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| **UNIT 20: Rearranging equations, graphs of cubic and reciprocal functions and simultaneous equations** | **Teaching time**  4–6 hours |

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**SPECIFICATION REFERENCES**

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

A3 understand and use the concepts and vocabulary of expressions, equations, formulae, identities, inequalities, terms and factors

A5 understand and use standard mathematical formulae; rearrange formulae to change the subject

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

A9 … use the form *y* = *mx* + *c* to identify parallel lines; find the equation of the line through two given points, or through one point with a given gradient

A10 identify and interpret gradients and intercepts of linear functions graphically and algebraically

A12 recognise, sketch and interpret graphs of … the reciprocal function  with *x* ≠ 0

A14 plot and interpret … reciprocal graphs …

A19 solve two simultaneous equations in two variables (linear/linear) algebraically; find approximate solutions using a graph

A21 translate simple situations or procedures into algebraic expressions or formulae; derive an equation (or two simultaneous equations), solve the equation(s) and interpret the solution.

R10 solve problems involving direct and inverse proportion, including graphical and algebraic representations

R14 … recognise and interpret graphs that illustrate direct and inverse proportion

**PRIOR KNOWLEDGE**

Students should be able to draw linear graphs.

Students should be able to plot coordinates and sketch simple functions with a table of values.

Students should be able to substitute into and solve equations.

Students should have experience of using formulae.

Students should recall and use the hierarchy of operations and use of inequality symbols.

**KEYWORDS**

Reciprocal, linear, gradient, functions, direct, indirect, estimate, cubic, subject, rearrange, simultaneous, substitution, elimination, proof

**OBJECTIVES**

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

* Know the difference between an equation and an identity and use and understand the   
  ≠ symbol;
* Change the subject of a formula involving the use of square roots and squares;
* Answer ‘show that’ questions using consecutive integers (*n*, *n* + 1), squares *a*2, *b*2, even numbers 2*n*, and odd numbers 2*n* +1;
* Solve problems involving inverse proportion using graphs, and read values from graphs;
* Find the equation of the line through two given points;
* Recognise, sketch and interpret graphs of simple cubic functions;
* Recognise, sketch and interpret graphs of the reciprocal function  with *x* ≠ 0;
* Use graphical representations of inverse proportion to solve problems in context;
* identify and interpret the gradient from an equation *ax* + *by* = *c*;
* Write simultaneous equations to represent a situation;
* Solve simultaneous equations (linear/linear) algebraically and graphically;
* Solve simultaneous equations representing a real-life situation, graphically and algebraically, and interpret the solution in the context of the problem;

**POSSIBLE SUCCESS CRITERIA**

Solve two simultaneous equations in two variables (linear/linear) algebraically and find approximate solutions using a graph.

Identify expressions, equations, formulae and identities from a list.

**OPPORTUNITIES FOR REASONING/PROBLEM SOLVING**

Simple simultaneous equations can be formed and solved from real life scenarios, such as   
2 adult and 2 child tickets cost £18, and 1 adult and 3 child tickets costs £17. What is the cost of 1 adult ticket?

**COMMON MISCONCEPTIONS**

The effects of transforming functions are often confused.

**NOTES**

Emphasise the need for good algebraic notation.