

Hillcrest Mathematics Knowledge Organiser



39 - Prime Numbers

2 3 5 7 11 13 17 19 23 29 31 37 41 43...

Content:

- A prime number (or a prime) is a natural number greater than 1 that has no positive divisors other than 1 and itself.
- Any number can be written as the product of prime factors – you can use the factor tree method to do this.
- Any number can be broken down into a string of prime factors all multiplied together – this is called ‘prime factor decomposition’ or ‘prime factorisation’.
- Product means ‘times’ or ‘multiply’.
- We can write the product of a number in the form of index notation.
e.g. $2^3 \times 5$

HCF & LCM:

When you have found the prime factors of a number you can use this information in order to find out the LCM and HCF.

Common Misconceptions

- 0 and 1 are not considered prime numbers.

Vocabulary

- Prime Number
- Product
- Decomposition
- Positive Integer

- Index Notation

Linked Future Topics:

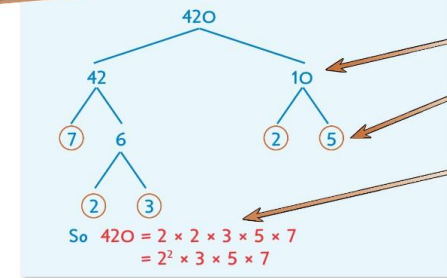
- Re-occurring decimals
- Coding

No matter which numbers you choose at each step, you'll find that the prime factorisation is exactly the same. Each number has a unique set of prime factors.

Linked Prior Topics:

- Factors, Multiples & Prime Numbers
- Multiplication
- Division

EXAMPLE: Express 420 as a product of prime factors.



To write a number as a product of its prime factors, use the **Factor Tree** method:

- Start with the number at the top, and **split** it into **factors** as shown.
- Every time you get a prime, **ring it**.
- Keep going until you can't go further (i.e. you're just left with primes), then write the primes out **in order**.
If there's more than one of the **same factor**, you can write them as **powers**.

Finding the HCF:

- List all the **PRIME FACTORS** that appear in **BOTH** numbers.
- MULTIPLY** these together to find the HCF.

EXAMPLE:

$180 = 2^2 \times 3^2 \times 5$ and $84 = 2^2 \times 3 \times 7$.
Use this to find the HCF of 180 and 84.

$$180 = (2) \times (2) \times (3) \times 3 \times 5 \quad 84 = (2) \times (2) \times (3) \times 7$$

2, 2 and 3 are prime factors of both numbers, so
HCF = $2 \times 2 \times 3 = 12$

Finding the LCM:

- List all the **PRIME FACTORS** that appear in **EITHER** number.
- If a factor appears **MORE THAN ONCE** in one of the numbers, list it **THAT MANY TIMES**.
- MULTIPLY** these together to give the **LCM**.

EXAMPLE:

$18 = 2 \times 3^2$ and $30 = 2 \times 3 \times 5$.
Find the LCM of 18 and 30.

$$18 = 2 \times 3 \times 3 \quad 30 = 2 \times 3 \times 5$$

So the prime factors that appear in either number are: 2, 3, 3, 5
List 3 twice as it appears twice in 18.
LCM = $2 \times 3 \times 3 \times 5 = 90$