COMM 215: Business Statistics Solution to Practice Problems 2
Chi-Square Tests

1. $H_0 : p_1 = 0.50,\ p_2=0.25,\ p_3=0.15,\ p_4=0.10$

   H_1 : at least one p ≠ to specified valuesχ^2

f_i	e_i	χ^2
27	30	0.300
19	15	1.067
11	9	0.444
3	6	1.500

$\chi^2_{0.05,3}$=7.8147. Since 3.311<7.8147, DO NOT REJECT H_0.

Brook's ideas regarding accounts are accurate. (No evidence to reject H_0)

2. H_0: Employment and wage rates are independent

   H_1: Employment and wage rates are NOT independent

	Yes	No	
High	18 (28.74)	40 (29.46)	58
Low	38 (27.26)	17 (27.74)	55
	56	57	113

Re ject if $\chi^2_{0.01,1} = 6.6349$

$\chi^2 = 4.016 + 3.945 + 4.235 + 4.16 = 16.355$

Since 16.355 > 6.6349, reject H_0 and conclude that classification are dependant.

3 a. H_0 : percentage in response categories are independent of type of firm.

H_1 : percentage in response categories are NOT independent.

	Yes	Neutral	No	
US	50 (64.465	57 (46.290)	19 (15.237)	126
Foreign	60 (45.535)	22 (32.702)	7 (10.763)	89
	110	79	26	215

b. $\chi^2_{.10,2} = 4.605.$ $\chi^2 = 16.06$

Since 16.06 > 4.605, Reject H_0 and conclude H_a. Evidence to indicate the two classification are dependant

Sample proportion: $\bar{p} = 50/126 = .397$

The 90% confidence interval estimate for the percentage of U.S. firms that give hiring preferences to business majors with foreign language skills:

$$0.397 \pm 1.645\sqrt{\frac{(.397)(.603)}{126}}$$

$0.397 \pm .072 \quad (.325, .469)$

4.

$H_0: p_1 = p_2 = p_3 = p_4 = p_5 = 0.20$

H_1: at least one $p \neq 0.20$

e_i for each day $= 362 \times .20 = 72.4$, $\chi^2_{.05,4} = 9.48773$

Since $\chi^2 = 4.768 < \chi^2_{.05,4} = 9.48773$, DO NOT REJECT H_0.

Insufficient evidence to say absenteeism is higher on some days.

5.

H_0: preference is independent of experience (no relationship)

H_1: preference is NOT independent of experience

$\chi^2_{.05,2} = 5.991$. Since $\chi^2 = 7.40136 > 5.991$, Reject H_0.

Sufficient evidence to conclude that preference and experiences are NOT independent. There is a relationship.

6.

a. H_0 : Scores are independent of gender

H_1 : Scores are NOT independent of gender

Reject H_0 if $\chi^2 > \chi^2_{.05,4} = 9.48773$ $\quad [(r-1)\times(c-1)=4]$

Test statistics: $\chi^2 = 1.172$ Since $1.172 < 9.487$

DO NOT Reject H_0 - Scores are independent of Genders

b. $$p(\bar{x} \le 570) = p\left(z \le \frac{570-550}{75/\sqrt{50}}\right) = 1.89$$

$p(z \le 1.89) = 0.470610 + 0.5 = 0.9706$

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7.

a. H_0: Same result obtained by ABC Inc.

H_1: Reason different than obtained by ABC Inc.

Reject H_0 if $\chi^2 > \chi^2_{.05,3} = 7.81473$

$\chi^2 = 1.0526+2.8125+2.3529+6.9231=13.1411$

Since $\chi^2 = 13.1411 > \chi^2_{.05,3} = 7.81473$,

reject H_0 and conclude that reasons are different.

b.

H_0: Reason for firing is independent to previous warning

H_0: Reason for firing is dependent to previous warning

Reject H_0 if $\chi^2 > \chi^2_{0.10,(4-1)(2-1)} = \chi^2_{0.10,3} = 6.251$.

Since $\chi^2 = \mathbf{5.423} < \chi^2_{0.10,3} = \mathbf{6.251}$, do not reject H_0.

8. a.

$\begin{cases} H_0: \text{Finding a job is independent of working experience} \\ H_1: \text{Finding a job is NOT independent of working experience} \end{cases}$

Reject H_0 if $\chi^2 > \chi^2_{.05,(r-1)(c-1)} = \chi^2_{.05,2} = 5.99$

Test statistics: $\chi^2 = 7.922$

Since $7.922 > 5.99$, Reject H_0.

Finding a job is NOT independent of work experience.

b.

$\begin{cases} H_0: p_1=.70; p_2=.15; p_3=.15 \\ H_1: \text{at least one (or two) p is different} \end{cases}$

Reject H_0 if $\chi^2 > \chi^2_{.10,2} = 4.60517$

Test statistics:

f_i	e_i	$\frac{(f_i - e_i)^2}{e_i}$
52	56	0.28571

16	12	1.33333
12	12	0.00000
80	80	1.61904

Since $1.61904 < 4.605$, do not reject H_0; insufficient evidence that proportions differed from the special values.