

4.11 Statistical tests

4.11.1 χ^2 test for independence

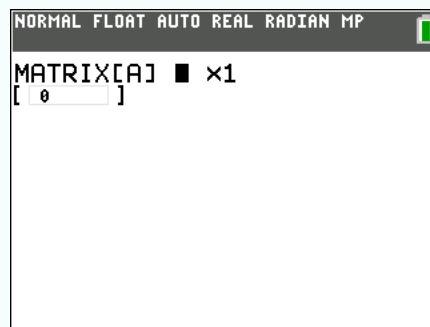
Consider the following set of data:

	Action	Horror	Comedy	Total
color-blind	120	90	40	250
non color-blind	110	95	45	250
Total	230	185	85	500

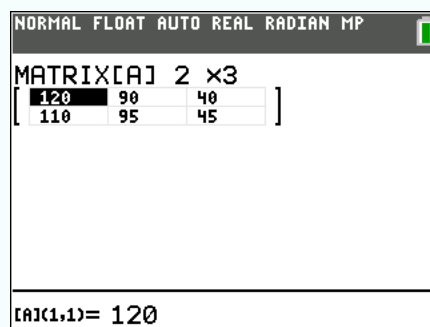
To be able to do a χ^2 test, you first need to put the data in a matrix.

Enter the data

① Press **2nd**, **matrix**, **EDIT**, **[A]**:



② Ignoring the “Total” rows and columns, set the matrix amount of rows and columns (here: 2×3), and enter the data:

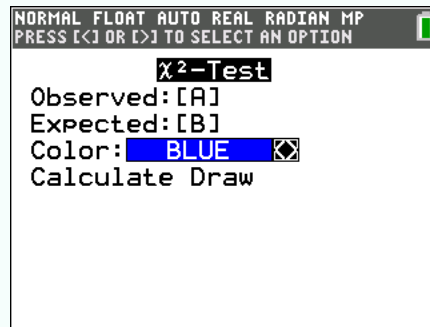


Do the test

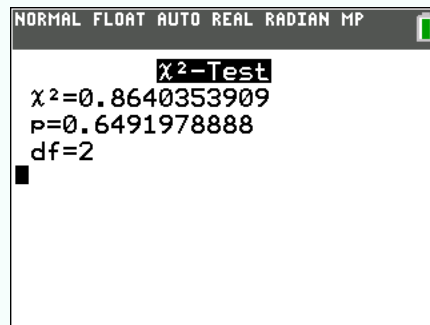
① Press  , TESTS, χ^2 -Test....

Set matrix [A] as **Observed** by pressing  ,  ,  .

Set a new matrix, e.g. matrix [B], as **Expected** by pressing  ,  ,  :



② Press **Calculate**. The following result should appear:



df means “degrees of freedom”

4.11.2 χ^2 goodness of fit test

Consider a person counting the amount of cyclists he sees passing by his street each day:

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
50	60	42	48	52	58	61

The null and alternative hypothesis are

H_0 : An equal amount of cyclists pass by his street each day.

H_1 : A different amount of cyclists pass by his street each day.

We want to know at a significance level of 0.05 if he must accept null hypothesis.

- ① Press , **Edit...** and enter the data in a list (here: L_1)
- ② fill L_2 with the average amount of cyclists (here: 52.8).

Tip: you can highlight L_2 and write $0*L_1+52.8$ to fill it quickly.

L1	L2	L3	L4	L5	L6
20	52.8				
60	52.8				
40	52.8				
48	52.8				
52	52.8				
58	52.8				
81	52.8				

L2(8)=

- ③ Press , TESTS, χ^2 GOF-Test and fill the parameters as follows:

NORMAL FLOAT AUTO α +bi RADIAN MP
 χ^2 GOF-Test
 Observed:L1
 Expected:L2
 df:6
 Color: BLUE
 Calculate Draw

$$\mathbf{df} = 7 - 1 \text{ (degrees of freedom),}$$

Color doesn't matter

Press Calculate

The results should be $\chi^2 = 6.467$ (for the critical value) and $p = 0.373$ (for the significance level), rounded.

We must then accept the null hypothesis.

4.11.3 The student's t-test

Consider the following data:

$\mathbf{x}_1$	2.8	3.2	2.7	3.5	3.0	2.9	4.1	3.9	
$\mathbf{x}_2$	3.1	3.5	2.8	3.7	4.2	2.6	3.2	2.9	3.8

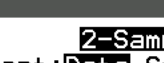
You want to test whether the x_1 data is on average a than x_2 ($\mu_1 > \mu_2$), at a significance level of 10%

- ① Press  **stat**, **Edit...** and enter both lists (here: x_1 in L_1 and x_2 in L_2):

NORMAL FLOAT AUTO a+bi DEGREE MP					
L1	L2	L3	L4	L5	L6
2.8	3.1	-----	-----	-----	
3.2	3.5				
2.7	2.8				
3.5	3.7				
3	4.2				
2.9	2.6				
4.1	3.2				
3.9	2.9				
-----	3.8				

L2(10)=

- ② Press  **stat**, **TESTs**, **2-SampTTest...** and enter the parameters as follow:



2-SampTTest

Inpt: Data Stats

List1: L1

List2: L2

Freq1: 1

Freq2: 1

$\mu_1 \neq \mu_2$ $< \mu_2$ $> \mu_2$

Pooled: No Yes

Color: BLUE

Calculate Draw

Press  ,  to get L_1 ,
Color doesn't matter

Press **Calculate**.

The t -value should be $t = -0.191$ and the p -value should be $p = 0.575$ (rounded). Therefore we must accept the null hypothesis (we **cannot** infer that $\mu_1 > \mu_2$).