Ex: A simple random sample of 200 Utah schoolchildren were asked whether or not they like math. 102 kids were boys, 41 of whom said they liked math. The other 98 were girls, 29 of whom said they like math. Is liking math independent of gender for Utah schoolchildren?

Obs ⁝ Exp	Like Math		Don't Like Math		Total
Boys	41	36	61	66	102
Girls	29	34	69	64	98
Total	70		130		200

Expected: $\frac{70 \cdot 102}{200} = 36$ $\qquad \frac{130 \cdot 102}{200} = 66$

$\frac{70 \cdot 98}{200} = 34$ $\qquad \frac{130 \cdot 98}{200} = 64$

① Null: Gender and Liking Math are independent, i.e., boxes are the same

Alternative: Gender and Liking Math are not independent, i.e., boxes are different

② $\chi^2 = \frac{(41-36)^2}{36} + \frac{(61-66)^2}{66} + \frac{(29-34)^2}{34} + \frac{(69-64)^2}{64}$

$= 2.2$

$\# df = (2-1)\cdot(2-1) = 1$

③ $\chi^2 = 2.2$ is between 1.07 and 2.71

$1.07 \downarrow 30\%$, $2.71 \downarrow 10\%$

→ p-value is somewhere between 10% and 30%

④ p-value is greater than 5%

→ do not reject null hypothesis

→ Gender and Liking Math are independent