

Math 308 Assignment 7

Exercises 3.9

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The null hypothesis is that the difference in proportions is zero. However, performing the permutation test gave a p -value of 0.002, allowing us to reject the null at 1% confidence. Thus, the difference in proportions is statistically significant.

Age	Response	
	For	Against
18-29	164	60
30-49	304	112
50+	275	102

Table 2: Expected values

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The p -value is 1, which does not let us reject the null hypothesis that the presence of competition has no value on the height change of the seedlings.

Then, we calculate the χ^2 test statistic:
 $c = \sum_{i,j}^{\text{all cells}} \frac{(\text{observed}_{i,j} - \text{expected}_{i,j})^2}{\text{expected}_{i,j}} = 6.33$
 Under the null, C follows a χ^2 distribution with $(3 - 1) \times (2 - 1) = 2$ degrees of freedom; i.e. $C \sim \chi^2_2$.
 So, the p -value is $P(C > c) = \int_c^\infty \frac{e^{-t/2}}{2} dt \approx 0.042$.
 Thus, we can reject the null at 5% significance, but not at 1% significance.

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Null Hypothesis Voting preference is independent of age.

Alternative hypothesis Voting preference depends on age.

Age	Response		
	For	Against	All
18-29	172	52	224
30-49	313	103	416
50+	258	119	377
All	743	274	1017

Table 1: Observed values

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Multiplying column marginal fractions by row marginal totals, we can get the expected values: