



Hands-on Genetics Activity 2

Topic: Human Genetics and Pedigrees

Learning Objective: Students will be able to see the frequency of human traits in the class. From there, they will learn how pedigrees are used and show how these traits are passed through generations.

Alignment with NGSS Grades 3-5

Science and Engineering Practices

Analyzing and Interpreting Data

- Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.
- Analyze and interpret data to make sense of phenomena using logical reasoning.

Disciplinary Core Ideas

LS3.A: Inheritance of Traits

- Many characteristics of organisms are inherited from their parents.

LS3.B: Variation of Traits

- Different organisms vary in how they look and function because they have different inherited information.

Materials:

Pencils (114, Shelf), Colored Pencils/Crayons (114, cab), copies of Pedigree Worksheet (5 per class), Extra paper

Detailed Description

Using the traits listed below, ask the students who has which traits and keep a tally. Keep track on the whiteboard. Allow the students to make observations on the numbers and see what traits are frequent or not (add data throughout the day from each class). From there, start the lesson on pedigrees to see how these traits are could be passed through generations. Allow students to make their own pedigrees if they feel comfortable with the material. If time allows, do board races.

How will you conclude the lesson to enforce the learning objective?

If time permits, allow students to present their pedigrees and how they traced traits.

What science process skills will this lesson exercise?

Observing, Inferring, Classifying, Predicting, Acquiring Data, Analyzing Data

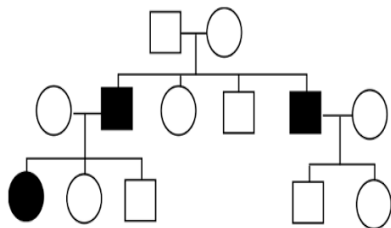
Safety precautions: None

For the board:

	Trait	Amount with trait
1.	Tongue Rolling	
2.	Widow's Peak	
3.	Hitchhiker's Thumb	
4.	Hand clasping, left over right thumb	
5.	Arm folding over chest/stomach... which is on top?	
6.	Attached earlobe	
7.	Cleft chin	
8.	Curly Hair	
9.	Eye color	
10.	Male or Female	
11.	Dimples	
12.	Allergies	
13.	Colorblind	
14.	Freckles	
15.	Righthanded	

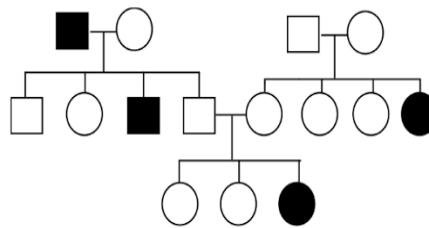
Example Pedigrees:

1. *Albinism* is a recessive disorder affecting humans. If someone has this disorder, they can not produce skin pigment, and have the genotype aa. The pedigree below shows people with *albinism*.



- On the pedigree, mark each person's genotype. If a dominant individual's genotype is unknown, write A__.
- How many people have the disorder?
- Both generation I-1 and I-2 must have what genotype? _____
How do you know?
- If generation III-4 marries an albino woman and has a child, what is the probability that the child will have the disorder? Use a Punnett square to justify

2. Some groups of people in rural Kentucky are affected with a skin disorder called *Blue offspring*, where the skin appears to be bright blue. The pedigree below shows people who have this disorder.



- How many individuals have the *Blue offspring* disorder?
- Look at generation I-3 and I-4. Neither of these people have the disorder, but their last daughter, II-8 does. What does this tell you about the disorder? Use a Punnett square to justify your answer.
- Fill in the genotypes for the pedigree, using the letter B.
- If generation III-3 marries a pure dominant normal male, what is the probability of each of their children having the disorder? Use a Punnett square to justify your

Class Notes

Review:

Homozygous Dom and Rec/Heterozygous
Genotype/Phenotype

New Material:

Vocab: Pedigree, Carrier, Generation

Symbols:

Male (square) and Female (circle)

Highlighted portion has the trait

Carrier: half shaded

Married: horizontal line connecting

Carrier: has one recessive allele (little letter)

Generation labeled by Roman Numeral

oldest at top, current at bottom

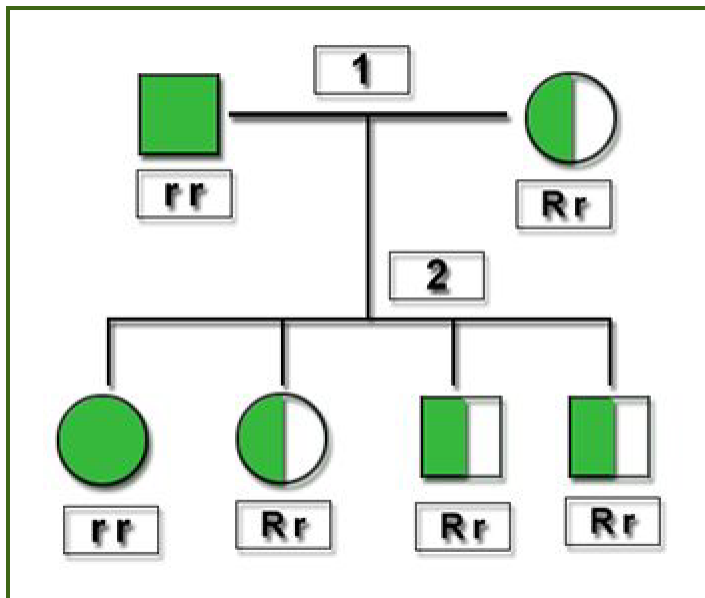
siblings: oldest to left

Dominant traits never skip a generation

Board Races:

