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Topic: 1.10 – Chi square -Goodness of fit.

Chi-Square Test - Goodness of Fit.
The test of significance of experimental values and theoretical values under some theory of hypothesis is called as chi square test (χ^2)

Test Statistics

$$\chi^2 = \sum \frac{(O-E)^2}{E}$$

O - Observed frequency
E = Expected frequency = $\frac{\text{Total}}{\text{no of terms}}$

Dof : n-1

1) The number of automobile accidents per week in a certain community are as follows: 12, 8, 20, 2, 14, 10, 15, 6, 9, 4. are these frequencies in agreement with the belief that accident conditions were the same during this 10 week period.

$E = \frac{100}{10} = 10$

H_0 : Accident conditions were the same during 10 weeks
 H_1 : Accident conditions were not the same.



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O	E	O-E	$(O-E)^2/E$
0	10	2	0.4
12	10	-2	0.4
8	10	10	10
20	10	-8	6.4
2	10	4	1.6
14	10	0	0.0
10	10	5	2.5
15	10	-4	1.6
6	10	7	0.1
9	10	-6	3.6
4	10		<u>26.6</u>

Dof: $n-1 = 10-1 = 9$
LOS: 5%
Test Statistic
 $\chi^2 = \frac{(O-E)^2}{E} = \frac{26.6}{10} = 2.66$
Critical value: $\alpha = 5\%$ $V = 9$
 $\chi^2_{\alpha} = 16.9$
Conclusion: C.V T.V
 $2.66 < 16.9$
 H_0 rejected.



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2. A sample analysis of examination results of 500 students was made. It was found that 220 students had failed, 170 had secured a third class, 90 were placed in second class and 20 got a first class. Do these figures commensurate with the general examination result which is in the ratio 4:3:2:1 for various categories resp.

H_0 : The observed results commensurate with the general examination result

H_1 : The observed results does not commensurate with the examination results

$E = 4:3:2:1 = 10$

Total frequency = 500 $\frac{500}{10} = 50$

\therefore Expected frequency in the ratio 4:3:2:1 is 200, 150, 100, 50

O	E	(O-E)	$\frac{(O-E)^2}{E}$
220	200	20	$\frac{400}{200} = 2$
170	150	20	$\frac{400}{200} = 2$
90	100	-10	$\frac{100}{100} = 1$
20	50	-30	$\frac{900}{50} = 18$
500	500		1800 23.64



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LOS : 5%

Dof : $n-1 = 4-1 = 3$.

T.S $\chi^2 = \frac{1800}{500} = 3$.

Critical value : $\chi^2_{\alpha} = 7.81$

Conclusion: C.V T.V
 $23.66 > 7.81$
 H_0 rejected