TEACHER'S NOTES
FAMILY TREES

OVERVIEW

Aimed at key stage 4 pupils.
They will practice interpreting and drawing pedigrees.

LEARNING OBJECTIVES

- To understand how symbols can be used to represent the individuals in a family
- To draw family trees to clearly show relationships and identify who is affected by genetic conditions in the family

CURRICULUM LINKS

- **KS4**: The ways in which organisms function are related to the genes in their cells
- **KS4**: Human health is affected by a range of environmental and inherited factors, by the use and misuse of drugs and by medical treatments

Activity

- Discuss the different inheritance patterns for certain genes that cause genetic conditions (dominant, recessive and sex-linked)
- Introduce that family trees can clearly show how conditions are being inherited
- Give pupils the worksheets and ask them to complete the questions
- Show pupils films from **www.genesareus.org**. Pupils could try to draw the family trees of the people in the films or just use the films to gain an insight into the way genetic conditions affect families.

ANSWERS

1. How many sisters does Emma have?
One

2. How many uncles does Mark have?
Three

3. How many of Mark's grandparents are still alive?
Three

4. If James and Emma wanted to have another child, what is the chance of them having another child affected by CF?
1 in 4 or 25%. It is important to emphasise that this risk applies to every pregnancy and is not affected by prior pregnancies.

5. Who else in this family is definitely a carrier of CF?
Emma's sister and her partner are the only people we know are definitely carriers.

6. How would a pedigree for a family affected by a dominantly inherited condition look different?
In general, we would expect more members of the family to be affected for a dominant condition. We would also expect a dominantly inherited condition to affect someone in each generation, whereas this would be unusual for a recessive condition.

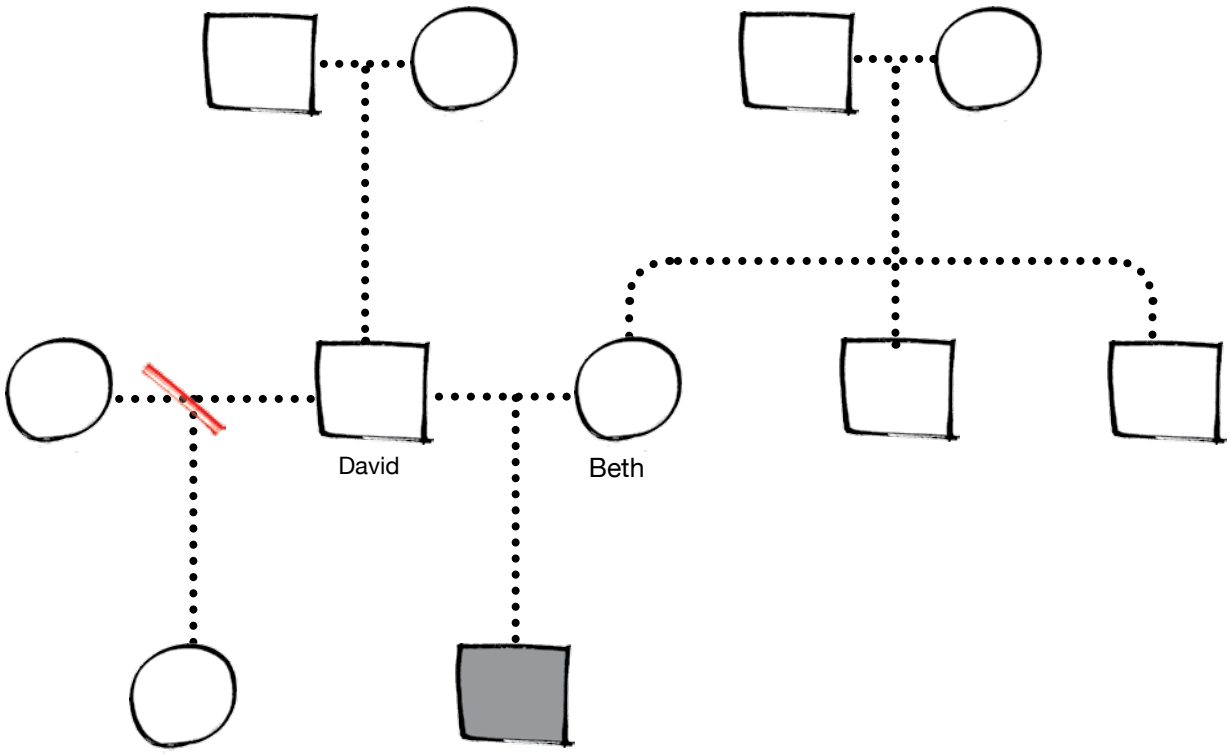
7. Draw Beth's family tree:

(see next page)

8. Which inheritance pattern is most likely to explain this?
c) sex-linked

ANSWERS continued

7. Draw Beth's family tree:



FURTHER information

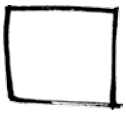
- The CF Trust provides excellent information about cystic fibrosis
  www.cftrust.org
- The NHS has created training tools on how to draw pedigrees including videos and PowerPoint slides
  www.geneticseducation.nhs.uk

EXTENSION

- Pupils could be asked to research into the options available for couples that are both carriers of CF (like Emma and James).
- **Note**: Some pupils might be keen to draw their own family tree, but this can highlight difficult family situations (relationships breaking down, etc.), so this is not to be encouraged as a class activity.

