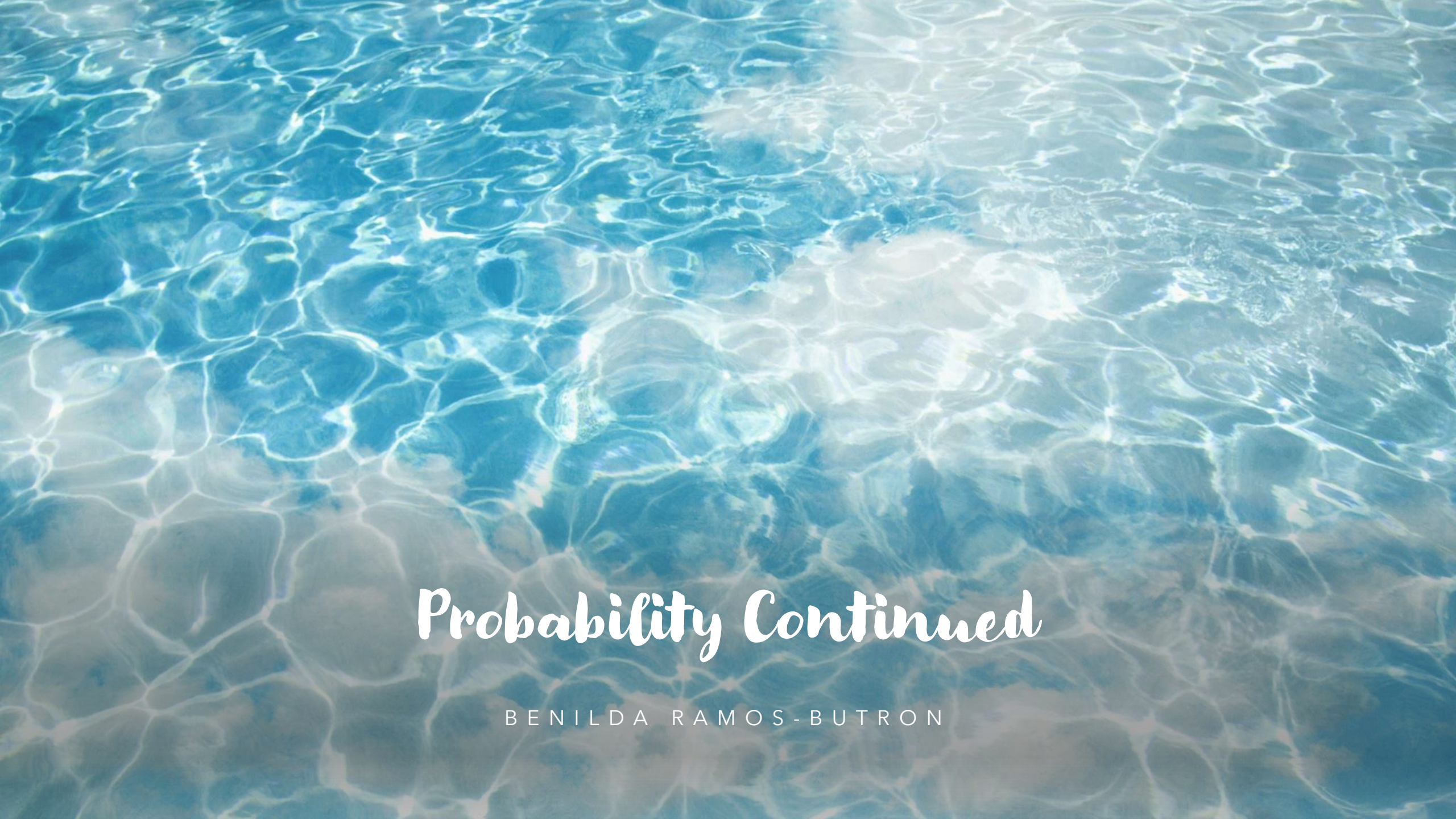


The background of the slide is a close-up, top-down view of water with numerous small, concentric ripples. The water is a deep blue color, and the ripples create a complex, organic pattern of light and dark blue lines across the entire surface.

Probability Continued

BENILDA RAMOS-BUTRON

Probability

- The number of times a particular event occurs, divided by the total number of opportunities for the event to occur

SUM Rule

- Combined probability of 2 (or more) mutually exclusive events occurring is the sum of their individual probabilities

Product Rule

- The joint probability of both of 2 independent events occurring is the product of their individual probabilities
- The product of 2 independent events occurring simultaneously

Conditional Probability

- A probability that is contingent on given circumstances
- **Example:** What is the probability of heterozygotes among dominant progeny from a cross, $Aa \times Aa$?
- **Formula:** $P = \text{probability of specific event} / \text{probability of general event}$
- **Solution:**

Conditional Probability

- **Problem:** What is the probability that a couple will have a female colorblind child if the mother is a carrier, and the father colorblind?

