

Chapter 14A:

Read carefully the material on pages 359 - 362 of your text, and on pages 90 - 90.1 of your Lecture Notes. Then answer the **two problems** that follow.

Problem #1:

A large publication house recently conducted a survey to assess the reading habits of teenagers. The company publishes four magazines specifically tailored to suit the interests of teenagers. Management hypothesized that there were no differences in the preferences for the magazines. A sample of 1,600 teenagers interviewed in the city of

Buffalo, New York, indicated the following preferences for the four magazines.

Publication	Rock-Town	Rappin'	Teen-Tips	R.A.D.	Total
Frequency of Preference	350	500	450	300	1600

The cells in the above table give you the **observed frequencies**, O_i . To get the **expected frequency for each cell above**, simply **divide the total sample size by the number of publications**.

In this problem, the **null hypothesis** is: There are **no differences** in the preferences for the various magazines. (Note: your **expected frequencies** should be consistent with the **null hypothesis**. Also note that the **total for your observed frequencies** should equal the **total for the expected frequencies**.)

The **alternate hypothesis** is: There are **differences** in the preferences for the various magazines.

Answer the following questions:

- How many degrees of freedom are there?
- What is the chi-square critical **table value** at the .05 level of significance, i.e., $\alpha = .05$?
- What is the chi-square **calculated value**? Show all supporting calculations.
- Should the null hypothesis be rejected or not? Explain why or why not.

Problem #2: Census Data Problem

midterm

Suppose that you **survey 150 people**. You determine that **65.3333% of your sample** are males and the remainder are females. **Census data** for the area of your sample indicates that **40% of the population are males** and **60% are females**. Determine whether your sample data is representative of the population data. To determine this, set up a table similar to the top table on page 90.1 of your Lecture Notes. Your rows will be "male" and "female." Your **null hypothesis** will be: There is **no difference** between the gender frequencies **observed** in the sample data and the sample frequencies one would **expect** from the census data. Note: your observed and expected frequencies should be based on the **total sample size**. That is, the **total for your observed frequencies** (from your sample) and the **total from your expected frequencies** (from census data) should be identical. **Calculate the X^2 value** and the **standardized residuals**. Then determine whether you should reject or not reject the null hypothesis at the **.10 alpha level**. What do your standardized residuals indicate? Hint: You examine the standardized residuals **only if you reject the above null hypothesis**. (For interpreting the standardized residuals, assume $\alpha = .10$. This means you should be comparing the standardized residuals to a Z value of 1.645.)

INCOME	(2) Observ- ed # Fami- lies O_i	(3) Census Proportions	(4) Census Proportions \times Sample Size e_i	(5) Standar- dized Re- sidual $(O_i - e_i)/\sqrt{e_i}$	(6) Squaring Column 5 $(O_i - e_i)^2/e_i$
<\$15,000	8	22%	22	-2.985	8.909
\$15k - \$24.9k	25	19%	19	1.377	1.895
\$25k - 34.9k	15	12%	12	.866	.750
\$35k - \$44.9k	18	18%	18	.000	.000
\$45 - \$54.9	8	6%	6	.816	.667
\$55k - \$64.9k	8	5%	5	1.342	1.800
\$65k +	18	18%	18	.000	.000
TOTAL	100	100%	100		$\chi^2_{CAL} =$ 14.02

O_i	e_i	$(O_i - e_i)$	$\sqrt{e_i}$	$(O_i - e_i)/\sqrt{e_i}$
8	22	-14	4.69	-2.985
25	19	6	4.36	1.377
15	12	3	3.46	.866
18	18	0	4.24	.000
8	6	2	2.45	.816
8	5	3	2.24	1.342
18	18	0	4.24	.000
100	100			

Since our $\chi^2_{CAL} > \chi^2_{TABLE}$, we are able to **reject our null hypothesis**, i.e., we do not believe that our sample data is representative of our target population in **ALL** income categories.

To determine in which areas we are and are not representative of the target market, examine the **standardized residuals (column 5 above)**. These can be interpreted like Z-scores (see Appendix A on page 576 of your text). Since we are testing at the .10 alpha level, any **standardized residual that exceeds 1.645 is significant**. In our