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| **UNIT 1: Number, powers, decimals, HCF and LCM, roots and rounding** |

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**SPECIFICATION REFERENCES**

N1 order positive and negative integers, decimals and fractions; use the symbols =, ≠, <, >, ≤,≥

N2 apply the four operations, including formal written methods, to integers, decimals and simple fractions (proper and improper), and mixed numbers – all both positive and negative; understand and use place value (e.g. when working with very large or very small numbers, and when calculating with decimals)

N3 recognise and use relationships between operations, including inverse operations (e.g. cancellation to simplify calculations and expressions); use conventional notation for priority of operations, including brackets, powers, roots and reciprocals

N4 use the concepts and vocabulary of prime numbers, factors (divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation theorem

N5 apply systematic listing strategies

N6 use positive integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5

N7 calculate with roots and with integer and with integer indices

N13 use standard units of mass, length, time, money and other measures (including standard compound measures) using decimal quantities where appropriate

N14 estimate answers; check calculations using approximation and estimation, including answers obtained using technology

N15 round numbers and measures to an appropriate degree of accuracy (e.g. to a specified number of decimal places or significant figures);

**PRIOR KNOWLEDGE**

Students will have an appreciation of place value, and recognise even and odd numbers.

Students will have knowledge of using the four operations with whole numbers.

Students should have knowledge of integer complements to 10 and to 100.

Students should have knowledge of strategies for multiplying and dividing whole numbers by 2, 4, 5, and 10.

Students should be able to read and write decimals in figures and words.

**KEYWORDS**

Integer, number, digit, negative, decimal, addition, subtraction, multiplication, division, remainder, operation, estimate, power, roots, factor, multiple, primes, square, cube, even, odd

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| **1d. Factors, multiples and primes**  (N4, N5) | **Teaching time**  3-5 hours |

**OBJECTIVES**

By the end of the sub-unit, students should be able to:

* List all three-digit numbers that can be made from three given integers;
* Recognise odd, even and prime (two digit) numbers;
* Identify factors and multiples and list all factors and multiples of a number systematically;
* Find the prime factor decomposition of positive integers and write as a product using index notation;
* Find common factors and common multiples of two numbers;
* Find the LCM and HCF of two numbers, by listing, Venn diagrams and using prime factors: include finding LCM and HCF given the prime factorisation of two numbers;
* Understand that the prime factor decomposition of a positive integer is unique – whichever factor pair you start with – and that every number can be written as a product of two factors;
* Solve simple problems using HCF, LCM and prime numbers.

**POSSIBLE SUCCESS CRITERIA**

Given the digits 1, 2 and 3, find how many numbers can be made using all the digits.

Convince me that 8 is not prime.

Understand that every number can be written as a unique product of its prime factors.

Recall prime numbers up to 100.

Understand the meaning of prime factor.

Write a number as a product of its prime factors.

Use a Venn diagram to sort information.

**OPPORTUNITIES FOR REASONING/PROBLEM SOLVING**

Students should be able to provide convincing counter-arguments to statements concerning properties of stated numbers, i.e. Sharon says 108 is a prime number. Is she correct?

Questions that require multiple layers of operations such as:

Pam writes down one multiple of 9 and two different factors of 40. She then adds together her three numbers. Her answer is greater than 20 but less than 30. Find three numbers that Jan could have written down.

**COMMON MISCONCEPTIONS**

1 is a prime number.

Particular emphasis should be made on the definition of ‘product’ as multiplication as many students get confused and think it relates to addition.

**NOTES**

Use a number square to find primes (Eratosthenes sieve).

Using a calculator to check factors of large numbers can be useful.

Students need to be encouraged to learn squares from 2 × 2 to 15 × 15 and cubes of 2, 3, 4, 5 and 10 and corresponding square and cube roots.