Binomial Probability

- Probability of a group having one of the 2 alleles of a certain number and the 2nd allele of a certain number
- **Example:** If you toss 3 coins one at a time, what is the probability that 2 heads and 1 tail will turn up in any order?
- **Formula:** $Cp^x q^{N-x}$ **where:**
 - C – binomial coefficient of the number of sequence
 - p – probability of 1st type
 - q – probability of 2nd type
 - N – total events
 - x – events of the 1st type
 - N-x – events of the 2nd type

Binomial Probability

- Probability of a group having one of the 2 alleles of a certain number and the 2nd allele of a certain number
- **Example:** If you toss a coin one at a time, what is the probability that 2 heads and 1 tail will turn up in any order?
- **Formula for Binomial Coefficient:** $C = N! / x!(N-x)!$

Binomial Probability

- Probability of a group having one of the 2 alleles of a certain number and the 2nd allele of a certain number
- **Example:** If you toss a coin one at a time, what is the probability that 2 heads and 1 tail will turn up in any order?
- **Another Option:** Using the Pascal Triangle or the usual $(atb)^n$

Example: If you toss a coin one at a time, what is the probability that 2 heads and 1 tail will turn up in any order?



Forked Line Approach

- Useful for visualizing 3 or more genes where probabilities for each category are determined and combined one gene at a time
- Assumes independent assortment of all involved genes.
- **Example:** $AaBbCcDd \times AaBbCcDd$ (Compute for the probability of an aaB-C-D-offspring)

Example: AaBbCcDd x
AaBbCcDd (Compute for
the probability of an aaB-C-
D- offspring)



Goodness of Fit (Chi-square Test)

- **Formula:**
$$X^2 = \sum \frac{(o - e)^2}{e}$$
 df = N-1

where: O = observed number
E = expected number
X = chi

Example: Does the cross of violet flowers (VV) and white flowers (vv) follow Mendelian inheritance pattern? There are 166 progeny with 85 violet flowers and 81 white flowers.

Decision Rule (DR) : CV > TV Significant
CV < TV Not significant

Does the cross of violet flowers (VV) and white flowers (vv) follow Mendelian inheritance pattern? There are 166 progeny with 85 violet flowers and 81 white flowers.

