

# Chi-Squared Tests 2

## Test for Independence

Q1.

Members of a Statistics club are voting to elect a new president of the club. Members must choose to vote either by post or by text or by email. The method of voting chosen by a random sample of 60 male members and 40 female members is given in the following table.

		Method of voting		
		Post	Text	Email
Gender	Male	10	12	38
	Female	5	21	14

Test, at the 1% significance level, whether there is an association between method of voting and gender. [8]

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Q2.

A manufacturer produces three types of car: hatchbacks, saloons and estates. Each type of car is available in one of three colours: silver, blue and red. The manufacturer wants to know whether the popularity of the colour of the car is related to the type of car. A random sample of 300 cars chosen by customers gives the information summarised in the following table.

		Colour of car		
		Silver	Blue	Red
Type of car	Hatchback	53	36	41
	Saloon	29	40	31
	Estate	28	24	18

Test at the 10% significance level whether the colour of car chosen by customers is independent of the type of car. [8]

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Q3.

Two salesmen, A and B, work at a company that arranges different types of holidays: self-catering, hotel and cruise. The table shows, for a random sample of 150 holidays, the number of each type arranged by each salesman.

		Type of holiday		
		Self-catering	Hotel	Cruise
Salesman	A	25	38	21
	B	28	21	17

Test at the 10% significance level whether the type of holiday arranged is independent of the salesman. [8]

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Q4.

Two randomly selected groups of students, with similar ranges of abilities, take the same examination in different rooms. One group of 140 students takes the examination with background music playing. The other group of 210 students takes the examination in silence. Each student is awarded a grade for their performance in the examination and the numbers from each group gaining each grade are shown in the following table.

	Grade awarded		
	A	B	C
Background music	49	51	40
Silence	93	68	49

Test at the 10% significance level whether grades awarded are independent of whether background music is playing during the examination. [6]

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Q5.

Residents of three towns *A*, *B* and *C* were asked to grade the reliability of their digital television signal as good, satisfactory or poor. A random sample of responses from each town is taken and the numbers in each category are given in the following table.

	Good	Satisfactory	Poor
Town <i>A</i>	24	34	14
Town <i>B</i>	58	60	26
Town <i>C</i>	20	34	30

Test, at the 2.5% significance level, whether grade of reliability is independent of town. [7]

Identify which town makes the greatest contribution to the test statistic and relate your answer to the context of the question. [2]

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