(1)

STA301

Practice Questions

lecture No 23 To 27

QNo1: Find $E(X)$

x	$f(x)$	$xf(x)$
-1	0.125	-0.125
0	0.50	0
1	0.20	0.20
2	0.05	0.1
3	0.125	0.375
		0.55

We know that

$$E(X) = \Sigma x f(x)$$
$$= 0.55$$

$$\boxed{E(X) = 0.55}$$

QNo 2

Find $g(2)$

$y \backslash x$	2	4	$h(y)$
1	0.10	0.15	0.25
3	0.20	0.30	0.50
5	0.10	0.15	0.25
$g(x)$	0.4	0.6	1

$g(2) = ?$

$$\boxed{g(2) = 0.4}$$

QNO3

let X be a Continuous r.v with p.d.f

$f(x) = 6x(1-x) \quad , \quad 0 \leq x \leq 1$
$\quad = 0 \quad , \quad$ elsewhere

check that $f(x)$ is a p.d.f

The function be a density function if

$$\int_{-\infty}^{\infty} f(x)\,dx = 1$$

$$\int_{0}^{1} 6x(1-x)\,dx = 1$$

$$\int_{0}^{1} 6x - 6x^2 = 1$$

$$6\left[\frac{x^2}{2}\right]_0^1 - 6\left[\frac{x^3}{3}\right]_0^1 = 1$$

$$\frac{\cancel{6}^{3}}{\cancel{2}}\left[1-0\right] - \frac{\cancel{6}^{2}}{\cancel{3}}\left[1-0\right] = 1$$

$3(1) - 2(1) = 1$

$3 - 2 = 1$

$1 = 1$

Hence proved that the function $f(x)$ is a p.d.f

Q No 4

Let X and Y be a independent r.v's with joint p.d.f

$f(x,y) = x^2 + \frac{1}{3}xy$, $0 \le x \le 1, 0 \le y \le 2$

$= 0$ elsewhere

Find the E(X).

We are given that

$f(x,y) = x^2 + \frac{1}{3}xy$

$0 \le x \le 1, 0 \le y \le 2$

$E(X) = ?$

We know that

$$E(X) = \int_{-\infty}^{\infty} x\, g(x)\, dx$$

we first find $g(x)$

$$g(x) = \int_{-\infty}^{\infty} f(x,y)\,dy$$

$$= \int_{0}^{2} \left(x^2 + \frac{1}{3}xy\right) dy$$

$$= \int_{0}^{2} x^2\,dy + \frac{1}{3}\int_{0}^{2} xy\,dy$$

$$= x^2\left[y\right]_0^2 + \frac{1}{3}x\left[\frac{y^2}{2}\right]_0^2$$

$$= x^2\left[2-0\right] + \frac{1}{6}x\left[2^2-0\right]$$

$$= 2x^2 + \frac{1}{\cancel{6}_3}x\left(\cancel{4}^2\right)$$

$$= 2x^2 + \frac{2x}{3}$$

Now

$$E(X) = \int_{-\infty}^{\infty} x\,g(x)\,dx$$

$$= \int_{0}^{1} x\left[2x^2 + \frac{2x}{3}\right] dx$$

(6)

$$= \int_0^1 \left(2x^3 + \frac{2x^2}{3}\right) dx$$

$$= 2\int_0^1 x^3 dx + \frac{2}{3}\int x^2 dx$$

$$= 2\left[\frac{x^4}{4}\right]_0^1 + \frac{2}{3}\left[\frac{x^3}{3}\right]_0^1$$

$$= \frac{2}{4}\left[1-0\right] + \frac{2}{9}\left[1-0\right]$$

$$= \frac{2}{4} + \frac{2}{9} = \frac{18+8}{36} = \frac{\cancel{26}\,13}{\cancel{36}\,18}$$

$$= \frac{13}{18}$$

$$\boxed{E(X) = \frac{13}{18}}$$

Lecture 28-32

Q.No1

if $n=10$ and variance of the binomial distribution is 21.25 then find the standard deviation of binomial distribution.

