§ 8.5 INTERVAL ESTIMATION

SUPPOSE I WANT TO KNOW THE AVERAGE WEIGHT OF A COFFEE BEAN.
I GATHER A RANDOM SAMPLE $n = 50$
AND FIND $\bar{x} = 80$ mg , $s = 1.5$ mg.

CLT $\Rightarrow$ $\bar{X}$ HAS APPROX. NORMAL DISTR. WITH MEAN = POP. MEAN (μ) ← UNKNOWN

USE s AS ESTIMATOR (POINT) FOR σ, SO $S.E. = \frac{1.5}{\sqrt{50}} \approx .2121$

PROBABILITY $\bar{X}$ IS WITHIN 1 S.E. OF μ IS .6826
2 S.E. .9544

↕ EQUIVALENTLY

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2 S.E. .9544

↕ EQUIVALENTLY

WE ARE 68.26% CONFIDENT μ IS WITHIN 1 S.E. OF $\bar{X}$
WITHIN .2121 OF 80
IS BETWEEN 79.79 AND 80.21 , [79.79, 80.21]

68.26% ↑ CONFIDENCE COEFFICIENT (DECIMAL) ↓ 95.44%

WE ARE 95.44% CONFIDENT μ IS WITHIN 2 S.E. OF $\bar{X}$
WITHIN 3 S.E. OF 80
IS BETWEEN 79.58 & 80.42 [79.58, 80.42]

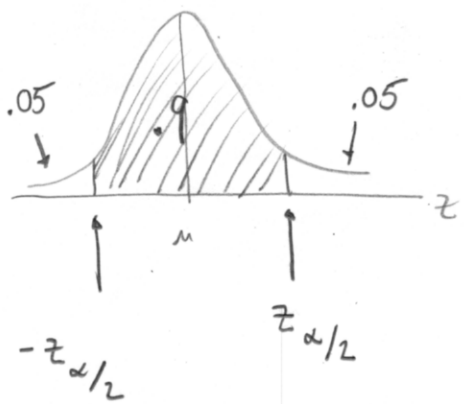
[79.79, 80.21] ↑ CONFIDENCE INTERVAL ↓ [79.58, 80.42]

CONFIDENCE COEFFICIENT	CORRESPONDING α (COMPLIMENT)	CORRESPONDING $z_{\alpha/2}$
.9	.1	1.645
.95	.05	1.96
.98	.02	2.33
.99	.01	2.58

e.g. SUPPOSE $n = 50$, $\bar{x} = 80$, $s = 1.5$.

FIND 90% CONFIDENCE INTERVAL FOR μ. $(\alpha = .1)$

99% CONFIDENCE INTERVAL FOR μ. $(\alpha = .01)$



WE SEE $P(z \leq z_{\alpha/2}) = .95$

$\Rightarrow z_{\alpha/2} = 1.645$

$$[\bar{x} - 1.645\,\sigma, \bar{x} + 1.645\,\sigma] \approx [\bar{x} - 1.645\,s, \bar{x} + 1.645\,s]$$

$$= [$$

CONFIDENCE INTERVALS FOR POPULATION PROPORTIONS

$$\hat{p} \pm z_{\alpha/2} \sqrt{\frac{pq}{n}}$$

$\hat{p}$: $\frac{\bar{x}}{n}$

$\sqrt{\frac{pq}{n}}$: $\sigma \times \sqrt{\frac{\hat{p}\hat{q}}{n}} = S.E.$

ex. # 34, 37