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# STRIDE INTO *THE FUTURE* OF ASSESSMENT

Teacher Companion Guide

**Algebra**



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## Overview

Stride is a new offering from AQA which is designed to empower students and quickly identify and close their knowledge gaps in mathematics. Designed to help students starting their GCSEs – either for the first time or as a resit – the tests are accessible for all and adapt to students' knowledge, delivering the right amount of challenge.

Our new maths tests will allow teachers to pinpoint gaps in their students' conceptual knowledge - saving them time and empowering students, who will understand how to improve. They're fully funded for schools and colleges, easy to use for teachers and engaging for students.

The five short tests, created with the [Key Stage 1 and 2](#) and [Key Stage 3](#) guidance in mind, focus on key areas of maths that experts have identified as the most impactful for GCSE success. They come with personalised learning and next steps to allow students to develop in both knowledge and confidence.

### Rationale

We know that maths is a hierarchical subject, with knowledge being built upon foundational maths which underpins the new concept. We have analysed data from hundreds of thousands of exam questions and found that even though content is first encountered in the early stages of a learner's schooling, a significant proportion of learners answer questions on the foundations of maths incorrectly.

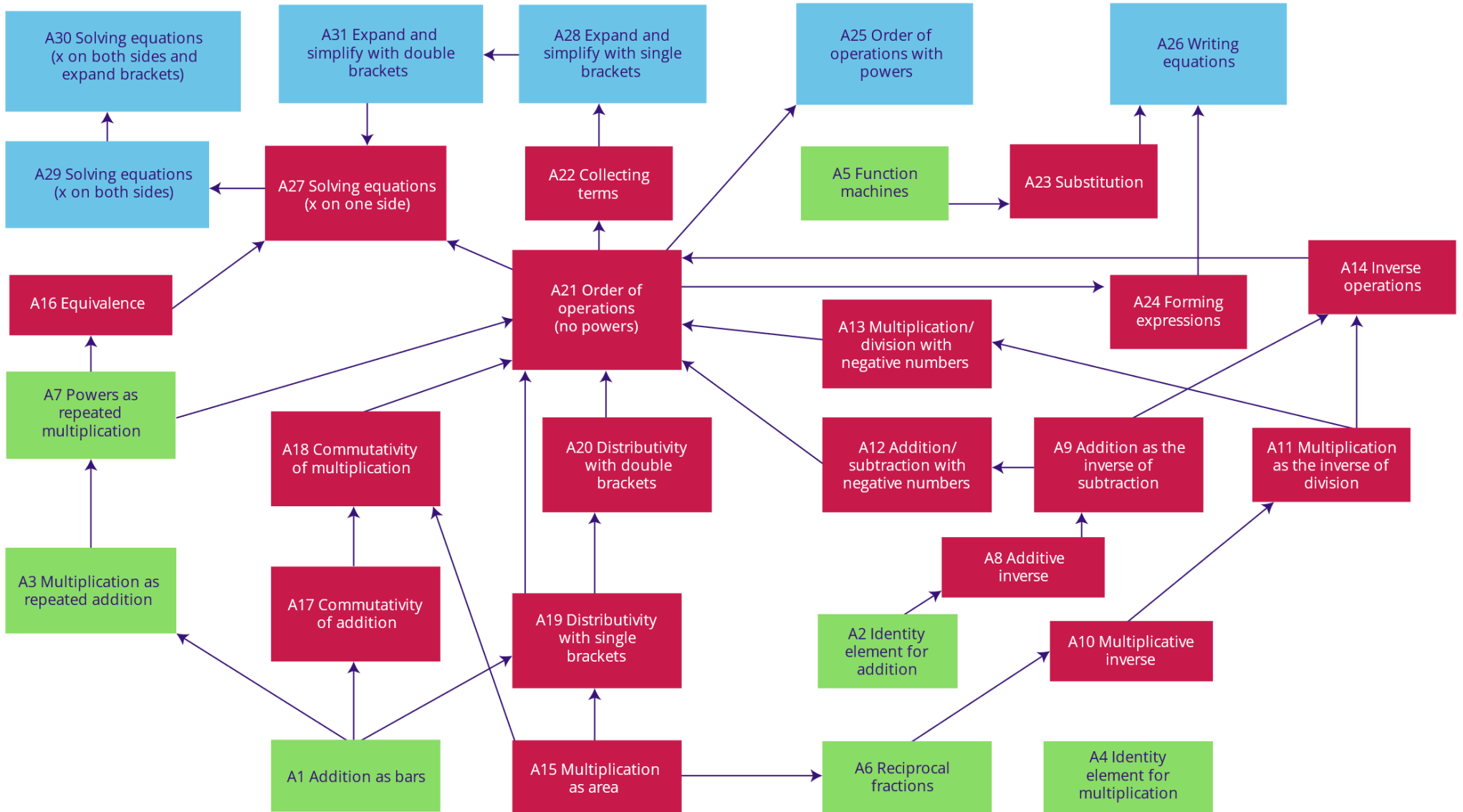
With this in mind, we want to empower teachers to take control of their classrooms and provide a nurturing environment in which gaps within key prerequisite understanding are identified and corrective instruction is deployed, filling the gaps and ensuring that more complex content can be taught, safe in the knowledge that learners have the underlying knowledge required to be successful in their lessons, and thrive in the GCSE examinations.

