Name: ID   Serial:

Question One (5-Points)

Toy city opens four hours daily, the following table represents a sample of children who came during one hour:

Hour	Number of children	e_i
1	125	152.5
2	145	152.5
3	160	152.5
4	180	152.5

Using a significance level of 0.05 is there sufficient evidence to conclude that the distribution of children over the four hours is <u>uniformly</u> distributed?

The hypotheses are:

H_0: The dist. of children over the four hours is uniformly distributed. ⎫ ①

H_A: ≠ = = = = = = = = not uniformly.

The test statistic value: $e_i = \dfrac{610}{4} = 152.5$

$$X_c^2 = \sum_{i=1}^{k} \frac{(O_i - e_i)^2}{e_i} = \frac{(125-152.5)^2}{152.5} + \frac{(145-152.5)^2}{152.5} + \frac{(160-152.5)^2}{152.5} + \frac{(180-152.5)^2}{152.5}$$

$$= 4.9590 + 0.3689 + 0.3689 + 4.9590$$

$$= 10.6558 \quad ⎫ ②$$

Decision Rule: $\alpha = .05 \Rightarrow X_{\alpha, k-1}^2 = X_{.05, 3}^2 = 7.8147$

Reject H_0 if $X_c^2 > X_{\alpha, k-1}^2 \Rightarrow 10.6558 > 7.8147$ ✓ ⎫ ①

∴ Reject H_0.

Conclusion: The dist. of the children over the four hours is NOT uniformly distributed. ①

Question Two (5-Points)

A study was made about smoking and drinking-Coffee habits, a sample of 200 persons were asked to answer the following two questions:

1. About the smoking habit, I considered my self as :
   a. Heavy smoker (HS)   b. Light smoker (LS)   c. Nonsmoker (NS)
2. About the drinking-Coffee habit , I considered my self as:
   a. Heavy drinker (HD) b. Light drinker (LD)   c. Nondrinker (ND)

The results are summarized in the following table:

Smoking	Drinking			Total
	ND	LD	HD	
NS	40 _28·52_	42 _49·22_	10 _14·26_	92
LS	15 _19·53_	38 _33·705_	10 _9·765_	63
HS	7 _13·95_	27 _24·075_	11 _6·975_	45
Total	62	107	31	200

Based on these data, can we conclude that the drinking and smoking habits are independent? Use $\alpha = 0.05$

The hypotheses are:

H_0: Drinking and Smoking habits are indep. $\rbrace$ ①

H_A: ≠   ≠   ≠   ≠   ≠   not indep.

The test statistic value:

$$x_c^2 = \sum_{i=1}^{r} \sum_{j=1}^{c} \frac{(O_{ij} - e_{ij})^2}{e_{ij}} = \frac{(40 - 28.52)^2}{28.52} + \frac{(42 - 49.22)^2}{49.22} + \cdots + \frac{(11 - 6.975)^2}{6.975}$$

$$= 14.69698 \quad \rbrace ②$$

Decision Rule: $\alpha = .05 = x_{\alpha, (r-1)(c-1)}^2 = x_{.05, 4}^2 = 9.4877$

Reject H_0 if $x_c^2 > x_{\alpha, (r-1)(c-1)}^2$ $\rbrace$ ①

$14.69698 > 9.4877$ ✓

∴ Reject H_0.

Conclusion: Drinking and Smoking habits are NOT indep. $\rbrace$ ①