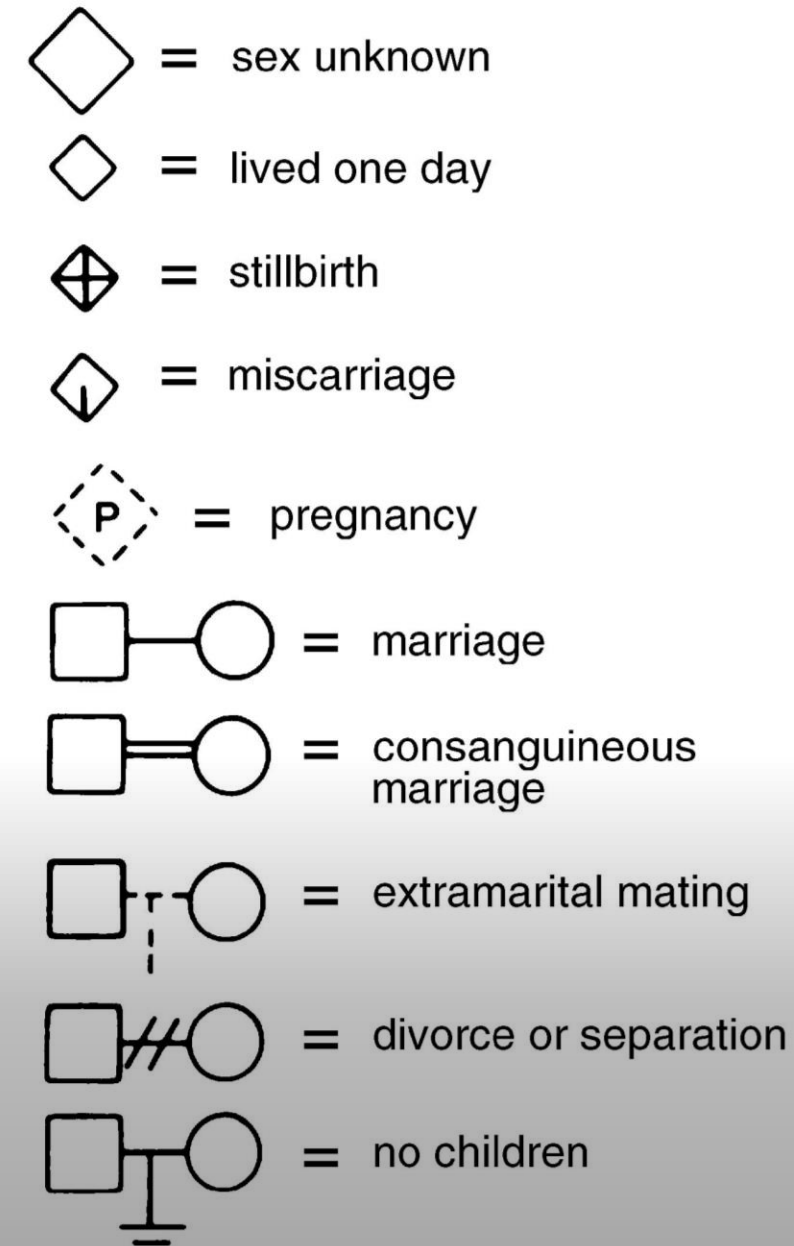
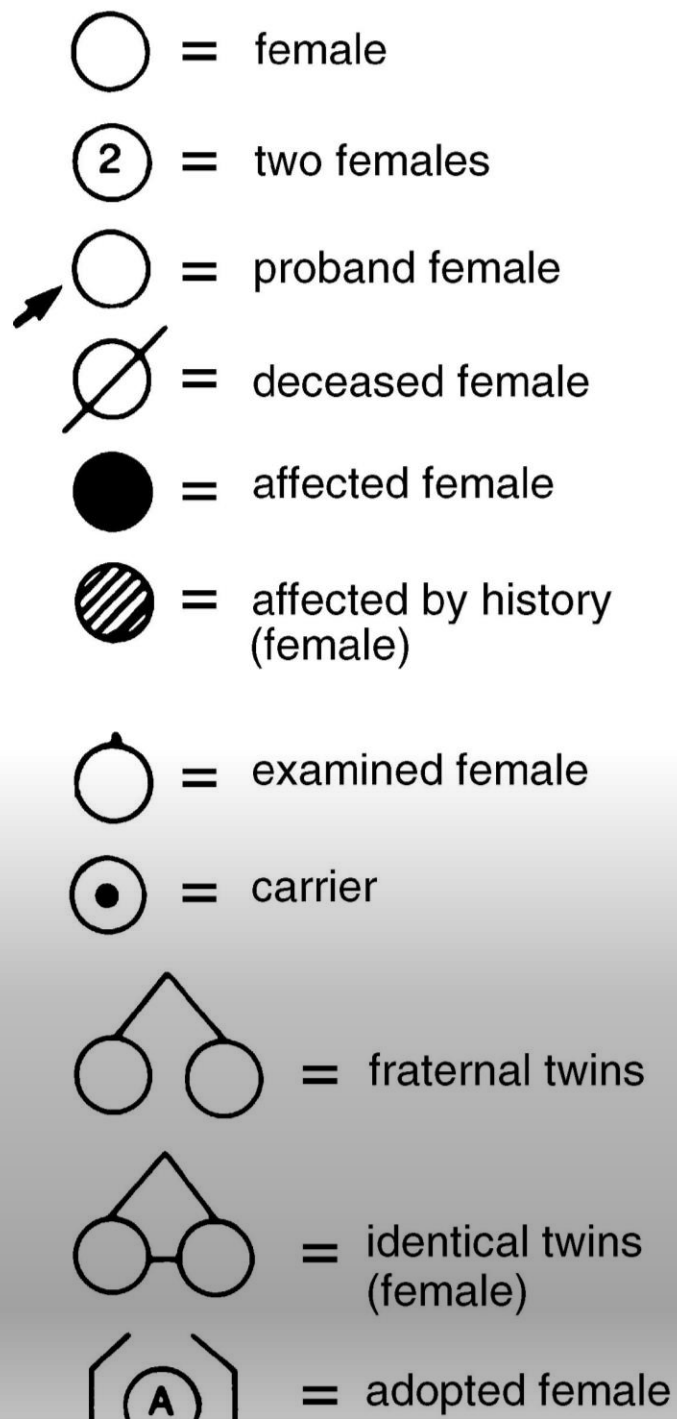
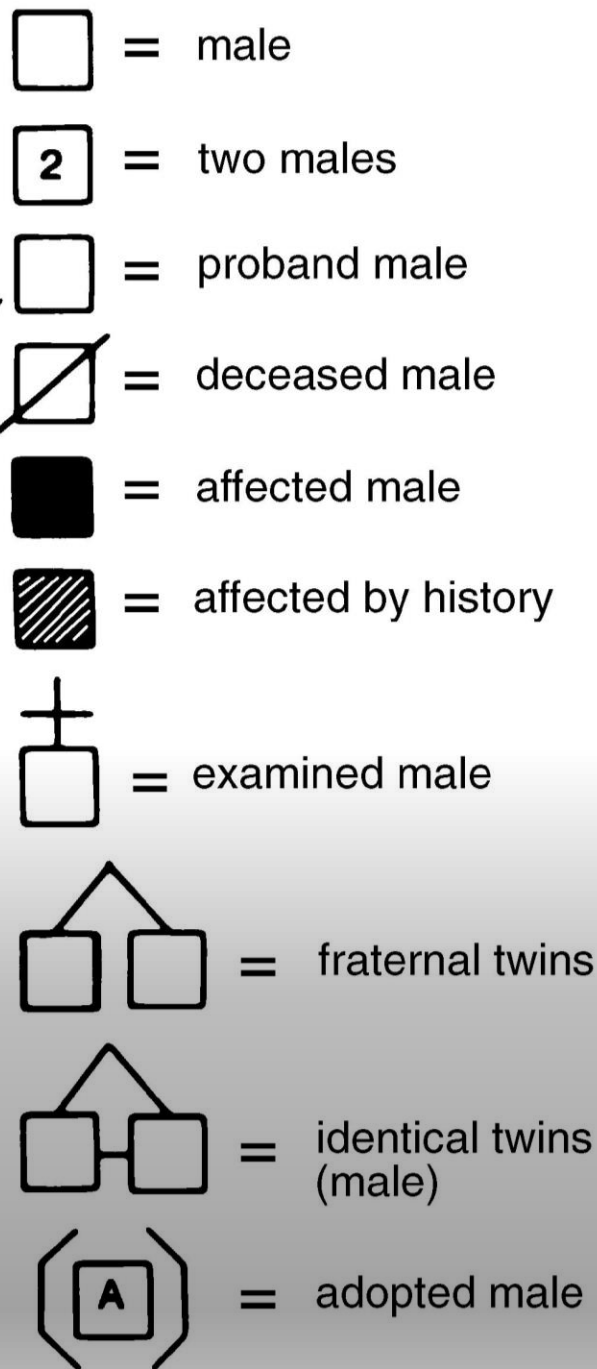
Event (N)	Observed	Expected	(O-E) ² /E