### Key features

The Concept Map for Algebra, shown on the following page, identifies A21 Order of Operations as key understanding for success with algebraic techniques, particularly with A27 Solving Equations where the variable appears on one side of the equals sign only.

Order of Operations has many predecessors which can be summarised as the four mathematical operations, and it is clear that to succeed in Algebra, learners must have developed significant expertise with addition, subtraction, multiplication and division, appreciating the many relationships that exist between the four operations.

## 2. Algebra



## A1 Addition as bars

What is being tested	Learners are being tested on their understanding of collecting separate groups to form a single group
Learning Objectives	<p>A1.1 Match whole number additions to their diagram representations</p> <p>A1.2 Recognise the diagram that represents addition</p> <p>A1.3 Identify diagrams where changing the grouping does not change the answer</p>
Predecessors	None
Successors	<p>A3 Multiplication as repeated addition</p> <p>A15 Multiplication as area</p> <p>A17 Commutativity of addition</p>
KS2 & KS3 Guidance	Learners encounter bar models in Year 1 (page 36, KS1 and KS2 guidance) as a representation for addition.
Hachette Learning (formerly Hodder Education) Platform References	<p><i>No appropriate Shine Intervention</i></p> <p>No Mastering Mathematics content</p>

## A2 Identity element for addition

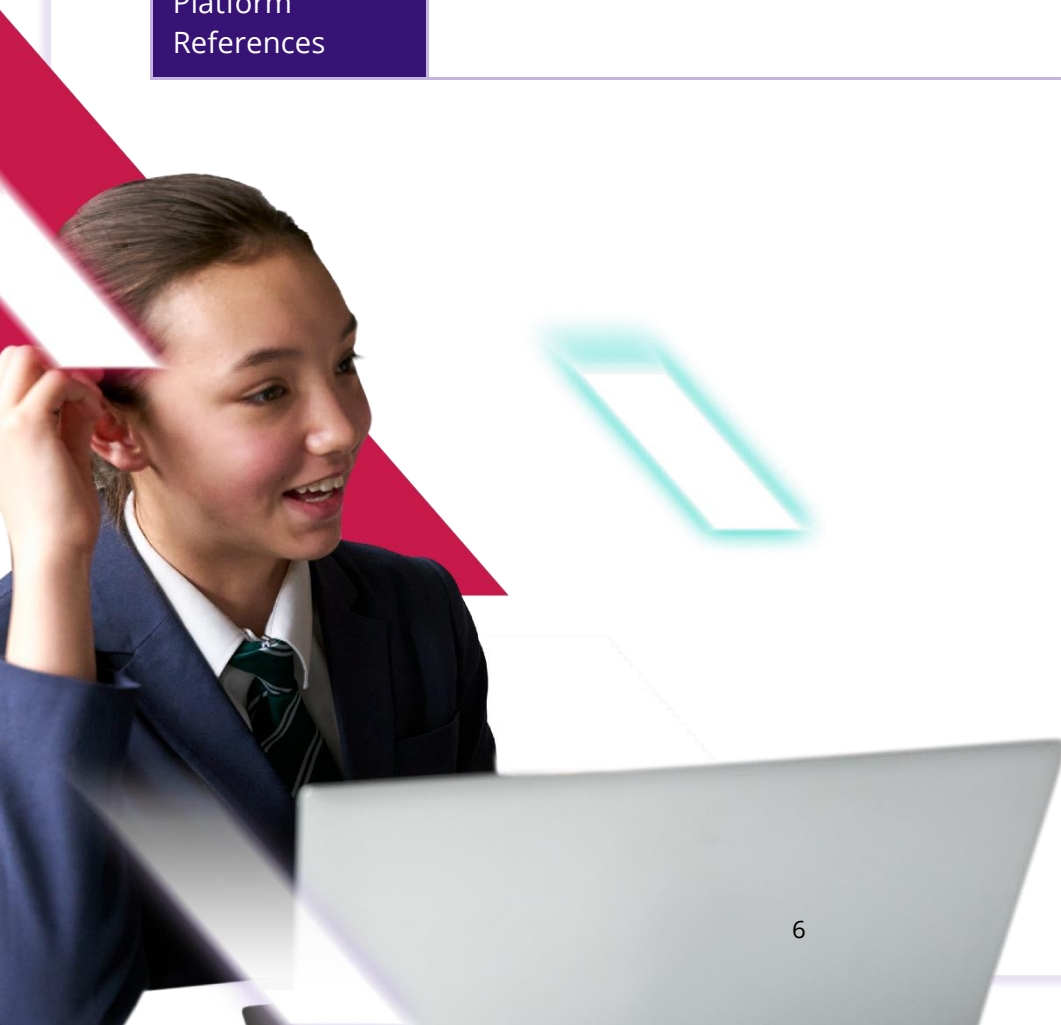
What is being tested	Learners are being tested on their understanding of the effect of adding and subtracting zero from a specified value.
Learning Objectives	A2.1 Recall that adding 0 to a number results in no change to the number A2.2 Recall that subtracting 0 from a number results in no change to the number
Predecessors	None
Successors	A8 Additive inverse
KS2 & KS3 Guidance	Learners begin to add in subtract in Year 1, and will explore the result of adding and subtracting 0 (KS1 and KS2, page 24).
Hachette Learning (formerly Hodder Education) Platform References	<i>No appropriate Shine Intervention</i> No Mastering Mathematics content

