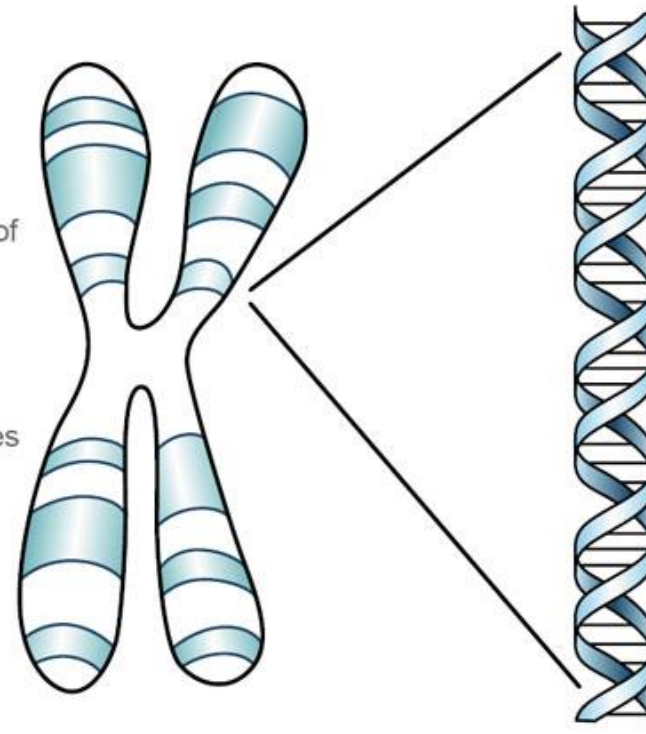


Unit 7

Genetics

We all have 23 pairs of chromosomes. One pair of chromosomes determines our sex. The other 22 pairs of chromosomes are non-sex chromosomes and determine things like hair color and our eye color.

Chromosome

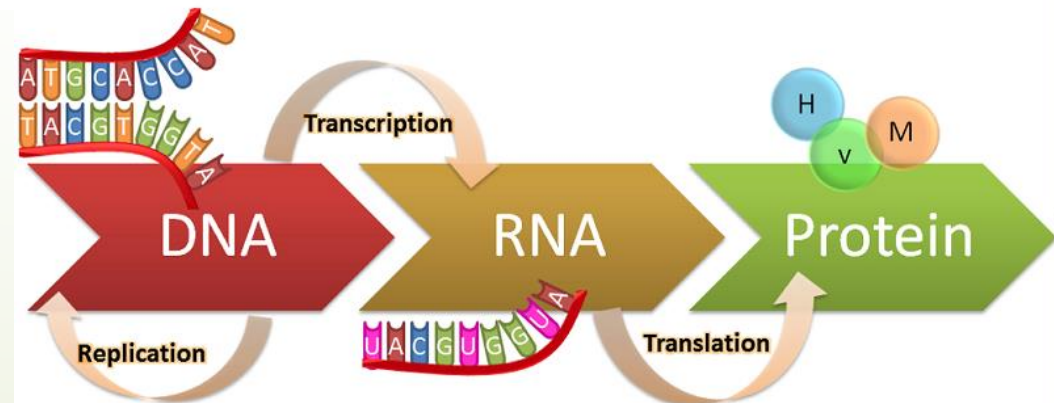


Gene

Each chromosome is made up of many genes. Genes are made of a section of a long molecule called DNA. Genes carry the genetic information.

DNA

DNA codes the genetic information on a gene.



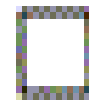
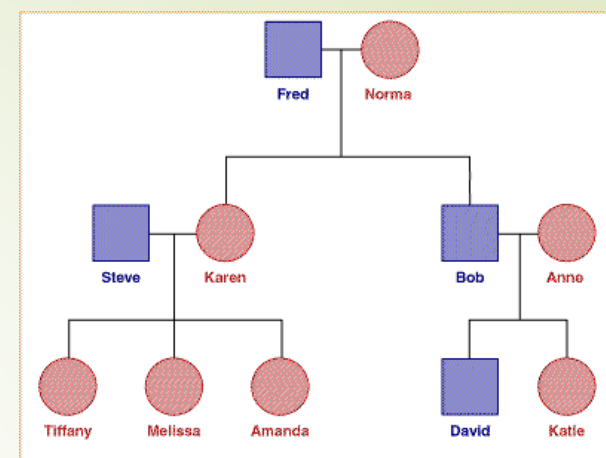


Topic 3: Pedigrees

- By the end of this topic, I should be able to:
 - Analyze pedigrees
 - Create a pedigree

Pedigree

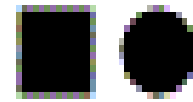
- A diagram representing a family tree that shows how a trait is passed from generation to generation
- The alleles that each person in the family has



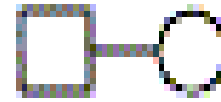
Male



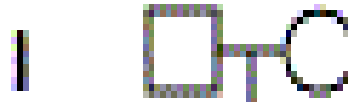
Female



Affected individual

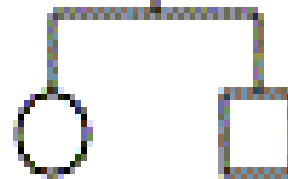


Mating



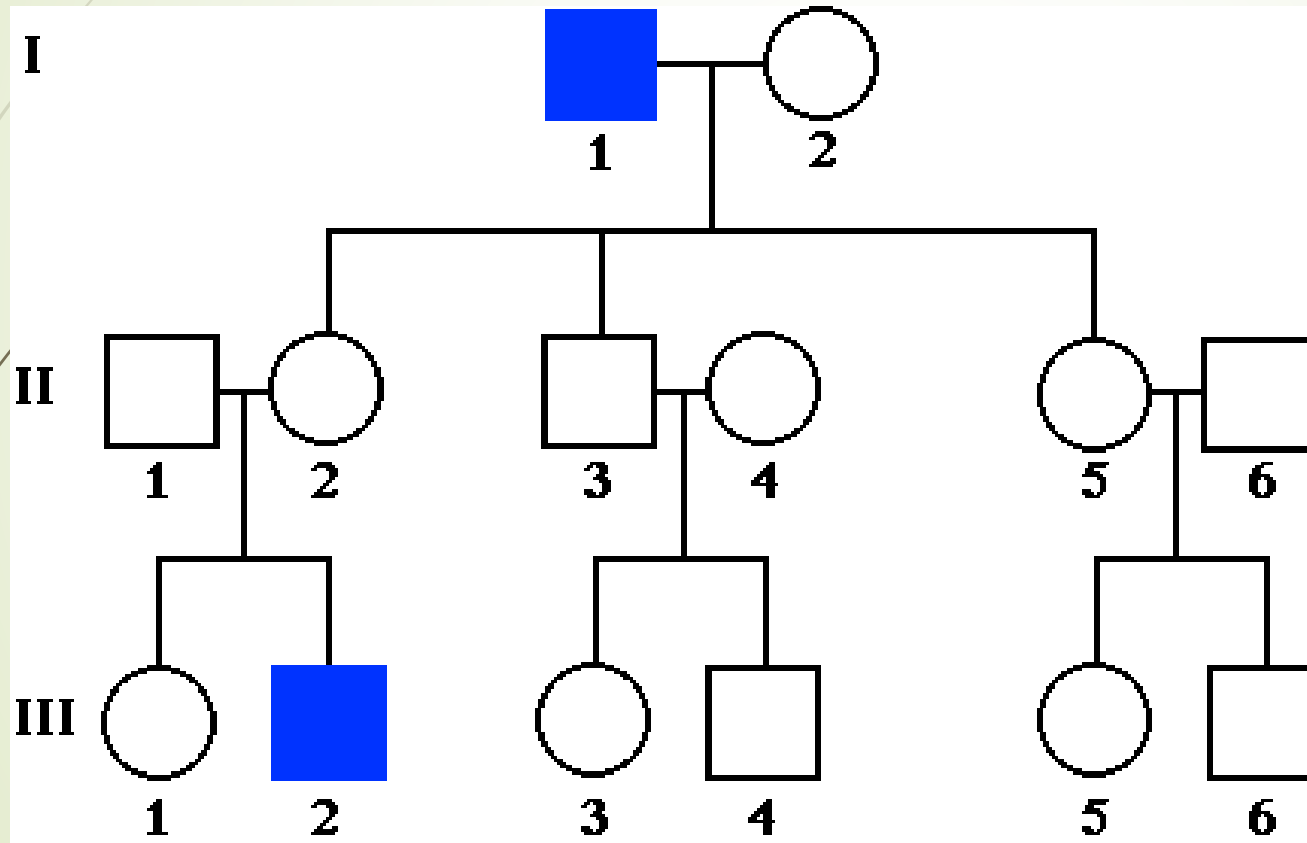
Offspring in birth order; I and II are generations; offspring numbered II-1 and II-2

I



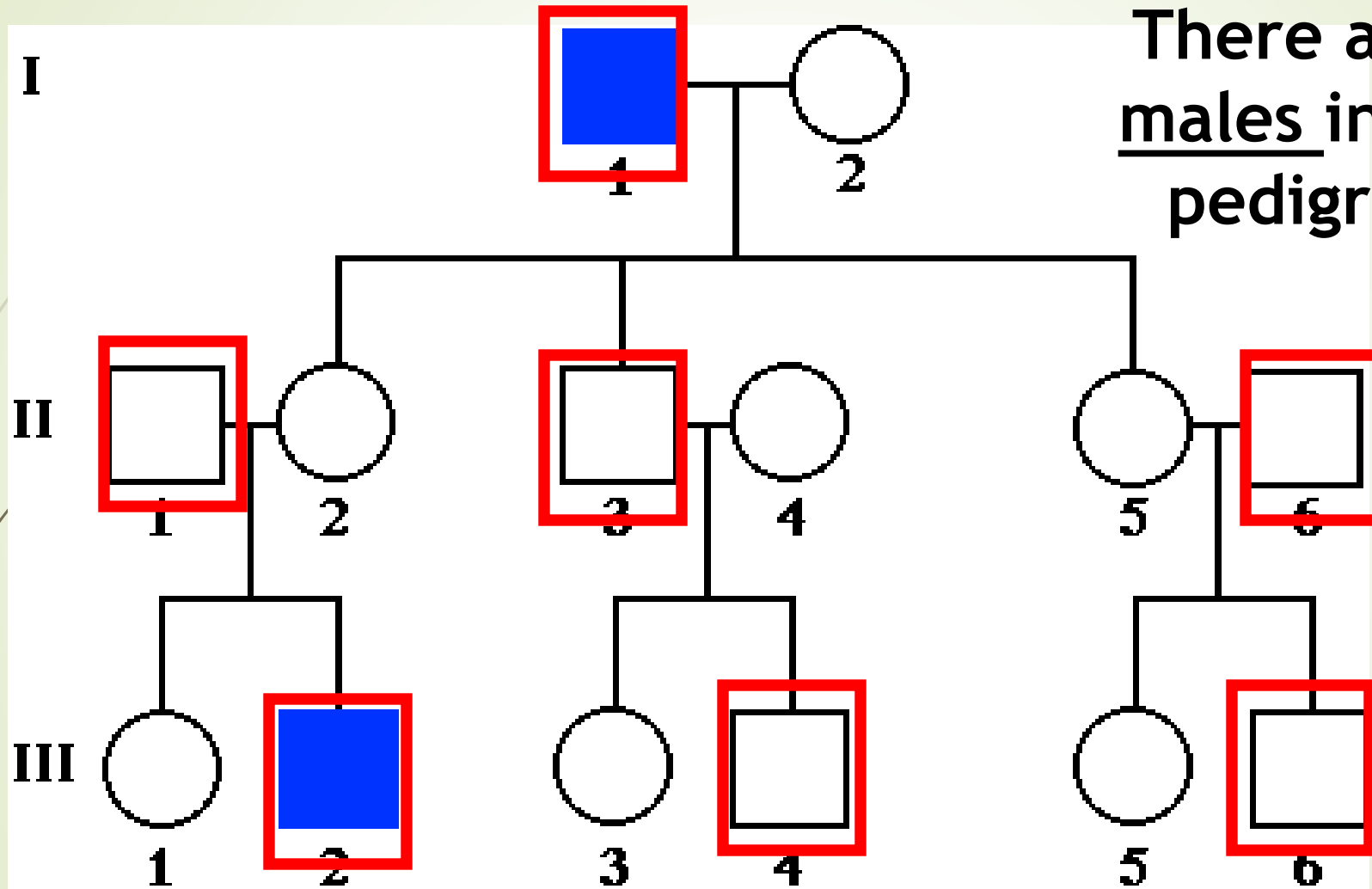
II-1 and II-2

Example 1: Pedigree!



Pedigree 7. X-linked recessive inheritance.

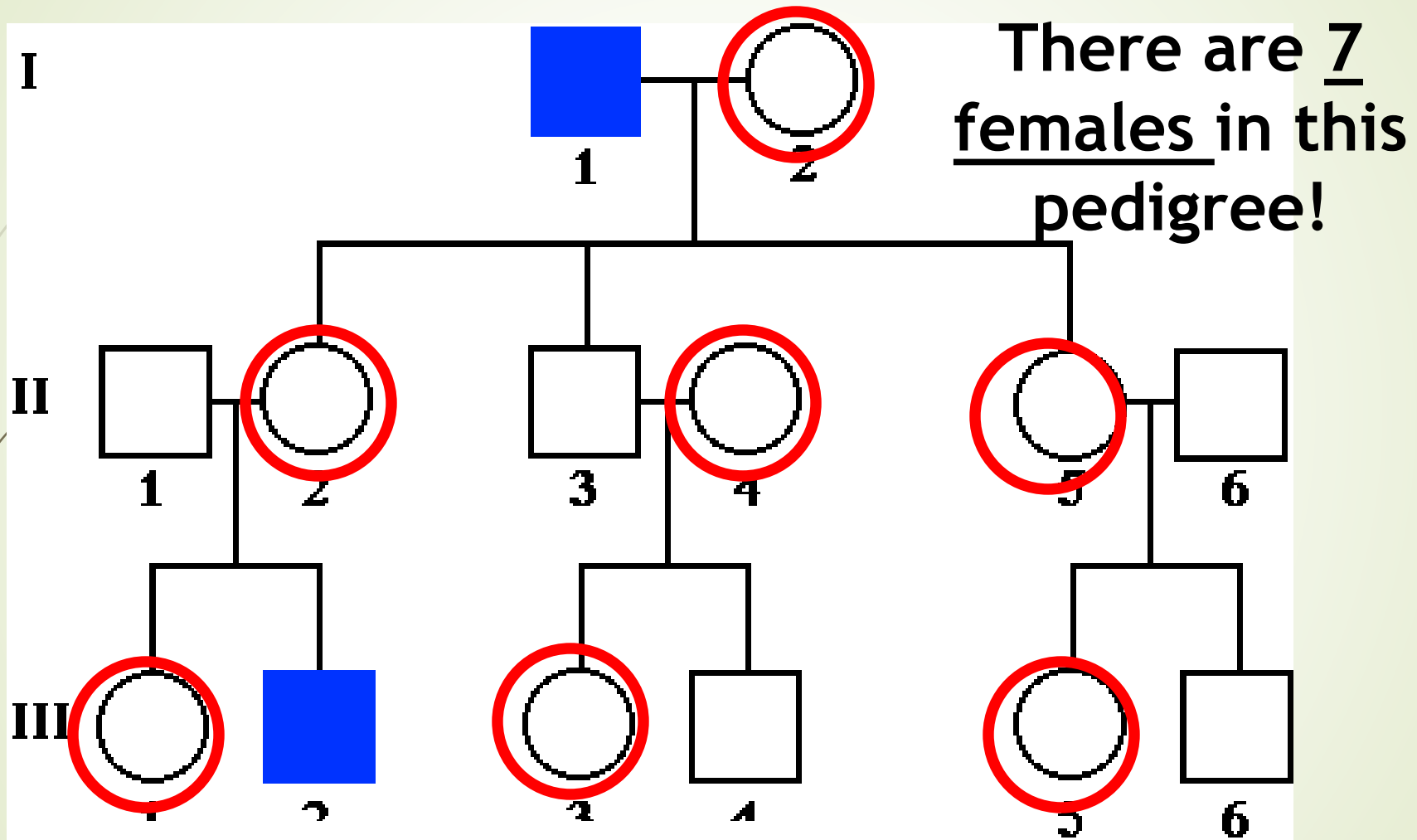
Squares indicate MALES



There are 7 males in this pedigree!

