

TI-83/83 Plus: The Chi-Square Test

The following pages contain some instructions on the usage of the TI-83/83 Plus graphing calculator.

The examples used below are taken out of David Moore's text titled "The Basic Practice of Statistics, 2nd Edition".

Example#9.7 and 9.8 on pages 482 and 483: A study of the relationship between men's marital status and the level of their jobs used data on all 8235 male managers and professionals employed by a large manufacturing firm. Each man's job has a grade set by the company that reflects the value of that particular job to the company. The authors of the study grouped the many job grades into quarters. Grade 1 contains jobs in the lowest quarter of job grades, and grade 4 contains those in the highest quarter. The following two-way table summarizes the data.

Job Grade	Marital status			
	Single	Married	Divorced	Widowed
1	58	874	15	8
2	222	3927	70	20
3	50	2396	34	10
4	7	533	7	4

Do these data show a statistically significant relationship between marital status and job grade?

The MATRX menu is used to enter the above two-way table. Start from the Home screen. Press $\boxed{2\text{nd}}$ and $\boxed{x^{-1}}$ for the MATRX menu. (For the TI-83: Press $\boxed{\text{MATRX}}$ for the MATRX menu). Your screen should look like the screen on the left given below. You may possibly have different dimensions for different matrices.

```

MATH EDIT
1: [A] 4x4
2: [B] 4x4
3: [C]
4: [D]
5: [E]
6: [F]
7: [G]

```

```

MATRIX[A] 4 x4
[ 14  8  17  -
 [ 21 21  10  -
 [ 10  6  19  -
 [  6  10  19  -

```

```

MATRIX[A] 4 x4
- 874  15  8  ]
- 3927 70  20  ]
- 2396 34  10  ]
- 533  7  4  ]
4, 4=4

```

Press $\boxed{\blacktriangleright}$ two times to scroll right to the EDIT menu option. Press $\boxed{\text{ENTER}}$ to edit matrix A. Your screen should look like the screen in the middle given above with the contents of matrix A more than likely being different on your calculator. The cursor is blinking over the first number on the first line of your display. The above two-way table has four different job grades. Type in a 4 to indicate that the observed count table has four rows. Press $\boxed{\text{ENTER}}$. The above observed count table has four different marital status options. Type in a 4 to indicate that the observed count table has four columns. Press $\boxed{\text{ENTER}}$. Type in the values from the observed count table starting from row 1 and column 1 and moving across, and pressing $\boxed{\text{ENTER}}$ after typing each value. After typing the value for the row four and column four, your screen should look like the screen on the right given above.

Press **[STAT]**. Press **[▶]** two times to scroll right to the TESTS menu option. Press **[▼]** several times to move the cursor down to **C:χ²-Test**. At this point, your screen should look like the screen on the left given below.

```

EDIT CALC TESTS
7:ZInterval...
8:TInterval...
9:2-SampZInt...
0:2-SampTInt...
A:1-PropZInt...
B:2-PropZInt...
C:χ2-Test...

```

```

χ2-Test
Observed: [A]
Expected: [B]
Calculate Draw

```

```

χ2-Test
Observed: [A]
Expected: [B]
Calculate Draw

```

Press **[ENTER]** to select **C:χ²-Test** and go into the STAT TESTS menu screen. At this point, your screen should look like the screen in the middle given above with the cursor blinking by **Observed:**. You may have different matrix names showing up by the **Observed:** and the **Expected:** menu options.

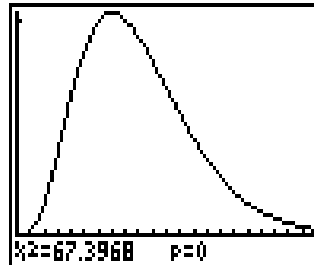
The matrix name A, which had been already stored, must be assigned to **Observed:** Press **[2nd]** and **[x⁻¹]** to access the MATRX menu. (For the TI-83: Press **[MATRX]** to access the MATRX menu). While the cursor by the matrix name A, press **[ENTER]** to paste the name by **Observed:** Press **[▼]** to move the cursor down to **Expected:** The matrix name B must be assigned to **Expected:** Press **[2nd]** and **[x⁻¹]** to access the MATRX menu. (For the TI-83: Press **[MATRX]** to access the MATRX menu). Press **[▼]** to move the cursor by the matrix name B and press **[ENTER]** to paste the name by **Expected:** Press **[▼]** to move the cursor down to **Calculate Draw** option. At this point, your screen should look like the screen on the right given above with the cursor blinking over the **Calculate** option.

Press **[ENTER]** to select the **Calculate** option. Your calculated result screen should look like the screen on the left given below.

```

χ2-Test
χ2=67.39679601
P=4.920755E-11
df=9

```



The observed chi-square value is very large, $\chi^2=67.3968$. As it is indicated by the scientific notation, the P-value is very close to 0, or practically 0. Since the observed count table is a 4 x 4 table, the degrees of freedom are $df=(4-1)*(4-1)=9$. We have overwhelming evidence that job grade is related to marital status.

We could also draw the χ^2 distribution curve with the observed value of $\chi^2=67.3968$ and the computed P-value indicated by the shaded regions of the curve. To accomplish this task, press **[STAT]**. Press **[▶]** two times to scroll right to the TESTS menu option. Press **[▼]** several times to move the cursor down to **C:χ²-Test**. Press **[ENTER]** to select **C:χ²-Test** and go into the STAT TESTS menu screen. Scroll all the way down to the **Calculate Draw** option. Press **[▶]** to move the cursor over the **Draw** option. Press **[ENTER]** to select this option. Your screen should look like the screen on the right given above.