## A3 Multiplication as repeated addition

What is being tested	Learners are being tested on their understanding of representing repeated addition as a scalar.
Learning Objectives	<p>A3.1 Identify the corresponding repeated number addition for a given multiplication with whole numbers</p> <p>A3.2 Identify the corresponding repeated number addition for a given multiplication with algebra</p> <p>A3.3 Recognise repeated addition as multiplication with algebra</p>
Predecessors	A3 Addition as bars
Successors	A7 Powers as repeated multiplication
KS2 & KS3 Guidance	Learners are introduced to the idea of writing repeated addition as a multiplication in Year 2 (page 69, KS1 and KS2 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<p><b>Shine Interventions: Access Mathematics Tests</b></p> <p><b>Strand 7: Algebra</b></p> <p>Intervention Learning Sequence:</p> <p>7.3 Expressions</p> <p><i>No Mastering Mathematics content</i></p>

## A4 Identity element for multiplication

What is being tested	Learners are being tested on their understanding of multiplying and dividing by one.
Learning Objectives	<p>A4.1 Recall that multiplying a number by 1 does not change the value of the number</p> <p>A4.2 Multiply a number by 1</p> <p>A4.3 Recall that dividing a number by 1 does not change the value of the number</p> <p>A4.4 Divide a number by 1</p>
Predecessors	None
Successors	A10 Multiplicative inverse
KS2 & KS3 Guidance	Learners begin to multiply single-digit numbers in Year 2 (KS1 and KS2, page 70), and explore this idea throughout KS2.
Hachette Learning (formerly Hodder Education) Platform References	<p><i>No appropriate Shine Intervention</i></p> <p><i>No Mastering Mathematics content</i></p>



## A5 Function machines

What is being tested	Learners are being tested on their ability to use two-step function machines, as well as using function machines inversely.
Learning Objectives	<p>A5.1 Calculate an output for a two-step function machine with a +/- and a <math>\times/\div</math> when given a positive integer input</p> <p>A5.2 Calculate an output for a two-step function machine with a +/- and a <math>\times/\div</math> when given a negative integer input</p> <p>A5.3 Calculate an input for a two-step function machine with a +/- and a <math>\times/\div</math> when given an output</p> <p>A5.4 Calculate the input and the output from a simple two step function machine</p>
Predecessors	None
Successors	A23 Substitution
KS2 & KS3 Guidance	A function machine is a key representation for developing understanding with operations and their inverses, deployed throughout Key Stages 1, 2 and 3.
Hachette Learning (formerly Hodder Education) Platform References	<p><i>No appropriate Shine Intervention</i></p> <p><i>No Mastering Mathematics content</i></p>

## A6 Reciprocal fractions

What is being tested	Learners are being tested on their understanding of reciprocals, using the correct terminology.
Learning Objectives	<p>A6.1 Identify the reciprocal of a given number</p> <p>A6.2 Write the reciprocal of a given whole number</p> <p>A6.3 Write the reciprocal of a given unit fraction</p> <p>A6.4 Write the reciprocal fraction for a given fraction</p>
Predecessors	A15 Multiplication as area
Successors	A10 Multiplicative inverse
KS2 & KS3 Guidance	Learners are first introduced to reciprocals in Year 7 (page 46, KS3 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<p><b>Shine Interventions: Access Mathematics Tests</b></p> <p><b>Strand 4: Fractions, decimals and percentages</b></p> <p>Intervention Learning Sequence:</p> <p>4.9 Multiplying and dividing fractions</p> <p><b>Key Stage 3 Mastering Mathematics</b></p> <p>Book 1: Chapter 8: 8.4 Dividing an integer by a fraction</p>

## A7 Powers as repeated multiplication

What is being tested	Learners are being tested on their understanding of representing repeated multiplication using index notation.
Learning Objectives	<p>A7.1 Match the corresponding repeated multiplication for given number in index form with whole numbers</p> <p>A7.2 Match the corresponding index form for given repeated multiplications with whole numbers</p> <p>A7.3 Identify the corresponding index form for given repeated multiplication with decimals</p> <p>A7.4 Write repeated multiplication with algebra in index form</p> <p>A7.5 Calculate powers with a whole number base</p> <p>A7.6 Calculate powers with a negative integer base</p> <p>A7.7 Calculate powers with a rational (fraction) base</p>
Predecessors	A3 Multiplication as repeated addition
Successors	A21 Order of operations (no powers)
KS2 & KS3 Guidance	Learners are introduced to index notation for writing repeated multiplication at Upper KS2 (page 30, KS3 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<p><b>Shine Interventions: Access Mathematics Tests</b>  <b>Strand 3: Types of number and calculations</b></p> <p>Intervention Learning Sequence:            3.3 Powers, roots and order of operations</p> <p><b>Key Stage 3 Mastering Mathematics</b>            Book 1: Chapter 4: 4.3 Powers and roots</p>

## A8 Additive inverse

What is being tested	Learners are being tested on their understanding of the 'additive inverse', referring to the additive identity as a 'zero pair'.
Learning Objectives	<p>A8.1 Identify the zero pair to a given integer</p> <p>A8.2 Recall that subtracting a number from 0 gives its zero pair</p> <p>A8.3 Describe a zero pair</p> <p>A8.4 Write the zero pair to a given number with mixed number types</p> <p>A8.5 Add a number to its zero pair</p>
Predecessors	A2 Identity element for addition
Successors	A9 Addition as the inverse of subtraction
KS2 & KS3 Guidance	Learners are first introduced to the idea of a 'zero pair' in Year 7 (page 47, KS3 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<p><b>Shine Interventions: Access Mathematics Tests</b></p> <p><b>Strand 3: Types of number and calculations</b></p> <p>Intervention Learning Sequence:</p> <p>3.5 Directed number calculations</p> <p><i>No Mastering Mathematics content</i></p>

