence level?

   c) Who will win the election?

How does sample size and confidence level affect results?

   1) A larger sample size should decrease the _____

   2) To increase the confidence level you would need to
      _____

Assignment

1) A poll determined that 81% of people who live in Canada know that climate change is affecting Inuit more than the rest of Canadians. The results of the survey are considered accurate within ± 3.1 percent points, 19 times out of 20.

a) State the confidence level

b) Determine the confidence interval

c) The population of Canada was 33.5 million at the time of the survey. State the range of the number of people who knew that climate change is affecting Inuit more than the rest of Canadians.

2) A cereal company takes a random sample to check the masses of boxes of cereal. For a sample of 200 boxes, the mean mass is 542 g, with a margin of error of ± 1.9g. The result is considered accurate 95% of the time.

a) State the confidence interval for the mean mass of the cereal boxes.

b) Three other samples of different sizes were taken using the same confidence level, as shown below, but the margin of error for each sample was mixed up. Match the correct margin of error with each sample size.

Sample Size	Margin of Error (g)
50	1.2
100	3.9
500	2.7

3) An advertisement for a new toothpaste states that 64% of users reported better dental checkups. The results of the poll are accurate within 3.4 percentage points, 9 times out of 10.

a) State the confidence level.

b) Determine the confidence interval.

c) If all 32 students in a mathematics class used this toothpaste, determine the range of the mean number of classmates who could expect better dental checkups.

4) Toxic materials, such as arsenic, lead, and mercury, can be released into the air if a discarded cellphone is incinerated. Toxins can be released into the groundwater if a discarded cellphone ends up in a landfill. In a recent survey, 89% of those surveyed answered yes to the following question: Would you recycle your cellphone if it were convenient? The survey is considered accurate to within 4.3 percent points, 99 times out of 100.
a) Determine the confidence level and the confidence interval

b) If 23 500 000 people in Canada own cellphones, state the range of the number of people who would indicate that they would recycle their cellphone if it were convenient

5) A company produces regulation ultimate discs. The discs have a mean mass of 175.0g, with a standard deviation of 0.9g. To ensure that few discs are rejected, the quality control manager must ensure that the mean mass of the discs lies in the acceptable range of 174.8 g to 175.2 g. During each shift, a random sample of discs is selected and the mass of each disc in the sample is measured. The table below shows the sampling process.

Confidence Level	Sample Size Needed
90%	55
95%	78
99%	135

a) What is the confidence interval and margin of error this company is using for its quality control tests?

b) Approximately how many discs should be measured to ensure the mean mass is within ± 0.2 g, 99% of the time.

c) The manager wants to save on labour costs by using a smaller sample size. She knows that any discs that do not meet the regulation standards can be sold as recreational discs. Approximately how many discs should be measured to ensure that the mean mass is within ± 0.2 g, 90% of the time?

d) Estimate the number of discs the company should measure to be confident that the mean mass of the ultimate discs lies in the acceptable range 19 times out of 20.

Answer Key

1) a) 95%   b) 77.9% - 84.1%   c) 26.1 million to 28.2 million

2) a) 540.1 g to 543.9 g   b) 50: 3.9 g; 100: 2.7 g; 500: 1.2 g

3) a) 90%   b) 60.6% - 67.4%   c) about 19-22 students

4) a) 99%; 84.7% to 93.3%   b) 19 904 500 to 21 925 500

5) a) confidence interval: 174.8 g to 175.2 g   margin of error: ±0.2 g
   b) 135   c) 55   d) 78