Q.1) → Given:- $n = 61$, $\bar{x} = 48$, $S = 14$

$\alpha = 0.05$ $\frac{\alpha}{2} = 0.025$ (95% of C.I.)

$|Z_{\alpha/2}| = $ Sp. norm. ppf $(0.025) = |-1.95| = 1.95$

As sample size ≥ 30, we are using Normal Distribution

Confidence interval for mean (for large samples)

$$\left\{\bar{x} - Z_{\alpha/2} \cdot \frac{S}{\sqrt{n}}\right\} < \mu < \left\{\bar{x} + Z_{\alpha/2} \cdot \frac{S}{\sqrt{n}}\right\}$$

$$\left\{48 - (1.95 \times 1.792)\right\} < \mu < \left\{48 + (1.95 \times 1.792)\right\}$$

$$\boxed{S_{\bar{x}} = \frac{S}{\sqrt{n}} = \frac{14}{\sqrt{61}} = \frac{14}{7.810} = 1.792}$$

$$\left\{44.50\right\} < \mu < \left\{51.49\right\}$$

Sp. norm. interval (0.95, 48, 14/7.810)

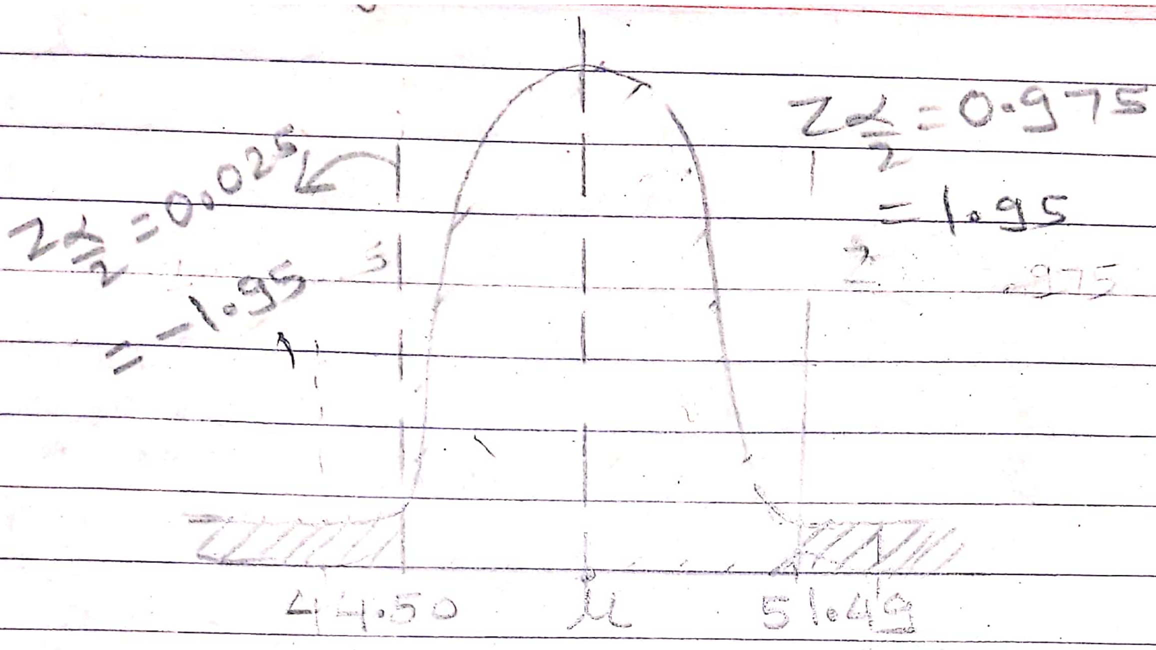
↑ Confidence interval (α)

↑ Mean ↑ (μ)

↑ Sampling Distribution of the Mean (S_x)

$= (44.486, 51.513)$

1) →



(99 % C.I.)