## A9 Addition as the inverse of subtraction

What is being tested	Learners are being tested on their understanding of addition and subtraction as inverse operations.
Learning Objectives	A9.1 Recall that addition is the inverse of subtraction A9.2 Recognise the equivalent calculation when subtraction is replaced with its zero pair
Predecessors	A8 Additive inverse
Successors	A12 Addition/ subtraction with negative numbers A14 Inverse operations
KS2 & KS3 Guidance	Learners begin to appreciate the inverse relationship between addition and subtraction in Year 3 (page 113, KS1 and KS2 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<b>Shine Interventions: Access Mathematics Tests</b> <b>Strand 3: Types of number and calculations</b> Intervention Learning Sequence: 3.4 Inverse operations <b>Key Stage 3 Mastering Mathematics</b> Book 1: Chapter 6, 6.4 Solving equations

## A10 Multiplicative inverse

What is being tested	Learners are being tested on their understanding of the 'multiplicative inverse', referring to the multiplicative inverse as the 'reciprocal'.
Learning Objectives	<p>A10.1 Calculate the product of a number and its reciprocal</p> <p>A10.2 Write the denominator of the reciprocal of a given number so the product is 1</p> <p>A10.3 Recall that a whole number multiplied by its reciprocal is equal to 1</p> <p>A10.4 Recall that a fraction multiplied by its reciprocal is equal to 1</p> <p>A10.5 Recall that the product of a number and its reciprocal is always 1</p> <p>A10.6 Recall that zero is the only number that does not have a reciprocal</p> <p>A10.7 Match an expression with repeated multiplication of reciprocals to the product</p>
Predecessors	<p>A6 Reciprocal fractions</p> <p>A4 Identity element for multiplication</p>
Successors	A11 Multiplication as the inverse of division
KS2 & KS3 Guidance	Learners are first introduced to reciprocals in Year 7 (page 46, KS3 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<p><b>Shine Interventions: Access Mathematics Tests</b></p> <p><b>Strand 3: Types of number and calculations</b></p> <p>Intervention Learning Sequence:</p> <p>3.4 Inverse operations</p> <p><b>Key Stage 3 Mastering Mathematics</b></p> <p>Book 1: Chapter 5, 5.1 Multiplying and dividing integers</p> <p>Book 1: Chapter 6, 6.4 Solving equations</p>

## A11 Multiplication as the inverse of division

What is being tested	Learners are being tested on their understanding of multiplication and division as inverse operations.
Learning Objectives	<p>A11.1 Recognise the correct calculation when division by a fraction has been replaced with its reciprocal</p> <p>A11.2 Recognise the correct calculation when division by a whole number has been replaced with its reciprocal</p> <p>A11.3 Recall that multiplication is the inverse of division</p>
Predecessors	A10 Multiplicative inverse
Successors	<p>A13 Multiplication/ division with negative numbers</p> <p>A14 Inverse operations</p>
KS2 & KS3 Guidance	Learners begin to appreciate the inverse relationship between multiplication and division in Year 6 (page 112, KS3 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<p><b>Shine Interventions: Access Mathematics Tests</b></p> <p><b>Strand 4: Fractions, decimals and percentages</b></p> <p>Intervention Learning Sequence:</p> <p>4.9 Multiplying and dividing fractions</p> <p><b>Strand 3: Types of number and calculations</b></p> <p>Intervention Learning Sequence:</p> <p>3.4 Inverse operations</p> <p><b>Key Stage 3 Mastering Mathematics</b></p> <p>Book 1: Chapter 5, 5.1 Multiplying and dividing integers</p> <p>Book 1: Chapter 6, 6.4 Solving equations</p>

## A12 Addition/subtraction with negative numbers

What is being tested	Learners are being tested on their ability to add and subtract using directed numbers, drawing on their understanding of 'zero pairs'.
Learning Objectives	<p>A12.1 Calculate the addition of a negative and a positive integer</p> <p>A12.2 Calculate the addition of two negative integers</p> <p>A12.3 Calculate the subtraction of two negative integers</p> <p>A12.4 Calculate the subtraction of up to three negative and positive integers</p>
Predecessors	A9 Addition as the inverse of subtraction
Successors	A21 Order of operations (no powers)
KS2 & KS3 Guidance	Learners begin to add and subtract using directed numbers in Year 7 (page 41, KS3 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<p><b>Shine Interventions: Access Mathematics Tests</b></p> <p><b>Strand 3: Types of number and calculations</b></p> <p>Intervention Learning Sequence:</p> <p>3.5 Directed number calculations</p> <p><b>Key Stage 3 Mastering Mathematics</b></p> <p>Book 2: Chapter 6, 6.2 Adding and subtracting negative numbers</p>

## A13 Multiplication/division with negative numbers

What is being tested	Learners are being tested on their ability to multiply and divide using directed numbers.
Learning Objectives	A13.1 Calculate the multiplication of a negative and a positive number A13.2 Calculate the division of two negative numbers A13.3 Calculate the multiplication of up to three negative and positive numbers
Predecessors	A11 Multiplication as the inverse of division
Successors	A21 Order of operations (no powers)
KS2 & KS3 Guidance	Learners begin to add and subtract using directed numbers in Year 7 (page 41, KS3 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<b>Shine Interventions: Access Mathematics Tests</b> <b>Strand 3: Types of number and calculations</b> Intervention Learning Sequence: 3.5 Directed number calculations  <b>Key Stage 3 Mastering Mathematics</b> Book 2: Chapter 6, 6.3 Multiplying and dividing negative numbers

## A14 Inverse operations

What is being tested	Learners are being tested on their understanding of inverse operations when working with multiplication.
Learning Objectives	<p>A14.1 Identify a specific inverse calculation for a given multiplication</p> <p>A14.2 Identify the inverse calculations of multiplication using a reciprocal</p> <p>A14.3 Identify the calculation that doesn't have an inverse calculation of multiplication using a reciprocal</p> <p>A14.4 Identify the reverse calculation of a given example with improper fractions using reciprocals</p>
Predecessors	<p>A9 Addition as the inverse of subtraction</p> <p>A11 Multiplication as the inverse of division</p>
Successors	A21 Order of operations (no powers)
KS2 & KS3 Guidance	Learners begin to appreciate the inverse relationship between multiplication and division in Year 6 (page 113, KS3 guidance), and are introduced to reciprocals in Year 7 (page 46, KS3 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<p><b>Shine Interventions: Access Mathematics Tests</b>  <b>Strand 3: Types of number and calculations</b></p> <p>Intervention Learning Sequence:            3.4 Inverse operations</p> <p><b>Key Stage 3 Mastering Mathematics</b></p> <p>Book 1: Chapter 5, 5.1 Multiplying and dividing integers</p> <p>Book 1: Chapter 6, 6.4 Solving equations</p> <p>Book 1: Chapter 8: 8.4 Dividing an integer by a fraction</p> <p>Book 2: Chapter 7: 7.3 Dividing fractions</p>

## A15 Multiplication as area

What is being tested	Learners are being tested on their understanding of multiplication, representing multiplications as areas.
Learning Objectives	<p>A15.1 Order the given dimensions of different rectangles by calculating the size of their area</p> <p>A15.2 Identify a graphic of the partitioned area corresponding to a distributed calculation</p> <p>A15.3 Recognise the diagram that represents multiplication</p> <p>A15.4 Identify the area corresponding to a given multiplication</p> <p>A15.5 Recognise equivalent partitions of a given area (2-digit <math>\times</math> 2-digit)</p>
Predecessors	A1 Addition as bars
Successors	<p>A6 Reciprocal fractions</p> <p>A19 Distributivity with single brackets</p>
KS2 & KS3 Guidance	Learners are introduced to the idea of arrays to represent multiplication in Year 2 (page 80, KS1 and KS2 guidance), and extend this to the area of a rectangle in Year 5 (page 269, KS3 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<p><b>Shine Interventions: Access Mathematics Tests</b></p> <p><b>Strand 9: Shape</b></p> <p>Intervention Learning Sequence:</p> <p>9.2 Perimeters and areas of squares and rectangles</p> <p><b>Key Stage 3 Mastering Mathematics</b></p> <p>Book 1: Chapter 16, 16.1 Perimeter and area</p> <p>Book 2: Chapter 5, 5.2 Multiplying decimals</p> <p>Book 2: Chapter 7, 7.2 Multiplying fractions</p>

## A16 Equivalence

What is being tested	Learners are being tested on their understanding of the term 'equivalence'.
Learning Objectives	<p>A16.1 Complete an equation by adding a shape on one side of the equation</p> <p>A16.2 Match equivalent expressions with whole numbers and one operation</p> <p>A16.3 Categorise equivalent expressions with whole numbers and mixed operations</p>
Predecessors	None
Successors	A27 Solving equations (x on one side)
KS2 & KS3 Guidance	Learners begin to explore equivalence through place value in Year 3 (KS1 and KS2, page 83), and extend on this idea throughout Key Stages 1, 2 and 3.
Hachette Learning (formerly Hodder Education) Platform References	<p><i>No appropriate Shine Intervention</i></p> <p><b>Key Stage 3 Mastering Mathematics</b></p> <p>Book 1: Chapter 5, 5.3 BIDMAS</p> <p>Book 1: Chapter 6, 6.2 Using letters</p>

## A17 Commutativity of addition

What is being tested	Learners are being tested on their understanding of 'commutativity' with additive relationships.
Learning Objectives	<p>A17.1 Distinguish whether the order of numbers matters in calculations with addition or subtraction with whole numbers</p> <p>A17.2 Distinguish whether the order of numbers matters in calculations with addition or subtraction with algebra</p> <p>A17.3 Recall that the order of numbers matters in subtraction</p> <p>A17.4 Subtract two numbers in different order to show that it changes the result of the subtraction</p>
Predecessors	A1 Addition as bars
Successors	A18 Commutativity of multiplication
KS2 & KS3 Guidance	Learners use the commutative property of addition in Year 3 (page 113, KS1 and KS2 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<p><b>Shine Interventions: Access Mathematics Tests</b>  <b>Strand 3: Types of number and calculations</b></p> <p>Intervention Learning Sequence:            3.3 Powers, roots and order of operations</p> <p><b>Key Stage 3 Mastering Mathematics</b></p> <p>Book 1: Chapter 5, 5.3 BIDMAS            Book 1: Chapter 6, 6.2 Using letters</p>

