

### Were the babies switched?

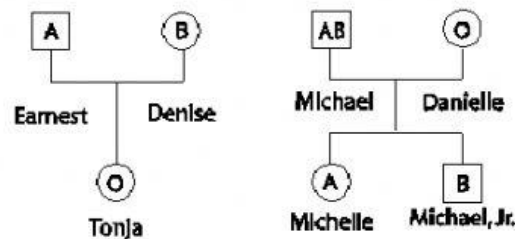
Two couples had babies on the same day in the same hospital. Denise and Earnest had a girl, Tonja. Danielle and Michael had twins, a boy, Michael, Jr., and a girl, Michelle. Danielle was convinced that there had been a mix-up and she had the wrong girl, since Michael Jr. and Tonja were both light-skinned, while Michelle was dark skinned. Danielle insisted on blood type tests for both families to check whether there had been a mix-up. In order to interpret the results of the blood type tests, you will need to understand the genetics of blood types.

### Blood Types

The ABO blood type system is the major blood type classification system that determines which type of blood can safely be used for a transfusion. The four blood types in the ABO system are Type A, Type B, Type AB, and Type O. These blood types refer to different versions of carbohydrate molecules (complex sugars) which are present on the surface of red blood cells.

### Were the babies switched?

Now you are ready to evaluate whether Earnest and Denise's baby girl was switched with Michael and Danielle's baby girl. The following family trees show the blood types for each person in both families.



5. What is Danielle's genotype? \_\_\_\_\_

Michael can produce sperm with either the \_\_\_\_\_ allele or the \_\_\_\_\_ allele.

Draw the Punnett Square that shows the possible genotypes for Danielle and Michael's children. Write in the blood type for each genotype to show the possible blood types for Danielle and Michael's children.


Is it possible for Danielle and Michael to have a child who has type O blood? \_\_\_\_\_

To check whether Earnest and Denise could have a baby with Type O blood, draw a Punnett square for a father who has either heterozygous type A or homozygous type A genotype and a mother who has either heterozygous type B or homozygous type B genotype. Do the work on a separate piece of paper and answer the questions.

What are the possible blood types for their children. Check all that apply.

Type A      Type B      Type AB      Type O

Were Earnest and Denise the parents of Tonja?

### Why do the twins look so different?

Now, Danielle wants to know how her twins could look so different, with Michelle having dark skin and Michael Jr. having light skin. First, Danielle needs to understand that there are two types of twins. Identical twins come from the same zygote when a developing embryo splits in two, so identical twins have exactly the same genes. Fraternal twins, the result of two separate eggs, each fertilized by a different sperm.

To understand how one of the twins could have light skin and the other dark skin, we will consider two alleles of one of the genes for skin color.

Genotype	Phenotype (skin color)
<b>BB</b>	dark brown
<b>BT</b>	light brown
<b>TT</b>	tan

Notice that for this gene a heterozygous individual has an intermediate phenotype, halfway between the two homozygous individuals. This is called **incomplete dominance**.

The parents, Michael and Danielle, both have light brown skin and **BT** genotype. Draw a Punnett square to show how these parents could have two babies with different color skin – one dark brown and the other tan.