Probability level (alpha)						
df	0.5	0.10	0.05	0.02	0.01	0.001
1	0.455	2.706	3.841	5.412	6.635	10.827
2	1.386	4.605	5.991	7.824	9.210	13.815
3	2.366	6.251	7.815	9.837	11.345	16.268
4	3.357	7.779	9.488	11.668	13.277	18.465
5	4.351	9.236	11.070	13.388	15.086	20.517

Pedigree

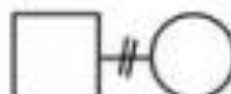
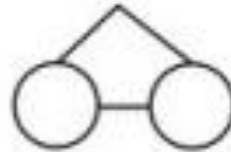
Pedigree charts are diagrams that show the phenotypes and/or genotypes for a particular organism, its ancestors, and descendants.



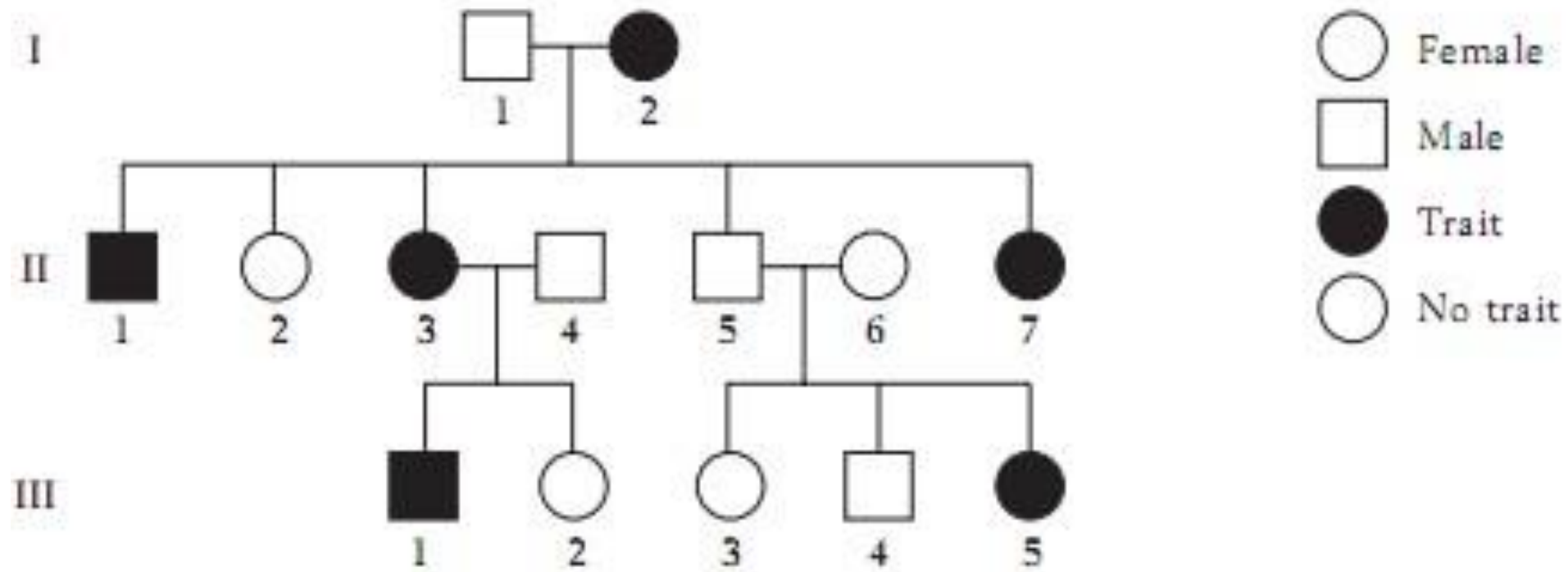


Pedigree Analysis

Simplified list of symbols

Male	Female			
		Unaffected		Marriage
		Affected		Consanguineous marriage (between close relatives)
		Heterozygous for recessive allele		Separated or divorced
		Deceased		Nonidentical twin
		Index case (propositus)		Identical twin
		Heterozygous carrier for X-linked recessive allele		