## A18 Commutativity of multiplication

What is being tested	Learners are being tested on their understanding of 'commutativity' with multiplicative relationships.
Learning Objectives	<p>A18.1 Distinguish whether the order of numbers matters in calculations with multiplication or division with whole numbers</p> <p>A18.2 Recall that the order of numbers matters in division</p> <p>A18.3 Divide two numbers in different order to show that it changes the result of the division</p> <p>A18.4 Sort operations by whether they give the same or a different answer</p>
Predecessors	<p>A15 Multiplication as area</p> <p>A17 Commutativity of addition</p>
Successors	A21 Order of operations (no powers)
KS2 & KS3 Guidance	Learners use the commutative property of multiplication in Year 4 (page 173, KS1 and KS2 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<p><b>Shine Interventions: Access Mathematics Tests</b></p> <p><b>Strand 2: The four operations</b></p> <p>Intervention Learning Sequences:</p> <p>2.1 Multiplication</p> <p>2.2 Division</p> <p><b>Strand 3: Types of number and calculations</b></p> <p>Intervention Learning Sequence:</p> <p>3.3 Powers, roots and order of operations</p> <p><b>Key Stage 3 Mastering Mathematics</b></p> <p>Book 1: Chapter 5, 5.1 Multiplying and dividing integers</p> <p>Book 1: Chapter 5, 5.3 BIDMAS</p> <p>Book 1: Chapter 6, 6.2 Using letters</p>

## A19 Distributivity with single brackets

What is being tested	Learners are being tested on their understanding of the distributive property, applying the property to expressions with a single set of brackets.
Learning Objectives	<p>A19.1 Identify the correct diagram representation for a given multiplication with single brackets</p> <p>A19.2 Identify the equation that represents a multiplication with single brackets, with whole numbers</p> <p>A19.3 Identify the equation that represents a multiplication with single brackets, with algebra</p> <p>A19.4 Identify the equation that represents a division with single brackets, with whole numbers</p> <p>A19.5 Identify the equation that represents a division with single brackets, with algebra</p>
Predecessors	A15 Multiplication as area
Successors	<p>A20 Distributivity with double brackets</p> <p>A21 Order of operations (no powers)</p>
KS2 & KS3 Guidance	Learners begin to appreciate distributivity across a single bracket in Year 7 (page 59, KS3 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<p><b>Shine Interventions: Access Mathematics Tests</b></p> <p><b>Strand 7: Algebra</b></p> <p>Intervention Learning Sequence:</p> <p>7.6 Formulae and brackets</p> <p><b>Key Stage 3 Mastering Mathematics</b></p> <p>Book 2: Chapter 8, 8.2 Expanding brackets</p>

## A20 Distributivity with double brackets

What is being tested	Learners are being tested on their understanding of the distributive property, applying the property to expressions with two sets of brackets.
Learning Objectives	<p>A20.1 Identify the equation that represents a multiplication with double brackets, with whole numbers</p> <p>A20.2 Identify the equation that represents a multiplication with double brackets, with algebra</p> <p>A20.3 Identify the equation that represents a division with double brackets, with whole numbers</p>
Predecessors	A19 Distributivity with single brackets
Successors	A21 Order of operations (no powers)
KS2 & KS3 Guidance	Learners extend their understanding of distributivity, working with pairs of brackets in Year 9 (page 234, KS3 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<p><i>No appropriate Shine Intervention</i></p> <p><b>Key Stage 3 Mastering Mathematics</b></p> <p>Book 3: Chapter 7, 7.3 Expanding brackets</p>



## A21 Order of operations (no powers)

What is being tested	Learners are being tested on their understanding of the priority of the four mathematical operations in a given calculation.
Learning Objectives	<p>A21.1 Know the order of operations</p> <p>A21.2 Identify the first calculation in complex calculations with whole numbers (four operations and brackets)</p> <p>A21.3 Rank the operations in a complex calculation with decimals (four operations)</p> <p>A21.4 Apply the order of operations to positive and negative integer number calculations without a power</p> <p>A21.5 Identify the correct first calculation in complex calculations with fractions (four operations)</p>
Predecessors	<p>A7 Powers as repeated multiplication</p> <p>A12 Addition/ subtraction with negative numbers</p> <p>A13 Multiplication/ division with negative numbers</p> <p>A14 Inverse operations</p> <p>A18 Commutativity of multiplication</p> <p>A19 Distributivity with single brackets</p> <p>A20 Distributivity with double brackets</p>
Successors	<p>A22 Collecting terms</p> <p>A24 Forming expressions</p> <p>A25 Order of operations with powers</p> <p>A27 Solving equations (x on one side)</p>
KS2 & KS3 Guidance	Learners are introduced to the idea of the priority of operations in Upper KS2, extending their knowledge in Year 7 (page 41, KS3 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<p><b>Shine Interventions: Access Mathematics Tests</b></p> <p><b>Strand 3: Types of number and calculations</b></p> <p>Intervention Learning Sequence:</p> <p>3.3 Powers, roots and order of operations</p> <p><b>Key Stage 3 Mastering Mathematics</b></p> <p>Book 1: Chapter 5, 5.3 BIDMAS</p> <p>Book 1: Chapter 12, 12.3 Multiplying and dividing decimals</p> <p>Book 2: Number crossword page 125</p> <p>Book 3: Chapter 2, 2.3 Multiplying and dividing mixed numbers</p>