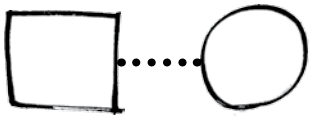
FAMILY TREES

Family relationships can be drawn in a picture, which are sometimes called family trees or 'pedigrees'. The medical teams caring for families affected by genetic conditions draw family trees using the standard symbols shown here.

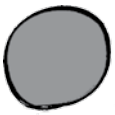


Males are represented as square

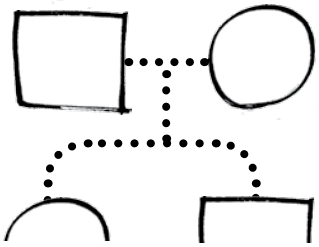
Females are represented as circles.



A couple in a relationship are linked by a horizontal line.

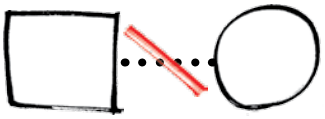


When someone is affected by a genetic condition the shape is shaded.



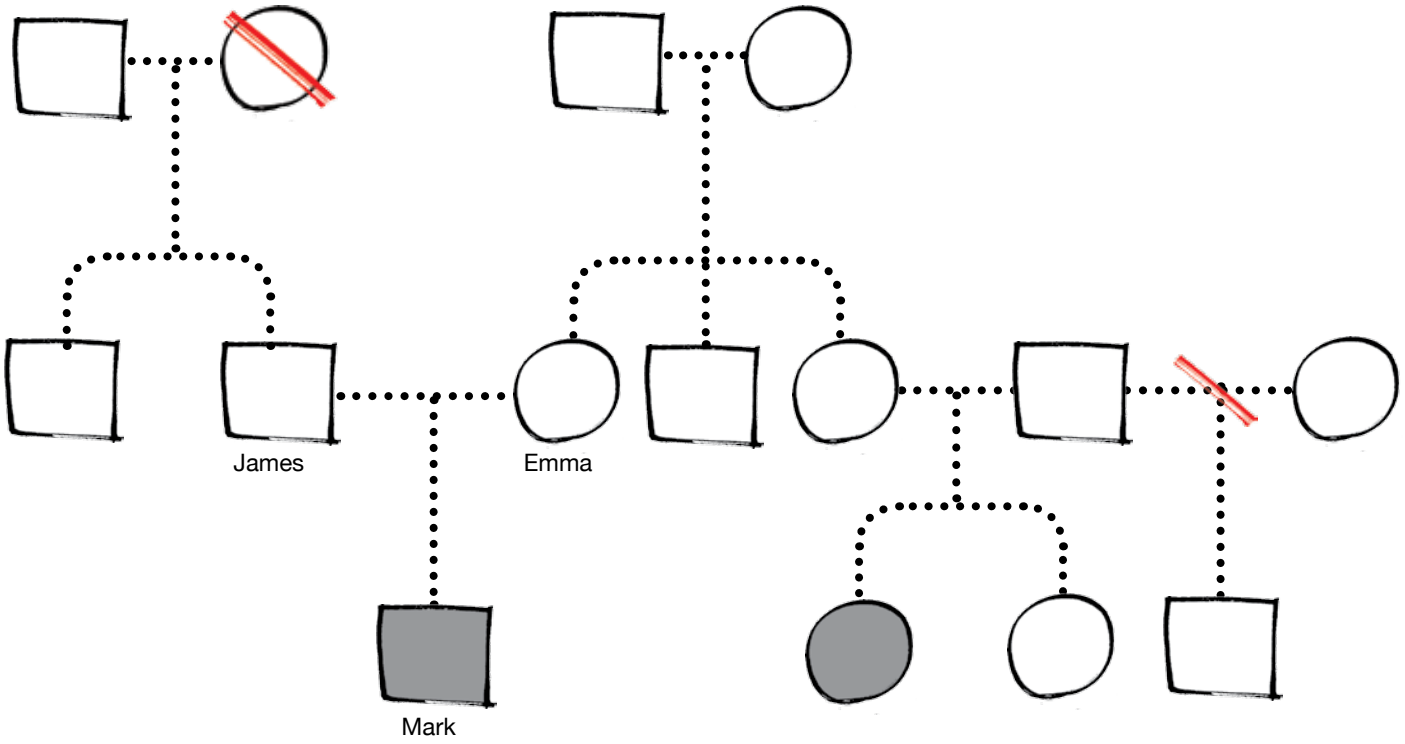
Different generations are recorded on different levels on the diagram, with the oldest generation at the top. Siblings are positioned alongside one another.

When a diagonal line is drawn through an individual, it indicates that they have died.



When a diagonal line is drawn through a relationship, it shows that it has ended.

Study this family tree, then answer the questions on the next page.



FAMILY TREES

1. ***How many sisters does Emma have?***

2. ***How many uncles does Mark have?***

3. ***How many of Mark's grandparents are still alive?***

Mark and one of his cousins are affected by cystic fibrosis (CF), which is a genetic condition. CF is inherited in a recessive pattern; this means that Emma and James must both be carriers of the gene variant (allele) that causes CF.

4. ***If James and Emma wanted to have another child, what is the chance of them having another child affected by CF?***

5. ***Who else in this family is definitely a carrier of CF?***

6. ***How would a pedigree for a family affected by a dominantly inherited condition look different?***

7. ***Draw Beth's family tree from the description below:***

Beth has two brothers and no sisters. Beth has one son with her partner David and their son is affected by CF. David is an only child. Both of Beth and David's parents are alive. David has one daughter from a previous relationship.

8. ***Look at the family tree below. Which inheritance pattern is most likely to explain this?***
   a) dominant
   b) recessive
   c) sex-linked