

# MATHS – Algebra, Ratio & Proportion Performance Descriptors

	Algebra	Ratio and proportion
<p>YEAR 9</p> <p>41</p> <p>40</p> <p>39</p> <p>(38)</p>	<ul style="list-style-type: none"> <li>Solve equations of the form <math>(ax +/- b)/c = (dx +/- e)</math></li> <li>Solve linear equations which involve brackets, including those that have negative signs and those with a negative solution</li> <li>Use systematic trial and improvement to find the approximate solution to one decimal place of a range of equations (eg. <math>x^3 + x = 50</math>)</li> <li>Construct and solve equations that involves multiplying out brackets by a negative number Derive a simple formula, inc squares, cubes and roots</li> <li>Multiply out brackets involving positive terms such as <math>(a + b)(c + d)</math> and collect like terms</li> <li>Substitute positive and negative integers into linear expressions and expressions involving powers</li> <li>Factorise to one bracket by taking out the highest common factors for all terms</li> <li>Find an unknown where it is not the subject of the formula and where an equation must be solved.</li> <li>Rearrange simple equations</li> <li>Know that the gradient of a line is the change in y over change in x.</li> <li>Without drawing the graphs, compare and contrast features of graphs such as <math>y = 4x</math>, <math>y = 4x + 6</math>, <math>y = x + 6</math>, <math>y = -4x</math>, <math>y = x - 6</math></li> <li>Identify parallel lines from their equations</li> <li>Generate points and plot graphs of simple quadratic functions, then more general functions</li> <li>Construct a table of values, including negative values of x for a function such as <math>y = ax^2</math></li> <li>Recognise a graph which represents a quadratic function</li> <li>Plot the graphs of linear functions in the form <math>y = mx + c</math> and recognise and compare their features</li> <li>Recognise that linear functions can be rearranged to give y explicitly in terms of x e.g. rearrange <math>y + 3x - 2 = 0</math> in the form <math>y = 2 - 3x</math></li> <li>Solve simple linear inequalities in one variable and represent the solution on a number line e.g. <math>3n + 2 &lt; 11</math> and <math>2n - 1 &gt; 1</math></li> <li>Represent the solution set for inequalities using set notation</li> <li>Argue mathematically to show algebraic expressions are equivalent Find and use the nth term of an arithmetic sequence</li> <li>Simplify simple expressions involving index notation</li> </ul>	<ul style="list-style-type: none"> <li>Interpret and write ratios to describe a situation</li> <li>Understand and use compound measures (density, speed, pressure)</li> <li>Solve problems using constant rates and related formulae</li> <li>Solve problems involving compound measures</li> <li>Write lengths, areas and volumes of two shapes as ratios in simplest form</li> <li>Estimate conversions</li> <li>Use algebraic methods to solve problems involving variables in direct proportion</li> <li>Use expressions of the form <math>y \propto 1/x</math></li> <li>Interpret the gradient of a straight line graph as a rate of change</li> <li>Use calculators to explore exponential growth and decay</li> <li>Use compound interest</li> <li>Represent repeated proportional change using a multiplier raised to a power</li> <li>Understand direct proportion as equality of ratios</li> <li>Use measures in ratio and proportion problems (currency conversion, rates of pay, best value)</li> <li>Express a multiplicative relationship between two quantities as a ratio or a fraction</li> <li>Use the unitary method for an inverse operation, e.g. If I know an item was 80% of the original cost in a sale, find the original price</li> <li>Use and interpret scale drawings, where scales use mixed units, and drawings aren't done on squared paper, but have measurements marked on them.</li> <li>Know that enlargements of 2D shapes produce similar shapes</li> </ul>