Sample pedigree chart



Uses of Pedigree

- Determine mode of inheritance
- Predict probability of the appearance of a genetic trait/disease among offsprings



Guides in Pedigree Analysis

- **Recessive Disease**

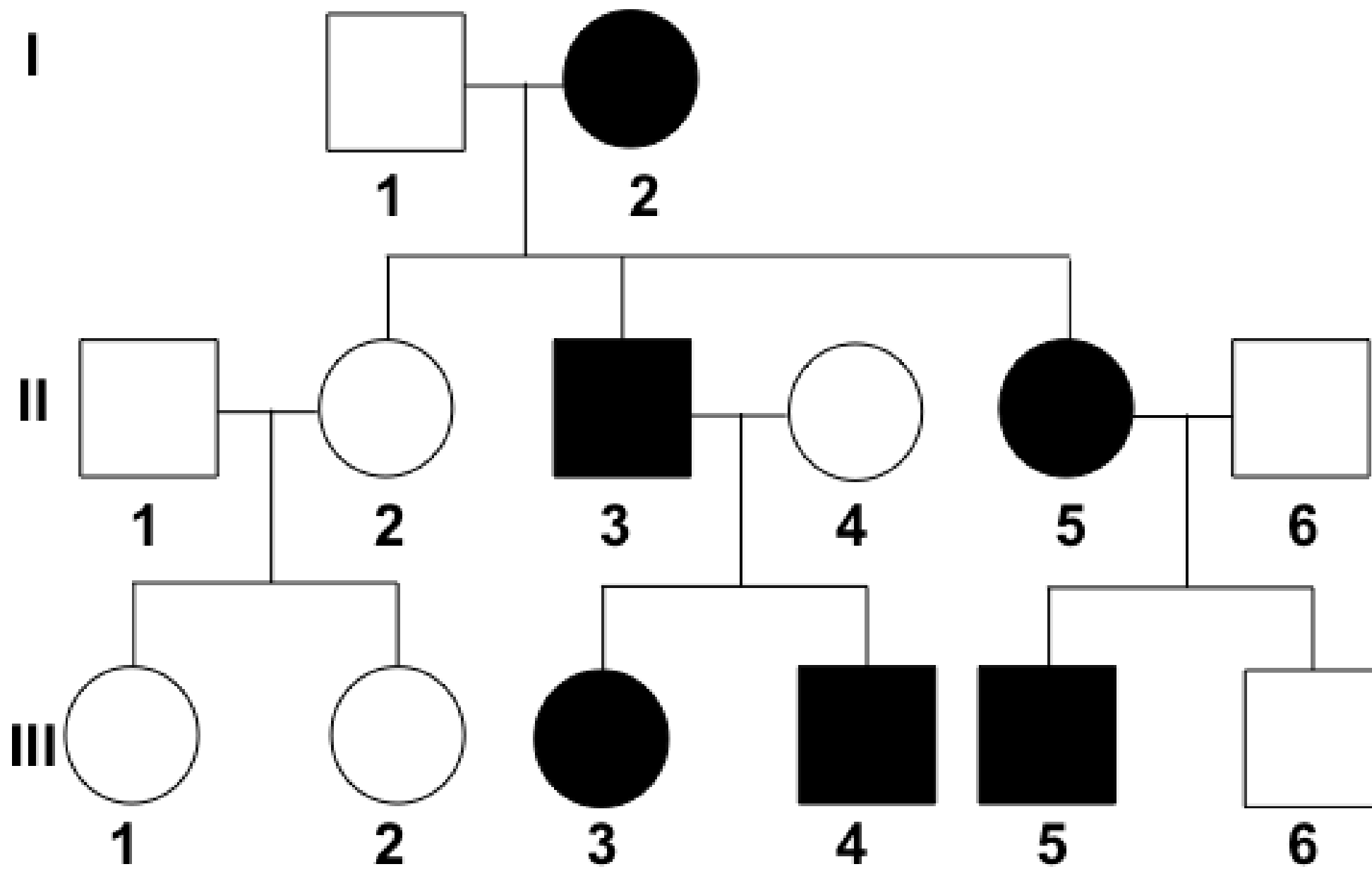
1. Parents are generally unaffected.
2. Approximately one-quarter of the siblings of an affected individual are affected (assuming both parents are carriers)
3. The probability that an additional child will be affected is $\frac{1}{4}$
4. Recessive traits often result from consanguineous mating
5. Two affected parents cannot have unaffected offspring

