Sample proportions and confidence intervals

Learn and practise | Free preview

A sample from this topic. The complete topic collection contains three different resources and worked solutions.

Read the worked example, then show each step in the practice questions. A scientific, statistical or financial calculator, or suitable spreadsheet, can support these calculations. Record the formula, inputs and interpretation.

What you will practise

• Sampling distributions and confidence intervals for population proportions

Useful starting skills: Mathematical Methods Units 1–2 functions, algebra, probability and introductory calculus.

For independent Bernoulli trials, the sample proportion $\hat{p}=X/n$ has mean p and SD $\sqrt{[p(1-p)/n]}$. A normal approximation requires a large suitable sample with enough expected successes and failures.

An approximate 95% interval is $\hat{p}\pm1.96\sqrt{[\hat{p}(1-\hat{p})/n]}$. It describes the long-run capture behaviour of the procedure, not probability that a fixed p moves after the interval is observed.

Worked example

A random sample of 400 contains 240 successes. Find $\hat{p}$ and its estimated standard error.

$\hat{p}=240/400$

$SE=\sqrt{(0.6\times0.4/400)}$.

Answer: 0.6; $\sqrt{0.0006}\approx0.024495$.

Try it yourself

Name: _____ Date: _____

1. For p=0.5, n=100, find mean and SD of phat.

2. For phat=0.5, n=400, find approximate 95% interval.

Answers and explanations

Check the method as well as the final answer. An alternative correct method is also valid.

1. 0.5; 0.05.

Use p and √[p(1-p)/n].

2. [0.451, 0.549].

SE 0.025; margin 1.96×0.025=0.049.

Curriculum reference: Mathematical Methods Units 3–4 — Sampling distributions and confidence intervals for population proportions

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