## A22 Collecting terms

What is being tested	Learners are being tested on their understanding of 'like terms', simplifying algebraic expressions.
Learning Objectives	A22.1 Identify like terms in a given expression A22.2 Simplify an expression by collecting like terms A22.3 Simplify an expression with some variables with no powers and some squared variables
Predecessors	A21 Order of operations (no powers)
Successors	A28 Expand and simplify with single brackets
KS2 & KS3 Guidance	Learners are introduced to the idea of 'like terms' in Year 7 (page 41, KS3 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<p><b>Shine Interventions: Access Mathematics Tests</b> <b>Strand 7: Algebra</b></p> <p>Intervention Learning Sequences: 7.3 Expressions 7.5 More expressions</p> <p><b>Key Stage 3 Mastering Mathematics</b> Book 1: Chapter 6, 6.3 Simplifying expressions Book 2: Chapter 8, 8.1 Working with letter symbols review</p>

## A23 Substitution

What is being tested	Learners are being tested on their ability to substitute into algebraic expressions to evaluate an expression for a given value.
Learning Objectives	<p>A23.1 Evaluate single variable positive integer substitutions</p> <p>A23.2 Describe what substitution means</p> <p>A23.3 Evaluate dual positive integer substitutions</p> <p>A23.4 Evaluate multiple variable positive and negative integer substitutions</p>
Predecessors	A5 Function machines
Successors	A26 Writing equations
KS2 & KS3 Guidance	Learners begin to appreciate the idea of substitution in Year 7 (page 59, KS3 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<p><b>Shine Interventions: Access Mathematics Tests</b></p> <p><b>Strand 7: Algebra</b></p> <p>Intervention Learning Sequences:</p> <p>7.1 Using and writing formulae</p> <p>7.4 More formulae</p> <p><b>Key Stage 3 Mastering Mathematics</b></p> <p>Book 1: Chapter 6, 6.2 Using letters</p> <p>Book 2: Chapter 8, 8.1 Working with letter symbols review</p> <p>Book 3: Chapter 7, 7.4 Formulas</p>

## A24 Forming expressions

What is being tested	Learners are being tested on their understanding of algebraic notation, forming expressions which involve an unknown quantity.
Learning Objectives	<p>A24.1 Write an expression by subtracting an unknown from a number</p> <p>A24.2 Match expressions with division or subtraction to their descriptions</p> <p>A24.3 Write an expression by multiplying an unknown and then subtracting a number</p> <p>A24.4 Identify the correct order of statements to interpret an expression</p> <p>A24.5 Identify an expression from its description (multiplication)</p> <p>A24.6 Identify an expression from its description (division)</p>
Predecessors	A21 Order of operations (no powers)
Successors	None
KS2 & KS3 Guidance	Learners begin to work with algebraic notation in Year 7 (page 130, KS3 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<p><b>Shine Interventions: Access Mathematics Tests</b></p> <p><b>Strand 7: Algebra</b></p> <p>Intervention Learning Sequence:</p> <p>7.3 Expressions</p> <p><b>Key Stage 3 Mastering Mathematics</b></p> <p>Book 1: Chapter 6, 6.2 Using letters</p> <p>Book 2: Chapter 8, 8.1 Working with letter symbols review</p>

## A25 Order of operations with powers

What is being tested	Learners are being tested on their understanding of the priority of operations in a given calculation, including powers.
Learning Objectives	<p>A25.1 Identify the correct first calculation in complex calculations (four operations and powers), with whole numbers</p> <p>A25.2 Identify the correct first calculation in complex calculations (four operations and powers), with algebra</p> <p>A25.3 Perform successive steps in complex calculations (four operations), with mixed numbers</p> <p>A25.4 Apply the order of operations to positive and negative integer number calculations with a power</p>
Predecessors	A21 Order of operations (no powers)
Successors	None
KS2 & KS3 Guidance	Learners are introduced to the idea of the priority of operations in Upper KS2, extending their knowledge in Year 7 (page 41, KS3 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<p><i>No appropriate Shine Intervention</i></p> <p><b>Key Stage 3 Mastering Mathematics</b></p> <p>Book 1: Chapter 5, 5.3 BIDMAS</p> <p>Book 3: Chapter 7, 7.4 Formulas</p>

## A26 Writing equations

What is being tested	Learners are being tested on their ability to form expressions in context, leading to a formula.
Learning Objectives	A26.1 Recognise the correct formula for a given description A26.2 Construct a formula for a given description A26.3 Recognise the correct description for a given formula
Predecessors	A23 Substitution A24 Forming expressions
Successors	None
KS2 & KS3 Guidance	Learners begin to work with algebraic notation in Year 7 (page 130, KS3 guidance), and are introduced to formulae in Year 8 (page 155, KS3 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<p><b>Shine Interventions: Access Mathematics Tests</b>  <b>Strand 7: Algebra</b></p> <p>Intervention Learning Sequences:            7.1 Using and writing formulae            7.4 More formulae</p> <p><b>Key Stage 3 Mastering Mathematics</b></p> <p>Book 1: Chapter 6, 6.2 Using letters; 6.4 Equations            Chapter 17, Angles</p> <p>Book 2: Chapter 8, 8.1 Working with letter symbols review;            Chapter 9, 9.2 Solving equations with an unknown on both sides            Chapter 15 Circles</p> <p>Book 3: Chapter 7, 7.1 Solving equations            Chapter 11 Prisms and cylinders</p>

