

6) Suppose teenagers come in 3 varieties: toothsome, lucky and giant. Because you don't have anything better to do you find 60 teenagers and count how many fall into each variety. This generates the following table:

observed frequencies of teenagers		
toothsome	lucky	giant
25	12	23

observed frequencies f_o

Make a table of the expected frequencies.

Using an alpha value of $\alpha = 0.01$ test the null hypothesis that the 60 teenagers are distributed evenly across the 3 varieties of toothsome, lucky and giant.

χ^2 test for frequencies $\alpha = 0.01$ $df = 3 - 1 = 2$

expected frequencies $\frac{60}{3} = 20$ $f_e = 20$

$$\chi^2 = \sum \frac{(f_o - f_e)^2}{f_e} = \frac{(25 - 20)^2}{20} + \frac{(12 - 20)^2}{20} + \frac{(23 - 20)^2}{20}$$

$$\chi^2_{obs} = 4.9 \quad \chi^2_{crit} = 9.21 > \chi^2_{obs} \quad p > 0.01$$

fail to Reject H_0 . $\chi^2(2, N=60) = 4.90, p = 0.0863$

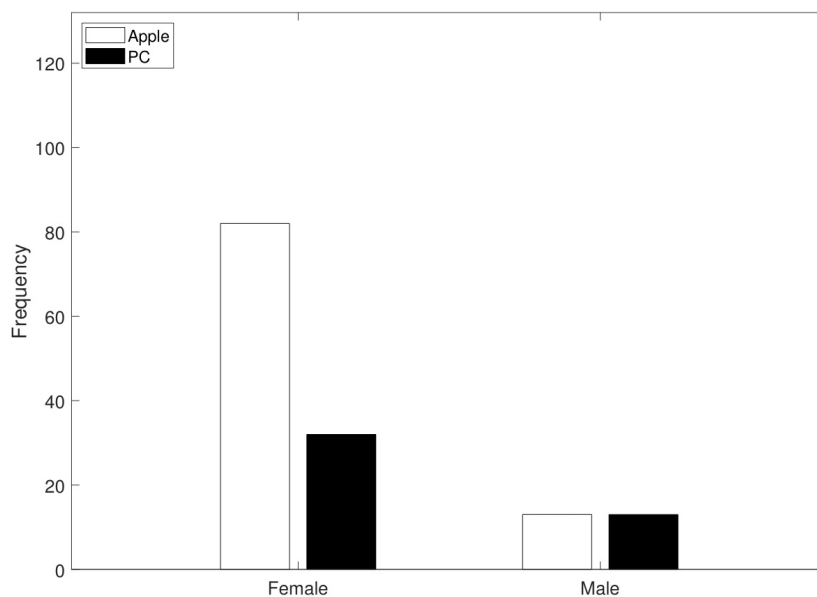
χ^2 test for independence!

Does the type of computer that students use in our class depend on gender? To find out we'll run a χ^2 test for independence using $\alpha = 0.05$.

We'll use our survey data and count the number of students who use each kind of computer, depending upon their gender. This generates the following 2 X 2 table:

observed frequencies		
	Apple	PC
Female	82	32
Male	13	13

$$N = 140, \alpha = .05$$



add up rows & columns

observed frequencies		
	Apple	PC
Female	82	32
Male	13	13

114

26

95

45

N=140

Calculate expected frequencies (f_e):
for each cell, multiply the column sum by
the row sum & divide by total (N)

Apple

PC

Female

$$\frac{95 \cdot 114}{140} = 77.3571$$

$$\frac{45 \cdot 114}{140} = 36.6429 \quad \swarrow f_c$$

Male

$$\frac{95 \cdot 26}{140} = 17.6429$$

$$\frac{45 \cdot 26}{140} = 8.3571$$

$$\chi^2 = \sum \frac{(f_o - f_e)^2}{f_e} = \frac{(82 - 77.3571)^2}{77.3571} + \dots + \frac{(13 - 8.3571)^2}{8.3571}$$

$$= \underline{4.6682}$$

$$df = (\# \text{ rows} - 1)(\# \text{ columns} - 1)$$

$$= (2 - 1)(2 - 1) = 1.$$

$$\chi^2_{crit} = 3.84 < 4.6682$$

Reject H_0 . "The choice of computer varies with gender"

$$\chi^2(1, N=140) = 4.67, p = .0307$$

