

## Chi Square test

1)

The same 100 students are also asked how many meals on average they have per day. The data collected is organized in the following table.

	<b>3 or fewer meals per day</b>	<b>4 or 5 meals per day</b>	<b>More than 5 meals per day</b>	<b>Total</b>
<b>Male</b>	15	25	15	55
<b>Female</b>	12	20	13	45
<b>Total</b>	27	45	28	100

A  $\chi^2$  test is carried out at the 5 % level of significance.

- (a) Write down the null hypothesis,  $H_0$ , for this test. [1 mark]
- (b) Write down the number of degrees of freedom for this test. [1 mark]
- (c) Write down the critical value for this test. **= 5.99 (not in course anymore)** [1 mark]
- (d) Show that the expected number of females that have more than 5 meals per day is 13, correct to the nearest integer. [2 marks]
- (e) Use your graphic display calculator to find the  $\chi^2_{calc}$  for this data. **and P value** [2 marks]
- (f) Decide whether  $H_0$  must be accepted. Justify your answer. [2 marks]

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2)

Jorge conducted a survey of 200 drivers. He asked two questions:

How long have you had your driving licence?  
Do you wear a seat belt when driving?

The replies are summarized in the table below.

	<b>Wear a seat belt</b>	<b>Do not wear a seat belt</b>
<b>Licence less than 2 years</b>	38	42
<b>Licence between 2 and 15 years</b>	30	45
<b>Licence more than 15 years</b>	30	15

- (a) Jorge applies a  $\chi^2$  test at the 5 % level to investigate whether wearing a seat belt is associated with the time a driver has had their licence.
- (i) Write down the null hypothesis,  $H_0$ .
  - (ii) Write down the number of degrees of freedom.
  - (iii) Show that the expected number of drivers that wear a seat belt and have had their driving licence for more than 15 years is 22, correct to the nearest whole number.
  - (iv) Write down the  $\chi^2$  test statistic for this data.
  - (v) Does Jorge accept  $H_0$ ? Give a reason for your answer.

[8 marks]

## Chi Square test

- 3) (i) A survey of 400 people is carried out by a market research organization in two different cities, Buenos Aires and Montevideo. The people are asked which brand of cereal they prefer out of Chocos, Zucos or Fruti. The table below summarizes their responses.

	Chocos	Zucos	Fruti	Total
Buenos Aires	43	85	62	190
Montevideo	57	35	118	210
Total	100	120	180	400

- (a) One person is chosen at random from those surveyed. Find the probability that this person
- (i) does not prefer Zucos;
  - (ii) prefers Chocos, given that they live in Montevideo. *[4 marks]*
- (b) Two people are chosen at random from those surveyed. Find the probability that they both prefer Fruti. *[3 marks]*

The market research organization tests the survey data to determine whether the brand of cereal preferred is associated with a city. A chi-squared test at the 5% level of significance is performed.

- (c) State the null hypothesis. *[1 mark]*
- (d) State the number of degrees of freedom. *[1 mark]*
- (e) Show that the expected frequency for the number of people who live in Montevideo and prefer Zucos is 63. *[2 marks]*
- (f) Write down the chi-squared statistic for this data. *[2 marks]*
- (g) State whether the market research organization would accept the null hypothesis. Clearly justify your answer. *[2 marks]*

## Chi Square test

4)

200 people of different ages were asked to choose their favourite type of music from the choices Popular, Country and Western and Heavy Metal. The results are shown in the table below.

Age/Music choice	Popular	Country and Western	Heavy Metal	Totals
11 – 25	35	5	50	90
26 – 40	30	10	20	60
41 – 60	20	25	5	50
Totals	85	40	75	200

It was decided to perform a chi-squared test for independence at the 5 % level on the data.

- (a) Write down the null hypothesis. *[1 mark]*
- (b) Write down the number of degrees of freedom. *[1 mark]*
- (c) Write down the chi-squared value. **Use P value** *[2 marks]*
- (d) State whether or not you will reject the null hypothesis, giving a clear reason for your answer. *[2 marks]*