

The χ^2 (Chi-Square) Goodness of Fit Test

Biologists wish to mate two fruit flies having genetic makeup RrCc, indicating that it has one dominant gene (R) and one recessive gene (r) for eye color, along with one dominant (C) and one recessive (c) gene for wing type. Each offspring will receive one gene for each of the two traits from both parents. Any offspring receiving an R gene will have red eyes, and any offspring receiving a C gene will have straight wings.

1. What is the theoretical distribution of the population of offspring from fruit flies having the genetic makeup RrCc? (Make a Punnett square.)

	Parent 2 passes on			
Parent 1 passes on				

In order to test the hypothesized distribution of offspring, the biologists mate the fruit flies. Of 200 offspring, 99 had red eyes and straight wings, 42 had red eyes and curly wings, 49 had white eyes and straight wings, and 10 had white eyes and curly wings. Do these data differ significantly from what the biologists have predicted?

2. First compare the distributions by comparing the “expected” counts of fruit flies versus the “observed” counts of fruit flies.

Expected	Observed

3. Write a set of hypotheses that we wish to test.

4. Calculate this statistic:

$$\chi^2 = \sum \frac{(\text{Observed} - \text{Expected})^2}{\text{Expected}}$$