

## UNIVERSITY OF TEXAS AT AUSTIN

Problem Set # 15Goodness of fit.

**Problem 15.1.** Gregor Almond, the local horticulturalist, grows 400 progeny from a cross of peas. The cross is hypothesised to have a ratio of 1 green to 7 yellow seeds. Suppose that the cross actually produces 360 yellow and 40 green seeded plants.

- (i) Calculate the observed value of the test statistic.
- (ii) Using the  $\chi^2$ -tables, what would your decision be at the significance level  $\alpha$ .
- (iii) Using **R** with the observed value of the test statistic, find the  $p$ -value.
- (iv) Using the command  
`chisq.test()`  
 perform the  $\chi^2$ -test and provide the summary.
- (v) In this case, you can test the same hypotheses using the  $z$ -test. Do this for practice!

**Problem 15.2.** (8 points) You suspect that a die has been altered so that the outcomes of a roll (the numbers 1 through 6) are not equally likely. You roll the die 600 times and observe the following counts:

Outcome	1	2	3	4	5	6
Count	85	86	120	118	91	100

- (i) Using the  $\chi^2$ -tables, at the significance level of 0.05 perform the goodness-of-fit test and report your conclusions.
- (ii) Using **R**, perform the goodness-of-fit test.

**Problem 15.3.** The early education department of the local community college conducts a survey of 1000 randomly chosen children on their favorite among certain offered holidays. Here are the results of this survey:

Halloween	Thanksgiving	Arbor Day	Other
60%	10%	2%	28%

Then, the children were shown an inspirational movie on ecology and horticulture. After that, they were asked, again, to choose their favorite holiday among those offered. Here are the results of the renewed survey:

Halloween	Thanksgiving	Arbor Day	Other
58%	8%	8%	26%

Using the  $\chi^2$ -goodness-of-fit test, say whether there is sufficient evidence that the childrens' opinion was changed by the movie at the 0.01 significance level. Solve this problem both ways, i.e., using the  $\chi^2$ -tables and using **R**.