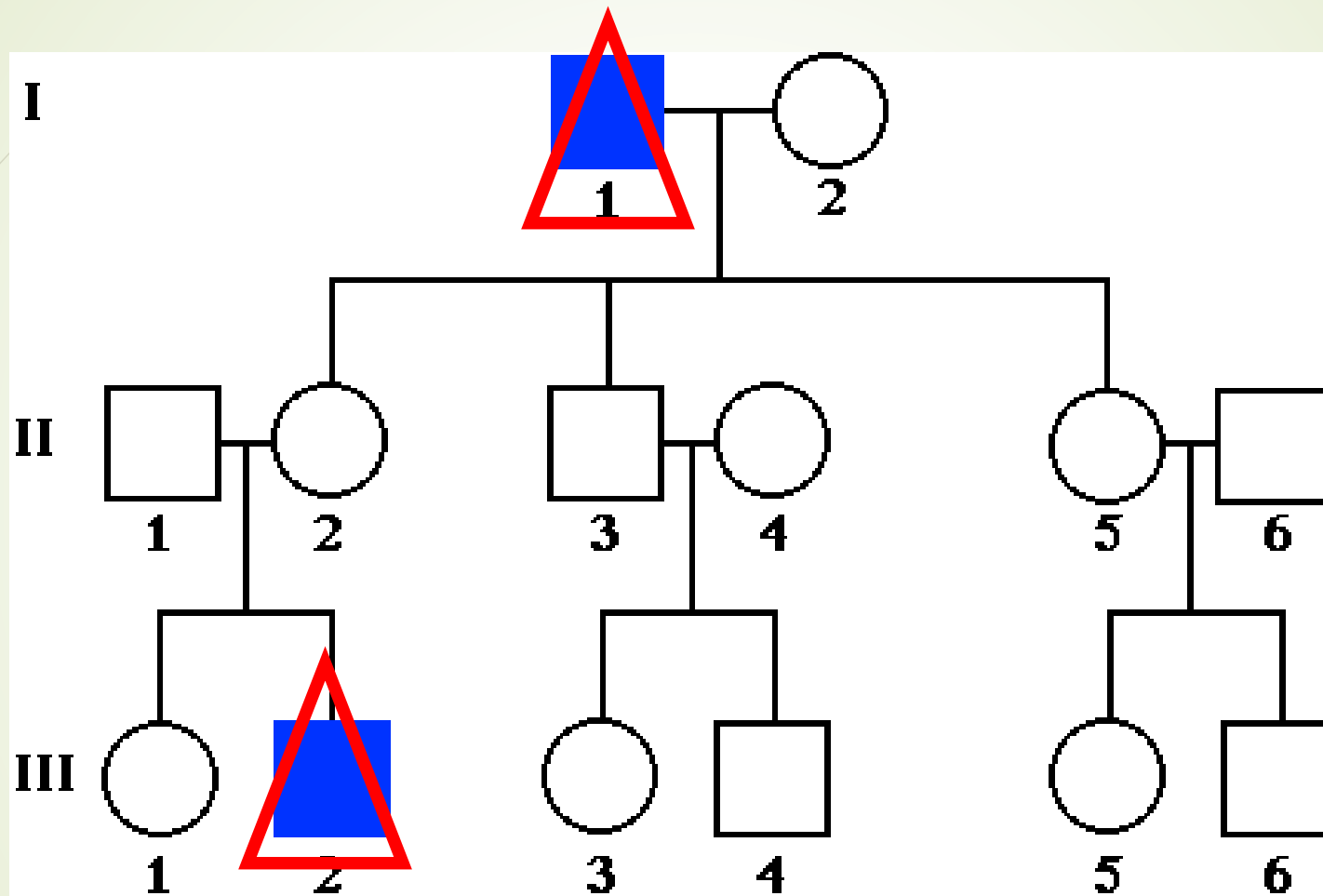
Pedigree 7. X-linked recessive inheritance.

Circles indicate FeMALES



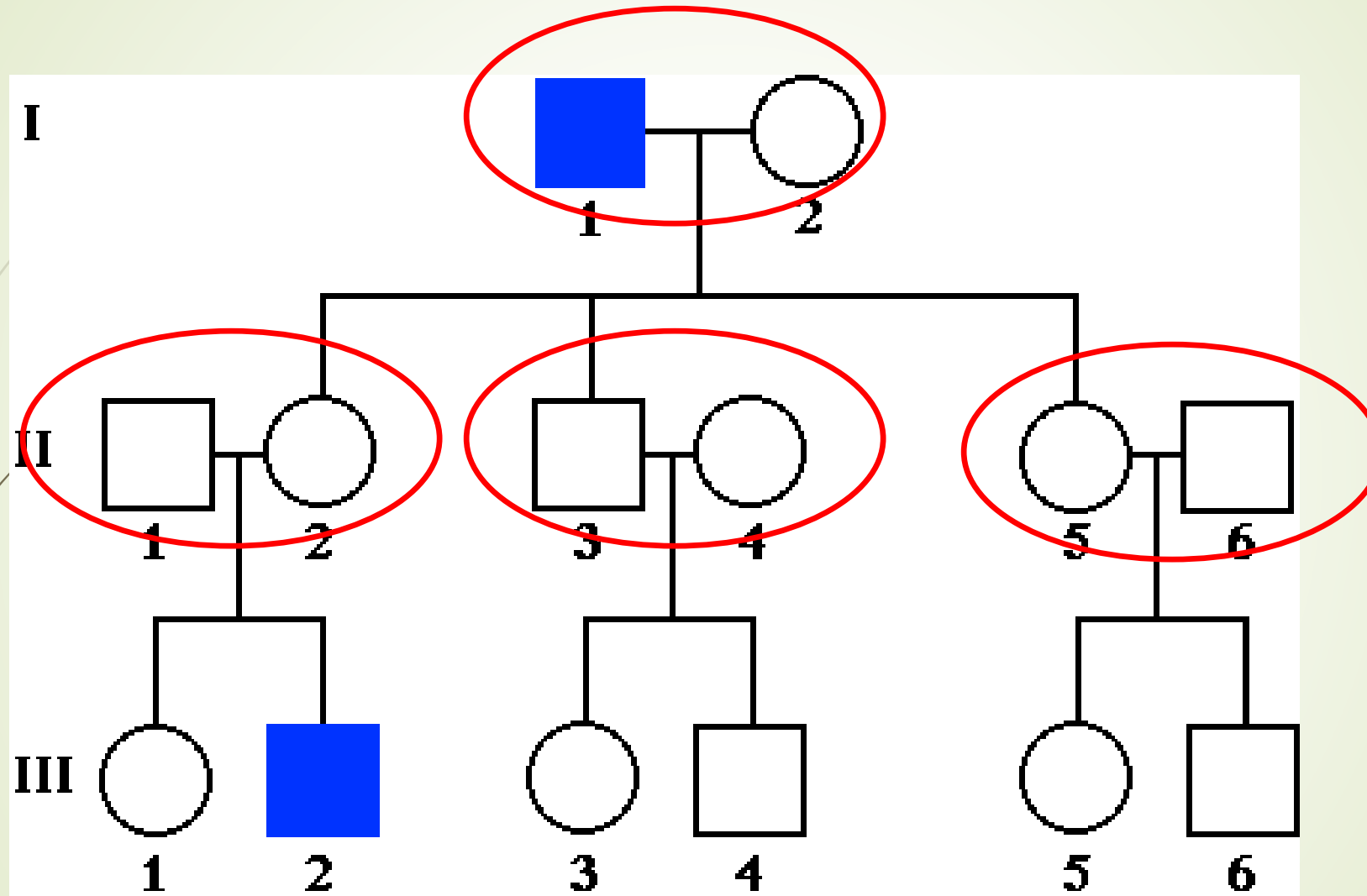
Pedigree 7. X-linked recessive inheritance.

that have the trait



There are 2 individuals in this pedigree that are affected!

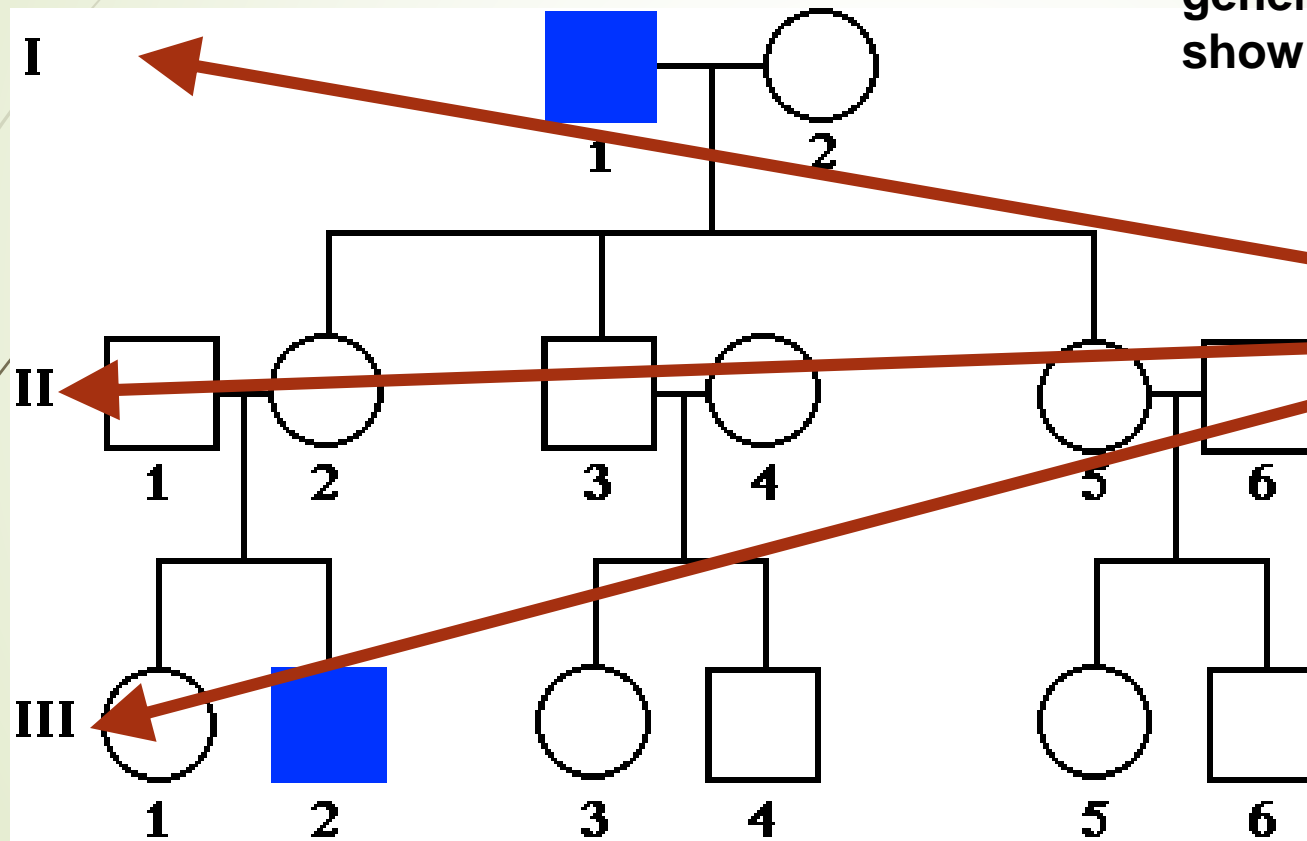
Matings Between Individuals = Horizontal Lines



Pedigree 7. X-linked recessive inheritance.

Pedigrees!

