4.11 Statistical tests

4.11.1 χ^2 test for independence

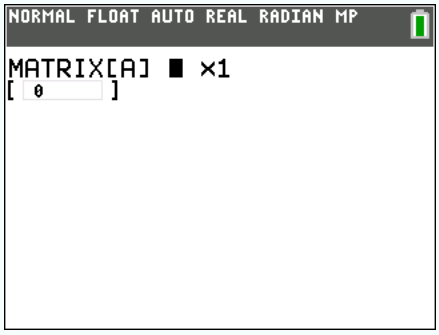
Consider the following set of data:

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

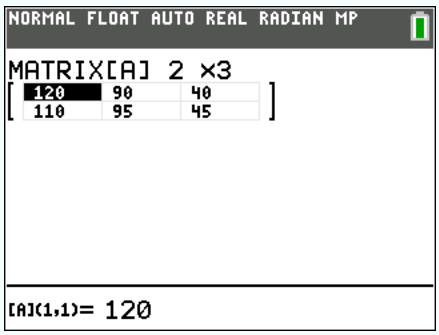
To be able to do a χ^2 test, you first need to put the data in a matrix.

Enter the data

① Press 2nd , matrix D x^{-1} , EDIT, [A]:



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

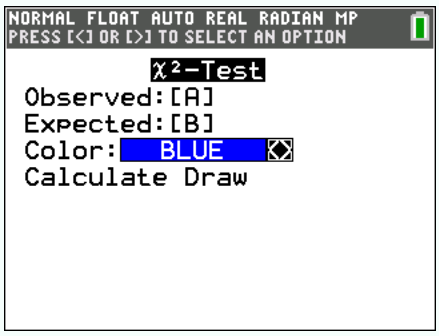


Do the test

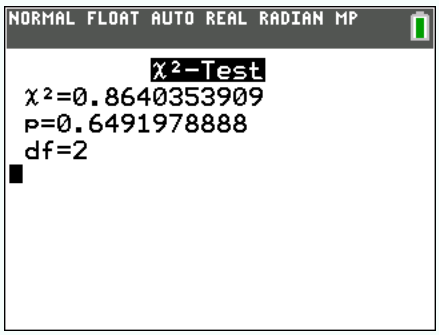
① Press list stat, TESTS, χ^2-Test....

Set matrix [A] as Observed by pressing 2nd, matrix D x^{-1}, L1 Y 1.

Set a new matrix, e.g. matrix [B], as Expected by pressing 2nd, matrix D x^{-1}, L2 Z 2:



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 hypthesis are

$\boldsymbol{H_0}$ **:** An equal amount of cyclists pass by his street each day.

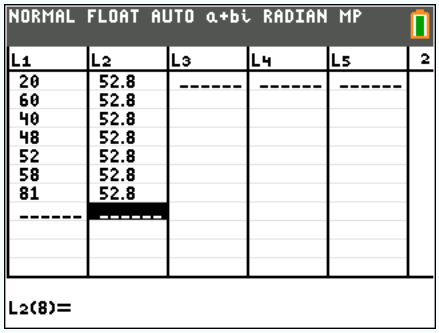
$\boldsymbol{H_1}$ **:** A different amount of cyclists pass by his street each day.

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

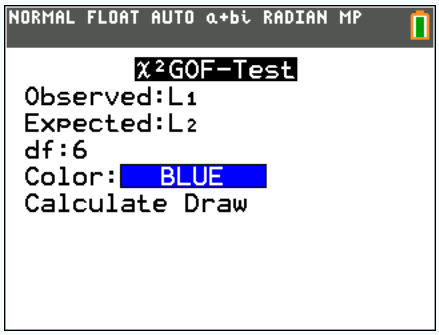
① Press list stat, `Edit...` and enter the data in a list (here: L_1)

② fill L_2 with the average amount of cyclists (here: 52.8).

Tip: you can highlight L_2 and write `0*L1+52.8` to fill it quickly.



③ Press list stat, `TESTS`, `χ² GOF-Test` and fill the parameters as follows:



`df`$= 7 - 1$ (degrees of freedom),

`Color` doesn't matter

Press `Calculate`

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

We must then accept the null hypothesis.

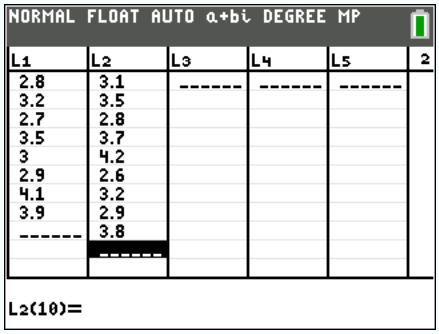
4.11.3 The student's t-test

Consider the following data:

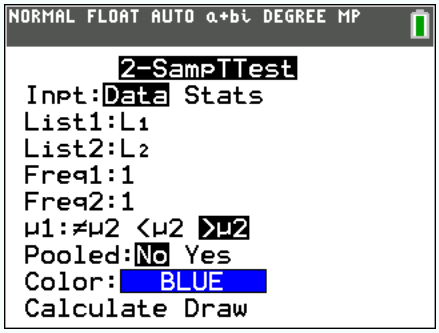
x_1	2.8	3.2	2.7	3.5	3.0	2.9	4.1	3.9	
x_2	3.1	3.5	2.8	3.7	4.2	2.6	3.2	2.9	3.8

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 list stat, `Edit...` and enter both lists (here: x_1 in L_1 and x_2 in L_2):



② Press list stat, `TESTS`, `2-SampTTest...` and enter the parameters as follow:



Press 2nd, 1 (L1) 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 $\mu_1 > \mu_2$).