Sieve of Eratosthenes

You will need one sheet of small grids, and one big master grid.

On the first small grid, shade in all the multiples of 2 except 2.

- What do you notice? Can you **explain** what you see?
- Now update the master grid, by crossing out the multiples of 2 except 2.

On the second small grid, shade in all the multiples of 3 except 3.

- What do you notice? Can you **explain** what you see?
- Before you update the master grid, can you **predict** what will happen? Will you cross out any numbers that are already crossed out? If so, which ones?
- Now update the master grid, by crossing out the multiples of 3 except 3. Can you **explain** why some numbers have been crossed out twice and others only once?

Use the next four small grids to explore what happens for multiples of 4, 5, 6 and 7.

- Before you shade in the multiples of each number (but not the number itself), try to **predict** what patterns might emerge.
- After you have shaded in the multiples, try to **explain** the patterns you've found.
- Before you update the master grid, try to **predict** what will happen. Will you cross out any numbers that are already crossed out? If so, which ones?
- After you have updated the master grid, try to **explain** why some numbers have been crossed out again and others haven't.

Now look at the master grid. What is special about the numbers that you haven't crossed out?

What would change on the master grid if you were to cross out multiples of larger numbers?

Imagine you want to find all the prime numbers up to 400.
You could do this by crossing out multiples in a 2-400 number grid.
Which multiples will you choose to cross out?
How can you be sure that you are left with the primes?

Final challenge
Imagine you want to find all the prime numbers up to 1000 by crossing out multiples in a 2-1000 number grid.
Which number will you cross out last?