We are given that

$n=10$, variance $= npq = 21.25$

S.D = ?

We know that the standard deviation is the positive square root of variance then,

$$S.D = \sqrt{npq} = \sqrt{21.25}$$

$$\boxed{S.D = 4.609}$$

Q.No 2.

if $P(X=x) = \binom{6}{x}\left(\frac{1}{2}\right)^{x}\left(\frac{1}{2}\right)^{6-x}$

Then find $P(X=5)$.

$$P(X=x) = \binom{6}{x}\left(\frac{1}{2}\right)^{x}\left(\frac{1}{2}\right)^{6-x}$$

we have the to find

$$P(X=5) = ?$$

$$P(X=5) = \binom{6}{5}\left(\frac{1}{2}\right)^{5}\left(\frac{1}{2}\right)^{6-5}$$

$$= (6)\left(\frac{1}{32}\right)\left(\frac{1}{2}\right)$$

$$\boxed{P(X=5) = \frac{3}{32}}$$

QNo3 A computer shop ~~is~~ contain 3 goods and 2 defective monitor. Two monitors are selected by without replacement. Find the probability That:

i) Both will be good

ii) One is good and one is defective.

Solution

we are given That

good monitors = 3

defective monitors = 2

Total = 5

Selected = 2

i) Both will be good

$$P(X=2) = \frac{\binom{3}{2}\binom{2}{0}}{\binom{5}{2}} = \frac{3(1)}{10}$$

$$\boxed{P(X=2) = \frac{3}{10}}$$

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ii) 1 good & 1 defective

~~P(X=1 &~~

P(X= 1 is good + ~~Y~~= 1 is defective)

$$= \frac{\binom{3}{1}\binom{2}{1}}{\binom{5}{2}} = \frac{3 \times 2}{10} = \frac{6}{10}$$

$$\boxed{P(X=1)+P(\cancel{Y}=1) = \frac{6}{10}}$$

Q.No 4

X is a normally distributed variable with mean $\mu = 30$ and standard deviation $\sigma = 4$ Find

a) $P(x < 40)$

b) $P(x > 21)$

c) $P(30 < x < 35)$

we are given that

$\mu = 30, \sigma = 4$

a) $P(x < 40)$

$$P(x < 40) = P\left(\frac{x-\mu}{\sigma} < \frac{40-\mu}{\sigma}\right)$$

$$P\left(z < \frac{40-30}{4}\right) = P\left(z < \frac{10}{4}\right)$$

$$P(z < 2.5) = 0.99379$$

$\because$ $\boxed{\text{From table 9}}$

b) $P(X > 21)$

$= P\left(\frac{x-\mu}{\sigma} > \frac{21-\mu}{\sigma}\right)$

$= P\left(z > \frac{21-30}{4}\right)$

$= P\left(z > \frac{-9}{4}\right) = P(z > -2.25)$

$= P(z > -2.25) = 1 - P(z < -2.25)$

$\because$ table 9

$= 1 - 0.01191$

$= 0.98809$

c) $P(30 < x < 35)$

$= P\left(\frac{30-\mu}{\sigma} < \frac{x-\mu}{\sigma} < \frac{35-\mu}{\sigma}\right)$

$= P\left(\frac{30-30}{4} < z < \frac{35-30}{4}\right)$

$= P(0 < z < 1.25)$

$= P(z < 1.25) - P(z < 0)$

$= 0.89435 - 0.5$

$= 0.39435$

Lecture 33-37

Q No 1

Define an unbiased estimator.

An estimator is unbiased if the mean of its sampling distribution is equal to the population parameter to be estimated.

$$E(T) = \theta$$

OR

An estimator is defined to be unbiased if the statistic is used as a estimator has its expected value equal to the true value of population parameter being estimated

$$E(\hat{\theta}) = \theta$$

Q No 2
What is meant by confidence interval?

