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DPP-2 Unit-5 Maths-IV

Topic - t-test for one sample

Q-1- A sample of 20 items has mean 42 units and S.D. 5 units. Test the hypothesis that is a random sample from a normal population with mean 45 units.

Sol- $n = 20$
$\bar{x} = 42$
$s = 5$
$\mu = 45$

Null Hypothesis (H_0)

$H_0: \mu = 45$

Alternative Hypothesis (H_1)

$H_1: \mu \neq 45$ (two tailed test)

Calculation of $|t| \Rightarrow t = \dfrac{\bar{x} - \mu}{\dfrac{s}{\sqrt{n-1}}}$

$$t = \frac{-3}{5} \times \sqrt{19}$$

$$t = -2.615$$

$$|t| = 2.615$$

Degree of freedom $= n - 1 = 19$

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Level of Significance

$\alpha = 5\% = 0.05$

From the t-test table

$t_{0.05} = 2.09$

Conclusion :- $|t| = 2.61$ and $t_{0.05} = 2.09$

$\because |t| > t_{0.05}$

$\therefore H_0$ Hypothesis is rejected.

Q- Ten individuals are chosen at random from a normal population of students and their marks are found to be 63, 63, 66, 67, 68, 69, 70, 70, 71, 71. In the light of these data discuss that mean mark of the population of students is 66.

Sol- $n = 10$, $\mu = 66$

$$\bar{x} = \frac{\Sigma x}{n}$$

$$= \frac{678}{10}$$

$$\boxed{\bar{x} = 67.8}$$

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x	$x-\bar{x}$	$(x-\bar{x})^2$
63	-4·8	23·04
63	-4·8	23·04
66	-1·8	3·24
67	-0·8	0·64
68	0·2	0·04
69	1·2	1·44
70	2·2	4·84
70	2·2	4·84
71	3·2	10·24
71	3·2	10·24

$\Sigma x = 678$ $\quad \Sigma (x-\bar{x})^2 = 81·6$

$$S = \sqrt{\frac{\Sigma (x-\bar{x})^2}{n-1}} = \sqrt{\frac{81·6}{9}} = 3·009 \approx 3$$

$|t|$ = Null Hypothesis (H_0)

H_0 : —

H_0 : $\mu = 66$

Alternative Hypothesis (H_1)

H_1 : $\mu \neq 66$ (Two tailed test)

Calculation of $|t|$

$$|t| = \frac{\bar{x} - \mu}{S/\sqrt{n}}$$

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$$|t| = \frac{67.8 - 66}{3/\sqrt{10}}$$

$$|t| = \frac{1.8}{3} \times \sqrt{10}$$

$$\boxed{|t| = 1.896}$$

$$D.of = n - 1 = 10 - 1 = 9$$

$$\alpha = 0.05$$

$$\boxed{t_{0.05} = 2.26}$$

Conclusion :- $|t| < t_{0.05}$ at 5% level of significance, the null hypothesis H_0 is accepted.

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