

Chi squared

Chi-square test χ^2

Determines how likely the result you got was significant

$$\chi^2 = \sum \frac{(\text{observed} - \text{expected})^2}{\text{expected}}$$

Do not solve for X!!! The value you want is calculated as given.
NEVER TAKE THE SQUARE ROOT OF ANYTHING in a chi-square calculation!

The chi-squared test is to see if your data are a good fit to a random distribution. Formally, your *null hypothesis* should be something like: "this is just variations of a random distribution...there is no real pattern." Remember, most of the time your *actual* hypothesis is that there is some preference or pattern. You are asking the chi square test to *DISPROVE* the null hypothesis.

Possible outcomes:

1. Chi squared value is small, less than would give you a p-value of 0.05 or 0.01 or so. In this case you have failed to disprove the null hypothesis. You **cannot** conclude that there is no pattern or preference (in the case below). You can only conclude that you don't have enough data to show a pattern.
2. Chi-squared value is high, resulting in a p-value less than 0.05 or 0.01 (depending on the requirements given). This allows you to conclude that the null hypothesis is extremely unlikely. You therefore conclude that a pattern other than random does exist.

Using a choice chamber to measure preferences of mosquitos, a student compares the relative attractiveness of different strips of cotton cloth taken from undershirts, either brand new or worn by one of 4 different individuals (2 male, 2 female) for 3 hours during their day. She counts how many times mosquitos land on the cloth per minute, for 5 separate trials. She finds the following:

Trial	New Undershirt	F1	F2	M1	M2
1	1	18	15	28	20
2	2	22	16	25	19
3	1	17	14	29	22
4	0	25	14	31	22
5	3	20	12	30	18
average	1.4	20.4	14.2	28.6	20.2
totals (no gender)	1.4	20.85			

- a. It seems from the last row that mosquitos prefer cloth from shirts worn by humans. What would be a good "null hypothesis," to test by a chi-squared method?

- b. determine whether the null hypothesis is disproved or not using chi-squared.

- c. The data may suggest a slight preference for men's clothing. Propose an experiment to test that.