

Mendelian Genetics

**Solving Genetics Problems:
Crosses with 2 Traits
*(Dihybrid Crosses)***

Dihybrid crosses:

genetics problems involving 2 traits.

→ We'll add one step before we fill out the Punnett square.

Steps for solving genetics problems involving dihybrid crosses:

1. Assign letters for the alleles.
2. Write the cross.
3. Identify the combinations of alleles in the gametes.
4. Set up Punnett square to find the possible offspring of the cross.
5. Answer the question in the problem.

Practice Dihybrid Problem #1

In guinea pigs, black fur (B) is dominant to brown fur (b). Short hair (S) is dominant to long hair (s). What is the ratio of phenotypes of the offspring from a cross between two heterozygous black, short-haired guinea pigs (BbSs)?

1. Assign letters for the alleles.
 - B = black fur, b = brown fur
 - S = short hair, s = long hair
2. Write the cross.
 - Phenotypes: Black, short hair x Black, short hair
 - Genotypes: BbSs x BbSs

3. Identify the combinations of alleles in the gametes.



	BS	Bs	bS	bs
BS				
Bs				
bS				
bs				

4. Set up Punnett square to find the possible offspring of the cross

	BS	Bs	bS	bs
BS	BBSS Black, short	BBSSs Black, short	BbSS Black, short	BbSs Black, short
Bs	BBSSs Black, short	BBss Black, long	BbSs Black, short	Bbss Black, long
bS	BbSS Black, short	BbSs Black, short	bbSS Brown, short	bbSs Brown, short
bs	BbSs Black, short	Bbss Black, long	bbSs Brown, short	bbss Brown, long

5. Answer the question in the problem.

What is the ratio of phenotypes of the offspring?

Genotypes → BBSS, BBSs, BBss, BbSS, BbSs, Bbss, bbSS, bbSs, bbss

Phenotypes → Black, short:Black, long:brown, short: brown, long

The ratio of phenotypes is:

9 : 3 : 3 : 1

	BS	Bs	bS	bs
BS	BBSS Black, short	BBSs Black, short	BbSS Black, short	BbSs Black, short
Bs	BBSs Black, short	BBss Black, long	BbSs Black, short	Bbss Black, long
bS	BbSS Black, short	BbSs Black, short	bbSS Brown, short	bbSs Brown, short
bs	BbSs Black, short	Bbss Black, long	bbSs Brown, short	bbss Brown, long

Practice Dihybrid Problem #2

In guinea pigs, black fur (B) is dominant to brown fur (b). Short hair (S) is dominant to long hair (s). What is the ratio of phenotypes of the offspring from a cross between a heterozygous black, short-haired guinea pig and a brown, long-haired guinea pig?

1. Assign letters for the alleles.

- B = black fur, b = brown fur
- S = short hair, s = long hair

2. Write the cross.

- Phenotypes: Black, short hair x brown, long hair
- Genotypes: BbSs x bbss

3. Identify the combinations of alleles in the gametes.



	BS	Bs	bS	bs
bs				
bs				
bs				
bs				

4. Set up Punnett square to find the possible offspring of the cross

	BS	Bs	bS	bs
bs	BbSs Black, short	Bbss Black, long	bbSs Brown, short	bbss Brown, long
bs	BbSs Black, short	Bbss Black, long	bbSs Brown, short	bbss Brown, long
bs	BbSs Black, short	Bbss Black, long	bbSs Brown, short	bbss Brown, long
bs	BbSs Black, short	Bbss Black, long	bbSs Brown, short	bbss Brown, long

5. Answer the question in the problem.

What is the ratio of phenotypes of the offspring?

Genotypes → BbSs, Bbss, bbSs, bbss

Phenotypes → Black, short:Black, long:brown, short: brown, long

The ratio of phenotypes is:

4 : 4 : 4 : 4

bs	BbSs Black, short	Bbss Black, long	bbSs Brown, short	bbss Brown, long
bs	BbSs Black, short	Bbss Black, long	bbSs Brown, short	bbss Brown, long
bs	BbSs Black, short	Bbss Black, long	bbSs Brown, short	bbss Brown, long
bs	BbSs Black, short	Bbss Black, long	bbSs Brown, short	bbss Brown, long