

## Pedigrees and Modes of Inheritance

While many disorders arise from mutations in DNA, not all individuals have the same likelihood of inheriting a disorder. The chromosome that the mutation is on can influence who can inherit the mutation and which individuals can pass the mutation down to their offspring. If the mutant allele is dominant or recessive (haploinsufficiency) also explains who is likely to have a mutant phenotype.

A mutation can reside on an autosomal chromosome or a sex chromosome (X or Y chromosome). While sex chromosomes differ between the sexes, autosomal chromosomes are the same in women and men. Because autosomal chromosomes are the same for females and males, there is no sex bias on who can inherit an autosomal mutation. A son and a daughter of the same parents are equally likely to inherit a mutation that their parent(s) have.

Pedigrees are a way to show the phenotype of many individuals in a family. By looking at a pedigree, you can determine modes of inheritance and, in some cases, determine the genotypes of some individuals. It is important to remember that the pedigree shows phenotype rather than genotype, though. To determine genotype, you must first determine the mode of inheritance and then you may need to look at the individual and their related family.

### Learning Objectives:

- Be able to read a pedigree. Know what circles, squares, shaded shapes, unshaded shapes, and dots inside of a shape mean.
- Understand why there is a different inheritance probability for the different modes of inheritance.
- Be able to correctly identify the mode of inheritance from a pedigree and explain why that is the correct mode of inheritance.

### Order of Activities:

1. Read the following article about pedigrees. <https://www.edrawmax.com/article/everything-you-need-to-know-about-pedigree-chart.html>
2. Read the introduction, modes of inheritance, and steps identifying mode of inheritance [sections of the worksheet](#) and answer the included thought questions.
3. Check your work on those questions compared to the answer key and take note of which you got wrong.
4. Read the following articles if you missed any questions or want extra guidance.
  - [https://bio.libretexts.org/Bookshelves/Genetics/Book%3A Online Open Genetics \(Nicole and Barrette-Ng\)/05%3A Pedigrees and Populations/5.03%3A Inferring the Mode of Inheritance](https://bio.libretexts.org/Bookshelves/Genetics/Book%3A%20Online%20Open%20Genetics%20(Nicole%20and%20Barrette-Ng)/05%3A%20Pedigrees%20and%20Populations/5.03%3A%20Inferring%20the%20Mode%20of%20Inheritance)
  - <https://ib.bioninja.com.au/standard-level/topic-3-genetics/34-inheritance/pedigree-charts.html>
5. Test your knowledge by completing the [corresponding worksheet section labeled "practice"](#) for this material. Attempt to first complete this on your own, then pair up with a partner or group to discuss when possible. There is an [answer key provided](#) so you can check your work. Any

questions you get wrong or confused about you should attempt to explain why the answer is correct and then complete again after you finish the activities in this guide.

6. To wrap up your understanding of modes of inheritance, write out what you would see for each mode of inheritance without using your notes/reading material. After you are finished, compare what you have written with the reading/ your notes to see what you missed.
7. After reviewing any topic, it is a good idea to have a metacognition check. Ask yourself the following questions:
  - a. What are my emotional responses to learning this material? Which material am I frustrated with and need aid in understanding?
  - b. What difficulties have I had with the learning tasks? What specific tasks will I do to master this content?
  - c. Do I understand all of the learning goals? Can I explain each of them out loud to someone clearly and concisely?
  - d. How is what I learned related to other things I have learned in this class? How is it related to other classes, my career, and my life?
8. If you would like to have more aid in learning this material, please reach out. There are numerous individuals who want to help you feel confident in your understanding. If your course has learning assistants or teaching assistant(s), you should reach out to them to review concepts you want to learn more about. Your professor is also a great resource to go to when you do not understand a topic. You can study with your peers or receive academic support through the LRC as well. If you would like help identifying how to receive the support you need, do not hesitate to contact the CU Denver Learning Resources Center at [LRC@ucdenver.edu](mailto:LRC@ucdenver.edu) or stop by our front desk in the learning commons building.