Q.2) → Given:-

$\hat{p} = \frac{x}{n} = \frac{55}{100} = 0.55$

As sample is large we are using Normal distribution:-

$\alpha = 0.01 \qquad \frac{\alpha}{2} = 0.005$

Calculating $|Z_{\frac{\alpha}{2}}| = 0.005 = 2.57$

$Z_{\frac{\alpha}{2}} \times \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$

$2.57 \times \sqrt{\frac{(0.55)(0.45)}{100}}$

$2.57 \times 0.049 = 0.125$

$0.55 - (2.57 \times 0.049) < p < 0.55 + (2.57 \times 0.049)$

$0.55 - (0.125) < p < 0.55 + (0.125)$

$\boxed{0.425 < p < 0.675}$

Q.3] → Given Data:- $n = 15$, $\bar{x} = 12.30$

$S = 2.70$, $\alpha = 0.01$, $\frac{\alpha}{2} = 0.005$

$n-1 = 14$

As sample size < 30, we are using student's t distribution here

Sp. t. ppf (0.005, 14) = −2.97

taking positive value into consideration

= 2.97

Confidence interval Estimate Use Student's t Distribution

$$\left\{\bar{x} - t_{\alpha/2}\frac{s}{\sqrt{n}}\right\} < \mu < \left\{\bar{x} + t_{\alpha/2}\frac{s}{\sqrt{n}}\right\}$$

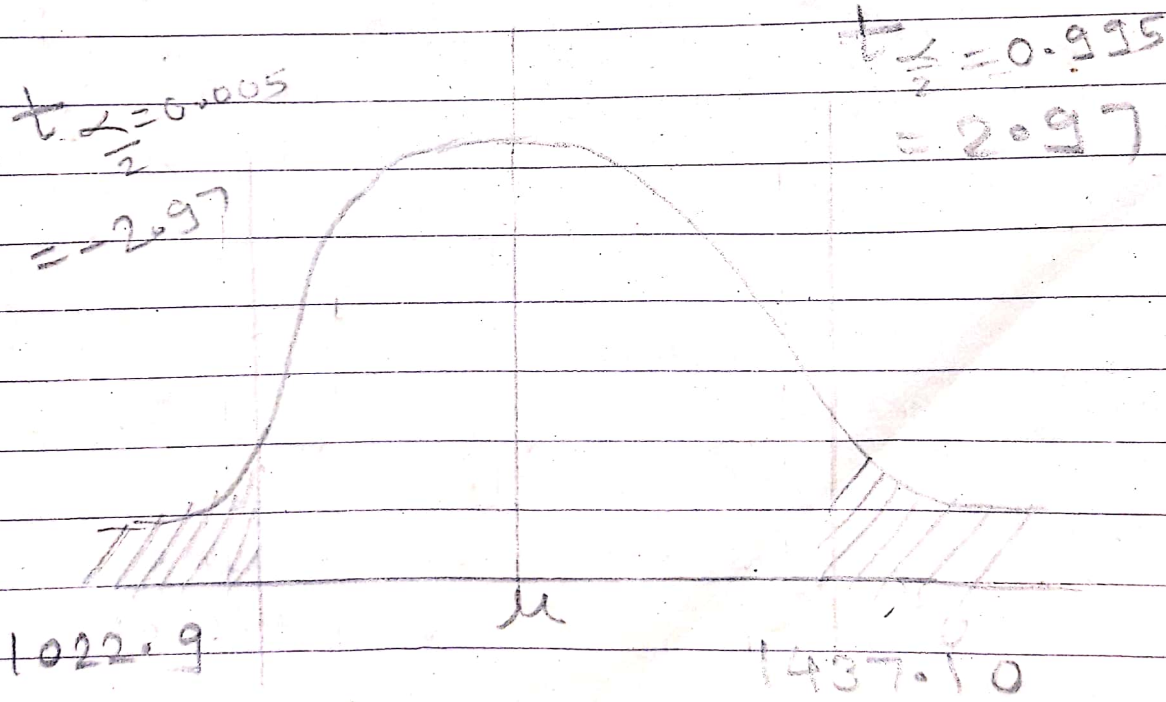
$$\left\{1230 - \left(2.97 \times \frac{270}{\sqrt{15}}\right)\right\} < \mu < \left\{1230 + \left(2.97 \times \frac{270}{\sqrt{15}}\right)\right\}$$

