

## Probability

Probability describes the likelihood something will occur. Genetics relies heavily on probability. Every time you make a Punnett square you express the probability of an offspring having each possible genotype.

The probability you learn in this class is said to be true for “independent events”. This means that what happens in each event does not alter what happens in another event. An example of this in real life is that your neighbor’s eye color does not determine what color eye color your children will have. These are unrelated “independent” events. For your genetics course, you must learn some fundamental rules of probability and then understand what they mean for genetics.

### Learning Goals:

- Understand what probability is and what the numerator and denominator of a fraction mean in terms of possible outcomes.
- Understand how to use and when to use the sum (or) and product (and) rules.
- Be able to apply probability rules to word problems featuring real life situations including genetic outcomes.
- Use probability to find the possibility of a genotype given multiple un-interacting genes.
- Complete and understand probability tree diagrams.

### Order of Activities:

1. Read about the fundamental ideas of probability and follow practice problems using the product rule <https://www.mathsisfun.com/data/probability-events-independent.html>
2. Read about the sum and product rules. The sum rule is sometimes referred to as the “or” rule and the product rule is sometimes referred to as the “and” rule because they are used when you see such words in a word problem.  
[https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjok-bI5-j0AhUGXc0KSHkDuEQFnoECAwQAw&url=https%3A%2F%2Fsciencing.com%2Fhow-to-explain-the-sum-and-product-rules-of-probability-12750588.html&usg=AOvVaw1R9fw9\\_MrAlDn-wZB1RHma](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjok-bI5-j0AhUGXc0KSHkDuEQFnoECAwQAw&url=https%3A%2F%2Fsciencing.com%2Fhow-to-explain-the-sum-and-product-rules-of-probability-12750588.html&usg=AOvVaw1R9fw9_MrAlDn-wZB1RHma)  
When lost on which rule to use, try rewriting the situation using the word “and” or “or”.
3. Test yourself by completing the [corresponding worksheet 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 and read explanations of how to answer the problem. 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.
4. 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 aloud 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?
5. 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 (Learning Resources Center) 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.