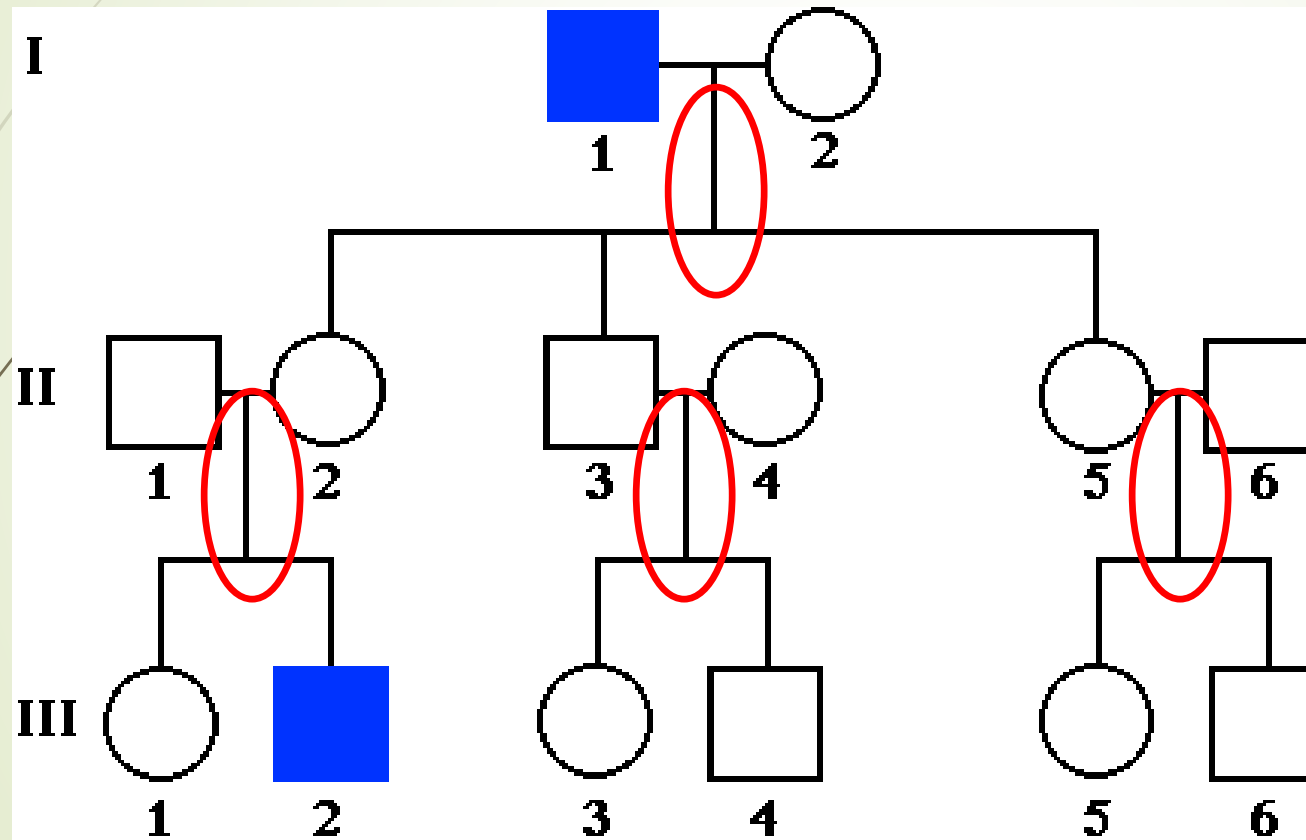
How many generations are shown here?



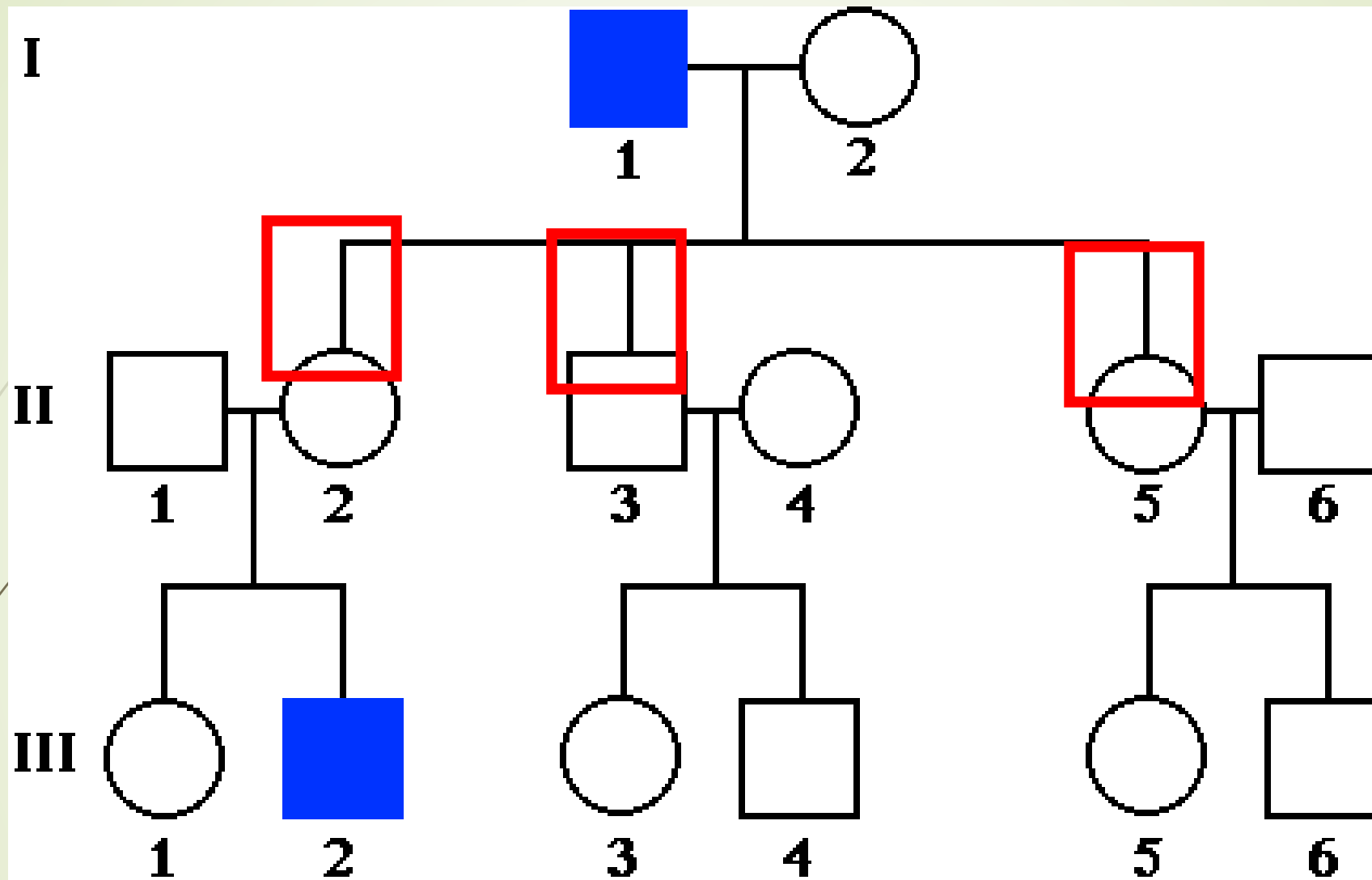
3!

Pedigree 7. X-linked recessive inheritance.

Vertical line from relationship line = children

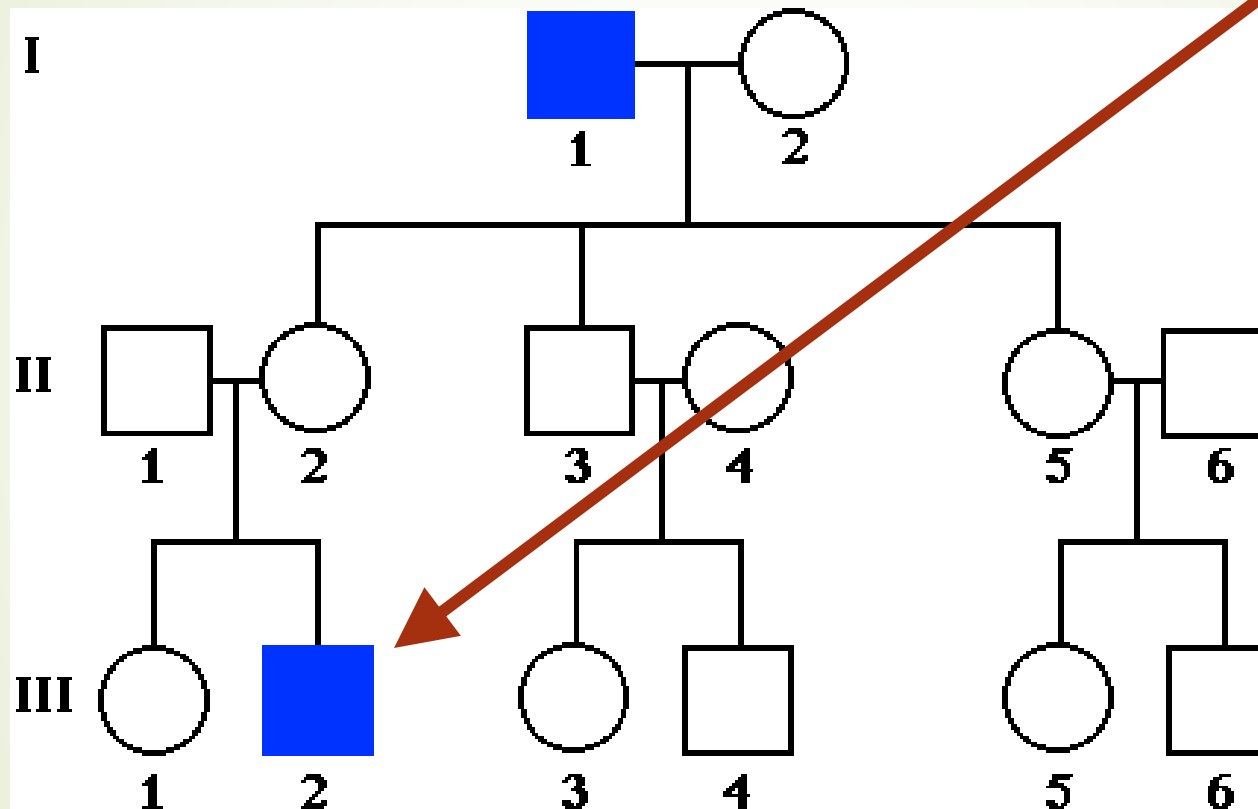


Pedigree 7. X-linked recessive inheritance.



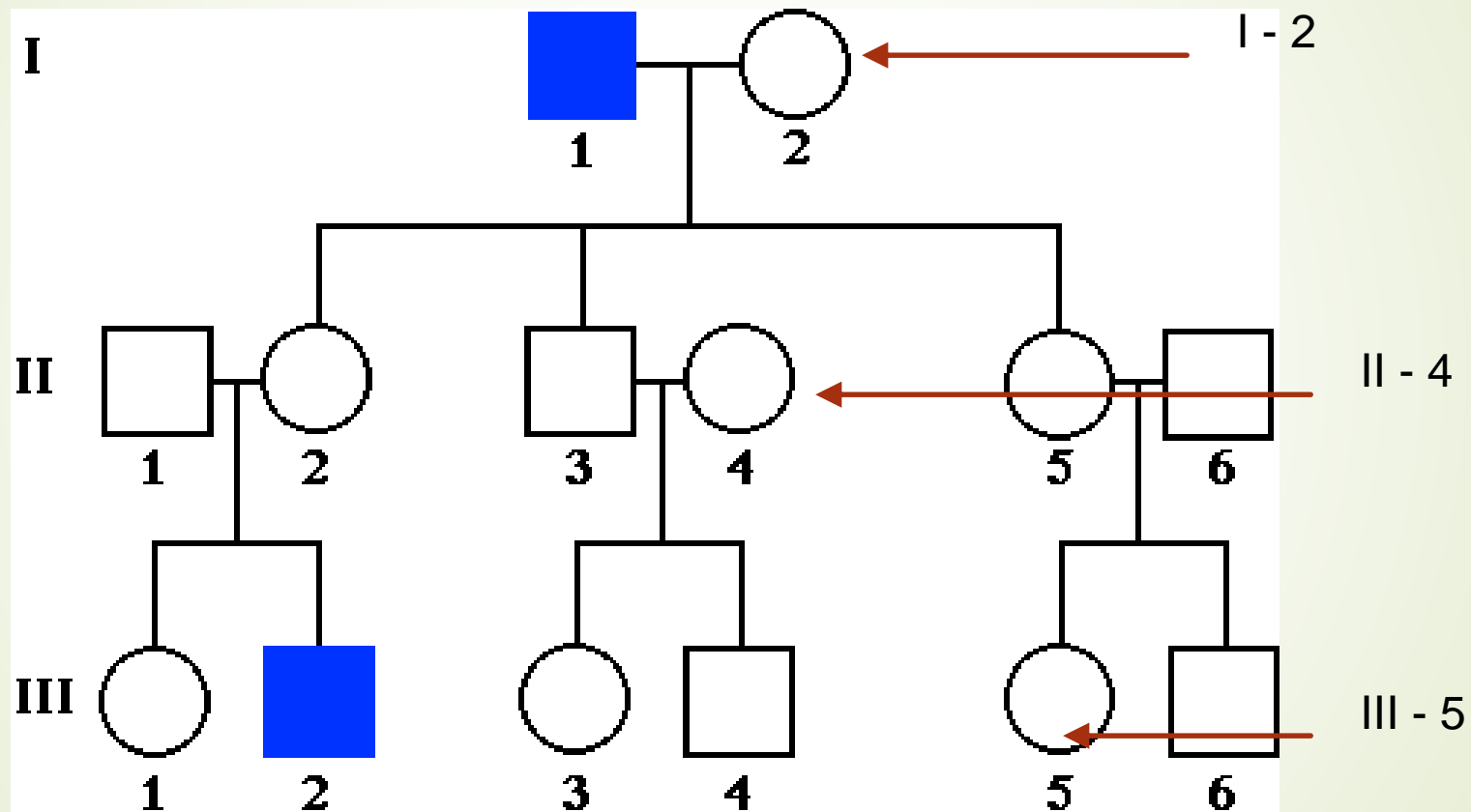
How many children do parents in generation 1 have? **3 children!**