## A27 Solving equations (x on one side)

What is being tested	Learners are being tested on their understanding of the use of inverse operations to solve linear equations.
Learning Objectives	<p>A27.1 Solve equations of the form <math>x + a = b</math> (x is negative)</p> <p>A27.2 Solve equations of the form <math>ax = b</math> (x is negative)</p> <p>A27.3 Solve equations of the form <math>ax + b = c</math> (x is negative)</p> <p>A27.4 Solve equations of the form <math>ax + b = c</math> with fractions (x is negative)</p>
Predecessors	<p>A16 Equivalence</p> <p>A21 Order of operations (no powers)</p> <p>A31 Expand and simplify with double brackets</p>
Successors	A29 Solving equations (x on both sides)
KS2 & KS3 Guidance	Learners begin solving equations to calculate the value of an unknown in Year 8 (page 147, KS3 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<p><i>No appropriate Shine Intervention</i></p> <p><b>Key Stage 3 Mastering Mathematics</b></p> <p>Book 1: Chapter 6, 6.4 Equations Chapter 17, Angles</p> <p>Book 2: Chapter 9, 9.2 Solving equations with an unknown on both sides</p> <p>Book 3: Chapter 7, 7.1 Solving equations</p>

## A28 Expand and simplify with single brackets

What is being tested	Learners are being tested on their understanding of the distributive property and collecting like terms, simplifying the sums of expanded brackets.
Learning Objectives	<p>A28.1 Simplify by expanding a single bracket with addition and collecting like terms</p> <p>A28.2 Simplify by expanding a single bracket with subtraction and collecting like terms</p> <p>A28.3 Identify the correct area of a given rectangle by expanding single brackets</p>
Predecessors	A22 Collecting terms
Successors	A31 Expand and simplify with double brackets
KS2 & KS3 Guidance	Learners first encounter the expansion of brackets (page 64, KS3 guidance) and collecting like terms (page 41, KS3 guidance) in Year 7.
Hachette Learning (formerly Hodder Education) Platform References	<p><i>No appropriate Shine Intervention</i></p> <p><b>Key Stage 3 Mastering Mathematics</b></p> <p>Book 2: Chapter 8, 8.2 Expanding brackets</p>

## A29 Solving equations (x on both sides)

What is being tested	Learners are being tested on their understanding of the use of inverse operations to solve linear equations where the unknown appears twice.
Learning Objectives	<p>A29.1 Solve equations of the form <math>ax + b = cx + d</math> (x is positive)</p> <p>A29.2 Solve equations of the form <math>ax + b = cx + d</math> (x is negative)</p> <p>A29.3 Solve equations of the form <math>ax + b = cx + d</math> with fractions (x is positive, same denominator)</p>
Predecessors	A27 Solving equations (x on one side)
Successors	A30 Solving equations (x on both sides and expand brackets)
KS2 & KS3 Guidance	Learners begin to solve equations with the unknown on both sides in Year 8 (page 156, KS3 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<p><i>No appropriate Shine Intervention</i></p> <p><b>Key Stage 3 Mastering Mathematics</b></p> <p>Book 2: Chapter 9, 9.2 Solving equations with an unknown on both sides</p>



## A30 Solving equations (x on both sides and expand brackets)

What is being tested	Learners are being tested on their understanding of the use of inverse operations to solve linear equations where the unknown appears twice and involves brackets.
Learning Objectives	A30.1 Solve equations of the form $a(bx + c) = d(ex + f)$ (x is positive) A30.2 Solve equations of the form $a(bx + c) = d(ex + f)$ (x is negative) A30.3 Solve equations of the form $a(x + b) = c(x + d)$ (plus or minus, fractions)
Predecessors	A29 Solving equations (x on both sides)
Successors	None
KS2 & KS3 Guidance	Learners first encounter the expansion of brackets (page 64, KS3 guidance) and begin to solve equations with the unknown on both sides in Year 8 (page 156, KS3 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<i>No appropriate Shine Intervention</i>  <b>Key Stage 3 Mastering Mathematics</b> Book 2: Chapter 9, 9.3 Solving equations with brackets Book 3: Chapter 7 7.1 Solving equations (review)

## A31 Expand and simplify with double brackets

What is being tested	Learners are being tested on their understanding of the distributive property with two sets of brackets and collecting like terms, expanding brackets and simplifying the resultant expression.
Learning Objectives	<p>A31.1 Simplify by expanding double brackets with subtraction and collecting like terms</p> <p>A31.2 Simplify by expanding a difference of 2 squares</p> <p>A31.3 Identify the correct area of a given rectangle by expanding double brackets</p>
Predecessors	A28 Expand and simplify with single brackets
Successors	A27 Solving equations (x on one side)
KS2 & KS3 Guidance	Learners first encounter collecting like terms (page 41, KS3 guidance) in Year 7, and expand pairs of brackets in Year 9 (page 234, KS3 guidance).
Hachette Learning (formerly Hodder Education) Platform References	<p><i>No appropriate Shine Intervention</i></p> <p>Book 3: Chapter 7, 7.3 Expanding brackets</p>

## Contributors

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