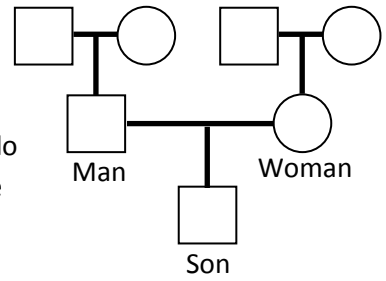
AP Biology
Genetics Practice Problems

Directions: Complete the following problems on a separate sheet of paper.

1. In squash, a single gene locus determines the color of the fruit. The allele for yellow color (Q) is dominant over the allele for white color (q). What are the genotypic and phenotypic ratios for the results of each of the following crosses?
    a. QQ x qq
    b. Qq x qq
    c. Qq x Qq
2. A brown-eyed man whose father was brown-eyed and whose mother was blue-eyed, married a blue-eyed woman whose father and mother were both brown-eyed. The couple has a blue-eyed son. If brown eyes are dominant over blue eyes, for which of the individuals do you know the genotypes for sure? What are they? What genotypes are possible for the others? Use the pedigree chart to help you.



3. If a brown-eyed man and a blue-eyed woman have ten brown-eyed children, can you be certain the man is homozygous? What if they have an 11th child, also brown-eyed?
4. The litter resulting from the mating of two short-tailed cats contains three kittens without tails, two kittens with long tails, and six kittens with short tails. What is the simplest explanation for these results? Show the genotypes.
5. In peas, the allele for tall (T) is dominant over the allele for short (t). At another locus on another chromosome, the allele for smooth peas (S) is dominant over the allele for wrinkled (s).
    a. Calculate the genotypic and phenotypic ratios for this cross: Ttss x ttss.
    b. For the following cross TtSs x TtSs, what is the probability of:
        i. A homozygous dominant (TTSS) offspring?
        ii. A homozygous recessive (ttss) offspring?
        iii. A heterozygous (TtSs) offspring?
        iv. An offspring that is TTSs?
        v. An offspring that is TtSS?
6. In human beings, brown eyes are dominant over blue eyes. If a blue-eyed man marries a brown-eyed woman whose father was blue-eyed, what proportion of their children would you predict will have blue eyes?
7. The shape of the root in radishes may be long, oval, or round. In a series of experiments, crosses between long and oval produced 159 long and 156 oval. Crosses between round and oval produced 199 round and 203 oval. Crosses between long and round produced 576 oval. Crosses between oval and oval produced 121 long, 243 oval, and 119 round. How is root shape inherited in radishes? Draw a Punnett square to illustrate the last cross.

8. In garden peas, the allele for tall plants (T) is dominant over the allele for short plants (t). On another chromosome, there is a locus for the amount of moisture in the dormant pea, and smooth (S) is dominant over wrinkled (s).
    a. Calculate the genotypic and phenotypic ratios for these crosses:
        i. ttSs x Ttss
        ii. TTss x ttSS
    b. Calculate the phenotypic ratio for this cross: TtSs x TtSs.
9. In watermelons the allele for green color (G) is dominant over the allele for striped green and white color (g), and the allele for short shape (S) is dominant to the allele for long shape (s). If a plant with long, striped fruit is crossed with a plant heterozygous for both these traits, what phenotypes would be produced? What are the ratios for these phenotypes?
10. If a man with blood Type B, whose father had blood Type O, marries a woman with blood Type AB, what is the probability that their children will have blood Type B?
11. Mrs. Smith and Mrs. Jones had babies the same day. Mrs. Smith left the hospital with a baby she called Shirley, while Mrs. Jones took home a baby she named Jane. Mrs. Jones suspected that a switch had been made so blood tests were conducted: Mr. Smith was Type A; Mrs. Smith, Type B; Mr. Jones, Type A; Mrs. Jones, Type A; Shirley, Type O; and Jane, Type B. Had a mix-up occurred? Draw Punnett squares or a pedigree chart to support your answer.
12. The pedigree below shows 6 generations of a family that has been affected by syndactyly (fused fingers). The affected individuals are shaded. Study the pedigree carefully. Is syndactyly an autosomal dominant, autosomal recessive or sex-linked disorder? Explain your answer.