STATISTICS DA - 2

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Ans 1 :

$n = 100$

$\mu = 30.5$

$\bar{x} = 28.5$

$\sigma = 6.35$

H_0 : $\bar{x} = \mu$

ie. sample is drawn from above population

H_1 : $\bar{x} \neq \mu$

test stadistic $z = \frac{\bar{x} - \mu}{\sigma\sqrt{n}}$

$z = \frac{28.8 - 30.5}{6.35\sqrt{100}} = \frac{-1.7}{63.5} = -0.0267$

Tabulated value

$z_\alpha = 1.96$ at 5% level

& $|z| = 0.0267$

calculated value

$|z| < z_\alpha$

CV < TV

$\therefore$ we accept null hypothesis H_0

ie sample is drawn from the population of mean 30.5

Ans 2 :

$n_1 = 1000$

$n_2 = 2000$

$\bar{x}_1 = 67.5$

$\bar{x}_2 = 68.0$

$\sigma = 2.5$

H_0 : $\bar{x}_1 = \bar{x}_2$

samples drawn from population

H_1 : $\bar{x}_1 \neq \bar{x}_2$

test statistic :

$$z = \frac{\bar{x}_2 - \bar{x}_1}{\sqrt{\frac{\sigma^2}{n_1} + \frac{\sigma^2}{n_2}}}$$

$$z = \frac{68 - 67.5}{2.5\sqrt{\frac{1}{1000} + \frac{1}{2000}}}$$

$z = 5.163$ (CV)

$|z_\alpha| = 1.96$ for 5% level (TV)

$|z| > |z_\alpha|$

$\therefore$ we reject H_0

$\therefore$ samples are not drawn from same population

Ans 3

$n_1 = 400$ (men)

$n_2 = 600$ (women)

P_1 (men in favour) $= 200/400 = 0.5$

P_2 (women in favour) $= 325/600 = 0.541$

Consider

$H_0 : P_1 = P_2$

proportion of men in favour & women in favour is same

$H_1 : P_1 \neq P_2$

Now

$$z = \frac{P_1 - P_2}{\sqrt{pq\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} , \qquad p = \frac{n_1 P_1 + n_2 P_2}{n_1 + n_2}$$

$$q = 1 - p$$

$$p = \frac{200 + 325}{1000} = 0.525$$

$q = 0.475$

$$z = \frac{0.041}{\sqrt{\frac{0.525 \times 0.475}{200}\left(\frac{1}{2} + \frac{1}{3}\right)}} = 0.41\sqrt{10}$$

$z = 1.296$

$z_\alpha = 1.96$ at 5% level

$\therefore$ we must accept null hypothesis (H_0)

$\therefore$ ~~pr~~ proportions of men & women are equal

Ans 4:

~~no~~ $n = 900$

$\mu = 3.25$

$\bar{x} = 3.4$

$\sigma = 2.61$

$SD = 2.61$

$H_0 : \bar{x} = \mu$

given sample drawn from population

$H_1 : \bar{x} \neq \mu$

$$z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}} = \frac{3.4 - 3.25}{2.61 / \sqrt{900}}$$

$$z = \frac{0.15 \times 30}{2.61} = 1.724$$

for 5% level $\quad z_\alpha = 1.96$

$|z_\alpha| > |z|$

$\therefore$ we accept null hypothesis

ie sample is from given population

95% confidence limits of true mean

$$\bar{x} \pm 1.96 \frac{\sigma}{\sqrt{n}}$$

$\Rightarrow \quad 2.4 + 1.96 \left(\frac{2.61}{\sqrt{30}}\right) \quad \& \quad 3.4 - 1.96 \left(\frac{2.61}{30}\right)$

$\Rightarrow \quad 3.57 \quad \& \quad 3.22$

limit $\Rightarrow$ $(3.23, 3.57)$

Ans 5 :

"A"	"B"
$n_1 = 1000$	$n_2 = 1500$
$\bar{x}_1 = 47$	$\bar{x}_2 = 49$
$\sigma_1 = 28$	$\sigma_2 = 40$

Null hypothesis $H_0 : \bar{x}_1 = \bar{x}_2$

$\therefore$ no significance diff. b/w wages

Alt. hypothesis $H_1 = \bar{x}_1 \neq \bar{x}_2$

$$z = \frac{|\bar{x}_2 - \bar{x}_1|}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} = \frac{20}{\sqrt{\frac{28^2}{10} + \frac{40^2}{15}}} = 1.47$$

$|z_\alpha| = 1.96$ (at 5% level)

$|z_\alpha| > |z| \quad \therefore \quad H_0$ is true

No significant difference b/w wages