

## Growing food : Growing more

### Description

Experimental design for agriculture relies heavily on Latin and Graeco-Latin squares to cope with different fertility patterns found in different parts of a given experimental growing space.

### Resources

Squared paper, scissors.

#### Activity 1: Three types of rhubarb

#### Activity 2: Four types of wheat

#### Activity 3: Graeco-Latin designs

These three activities lead into one another and form a continuous thread of development. *Sudoku* has made Latin squares more readily recognisable. A whole class discussion about the need for Latin square designs in field experiments will provide a good introduction to **Three types of rhubarb**. (West Yorkshire is well known for the forced rhubarb crop grown in the area known as The Rhubarb Triangle.) Draw out the wide range of factors which might affect crop yield in different parts of a field – yield will be affected by height, slope, wind, drainage and so on and all these factors vary across a given experimental field area and need to be controlled for in any field experiment. All of the twelve designs can be obtained from each other by substituting one variety for another or by vertical reflection of the whole design. Trial and error makes a useful starting strategy but a more systematic approach is needed in order to find all twelve possible layouts. This activity should conclude with a discussion about what makes one design *really different* from another in order to prepare for **Four types of wheat**. Here the task is to find the four solutions that are *really different* from each other.



**Graeco-Latin designs** is a more difficult task and requires the pupils to grapple with notions of proof. Finding the one possible Graeco-Latin square of order 3 provides a straightforward introduction to the problem but finding a complete solution for order 4 is a significant challenge. For pupils who become intrigued by it, the problem can provide the opportunity for an extended piece of work. Results and mathematical arguments can be displayed in poster format and presented to the rest of the class. The amazing fact can be used to generate work on very large numbers – *How could we say this number? If we could draw one solution in 5 minutes, how long would it take to draw them all?* A cut-up sheet is provided to support those who are finding the problem too hard and need a more supported way into solving it.

### The mathematics

All three activities engage the pupils in systematic analysis, the need for careful recording and proof. **Four types of wheat** also draws attention to rotation and reflection.

