

7.16

Fated	Sick	Back	Stowed	None
391	257	156	89	107
419. →	289. →	179. →	79. →	119. →
410	280	170	70	110

← observed

← expected

$$H_0: p = 419, p_{sick} = 289,$$

$$p_B = 139, p_{stowed} = 79,$$

$$p_N = 119.$$

vs.  $H_a: \text{not } H_0$

$$\chi^2 = \frac{(391 - 419)^2}{419} + \frac{(257 - 289)^2}{289} + \frac{(156 - 179)^2}{179} + \frac{(89 - 79)^2}{79} + \frac{(107 - 119)^2}{119}$$

$$= 1.8805 + 1.8893 + 5.12 + 5.157 + .0818$$

$$= 13.2$$

$$df = 4$$

$$\chi^2 = 13.2$$

$$p\text{-value} = .01$$

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total:

~~8044.192~~

32,968

Jan-Mar

Apr-Jun

July-Sep

Oct-Dec

6880

7982

9161

8945

observed

.244

.248

.257

.241

expected

8044.192

8505.744

8472.776

7945.288

$H_0$  vs.  $H_a$ : not  $H_0$

$$\chi^2 = \frac{(6880 - 8044.192)^2}{8044.192} + \frac{(7982 - 8505.744)^2}{8505.744}$$

$$+ \frac{(9161 - 8472.776)^2}{8472.776}$$

$$+ \frac{(8945 - 7945.288)^2}{7945.288}$$

$$= 168.5 + 32.25 + 55.9 + 125.8$$

$$= \underline{\underline{382.45}}, \text{ df} = 3, p \approx 0$$

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	Grades	Spork	Popular	
B	117	60	50	227
G	130	30	91	251
	247	90	141	478

(a)

$H_0: p = \frac{1}{3}$  for each category

$\chi^2 = (247 - 159.33)^2 + (90 - 159.33)^2 + (141 - 159.33)^2$

$= 80.5, df = 2 \Rightarrow p \approx 0 \Rightarrow \text{reject } H_0!$

(b) Independence  $H_0$ : no association vs.  $H_a$ : dependence; is  $\chi^2$  test for independence an association

	Garden	Spots	Poplar	
B	117.3	42.24	66.96	227 → 42.59 = 42.59
C	129.7	42.26	74.04	251 → 52.59
	<u>247</u>	90	141	478

$$\left( \frac{227}{478} \right) (247) = 117.3$$

$$\chi^2 = 21.46, df = 2 \Rightarrow \underline{p = .000022}$$