10. The manager of a travel agency surveyed 1200 travellers. She wanted to find out whether there was a relationship between a traveller's age and their preferred destination. The travellers were asked to complete the following survey.

Traveller survey

My age is:

25 or younger	26–40	41–60	61 or older

My preferred destination is:

New York	Tokyo	Melbourne	Dubai	Marrakech

A χ^2 test was carried out, at the 5% significance level, on the data collected.

(a)   Write down the null hypothesis.   [1]

(b)   Find the number of degrees of freedom.   [2]

The critical value of this χ^2 test is 21.026.

(c)   Use this information to write down the values of the χ^2 statistic for which the null hypothesis is rejected.   [1]

From the travellers taking part in the survey, 285 were 61 years or older and 420 preferred Tokyo.

(d)   Calculate the expected number of travellers who preferred Tokyo and were 61 years or older.   [2]

(This question continues on the following page)

Chi sq 2

8. Members of a certain club are required to register for one of three sports, badminton, volleyball or table tennis. The number of club members of each gender choosing each sport in a particular year is shown in the table below.

A χ^2 (Chi-squared) test at the 5 % significance level is used to determine whether the choice of sport is independent of gender.

	Badminton	**Volleyball**	**Table tennis**
Male	40	20	10
Female	20	15	15

(a) Find the expected number of female volleyball players under this hypothesis. *[2 marks]*

(b) Write down the p-value for the test. *[2 marks]*

(c) State, with a reason, the conclusion of the test. *[2 marks]*

Working:

Answers:

(a) ....

(b) ....

(c) ....

....

Answer **all** questions in the answer booklet provided. Please start each question on a new page.
You are advised to show all working, where possible. Where an answer is incorrect, some marks may
be given for a correct method, provided this is shown by written working. Solutions found from a graphic
display calculator should be supported by suitable working, for example, if graphs are used to find a
solution, you should sketch these as part of your answer.

1.   **[Maximum mark: 10]**

In a debate on voting, a survey was conducted. The survey asked people's opinion on
whether or not the minimum voting age should be reduced to 16 years of age. The results
are shown as follows.

	Age 18–25	Age 26–40	Age 41+	Total
Oppose the reduction	12	20	48	80
Favour the reduction	18	15	17	50
Total	30	35	65	130

A χ^2 test at the 1% significance level was conducted. The χ^2 critical value of the test
is 9.21.

(a)   State

(i) H_0, the null hypothesis for the test;

(ii) H_1, the alternative hypothesis for the test.   [2]

(b)   Write down the number of degrees of freedom.   [1]

(c)   Show that the expected frequency of those between the ages of 26 and 40 who
oppose the reduction in the voting age is 21.5, correct to three significant figures.   [2]

(d)   Find

(i)   the χ^2 statistic;

(ii)   the associated p-value for the test.   [3]

(e)   Determine, giving a reason, whether H_0 should be accepted.   [2]

4. A study was carried out to determine whether the country chosen by students for their university studies was influenced by a person's gender. A random sample was taken. The results are shown in the following table.

	Country Chosen		
	USA	Australia	UK
Male	55	26	40
Female	25	31	41

A χ^2 test was performed at the 1 % significance level.
The critical value for this test is 9.210.

(a) State the null hypothesis.   [1]

(b) Write down the number of degrees of freedom.   [1]

(c) Write down

   (i)   the χ^2 statistic;

   (ii) the associated p-value.   [2]

(d) State, giving a reason, whether the null hypothesis should be accepted.   [2]

Working:

Answers:

(a) . . . .
     . . . .
     . . . .

(b) . . . .

(c) (i)   . . . .

     (ii) . . . .

(d) . . . .
     . . . .
     . . . .