Part 5.2: Comparison Within One Group

The second type of claim we look at is where we are given a claim comparing numbers from within one group. This could be something like "more people have an iPhone than a Samsung phone."

The "rule of thumb" formula for the comparison within one group 95% margin of error is

$$2 \times \frac{1}{\sqrt{n}}$$

where n is the sample size. The reason this is multiplied by two is that each of the groups has the variation of $\frac{1}{\sqrt{n}}$ so to account for both groups we have to multiply it by two.

This formula only works where **both** the percentages you are comparing are between **30% and 70%**. Outside of this range the margin of error is **smaller**. You cannot use this formula if **either** of the percentages are outside this range.

If you want to play around with seeing where this formula comes from see the simulator used in the videos here: https://www.mathsnz.com/resources/files/3.12/moe
And change the type to "Comparison within one group".

Let's look at an example for when we are making a claim with a comparison inside a group: "more kiwi students have an iPhone than a Samsung phone."
We are given some more information as well:

- The survey questioned 770 people
- 40 percent said they owned an iPhone
- 33 percent said they owned a Samsung Phone

Looking at this we can see the number of people who said they owned an iPhone was 7 percentage points higher than said owned a Samsung. We need to see if the 7 percentage points difference from the sample is actually enough for us to conclude that there is a difference back in the population.

There are four things we need to do now.

- **Find the margin of error:** $2 \times \frac{1}{\sqrt{770}} = 0.0721\ (3\text{sf}) = 7.21\%$.
- **Construct the confidence interval:** 7% ± 7.21% (-0.21%, 14.21%)
- **Interpret what this means:** It is a fairly safe bet that the percentage of kiwi students who own an iPhone is somewhere between 0.21 percentage points lower and 14.21 percentage points higher than the percentage of kiwi students who own a Samsung Phone.
- **Make a judgement:** This confidence interval does not support the claim that a higher percentage of kiwi students own iPhones than own Samsung phones because zero is contained within the confidence interval.

It is **really important** that you keep these last as two separate sentences, as that is something the markers have specifically said, as often when people combine them into one sentence they end up mixing up the two.

There are three types of judgements we can make:

- The confidence interval **does not** support the claim that … because **zero is contained within the confidence interval**.
- The confidence interval **does** support the claim that … because **the confidence interval is entirely positive**.
- The confidence interval **does** support the claim that … because **the confidence interval is entirely negative**.