Confidence interval and Margin of Error

Example :- What is the potential score ?

80 marks ✗

75 - 85 ✓ ⟶ more confident

Analysis

↳ Sample ⟶ Avg height of Employees of a company

↓ true for population

↓

Sample ($\bar{x}$) ⟶ Point estimate

* estimate → An estimate of a population parameter is an approximation depending solely on sample information.

→ A point estimate is a single no.
eg 180 cm (height)

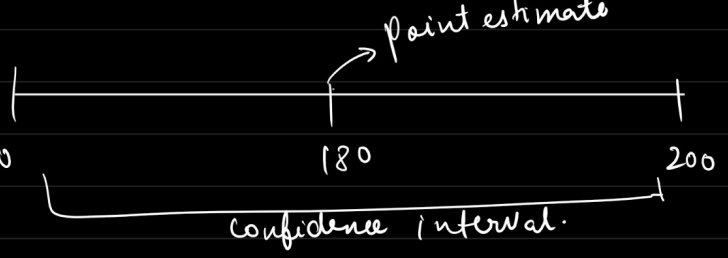
→ Confidence interval ⟶ interval (range of values)

point estimate ± Error.

Confidence interval = 180 ± 20

= 160 — 200

* Point estimate is located exactly in the middle of confidence interval



If people visiting this restaurant spends 1000 Rs on an avg.

↳ It is much safer to say that people spend

800 - 1200 Rs

↓

Confidence Interval

⇓

More accurate representation of reality.

Why ? → You cannot be 100% confident Unless you go through entire population.

CI = point estimate ± margin of error

(in hypothesis testing, margin of error is α)

Z test (two tail) → $CI = \bar{x} \pm Z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$ → where σ is population std dev^n

Z test (one tailed) → $CI = \bar{x} \pm Z_{\alpha} \frac{\sigma}{\sqrt{n}}$ ($\frac{\sigma}{\sqrt{n}}$ → margin of error)

→ n - Sample size

→ $\bar{x}$ - Sample mean

→ $Z_{\alpha/2}$ → Z score corresponding to given $\alpha/2$

→ α level of significance.

t-test = $CI = \bar{x} \pm t_{\alpha/2} \frac{s}{\sqrt{n}}$ → s → Sample std dev^n

CI → what value the sample statistic will take Can be known through confidence interval.

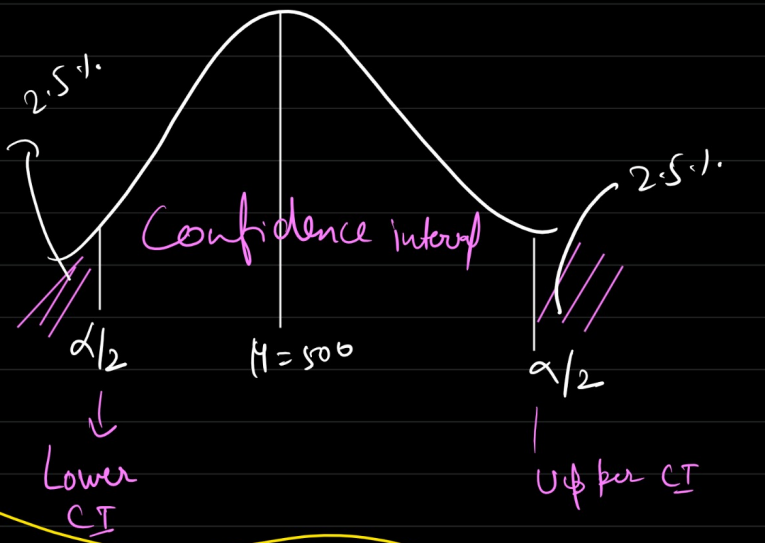
Q. In an Exam the standard deviation of marks is 100. A sample of 36 students has a mean of 500 marks.

Construct a 95% confidence interval about the mean?

→

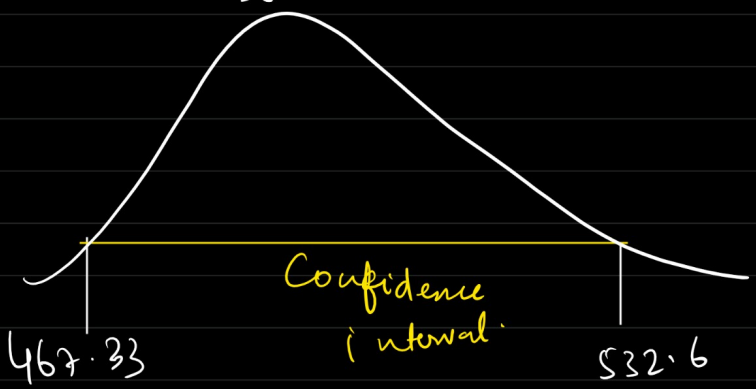
$$CI = \bar{x} \pm Z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$$

$$= 500 \pm 1.96 \times \frac{100}{\sqrt{36}}$$



$$\text{Lower CI} = 500 - 1.96 \times \frac{100}{\sqrt{36}} = 467.33$$

$$\text{Upper CI} = 500 + 1.96 \times \frac{100}{\sqrt{36}} = 532.6$$

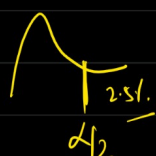


Z table → 0.9750

What is Z score?

↓

1.96



Interpretation

I am 95% confident that the mean score in the exam lies between 467.3 and 532.6.