DIHYBRID PUNNETT SQUARE PRACTICE

Directions:

In rabbits, gray hair (G) is dominant to white hair (g), and black eyes (B) are dominant to red eyes (b). These two traits are independent of each other. In other words, a female rabbit with the genotype GgBb may produce eggs with the alleles GB, Gb, gB, or gb. To predict the probability of these sorts of crosses, we will make a dihybrid Punnett Square.

Activity:

1. What are the phenotypes (descriptions) of rabbits that have the following genotypes:

Ggbb _____ ggBB _____

ggbb _____ GgBb _____

2. A male rabbit with the genotype **GGbb** is crossed with a female rabbit with the genotype **ggBb** The square is set up below. Fill it out and determine the phenotypes and proportions in the offspring.

	Gb	***Gb***	***Gb***	***Gb***
gB				
gB				
gb				
gb				

How many out of 16 are:

Grey, red-eyed _____

Grey, black-eyed _____

White, red-eyed _____

White, black-eyed _____

3. A male rabbit has the genotype GgBb. Determine the gametes produced by this rabbit.
Hint: There are 4 possible combinations.

4. A female rabbit has the genotype ggBb. Determine the gametes (eggs) produced by this rabbit.

5. Use the gametes from #3 and #4 to set up a Punnett Square below. Put the male's gametes on the top and the female's gametes down the side. Then fill out the square and determine what kind of offspring would be produced from this cross and in what proportion.

6. An aquatic arthropod called a Cyclops has antennae that are either smooth or barbed. The allele for barbs is dominant. In the same organism, resistance to pesticides is a recessive trait. Make a "key" to show all the possible genotypes (and phenotypes) of this organism.

7. A Cyclops that is resistant to pesticides and has smooth antennae is crossed with one that is heterozygous for both traits. Show the genotypes of the parents.

_____ x _____

8. Set up a Punnett Square for the cross.

How many are smooth, resistant?
_____

How many are smooth, not resistant?
_____

How many are barbed, resistant?
_____

How many are barbed, not resistant?
_____

9. A Cyclops that is homozygous dominant for the barbed gene and is resistant to pesticides is crossed with one that is resistant to pesticides but not barbed. What proportion of the offspring will be barbed and resistant? _____

10. If two Cyclops that are heterozygous for both traits are crossed, what are the resulting phenotypes and in what proportion?

DIHYBRID PUNNETT SQUARE SOLUTIONS

1. What are the phenotypes (descriptions) of rabbits that have the following genotypes:

Ggbb ***Gray fur, red eyes*** ggBB ***White fur, black eyes***

ggbb ***White fur, red eyes*** GgBb ***Gray fur, black eyes***

2. A male rabbit with the genotype **GGbb** is crossed with a female rabbit with the genotype **ggBb** The square is set up below. Fill it out and determine the phenotypes and proportions in the offspring.

	Gb	***Gb***	***Gb***	***Gb***
gB	GgBb	GgBb	GgBb	GgBb
gB	GgBb	GgBb	GgBb	GgBb
gb	Ggbb	Ggbb	Ggbb	Ggbb
gb	Ggbb	Ggbb	Ggbb	Ggbb

How many out of 16 are:

Grey, red-eyed ***8***

Grey, black-eyed ***8***

White, red-eyed ***0***

White, black-eyed ***0***

3. A male rabbit has the genotype GgBb. Determine the gametes produced by this rabbit.
Hint: There are 4 possible combinations.

GB, Gb, gB, and gb.

4. A female rabbit has the genotype ggBb. Determine the gametes (eggs) produced by this rabbit.

gB, gB, gb, and gb

5. Use the gametes from #3 and #4 to set up a Punnett Square below. Put the male's gametes on the top and the female's gametes down the side. Then fill out the square and determine what kind of offspring would be produced from this cross and in what proportion.

	GB	***Gb***	***gB***	***gb***
gB	GgBB	GgBb	ggBB	ggBb
gB	GgBB	GgBb	ggBB	ggBb
gb	GgBb	Ggbb	ggBb	ggbb
gb	GgBb	Ggbb	ggBb	ggbb

Grey, red-eyed ***2 (12.5%)***

Grey, black-eyed ***6 (37.5%)***

White, red-eyed ***2 (12.5%)***

White, black-eyed ***6 (37.5%)***

6. An aquatic arthropod called a Cyclops has antennae that are either smooth or barbed. The allele for barbs is dominant. In the same organism, resistance to pesticides is a recessive trait. Make a "key" to show all the possible genotypes (and phenotypes) of this organism.

BBPP = barbed, not resistant
BBPp = barbed, not resistant
BBpp = barbed, resistant
bbPP = smooth, not resistant
bbpp = smooth, resistant
BbPP = barbed, not resistant
BbPp = barbed, not resistant
Bbpp = barbed, resistant
bbPp = smooth, not resistant

7. A Cyclops that is resistant to pesticides and has smooth antennae is crossed with one that is heterozygous for both traits. Show the genotypes of the parents.

bbpp x ***BbPp***

8. Set up a Punnett Square for the cross.

	bp	***bp***	***bp***	***bp***
BP	BbPp	BbPp	BbPp	BbPp
Bp	Bbpp	Bbpp	Bbpp	Bbpp
bP	bbPp	bbPp	bbPp	bbPp
bp	bbpp	bbpp	bbpp	bbpp

How many are smooth, resistant? ***4 (25%)***

How many are smooth, not resistant? ***4 (25%)***

How many are barbed, resistant? ***4 (25%)***

How many are barbed, not resistant? ***4 (25%)***

9. A Cyclops that is homozygous dominant for the barbed gene and is resistant to pesticides is crossed with one that is resistant to pesticides but not barbed. What proportion of the offspring will be barbed and resistant?

	Bp	***Bp***	***Bp***	***Bp***
bp	Bbpp	Bbpp	Bbpp	Bbpp
bp	Bbpp	Bbpp	Bbpp	Bbpp
bp	Bbpp	Bbpp	Bbpp	Bbpp
bp	Bbpp	Bbpp	Bbpp	Bbpp

All (100%) of the offspring will be barbed and resistant to pesticides.

10. If two Cyclops that are heterozygous for both traits are crossed, what are the resulting phenotypes and in what proportion?

	BP	***Bp***	***bP***	***bp***
BP	BBPP	BBPp	BbPP	BbPp
Bp	BBPp	BBpp	BbPp	Bbpp
bP	BbPP	BbPp	bbPP	bbPp
bp	BbPp	Bbpp	bbPp	bbpp

Smooth and resistant: ***1 (6.25%)***

Smooth and not resistant: ***3 (18.75%)***

Barbed and resistant: ***3 (18.75%)***

Barbed and not resistant: ***9 (56.25%)***