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| **UNIT 17: Changing the subject of formulae (more complex), algebraic fractions, solving equations arising from algebraic fractions, rationalising surds, proof** | **Teaching time**  6-8 hours |

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**SPECIFICATION REFERENCES**

N8 … **simplify surd expressions involving squares (e.g. √12 = √(4 × 3) = √4 × √3   
= 2√3) and rationalise denominators**

A4 simplify and manipulate algebraic expressions (including those involving surds **and algebraic fractions**) by:

* collecting like terms
* multiplying a single term over a bracket
* taking out common factors
* expanding products of two **or more** binomials
* factorising quadratic expressions of the form *x*2 + *bx* + *c*, including the difference of two squares; **factorising quadratic expressions of the form *ax*2 + *bx* + *c***
* simplifying expressions involving sums, products and powers, including the laws of indices

A5 … rearrange formulae to change the subject

A6 … argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments **and proofs**

A7 where appropriate, interpret simple expressions as functions with inputs and outputs; **interpret the reverse process as the ‘inverse function’; interpret the succession of two functions as a ‘composite function’ (the use of formal function notation is expected)**

A18 solve quadratic equations **(including those that require rearrangement)** algebraically by factorising, …

**PRIOR KNOWLEDGE**

Students should be able to simplify surds.

Students should be able to use negative numbers with all four operations.

Students should be able to recall and use the hierarchy of operations.

**KEYWORDS**

Rationalise, denominator, surd, rational, irrational, fraction, equation, rearrange, subject, proof, function notation, inverse, evaluate

**OBJECTIVES**

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

* Rationalise the denominator involving surds;
* Simplify algebraic fractions;
* Multiply and divide algebraic fractions;
* Solve quadratic equations arising from algebraic fraction equations;
* Change the subject of a formula, including cases where the subject occurs on both sides of the formula, or where a power of the subject appears;
* Change the subject of a formula such as , where all variables are in the denominators;
* Solve ‘Show that’ and proof questions using consecutive integers (*n*, *n* + 1), squares *a*2, *b*2, even numbers 2*n*, odd numbers 2*n* +1;
* Use function notation;
* Find f(*x*) + g(*x*) and f(*x*) – g(*x*), 2f(*x*), f(3*x*) etc algebraically;
* Find the inverse of a linear function;
* Know that f –1(*x*) refers to the inverse function;
* For two functions f(*x*) and g(*x*), find gf(*x*).

**POSSIBLE SUCCESS CRITERIA**

Rationalise: , , (√18 + 10) +√2.

Explain the difference between rational and irrational numbers.

Given a function, evaluate f(2).

When g(*x*) = 3 – 2*x*, find g–1 (*x*).

**OPPORTUNITIES FOR REASONING/PROBLEM SOLVING**

Formal proof is an ideal opportunity for students to provide a clear logical chain of reasoning providing links with other areas of mathematics.

**COMMON MISCONCEPTIONS**

√3 x √3 = 9 is often seen.

When simplifying involving factors, students often use the ‘first’ factor that they find and not the LCM.

**NOTES**

It is useful to generalise √*m* × √*m* = *m*.

Revise the difference of two squares to show why we use, for example, (√3 – 2) as the multiplier to rationalise (√3 + 2).

Link collecting like terms to simplifying surds (Core 1 textbooks are a good source for additional work in relation to simplifying surds).

Practice factorisation where the factor may involve more than one variable.

Emphasise that, by using the LCM for the denominator, the algebraic manipulation is easier.