Chi-Square Test

"Which pet do you prefer?" Using Chi-Square Test. Significance 5%=0.05

	Cat	Dog
Men	207	282
Women	231	242

The two **hypotheses** are.

- Gender and preference for cats or dogs are **independent**.
- Gender and preference for cats or dogs are **not independent**.

By doing the calculations (shown later), we come up with:

Add up rows and columns:

	Cat	Dog	
Men	207	282	489
Women	231	242	473
	438	524	962

Calculate "Expected Value" for each entry:

Multiply each row total by each column total and divide by the overall total:

	Cat	Dog	
Men	$\dfrac{489 \times 438}{962}$	$\dfrac{489 \times 524}{962}$	489
Women	$\dfrac{473 \times 438}{962}$	$\dfrac{473 \times 524}{962}$	473
	438	524	962

Which gives us:

	Cat	Dog	
Men	222.64	266.36	489
Women	215.36	257.64	473
	438	524	962

Subtract expected from observed, square it, then divide by expected:

In other words, use formula *(O−E)2/*E where

- O = **Observed** (actual) value
- E = **Expected** value

	Cat	Dog	
Men	$\dfrac{(207-222.64)2}{222.64}$	$\dfrac{(282-266.36)2}{266.36}$	489
Women	$\dfrac{(231-215.36)2}{215.36}$	$\dfrac{(242-257.64)2}{257.64}$	473
	438	524	962

Which gets us:

	Cat	Dog	
Men	1.099	0.918	489
Women	1.136	0.949	473
	438	524	962

Now add up those calculated values:

1.099 + 0.918 + 1.136 + 0.949 = 4.102

Chi-Square is 4.102

Degrees of Freedom(DF):

First we need a "Degree of Freedom"

Degree of Freedom = (rows − 1) × (columns − 1)

For our example we have 2 rows and 2 columns:

DF = (3− 1)*(2 − 1) = 1×1 = **2**