$$\{1230 - 207.10\} < \mu < \{1230 + 207.10\}$$

$$\{1022.9\} < \mu < \{1437.10\}$$

$$[1022.9, 1437.10]$$

3) →



Q.4] → Given Data:-

$n = 1600$

$\alpha = \frac{1}{100} = 0.01$

$\frac{\alpha}{2} = 0.005$

$\hat{p} = \frac{40}{100} = 0.40$

Sp. norm. ppf(0.005) = − 2.57

Taking positive value into Consideration i.e. 2.57

$$Z_{\frac{\alpha}{2}} \times \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$2.57 \times \sqrt{\frac{0.4 \times 0.6}{1600}}$$

$2.57 \times 0.012 = 0.031$

Confidence Interval Estimate

$$\hat{p} - Z_{\alpha/2}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}} < p < \hat{p} + Z_{\alpha/2}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$(0.40 - 0.031) < p < (0.40 + 0.031)$$

$$\boxed{0.369 < p < 0.431}$$

Q.5) → Given Data:-

$n = 12 \quad S^2 = 0.153 \quad (n-1) = (12-1) = 11$

$\alpha = \frac{5}{100} = 0.05$ {we are using chi-square Distribution}

$\frac{\alpha}{2} = 0.025$

Sp.chi2.ppf (0.025, 11) = 3.815