A confindence interval estimate of the unknown parameter θ is an interval computed from a random sample of n values $x_1, x_2, \ldots, x_n$ with a statement of how confident (e.g 90%, 95% or 99%).

we are that the interval contains the unknown parameter θ.

$$P(\underbrace{L}_{\text{lower limit}} < \theta < \underbrace{U}_{\text{upper limit}}) = 1 - \alpha \text{ for } 0 < \alpha < 1$$

Q No 3 we are given that

$n_1 = 90$, $n_2 = 100$

$\bar{x}_1 = \mu_1 = 76.4$, $\bar{x}_2 = \mu_2 = 81.2$

$\sigma_1 = 8.2$, $\sigma_2 = 7.6$

confidence coefficient

$1 - \alpha = 98\% = 0.98$

$1 - \alpha = 0.98 \Rightarrow \alpha = 0.02$

$\Rightarrow \frac{\alpha}{2} = \frac{0.02}{2} = 0.01 \Rightarrow 1 - \frac{\alpha}{2} = 1 - 0.01$

$\Rightarrow 1 - \frac{\alpha}{2} = 0.99$

$Z_{1-\alpha/2} = Z_{0.99} = 2.326$

∴ Table 10 (b)

Now

$$(\bar{x}_1 - \bar{x}_2) \pm Z_{1-\alpha/2} \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

$$(76.4 - 81.2) \pm 2.326 \sqrt{\frac{(8.2)^2}{90} + \frac{(7.6)^2}{100}}$$

$$-4.8 \pm 2.326 \sqrt{1.3247}$$

$$-4.8 \pm 2.326(1.1509)$$

-4.8 ± 2.6771

$-4.8 + 2.6771$, $-4.8 - 2.6771$

-2.12 , $= -7.48$

Hence the confindence interval is

$(-7.48, -2.12)$

QNo4 Find upper limit :

we are given that

$\bar{X} = 400$, $\sigma = 21$, $n = 29$

$1 - \alpha = 0.95 \Rightarrow \alpha = 1 - 0.95 \Rightarrow 0.05$

$\frac{\alpha}{2} = 0.025 \Rightarrow 1 - \frac{\alpha}{2} = 0.975$

Now

$\bar{X} \pm Z_{1-\alpha/2} \frac{\sigma}{\sqrt{n}}$

$400 \pm Z_{0.975} \frac{21}{\sqrt{29}}$

$400 \pm 1.960 \frac{21}{\sqrt{29}}$

$400 + 7.643$

$\boxed{407.643}$

Q No5

Define one tailed and Two tailed test

One tailed Test.

If the critical region is located in only on tail of the sampling distribution of test statistic, the test is called one-tailed Test.

Two-tailed Test

If the critical region is located equally in both tails of sampling distribution of Test statistic, the test is called Two-tailed test.

lecture 38-42

Q No 1

if $n=10$ & $\alpha=0.05$, find $t_{\alpha/2;v}$

we are given that

$n=10$, $\alpha=0.05$, $t_{\alpha/2;v}=?$

we know that

$v=n-1=10-1=9$

$\alpha=0.05 \Rightarrow \frac{\alpha}{2}=\frac{0.05}{2}=0.025$

$t_{\alpha/2;v}=t_{0.025;9}=+2.262$

$\boxed{t_{0.025;9}=2.262}$ ∵ From Table of t-distribution

Q No 2

if $n=5$ and $\alpha=0.05$, find $t_{\alpha/2;v}$ -

we are given that

$n=5$, $\alpha=0.05$, $t_{\alpha/2;v}=?$

we know that

$V=n-1=5-1=4$

$$\alpha = 0.05 \Rightarrow \frac{\alpha}{2} = \frac{0.05}{2} = 0.025$$

$$t_{\alpha/2;v} = t_{0.025;4} = 2.776$$

$$\boxed{t_{0.025;4} = 2.776}$$

Q No 3

Write down critical region for the following ~~distribution~~ hypothesis.

