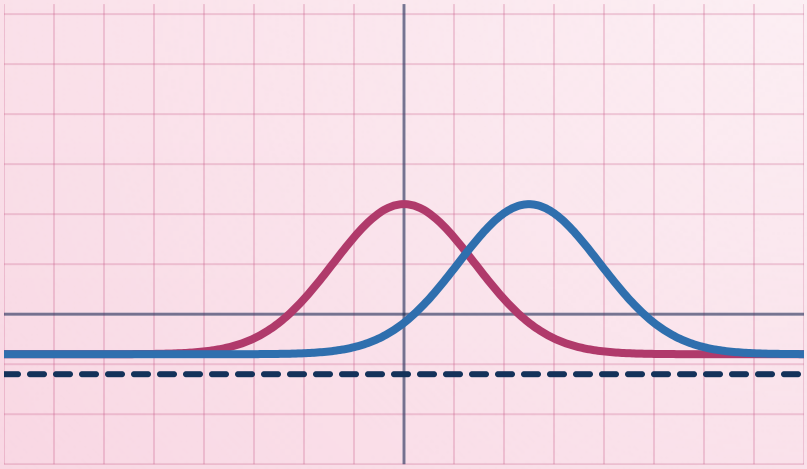
KECUDO

2026 EDITION · COLLEGE MATH SERIES



PROBABILITY & STATISTICS

Class H4

Statistical Inference

From a sample to a confident conclusion

PREMIUM EDITION · KECUDO · H4

13 CHAPTERS · 120 SELF-ASSESSMENT QUESTIONS

INTERACTIVE EDITION + PRINT PDF

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●○○ FOUNDATION

Chapter 1

The Idea of Estimation

We want a **parameter** (the true mean ride length μ, the true share of e-bike rentals p) but only see a sample. A **point estimate** is our single best guess: $\bar{x}$ for μ, $\hat{p}$ for p.

estimate ± margin of error, where margin of error = critical value × standard error

WHY A RANGE?

A different sample would give a different $\bar{x}$. The standard error (Class H3) tells us how much estimates vary, so we report a range that probably contains the truth.

Parameter	Estimate	Standard error
mean μ	$\bar{x}$	$s/\sqrt{n}$
proportion p	$\hat{p}$	$\sqrt{\hat{p}(1-\hat{p})/n}$
difference $\mu_1 - \mu_2$	$\bar{x}_1 - \bar{x}_2$	$\sqrt{s_1^2/n_1 + s_2^2/n_2}$

FOUNDATION

Chapter 2

Confidence Interval for a Mean

$$\bar{x} \pm t^* \cdot s/\sqrt{n} \quad (df = n - 1)$$

WORKED EXAMPLE **25 timed rides: $\bar{x}$ = 31.2 min, s = 9**

1. SE = 9/√25 = 1.8; t* (24 df, 95%) = 2.064.
2. Margin = 2.064 · 1.8 ≈ 3.7.
3. 95% CI: 31.2 ± 3.7 → (27.5, 34.9) minutes.

✓ **We're 95% confident the true mean ride length is between 27.5 and 34.9 minutes**

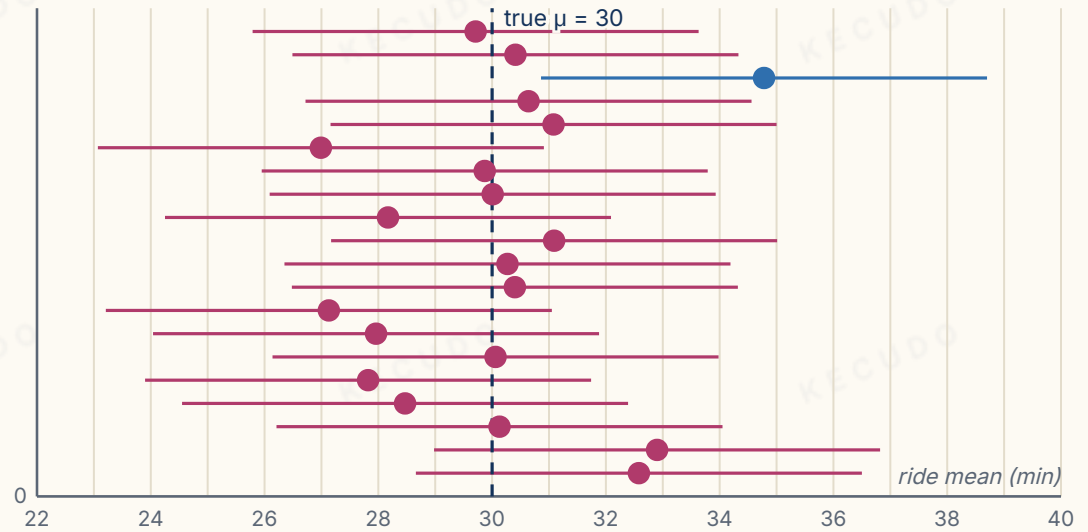


FIG 2.1 20 samples, 20 intervals of the form $\bar{x}$ ± 3.92. Nineteen capture μ = 30; one (blue) misses.

WHAT "95% CONFIDENT" MEANS

The method captures the true μ in about 95% of samples. It does not mean a 95% chance that μ is in this particular interval: μ is fixed.

CHECK YOUR UNDERSTANDING

Chapter 1: The Idea of Estimation

5 questions · your answer locks when you choose it

1. The point estimate of μ is:

- **A** μ
- **B** n
- **C** s
- **D** $\bar{x}$

2. Margin of error =

- **A** s^2
- **B** critical value × SE
- **C** SE/n
- **D** $\bar{x} - \mu$

3. $\hat{p}$ = 180/500 estimates:

- **A** μ
- **B** the sample size
- **C** the SE
- **D** the true e-bike share p

4. A larger sample makes the SE:

- **A** unchanged
- **B** larger
- **C** zero
- **D** smaller

5. Why report a range, not one number?

- **A** Rules require it
- **B** To look precise
- **C** Estimates vary from sample to sample
- **D** Parameters change

FINAL EXAM

25 Questions on the Whole Book

Parts A–E · 5 questions each

Part A · Basics

1. A confidence interval estimates:

A a parameter | **B** the sample size | **C** a statistic | **D** a p-value

2. The p-value assumes:

A H_o is true | **B** nothing | **C** n is large | **D** H_a is true

3. A Type I error is:

A a correct decision | **B** missing a real effect | **C** rejecting a true H_o | **D** low power

4. Paired data are analyzed with:

A pooled proportions | **B** differences | **C** χ^2 | **D** ANOVA

5. Chi-square tests are for:

A categorical counts | **B** paired means | **C** slopes | **D** one mean



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Thank you for learning with Kecudo.

NEXT IN THE SERIES

Class H5 · Regression & Correlation