Pedigrees

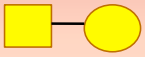
Pedigrees

- **Pedigrees** = a valuable tool for anyone working in the field of genetics.
- Used to show **relationships** in families, and resemble a **family tree**.

- Circles represent **females**, and squares represent **males**.

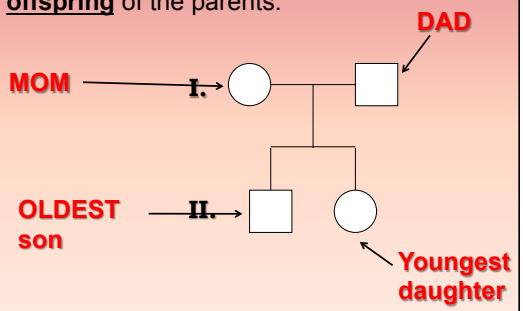
- **Generations** are represented by roman numerals on the **LEFT** side of the pedigree.
- **Death** is represented by a **slash** through the symbol

- Lines that connect circles and squares horizontally represent that **reproduction** has occurred.

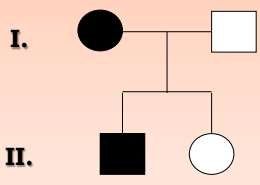


- The further to the **left** an individual is the **older** they are.

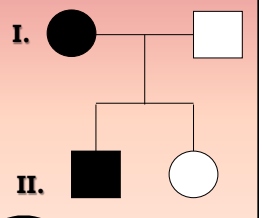
- Any vertical lines that drop down from the center of the above horizontal line show the **offspring** of the parents.



- We can then mark offspring that **exhibit** or **DO NOT** exhibit certain characteristics, such as eye color.
- Ex: The following pedigree shows family members with **blue eye** color.



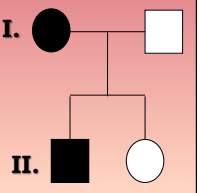
- **Brown eyes** (B) are dominant over **blue eyes.** We can deduct the genotypes of some family members. Try to predict what the genotypes of the above family are for eye color.



A. What is the genotype of the mother? bb

B. What is the genotype of the son? bb

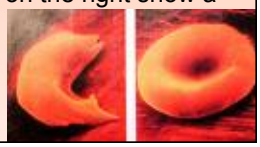
C. Can you deduce from the above information what the genotype of the father is? Yes….Bb



- How do you know?

He must be heterozygous b/c he has a son with blue eyes (recessive trait).

- Now let's discuss the story of sickle-cell anemia. In Africa, there is a high incidence of malaria. Malaria is caused by a parasite that is transmitted by mosquitoes. The parasite feeds on the hemoglobin protein in red blood cells. *If there is mutated strain of hemoglobin in the red blood cells, the parasite starves to death and dies.* The picture on the left shows a sickle red blood cell and the picture on the right show a normal red blood cell.



- *Persons who are homozygous for normal red blood cells easily die from malaria.* Persons who are homozygous for mutated red blood cells usually do not die from malaria, but could die from complications resulting from their odd shaped red blood cells (sickle-cell anemia). Individuals heterozygous also usually do not die from malaria and are spared from the awful complications of sickle-cell anemia.

- Using the following information, design a pedigree chart and designate which of the family members is homozygous for normal hemoglobin (HH), heterozygous (Hh), and homozygous recessive (hh).

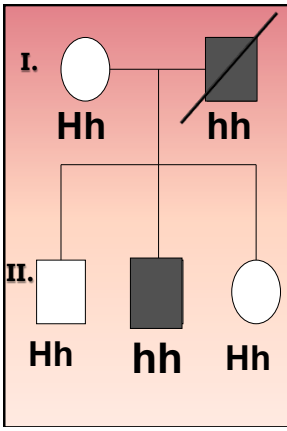
~Mom-survived malaria

~Dad- died from complications from sickle-cell anemia at age 42.

~Son #1- survived malaria

~Son#2- Survived malaria, has sickle-cell anemia

~Daughter #1- survived malaria

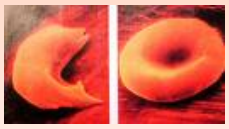


Make a Key:

hh = Sickle; survives malaria & dies of sickle cell

Hh = Normal; survives malaria

HH = Normal; dies of malaria



- If the daughter marries a man who has normal hemoglobin (HH) in his red blood cells, what is the probability that their children will have sickle-cell anemia? **0** out of **4**.

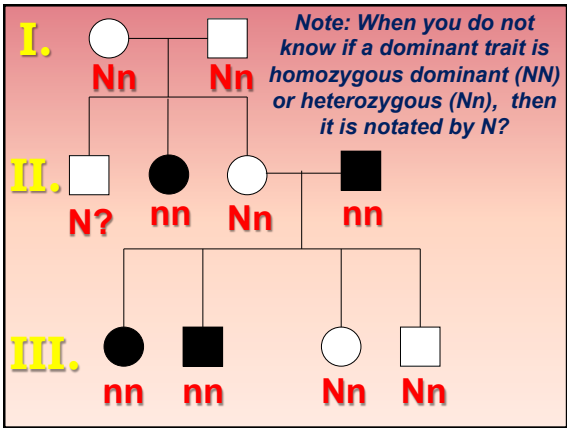
	H	H
H	HH	HH
h	Hh	Hh

- Would their family be wise to take drugs that prevent a person from dying if infected with the malaria parasite? Why?

Yes, b/c their children have a 50% chance of being HH and could die from malaria.

- Nearsightedness is a recessive trait (n). The shaded regions show individuals who are *recessive* for nearsightedness.

Note: Generations need to be labeled on the left hand side of pedigrees!



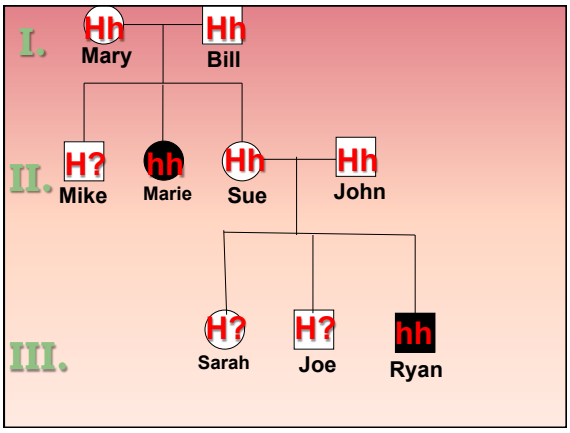
Note: When you do not know if a dominant trait is homozygous dominant (NN) or heterozygous (Nn), then it is notated by N?

Now you construct a pedigree!

- *Left-handedness (h) is a recessive trait.*
- *Bill and Mary have a son, Mike, and daughter, Sue (youngest) that are right-handed. They also have a middle daughter, Marie that is a lefty. Sue gets married to John (righty) and has three children. Their oldest daughter, Sarah and their middle son, Joe are right handed. Yet, their youngest son, Ryan is a lefty.*

Now you construct a pedigree!

1. Label the generations and label each individual in the pedigree by placing their name below the shape.
2. Determine the genotypes of as many individuals as possible.


I.
Hh
Mary
Hh
Bill
II.
H?
Mike
hh
Marie
Hh
Sue
Hh
John
III.
H?
Sarah
H?
Joe
hh
Ryan