

Family Trees and Pedigrees

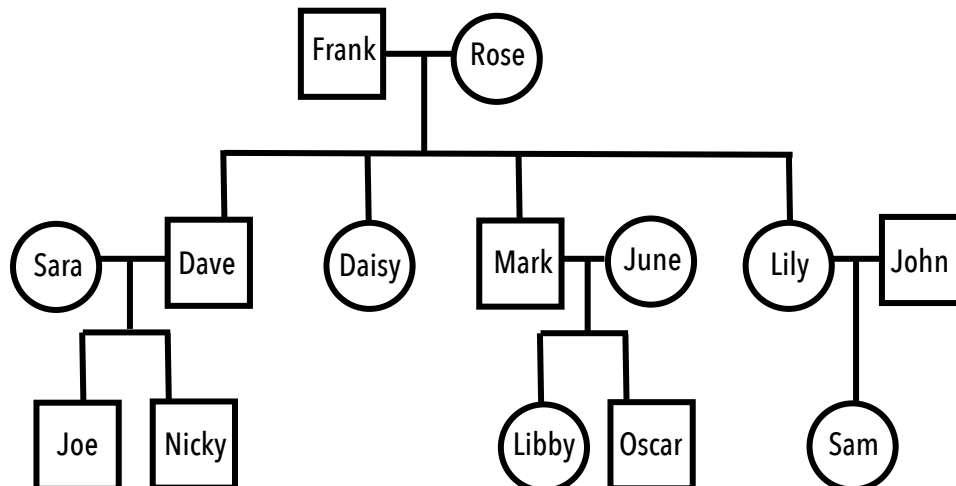
Do you have certain traits that are common in your family? Is it the shape of your nose or having a bunch of freckles? Sometimes family genetics can be very obvious and are seen in almost every generation. However, traits will occasionally appear that are somewhat unexpected.

A great example of this is red hair! Red hair is the result of a mutation in a gene called MC1R (melanocortin 1 receptor) that give us our hair color. When someone has two copies of that allele, their body produces more of a pigment called pheomelanin, which creates a reddish hair tone. Those with an unmutated MC1R gene produce more of a pigment called eumelanin, which produces darker tones like browns and blacks. It takes both parents having the allele for red hair for the child to be redheaded, as it is a recessive trait. (There are other factors in hair color, but for now we'll keep to this simpler explanation).

We can trace the inheritance of the MC1R allele through families using something called a pedigree chart (sometimes also called a family tree). This pedigree shows familial relationships and marriage lines in a visual format.

Male individuals are represented by squares and females are represented by circles. Marriage lines are **—** between individuals (for example, Frank and Rose) and each generation is on its own line (Frank and Rose's children are the row below them and directly connected). Take a look at the example below and see if you can identify:

1. How are Mark and Sam related?
2. Who is Joe's grandfather?
3. Who are Sam's cousins?
4. How many siblings does Mark have?



ANSWERS

1. Mark is Sam's uncle
2. Joe's grandfather is Frank
3. Sam's cousins are: Joe, Nicky, Libby, and Oscar
4. Mark has 3 siblings (Dave, Daisy, and Lily). Sara and June are his sisters-in-law and John is his brother-in-law.



Activity

Materials Needed:

- Family Pedigree Printout
- A writing utensil to make notes

Pedigrees can get really big as you add more generations. We'll keep this one simple.

You are going to analyze a pedigree to answer a couple questions about the inheritance of red hair in a particular family. Take a look at the "Family Pedigree" document. In this case, Tom and Jane are expecting their first child. Jane's cousin, Mary, recently had a son, Theo, who has red hair. Jane is curious what the chances are that her child will be a redhead.

Knowing that the allele for red hair is recessive, we will use 'r' to represent it. What will the genotype be for someone who is redheaded? (Answer: rr).

Use what you learn below about each person and go through the pedigree to assign the genotypes you know.

1. Jane's aunt, Sarah, had red hair
2. Theo has red hair
3. No one in Tom or Jack's family has red hair
4. None of Jane's siblings have red hair

See if you can answer the following questions (answers on next page)

1. What are the genotypes of Jane's grandparents?
2. What is Jack's genotype?
3. What is the probability that Jane's child will have red hair?

ANSWERS:

1. Both must be Rr- it's the only way their child could have a rr genotype
2. Rr
3. It depends. We don't know Jane or Tom's genotypes for certain; they are either RR or Rr. If both are Rr, then the child has a 25% chance of having red hair. If either Jane or Tom has a genotype of RR, the child won't be redheaded.

Extensions:

-What if one of Jane's nieces had red hair? Would that change the chances of Jane's child having red hair?

(Answer: Not really. You would know that both of Jane's parents must be Rr, which would mean Jane has a 50% chance of also being Rr. Not knowing Tom's genotype, though, it is still just a guess)

-Create your own family pedigree. Do you have red hair or another unusual trait you can track through the generations?