How many of the children in generation 3 have the trait? **One!**

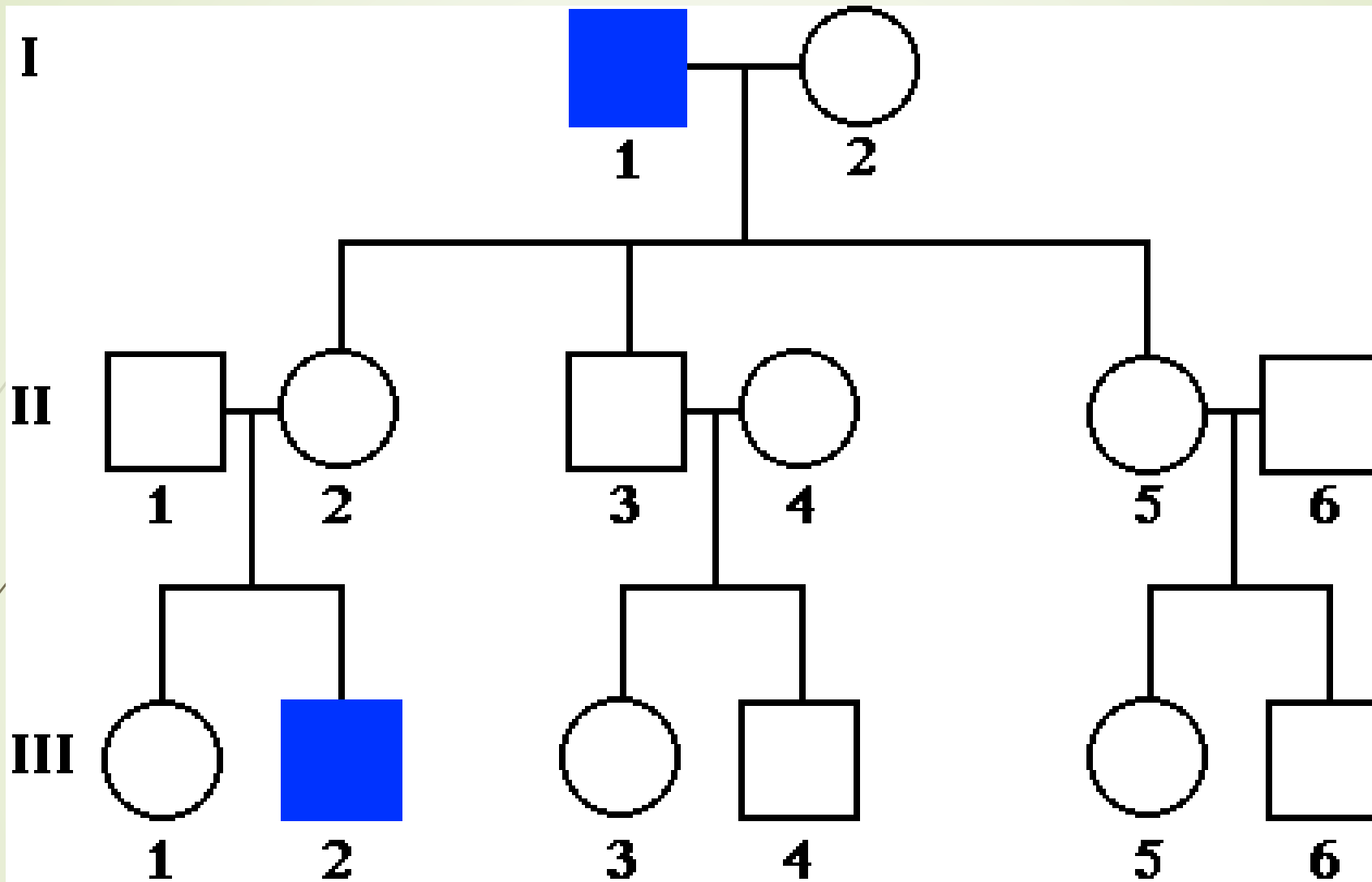


Pedigree 7. X-linked recessive inheritance.

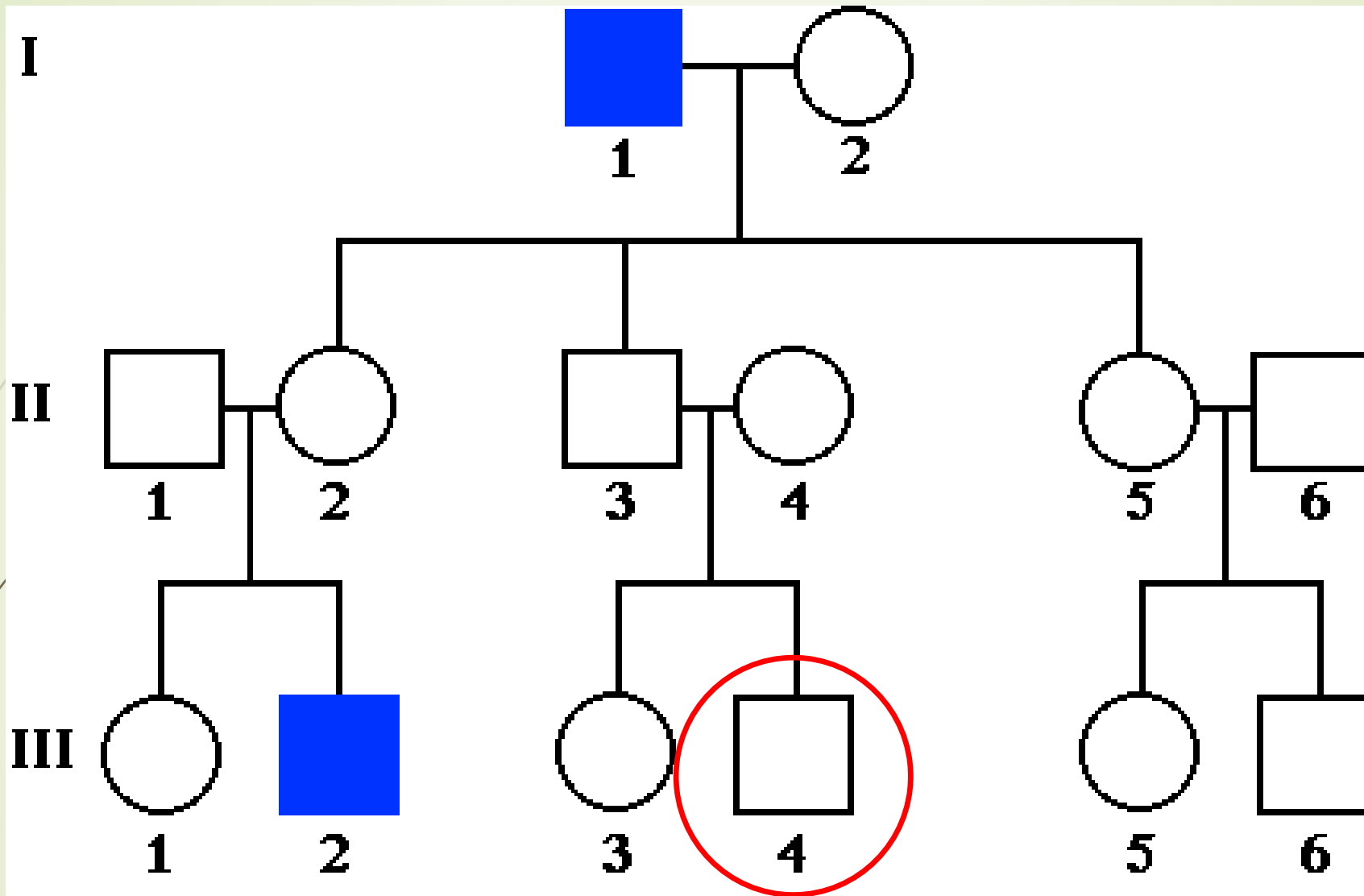
We label each individual by their generation and number



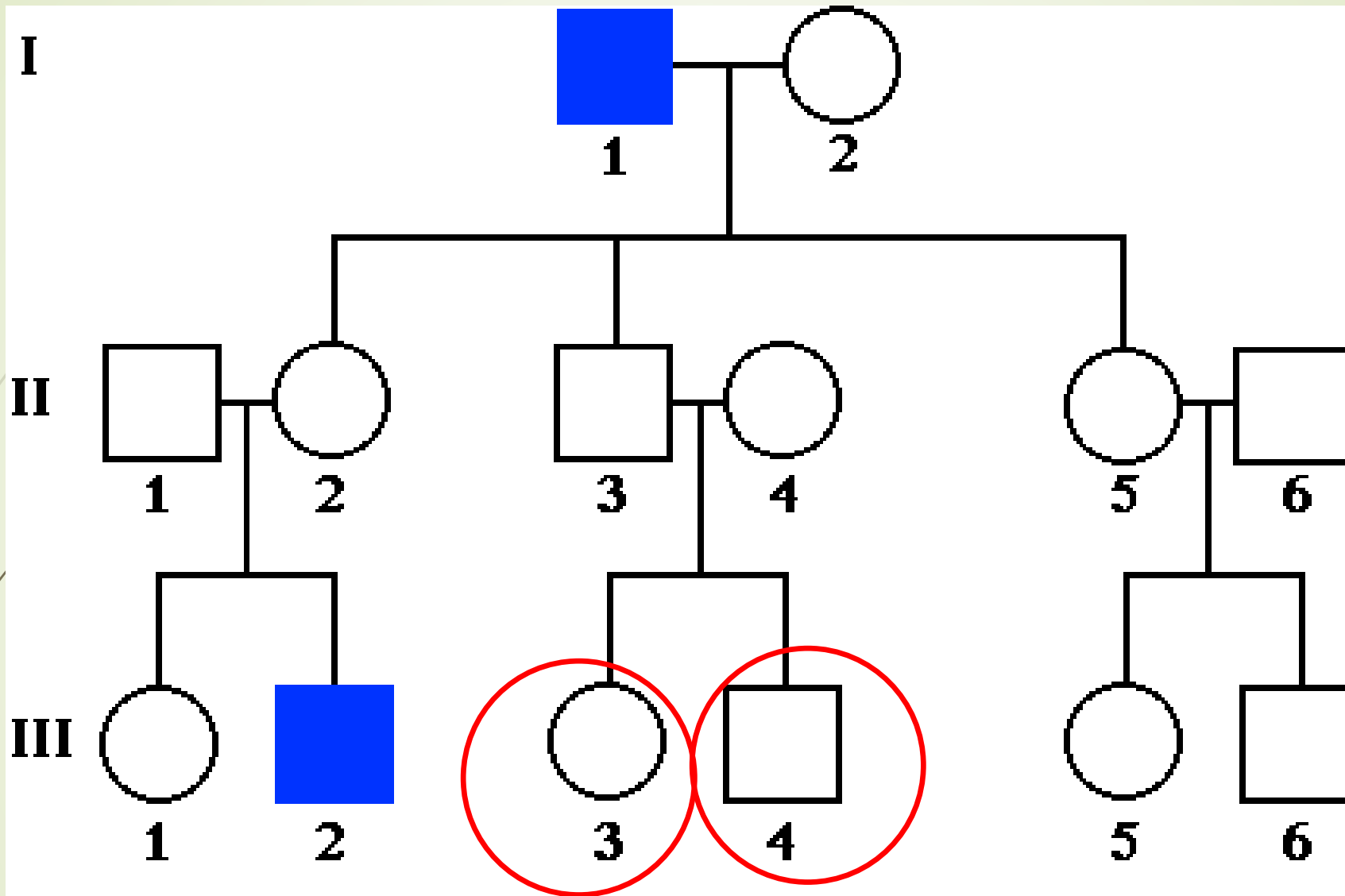
Pedigree 7. X-linked recessive inheritance.



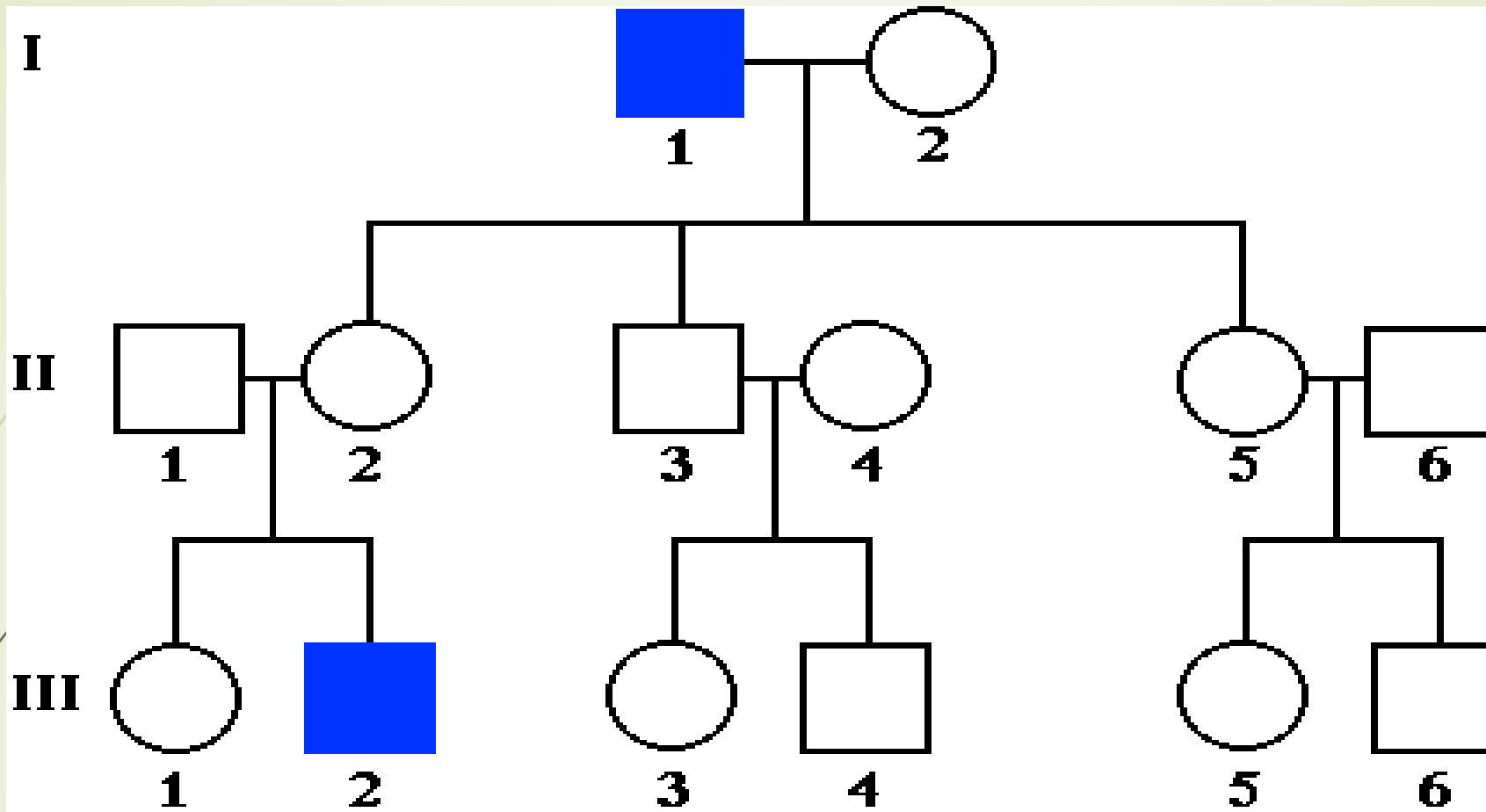
Which individual can be labeled as “III.4”?



Which individual can be labeled as “III.4”?



Which individuals are the kids of II.3 and II.4?

