You will receive credit for showing your steps even if your final answers are wrong.

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 website advertisement. The results obtained are shown below.

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

The pollster wants to test the claim that approval of the TV ad is the same regardless of age group.

1. Complete the Chi-square table below **[8 points]**

	Response to Website Ad			Totals
	18 to 35	36 to 59	60 & above	
Approve	x = 200	x = 300	x = 50	550
	e = 183.33	e = 261.9	e = 104.76	
	$(o-e)^2/e = 1.52$	$(o-e)^2/e = 5.54$	$(o-e)^2/e = 28.3$	
Disapprove	x = 150	x = 250 ~~200~~	x = 150	500 ~~600~~
	e = 166.67	e = 238.09	e = 95.24	
	$(o-e)^2/e = 1.67$	$(o-e)^2/e = 6.09$	$(o-e)^2/e = 31.44$	
Totals	350	500 ~~450~~	200	1000 ~~1050~~

$H_0: P_1 = \ldots = P_n$

$H_a:$ not all same

$\alpha = 0.05$

2. Calculate the Chi-square statistic **[1 points]**

$$\chi^2_{calc} = \sum \sum \frac{(o-e)^2}{e} = \cancel{74.44}\ 74.61$$

3. Test the claim that response to the website ad is the same regardless of age group. Use a 0.05 level of significance. **[1 points]**

$$\chi^2_{crit} = \chi^2_{\alpha=0.05,\ k-1=2} = 5.991$$

$$\chi^2_{calc} > \chi^2_{crit} \rightarrow \text{reject } H_0$$

Different ages respond differently to the ad.

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The data below resulted from measuring the performance of a bridge component subjected to three different environments. The engineer wants to test the claim that the component performs the same in all environments.

Environment (Treatment)	Mild	Moderate	Aggressive	Overall
	6.9	8.3	8.0	
	5.4	6.8	10.5	
	5.8	7.8	8.1	
	4.6	9.2	6.9	
	4.0	6.5	9.3	
	4.1	7.5	8.2	
	4.7		7.1	
	5.7			
Mean	5.15	7.68	8.30	6.92

The resulting (incomplete) ANOVA table is as follows:

Source	SS	DF	MS	F_{calc}	$F_{critical}$
Treatments	41.8	2	20.9	17.86	3.55
Error	21.068	18	1.17$\overline{6}$		
Total	—	20			

$H_0: \mu_1 = \cdots = \mu_n$

$H_a:$ not all same

$\alpha = 0.05$

$SST = \sum n_i (\bar{x}_i - \bar{x})^2$

$= 8(5.15 - 6.92)^2$
$+ 6(7.68 - 6.92)^2$
$+ 7(8.3 - 6.92)^2$

$= 41.8056$

$F_{critical} = F_{0.05, 2, 18}$

1. Complete the ANOVA table. **[8 points]**

2. At 95% confidence level, is the claim regarding the performance of this component valid? **[2 points]**

$F_{calc} > F_{crit} \longrightarrow$ reject H_0.

The component does not perform in all environments.