$H_0 : \sigma^2 = 18$

$H_1 : \sigma^2 > 18$

Critical region

~~reject $Z > Z_{1-\alpha}$~~

reject H_0 if

$$Z_{(c)} > Z_{1-\alpha}$$

$\because$ calculated

Q no 4

Calculate the pooled propostion $\hat{P}_c$ for the given that

we are given that

$x_1 = 20$, $n_1 = 100$

$x_2 = 30$, $n_2 = 125$

we know that

$$\hat{P}_c = \frac{n_1 \hat{P}_1 + n_2 \hat{P}_2}{n_1 + n_2}$$

$$\hat{P}_1 = \frac{x_1}{n_1} = \frac{20}{100} = 0.2$$

$$\hat{P}_2 = \frac{x_2}{n_2} = \frac{30}{125} = 0.24$$

$$\hat{P}_c = \frac{(100)(0.2) + (125)(0.24)}{100 + 125}$$

$$= \frac{50}{225} = 0.222$$

$$\boxed{\hat{P}_c = 0.222}$$

Q.No5

what are paired Samples?

Paired samples also called dependent samples. This generate a data set in which each data point in one sample is uniquely paired to a data point in the second sample.

Q.No6

Define Two-sample tests.

In statistical hypothesis, a Two-sample test is a Test performed on The data of Two random samples, each independently Obtained from a different given population. The purpose of The Test is To determine whether The difference b/w These Two populations is statistically significant.

Q.No7

Formulate 90% confidence interval for population variance, where $n = 8, s = 4$

We are given that

$1-\alpha = 90\% \Rightarrow 1-\alpha = 0.90$

$n = 8 \; ; \; s = 4$

$1-\alpha = 0.90 \Rightarrow \alpha = 1-0.90 = 0.1$

$\frac{\alpha}{2} = 0.05 \Rightarrow 1-\frac{\alpha}{2} = 1-0.05 = 0.95$

$v = n-1 = 8-1 = 7$

$$\frac{ns^2}{\chi^2_{\frac{\alpha}{2};v}} < \sigma^2 < \frac{ns^2}{\chi^2_{1-\frac{\alpha}{2};v}}$$

$$\frac{(8)(4)^2}{\chi^2_{0.05;7}} < \sigma^2 < \frac{(8)(4)^2}{\chi^2_{0.95;7}}$$

$$\frac{128}{14.07} < \sigma^2 < \frac{128}{2.17}$$

$$9.09 < \sigma^2 < 58.98$$

required confidence interval for population variance -

Qno9
Given that. X is normally distributed and given sample values
$\Sigma(x-\bar{x})^2 = 2.576$, and $n=10$. Find the 95% confidence interval for σ^2.

We are given that
$\Sigma(x-\bar{x})^2 = 2.576$, $n=10$, $\nu = n-1 = 9$
$1-\alpha = 95\% = 0.95 \Rightarrow \alpha = 1-0.95 = 0.05$
$\alpha/2 = \frac{0.05}{2} = 0.025 \Rightarrow 1-\alpha/2 = 1-0.025 = 0.975$
we have to find

$$\frac{\Sigma(x-\bar{x})^2}{\chi^2_{\alpha/2,\nu}} < \sigma^2 < \frac{\Sigma(x-\bar{x})^2}{\chi^2_{1-\alpha/2,\nu}}$$

$$\frac{2.576}{\chi^2_{0.025,9}} < \sigma^2 < \frac{2.576}{\chi^2_{0.975,9}}$$

$$\frac{2.576}{19.02} < \sigma^2 < \frac{2.576}{2.70}$$

$$0.135 < \sigma^2 < 0.95$$

Q No 8

Given that x is normally distributed and given the sample values $\bar{x} = 42$, $S = 5$ and $n = 20$. Find the 98% confidence interval for σ^2.

