Homework Solution

10.3. a)

$$\hat{p}_i \pm z_{\alpha/2}\sqrt{\frac{\hat{p}_i(1-\hat{p}_i)}{n}} = 0.275 \pm 2.576\sqrt{\frac{(0.275)(0.725)}{40}} = 0.275 \pm 0.261$$

b)

Everybody had it right.

10.9

	Hot	Cold	Neutral
Observed	123	147	2318
Expected	$2588 * 5\% = 129$	129	2330

$\chi^2 = (123-129)^2/129 + (147-129)^2/129 + (2318-2330)^2/2330 = 2.76$

Degrees of freedom=number of categories - 1 $= 2$

$\chi^2_{0.01} = 9.21 > \chi^2$

Thus, we cannot reject the theory about the proportions.

10.21 The MINITAB output in the book gives $\chi^2 = 1.351$

On $(3-1)(3-1) = 4$ degrees of freedom, $\chi^2_{0.05} = 9.488 < 1.351$

So, we cannot reject the null hypothesis that defect rate is independent with years of experience.

10.35

	1	2	3	4
Observed	31	28	45	47
Expected	37.5	37.5	37.5	37.5

Doing the same thing as we did in 10.9, we get

$\chi^2 = 7.38$

$df = 4 - 1 = 3, \chi^2_{0.05} = 7.81 > \chi^2$

Thus we cannot reject the null hypothesis that the proportions are the same for different components.

10.38 **a.** H_0: probabilities of accident in all 8 shifts are the same.

Expected number of accidents in each shift is $714/8 = 89.25$

Do the same thing as in 10.9, we get $\chi^2 = 15.91$

$df = 7, \chi^2_{0.10} = 12.01 < \chi^2$

Thus, we reject H_0.

b. To compare the probability of accident between the first 4 hours(p_1) and last 4 hours(p_2), we have 2 ways to do this:

—z-score method:

$H_0 : p_2 = 0.50$

$H_a : p_2 > 0.50$

$z = (399 - 714 * 0.50)/\sqrt{714 * 0.50 * 0.50} = 3.14$

Its p-value = 0.0008, so we can reject H_0 at 0.10 level.

Note: for those who compare z with its critical value, remember you are doing a one-sided test, so you should get $z_{0.10} = 1.28$

—χ^2 method:

$H_0 : p_1 = p_2 = 0.50$

	1-4	5-8
Observed	315	399
Expected	357	357

Then do the same thing as in 10.9, we get $\chi^2 = 9.8824$

$df = 1, \chi^2_{0.10} = 2.71 < \chi^2$

So H_0 should be rejected.