Engage: Punnett Squares

THE ACTIVITY

There are two example Punnett squares shown below. The first is a Punnett square for a single trait (2x2 grid). The second is a Punnett square to show the offspring while looking at two traits (4x4 grid). Follow the instructions below for completing five Punnett squares in your notebook (the first four are 2x2, the last one is a 4x4 Punnett square).

Sample Punnett squares:

(GG x Gg) G=green antennae, g=blue antennae

	G	G
G	GG	GG
g	Gg	Gg

Genotype
50% GG, 50% Gg

Phenotype
100% green

(GgPp x ggpp) G=green antennae, g=blue antennae
P=purple feet, p=orange feet

	GP	Gp	gP	gp
gp	GgPp	Ggpp	ggPp	ggpp
gp	GgPp	Ggpp	ggPp	ggpp
gp	GgPp	Ggpp	ggPp	ggpp
gp	GgPp	Ggpp	ggPp	ggpp

Genotype
25% GgPp, 25% Ggpp, 25% ggPp, 25% ggpp

Phenotype
25% green antennae/purple feet,
25% green antennae/orange feet,
25% blue antennae/purple feet,
25% blue antennae/orange feet

The Activity (cont.)

1. In your notebook, draw a Punnett square (using a ruler!) for a single trait (2x2 grid). Working with a partner, make up a trait: flower color, ear shape, etc. Be sure to list the key for your two alleles, the "cross" that you're depicting in your square, and the genotypes and phenotypes of all the offspring (including percentages) similar to what you see in the examples above. For the first Punnett square, show the cross between a heterozygous individual and a homozygous recessive individual.
2. In your notebook, draw a Punnett square again showing all the same information required in the first example. This time fill out a cross between a heterozygous individual and another heterozygous individual.
3. For your third Punnett square, you are going to show a cross between two heterozygous flowers. The trait you are mapping is flower color: blue or red. Blue is considered dominant, but this is a case of "incomplete dominance".
4. For your last two by two grid, you are going to map blood type which is co-dominant for types A and B, but type O is recessive to both. It is customary to show this by using the following allele designations: type A = I^A , type B = I^B , type O = I. Show the cross between a person who's heterozygous for type A and O with a person who is type AB.
5. For a dihybrid cross (2 traits), you will draw a 4x4 grid similar to the example shown above. For this cross, we will look at two traits in pea plants: color - whether the peas are green (dominant) or yellow (recessive) and texture - whether they are wrinkled (recessive) or smooth (dominant). For this Punnett square, you will cross two individuals who are heterozygous for both traits.

FOLLOW UP QUESTIONS

Answer the following questions in your notebook using complete sentences.

1. What is an "allele"?
2. What does "incomplete dominance" mean? How is this different than "co-dominance"?
3. In the example in number three above, what are the genotypes and phenotypes of the parent flowers?
4. Could a parent with type A blood and a parent with type B blood have a child with type O blood? If not, why not. If so, what would the genotypes have to be for the parents?
5. If red flowers show simple dominance over white flowers, what are the possible genotypes that one of the parents ***must*** be regardless of what the other parent is to be able to have some of the offspring be red.
6. Blue eyes are recessive to brown. If a child has blue eyes, what are the two possible genotypes of the parents?
7. What is the difference between genotype and phenotype?