Cross Application Problems
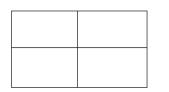
Name: _____ **Period:** _____

Part I Monohybrid Crosses:

1. Set up the square for each of the crosses listed below. The trait being studied is **round seeds (dominant)** and **wrinkled seeds (recessive)**
    a. **Rr x rr**

    i. What is the phenotypic ratio of the offspring? _____

    ii. What is the genotypic ratio of the offspring? _____

    b. **Rr x Rr**

    i. What is the phenotypic ratio of the offspring? _____

    ii. What is the genotypic ratio of the offspring? _____

    a. **RR x Rr**

    i. What is the phenotypic ratio of the offspring? _____

    ii. What is the genotypic ratio of the offspring? _____

Part II Monohybrid Cross Application: Show all of your work with PUNNETT SQUARES.

1. In guinea pigs, the allele for short hair (H) is dominant to long hair (h).

    a. What genotype would a heterozygous short haired guinea pig have? _____

    b. What genotype would a pure-breeding short haired guinea pig have? _____

    c. What genotype would a long haired guinea pig have? _____

    d. Show the cross for a pure breeding short haired guinea pig and a long haired guinea pig.
    What percentage of the offspring will have short hair? _____

    e. Show the cross for two heterozygous guinea pigs.
    What percentage of the offspring will have short hair? _____

    What percentage of the offspring will have long hair? _____

    f. Two short haired guinea pigs are mated several times. Out of 100
    offspring, 25 of them have long hair.

    What are the probable genotypes of the parents? _____ x _____

2. In plants round seeds (R) are dominant to wrinkled seeds (r).

   a. A heterozygous plant is crossed with a homozygous dominant plant.
   What percentage of the offspring will be homozygous dominant? _____

   b. A homozygous round-seeded plant is crossed with a homozygous wrinkled-seeded plant.
   What are the genotypes of the parents? _____ x _____

   What percentage of the offspring will also be homozygous? _____

3. In dogs, there is a hereditary deafness caused by a recessive gene, "d." A kennel owner has a male dog (Gilbert) that she wants to use for breeding purposes if possible. The dog can hear.

   a. What are the two possible genotypes of Gilbert? _____ & _____

   b. If the dog's genotype is Dd, the owner does not wish to use him for breeding so that the deafness gene will not be passed on. Gilbert's genotype can be tested by breeding him to a deaf female (dd). Draw **two** Punnett squares to illustrate these two possible crosses.

   c. In each case, what percentage of the offspring would be expected to be hearing? Deaf?

   d. How could you tell the genotype of this male dog?

   e. The breeder decided to cross Gilbert with a deaf female to see if he had the deaf gene. There were three puppies in the litter, two could hear but one could not. What is Gilbert's genotype? How do you know?

   f. If Gilbert mated with a heterozygous female what would the probability that the resulting litter of 5 puppies are all hearing dogs? (**HINT:** Litters are composed of individuals that are born AT THE SAME TIME)

Part III Dihybrid Cross Introduction:

   1. What do the letters at the top and to the sides of a Punnett Square represent? _____
   2. How many **copies** of each gene (alleles) are in a gamete? _____
   3. How many traits (genes) are studied in a dihybrid cross? _____
   4. Based on the previous answers; how many letters should each **gamete** have in a dihybrid cross? _____

Part IV Dihybrid Crosses:

1. A tall (T) phenotype is dominant to short (t) phenotype in plants. Purple flowers (P) are also dominant to white flowers (p).
   a. Cross a plant that is homozygous dominate for BOTH traits, with a plant that is homozygous recessive for BOTH traits.

   i. What is the probability of producing tall plants with purple flowers? Possible genotype(s)?

   ii. What is the probability of producing dwarf plants with white flowers? Possible genotype(s)?

   iii. What is the probability of producing tall plants with white flowers? Possible genotype(s)?

   iv. What is the probability of producing dwarf plants with purple flowers? Possible genotype(s)?

2. In corn purple kernels (K) are dominant to yellow kernels (k). Starchy kernels (S) are dominant to sweet kernels (s)
   a. Cross a corn plant that is homozygous dominant for BOTH traits, with a corn plant that is homozygous recessive for BOTH traits.

   i. What is the probability of producing purple, starchy corn kernels? Possible genotype(s)?

   ii. What is the probability of producing yellow, starchy corn kernels? Possible genotype(s)?

   iii. What is the probability of producing purple, sweet corn kernels? Possible genotype(s)?

   iv. What is the probability of producing yellow, sweet corn kernels? Possible genotype(s)?

3. In guinea pigs black fur (B) is dominant to tan fur (b). Rough fur (R) is dominant to smooth fur (r).
   a. Cross two guinea pigs that are heterozygous for BOTH traits.

      i. What is the probability of producing guinea pigs with black, rough fur? Possible genotype(s)?

      ii. What is the probability of producing guinea pigs with black, smooth fur? Possible genotype(s)?

      iii. What is the probability of producing guinea pigs with tan, rough fur? Possible genotype(s)?

      iv. What is the probability of producing guinea pigs with tan, smooth fur? Possible genotype(s)?

4. In wolves grey fur (G) is dominant to black fur (g). Brown eyes (B) are dominant to blue eyes (b).
   a. Cross two wolves that are heterozygous for BOTH traits.

      i. What is the probability of producing a wolf with grey fur and brown eyes? Possible genotype(s)?

      ii. What is the probability of producing a wolf with grey fur and blue eyes? Possible genotype(s)?

      iii. What is the probability of producing a wolf with black fur and brown eyes? Possible genotype(s)?

      iv. What is the probability of producing a wolf with black fur and blue eyes? Possible genotype(s)?