Let's Standardize!

$$W_n = \frac{\bar{X} - \mu}{(\sigma/\sqrt{n})} \sim N(0,1)$$

$$\text{"}\lim\text{"}(W_n) = Z \sim N(0,1)$$

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this is shorthand for i.i.d.

$\boxed{\text{The CLT}}$: Observe a $\overbrace{\text{random sample}}$ $X_1, X_2, \dots, X_n$ from a population with mean μ and variance $\sigma^2 < \infty$.

Let $W_n = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}} = \frac{(\sum X_i) - (n\mu)}{(\sqrt{n})(\sigma)}$

Then $W_n \xrightarrow{d} Z \sim N(0,1)$ as $n \to \infty$.

Note

1) "$\xrightarrow{d}$" converges in dist. means that

$$\lim_{n\to\infty} G_n(y) = G(y) \quad \text{for all } y$$

(i.e. the sequence of function converges pointwise)

2) If $M_n(t) \to M(t)$ on $(-\delta, \delta)$, then $W_n \xrightarrow{d} W$

☆ Q1 What's "lim"?

Q2 What if X_i are not normal?