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| **U****NIT 18: More fractions, reciprocals, standard form, zero and negative indices** |

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**SPECIFICATION REFERENCES**

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

N7 calculate with roots, and with integer indices

N8 calculate exactly with fractions …

N9 calculate with and interpret standard form *A* x 10*n*, where 1 ≤ *A* < 10 and *n* is an integer.

**PRIOR KNOWLEDGE**

Students should know how to do the four operations with fractions.

Students should be able to write powers of 10 in index form and recognise and recall powers of 10, i.e. 102 = 100.

Students should recall the index laws.

**KEYWORDS**

Add, subtract, multiply, divide, mixed, improper, fraction, decimal, indices, standard form, power, reciprocal, index

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| **18a. Fractions** (N2, N3, N8) | **Teaching time**4–6 hours |

**OBJECTIVES**

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

* Add and subtract mixed number fractions;
* Multiply mixed number fractions;
* Divide mixed numbers by whole numbers and vice versa;
* Find the reciprocal of an integer, decimal or fraction;
* Understand ‘reciprocal’ as multiplicative inverse, knowing that any non-zero number multiplied by its reciprocal is 1 (and that zero has no reciprocal because division by zero is not defined).

**POSSIBLE SUCCESS CRITERIA**

What is the reciprocal of 4, , –2, ?

**OPPORTUNITIES FOR REASONING/PROBLEM SOLVING**

Students should be able to justify when fractions are equal and provide correct answers as a counter-argument.

Links with other areas of mathematics should be used where appropriate to embed the notion that fractions are not just used in isolation, e.g. use 6 ½ cm instead of 6.5 cm.

**COMMON MISCONCEPTIONS**

The larger the denominator the larger the fraction.

**NOTES**

Regular revision of fractions is essential.

Demonstrate how to the use the fraction button on the calculator.

Use real-life examples where possible.