

Math 741 Assignment 23 (Quiz)

Arnold Jiadong Yu

May 16, 2019

10.5.1 solution:

A test can be formulated,

H_0 : The two conditions are independent

H_1 : The two conditions are not independent

with $\alpha = 0.05$ and $\alpha = 0.10$. The data is showed below

	Listed	Unlisted	Total
Own	628	146	774
Rent	172	54	226
Total	800	200	1000

Another table can be formulated

Class	Observed Frequency	Expected Frequency
Own, Listed	628	619.2
Rent, Listed	172	180.8
Own, Unlisted	146	154.8
Rent, Unlisted	54	45.2

$$df = (2 - 1)(2 - 1) = 1.$$

$$\begin{aligned}\chi_0^2 &= \frac{(628 - 619.2)^2}{619.2} + \frac{(172 - 180.8)^2}{180.8} + \frac{(146 - 154.8)^2}{154.8} + \frac{(54 - 45.2)^2}{45.2} \\ &= 2.7669\end{aligned}$$

$$p - value = 1 - P(0 \leq \chi_{(r-1)(c-1)}^2 \leq 2.7669) = 0.09623$$

10.5.3 solution:

10.5.6(H) solution: A test can be formulated,

H_0 : The blood pressure of children and their fathers are independent

H_1 : The blood pressure of children and their fathers are not independent

with $\alpha = 0.05$. A table can be formulated using the given data.

Row	Column	Class	Obs. Freq	Expected Freq
1	1	Lower Thrid, Lower Thrid	14	11.12
2	1	Middle Thrid, Lower Thrid	11	10.45
3	1	High Thrid, Lower Thrid	6	9.43
1	2	Lower Thrid, Middle Thrid	11	11.48
2	2	Middle Thrid, Middle Thrid	11	10.78
3	2	High Thrid, Middle Thrid	10	9.74
1	3	Lower Thrid, High Thrid	8	10.4
2	3	Middle Thrid, High Thrid	9	9.77
3	3	High Thrid, High Thrid	12	8.83

$$\begin{aligned}\chi_0^2 &= \frac{(14 - 11.12)^2}{11.12} + \frac{(11 - 10.45)^2}{10.45} + \frac{(6 - 9.43)^2}{9.43} + \frac{(11 - 11.48)^2}{11.48} + \frac{(11 - 10.78)^2}{10.78} \\ &\quad + \frac{(10 - 9.74)^2}{9.74} + \frac{(8 - 10.4)^2}{10.4} + \frac{(9 - 9.77)^2}{9.77} + \frac{(12 - 8.83)^2}{8.83} = 3.81 \\ p - value &= 1 - P(0 \leq \chi_{(r-1)(c-1)}^2 \leq 3.81) = 0.43233\end{aligned}$$

since $p - value = 0.43233 > \alpha = 0.05 \implies$ Fail to Reject H_0 . Hence, there is enough evidence to say that the blood pressure of children and their fathers are independent.

10.5.7 solution:

10.5.8(H) solution: A test can be formulated by the given information.

H_0 : The enrollment rates are independent on the racial groups

H_1 : The enrollment rates are dependent on the racial groups

with $\alpha = 0.05$. A table can be formulated using the given data.

Row	Column	Class	Obs. Freq	Expected Freq
1	1	White, Admitted	2592	2583.06
2	1	African-American, Admitted	159	150.3
3	1	Hispanic, Admitted	800	745.17
4	1	Asian, Admitted	667	676.05
1	2	White, Enrolled	1481	1428.70
2	2	African-American, Enrolled	78	83.13
3	2	Hispanic, Enrolled	375	412.16
4	23	Asian, Enrolled	399	373.93

$$\chi_0^2 = \frac{(2592 - 2583.06)^2}{2583.06} + \frac{(159 - 150.3)^2}{150.3} + \frac{(800 - 745.17)^2}{745.17} + \frac{(667 - 676.05)^2}{676.05} \\ + \frac{(1481 - 1428.7)^2}{1428.7} + \frac{(78 - 83.13)^2}{83.13} + \frac{(375 - 412.16)^2}{412.16} + \frac{(399 - 373.93)^2}{373.93} = 10.29$$

$$p - value = 1 - P(0 \leq \chi_{(r-1)(c-1)}^2 \leq 10.29) = 0.01626$$

since $p - value = 0.01626 < \alpha = 0.05 \implies$ Reject H_0 . Hence, there is enough evidence to say that the enrollment rates are dependent on the racial groups.

10.5.9 solution: