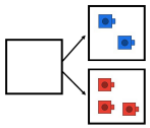
Algebra: Overview

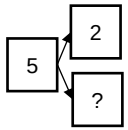
Concepts: Patterns and sequences, Reasoning about relations between quantities, Solving problems with unknown values, Representing relationships with formulae

Statements for Algebra **only appear in the Year 6 National Curriculum** but should be connected to previous learning on understanding equivalence, patterns and sequences, solving problems with unknown value and representing relationships as formulae. These connections from the other curriculum strands have been mapped in Reception-Year 5 in this document.

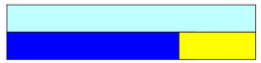
Please note: this list is not exhaustive and algebraic thinking can be applied throughout the mathematics curriculum, see this NRICH article for further reading.

Two cubes add three cubes is equal to five cubes.



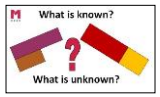


2 + ▲ = 5



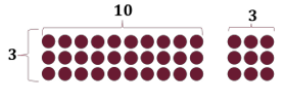
16 + 4 = 20
4 + 16 = 20
20 – 16 = 4
20 – 4 = 16

20 = 16 + 4
20 = 4 + 16
4 = 20 -16
16 = 20 - 4



315 = 254 + ☐

315	
254	?



13 x 3 = 39.
I know 10 x 3 = 30 and 3 x 3 = 9. So 30 + 9 = 39

Reception

- Continue, copy and create repeating patterns
- Pupils compare numbers and objects using the language of more than', 'less than', 'fewer', 'the same as', 'equal to'.

Year 1

- Identify and represent numbers using objects and pictorial representations including the number line, and use the language of: equal to, more than, less than (fewer), most, least
- Read, write and interpret mathematical statements involving addition (+), subtraction (−) and equals (=) signs
- Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = ? − 9

Year 2

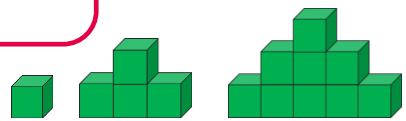
- Order and arrange combinations of mathematical objects in patterns
- Show that addition & multiplication of 2 numbers can be done in any order (commutative) and subtraction & division of 1 number from another cannot
- Add 3 one-digit numbers, *using associativity* (e.g, (3+4) + 2 = (2+4) + 3
- Compare and order numbers from 0 up to 100; use <, > and = signs
- Pupils should partition numbers in different ways (e.g, 23 = 20 + 3 and 23 = 10 + 13) to support subtraction.
- Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems

Year 3

- Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction
- Solve problems, including missing number problems, involving multiplication and division, including using the distributive law, positive integer scaling problems and correspondence problems in which n objects are connected to m objects

$x = 45y + 125$

The cost of a photo album book is £1.25 for binding and printing with an additional cost of 45p per photo



How many cubes will be in the next staircase?
How many cubes will be in the tenth staircase?

Year 4

- Solve problems involving patterns
- Estimate and use inverse operations to check answers to a calculation
- Solve problems involving multiplying and adding, including using the distributive law to multiply two-digit numbers by 1 digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects
- Express perimeter algebraically as 2(a + b) where a and b are the dimensions in the same unit.

Year 5

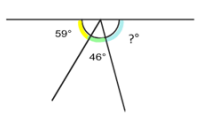
- Use and explain the equals sign to indicate equivalence, including in missing number problems (for example 13 + 24 = 12 + 25; 33 = 5 x ?).
- Use the properties of rectangles to deduce related facts and find missing lengths and angles
- Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why
- Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign
- Distributivity can be expressed as a(b + c) = ab + ac

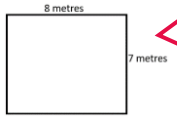
Year 6

- Generate and describe linear number sequences
- Express missing number problems algebraically
- Find pairs of numbers that satisfy an equation with 2 unknowns
- Enumerate possibilities of combinations of 2 variables
- Solve problems involving the relative sizes of 2 quantities where missing values can be found by using integer multiplication and division facts
- Find missing angles
- Use simple formulae and recognise when it is possible to use formulae for area and volume of shapes and translating vertices

7 12 17 22 27 32 37

"the (term-to-term) rule is **add five**"





