Assignment 3 : P452

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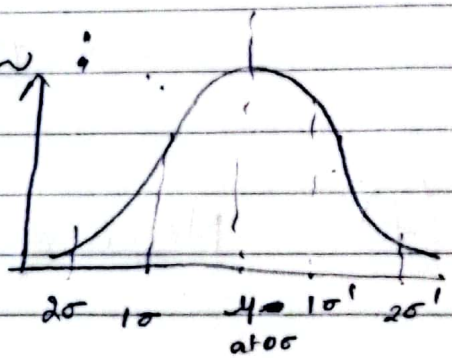
(3)

$$\text{mean} = \sum_{i=1}^{N} \frac{x_i}{N} = \frac{[77 + 150 + 210 + 125 + 38]}{5}$$

mean = 120 ; sum = 600

For standard normal distribution :



⇒ Expected values :

$e_1 = 0.15 \times (\text{sum}) = 90$
$e_2 = 0.24 \times 600 = 144$
$e_3 = 0.38 \times 600 = 228$
$e_4 = 0.18 \times 600 = 108$
$e_5 = 0.05 \times 600 = 30$

⇒

(O_i) Observed	(e_i) Expected	σ
77	90	13
150	144	6
210	228	18
125	108	17
38	30	8

N = 5
Sum = 600
mean = 120

⇒ D.O.F = N − 1 = 5 − 1 =

⇒ $\chi^2 = \sum_{i=1}^{N} \frac{(O_i - e_i)^2}{e_i} = 8.3581$

for dof = 4 :

⇒ At 5% significance ; (i.e probability mass = 95%)

$\chi^2_{(5c)} = 9.4877$

$\Rightarrow \chi^2 < \chi^2_{5c} \rightarrow$ Normal distribution

xly at 10% significance level (i e 90% prob. mass)

$\chi^2_{(10c)} = 7.7794$

$\Rightarrow \chi^2 > \chi^2_{10c}$

$\rightarrow$ Distribution not Normal.

(4) Mean of shipment A $= \mu_A = \sum_{i=1}^{N} (x_A)_i / N_A$

$\mu_A = 4.708$

xsly $\mu_B = 4.74$

Now $\sigma^2 = \sum_{i=1}^{N} (x_i - \mu)^2 / N$

$\Rightarrow \sigma_A^2 = 0.01$

xly $\sigma_B^2 = 0.006$

For F-test ; $F = \sigma_A^2 / \sigma_B^2 = 1.848$

now for ($\alpha = 0.05$ ∴ taken) & $df_1 = 12$, $df_2 = 6$

$F_c = 3.0$

$\Rightarrow F < F_c \rightarrow$ Same population for both shipment

T-statistic test:

$$D.o.f = (N_A - 1) + (N_B - 1) = 18$$
$$= df_1 + df_2$$

$$s^2 = \frac{df_A \cdot \sigma_A^2 + df_2 \cdot \sigma_B^2}{dof} \quad \text{(pooled variance)}$$

$$= (12 \times 0.01) + (6 \times 0.006)\frac{1}{18}$$

$$= 0.00867$$

$$\Rightarrow S = 0.0931$$

$$T = \frac{\mu_A - \mu_B}{\sqrt{S \cdot \left(\frac{1}{N_A} + \frac{1}{N_B}\right)}}$$

$$= \frac{(4.708 - 4.708)}{\sqrt{0.0931\left(\frac{1}{12} + \frac{1}{6}\right)}} = -0.726$$

$$\Rightarrow |T| = 0.726$$

taking $\alpha = 0.05 \Rightarrow 1 - \frac{\alpha}{2} = 0.975$

$\Rightarrow T_c = 2.109$

$\Rightarrow |T| < T_c$

$\Rightarrow$ Same population of lenses in both shipment.