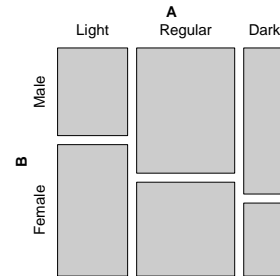




Beer Tastes

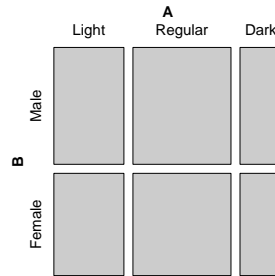
The new Brew Pub manufactures and distributes three types of beers: a low-calorie light beer, a regular beer, and a dark beer. To investigate the relationship between gender and beer preference, a sample of 450 beer drinkers was selected. After taste-testing each of the three beers, the individuals were asked to state their preference, defined as their first choice. The table at the right summarizes the responses.

	Beer Preference			
	Light	Regular	Dark	
Male	60	120	60	240
Female	90	90	30	210
	150	210	90	450



1. Compute the marginal totals, and write them on the table above.
2. Describe briefly in words what the value of 30 in the above table represents.
30 is the number of females who prefer dark beer.
3. Present the distribution of counts in the form of a mosaic plot.
4. The null hypothesis is that there is no difference in beer preference by gender. Compute the expected counts for each cell assuming the null hypothesis is true and write the values in the table below,

	Beer Preference			
	Light	Regular	Dark	
Male	80	112	48	240
Female	70	98	42	210
	150	210	90	450



5. Compute the chi-square test statistic.

$$\chi^2 = \frac{(60 - 80)^2}{80} + \frac{(120 - 112)^2}{112} + \frac{(60 - 48)^2}{48} + \frac{(90 - 70)^2}{70} + \frac{(90 - 98)^2}{98} + \frac{(30 - 42)^2}{42} = 18.4$$

6. Based on your calculations, should The New Brew Pub initiate a single advertising campaign for all of its beers, or tailor its promotions toward different target markets, such as male versus female? Explain.

The critical value for significance level $\alpha = 0.005$ from the χ^2 distribution with $(3 - 1) \times (2 - 1) = 2$ df is 10.6. Our observed test statistic value is larger than this, which means the p-value is smaller than 0.005. We would reject the null hypothesis and conclude that beer preference is different for males and females, so the company might benefit by targeted marketing.