Sp.chi2.ppf (0.975, 11) = 21.92

$$\frac{11 \times 0.153}{3.815} < \sigma^2 < \frac{11 \times 0.153}{21.92}$$

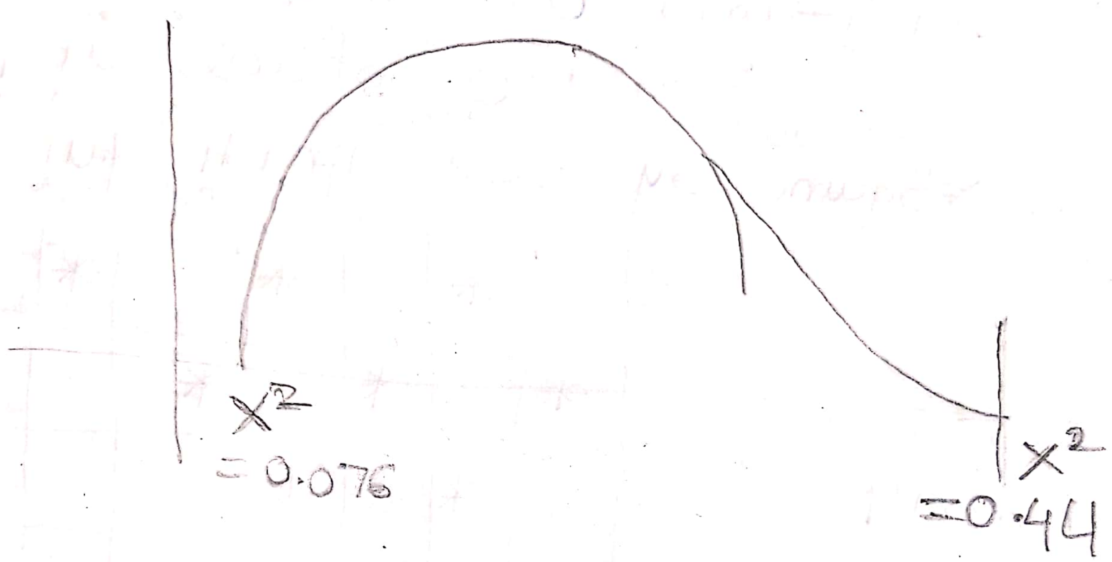
$$0.44 < \sigma^2 < 0.076$$

or

$$0.076 > \sigma^2 > 0.44$$

$$\boxed{0.076 < \sigma^2 < 0.44}$$

5) →



Q.6) → Given Data:-

$n = 150 \quad \bar{x} = 115 \quad S = 10$

$\alpha = \frac{1}{100} = 0.01 \quad \frac{\alpha}{2} = 0.005$

Sp.norm.ppf(0.005) = −2.57

Taking +ve value into consideration i.e. 2.57

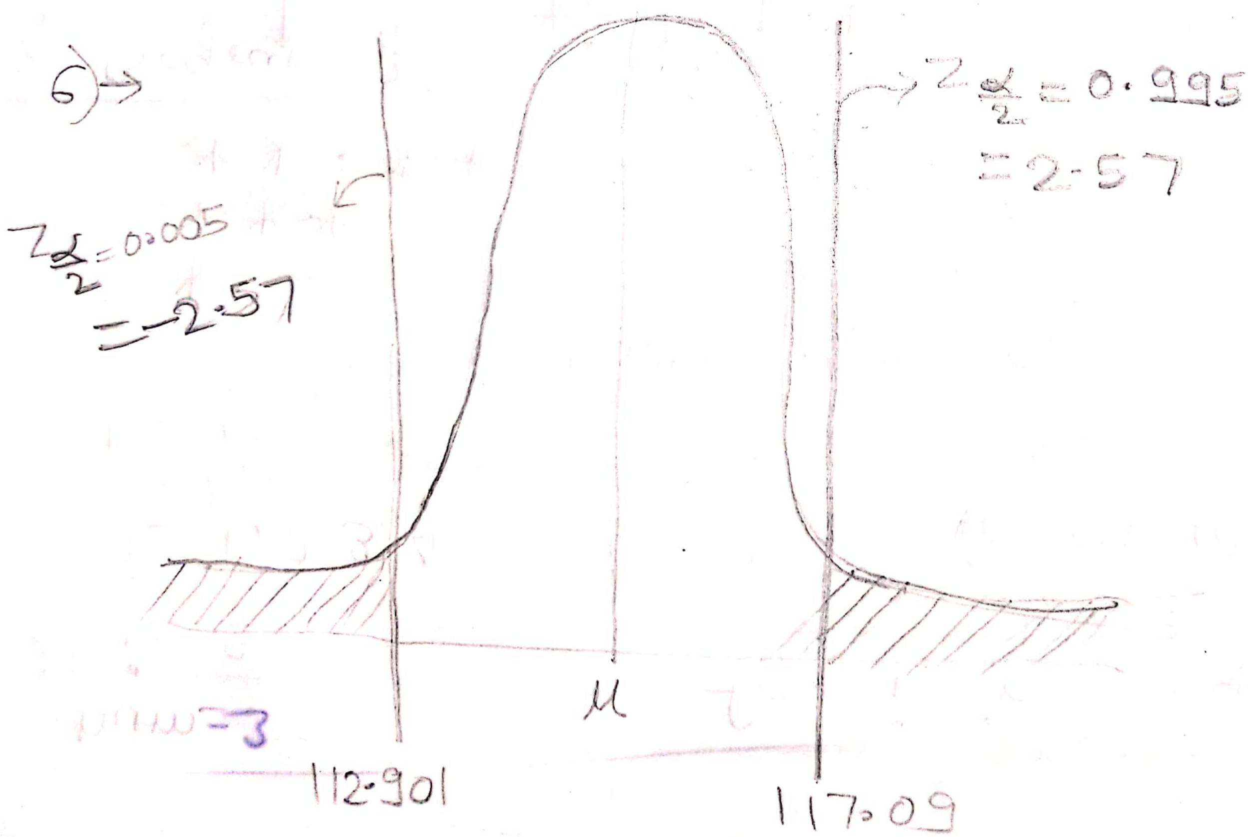
Confidence interval estimate:-

$$\left\{\bar{x} - Z_{\alpha/2} \cdot \frac{S}{\sqrt{n}}\right\} < \mu < \left\{\bar{x} + Z_{\alpha/2} \cdot \frac{S}{\sqrt{n}}\right\}$$

$$\left\{115 - \left(2.57 \times \frac{10}{\sqrt{150}}\right)\right\} < \mu < \left\{115 + \left(2.57 \times \frac{10}{\sqrt{150}}\right)\right\}$$

$$\{115 - 2.099\} < \mu < \{115 + 2.099\}$$

$$112.901 < \mu < 117.09$$



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