Subject Knowledge Audit
(Key Stage 3 Mathematics)

NCETM
NATIONAL CENTRE FOR EXCELLENCE
IN THE TEACHING OF MATHEMATICS

Core concept 1.2: Properties of number

This document is part of a set that forms the subject knowledge content audit for Key Stage 3 maths. The audit is based on the NCETM Secondary Professional Development materials and there is one document for each of the 17 core concepts. Each document contains audit questions with check boxes you can select to show how confident you are (1 = not at all confident, 2 = not very confident, 3 = fairly confident, 4 = very confident), exemplifications and explanations, and further support links. At the end of each document there is space to type reflections, targets and notes. The document can then be saved for your records.

1.2.1 Understand multiples

How confident are you that you can explain what a multiple is, including how to list multiples of *n* and identifying whether a number is a multiple of a given integer?

1 ☐   2 ☐   3 ☐   4 ☐

Students should be encouraged to examine the structure of numbers and be 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.

Further support links

- NCETM Secondary Professional Development Materials: 1.2 Properties of number, pages 10–13

1.2.2 Understand integer exponents and roots

How confident are you that you can explain, using representations if appropriate, the concepts of square and cube numbers, square and cube roots?

1 ☐   2 ☐   3 ☐   4 ☐

How confident are you that you can use the correct notation for positive integer powers?

1 ☐   2 ☐   3 ☐   4 ☐

How confident are you in your ability to use a calculator efficiently and accurately to find powers of numbers and use the square root key?

1 ☐   2 ☐   3 ☐   4 ☐

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.

Students should be encouraged to explore positive integer exponents (i.e., powers) 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.

Further support links

- NCETM Secondary Professional Development Materials: 1.2 Properties of number, pages 14–15

1.2.3 Understand and use the unique prime factorisation of a number

How confident are you that you can explain what a factor and prime number are, including being able to identify prime numbers and factors of positive integers?

1 ☐   2 ☐   3 ☐   4 ☐

How confident are you that you can explain how to find the unique prime factorisation of a positive integer?

1 ☐   2 ☐   3 ☐   4 ☐

How confident are you that you can use the prime factorisation of two (or more) positive integers to efficiently identify the highest common factor and lowest common multiple?

1 ☐   2 ☐   3 ☐   4 ☐

Students should be able to find factor pairs for a given number and know that a number which has exactly two factors is prime. They are expected to recall prime numbers up to 19 and be able to establish prime numbers up to 100. Students should be led to focus on being 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 should learn efficient methods for finding the prime factorisation of a positive integer. They 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 identify efficiently the highest common factor and lowest common multiple for two or more positive integers.

Students must be fluent at finding multiples and factors if they are to solve these problems efficiently.

The prime factorisation of a number can be applied to help solve problems involving highest common factors and lowest common multiples. Using the numbers in the original example:

$$24 = 2 \times 2 \times 2 \times 3 \qquad\qquad 30 = 2 \times 3 \times 5$$

The prime factors can then be placed in a Venn Diagram.
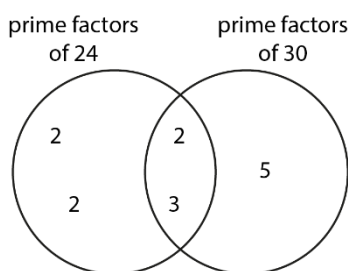
The highest common factor of the two numbers is the product of the prime factors in the intersection: $2 \times 3 = 6$.

The lowest common multiple of the two numbers is the product of the prime factors in the union: $2 \times 2 \times 2 \times 3 \times 5 = 120$.

Further support links

- NCETM Secondary Professional Development Materials: 1.2 Properties of number, pages 16–22

Notes