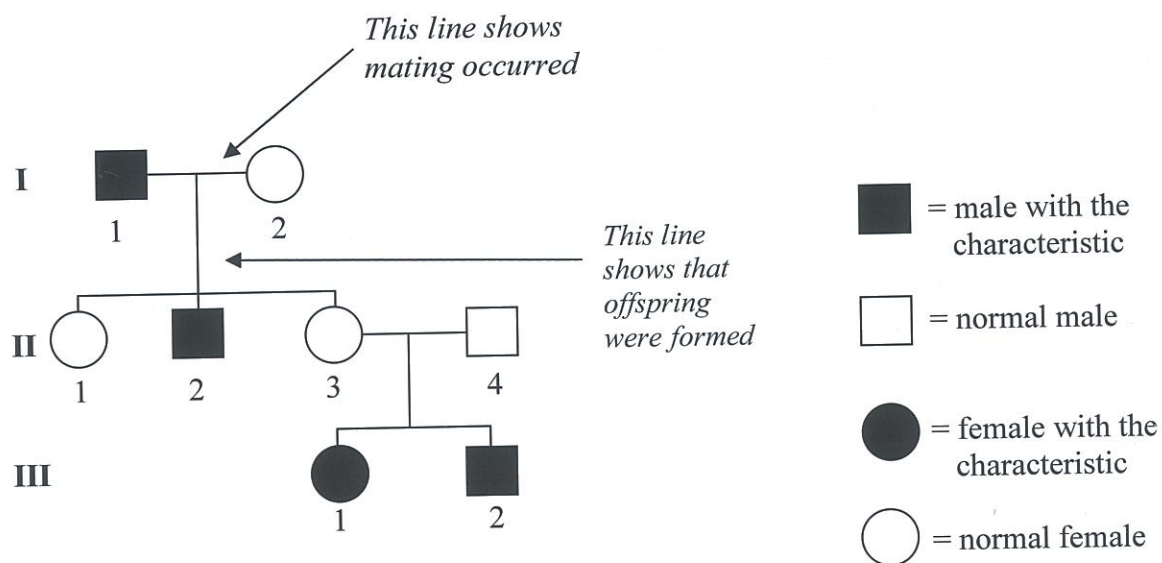


## Activity 19

### Pedigrees

The family history of the inheritance of a characteristic can often show if the characteristic is inherited as an intermediate trait or a dominant/recessive trait.

Sometimes the family history of a characteristic is represented as a chart called a pedigree chart. Here is one, which shows how the characteristic of blue eye colour is inherited in a family. Black shaded individuals will have blue eye colour.



What this shows is three generations within a family. Sometimes each new generation is numbered using Roman numerals I, II and III and the offspring within the generation are numbered consecutively. The generation and a number can identify each person. e.g. the last male shown in the chart is **III 2**. In other examples, the individuals are numbered consecutively without reference to the generation.

### DISCUSSION QUESTIONS

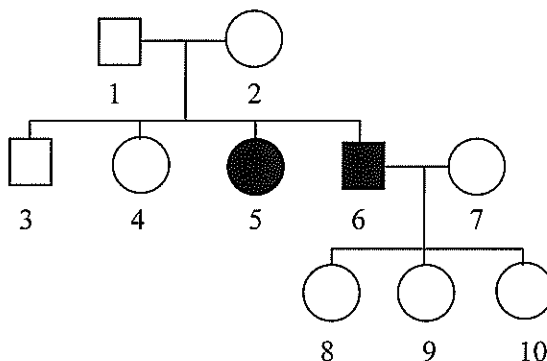
Within your groups answer these questions and then review your answers with your teacher.

1. Is the shaded characteristic dominant or recessive? How can you tell?
2. What is the genotype of **III 1** and **III 2**?
3. What must be the genotype of **II 3** and **II 4**?
4. What must be the genotype of **I 1**?
5. What must be the genotype of **I 2**?

*Collect a copy of Worksheet 3 "Pedigree Charts" from your teacher*

*Study this example showing how to complete a pedigree chart, then work on the problems that follow.*

Albino (*a*) is recessive to normal coloured fur (*A*). Work out the genotype and phenotype of each individual in this pedigree. (Shaded individuals are albino)



- STEPS:**
1. Begin from the known - what is the genotype of
    5. \_\_\_\_\_
    6. \_\_\_\_\_
  2. Work back to their parents - what must be the genotype of parents
    1. \_\_\_\_\_
    2. \_\_\_\_\_
  3. Go forward! - What could be the genotype/s of
    3. \_\_\_\_\_
    4. \_\_\_\_\_
  4. What must be the genotype of
    8. \_\_\_\_\_
    9. \_\_\_\_\_
    10. \_\_\_\_\_
  5. Give the possible genotypes of
    7. \_\_\_\_\_

**QUESTIONS:**

6. If individual 8 marries an albino what is the chance of the couple having an albino child?

**STEPS:** Genotype 8 = \_\_\_\_\_ Genotype of albino = \_\_\_\_\_  
 Genotypes of Offspring = \_\_\_\_\_  
 Answer: \_\_\_\_\_

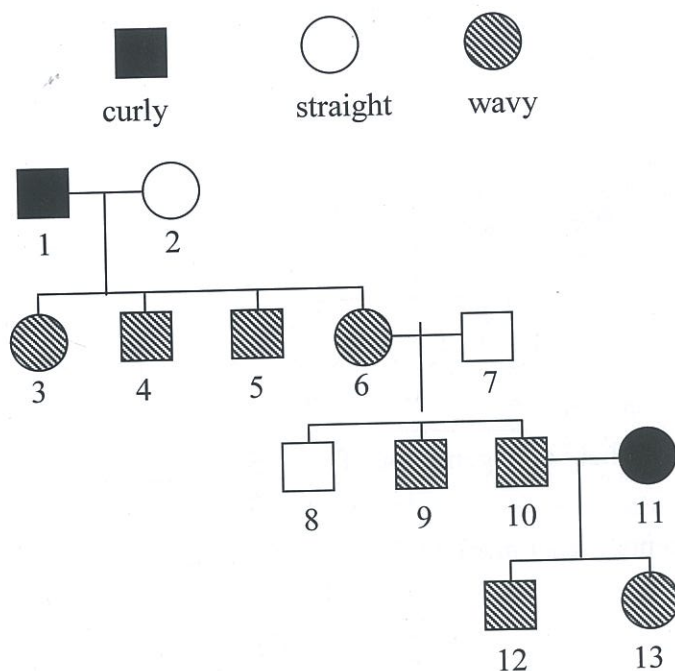
7. Which individuals in this pedigree can only be
  - a. homozygous (pure breeding)? \_\_\_\_\_
  - b. heterozygous (hybrid)? \_\_\_\_\_

## PROBLEMS INVOLVING THE INTERMEDIATE PATTERN OF INHERITANCE

Try each of these problems.

Set out your work clearly in your notebook.

1. The following pedigree is for a family showing the inheritance of curly and straight hair.



- a. Use the symbols C = curly hair  
 S = straight hair to show the genotypes of individuals 1 to 13
- b. What is the chance that the next child born to (1) and (2) will have wavy hair?
- c. What is the chance that the next child born to (1) and (2) will have curly hair?
- d. What is the chance that the next child born to (10) and (11) will have curly hair?
- e. What is the chance that the next child born to (10) and (11) will have straight hair?

2. Two genes, N and M control a form of anaemia called thalassaemia. The effect of different genotypes is given in this table:

Genotype	Phenotype
NN	normal
NM	Minor anaemia
MM	Major anaemia (usually the child dies at a young age)

- a. What would be the ratio of different genotypes expected amongst the children of a man and woman who both had thalassaemia minor?
- b. What chance is there that the couple could have a child with thalassaemia major?

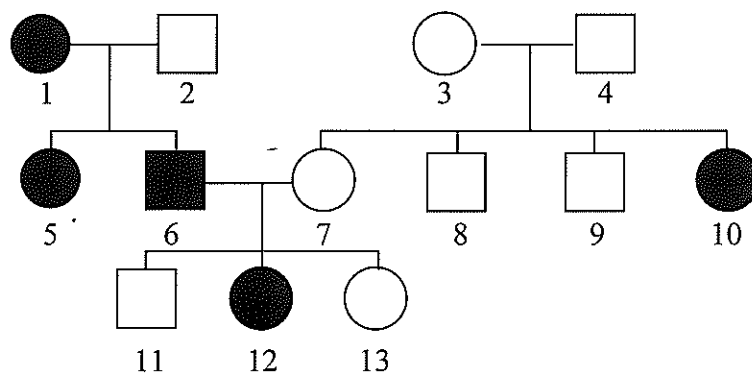
## PROBLEMS INVOLVING DOMINANT/RECESSIVE PATTERN OF INHERITANCE

1. A female mouse, homozygous (pure breeding) for white coat colour, mated with a mouse heterozygous for black coat colour and produced eight offspring.
  - a. Predict the colours of their coats, assuming black is dominant.
  - b. How many of the offspring would you expect to have white coats?
  - c. How many of the offspring would you expect to be homozygous for black coat colour?

2. In cats one gene "*L*" controls the presence of long hair on the coat. The recessive gene "*l*" controls the short hair characteristic.

Write down the genotype of a cat that is

- a. heterozygous for long hair.
  - b. short haired.
  - c. If amongst the offspring of a long haired female cat and a long haired tomcat was a short haired kitten, work out the genotype of the parents.
3. In humans, brown hair colour is dominant to red hair. Mabel's mother has red hair, as does Mabel's son Billy and daughter Tanya. Mabel's third child Josh has brown hair. Harry, who is Mabel's husband and Mabel herself, have brown hair. Harry's father, Brian, also has red hair.  
Draw up a pedigree chart to show the inheritance of hair colour in this family.
  4. This pedigree is for left-handedness, a recessive characteristic in humans.



- a. What is the genotype of 10 and 12?
- b. What is the genotype of 3?
- c. What is the genotype of 7?
- d. From the pedigree chart, list those who are heterozygous (hybrid) for right-handedness.
- e. List any individuals about whose genotype you are uncertain.
- f. If 6 and 7 have another child, what is the chance that it will be left-handed?