

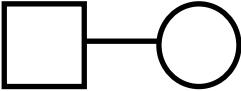
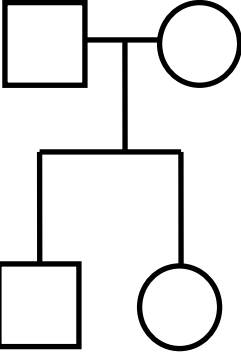





Name \_\_\_\_\_ period \_\_\_\_\_  
 date assigned \_\_\_\_\_ date due \_\_\_\_\_ date returned \_\_\_\_\_

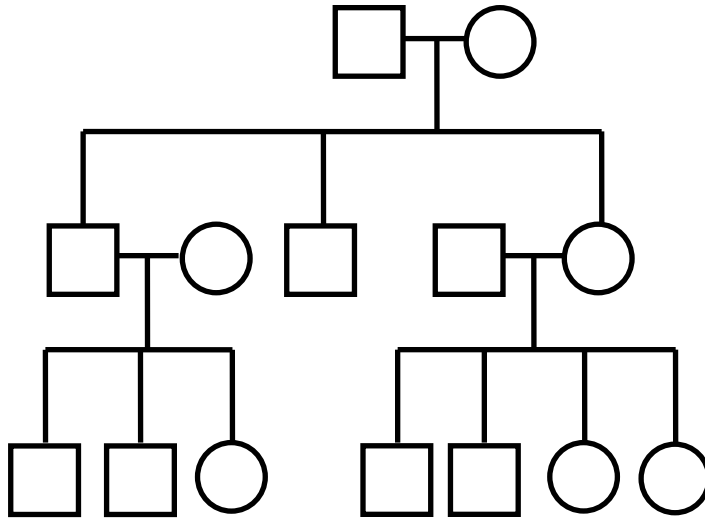
## Pedigrees

1. Geneticists use pedigrees to:
  - a. study human genetic \_\_\_\_\_.
  - b. predict the \_\_\_\_\_ that a person has or \_\_\_\_\_ a specific \_\_\_\_\_.

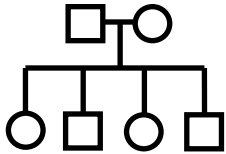
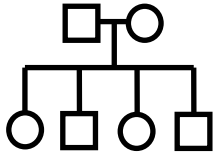
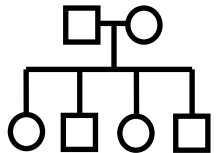
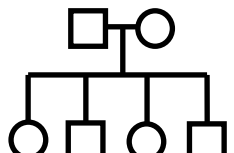
2. Common pedigree symbols:

Symbol	Meaning
	
	
	
	
	
	
	

3. Label and number the following pedigree correctly.

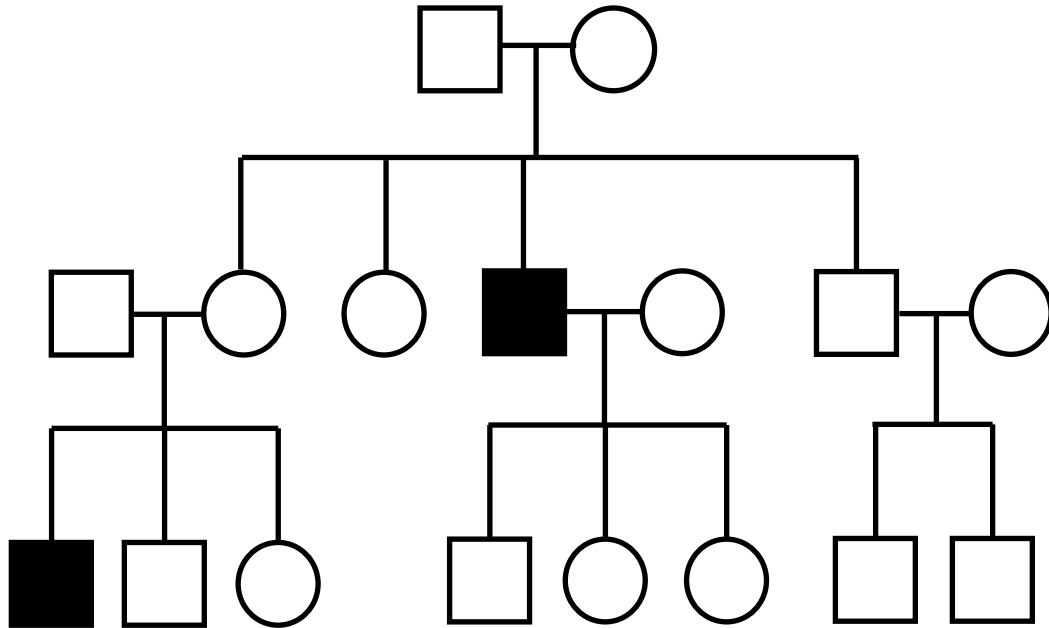


4. Complete the table by adding in the information about each inheritance pattern.

Inheritance Pattern	Facts	Examples
Autosomal Dominant		
		
Autosomal Recessive		
		

Inheritance Pattern	Facts	Examples
X Linked Recessive		
X Linked Dominant		
mitochondrial inheritance		

Pedigree



**43** According to the diagram, which individuals have the trait that is traced by the pedigree?

- A 2 and 3
- B 6 and 10
- C 2, 3, 14 and 15
- D 2, 3, 6, 10, 14 and 15



**44** What genetic disorder was found in the Russian royal family?

- A measles
- B AIDS
- C hemophilia
- D cystic fibrosis

## Science and History Pedigree Chart Russian Royal Families

Learning about genetics is interesting, but have you ever wondered if genetics can play a role in history? Today you are going to read a remarkable story from Russian history, and you will also learn how geneticists use pedigree charts to help them learn more about disease.

You will follow these instructions to learn how to fill out a pedigree chart. Each time you see the word **STOP** you should go to the pedigree chart and follow the instructions given.

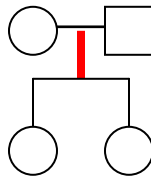
In a pedigree chart, women are represented with circles  and men are represented by squares . Each individual is then numbered. They are numbered top to bottom, left to right. On your pedigree chart number the individuals. The first three are done for you as an example.

**STOP – number all of the individuals on the pedigree chart.**

On a pedigree chart, people joined by a horizontal line are married.



Vertical lines indicate children.



For example, Queen Victoria and Prince Albert's children are numbers 4, 5, 7, 9, 10, 11, 12, 14, and 15.

**1. Which numbers are the children of 7 and 8?** \_\_\_\_\_

The two individuals at the top of the page were a very famous couple, Queen Victoria and Prince Albert. Queen Victoria was the queen of England during most of the 19<sup>th</sup> century. Cities, streets, states, architecture and clothing styles have been named after her. Something that many people don't know, however, is that she was a carrier of a recessive gene for the deadly disease hemophilia. She didn't have the disease; she just carried the recessive gene for it. This disease prevents blood from clotting. A child with hemophilia could possibly bleed to death from a simple cut. Before modern medicine helped these children with their uncontrolled bleeding they often died within the first six or seven years of life.

Queen Victoria (#1) was a carrier for this disease and so were numbers 7, 15, 20, 22, 24 and 26. All carriers should be colored blue.

**STOP – color all hemophilia carriers blue (1, 7, 15, 20, 22, 24 and 26)**

**2. What do all of the carriers have in common?** \_\_\_\_\_



Prince Leopold

Queen Victoria passed this gene on to three of her children. This meant that two daughters were carriers and one son had the disease. Leopold (#14), lived long enough to be married and have children of his own. This disease was passed on through several generations of Queen Victoria's family. This eventually led to tragic consequences for most of the royal families of Europe. Individuals 14, 21, 28, 29, 34, 35, 36, 42, 44, 45 and 46, all had hemophilia.

**STOP – Color all of those who had hemophilia red (14, 21, 28, 29, 34, 35, 36, 42, 44, 45, 46)**

**3. What do all those with hemophilia have in common?** \_\_\_\_\_

Royal families usually marry into other royal families. Queen Victoria's children, grandchildren, and great-grandchildren became part of the royal families of Norway, Prussia, Russia and Spain. It is now that we want to turn particular interest to her family that ended up in Russia.

**4. What relation is number 22 to Queen Victoria?** \_\_\_\_\_

Number 22's name was Alexandra. She married the Tsar (king) of Russia. His name was Nicholas II. They had four daughters – Olga, Tatiana, Maria and Anastacia. Still, they wanted a son so the Russian crown could be passed to him. Finally, they had a little boy they named Alexis. Alexis is number 41.

Tsar Nicholas II,  
Alexandra and  
their 5 children



Alexis' parents were consumed by his illness. Once Alexis was on a ship and he fell and bumped his knee. By the time they returned home, two days later, Alexis was swollen and purple (a gigantic bruise) from ankle to hip. The incident nearly killed him. Tsarina Alexandra constantly worried that the little Tsarevich (prince) would die. She contacted physicians and holy men from all over Europe to try and find a treatment for her son.

**5. What can you say about Alexis (does he have hemophilia)?** \_\_\_\_\_

One day, a man named Rasputin came to the palace. He claimed that he could cure the boy. Desperate, his parents agreed to let him try. Historical sources don't tell us what Rasputin did, but whatever it was, it actually worked. Alexis felt better and was able to be more active without so much worry about being hurt. The king and queen were overjoyed and paid Rasputin huge sums of money and allowed him to stay at the palace.



Rasputin  
6

But Rasputin was a very bad man. He continued to extract large sums of money and to live at the palace. He set himself up as a necessary advisor to the Tsar and began to give Tsar Nicolas bad advice about how to treat his people. In 1917, the common people seized Nicholas and his family from their home and took them to Poland, where they were all assassinated and their bodies hidden. The Russian monarchy was overthrown by the working class.

The story of what hemophilia did to the Russian monarchy is very sad. In addition to this, Alexis had six second cousins also die of the disease.

Color all of the normal individuals yellow except for numbers 37, 38, 39 and 40 – these children died too early to know if they had the disease.

**STOP – color all normal (unaffected) individuals yellow.**

The current Queen of England came through Edward VII (#5) and Alexandra of Denmark (#6). Her mother was number 33. There is no hemophilia in that line.

**Complete the following statement by using inferences (common sense). Circle the right answer choice.**

It seems likely that mothers fathers are carriers for hemophilia and they pass it on to their sons daughters. It is also interesting that although there were no cases in the parents, there is only one case in the second generation, 3 in the third, and seven in the last generation. It seems to show up more less often with each generation. Are all daughters carriers? yes no. Do all sons get the disease? yes no.

What type of inheritance pattern is this? (Autosomal dominant, autosomal recessive, X-linked dominant, X-linked recessive) \_\_\_\_\_

To complete the assignment, read back through and label all of the important individuals. You should have names next to 1, 2, 5, 6, 14, 22, 23, 33, 37, 38, 39, 40 and 41. #1 and #2 have been done for you as an example.

### Hemophilia Pedigree Chart for Queen Victoria and Prince Albert

To make the chart less complicated, 10 individuals have been left off of the 3<sup>rd</sup> generation and 8 individuals have been left off of the 4<sup>th</sup> generation.

