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| **UNIT 5: Equations, inequalities and sequences** |

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**SPECIFICATION REFERENCES**

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

N15 round numbers and measures to an appropriate degree of accuracy (e.g. to a specified number of decimal places or significant figures); use inequality notation to specify simple error intervals due to truncation or rounding

N16 apply and interpret limits of accuracy

A2 substitute numerical values into formulae and expressions, including scientific formulae

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

A7 where appropriate, interpret simple expressions as functions with inputs and outputs

A17 solve linear equations in one unknown algebraically (including those with the unknown on both sides of the equation); find approximate solutions using a graph

A21 translate simple situations or procedures into algebraic expressions or formulae; derive an equation, solve the equation and interpret the solution

A22 solve linear inequalities in one variable; represent the solution set on a number line

A23 generate terms of a sequence from either a term-to-term or a position-to-term rule

A24 recognise and use sequences of triangular, square and cube numbers, simple arithmetic progressions; Fibonacci type sequences and simple geometric progressions (*rn* where *n* is an integer, and *r* is a rational number > 0)

A25 deduce expressions to calculate the *n*th term of linear sequences.

**PRIOR KNOWLEDGE**

Students should be able to use inequality signs between numbers.

Students should be able to use negative numbers with the four operations, recall and use the hierarchy of operations and understand inverse operations.

Students should be able to deal with decimals and negatives on a calculator.

Students should be able to use index laws numerically.

Students should be able to draw a number line.

**KEYWORDS**

Arithmetic, geometric, function, sequence, *n*th term, derive, quadratic, triangular, cube, square, odd, even, solve, change, subject, inequality, represent, substitute, bracket, expand, linear, equation, balance, accuracy

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| **5a. Equations and inequalities**  (N1, N15, N16, A2, A3, A5, A7, A17, A21, A22) | **Teaching time**  8-10 hours |

**OBJECTIVES**

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

* Select an expression/equation/formula/identity from a list;
* Write expressions and set up simple equations including forming an equation from a word problem;
* Use function machines;
* Solve simple equations including those:
  + with integer coefficients, in which the unknown appears on either side or on both sides of the equation;
  + which contain brackets, including those that have negative signs occurring anywhere in the equation, and those with a negative solution;
  + with one unknown, with integer or fractional coefficients;
* Rearrange simple equations;
* Substitute into a formula, and solve the resulting equation;
* Find an approximate solution to a linear equation using a graph;
* Solve angle or perimeter problems using algebra.
* Show inequalities on number lines;
* Write down whole number values that satisfy an inequality;
* Solve an inequality such as –3 < 2*x* + 1 <7 and show the solution set on a number line;
* Solve two inequalities in *x*, find the solution sets and compare them to see which value of *x* satisfies both;
* Use the correct notation to show inclusive and exclusive inequalities;
* Construct inequalities to represent a set shown on a number line;
* Solve simple linear inequalities in one variable, and represent the solution set on a number line;
* Round answers to a given degree of accuracy;
* Use inequality notation to specify simple error intervals due to truncation or rounding.

**POSSIBLE SUCCESS CRITERIA**

Solve: *x* + 5 = 12, *x* – 6 = 3,  = 5, 2*x* – 5 =19, 2*x* + 5 = 8*x* – 7

Given expressions for the angles on a line or in a triangle in terms of *a*, find the value of *a*.

Given expressions for the sides of a rectangle and the perimeter, form and solve an equation to find missing values.

Solve –3 < 2*x* + 1 and show the solution set on a number line.

State the whole numbers that satisfy a given inequality.

Recognise that measurements given to the nearest whole unit may be inaccurate by up to one half in either direction.

**OPPORTUNITIES FOR REASONING/PROBLEM SOLVING**

Problems that:

* could be solved by forming equations such as: Pat and Paul have a combined salary of £800 per week. Pat earns £200 per week more than Paul. How much does Paul earn?
* involve the application of a formula with conflicting results such as: Pat and Paul are using the formula *y* = 8*n* + 4 When *n* = 2, Pat states that *y* = 86 and Paul states *y* = 20. Who is correct?

**COMMON MISCONCEPTIONS**

Rules of adding and subtracting negatives.

Inverse operations can be misapplied.

When solving inequalities, students often state their final answer as a number quantity and either exclude the inequality or change it to =.

**NOTES**

Emphasise good use of notation.

Students need to realise that not all linear equations can be solved by observation or trial and improvement, and hence the use of a formal method is important.

Students can leave their answer in fraction form where appropriate.

Emphasise the importance of leaving their answer as an inequality (and not change to =).