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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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| **1c. Indices, powers and roots**  (N3, N6, N7) | **Teaching time**  4-6 hours |

**OBJECTIVES**

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

* Find squares and cubes:
* recall integer squares up to 10 x 10 and the corresponding square roots;
* understand the difference between positive and negative square roots;
* recall the cubes of 1, 2, 3, 4, 5 and 10;
* Use index notation for squares and cubes;
* Recognise powers of 2, 3, 4, 5;
* Evaluate expressions involving squares, cubes and roots:
* add, subtract, multiply and divide numbers in index form;
* cancel to simplify a calculation;
* Use index notation for powers of 10, including negative powers;
* Use the laws of indices to multiply and divide numbers written in index notation;
* Use brackets and the hierarchy of operations with powers inside the brackets, or raising brackets to powers;
* Use calculators for all calculations: positive and negative numbers, brackets, square, cube, powers and roots, and all four operations.

**POSSIBLE SUCCESS CRITERIA**

What is the value of 23?

Evaluate (23 × 25) ÷ 24.

**OPPORTUNITIES FOR REASONING/PROBLEM SOLVING**

Problems such as: What two digit number is special because adding the sum of its digits to the product of its digits gives me my original number?

**COMMON MISCONCEPTIONS**

The order of operations is often not applied correctly when squaring negative numbers, and many calculators will reinforce this misconception.

103, for example, is interpreted as 10 × 3.

**NOTES**

Pupils need to know how to enter negative numbers into their calculator.

Use the language of ‘negative’ number and not minus number to avoid confusion with calculations.

Note that the students need to understand the term ‘surd’ as there will be occasions when their calculator displays an answer in surd form, for example, 4√2.