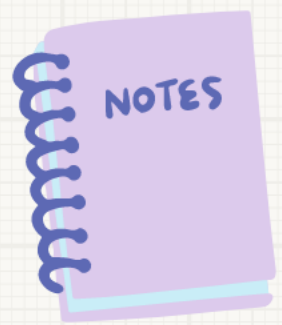


AP Bio

Math Mondays

Statistical Analysis:
Chi Square



Chi Square

$$\chi^2 = \sum \frac{(o - e)^2}{e}$$



Math Monday #2

Chi Square

In a certain species of flowering plant, the purple allele P is dominant to the yellow allele p .

A student performed a cross between a purple-flowered plant and a yellow-flowered plant. When planted, the 156 seeds that were produced from the cross matured into 92 plants with purple flowers and 64 plants with yellow flowers.

Calculate the chi-squared value for the null hypothesis that the purple-flowered parent was heterozygous for the flower-color gene. Give your answer to the nearest tenth.

Math Monday #2

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Calculate the chi-squared value for the null hypothesis that the purple-flowered parent was heterozygous for the flower-color gene. Give your answer to the nearest tenth.

	P	p
p	Pp	pp
p	Pp	pp


Phenotype	Observed (o)	Expected (e)
Purple	92	78
Yellow	64	78
	156	

Math Monday #2

Chi Square

Calculate the chi-squared value for the null hypothesis that the purple-flowered parent was heterozygous for the flower-color gene. Give your answer to the nearest tenth.

Chi Square


$$x^2 = \sum \frac{(o - e)^2}{e}$$

Phenotype	Observed (o)	Expected (e)
Purple	92	78
Yellow	64	78

$$x^2 = \frac{(92 - 78)^2}{78} + \frac{(64 - 78)^2}{78}$$

Math Monday #2

Chi Square

Calculate the chi-squared value for the null hypothesis that the purple-flowered parent was heterozygous for the flower-color gene. Give your answer to the nearest tenth.

$$\chi^2 = \frac{(92 - 78)^2}{78} + \frac{(64 - 78)^2}{78}$$

$$\chi^2 = \frac{(14)^2}{78} + \frac{(-14)^2}{78}$$

$$\chi^2 = \frac{196}{78} + \frac{196}{78}$$

$$\chi^2 = 2.51 + 2.51 = 5.02$$

5.0

Math Monday #2

Chi Square

Calculate the chi-squared value for the null hypothesis that the purple-flowered parent was heterozygous for the flower-color gene. Give your answer to the nearest tenth.

Phenotype	Observed (o)	Expected (e)	(o-e)	(o-e) ²	((o-e) ² /e)
Purple	92	78	14	196	2.51
Yellow	64	78	-14	196	2.51
Total					5.0

Chi-Square Table

p value	Degrees of Freedom							
	1	2	3	4	5	6	7	8
0.05	3.84	5.99	7.81	9.49	11.07	12.59	14.07	15.51
0.01	6.63	9.21	11.34	13.28	15.09	16.81	18.48	20.09

Example Problem

Chi Square

In pea plants, smooth seeds are dominant to wrinkled, and purple flowers are dominant to white. In a dihybrid cross where 9:3:3:1 ratio is expected, the following data was collected:

Smooth and Purple = 223

Smooth and White = 84

Wrinkled and Purple = 89

Wrinkled and White = 33

Determine the **chi square value**.
Round to the nearest hundredths.

Chi Square

$$\chi^2 = \sum \frac{(o - e)^2}{e}$$



Example Problem

Chi Square

In pea plants, smooth seeds are dominant to wrinkled, and purple flowers are dominant to white. In a dihybrid cross where 9:3:3:1 ratio is expected, the following data was collected:

Smooth and Purple = 223

Smooth and White = 84

Wrinkled and Purple = 89

Wrinkled and White = 33

3.89

Determine the chi square value. Round to the nearest hundredths.

Phenotype	Observed (o)	Expected (e)	(o-e)	(o-e) ²	((o-e) ² /e
Smooth & Purple	223	241.313	-18.313	305.366	1.390
Smooth & White	84	80.438	3.562	12.688	0.158
Wrinkled & Purple	89	80.438	8.562	73.308	0.911
Wrinkled & White	33	26.813	6.187	38.279	1.428
Total	429				3.887