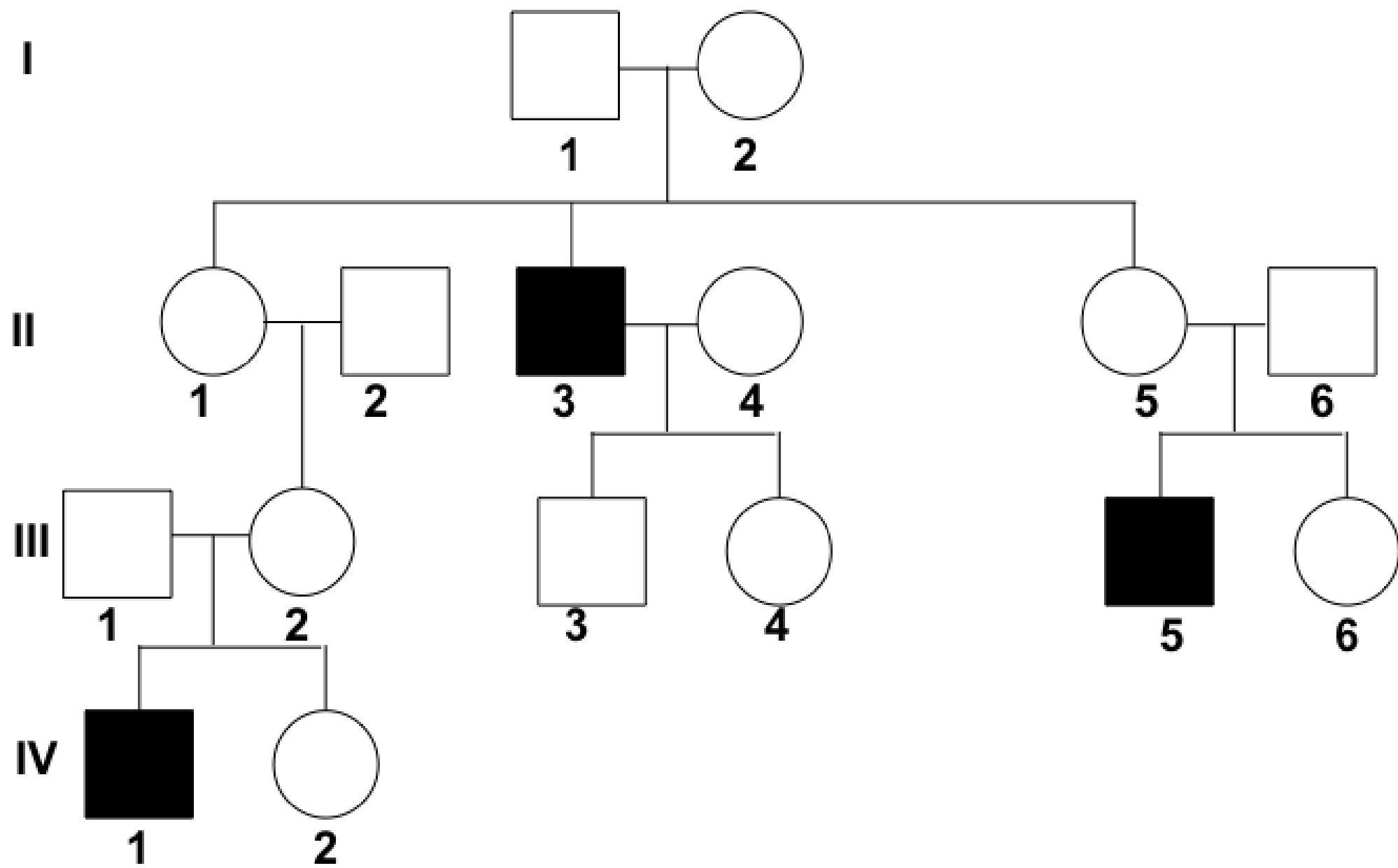
Guides in Pedigree Analysis

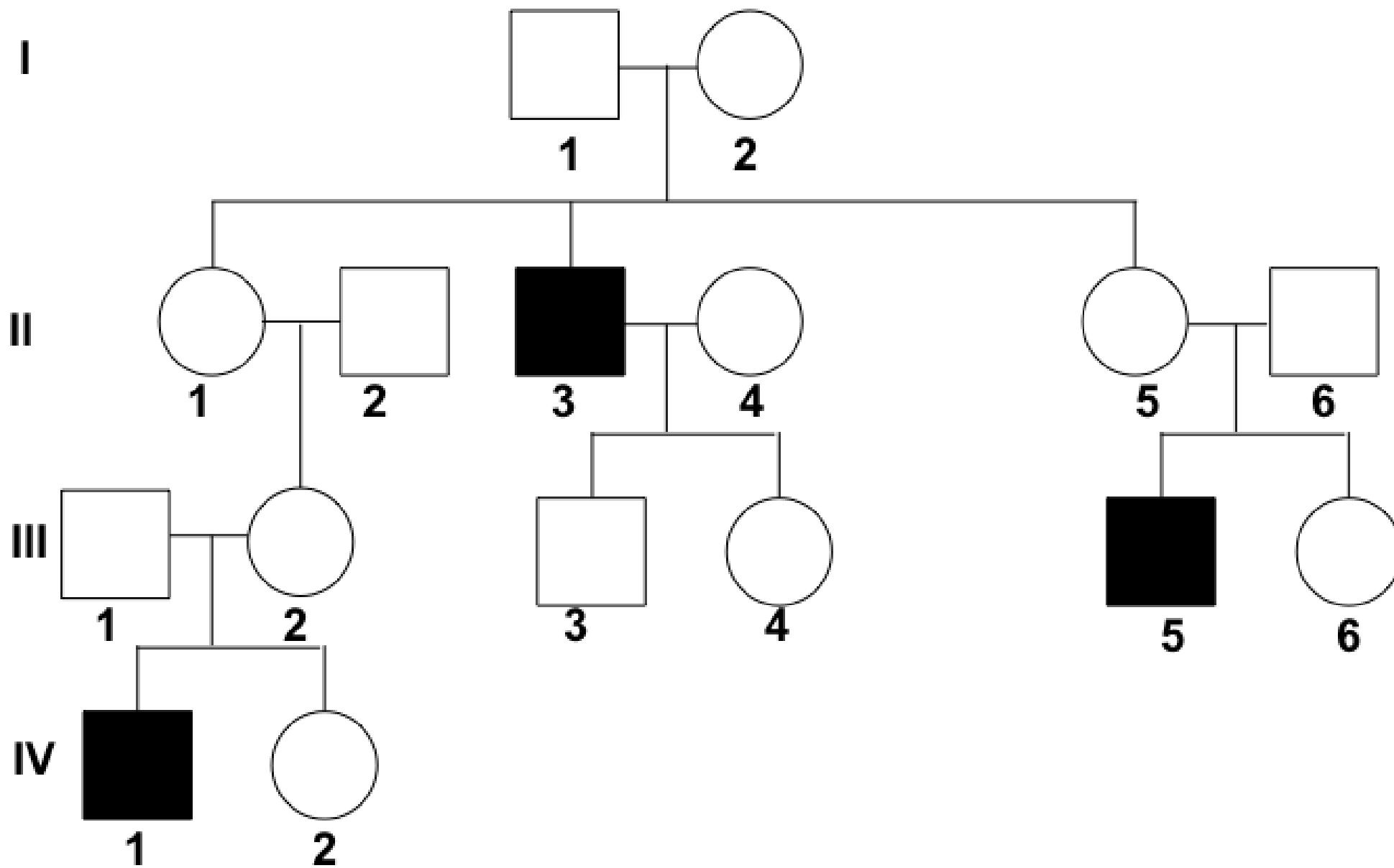
- **Dominant Disease**

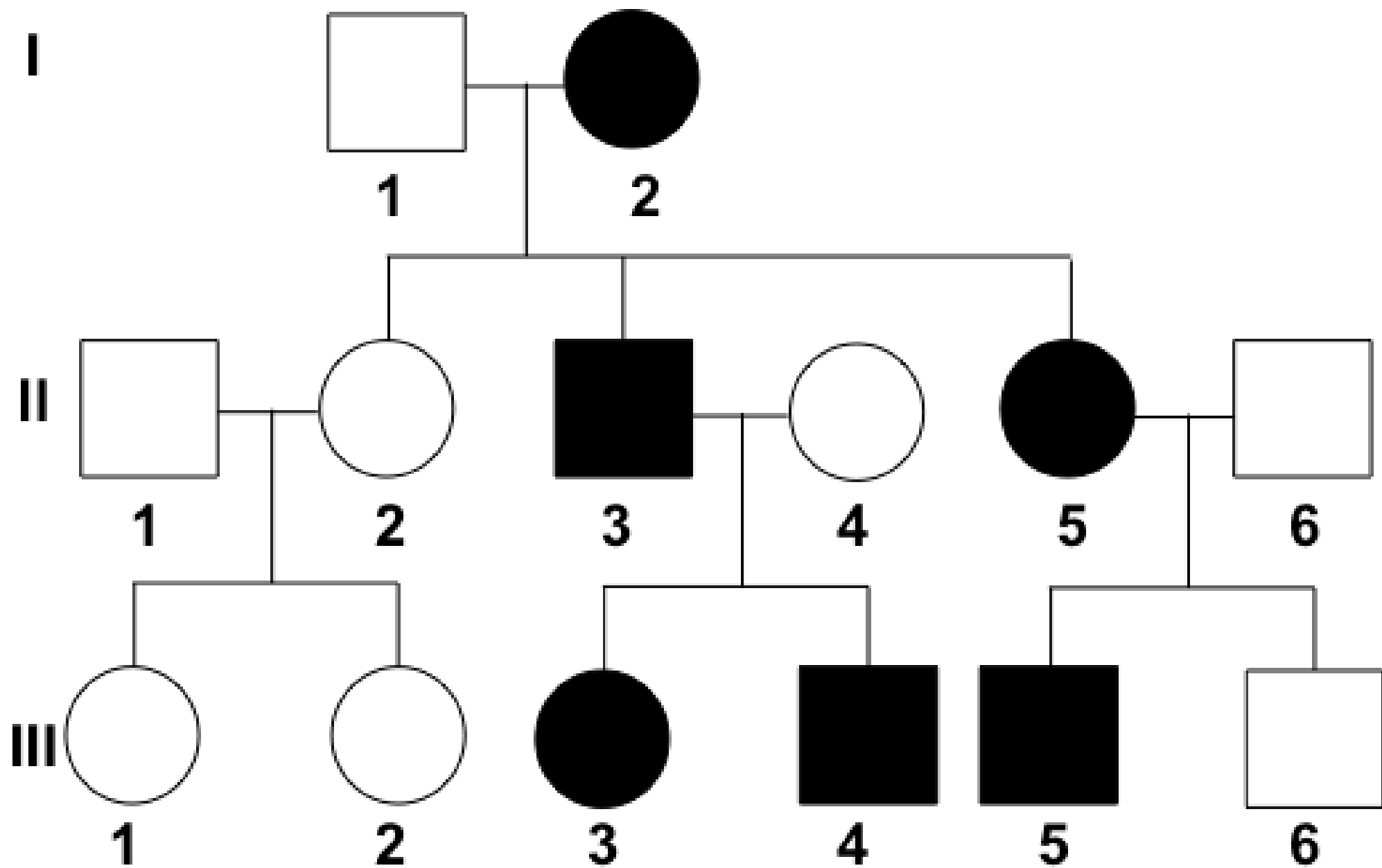
1. Trait occurs every generation (at least one parent is affected).
2. When one parent is affected, approximately one-half of progeny are affected.