2 x (8 + 7) = 30.
The perimeter is 30 metres

Algebra: Concept breakdown

Note: Statutory Curriculum requirements are in **bold**

	Reception →	Year 1 →	Year 2 →	Year 3 →	Year 4 →	Year 5 →	Year 6
Pattern and sequences							
Describing pattern	*Continue, copy and create repeating patterns* Unit 2	*Recognise and create repeating patterns* Unit 3	**Order and arrange combinations of mathematical objects in patterns and sequences** Unit 11	*Pupils should continue to consolidate describing and creating patterns Maths Meetings*	*Solve problems involving patterns* Unit 13	*Pupils continue to explore patterns in Maths Meetings*	**Generate and describe linear number sequences** Unit 3
Reasoning about relations between quantities							
Reasoning about relations between quantities	*Identify equal and unequal sets* Unit 1; Unit 10; Unit 11; Unit 15; Unit 16 *Compare numbers and objects using the language of more than', 'less than', 'fewer', 'the same as', 'equal to'* Unit 1; Unit 5; Unit 14; Unit 17;Unit 18	**Identify and represent numbers using objects and pictorial representations including the number line, and use the language of: equal to, more than, less than (fewer), most, least** Unit 1 ; Unit 4; Unit 8; Unit 12 **Read, write and interpret mathematical statements involving addition (+), subtraction (−) and equals (=) signs** Unit 2; Unit 5; Unit 7; Unit 9; Unit 13	**Compare and order numbers from 0 up to 100; use <, > and = signs** Unit 1; Unit 12 **Show that addition & multiplication of 2 numbers can be done in any order (commutative) and subtraction & division of 1 number from another cannot** Unit 2, Unit 6 **Add 3 one-digit numbers**, *using associativity* (e.g, (3+4) + 2 = (2+4) + 3 Unit 2 *Pupils should partition numbers in different ways (for example, 23 = 20 + 3 and 23 = 10 + 13) to support subtraction.* Unit 1	*Use larger numbers to at least 1000, applying partitioning related to place value using varied and increasingly complex problems, building on work in year 2 (for example, 146 = 100 + 40 and 6, 146 = 130 + 16).* Unit 2	**Estimate and use inverse operations to check answers to a calculation** Unit 2 *Pupils write statements about the equality of expressions (for example, use the distributive law 39 × 7 = 30 × 7 + 9 × 7 and associative law (2 × 3) × 4 = 2 × (3 × 4)). They combine their knowledge of number facts and rules of arithmetic to solve mental and written calculations for example, 2 x 6 x 5 = 10 x 6 = 60.* Unit 3	**Use and explain the equals sign to indicate equivalence, including in missing number problems (for example 13 + 24 = 12 + 25; 33 = 5 x ?).** Arithmetic Autumn 2 **Use the properties of rectangles to deduce related facts and find missing lengths and angles** Unit 7	**Express missing number problems algebraically** Unit 3

Algebra: Concept breakdown

Note: Statutory Curriculum requirements are in **bold**

	Reception →	Year 1 →	Year 2 →	Year 3 →	Year 4 →	Year 5 →	Year 6
Solving problems with unknowns							
Solving problems with unknowns		**Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = ? – 9** Unit 2; Unit 5; Unit 7; Unit 9; Unit 13	**Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems** Unit 3 (Do Nows); Unit 15	**Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction** Unit 4; Unit 13 **Solve problems, including missing number problems, involving multiplication and division, including using the distributive law, positive integer scaling problems and correspondence problems in which n objects are connected to m objects** Unit 6	**Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why** Unit 2; Unit 10 **Solve problems involving multiplying and adding, including using the distributive law to multiply two-digit numbers by 1 digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects** Unit 3	**Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.** Unit 2 **Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign** Unit 4	**Find pairs of numbers that satisfy an equation with 2 unknowns** Unit 3 **Numerate possibilities of combinations of 2 variables** Unit 3 **Solve problems involving the relative sizes of 2 quantities where missing values can be found by using integer multiplication and division facts** Unit 3
Representing relationships with formulae							
Representing relationships with formulae					*Express perimeter algebraically as 2(a + b) where a and b are the dimensions in the same unit.* Unit 9	*Distributivity can be expressed as a(b + c) = ab + ac* Unit 4	**Use simple formulae** Unit 3 **Find missing angles** Unit 7 **Recognise when it is possible to use formulae for area and volume of shapes** Unit 6 **and translating vertices** Unit 8