

STUDENT HANDOUT

Stage 1

- Analyze patterns in the colored blocks for the top 50 squares of this grid. Extend the patterns to fill in the remaining 50 squares.

Note. The goal is to figure out how many blocks of each color are in each square, not how they are arranged. (There is a pattern in the arrangement, too, but its purpose is just to make the grid easier to read.)

Exploration 1: Building Blocks

TEACHER'S GUIDE

STAGE 1

Problem #1

- Analyze patterns in the colored blocks for the top 50 squares of this grid. Extend the patterns to fill in the remaining 50 squares.

	□	■	□□	■	■□	■	□□□	■■	■□
■	■□	■	■□	■■	□□□□	■	■■	■	■□
■	■	■	■□□	■■	■□	■■	■□	■	■□
■	□□□□	■	■□	■	■■	■	■	■□	■□□
■	■□	■	■□	■■	■	■	■□□□	■□	■□

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EXPLORATION 1: BUILDING BLOCKS

Solution for #1

	□	■	□□	■	■	■	□□□	■	■
■	■	■	■	■	□□□□	■	■	■	■
■	■	■	■	■	■	■	■	■	■
■	□□□□□	■	■	■	■	■	■	■	■
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■	■	■	□□□□□	■	■	■	■	■	■
■	■	■	■	■	■	■	■	■	■
■	■	■	■	■	■	■	■	■	■
■	■	■	■	■	■	■	■	■	■

The general pattern is that the completed grid is a picture of the prime factorizations of the natural (counting) numbers from 2 through 100! (The number 1 is represented as no blocks.) Each color represents a prime number: 2 is white, 3 is red, 5 is orange, 7 is yellow, etc. Attaching the blocks represents multiplying the corresponding prime numbers.

EXPLORATION 1: BUILDING BLOCKS

- » *Where are the prime numbers in the grid? How can they help? As before, these are the squares that have just one block. How can you combine this knowledge with an understanding of the spacing between different colors?*

Solution for #2

444 $2^2 \cdot 3 \cdot 37$ 	445 $5 \cdot 89$ 	446 $2 \cdot 223$ 	447 $3 \cdot 149$ 	448 $2^6 \cdot 7$
449 449 	450 $2 \cdot 3^2 \cdot 5^2$ 	451 $11 \cdot 41$ 	452 $2^2 \cdot 113$ 	453 $3 \cdot 151$
454 $2 \cdot 227$ 	455 $5 \cdot 7 \cdot 13$ 	456 $2^3 \cdot 3 \cdot 19$ 	457 457 	458 $2 \cdot 229$
459 $3^3 \cdot 17$ 	460 $2^2 \cdot 5 \cdot 23$ 	461 461 	462 $2 \cdot 3 \cdot 7 \cdot 11$ 	463 463

Squares shown as light grey in this key may be any color that hasn't been used yet, but students should make each one a different color because each represents a different prime number. The color they use for 89 in the block diagram for 445 should be the same as the one they chose in the original grid.

Teacher's Note. Because the question did not specify the additional information that students should include, they may not have shown everything in this grid, especially the expressions for the prime factorizations. These are included here mainly for your information.