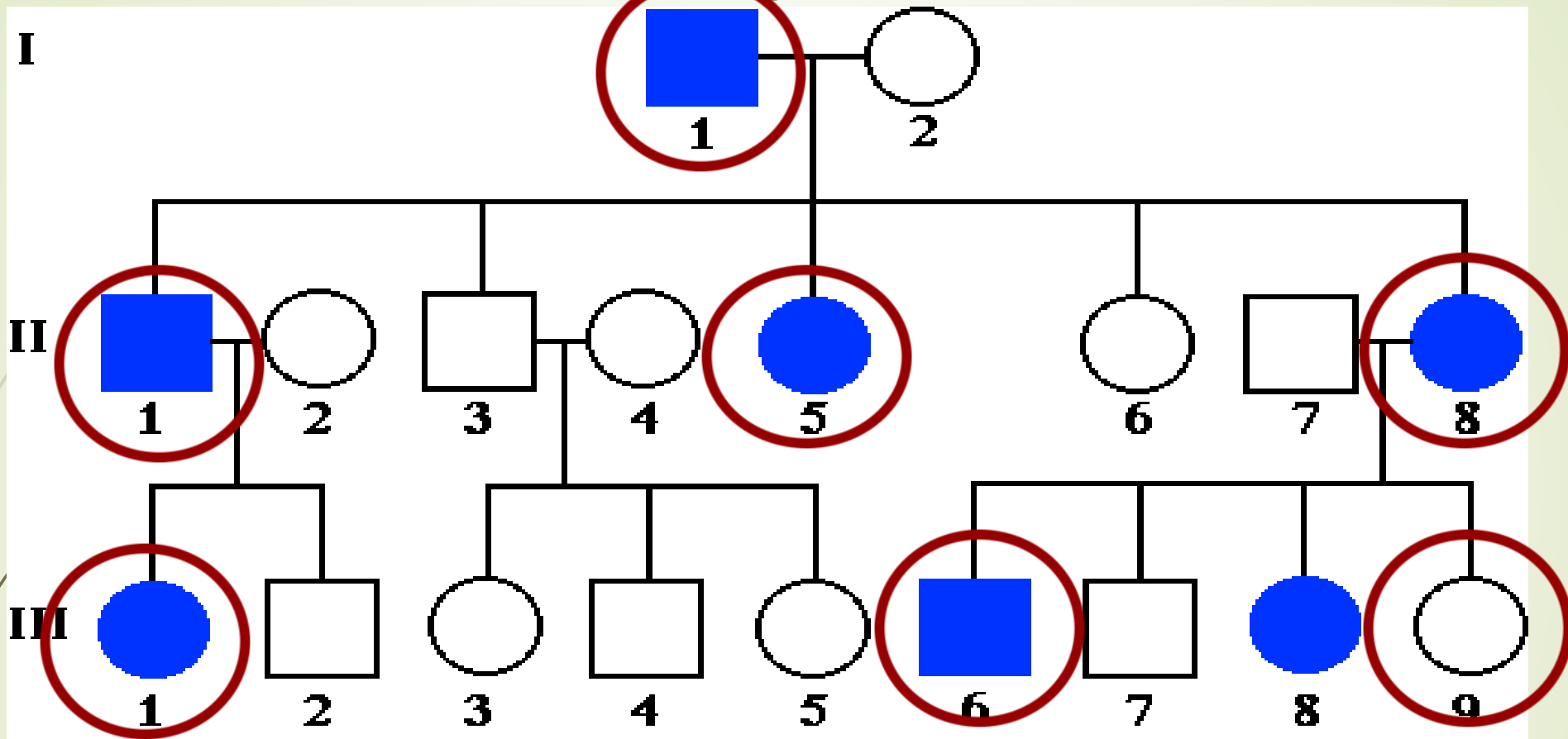


Pedigree 7. X-linked recessive inheritance.

How are individuals II.1 and II.2 related?

Marriage!

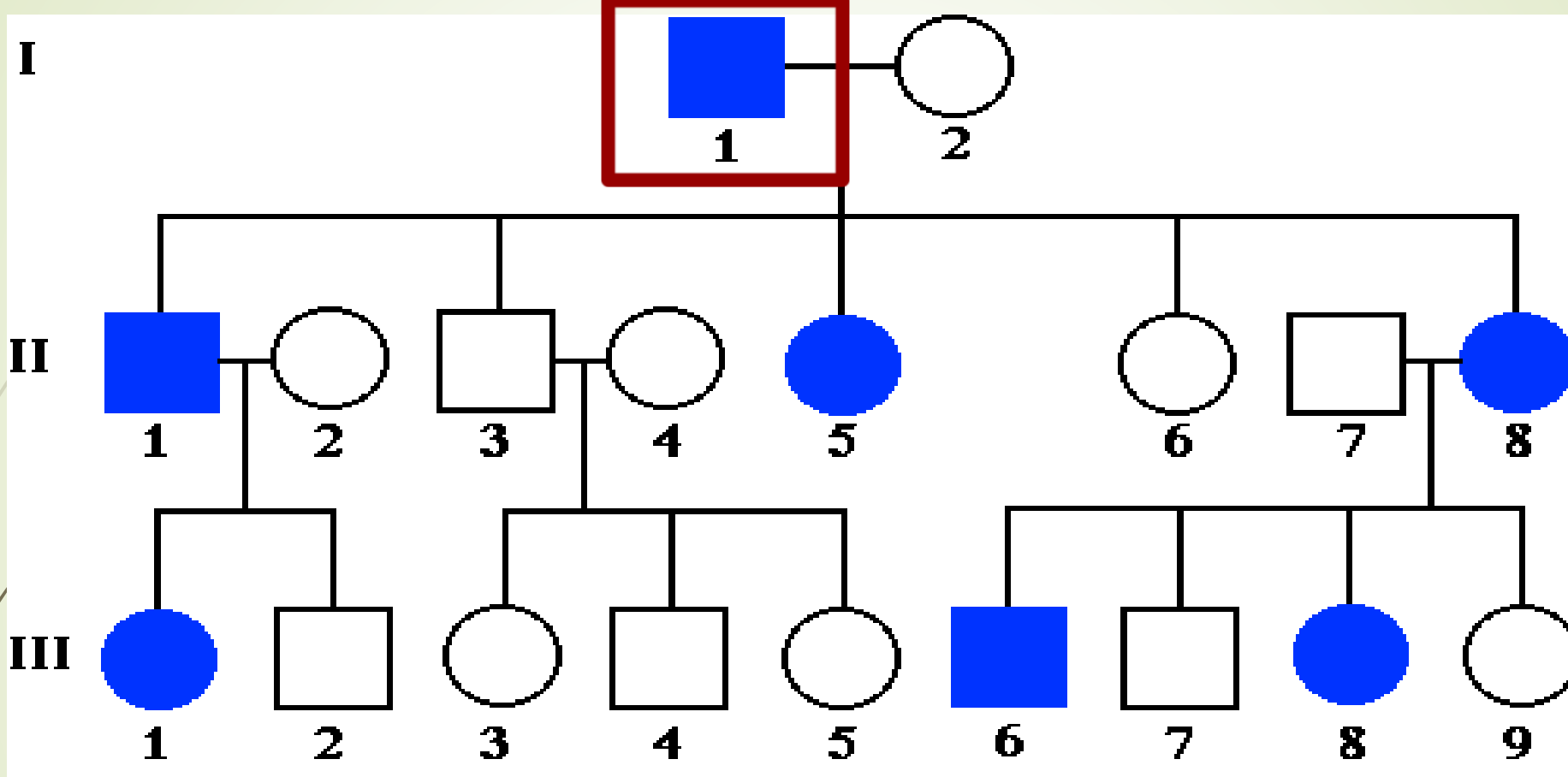
Pedigree 2



How many people in the family have the trait?

