

# ECE 376: Handout #15

## Chi-Squared Test

A 5-sided die is rolled 200 times. The frequency of each roll is listed below. Is the die fair?

$$\chi^2 = \sum \left( \frac{(np-N)^2}{np} \right)$$

Roll	p	n*p	N	Chi-Squared
1	1/5	40	46	
2	1/5	40	36	
3	1/5	40	38	
4	1/5	40	39	
5	1/5	40	41	
			Total	

### Chi-Squared Table

Probability of rejecting the null hypothesis

df	99.5%	99%	97.5%	95%	90%	10%	5%	2.5%	1%	0.5%
1	7.88	6.64	5.02	3.84	2.71	0.02	0	0	0	0
2	10.6	9.21	7.38	5.99	4.61	0.21	0.1	0.05	0.02	0.01
3	12.84	11.35	9.35	7.82	6.25	0.58	0.35	0.22	0.12	0.07
4	14.86	13.28	11.14	9.49	7.78	1.06	0.71	0.48	0.3	0.21
5	16.75	15.09	12.83	11.07	9.24	1.61	1.15	0.83	0.55	0.41

**Solution:**

A 5-sided die is rolled 200 times. The frequency of each roll is listed below. Is the die fair?

Roll	p	n*p	N	Chi-Squared
1	1/5	40	46	0.9
2	1/5	40	36	0.4
3	1/5	40	38	0.1
4	1/5	40	39	0.03
5	1/5	40	41	0.03
			<b>Total</b>	<b>1.45</b>

If the Chi-Squared score is 9.49 or more, you can reject the null hypothesis (that the die is fair)

A Chi-Squared score of 1.45 indicates that there is insufficient evidence to claim the die is loaded. It looks like a fair die.

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5	16.75	15.09	12.83	11.07	9.24	1.61	1.15	0.83	0.55	0.41