

Chapter 11

- 11.2 a.  $\alpha = 0.05$  and  $df = (3-1) \times (4-1) = 6$ . Thus, the critical  $\mathbf{P}^2_{(0.05, df=6)} = 12.5916$ , which is determined in EXCEL as `12.59157742 =CHIINV(0.05,6)`, and the null hypothesis rejection region is a calculated chi-square greater than 12.59.
- b.  $\alpha = 0.10$  and  $df = (3-1) \times (3-1) = 4$ . Thus,  $\mathbf{P}^2_{(0.1, df=4)} = 7.77944$ , which is determined in EXCEL as `7.779433964 =CHIINV(0.1,4)`; thus, the null hypothesis rejection region is the region beyond 7.78.
- c.  $\alpha = 0.01$  and  $df = (5-1) \times (7-1) = 24$ . Thus,  $\mathbf{P}^2_{(0.01, df=24)} = 42.9798$ , which is determined in EXCEL as `42.97978129 =CHIINV(0.01,24)`; and the null hypothesis rejection region is the region is a calculated  $\mathbf{P}^2$  that exceeds 42.9798.

11.4 We need to test the following hypothesis:

$H_0$ : Dock sites and shifts are independent.

$H_A$ : Dock sites and shifts are not independent.

To test this hypothesis, we can construct the following expected frequency table:

	Dock1	Dock2	Dock3	Dock4	Total
Shift1	9.33	10.62	8.04	9.01	37
Shift2	9.33	10.62	8.04	9.01	37
Shift3	10.34	11.77	8.91	9.98	41
Total	29	33	25	28	115

The  $\mathbf{P}^2$  test statistic is calculated to be 1.4047, which in EXCEL gives a p-value of `0.994179572 =CHIDIST(1.4047,8)`; This calculated  $\mathbf{P}^2$  value is smaller than the critical  $\mathbf{P}^2_{(0.05, df=6)} = 12.5916$ , and the p-value is larger than the typical 0.05  $\alpha$  level; thus, we do not reject  $H_0$ . We conclude that dock sites and shifts are independent.

11.6 We need to test the following hypothesis:

$H_0$ : Race of the judicial appointments and the president in power are independent.

$H_A$ : Race of the judicial appointments and the president in power are not independent.

To test this hypothesis, we can construct the following expected frequency table using the given observation:

Given observation

	Clinton	Bush	Reagan	Total
White	20	165	344	529
Non-white	7	20	24	51
Total	27	185	368	580

Expected frequency table

	Clinton	Bush	Reagan	Total
White	24.63	168.73	335.64	529
Non-white	2.37	16.27	32.36	51
Total	27	185	368	580

The  $\chi^2$  test statistic is calculated to be 13.18856, which EXCEL shows to have a p-value of 0.0014 =CHIDIST(13.1886,2). This calculated  $\chi^2$  value is greater than the critical  $\chi^2_{(0.05, df=2)} = 5.99147$ , and the p-value is less than the 0.05 " level. Thus, we reject  $H_0$  at  $\alpha = 0.05$ . We conclude that race of the judicial appointments and the president in power are dependent.