3. The probability that an additional child will be affected is $\frac{1}{2}$.
4. Two unaffected parents do not produce affected offspring.
5. Two affected parents can produce unaffected offspring.

Analyze the following
pedigree as to their mode of
inheritance



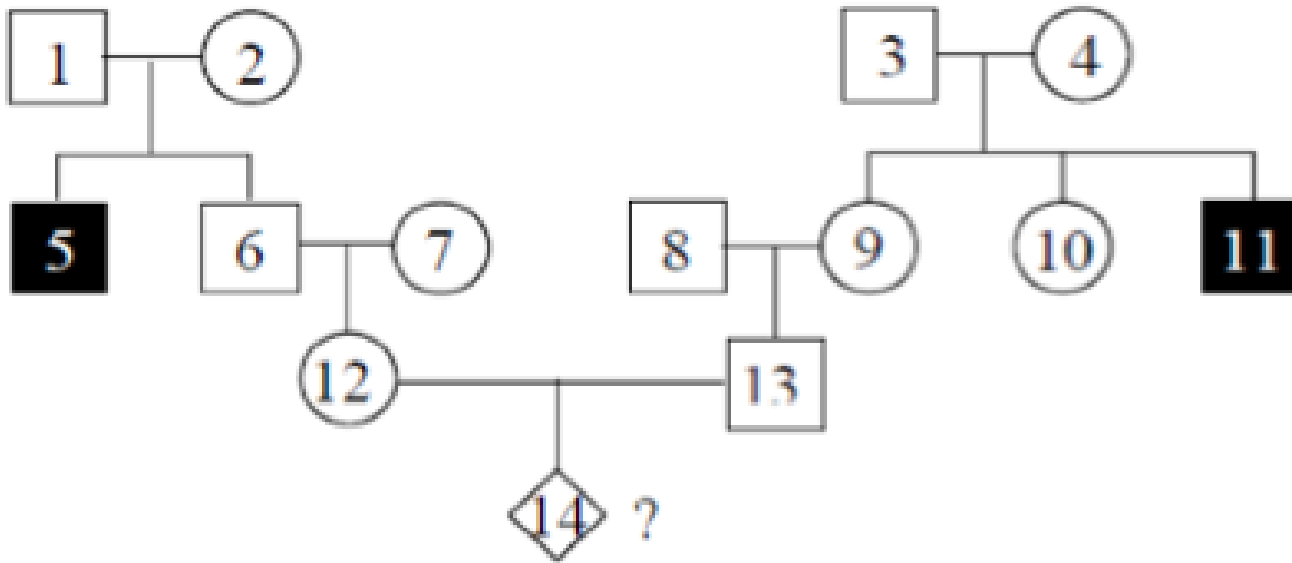






Pedigree Analysis Sample Problem

- This is a pedigree of an autosomal recessive disease, what is the probability that individual 14 will be homozygous of the recessive disease?





Fin.

PLEASE EXPECT PRACTICE
WORKSHEETS FOR THE DISCUSSED
CONCEPTS.