2017 Key Stage 2 Mathematics paper 3: reasoning question 8	Write three factors of 30 that are **not** factors of 15.
2017 Key Stage 2 Mathematics paper 3: reasoning question 18	A **square** number and a **prime** number have a total of 22. What are the two numbers? ____ + ____ = 22 square number prime number

Language

cube root, exponent, highest common factor (HCF), index, lowest common multiple (LCM), prime factor decomposition, square root, Venn diagram

Progression through key ideas

Understand multiples

Students should be familiar with the term 'multiple' from their work in Key Stage 2. They should be able to recognise whether a number is a multiple of another positive integer by recalling the lists of multiples or counting on multiples from the relevant times table.

The focus at Key Stage 3 is on examining the structure of numbers and being able to reason whether numbers are multiples of other numbers or not without the need for creating lists of multiples. For example, students should recognise that 176 is a multiple of eight because it is the sum of 160 and 16, both of which are multiples of eight. Connections can be made here to the rules for divisibility, with students exploring why the rules work and how they can help identify multiples of a number.

Key ideas

- Understand what a multiple is and be able to list multiples of n
- Identify and explain whether a number is or is not a multiple of a given integer*

Understand integer exponents and roots

Students should already be familiar with at least the first 12 square numbers and may be familiar with a range of cube numbers (1^3 to 5^3) from their work at Key Stage 2. They are

likely to have a basic grasp of the notation, including square and cube roots, and know that, e.g. $\sqrt{16}$ = 4 because 4^2 = 16 and $\sqrt[3]{8}$ = 2 because 2^3 = 8.

Students should recognise that the square (or cube) root of any number can be found, but that it is only when they are perfect square (or cube) numbers that this operation will give an integer solution.

In Key Stage 3, students will need to explore positive integer exponents greater than three. This will support other Key Stage 3 work involving writing numbers as the product of prime factors in simplified terms, thus enabling identification of the highest common factor and the lowest common multiple of two or more positive integers.

Key ideas

- Understand the concept of square and cube
- Understand the concept of square root and cube root
- Understand and use correct notation for positive integer exponents
- Understand how to use the keys for squares and other powers and square root on a calculator

Understand and use the unique prime factorisation of a number

Finding factors of a number will be familiar from Key Stage 2. Students should be able to find factor pairs for a given number and know that a number which has exactly two factors is prime. Students are expected to recall prime numbers up to 19 and be able to establish prime numbers up to 100. The focus in this set of key ideas is to be able to identify factors and prime numbers based on a deep understanding of number structure. Where rules for divisibility are used to help these processes, the focus should be on understanding why these rules work.

Students' experience of highest common factors and multiples at Key Stage 2 is likely to be limited to their work on simplifying fractions and checking to see if they have found the greatest number that is a factor of both the numerator and denominator. Similarly, when expressing fractions in the same denomination in order to compare them, for example, students may have identified the least common multiple of the two denominators even if this formal term has not been used.

In Key Stage 3, students will come across the unique prime factorisation property for the first time. Students will need to recognise that any positive integer greater than one is either a prime number itself or can be expressed as a product of prime numbers, and that there is only one way of writing a number in this way. It is this property that will help students to identify efficiently the highest common factor and lowest common multiple for two or more positive integers.

Key ideas

- Understand what a factor is and be able to identify factors of positive integers
- Understand what a prime number is and be able to identify prime numbers