Week 14/15
Term 4
2023

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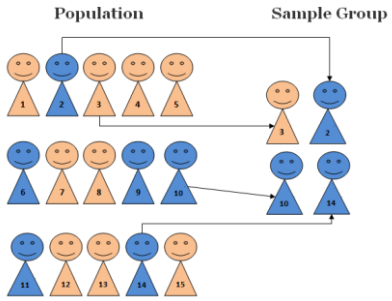
MM4
Sample Proportions and Confidence Intervals

Goals



By the end of this brief, you should be able to:

- Understand and use the concept of a random variable, be aware of bias in samples and use procedures to ensure randomness
- Understand and use the concept of the sample proportion and to learn the mean and standard deviation of sample proportion
- Understand and use the concept of an interval parameter associated with a random variable
- Understand and use the confidence interval as an estimate
- Define the approximate margin of error

Theoretical Components

Resources

- Cambridge Mathematical Methods Units 3 & 4, Chapter 17 (see pdf on Google Drive)
- Read through the chapter and make notes on the examples 1, 3, 12, 14, 15, 16

Video
Confidence intervals and margin of error
https://youtu.be/hlM7zdf7zwU

A **Random Sample** is a sample that is chosen so that each member of the population has the same chance of being selected for the sample. (Don't just ask your friends or the person sitting next to you!) You need to research Random Sample, Systematic Random Sample and Stratified Random Sample.

Sampling from a Population

- Watch the following video

http://onlinestatbook.com/2/sampling_distributions/samp_dist_meanM.html

- sample proportion $\hat{\mathbf{p}} = \frac{\mathbf{X}}{\mathbf{n}}$

- An approximate 95% **confidence interval** for p

$$\left(\hat{p} - 1.96\sqrt{\frac{\hat{p}(1-\hat{p})}{n}},\ \hat{p} + 1.96\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}\right)$$

- **Margin of error (*M*)** at the 95% confidence level

$$M = 1.96\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

- **Sample size** at the 95% confidence level

$$n = \left(\frac{1.96}{M}\right)^2 p^*(1-p^*)$$

Practical Components

Do the following questions from **Chapter 17: Sampling and estimation** (pdf – GC). Organise your solutions neatly in your exercise book.

Ex 17A Populations and samples

- Qs 1 – 5 (any 2), 12, 13

Ex 17D Confidence intervals for the population proportion

- Qs – All

Investigation

See the next page.

QFO

Quiz/Forum/Other

Start preparing for your exam ☺

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Week 14/15 Investigation

Question 1

Suppose that a market research firm is hired to estimate the percent of adults living in a large city who have mobile phones. Five hundred randomly selected adult residents in this city are surveyed to determine whether they have mobile phones. Of the 500 people sampled, 421 responded yes - they own mobile phones. Using a 98% confidence level, compute a confidence interval estimate for the true proportion of adult residents of this city who have mobile phones.

Question 2

It is thought that about 80% of Year 12 students in Canberra have obtained a Covid vaccination. How large a sample would be needed to establish this to within a margin of error of 5% at the 95% confidence level?