7 people

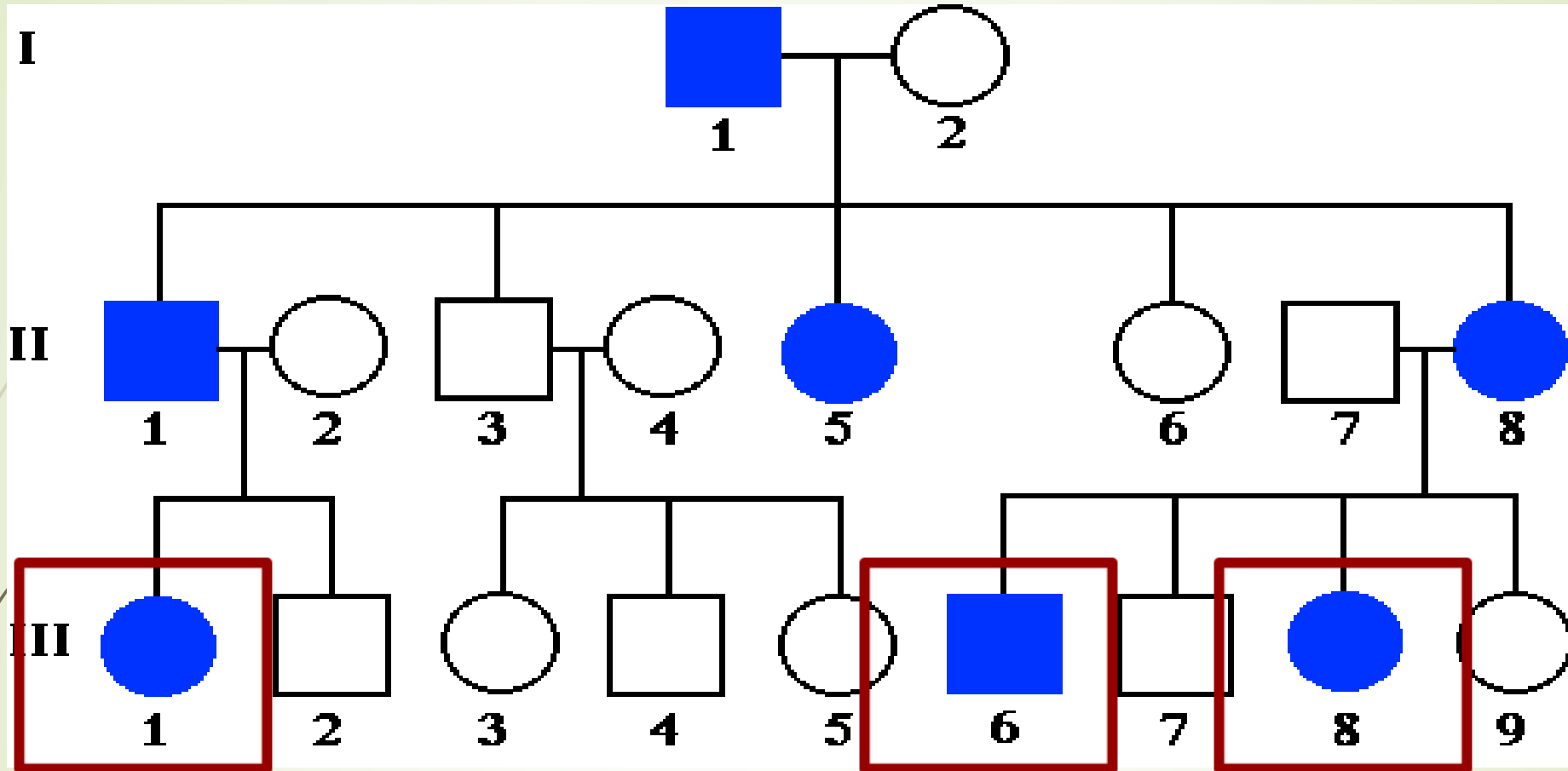
Pedigree 2



2. What is the sex of individual I – 1? **Male**

3. Does individual I-1 have the trait? **YES**

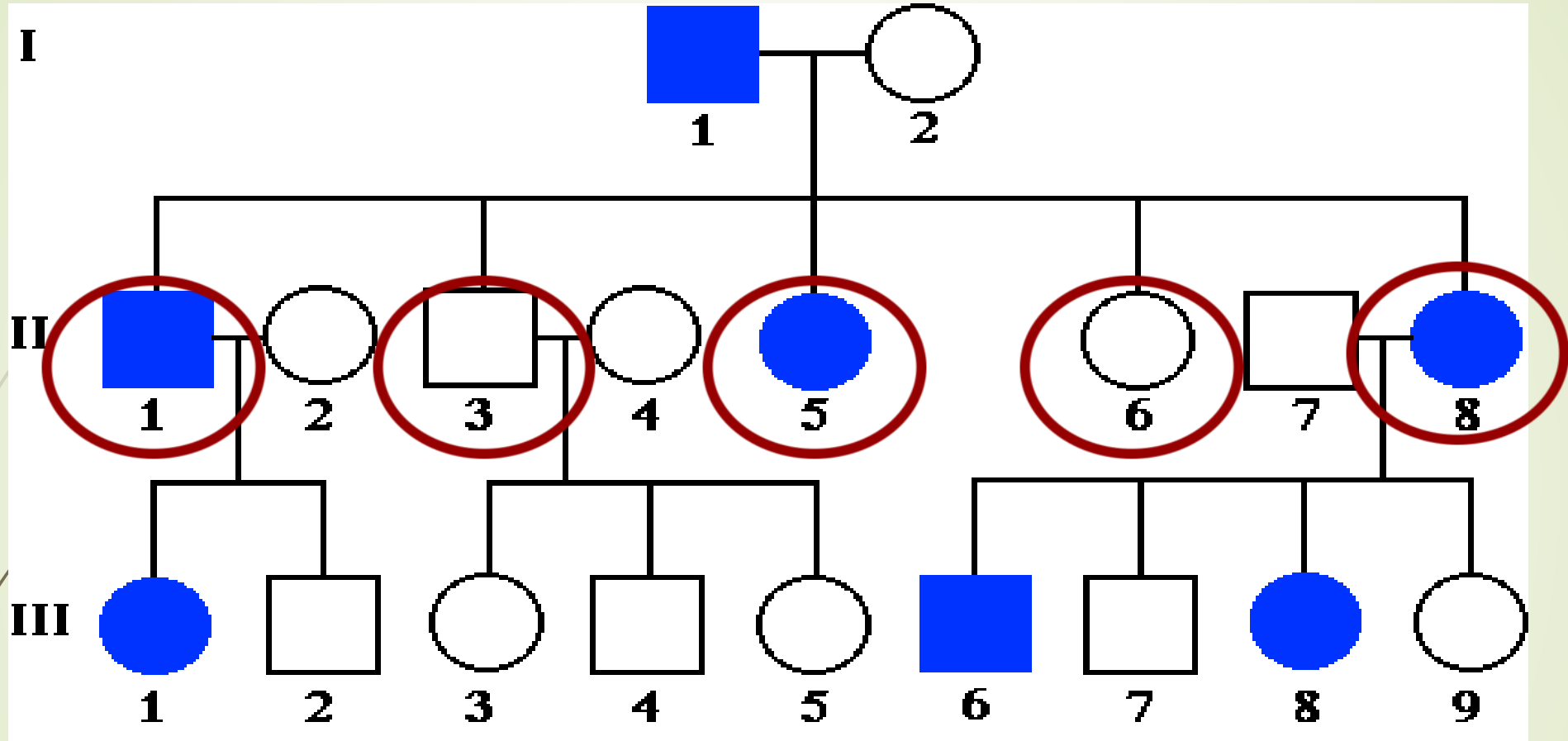
Pedigree 2



4. List the individuals in generation III that have the trait.

III-1 , III-6,
III-8

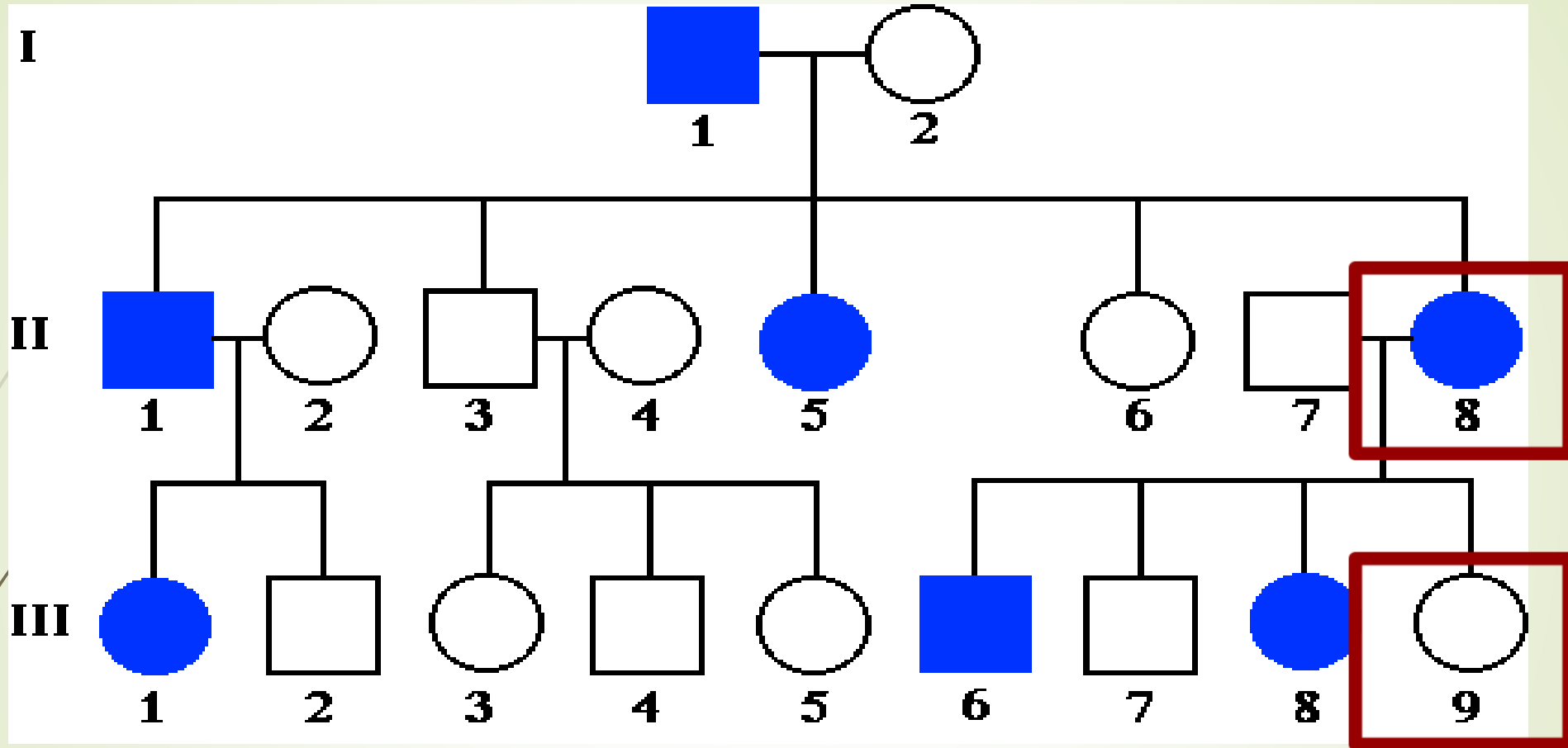
Pedigree 2



5. How many children did the couple from generation 1 have?

5 children

Pedigree 2



6. What is the relationship between individual II-8 and III-9?

Mother-Daughter

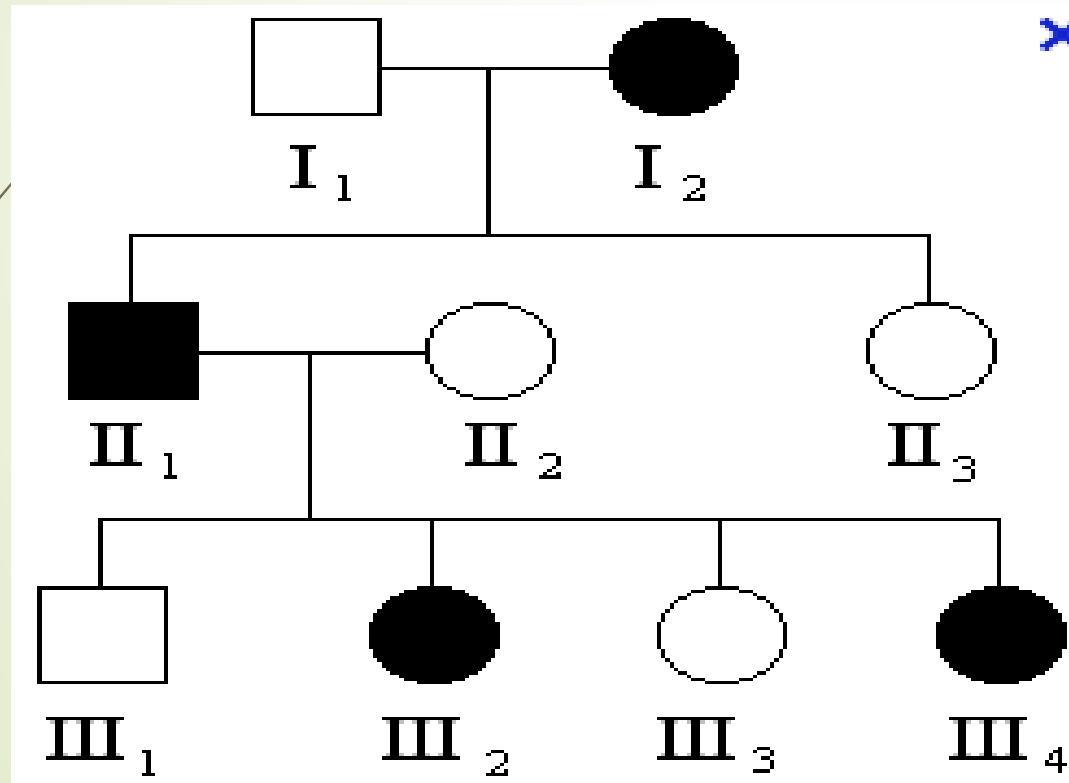
Pedigrees and Traits

Pedigrees are most useful when analyzing a family's history of genetic diseases and traits.

We can also predict if future family members will inherit a disease or trait using a pedigree.

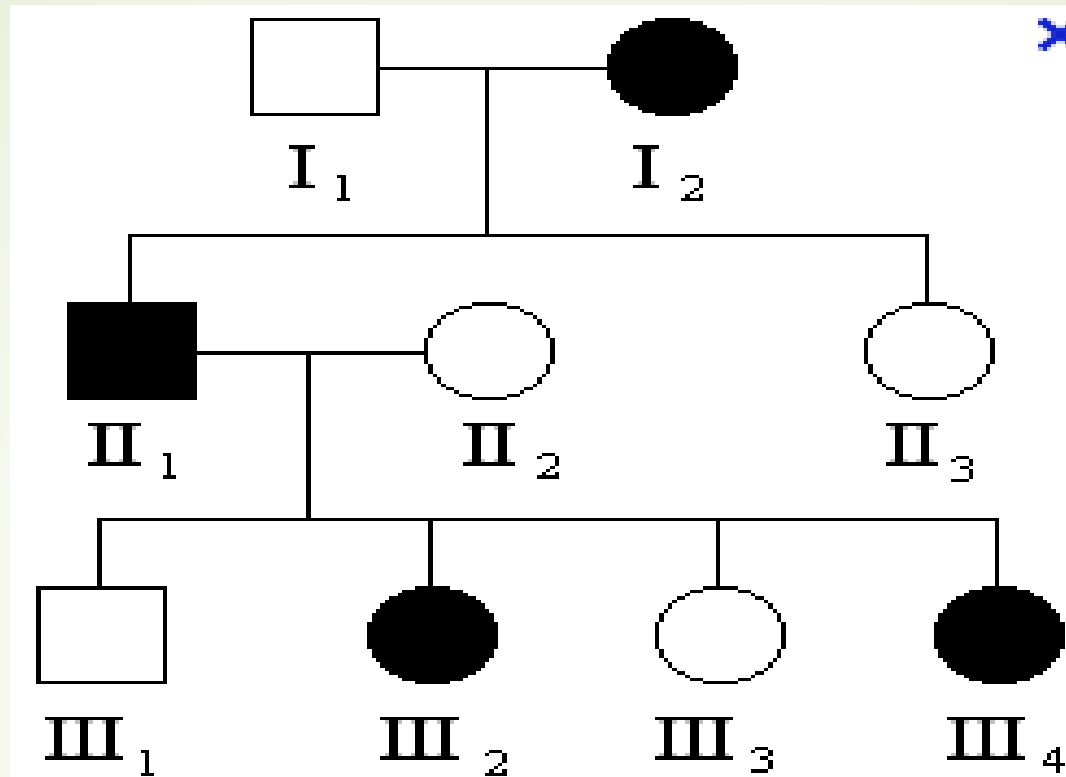
Let's look at some examples

Example 1: The pedigree below shows the inheritance of handedness in humans over three generations. The allele for right-handedness (R) is dominant over left-handedness (r). The shaded individuals below are recessive for handedness



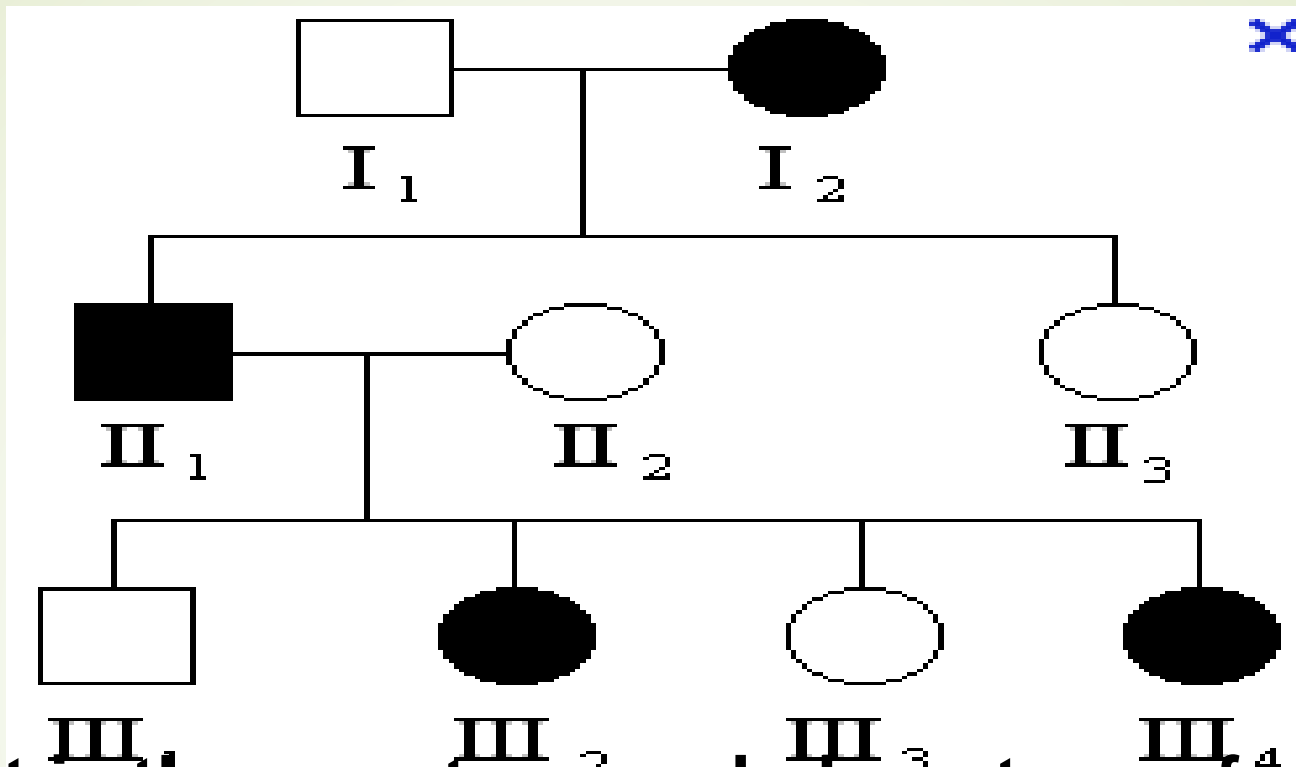
R = right-handed

r = left handed



- How many generations are there? **3**
- 2. How many individuals are left handed? **4**
- 3. Which individuals in the third generation are right handed?

III-1 and III-3



4. . What is the genotype² and phenotype³ of⁴ individual I-2

Genotype

rr

Phenotype

Left-hand

5. the father (I-1) is heterozygous, what is the genotype of his two children?

