A public opinion poll surveyed a simple random sample of 1000 respondents. Respondents were classified by Age bracket and by approval or otherwise of a controversial TV advertisement. The results obtained are shown below.

	Response to TV Ad		
	18 to 35	**36 to 59**	**60 & above**
Approve	200	150	50
Disapprove	250	300	50

The pollster wants to test the claim that percentage approval of the TV ad is the same regardless of age group.
Test the claim that response to the TV ad is the same regardless of age group. Use a 0.05 level of significance.

$H_0: p_1 = p_2 = p_3$
$H_a: not\ all\ the\ same, at\ least\ one\ is\ different$
$\alpha = 0.05$

The Chi-square table is as follows,

	Response to TV Ad			Totals
	18 to 35	**36 to 59**	**60 & above**	
Approve	x = o =200 $e = \frac{450*400}{100} = 180$ $(o-e)^2/e = 2.22$	x = 150 e=180 $(o-e)^2/e = 5.0$	x = 50 e=40 $(o-e)^2/e = 2.5$	400
Disapprove	x = 250 $e = \frac{450 * 600}{100} = 270$ 0 $(o-e)^2/e = 1.481$	x = 300 e=270 $(o-e)^2/e = 3.33$	x = 50 e =60 $(o-e)^2/e = 1.66$	600
Totals	450	450	100	1000

The Chi-square test statistic is

$$X^2_{calc} = \sum_{i=1}^{2} \sum_{j=1}^{k} \frac{(o_{ij} - e_{ij})^2}{e_{ij}}$$

So, for us,

$$X^2_{calc} = 2.22 + 5.0 + 2.5 + 1.481 + 3.33 + 1.66 = 16.191$$

$$X^2_{critical} = X^2_{\alpha=0.05, df=k-1=2} = 5.991$$

So our

$$X^2_{calc} > X^2_{critical}$$

So we are in rejection region. So we reject H_0.
This means that the proportion approving the ad is not the same for all age groups, at least one is different.