Chapter 14 / **Example 11**

χ^2 test for independence

A randomly selected group of 80 people were asked what their favourite genre of music was: pop, classical, folk or jazz. The results are in the table below.

	Pop	Classical	Folk	Jazz	Total
Male	18	9	3	8	38
Female	22	6	7	7	42
Total	40	15	10	15	80

A χ^2 test was carried out at the 10% significance level.

a Write down the null and alternative hypotheses.

b Show that the expected value for a female liking pop is 21.

c Find the full table of expected values.

d Combine two columns so that all expected values are greater than 5 and write down the new observed and expected tables.

e Write down the degrees of freedom for the new table.

f Use your GDC to find the χ^2 test statistic and the *p*-value for this test.

g Determine whether the null hypothesis is accepted or not.

First you will enter the observed frequencies in a matrix. This is an array of numbers, in this case two rows by 4 columns. The row and column totals are not included in the matrix.

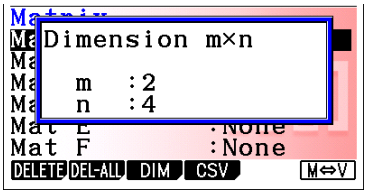
Press MENU 1 to display the Run-Matrix screen.

Press F3 MAT/VCT

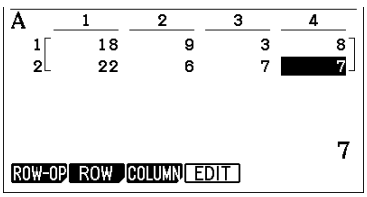
Press F3 DIM to define the dimensions of the matrix.

Select 2 rows (m) and 4 columns (n).

Press EXE when you have finished.



Enter the data into the matrix. (Not the totals). Press EXE after each item.



Press MENU 2 to enter statistics mode.

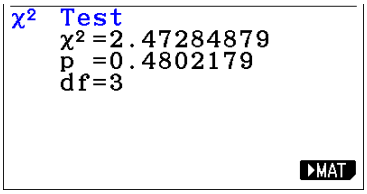
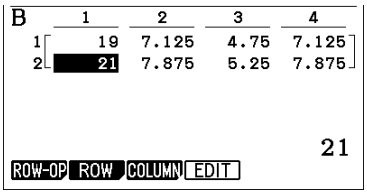
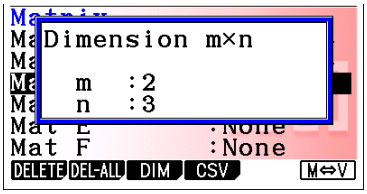
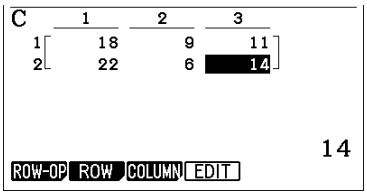
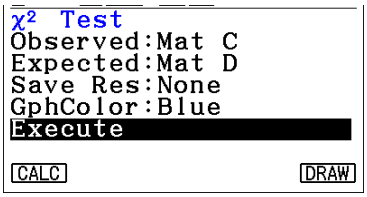
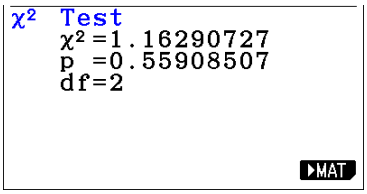
Press F3 TEST F3 CHI F2 2WAY

You should be able to leave the selections as they are.

Navigate down to Execute using ▼ and press F1 CALC.

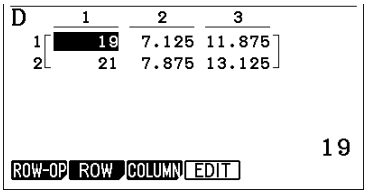
Chapter 14 / **Example 11**

χ^2 test for independence

The χ^2 statistic is 2.47, the *p*-value is 0.480 and the number of degrees of freedom is 3. However, before using these results, check whether any columns need to be combined.	
Press MENU 1 to display the Run-Matrix screen. Press F3 MAT/VCT select Mat B and press EXE. These are the expected values. The expected value for a female liking pop is 21. Combine the Folk column with Jazz (or Classical)	
Press EXIT Select Mat C Press F3 DIM to define the dimensions of the matrix. Select 2 rows (m) and 3 columns (n). Press EXE when you have finished.	
Enter the data into the matrix. Press EXE after each item.	
Press MENU 2 to enter statistics mode. Press F3 TEST F3 CHI F2 2WAY Choose Observed as Mat C by pressing F1 Mat, typing ALPHA C and pressing EXE. Choose Expected as Mat D by pressing F1 Mat, typing ALPHA D and pressing EXE. Navigate down to Execute using ▼ and press F1 CALC.	
The χ^2 statistic is 1.16, the *p*-value is 0.559 and the number of degrees of freedom is 2. However, before using these results, check again whether any columns need to be combined.	

Chapter 14 / **Example 11**

χ^2 test for independence

Press MENU 1 to display the Run-Matrix screen. Press F3 MAT/VCT select Mat D and press EXE. These are the expected values. This time all expected values are all greater than 5.	
From the previous screen the degrees of freedom is 2. χ^2 = 1.1629... and p = 0.559... 0.559 > 0.10 and so the result is not significant and there is no reason to reject the null hypothesis that favourite genre of music is independent of gender.