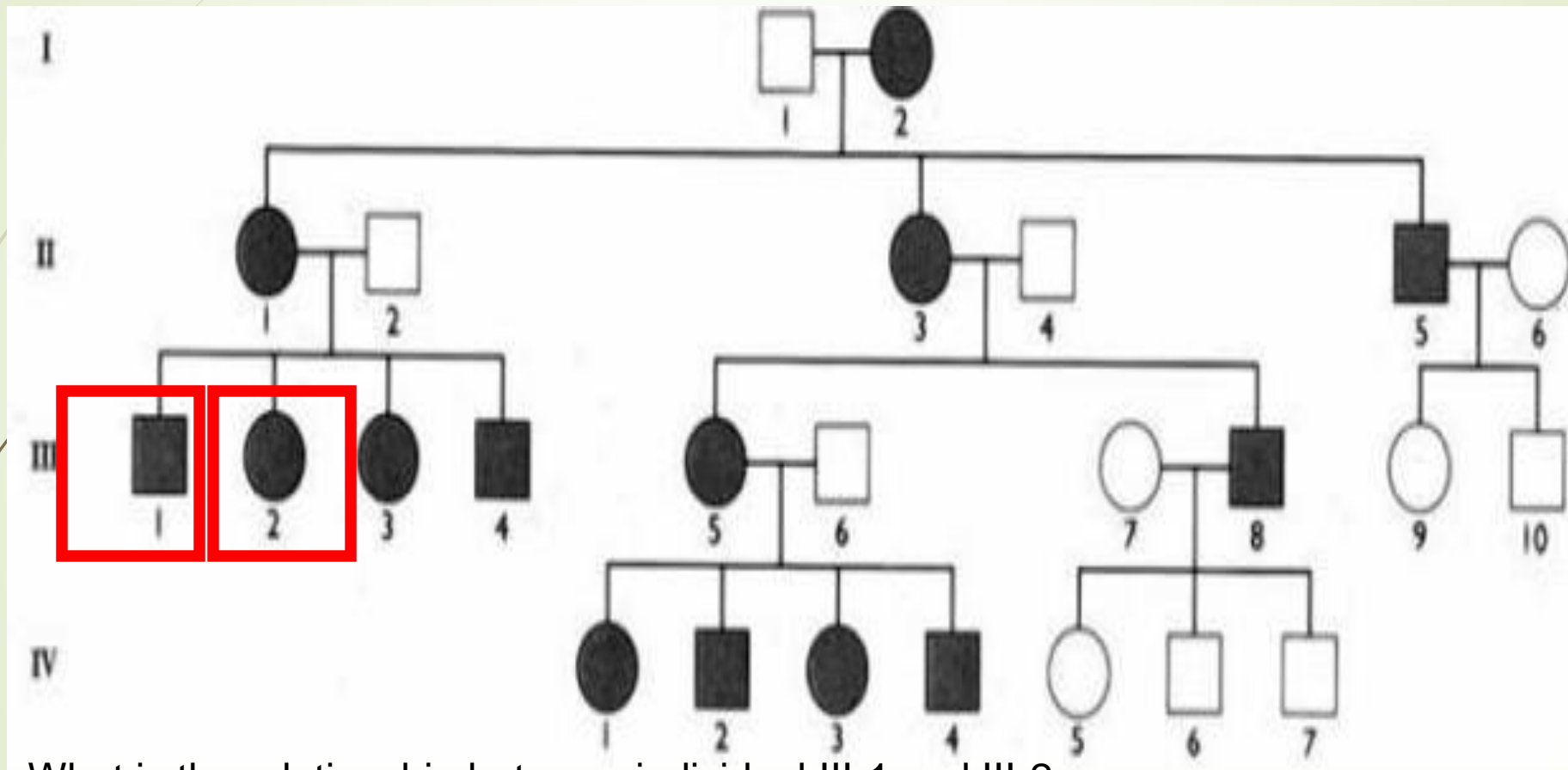
II-1

rr

II-3

Rr

Example 2: Huntington's Disease (H) is a dominant disorder.

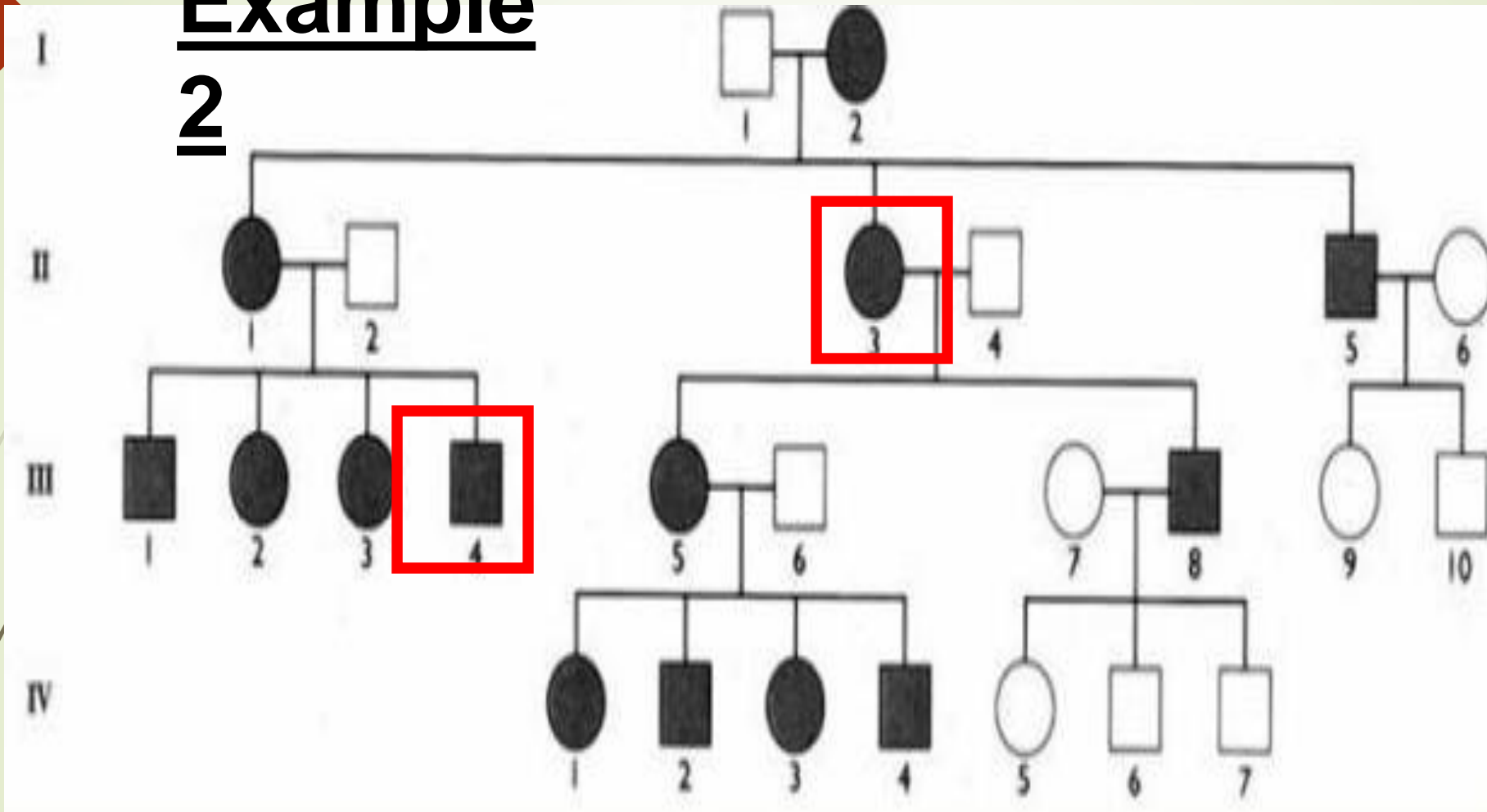


1. What is the relationship between individual III-1 and III-2

Brother and sister

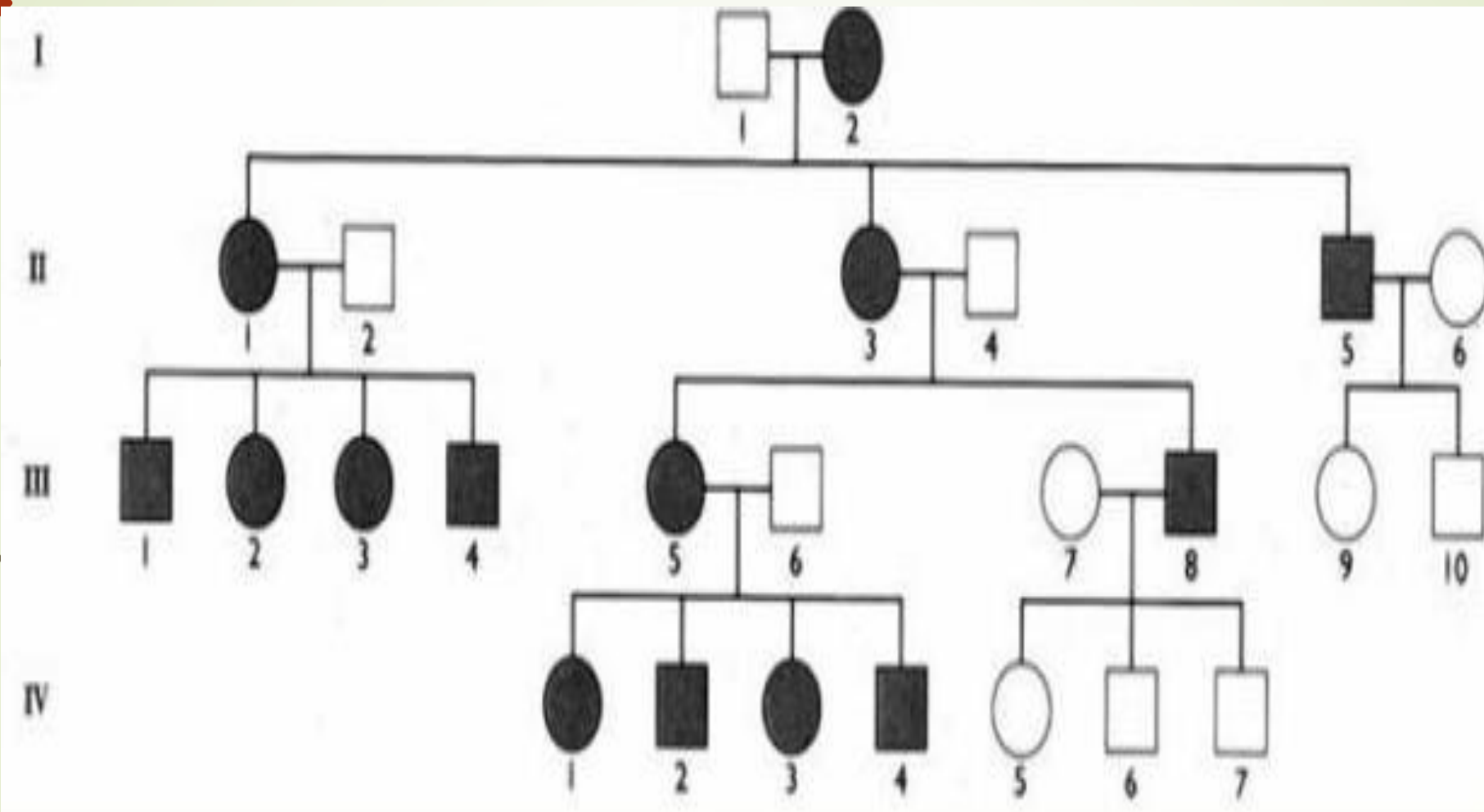
Example

2

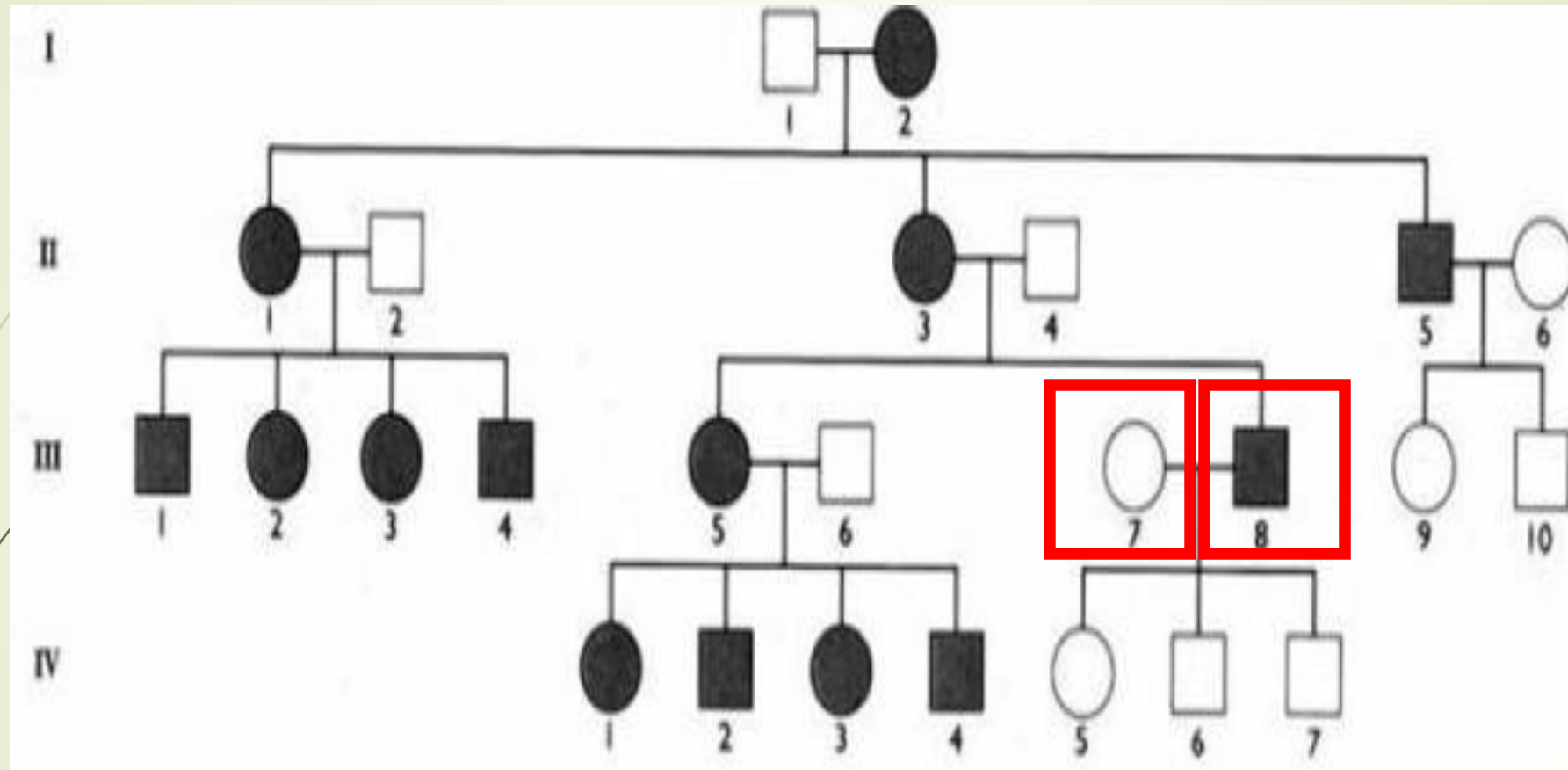


2. What is the relationship between individual II-3 and III-4

Aunt-nephew



How many individuals in generation II do not have Huntington's disease? **3 people (not shaded)**

