Y8 Maths Knowledge Organiser Topic 1: Types of number and indices

What must I be able to do?

You may need to revise the following:

- Year 7 Topic 3: Types of number

New content:

- ☐ Find the prime factors of a number and express as a product of prime factors
  - ➢ Mathswatch N30b
- ☐ Determine HCF and LCM by prime factorisation
  - ➢ Mathswatch N31a and N31b
- ☐ Find squares, square roots, cubes and cube roots using prime factorisation
- ☐ Use indices to record repeated multiplication

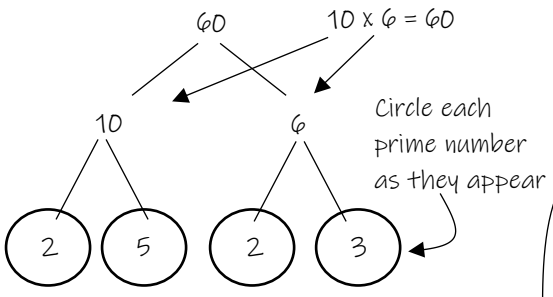
Key vocabulary

HCF	Highest common factor. The largest number which is a factor of all the numbers in the question.
LCM	Lowest common multiple. The smallest number which is a multiple of all the numbers in the question.
Prime factors	Factors of an integer which are prime numbers
Product of prime factors	All the prime factors of an integer which when multiplied together make the original integer.
Venn diagram	An illustration which uses circles to show what is in common between 2 or more things.

Express as a product of prime factors

Use a factor tree to find all the prime factors. Then write the prime factors as a multiplication.

e.g Write 60 as a product of prime factors



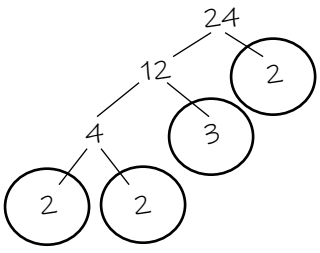
So the prime factors of 60 are 2, 3 and 5.

The product of prime factors for 60 is all of the circled numbers multiplied together which is:

$2 \times 2 \times 3 \times 5 = 2^2 \times 3 \times 5$

If you actually work this out it should equal 60

e.g. Write 24 as a product of prime factors



So as a product of prime factors 24 is

$= 2 \times 2 \times 2 \times 3$

$= 2^3 \times 3$

Indices notation for repeated multiplication

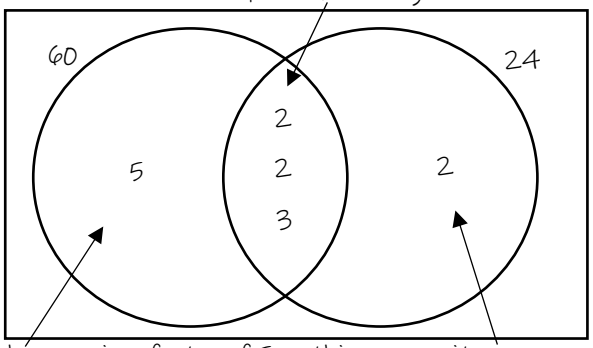
HCF and LCM using prime factorisation

The first step is to write each number as a product of prime factors, then put the factors into a Venn diagram.

e.g. Find the HCF and LCM of 60 and 24.

We already know that $60 = 2 \times 2 \times 3 \times 5$ and $24 = 2 \times 2 \times 2 \times 3$

They both have $2 \times 2 \times 3$ so these prime factors go into the intersection



60 also has a prime factor of 5 so this goes on its own as does the "extra" prime factor of 2 for 24.

The Highest Common Factor (HCF) is found by multiplying all the numbers in the intersection of the 2 circles.

So the HCF of 60 and 24 is $2 \times 2 \times 3 = 12$

The Lowest Common Multiple (LCM) is found by multiplying all the numbers in the 2 circles, including the intersection.

So the LCM of 60 and 24 is $5 \times 2 \times 2 \times 3 \times 2 = 120$

Prime factors of square and cube numbers

When written as a product of prime factors, all the prime factors of a square number can be written with even powers.

e.g. $36 = 2^2 \times 3^2$ $81 = 3^4$ $144 = 2^4 \times 3^2$

To square root these, you just divide the powers by 2.

Cube numbers have powers which are multiples of 3

e.g $125 = 5^3$ $216 = 2^3 \times 3^3$ $512 = 2^9$

To cube root these you divide the powers by 3.