<p>YEAR 8</p> <p>38</p> <p>37</p> <p>36</p> <p>(35)</p>	<ul style="list-style-type: none"> <li>Solve linear equations with integer coefficients in which the unknown appears on either side or on both sides of the equation.</li> <li>Construct and solve equations involving brackets e.g. <math>5(x + 2) = 22 - x</math></li> <li>Simplify after multiplying a single term over a bracket</li> <li>Substitute a positive value into the expression <math>x^2</math></li> <li>Substitute positive integers into expressions involving small powers (up to 3)</li> <li>Select an expression/ equation/ formula/identity from a list</li> <li>Use the distributive law to take out numerical common factors, e.g. <math>6a + 8b = 2(3a + 4b)</math></li> <li>Manipulate expressions by taking out common factors, not necessarily the highest</li> <li>Change the subject of a formula in one step e.g. <math>y = x + 4</math></li> <li>Begin to consider the features of graphs of simple linear functions, where y is given explicitly in terms of x, e.g. <math>y = x</math>, <math>y = 2x</math>, <math>y = 3x</math> are all straight lines that pass through the origin, vary in steepness depending on the function</li> <li>Use gradients to interpret how one variable changes in relation to another</li> <li>Discuss and interpret linear and non linear graphs from a range of sources</li> <li>Draw distance-time graphs and velocity-time graphs</li> <li>Find the coordinates of the midpoint of a line from a given graph</li> <li>Plot the graphs of simple linear functions in the form <math>y = mx + c</math> in four quadrants</li> <li>Recognise that equations of the form <math>y = mx + c</math> correspond to straight-line graphs in the coordinate plane</li> <li>Write down whole number values that satisfy an inequality</li> <li>Find a specific term in the sequence using position-to-term rules</li> <li>Begin to use formal algebra to describe the nth term in an arithmetic sequence.</li> <li>Know that expressions involving repeated multiplication can be written as <math>n</math>, <math>n^2</math>, <math>n^3</math></li> <li>Understand the difference between <math>2n</math> and <math>n^2</math></li> </ul>	<ul style="list-style-type: none"> <li>Compare ratios by changing them to the form 1 : m or m : 1</li> <li>Solve a ratio problem in context</li> <li>Divide a given quantity into two parts in a given part:part or part: whole ratio</li> <li>Write as ratio as a fraction</li> <li>Know rough metric equivalents of imperial measures in daily use (feet, miles, pounds, pints, gallons)</li> <li>Convert between area measures (e.g. <math>mm^2</math> to <math>cm^2</math>, <math>cm^2</math> to <math>m^2</math>, and vice versa)</li> <li>Convert between metric measures of volume and capacity eg <math>1\text{ cm}^3 = 1\text{ ml}</math></li> <li>Set up equations to show direct proportion</li> <li>Use expressions of the form <math>y \propto x</math></li> <li>Identify direct proportion from a graph</li> <li>Recognise graphs showing constant rates of change, average rates of change and variable rates of change</li> <li>Use a unitary method, e.g. if £40 is 60%, find 1% by dividing by 60 and then 100% by multiplying by 100. Give them the scaffolding to answer the question</li> <li>Compare two quantities using percentages, including a range of calculations and contexts</li> <li>Use percentages in real-life situations: VAT, value of profit or loss, simple interest, income tax calculations</li> <li>Use and interpret maps, using proper map scales (1 : 25 000)</li> <li>Simplify a ratio expressed in fractions or decimals</li> </ul>

