A **pedigree** is a diagram that shows the occurrence of a gene from one generation to the next.

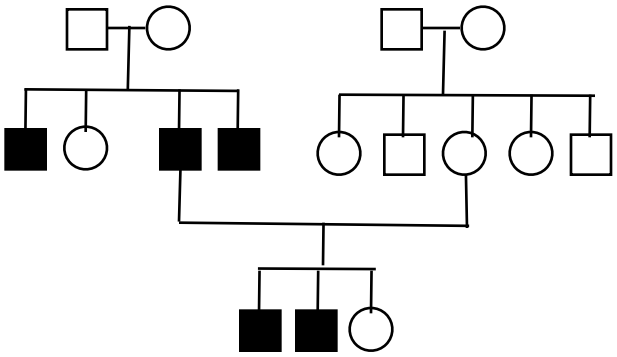
Males are represented by squares (☐) and females are represented by circles (◯). Circles and squares are connected by horizontal lines to denote mating, and vertical lines connect them to offspring. Roman numerals (I, II, III, IV, etc.) represent generations and Arabic numbers (1, 2, 3, etc.) represent birth order within generations. Circles and squares can be colored in to denote the appearance of a trait (**phenotype**), or left unfilled when the trait does not appear. A half filled circle or square indicates that the individual carries one **allele** of the gene, but the trait does not show up. An "X" through the circle or square indicates that the individual is deceased.

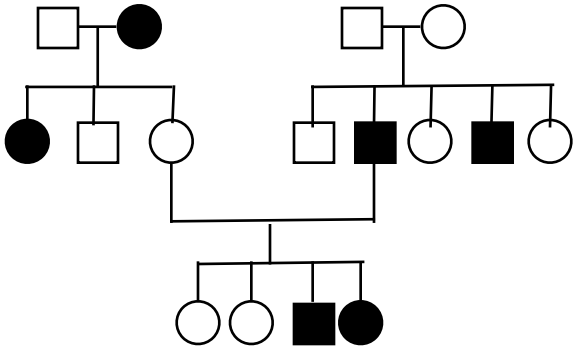
PART 1 - SEX-LINKED OR AUTOSOMAL TRAITS

Determine whether the trait is sex-linked or autosomal, based on affected individuals.

- If most males are affected, then the disorder is linked to the X chromosome.
- If the ratio is 50-50 between males and females, then the disorder is autosomal.

1) Determine whether these pedigrees illustrate a trait that is X-linked or autosomal.



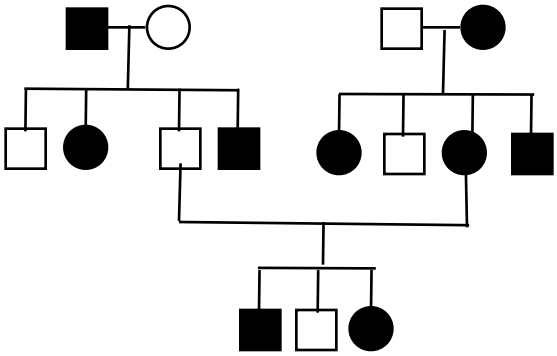


A) _____ **B)** _____

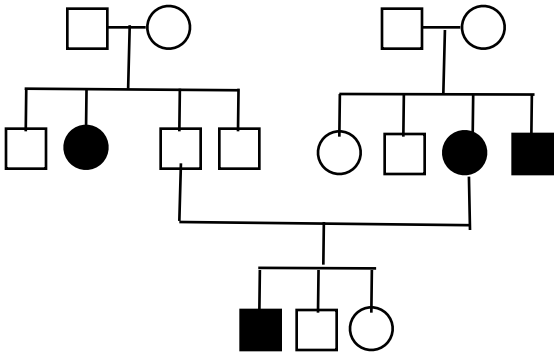
If the trait is autosomal, determine whether it is dominant or recessive.

• If two parents do not show the trait and their children do, then it is recessive.
• If at least one parent does show the trait, then it may be dominant.

2) Determine whether these pedigrees illustrate a trait that is dominant or recessive.



C) _____



D) _____

Estimate the genotypes of the individuals in your pedigree.

3) Go back and write down what you think the genotypes might be for each individual in the above pedigrees. Use "A" for dominant alleles and "a" for recessive alleles. Use whatever space is available near each individual.

PART 2 - CONSTRUCT A PEDIGREE

For this exercise, you will construct a pedigree beginning with individual **founder** California condors (*Gymnogyps californianus*), with an unknown genotype. The trait in question is that of a genetic disease called **chondrodystrophy**. This is a form of dwarfism that is lethal to condors, and is inherited as an **autosomal recessive allele**.

"D" will denote the allele for dwarism, where a capital "D" is dominant, and a lower case "d" is recessive. A **carrier** for this allele is an individual that contains at least one recessive "d". However, the disease will not affect the individual unless the genotype contains two recessive "d's."

Map out pedigree, including parents and offspring.

Begin with two sets of parents (each a male and a female) - mating pair A and mating pair B. Their genotypes are unknown at this point. Start your pedigree in the empty space below.

Pair A has 3 offspring (2 males, 1 female), and the female dies of chondrodystrophy. Pair B has 6 offspring (1 male, 5 females), all of them survive. Map this second generation onto your pedigree below. (Note that since chondrodystrophy is not sex-linked, the sexes do not matter in terms of genotypes).

Now map a third generation of offspring onto your pedigree from a mating between a male from the offspring of pair A and a female from the offspring of pair B. This mating pair has 7 offspring (3 females, 4 males), and 2 individuals die of chondrodystrophy.

4) Is it possible that any of the parents from generation I had a homozygous recessive genotype? Why or why not?

5) What must the genotype be of the deceased female from generation II? What about the genotypes of the deceased individuals from generation III?

6) Determine what the genotypes of the parents from generation I must have been, and then the genotypes of the parents from generation II.