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## How many Great Great Great Great Grandparents? Finding out how we inherit our characteristics

How do we inherit our characteristics?
Try addressing this question by asking the pupils this series of questions, when you have explained what a 'blood parent' means:

- How many blood parents do you have?

Answer-2

- How many blood grandparents do you have?

Answer-4

- How many blood great grandparents do you have?
Answer- 8
- How many do you have of blood:
great great grandparents?
- great great great grandparents?
- great great great great grandparents?
great great great great great grandparents?
- great great great great great great grandparents?
Answers - 16, 32, 64, 128, 256
When parents produce a child, half the DNA from each parent combines in that child.
- You have DNA from how many great great great great great great grandparents in your cells?
Answer-256
Family tree of Ahnentafel von Herzog Ludwig (1568-1593), (Würtembergisches Landesmuseum, Stuttgart)
- If most of these great great great great great great grandparents were tall - what are the chances that you would be tall? Choose from: Very likely; likely; 50:50 chance; unlikely; very unlikely
Answer - very likely
- If half these great great great great great great grandparents had good eyesight - what are the chances that you would have good eyesight? Choose from: Very likely; likely; 50:50 chance; unlikely; very unlikely Answer - 50:50 chance
- If one of these great great great great great great grandparents had a very good sense of smell - what are the chances that you would have a very good sense of smell? Very likely; likely; 50:50 chance; unlikely; very unlikely Answer - very unlikely
- Your great great great great great great grandparents lived more than 200 years ago which of these might have helped them to survive best then: being tall; having good eyesight; having a good sense of smell? Answer - there is no clear answer - but this question should prompt a discussion about which characteristics are best for survival, and how they might be inherited.

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## The back up

Title: How many Great Great Great Great Grandparents?

Subtitle: Finding out how we inherit our characteristics

Topic: A class discussion about numbers of ancestors and how these affect our make-up.

Age range of pupils: 8-16 years
Time needed to complete activity: 15 minutes
Pupil learning outcomes: Pupils can:

- describe how a pattern develops in calculating the numbers of their ancestors;
- explain how this relates to the characteristics they have inherited from their ancestors.


## Context:

In teaching about evolution, pupils first need to know how organisms inherit their characteristics. This activity helps them to do this. They can then tackle the idea of Darwin's 'survival of the fittest' for example by using the Earthlearningidea, 'How many Beany Beetles? - the evolution game: investigating evolution by adaptation and natural selection'.

Lead into the activity by asking pupils how many people they think they might have inherited characteristics from.
A. A table showing numbers of ancestors at: http://dgmweb.net/Ancillary/OnE/NumberAnce stors.html shows that if we go back 20 generations we have more than two million ancestors; at 30 generations we have more than two billion ancestors.

## Following up the activity:

Ask the pupils to plot the figure for numbers of grandparents on a graph - which might look like the graph below.


Ask pupils to use this formula to work out the number of ancestors they had in different generations: $2^{n}=x$ where $n$ is the number of generations and $x$ is the number of ancestors in that generation. The formula can also be written as: 2 (number of generations) $=$ number of ancestors in that generation.

So to calculate the number of ancestors six generations back, multiply 2 by itself six times to give the result $(2 \times 2 \times 2 \times 2 \times 2 \times 2=64)$.

## Underlying principles:

- There is a geometrical increase in the number of ancestors a person has, going back generation by generation.
- Each of us has DNA from a huge number of individuals, if we go back far enough in the generations.
- It is this process that results in great variety of individuals.
- This variety can lead to the Darwinian ‘survival of the fittest' in populations under stress.


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## Thinking skill development:

A pattern is constructed as pupils begin to see how the numbers increase geometrically.
Discussions about the best senses for survival can cause cognitive conflict.

## Resource list:

- none
- for follow up activity - graph paper, ruler, pencils


## Useful links:

A table showing numbers of ancestors can be found at: http://dgmweb.net/Ancillary/OnE/ NumberAncestors.html
Follow this activity with the Earthlearningidea
'How many Beany Beetles? - the evolution game: investigating evolution by adaptation and natural selection' (www.earthlearningidea.com).

Source: Devised by Chris King of the Earthlearningidea Team.

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