Assignment 5 manav_17

Q2.

→ since p is very small so we use Poisson's distribution

λ = mean = $2000 \times 0.001 = 2$

$P(x) = \frac{e^{-2}(2)^x}{x!}$

1. $P[\text{exactly } 3] = P[x=3] = \frac{e^{-2}(2)^3}{3!}$

$P[x=3] = 0.18$

2. $P[\text{more than } 2] = P[x>2] = 1 - P[x \leq 2]$

$= 1 - [e^{-2} + 2e^{-2} + 2e^{-2}]$

$= 1 - \frac{5}{e^2}$

$\therefore P[x>2] = 0.323$

Q8.

→ For area 0.43, $z = 1.48$, since 35 is less than μ, $z = -1.48$ and for area 0.39, $z = 1.23$

$\therefore \frac{(35-\mu)}{\sigma} = -1.48 \quad \cdots (1)$

$\frac{(63-\mu)}{\sigma} = 1.23 \quad \cdots (2)$

On solving we get

$\sigma = 10.33$ and $\mu = 50.2884$.

Q.16

→ $n_1 = 9$

$n_2 = 7$

Since both the sample size is less than 20. So it is small sample

$\bar{x_1} = 196.42$

$\bar{x_2} = 198.82$

$\Sigma(x_1 - \bar{x_1})^2 = 26.94$

$\Sigma(x_2 - \bar{x_2})^2 = 18.73$

$H_0 : \mu_1 = \mu_2$

$H_1 : \mu_1 \neq \mu_2$

Degree of freedom $= n_1 + n_2 - 2 = 14$.

Critical value $t = 2.145$

Since sample is small

$$S_p = \sqrt{\frac{\Sigma(x_1 - \bar{x_1})^2 + \Sigma(x_2 - \bar{x_2})^2}{n_1 + n_2 - 2}}$$

$S_p = 1.8061$

$$SE = S_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}} = 1.806 \sqrt{\frac{1}{9} + \frac{1}{7}}$$

$S_E = 0.9102$

Q.16

→ $t_{\alpha} = \frac{\bar{x}_1 - \bar{x}_2}{SE} = \frac{196.42 - 198.82}{0.9102} = -2.6368$

Since $|t_{\alpha}| > t$, H_0 is rejected

∴ The sample cannot be considered to have been drawn from the same population.

Q18

→ H_0 = There is no relationship b/w sex and colour

H_1 = There is relationship b/w sex and colour

Colour	male	Female	Total
Red	$\frac{110 \times 50}{200} = 28$	22	50
White	$\frac{110 \times 100}{200} = 55$	45	100
Green	$110 - 28 - 55 = 27$	23	50
Total	110	90	200

Calculation of $\frac{(O-E)^2}{E}$

Obs. Freq (O)	Exp. Freq. (E)	$(O-E)^2$	$x^2 = \frac{(O-E)^2}{E}$
10	28	324	11.5714
40	22	324	14.7273
70	55	225	4.0909
30	45	225	5
30	27	9	0.3333
20	23	9	0.3913
		Total	$x^2 = 36.1142$

$x_a^2 = 5.991$

∴ There is relationship b/w sex and colour

Q.20

→

O	E	$(O-E)^2$
15	22	49
20	22	4
25	22	9
15	22	49
29	22	49
28	22	36
	Total	196

H_0 = die is unbiased H_1 = die is not unbiased

On hypothesis that die is unbiased we should expect frequency of each number as $132/6 = 22$

$$x^2_{cal} = \sum \frac{(O-E)^2}{E} = \frac{198}{22} = 8.91$$

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Q.10

→ L.O.S $(\alpha) = 0.05$

degree of freedom $= n-1 = 6-1 = 5$

$(\chi_\alpha)^2 = 11.0705$

since $\chi^2_{cal} < \chi_\alpha^2$, Ho is accepted

∴ The die is unbiased