We are given that

$\bar{x} = 42$, $S = 5$, $n = 20$

$1 - \alpha = 98\% = 0.98 \Rightarrow \alpha = 1 - 0.98 = 0.02$

$\frac{\alpha}{2} = 0.01 \Rightarrow 1 - \frac{\alpha}{2} = 0.99$

$v = n - 1 = 20 - 1 = 19$

$$\frac{nS^2}{\chi^2_{\alpha/2, v}} < \sigma^2 < \frac{nS^2}{\chi^2_{1-\alpha/2, v}}$$

$$\frac{(20)(5)^2}{\chi^2_{0.01;19}} < \sigma^2 < \frac{(20)(5)^2}{\chi^2_{0.99;19}}$$

$$\frac{500}{36.19} < \sigma^2 < \frac{500}{7.63}$$

$13.82 < \sigma^2 < 65.53$

~~are~~ The required confidence interval for σ^2=

QNo10

if $X = 250, n = 630, P_0 = 0.50$

then find the z-test statistic for proportion.

we are given that

$X = 250, n = 630, P_0 = 0.50, q_0 = 1 - 0.5 = 0.5$

we have to find

$$Z = \frac{X - nP_0}{\sqrt{nP_0q_0}}$$

$$= \frac{250 - (630)(0.5)}{\sqrt{(630)(0.50)(0.50)}} = \frac{250 - 315}{\sqrt{157.5}}$$

$$= \frac{250 - 315}{12.55} = \frac{-65}{12.55} = -5.17$$

$$\boxed{Z = -5.17}$$

Q No 11

1- Formulation

$H_0 : \mu_1 = \mu_2 \Rightarrow \mu_1 - \mu_2 = 0 \quad (\delta_0 = 0)$

$H_1 : \mu_1 \neq \mu_2 \Rightarrow \mu_1 - \mu_2 \neq 0 \quad (\delta_0 \neq 0)$

$\because \mu_1 - \mu_2 = \delta_0$

2- Level of significance

$\alpha = 5\% = 0.05$

$\frac{\alpha}{2} = 0.025, \quad 1 - \alpha/2 = 0.975$

3- Test statistic

$$Z = \frac{(\bar{X}_1 - \bar{X}_2) - \delta_0}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

4- Critical region

$$Z_{1-\frac{\alpha}{2}} = Z_{0.975} = 1.96$$

$$|Z| > 1.96$$

5- Calculation

we are given that

$n_1 = 100$, $\bar{X}_1 = 1190$, $\sigma_1 = 90$

$n_2 = 95$, $\bar{X}_2 = 1230$, $\sigma_2 = 120$

we have to calculate

$$z = \frac{(\bar{X}_1 - \bar{X}_2) - \delta_0}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

$$= \frac{(1190-1230) - 0}{\sqrt{\frac{(90)^2}{100} + \frac{(120)^2}{75}}} = \frac{-40}{\sqrt{81+192}}$$

$$= \frac{-40}{16.5227} =$$

$$z = -2.42$$

6- Conclusion

Since

$$|-2.42| > 1.96$$

so we reject H_0 against H_1

QNo12

1- Formulation:

$H_0: \pi_2 \geq \pi_1 \Rightarrow (\pi_2 - \pi_1) \geq 0$

$H_1: \pi_2 < \pi_1 \Rightarrow (\pi_2 - \pi_1) < 0$

2- Level of significance:

$\alpha = 0.05$

3- Test statistic:

$$Z = \frac{(P_1 - P_2) - \delta_0}{\sqrt{\frac{P_1(1-P_1)}{n_1} + \frac{P_2(1-P_2)}{n_2}}} \text{ OR } = \frac{(P_1 - P_2) - \delta_0}{\sqrt{\hat{\pi}(1-\hat{\pi})\left[\frac{1}{n_1} + \frac{1}{n_2}\right]}}$$

