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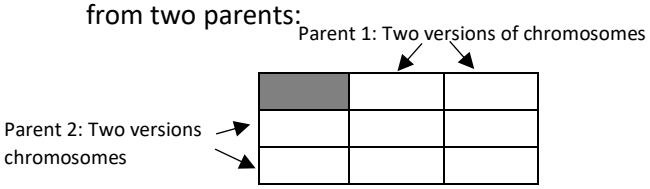
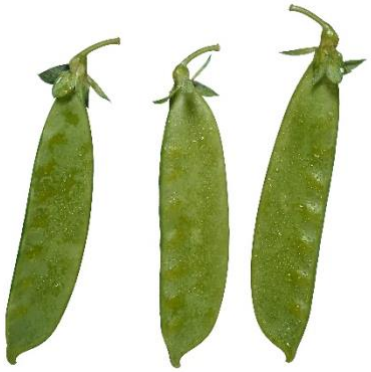
LG #14: How Does a DNA Sequence Become a Physical Feature?
Introduction to Punnett Squares
Worksheet

An Introduction to Punnett Squares

Punnett squares are diagrams used to help us predict the characteristics of the offspring that may result from two parents:





Each Punnett square examines only **one** trait, for example, Gregor Mendel examined the colour of pea pods.

He crossed a homozygous dominant green pod (GG) with a homozygous recessive yellow pod (gg).

Mendel had to wait until offspring were produced from this cross to see the results, however, using a Punnett square, we can determine the likely combination of offspring.

Capital letters (G, L, K, etc mean the DOMINANT version of the trait. Lower case means the recessive form.

Step 1: Place the genotype of parent 1 across the top of the Punnett square:

	G	G

Genotype of parent 1

Step 2: Place the genotype of parent 2 down the left hand side of the Punnett square:

Genotype of parent 2

	G	G
g		
g		

Question 1: What does each letter represent?

_____

_____

_____.

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Each box left in the Punnett square will represent a possible offspring, each inheriting one allele (trait) from each parent.

Step 3: Complete the punnet's square below, this shows the genotypes of the offspring:

Question 2: Can you guess how to fill the Punnett square in? It has been started for you.

	G	G
g	Gg	
g		

Question 3: Describe the genotype and phenotype of the offspring created from the crossing of alleles above._____

_____

_____.

Question 4: These offspring (called the F_1 generation) were then crossed to each other. Fill in the following Punnett square to show the expected genotypes of the two offspring were crossed together. (called the F_2 generation):

Step 4: State the proportions of offspring with each genotype/phenotype:

When describing the resulting offspring, you may be asked to express your answer in 3 different ways: as a percentage (e.g. 65%), ratio (e.g. 6:1), or fraction (e.g. 1/3).

Ratio:

Fraction:

Percentage:

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Question 5: Express the genotypes and phenotypes of the offspring from the second cross in each of these three forms:

	Percentages	**Ratios**	**Fractions**
Genotypes	_____ GG _____ Gg _____ gg		
Phenotypes	_____ Green _____ Yellow		

<u>What is this information really telling us?</u>

- *For every 4 offspring produced by the F_1 pea plants, 3 will be green and 1 will be yellow*
- *For every 4 offspring produced by the F_1 pea plants,1 will be homozygous dominant, 2 will be heterozygous and 1 will be homozygous recessive*
- And many other things….

Question 6: Make one other statement similar to the ones above about the offspring from a Gg x Gg cross of pea plants:

_____

_____

_____

_____.

One important point from this cross is the **expected ratio** of 3 green: 1 yellow pea plant. This ratio of 3 offspring showing the dominant phenotype: 1 offspring showing the recessive phenotype can be expected is any cross where both parents are heterozygous.

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Question 7: How many offspring would be expected to show each of the following genotypes and phenotypes for the cross above if 200 offspring were produced? What if 60 offspring were produced?

	200 offspring	**60 offspring**
Green	150	_____
Yellow	_____	_____
Homozygous dominant	_____	_____
Homozygous recessive	_____	_____
Heterozygous	_____	_____

How do I work this out?

3/4 of the offspring are expected to be green.

Therefore, I need to find 3/4 of 200:

$$\frac{3}{4} \times \frac{200}{1} = \frac{600}{4}$$

$$= 150$$

Remember that this is only a prediction of the offspring that will result.

Punnett squares can also be useful in determining the chances of a particular trait being passed on to offspring (e.g. a genetic disease).