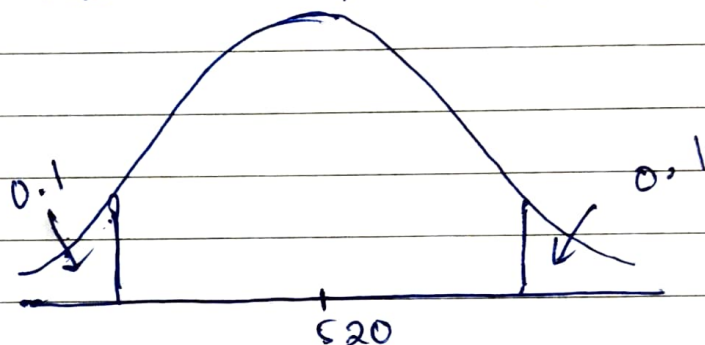Statistics Day-5 assignment

Q In the Quant test of CAT exam, the population standard deviation is known to be 100. A sample of 25 test takers has a mean of 520. Construct a 80% CI about the mean.

Soln $\sigma = 100$, $n = 25$, $\bar{x} = 520$, $CI = 80\%$

Significance value $(\alpha) = 1 - 80\% = 0.02\%$ $1 - 0.80 = 0.2$
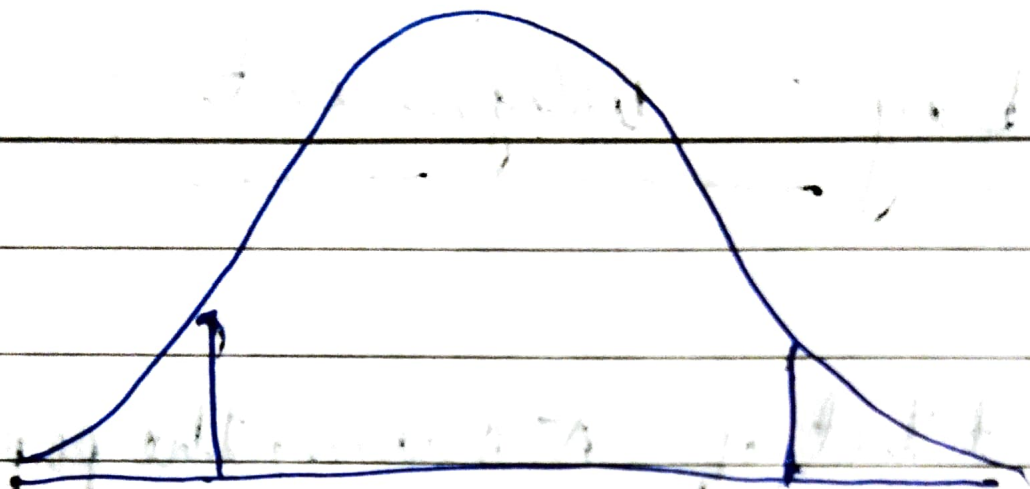

0.1 0.1

520

Parameter = Point estimate ± margin of error.

$$= \bar{x} \pm Z_{\alpha/2}\left(\frac{\sigma}{\sqrt{n}}\right)$$

$$Z_{\alpha/2} = Z_{\frac{0.2}{2}} = Z_{0.1} = 0.53983$$

$$\boxed{\text{Lower fence}} = \bar{x} - Z_{\alpha/2}\frac{\sigma}{\sqrt{n}}$$

$$= 520 - 0.53983\left(\frac{100}{5}\right)$$

$$= 520 - 0.53983\,(20)$$

$$= 509.2034$$

$$\boxed{\text{Higher fence}} = \bar{x} + Z_{\alpha/2}\left(\frac{\sigma}{\sqrt{n}}\right)$$

$$= 520 + 0.53983 = 530.7966$$

509.2034   530.7966

Assignment

_/_/_

Q A car company believes that the percentage of residents in city ABC that owns a vechicle is 60% or less. A sales manager disagrees with this, He conducts a hypothesis testing surveying 250 residents and found that 170 responded yes to owning a vechicle.

a) State the null and alternate hypothesis.

b) At 10% significance level, is there enough evidence to support the idea that vechicle ownership in city ABC is 60% or less?

Solution

a) i) $H_0 \to P_0 \leq 60\%$ (one tail)

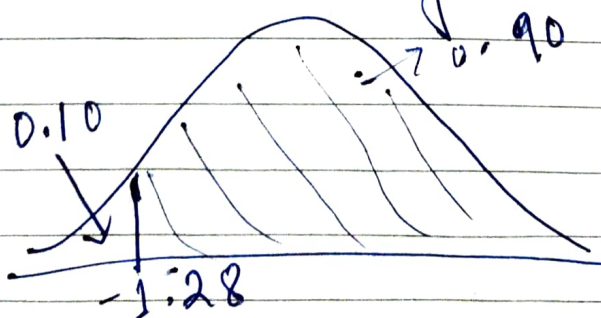 $H_1 \to P_0 > 60\%$ (Z test)

ii) given :—

$$P_0 = 60\% = 0.6$$

$$q_0 = 1 - 0.6 = 0.4$$

$$n = 250$$

$$\hat{q} = \frac{170}{250} = 0.68$$

b) iii) $d = 10\% = 0.1$, $C.I = 90\%$
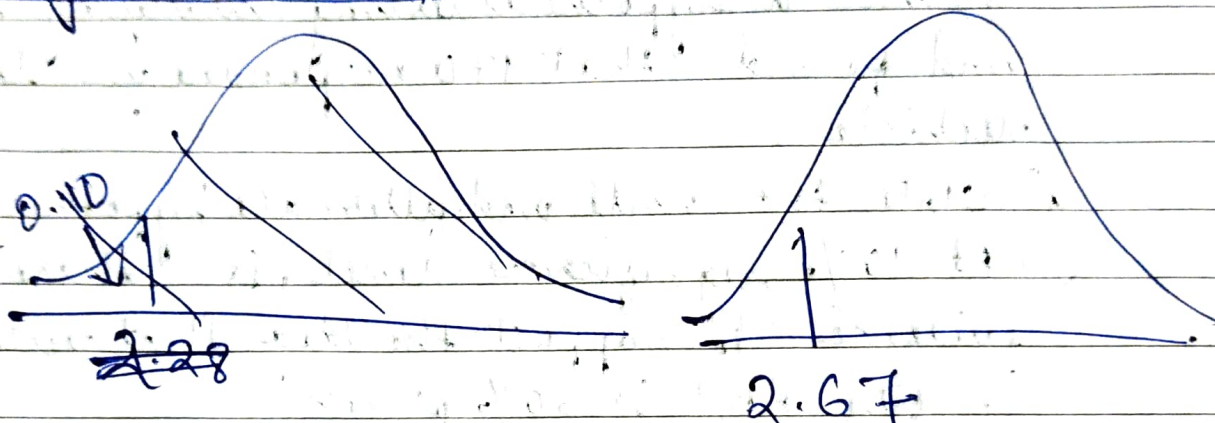
iv) Decision boundary :—

0.10

0.90

-1.28

v) Test statistics :— $Z = \dfrac{\hat{P} - P_0}{\sqrt{P_0 q_0 / n}} = 2.67$

VI) $2.67 > -1.28$ (Reject the null hypotheses)

[Using P-value]

0.110

~~-1.28~~

2.67

I) $2.67 \rightarrow 0.99621$
II) $1 - 0.99621 = 0.00379$
III) Using P value,

   P value $= 0.00379$

P value $< \alpha$, so reject the null hypotheses