Patch in the Pedigree

Use family observations to trace inheritance and predict risk.

GEN.4.4 "Construct pedigrees from observed phenotypes. Analyze and interpret data to determine patterns of inheritance and disease risk."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the sentence that explains how to connect generations in a pedigree, then circle each affected person's name in the family table.

A Pattern in the Family

1. At a neighborhood clinic, a counselor investigates a fictional condition that causes a pale patch of hair from birth. For this case, one gene on a non-sex chromosome controls the patch. Affected people always show it, and no new mutations occur. The counselor records who has the patch before making a pedigree.

2. A pedigree uses squares for males, circles for females, and shading for people who show the trait. A horizontal line joins partners, while a line downward leads to their children. A family record can be turned into this map by placing older generations above younger ones. The clinic's observations appear in the table.

FAMILY OBSERVATIONS

Generation	People and observed traits	Relationship
I	Elena, female, no patch; Marco, male, no patch	Partners
II	Rosa, female, patch; Theo, male, no patch	Children of Elena and Marco
II	Nia, female, no patch	Theo's partner
III	Ava, female, patch; Ben, male, no patch	Children of Theo and Nia

3. To test an inheritance pattern, compare parents and children, not just the total number affected. In a recessive model, a person with one copy of allele a can look unaffected; a person with two copies shows the trait. Each pregnancy is a new event with its own probability, so a sibling's phenotype does not change the next child's odds.

2 ANSWER WITH EVIDENCE

Use the passage

1. In a pedigree of generations I and II, how would you connect Elena, Marco, Rosa, and Theo? Which symbol would you shade?

2. Which observation rules out a simple dominant pattern for the patch, given the passage's assumptions?

3. Under a recessive model, which four unaffected adults must each carry one copy of allele a? Use the family relationships to explain.

4. What is the chance that Theo and Nia's next child will have the patch? Does Ben's lack of a patch change that chance?

3 YOUR TURN

Your own words

Draw a three-generation pedigree for everyone in the table. Add Ivo, an unaffected male whose genetic test shows he carries allele a, as Rosa's partner; then state the chance that their first child will have the patch and explain why.

ANSWER KEY

Patch in the Pedigree

PART 1 · READ AND MARK

Underline the sentence that explains how to connect generations in a pedigree, then circle each affected person's name in the family table. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	In a pedigree of generations I and II, how would you connect Elena, Marco, Rosa, and Theo? Which symbol would you shade?	**Connect Elena and Marco as partners, with Rosa and Theo below them as their children. Shade Rosa's circle only.**
2	Which observation rules out a simple dominant pattern for the patch, given the passage's assumptions?	**Elena and Marco have no patch, but their daughter Rosa has one. With full penetrance and no new mutations, two unaffected parents cannot have an affected child under a simple dominant model.**
3	Under a recessive model, which four unaffected adults must each carry one copy of allele a? Use the family relationships to explain.	**Elena and Marco must carry a because Rosa is affected. Theo and Nia must carry a because their daughter Ava is affected.**
4	What is the chance that Theo and Nia's next child will have the patch? Does Ben's lack of a patch change that chance?	**The chance is 1 in 4. Ben's phenotype does not change the chance for a new pregnancy.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The pedigree shows unshaded Elena and Marco connected as partners, with shaded Rosa and unshaded Theo below them. Unshaded Nia is connected to Theo, with shaded Ava and unshaded Ben below them. Unshaded Ivo is connected to Rosa. Rosa has two copies of a, and Ivo carries one, so their first child has a 1 in 2 chance of having the patch.

Accept equivalent pedigree layouts with circles for females, squares for males, and correct shading and family connections. The risk for Rosa and Ivo is 1 in 2 for each child.