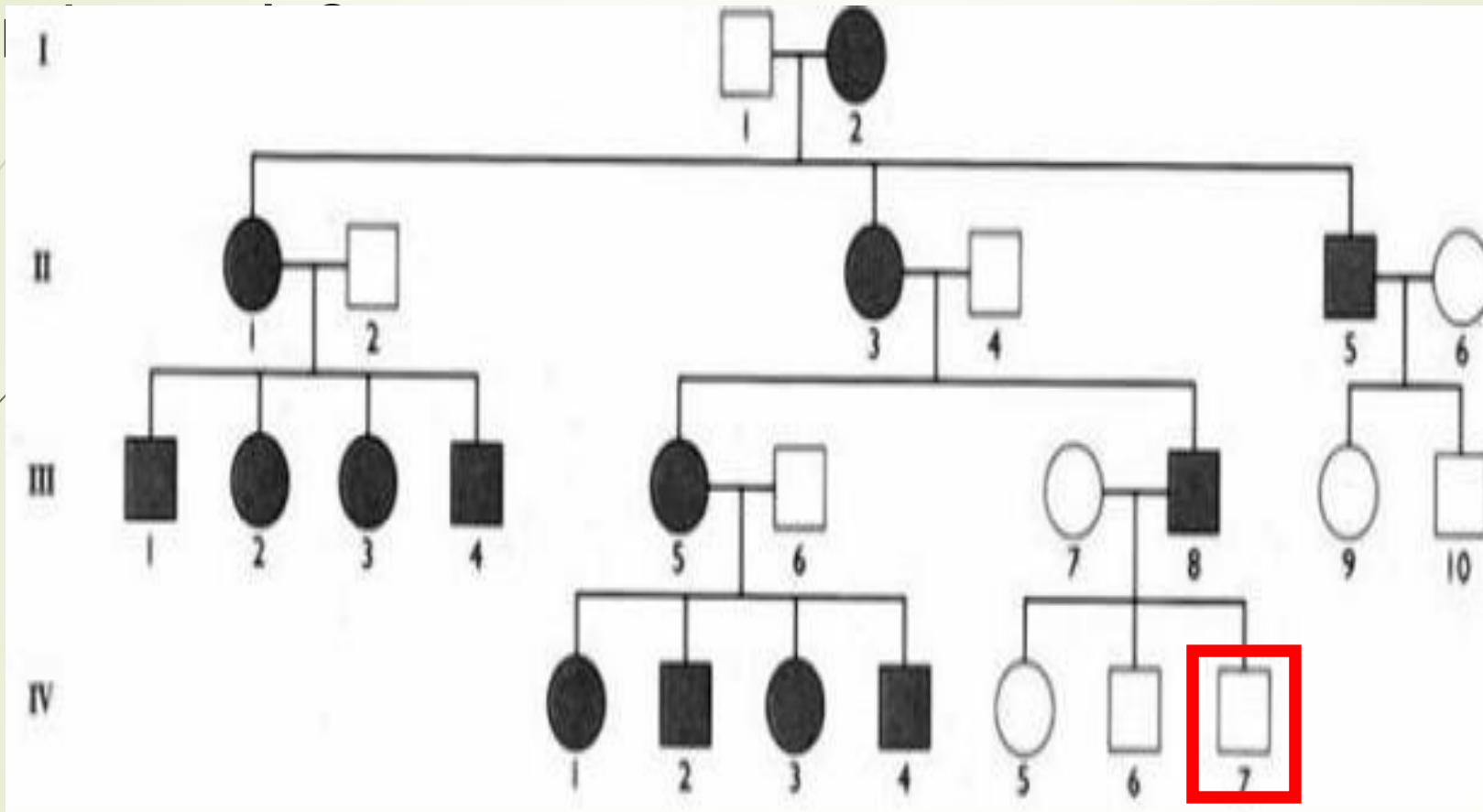


4. Based on the traits of IV-5, IV-6, and IV-7, what **MUST** the genotype of III-8 be?

Hh (Heterozygous)

If individual IV-7 mated with a heterozygous individual, what is the percentage their offspring has

Hu

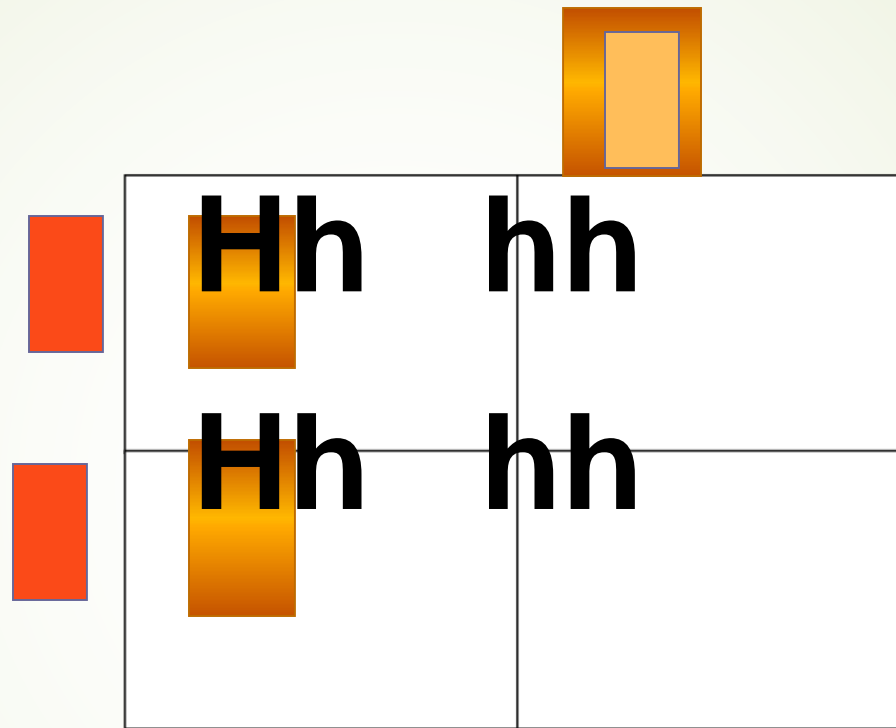


Genotype of IV-7:

hh

Heterozygous genotype:

Hh

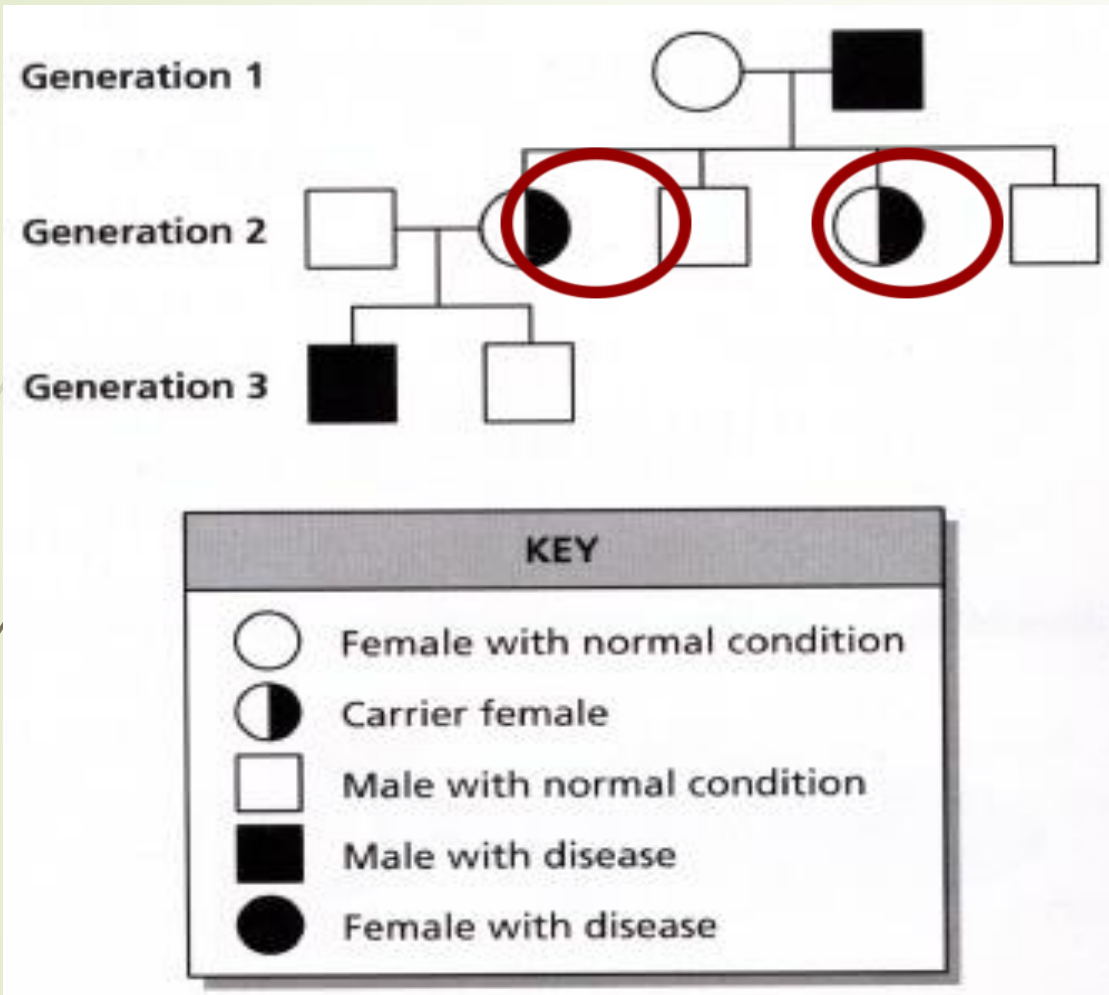


50% has the
disease

**Note on sex-linked pedigrees

- For sex-linked traits, female carriers are always represented as a circle half-way shaded, even though they do not express the recessive trait.
- A female carrier looks like:

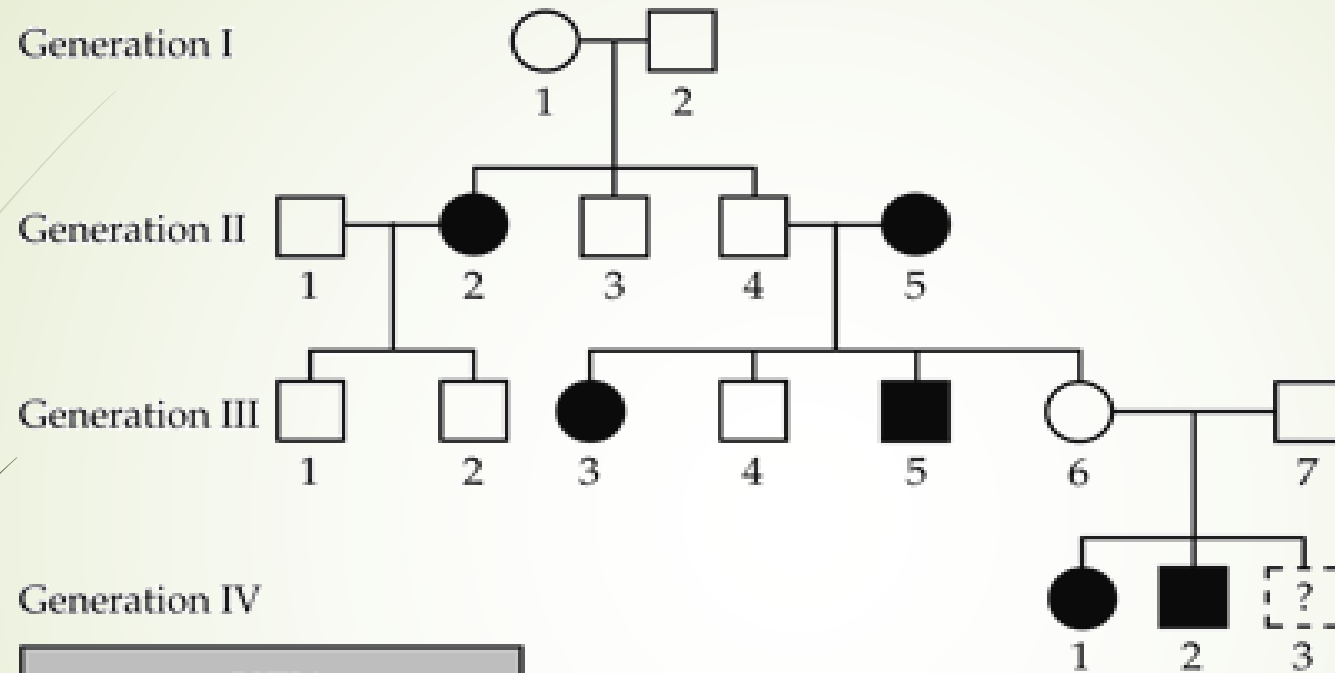




Which generation has female carriers in it?

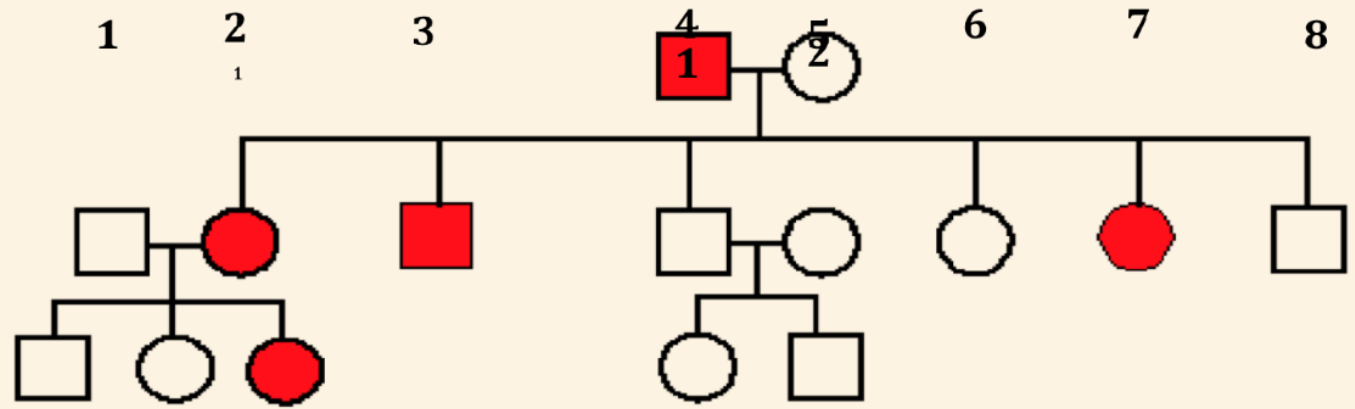
- A. Generation 1
- B. Generation 2
- C. Generation 3

PEDIGREE FOR INHERITANCE OF NORMAL ARCHES



KEY	
○	Normal Female
□	Normal Male
●	Flat-footed Female
■	Flat-footed Male
□ ? □	Unknown

H



COLORBLINDNESS PEDIGREE