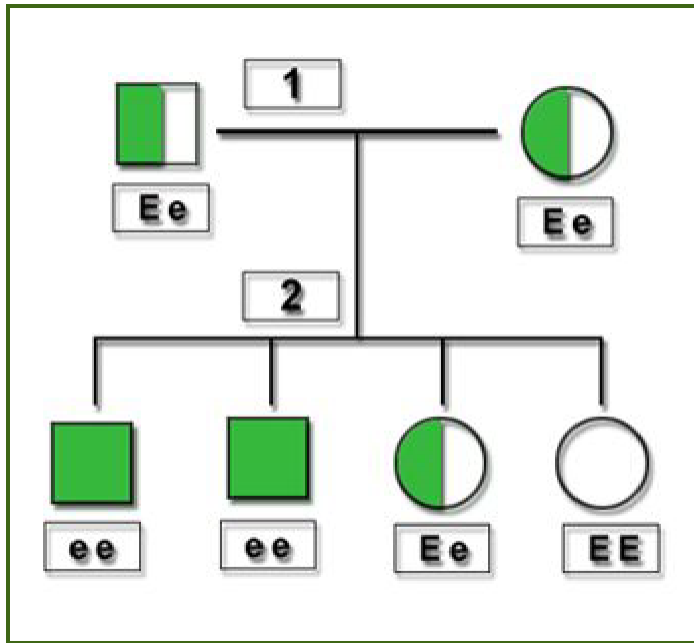
Trait: Can't roll tongue (highlighted)

A father cannot roll his tongue but a mother can. Of their four children, one daughter cannot roll her tongue. The other daughter and both sons can roll their tongues.



Trait: Blue eyes (highlighted)

A father and a mother both have brown eyes. Their two sons have blue eyes and their two daughters have brown eyes. One daughter carries the gene for blue eyes, the other doesn't.

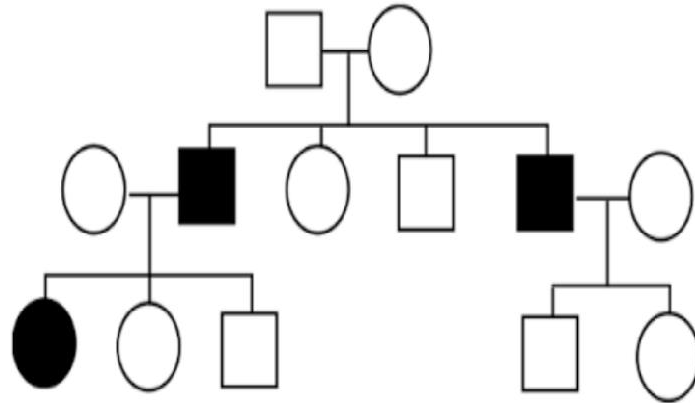


Trait: Diabetes (highlighted)

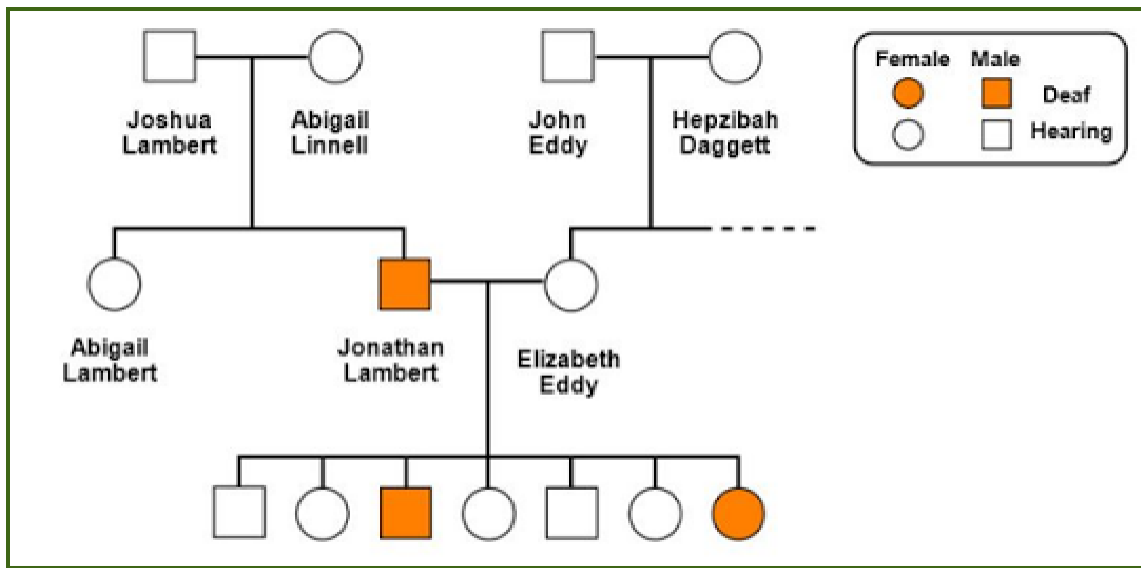
A father carries the recessive gene for diabetes and a mother does not (generation 1). They have two children (generation 2), a daughter and a son. The daughter does not suffer from diabetes and marries a man who does not carry the gene for diabetes. They have one child, a girl who is a carrier (generation 3). The son marries a diabetic woman and they have two boys, both who suffer from diabetes (generation 3).

Trait: Albinism (highlighted)

1. *Albinism* is a recessive disorder affecting humans. If someone has this disorder, they can not produce skin pigment, and have the genotype aa. The pedigree below shows people with *albinism*.



Trait: Deafness (highlighted)



Trait: Bright Blue Skin (highlighted)

2. A group of people in rural Kentucky are afflicted with a kind of disorder called *offspring*, hereditary kinship to be bright blue. The pedigree shows how people have this disorder.

