Name:_____Date:_____

Genetics Practice Problems

1. For each of the **genotypes** (letters) listed, write a **phenotype** (description).

In pea plants, purple flowers are dominant to white.

PP = purple Pp = _____ pp = _____

In guinea pigs, short hair is dominant to long hair.

HH = _____ Hh = _____ hh = _____

2. In guinea pigs, black eyes are dominant to red eyes. Choose a letter combination for each phenotype.

_____ = black eyes _____ = black eyes _____ = red eyes

Level 1 (Easy Mode): Complete the Punnett squares for each of the crosses for guinea pigs and eye color.
Write answers as fractions.

3. **Bb x bb**

	B	**b**
b		
b		

How many guinea pigs will have black eyes _____ **red eyes** _____

4. **bb x BB**

	B	**B**
b		
b		

How many guinea pigs will have black eyes _____ **red eyes** _____

5. **Bb x Bb**

	B	**b**
B		
b		

How many guinea pigs will have black eyes _____ **red eyes** _____

Level 2 (Normal Mode): Setup and complete punnett squares for each of the crosses.

Reminder: In guinea pigs, black eyes (BB, Bb) are dominant to red eyes (bb)
Short hair (HH, Hh) is dominant to long hair (hh)

6. A guinea pig with long hair (hh) is crossed with one that has short hair (H H).
   Set up the Punnett square below.

   What percentage of the offspring will have have short hair? _____

7. A guinea pig with long hair (hh) is crossed with one that has short hair (H h).
   Set up the Punnett square below.

   What percentage of the offspring will have have short hair? _____

7. A guinea pig with black eyes (B b) is crossed with one that also has black eyes (B b).
   Set up the Punnett square below.

   What percentage of the offspring will have have black eyes? _____ red eyes? _____

Name:_____ Date_____

Level 3 - Hard Mode

Heterozygous means that the individual has two different letters, for example Aa, Bb, Dd.
Homozygous means that the individual has two same letters, for example AA, bb, DD, eee

Cats can have a trait where their ear folds down, a breed called the "Scottish Fold," displays this phenotype in most breedings The gene for folded ears is dominant (E) and the gene for straight ears (e) is recessive.

1. Write the three **genotypes** that are possible (choose your letters) and describe their **phenotypes**. Remember, genotypes have two letters and the phenotype describes what the cat looks like (folded or straight).

2. Show the cross of two heterozygous cats. What percentage of their offspring will have folded ears?

3. A heterozygous cat is crossed with a cat that has straight ears. What percentage of their offspring will have folded ears?

4. If both parents have straight ears, What percentage of the kittens will have straight ears also?

Additional notes on Scottish Fold Cats:

Scottish Fold osteochondrodysplasia is an inherited bone and cartilage disorder specific for this cat breed. It belongs in a wider group of disorders, generally known as osteochondrodysplasia, but the form occurring in the Scottish Fold breed is specific by its causative mutation. Osteochondrodysplasia is a disorder (”dysplasia”) of bones (”osteo”) and cartilage (”chondro”). It can be characterized into group of musculoskeletal disorders, a broad category of diseases that affects the muscles or bones. Cats can have other issues associated with this disorder, like stiffness in joints, deformed legs and toes, thickened and inflexible tails and accelerated progressive osteoarthritis. Cats with two copies of the gene are likely to have more severe symptoms.

*** This is an opportunity to discuss selective breeding in cats and dogs and whether it is ethical to breed animals with known genetic disorders that are painful for the animal.

Source: https://icatcare.org/advice/cat-health/scottish-fold-disease-%E2%80%93-osteochondrodysplasia

Students may also wonder if normal cats (ee) can only have normal offspring, then where did the first Scottish fold come from. This is a good time to remind them that DNA can spontaneously mutate and likely it was just a random mutation.