Section 5.6
Confidence Intervals (day 1)

Learning targets:

1. Demonstrate understanding of new terminology.
2. Interpret a survey result statement to determine the confidence interval, margin of error, and confidence level.

Survey Results

When a survey is conducted in order to determine how a population feels about an issue, it is usually accomplished by surveying just a ***random sample*** of the population.

A **sample** of a population may not 100% accurately reflect the response of the **entire** population, so the survey results contain a degree of **uncertainty**. Generally speaking, the smaller the sample used, the greater the degree of uncertainty (sounds reasonable, right?)

This uncertainty is expressed using:

- a margin of error – you'd like this to be as low as possible
- a confidence level – you'd like this to be as high as possible

Using the survey result, coupled with the margin of error, we come up with what is known as a **confidence interval** for the results of the survey.

Key Terms:

Margin of error: how far away from the "true" value you might be; stated as **"plus or minus..."** . This may be stated in percentages, or in number values. **You want this to be as low as possible.**

Confidence interval: the true value will lie within this interval of values

- Stated as **"survey result plus or minus margin of error"** or as a range of values "between this and that", or "from this value to this other value".

Confidence level: if the survey were repeated over and over, the confidence level tells us how often the results would come out with the stated confidence interval. **You want this to be as high as possible.**

- Stated as **"x times out of y"**, or converted to a percent.

Illustrating the Key Terms:

A survey of 600 people aged 18 to 34 in an urban area 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**, **19 times out of 20**.

- **76% = survey result**
- **plus or minus 4 percent = margin of error**
  (symbolically $\pm 4\%$, or may be stated as within 4%)
- **19 times out of 20 = confidence level (often gets converted to a %)**

$19/20 = 95\%$

- **76% $\pm$4 % = confidence interval**
  (may also be stated as from "72% to 80%" or "between 72% and 80%")

Interpreting the results:

What does the confidence level tell us?

If the confidence level is "**19 times out of 20**", which is **95%**. This means that the **probability of error in the survey results is 5%.**

If the survey were conducted 100 times, then 95 times out of 100 the survey results would show that from 72% to 80% of people in this population have a social networking account. The other 5 survey results would be different.

The survey results from this sample of 600 people can be used to make **inferences** about the whole population with the same degree of certainty:

If the total population of 18 to 34-year-olds is 92,500 in this urban area, how many of them have a social networking account?

Using the confidence interval of 72% to 80% we can calculate:

72% of 92 500 = (0.72)(92 500) = 66 600

80% of 92 500 = (0.8)(92 500) = 74 000

Conclusion (interpreting the results):

It can be said, with 95% confidence, that 66 600 to 74 000 people, in a population of 92 500 aged 18 to 34, have a social networking account.

Example #1:

Determine the **margin of error** for each confidence interval:

(1) 250 ± 20 margin error ± 20

230 - 270

(2) 68% to 84%. $\pm 8\%$

(3) between 80% and 90% $\pm 5\%$

Example #2:

In a recent poll, 34% of Canadians eligible to vote said they would vote for the Conservative Party in the next federal election. The results are considered accurate within 3.2 percentage points.

What is the confidence interval?

$34\% \pm 3.2\%$

$30.8\% \text{ —— } 37.2\%$

Example #3:

In the same poll, 28% of Canadians eligible to vote said they'd vote for the NDP in the next federal election. ± 3.2

Determine the range of the number of people you would expect to vote NDP if the population of Canadians of voting age is 23,785,000.

28% ± 3.2%

24.8% – 31.2%

(.248)(23785000) = 5898680

(.312)(23785000) = 7419720

Example #4:

In a recent survey of 300 students, 240 responded that they would purchase pizza once a week if the canteen starting serving it once a week. The results of this survey are accurate within 5%, 18 times out of 20.

If the school population is 950, determine the range of the number of people the canteen should expect to purchase pizza once a week.

Confidence level
$\frac{18}{20} = 90\%$

margin error $\pm 5\%$

$\frac{240}{300} = 80\%$

$80\% \pm 5\%$

$75\% - 85\%$

$(.75)(950) = 712 \quad - \quad 807 \quad (.85)(950)$

Example #5:

Interpret the following survey result:

"A 2010 poll determined that 65% of the people agreed that wind power should be used over hydro power. The results are accurate within plus or minus 2.9 percent, 19 times out of 20."

Answer:

It can be said, with 95 % certainty, that between 62.1% and 67.9% of people believe that wind power should be used over hydropower.

ASSIGNMENT:

Page 274 – 276: #1, 3, 4, 5, 6, 9 (day 1)