TEACHER NOTES SQUARED SQUARES

A perfect squared square is a square that can be composed of a set of entirely unique smaller squares.

The first perfect squared square was found in 1939. Before that mathematicians could only find rectangles made from squares.

The original squared squares found were huge, so it took a search in the 1970s to find the smallest one (by number of squares) – this uses 21 squares.

Note: In the representation of all squared squares the number inside any particular square is the side length of that square, not the area of the square.

Solutions to all the activities are in the document **Squared Square Solutions**.

Below each document/activity is outlined:

Deduction puzzles:

In these puzzles students need to use the information they have been given to deduce the dimensions of all the smaller squares in the big squared square. The design is to scale but students should **use deduction rather than measuring**.

The puzzles feature the squared square **21:112A**, the smallest (by number of squares) squared square ever found, and the squared square **33:1625A**, which was discovered more recently, in 2014.

We've also provided an empty version of each of the squared squares above so **teachers can make their own puzzles of this type**. Teachers can write into the diagram the dimensions of whichever smaller squares they wish.

After students have found the dimensions of all the squares, they can be challenged to **colour the square using only four colours**, such that small squares that touch each other are different colours. (By the Four Colour Theorem, four is the minimum number of colours all maps would need in order to be coloured in this way). See the solutions document for possible colouring solutions.

Jigsaw Squared Square

This is a challenge for students to arrange the squared square **21:112A** (this square is also featured in the deduction puzzles) as a jigsaw.

Print out the first three pages of the document on card. Students need to cut the squares out. **Note:** Some of the 'pieces' of the squared square jigsaw are made up of **more than one square** – there is **no need to cut these pieces into separate squares**. These squares go together in this way in the completed squared square.

On page 4 – 6 of the jigsaw document we have provided **'jigsaw guides'** - these are diagrams that show students where some of the squares go. **The first of these provides the least structure, and the third provides the most structure.** Teachers could give students the first/second guide, and then reveal the second/third guide (which has additional squares given) if students are still struggling.

Note: These guides are to scale but are much smaller than the squared square that would be made from the cut-out squares. **The cut-out squares do not fit on top of the jigsaw guides.** Students need to replicate what they see in the guide with their big cut-out squares, and then fill in the gaps with the other squares.

More Squared Squares

This set of resources was inspired by the Numberphile video about Squared Squares, featuring James Grime. **Watch the video here:** https://www.youtube.com/watch?v=NoRjwZomUK0

The online maths shop Maths Gear has made a set of squared square coasters, designed by James Grime. Each of the four coasters features a different squared square, and amazingly, when all four of the coasters are put together, the larger square they form is itself a squared square!

The coasters have also been coloured using only four colours and such that no touching squares are the same colour. (By the Four Colour Theorem, four is is the minimum number of colours all maps would need in order to be coloured in this way).

Find out more about the coasters at:
mathsgear.co.uk/products/squared-square-coasters

Thank you very much to James Grime for providing his diagrams of the squared squares for our use.