**Name\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period\_\_\_\_\_\_\_ Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Punnet Square Practice**

***Directions:*** Use the Punnet Square to calculate the likelihood of inheriting the characteristics specified below.

1. *In Angus cattle, black hair (B) is dominant over red hair (b).*



1. **BB male X BB female**

What **genotype**(s) are possible with the mating? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Offspring will have a \_\_\_\_\_\_% chance of being red, and a \_\_\_\_\_\_% chance of being black.



**B. Bb male X bb female**

What **genotype**(s) are possible with the mating? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Offspring will have a \_\_\_\_\_\_% chance of being red, and a \_\_\_\_\_\_% chance of being black.



**C. bb male X bb female**

What **phenotype(s)** are possible with this mating? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Offspring will have a \_\_\_\_\_\_% chance of being BB, a \_\_\_\_\_\_% chance of being Bb,

and a \_\_\_\_\_\_% chance of being bb.

2. *Hereford cattle can be naturally “polled,” which means they do not have horns. This trait is dominant (P) over cattle with horns (p).*



* 1. **Cross a homozygous polled cow (P) to a homozygous horned bull (p).**

What **genotype(s)** are possible with this mating?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Offspring will have a \_\_\_\_\_\_% chance of being polled, and a \_\_\_\_\_\_% chance of having horns.

1. **Cross a heterozygous polled cow (Pp) to a homozygous horned bull (pp).**



What **genotype(s)** are possible with this mating?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Offspring will have a \_\_\_\_\_\_% chance of being polled, and a \_\_\_\_\_\_% chance of having horns.

1. **Suppose your entire herd of cows is polled, what genotype(s) can your bulls have to guarantee that you never have a calf with horns? Is this possible?**
2. *Phenotypic traits are not always inherited with 1 simple pair of dominant or recessive genes like those used in problems 1 and 2 of this worksheet. Coat colors and patterns for an animal like an Australian Shepherd are inherited on multiple loci (pairs of alleles), but still use the same principles.*



1. **Base coat color:** Black (B) is dominant over red (b). If you cross a heterozygous black female with a red male, the puppies will each have a \_\_\_\_\_\_% chance of having a black base coat, and a \_\_\_\_\_\_% chance of having a red base coat.
   1. If you want red puppies from your heterozygous (Bb) black female, what genotype(s) must the male be to have a chance of producing red puppies?
   2. If you cross 2 phenotypically black Australian Shepherds and get red puppies, what is the genotype of BOTH parents?



1. **Ticking:** Another trait in Australian Shepherds is “ticking,” the presence of copper or black spots in the white areas of the dog. They are most noticeable on the muzzle and feet. The presence of ticks is dominant (T) and the absence of ticks is recessive (t). If you cross 2 dogs WITHOUT ticks, the puppies will have a \_\_\_\_\_\_% chance of having ticks.
2. **Coat Pattern:** Australian Shepherds can have either a solid coat pattern or a “merle” coat pattern. Merle is dominant (M) over solid (m).



* 1. If you cross a heterozygous merle (Mm) with a homozygous solid (mm), the puppies have a \_\_\_\_\_\_% chance of being merle, and a \_\_\_\_\_\_% chance of being solid.



* 1. If you cross 2 solid Australian Shepherds, the puppies have a \_\_\_\_\_\_% chance of being merle, and a \_\_\_\_\_\_% chance of being solid.

*\*\* Fact: Australian Shepard’s with a merle coat pattern are more valuable than solid colors. Though merle is a dominant trait, 2 merles should not be bred because a homozygous dominant (MM) merle puppy will be blind and deaf. Breeding 2 heterozygous merles (Mm) leaves a 25% chance of this “lethal white” genotype. Merles should only be bred to solid colored dogs, which is why the merle coat pattern is often more valuable than the solid coat. (Note=”Solid” is the same as “tri” coloring. They are mostly black with white and brown markings)*