**Prime numbers: Activity sheet**

This activity will help you to investigate prime numbers.



Definition: A prime number has exactly two factors.

Firstly, consider the factors of all the numbers from 1 to 20. Continue the table.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Factors** | **Number of factors** | **Prime?** |
| Factors of 1 | 1 | 1 | No |
| Factors of 2 | 1,2 | 2 | Yes |
| Factors of 3 | 1,3 | 2 | Yes |
| Factors of 4 | 1,2,4 | 3 | No |
| Factors of 5 |  |  |  |
| Factors of 6 |  |  |  |
| Factors of 7 |  |  |  |
| Factors of 8 |  |  |  |
| Factors of 9 |  |  |  |
| Factors of 10 |  |  |  |
| Factors of 11 |  |  |  |
| Factors of 12 |  |  |  |
| Factors of 13 |  |  |  |
| Factors of 14 |  |  |  |
| Factors of 15 |  |  |  |
| Factors of 16 |  |  |  |
| Factors of 17 |  |  |  |
| Factors of 18 |  |  |  |
| Factors of 19 |  |  |  |
| Factors of 20 |  |  |  |

Note: A number with an odd number of factors is called a square number.

**Numbers 1-100**



As part of this investigation into prime numbers, a grid of the numbers 1 to 100 has been provided. Open the file **Numbers 1-100 spreadsheet**.

By choosing from the dropdown menu on the left, you can cover numbers which are multiples of the numbers listed. By shading multiples of 2, 3, 5 and 7, you should reveal all prime numbers less than 100. Cross out multiples of 2, 3, 5 and 7. **Do not shade in 2, 3, 5 or 7 though!**



1 Why is 1 not a prime number?

2 Why is there no need to shade all the multiples of 4?

3 Why is there no need to shade all the multiples of 6?

4 Why is there no need to shade all the multiples of 8?

5 Why is there no need to shade all the multiples of 9?

6 If the grid were to be expanded, what would be the next number that would be
needed on the dropdown menu?

7 Why is there no need to shade all the multiples of this number (your answer to
question 6) on the grid covering numbers up to 100?

8 Why, for all numbers up to 100, is it only necessary to shade the multiples of
2, 3, 5 and 7 in order to leave only the prime numbers unshaded?

**Larger grids**

A spreadsheet has been provided which enables you to draw a grid of up to
25 columns and up to 25 rows. Open the file **Larger grid spreadsheet**. Clicking on the grid button will give you the opportunity to choose the number of columns and rows in your grid.

Draw a grid of 10 columns and 10 rows.

By choosing from the dropdown menu on the left, you can cover numbers which are multiples of the numbers listed.

1 Shade multiples of 13. For each of the numbers shaded, state how each could
have been shaded by the use of multiples of other (smaller) numbers. (Consider the 13 times table.)

Draw a grid with 10 columns and 21 rows (numbers 1 to 210). Shade the multiples of 2, 3, 5, 7.

There are numbers left unshaded which are not prime (eg 121, 143). Shade the grid with the multiples of the other numbers you feel are necessary to reveal only the prime numbers. Try not to shade multiples of unnecessary numbers.

2 Apart from shading multiples of 2, 3, 5 and 7, what numbers did you feel it was
necessary to shade multiples of?

3 List all the prime numbers between 180 and 210.

Draw a grid with 25 columns and 22 rows (1 to 550).

Shade the multiples of 2, 3, 5, 7 and all the multiples of the other numbers you feel are necessary to reveal only the prime numbers. Try not to shade multiples of unnecessary numbers.

4 Apart from shading multiples of 2, 3, 5 and 7, what numbers did you feel it was
necessary to shade multiples of?

5 What is the largest prime number less than 550?

**Checker**

This is a spreadsheet with a simple application that checks for division by prime numbers. This is all that is necessary to find whether a number is prime. Use the example spreadsheet to check any number up to 210. Check your answers to question 3 above.

1 What is the highest number that the current spreadsheet could be used
for testing?

This spreadsheet can be extended to check for very large prime numbers. To do this, type a list of prime numbers in column D. The text in column C and the formula in column E must be continued down to match the level of the prime numbers. The formula in cell A6 must have its range increased to match the extra rows listing the multiples of the prime numbers.

Extend the spreadsheet to test for prime numbers up to 1000.

2 What is the largest number you will need to find multiples of?

3 Are the following numbers prime?

 • 217

 • 371

 • 487

 • 773

 • 991

 • 992

 • 993

 • 994

 • 995

 • 996

 • 997

 • 998

 • 999

4 If you were to extend the spreadsheet to test for prime numbers up to
2000, what would be the largest number you would need to exclude the multiples of?