4- Critical region:

$Z_\alpha = Z_{0.05} = -1.645$

$\because$ From table 10 (b)

$Z_{calculated} < -1.645$

5- Calculation:

we are given that

$x_1 = 19$, $x_2 = 5$

$n_1 = 200$, $n_2 = 100$

$$P_1 = \frac{x_1}{n_1} = \frac{19}{200} = 0.095$$

$$P_2 = \frac{x_2}{n_2} = \frac{5}{100} = 0.05$$

$$\hat{\pi} = \frac{x_1 + x_2}{n_1 + n_2} = \frac{19+5}{200+100} = \frac{24}{300}$$

$$\hat{\pi} = 0.08$$

$$Z = \frac{(0.095 - 0.05) - (0)}{\sqrt{0.08(1-0.08)\left[\frac{1}{200} + \frac{1}{100}\right]}}$$

$$= \frac{0.045}{\sqrt{0.0736\left[0.015\right]}} = \frac{0.045}{0.0332}$$

$$Z = 1.354$$

6 - Conclusion:

Since

$z_c < -1.645$

$1.354 < -1.645$

so we do not reject H_o against H_1.

QNo 13

Calculate $F_{0.05(11,9)} = ?$

Here

$v_1 = 11, \ v_2 = 9$

we have to find

$F_{0.05(11,9)} = 3.10$

$\because$ [From Table of F-distribution (5%)]

lecture 43-44

Q.No 1

A random sample of 100 people each from 3 cities gave weekly income figures as summarized, with X_{ij} the income of the ith person from the city. Set up a ANOVA table. State the ~~City~~ standard hypothesis from the table.

1- Formulation:

$H_0 : \mu_1 = \mu_2 = \mu_3$ (all means are equal)

$H_1 : \mu_1 \neq \mu_2 \neq \mu_3$ (all means are not equal)

2 - LOS

$\alpha = 0.05$

3 - Test Statistic:

$$F = \frac{\text{treatment Mean Square}}{\text{Error mean Square}}$$

4- Critical region:

$v_1 = k-1 = 3-1 = 2$

$v_2 = n-k = 300-3 = 297$

$F_{\alpha;(v_1,v_2)} = F_{0.05;(2,297)} = 3.01$

$F_c > 3.01$

5- Calculation

	A	B	C	Total
N	100	100	100	300
ΣX	10000	11200	9800	31000
ΣX^2	1056300	1596000	1100000	3752300
$\frac{(\Sigma X)^2}{n}$	1000000	1254400	960400	3214800

$C.F = \frac{(\Sigma X)^2}{n_j} = \frac{(31000)^2}{300} = 3203333.33$

$T.S.S = \Sigma\Sigma X_{ij}^2 - C.F$

$= 3752300 - 3203333.33$

$= 548966.67$

Treatment SS $= \sum \frac{(\sum X)_{ij}}{n_j} - C.F$

$= 3214800 - 3203333.33$

$T_r SS = 11466.67$

$ESS = TSS - T_r SS$

$= 548966.67 - 11466.67$

$= 537500$

SOV	d.f	SS	MS	F
$T_r SS$	2	11466.67	5733.34	F = 3.17
ESS	297	537500	1809.76	—
Total	299	548976.661	—	

$F_c = 3.17$

6- Conclusion

Since

$F_c > 3.01$

$3.17 > 3.01$

So we reject H_0 against H_1

QNO2

Complete an ANOVA table

SOV	df	SS	MS
T_rSS	3	330	110
BSS	4	392	98
ESS	12	1212	101
Total	19	1934	—

we know that
in the Two-way ANOVA the degree
of freedom is

① $V_1 = r - 1$ = 3 (given)

② $V_2 = c - 1$

③ $V_3 = (r-1)(c-1)$

④ Total $= rc - 1$ = 19 (given

=> ①

$r - 1 = 3$

$\boxed{r = 4}$

put in ④

$$rc - 1 = 19$$

$$(4)c - 1 = 19$$

$$4c = 20$$

$$c = \frac{\cancel{20}^{5}}{\cancel{4}} = 5$$

$$c = 5$$

$$v_2 = c - 1$$

$$= 5 - 1 = 4$$

$$\boxed{v_2 = 4}$$

$$v_3 = (r-1)(c-1)$$

$$= (3)(4)$$

$$\boxed{v_3 = 12}$$

lecture 45

Q No 14

Find coefficient of association

$AB = 55, \alpha\beta = 75, A\beta = 45, \alpha B = 125$

we know that
coefficient of association

$$Q = \frac{(AB)(\alpha\beta) - (A\beta)(\alpha B)}{(AB)(\alpha B) + (A\beta)(\alpha B)}$$

we are given that

$AB = 55, (\alpha\beta) = 75, A\beta = 45, \alpha B = 125$

$$= \frac{(55)(75) - (45)(125)}{(55)(75) + (45)(125)}$$

$$= \frac{4125 - 5625}{4125 + 5625} = \frac{-1500}{9750}$$

$Q = -0.1538$

This indicate negative association b/w A and B.

Q No 15

Test the independence by a simple approach b/w intelligences of fathers and sons.

Sons	Intelligent	Non-Intelligent	Total
Intelligent	$(AB)=300$	$(A\beta)=200$	$(A)=500$
Not-Intelligent	$(\alpha B)=100$	$(\alpha\beta)=400$	$(\alpha)=500$
Total	$(B)=400$	$(\beta)=600$	$n=1000$

Let 'A' denotes intelligent father and 'B' denotes intelligent sons

Then

$$(AB) = 300$$

$$\frac{(A)(B)}{n} = \frac{(500)(400)}{1000} = 200$$

$$(AB) > \frac{(A)(B)}{n}$$

$$300 > 200$$

Thus there is +ve association b/w father and sons's intelligent.

QNO 16

From The following table, test The hypothesis that flower color is independent of flatness of leaf. Use $\alpha = 0.05$

1- Formulation:

H_0 : The flower color is independent of flatness of leaves.

H_1 : The flower color is not independent of flatness of leaves.

2- LOS

$\alpha = 0.05 \Rightarrow 1-\alpha = 1-0.05 = 0.95$

3 - Test statistic

$$x^2 = \sum\left[\frac{(o-e)^2}{e}\right]$$

for continuity correction we must use

$$x^2 = \sum\left[\frac{(|o-e|-0.5)^2}{e}\right]$$

4: Critical region:

$\cancel{\chi^2 > \chi^2_{\alpha}}$

$\chi^2_c > \chi^2_{v;1-\alpha}$

$v = (r-1)(c-1)$

$= (2-1)(2-1) = 1$

$\chi^2_c > \chi^2_{1;0.95}$

$\chi^2_c > 3.84$

5- Calculation

	Flat leves	leans leves	Total
white flower	$\overset{o}{99}$ $(\overset{e}{100.41})$	$\overset{o}{36}$ $(\overset{e}{34.59})$	135
Red flowers	$\overset{o}{20}$ $(\overset{e}{18.59})$	$\overset{o}{5}$ $(\overset{e}{6.41})$	25
Total	119	41	160

o	e	$\lvert o-e \rvert$	$(\lvert o-e \rvert - 0.5)^2/e$
99	100.41	1.41	0.0082
20	18.59	1.41	0.044
36	34.59	1.41	0.023
5	6.41	1.41	0.129
160	160	—	$\chi^2 = 0.2042$

$$\chi^2 = 0.2042$$

6- Conclusion:

since

$$\chi^2_c > 3.84$$

$$0.2042 > 3.84$$

so, we do not reject H_0 against H_1