Number of blocks supposed to be on each square shown in red

- **What interesting patterns can you spot on your grid?** – Students explore patterns they see (might see patterns relating to certain columns, or to primes or that the height of blocks get bigger as numbers increase, etc.)

- **Which number has the tallest tower?** – 36 is tallest, it has largest number of factors

- **Which number has the smallest tower of factors (blocks)? Why is this?** – 1, it is only divisible by itself

- **Which numbers have the next smallest tower of factors (blocks)?** – All the prime numbers have 2 blocks on them. Why is this? - they are divisible by themselves and 1

- **Do all the numbers have an even number of factors (blocks)?** – No, some are odd. Why is this? - For even ones each factor pairs add up to make an even number. Odd ones have one factor ‘pair’ that is a square number e.g. 25 = 5x5. The factor is only counted once, so total number of factors is odd.

- **Is there any pattern to the numbers that have only two factors?** – This question leads on to the next activity where they explore this further.
Ri OTS Masterclass: Patterns in Prime

Worksheet 2 – Small 36 grid SOLUTION

```
1  2  3  4  5  6
7  8  9 10 11 12
13 14 15 16 17 18
19 20 21 22 23 24
25 26 27 28 29 30
31 32 33 34 35 36
```

Solutions

What patterns are created by the prime numbers?... The grid above shows all prime numbers shaded.

Can we create a rule for predicting prime numbers?... Not exactly, but they do all fall into two columns so we can predict this will carry on. Recognising patterns can help us to predict.

What do all the primes have in common (apart from 2)?... they are all odd.

If the prime numbers only appear in these two columns (ignoring 2/3), we might predict that this rule holds for larger primes. What is the relationship?... They are always one more than or one less than a multiple of 6.
There are 25 prime numbers between 1 and 100: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, and 97

- Which numbers get crossed out more than once, and why? Numbers with multiple prime factors
- Which numbers don’t get crossed out at all, and why? Prime numbers
- What pattern on the grid did the 3 times table have? Diagonal pattern
- Why do you not need to test for 4, 6 or any number above 7 in this grid? Looking at numbers on the top row: 4, 6, 8, 9 and 10 are multiples of 2 or 3 so have already been sieved. In other words, we only need to sieve for prime numbers. Also, if you chose a number greater than 10 (square root of max number on grid), its factor pair must be less than 10 and has therefore already been sieved.

OTS Patterns in Prime Worksheet 4 – 324 grid SOLUTION

There are 66 prime numbers between 1 and 324: