**Math, Genes, and You**

Week 4, Day 1: Inheritance Models

**Plan for today**

Genetics news

Group activity: Problem set 3

Group activity: Choose topic for group projects

Lecture: Inheritance models

**Group projects**

* We will form groups of 3-4 students. Each will be assigned an instructor or TA to help them
* Groups will get 10-20 minutes during each class to work on projects and can also use open math time
* Students will present their work on the last day of class
* Possible projects
  + Construct the pedigree for your family and follow the inheritance of a trait
  + Calculate how much DNA you share with a distant relative
  + Predict the results of a cross between two individuals using Punnett squares and different inheritance models
  + Infer allele frequencies from trait frequencies using an inheritance model
  + Generalize Hardy-Weinberg equilibrium for polyploid organisms
  + Describe a real genetic variant and determine whether it is in Hardy-Weinberg equilibrium
  + Propose your own projects!

**Definitions**

**Phenotype** – The observable characteristics of an organism

**Additive** – A trait where AB individuals have an intermediate phenotype between AA and BB. Example: Hair color.

**Dominant** – A trait where individuals one (Aa) or two alleles (AA) have the same phenotype. Example: Blood type A vs O.

**Recessive** – A trait where individuals need two alleles (aa) to have the phenotype. Example: Blood type O vs A.

**Complex** – A trait that is influenced by many genes. Example: height. Also called **polygenic**.

**Examples**

**Example 1:** Assume ABO blood type is determined by genotype at a multi-allelic variant with alleles A, B, and O in the following fashion:

|  |  |
| --- | --- |
| Genotype | Phenotype |
| AA | Blood type A |
| AB | Blood type AB |
| AO | Blood type A |
| BB | Blood type B |
| BO | Blood type B |
| BO | Blood type O |

What would be the expected results of a cross between a type A and a type O individual?

If type A individual is AA:

|  |  |  |
| --- | --- | --- |
|  | **A** | **A** |
| **O** | AO | AO |
| **O** | AO | AO |

All offspring will be type A.

If type A individual is AO:

|  |  |  |
| --- | --- | --- |
|  | **A** | **O** |
| **O** | AO | OO |
| **O** | AO | OO |

½ of the offspring will be type A, ½ will be type O.