Exercises VII

1. Test the hypothesis that the average weight of containers of a particular lubricant is 10 ounces if the weights of a random sample of 10 containers are 10.2, 9.7, 10.1, 10.3, 10.1, 9.8, 9.9, 10.4, 10.3, and 9.8 ounces. Use 0.01 level of significance and assume that the distribution of weights is normal.

Test The hypothesis

1 ~~Test the hypothesis that the average~~

1 $\mu = 10$, $n = 10$, $\alpha = 0.01$

$x_i = 10.2 \,\&\, 9.7 \,\&\, 10.1 \,\&\, 10.3 \,\&\, 10.1 \,\&\, 9.8$

$9.9 \,\&\, 10.4 \,\&\, 10.3 \,\&\, 9.8$

$$\bar{x} = \sum_{i=1}^{n} \frac{x_i}{n} = \frac{1}{10}\sum_{i=1}^{n} x_i = \frac{100.6}{10} = 10.06$$

$$s^2 = \frac{1}{n-1} \sum [x_i - \bar{x}]^2 = \frac{1}{9}\sum[x_i - \bar{x}]^2$$

$$s^2 = \frac{1}{9}\left[(10.2 - 10.06)^2 + (9.7 - 10.06)^2 + \cdots \right.$$

$$\left. \cdots \right] = (0.245)^2$$

$\therefore S = 0.245$

1 $H_0 : \mu = 10$

2 $H_1 : \mu \neq 10$

3 $\alpha = 0.01$

4 $$t_c = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{10.06 - 10}{0.245/\sqrt{10}} = 0.769$$

5 $$t_t = t_{(\alpha/2,\, n-1)} = t_{(0.005,\, 9)} = -1.833$$

accept H_0 ; since $-t_t < t_c < t_t$

5. In a shop study, a set of data was collected to determine whether or not the proportion of defectives produced by workers was the same for the day, evening, or midnight shift worked. The following data were collected on the items produced:

	Shift		
	Day	*Evening*	*Midnight*
Defective	45	55	70
Nondefective	905	890	870

What is your conclusion? Use an $\alpha = 0.025$ level of significance.

[5]

	Shift			total
	Day	Evening	midnight	
Defective	45 (56,97)	55 (56,67)	70 (56,37)	170
Nondefective	905 (893,03)	890 (888,33)	870 (883,63)	2665 R_n
Total	950	945	940 C_m	2835

[1] H$_0$: The proportion of defectives and nondefective items are independent of The day, eveing or midnight shift worked

[2] H$_1$: ______ dependent of ______ ______ ______

[3] $\alpha = 0.05$

[4]
$$\chi^2_c = \sum_i \sum_j \frac{(o_{ij} - e_{ij})^2}{e_{ij}} \rightarrow (*)$$

$$\chi^2_{(\alpha, \nu)} = \chi^2_{(0.05, 2)} = 5.991$$

$\nu = (n-1)(m-1)$ d.f

[5] Computations:

$$e_{11} = \frac{170 \times 950}{2835} = 56{,}97$$

$$e_{12} = \frac{170 \times 945}{2835} = 56{,}67$$

$$e_{13} = \frac{170 \times 940}{2835} = 56,37$$

$$e_{21} = \frac{2665 \times 950}{2835} = 893,03$$

$$e_{22} = \frac{2665 \times 945}{2835} = 888,33$$

$$e_{23} = \frac{2665 \times 940}{2835} = 883,63$$

from (*)

$$\chi_c^2 = \frac{(45 - 56,97)^2}{56,97} + \frac{(55 - 56,67)^2}{56,67} + \frac{(70 - 56,37)^2}{56,37)}$$

$$+ \frac{(905 - 893,03)^2}{893,03} + \frac{(890 - 888,33)^2}{888,33}$$

$$+ \frac{(870 - 883,63)^2}{883,63}$$

$$= 2,52 + 0.05 + 3.30 + 0.16 + 1.88 \times 10^{-3}$$

$$+ 0.21$$

$$= 6.24188$$

$\boxed{6}$ Conclusion Reject H_0, since $\chi_c^2 > 5.991$