

Genetics laboratory

Chi-square (X^2) sheets

Cross _____

STEP 1: Observations

1. Observe the zebrafish embryos and larva and identify all of the phenotypes present. Refer to the laboratory handout for more complete instructions and descriptions of the possible inheritance patterns.
2. Decide on the phenotype(s) important for understanding the genetics.
3. Count the number of embryos that have each phenotype and record in columns 1 and 2 below.

Clutch _____ Table:

(1)	(2)	(3)	(4)	(5)	(6)
Phenotype	Observed Number (O)	Expected Number (E)	$D=(O - E)$	D^2	$X^2=D^2/E$
Total X^2					

(7) X^2 = the sum of all of the numbers in column 6 =

(8) n= the number of phenotypes listed in column 1. Degrees of freedom (df) = n-1 =

Conclusion:

(9) P-value and conclusion about your hypothesis:

STEP 2: Generate a Hypothesis

1. Compare the number of fish in each clutch that have a wild-type phenotype versus the number of fish with a mutant phenotype. If you think you are seeing more than one phenotype, it is likely best to start by considering each phenotype separately.
2. Form a hypothesis about what type of inheritance they have (recessive, dominant, etc.-see lab handout for more information). Punnett squares will likely help you come up with a good hypothesis.

Hypothesis for cross _____:

STEP 3: Analysis

1. Use your hypothesis to calculate the expected values for each of the phenotypes. Fill in your calculated values in column 3 of the clutch 1 table.

Calculate here:

2. Chi-square test

How to do a chi-squared test:

- A. Determine D and D^2 from the observed and expected numbers you have gathered/calculated. Enter these numbers in columns 4 and 5 of the table.
- B. Calculate D^2/E for each phenotype, these are the phenotype X^2 values. Record in column 6.
- C. The chi-squared value, X^2 , is the total of all the values in column 6. Place this number in the total row of column 6 and in row 7.
- D. Count the number of phenotypes you have listed in column 1. The number equals n. For instance, if you observe two different phenotypes then $n = 2$.
- E. Calculate the degrees of freedom (df). $df = n - 1$. Place this number in row 8.
- F. Use the chi-square table, the chi-squared value, and the df to calculate your P value. You will probably end up with a range, such as $1.0 > P > 0.5$. Place this P value in row 9.
- G. Make a conclusion-what does your P value tell you about your hypothesis? Place this statement in row 9.