4.11 Statistical tests

4.11.1 χ^2 test for independence

Consider the following set of data:

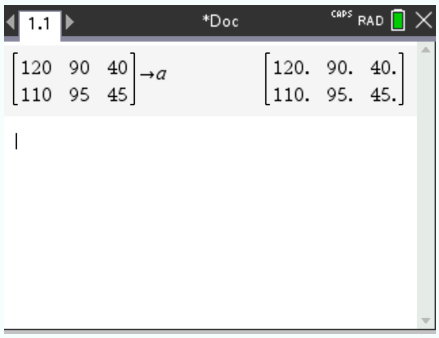
	Action	Horror	Comedy	Total
color-blind	120	90	40	250
non color-blind	110	95	45	250
Total	230	185	85	500

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

Enter the data

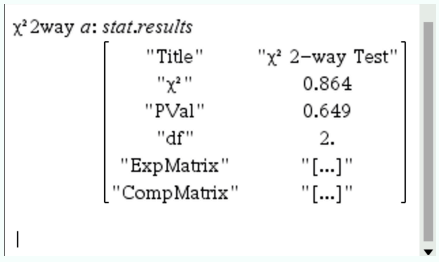
① Press menu, select Matrix & Vector > Create > Matrix. Set the matrix amount of rows and columns (here: 2×3), and enter the data.

② Store the matrix as A. To do that press ctrl then sto→ var and enter A:



Do the test

① Press menu, select Statistics > Stat Tests > χ^2 2-way Test. Set matrix [A] as Observed. Press ≈ enter, these results should be displayed:



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

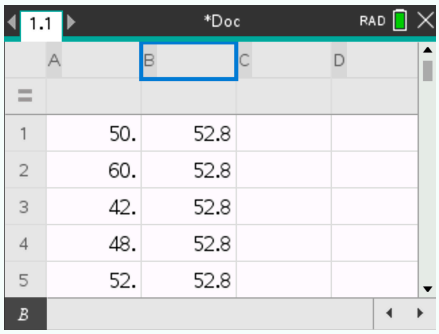
$\boldsymbol{H_0}$ **:** An equal amount of cyclists pass by his street each day.

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

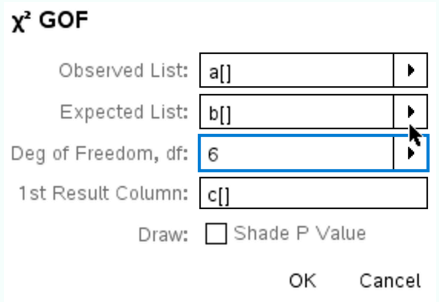
We want to know at a significance level of 0.05 if he must accept null hypothesis.

① Create a new document and select Add List & Spreadsheet.

② Fill column A with the amount of cyclist each day. Fill column B with the average amount of cyclists (here: 52.8).



③ Press menu, select Statistics > Stat Tests > χ^2 GOF. Fill the parameters as folows:



Press enter. These results should be displayed:

Title	χ^2 GOF
χ^2	5.57
PVal	0.473
df	6.
CompLis...	{0.14848...

The results should be $\chi^2 = 5.57$ (for the critical value) an $p = 0.473$ (for the significance level), rounded.

We must then accept the null hypothesis.

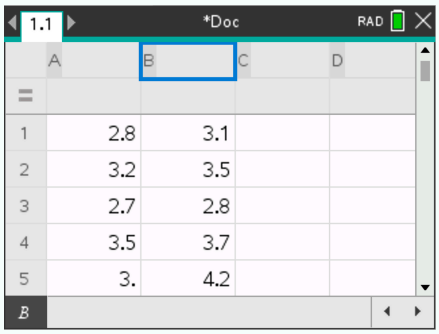
4.11.3 The student's t-test

Consider the following data:

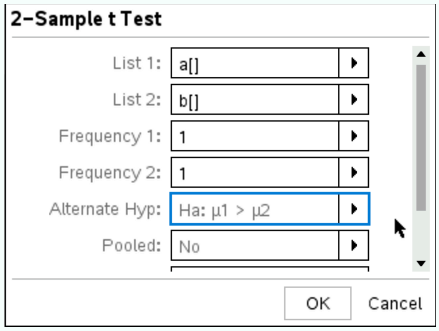
x_1	2.8	3.2	2.7	3.5	3.0	2.9	4.1	3.9	
x_2	3.1	3.5	2.8	3.7	4.2	2.6	3.2	2.9	3.8

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 Create a new document and select Add List & Spreadsheet. Fill column A with x1 values and column B with x2 values.



② Press menu, select Stastistics > Stat Tests > 2-Sample t Test. Select Data as data input and fill the parameters as follows:



Press enter. These results should be displayed:

Title	2-Samp...
Alternate...	μ1 > μ2
t	-0.191
PVal	0.575
df	14.8

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 $\mu_1 > \mu_2$).