# MATHS – Algebra, Ratio & Proportion Performance Descriptors

	Algebra	Ratio and proportion
<p>YEAR 7</p> <p>35</p> <p>34</p> <p>33</p> <p>(32)</p>	<ul style="list-style-type: none"> <li>• Begin to multiply a single positive term over a bracket containing linear terms e.g. <math>4(x+3)</math></li> <li>• Plot a simple distance-time graph (straight-line graphs) and use graphs to solve problems</li> <li>• Plot and draw graphs of <math>y = a</math>, <math>x = a</math>, <math>y = x</math> and <math>y = -x</math></li> <li>• Show inequalities on a number line</li> <li>• Solve simple two-step linear equations with integer coefficients, of the form <math>ax \pm b = c</math>,</li> <li>• Construct expressions from worded descriptions, using all 4 basic operations Construct equations by linking expressions to given information, e.g. if the expression <math>2d + 18</math> is used to find the cost of hiring a machine for <math>d</math> days and I spend £34 hiring it, form an equation using this information</li> <li>• Substitute positive integers into more complex formulae (involving brackets and more than one operation) expressed in letter symbols (e.g. <math>D = n(n - 3)/2</math> where <math>D</math> is the number of diagonals in a polygon of <math>n</math> sides)</li> <li>• Write expressions to solve problems representing a situation</li> <li>• Understand the difference between an expression and an equation and the meaning of the key vocabulary 'term'</li> <li>• Understand the different role of letter symbols in formulae and functions</li> <li>• Select an expression/ equation/ formula from a list</li> <li>• Generate four quadrant coordinate pairs of simple linear functions</li> <li>• Interpret information from a complex real life graph (fixed charge/unit cost), read values and discuss trends</li> <li>• Find the coordinates of points identified by geometrical information in 2D (all four quadrants) for simple shapes</li> <li>• Plot and draw graphs of straight lines using a table of values</li> <li>• Drawing and recognising lines parallel to axes, plus <math>y = x</math> and <math>y = -x</math></li> <li>• Generate terms of a linear sequence using position to term with positive integers.</li> <li>• Recognise arithmetic sequences from diagrams and draw the next term in a pattern sequence</li> <li>• Predict how the sequence should continue and test for several more terms</li> <li>• Recognise simple sequences including triangular, square, cube numbers and Fibonacci-type sequences</li> <li>• Begin to use linear expressions to describe the <math>n</math>th term in a one-step and 2-step arithmetic sequence (e.g. <math>n</math>th term is <math>3n</math> or <math>n + 5</math>)</li> </ul>	<ul style="list-style-type: none"> <li>• Use the unitary method to solve simple word problems involving ratio and direct proportion</li> <li>• Divide a quantity into more than two parts in a given ratio</li> <li>• Convert one metric unit to another, including decimals (e.g. 3250 grams to 3.25 kilograms, or 3.25kg to 3250g)</li> <li>• Use fraction notation to express a smaller whole number as a fraction of a larger one</li> <li>• Use a ratio to find one quantity when the other is known</li> <li>• Use proportional reasoning to solve a problem</li> <li>• Use strategies for finding equivalent fractions, decimals and percentages involving decimal percentages and decimals greater than 0</li> <li>• Find the outcome of a given percentage increase</li> <li>• Find the outcome of a given percentage decrease</li> <li>• Use a multiplier to increase or decrease by a percentage</li> <li>• Use percentages greater than 100%</li> <li>• Express one quantity as a percentage of another</li> <li>• Simplify a ratio expressed in different units</li> <li>• Reduce ratios in the simplest form, including three-part ratios</li> </ul>
<p>YEAR 6</p> <p>32</p> <p>31</p> <p>30</p> <p>(29)</p>	<ul style="list-style-type: none"> <li>• Substitute integers into algebra equations and formulae and solve for missing values</li> <li>• Construct expressions from worded descriptions, using addition, subtraction and Identify variables and use letter symbols, e.g. 'the cost of hiring a van...', <math>c = \text{cost}</math>, <math>v = \text{van}</math></li> <li>• Identify formulae and functions and identify the unknowns</li> <li>• Explain the distinction between equations, formulae and functions</li> <li>• simplify algebraic expressions by collecting like terms</li> <li>• Find outputs of more complex functions and inputs using inverse operations</li> <li>• Read <math>x</math> and <math>y</math> coordinate in all four quadrants</li> <li>• Identify points with given coordinates and coordinates of a given point in all four quadrants</li> <li>• Find a term given its position in a sequence like tenth number in <math>4 \times</math> table is 40 (one operation on <math>n</math>)</li> <li>• Find a term of a practical sequence given its position in the sequence</li> <li>• Generate terms of a linear sequence using term-to-term using positive or negative integers.</li> <li>• Generate and describe integer sequences such as powers of 2 and growing rectangles</li> <li>• Know that an arithmetic sequence is generated by a starting number then adding a constant number</li> <li>• Write the term-to-term definition of a sequence in words</li> <li>• Know that expressions can be written in more than one way, e.g. <math>2 \times 3 + 2 \times 7 = 2(3 + 7)</math></li> <li>• Use arithmetic operations with algebra</li> <li>• Multiply together two simple algebraic expressions, e.g. <math>2a \times 3b</math></li> </ul>	<ul style="list-style-type: none"> <li>• Divide a quantity into two parts in a given ratio, where ratio given in ratio notation</li> <li>• Convert a larger whole number metric unit to a smaller unit (e.g. 3 kilograms to 3000 grams)</li> <li>• Convert between simple metric units.</li> <li>• Convert a smaller whole number metric unit to a larger unit (e.g. 3000 grams to 3 kilograms)</li> <li>• Express one number as a fraction of another</li> <li>• Express the division of a quantity into a number of parts as a ratio</li> <li>• Use percentages to compare simple proportions</li> <li>• Recall equivalent fractions, decimals and percentages including for fractions that are greater than 1. Match across all 3 types, and need to be simple fractions (<math>1/2</math>, <math>1/4</math>, <math>1/5</math>, <math>1/10</math>)</li> <li>• Express one given number as a percentage of another</li> <li>• Find a percentage of a quantity using a multiplier</li> <li>• Interpret percentages and percentage change as a fraction or a decimal</li> <li>• Use ratio notation</li> <li>• Reduce a ratio to its simplest form</li> </ul>

## MATHS – Algebra, Ratio & Proportion Performance Descriptors

	<b>Algebra</b>	<b>Ratio and proportion</b>
YEAR 5  29 28 27 (26)	<ul style="list-style-type: none"> <li>• Use function machines to create expressions</li> <li>• Use distributive law with brackets, with numbers</li> <li>• Find outputs of more complex functions expressed in words (e.g. add 6 then multiply by 3)</li> <li>• Find the inputs of simple functions expressed in words by using the output and inverse operations</li> <li>• Use function machines to find coordinates</li> <li>• Use conventions and notation for 2-D co-ordinates in all four quadrants.</li> <li>• Draw, label and scale axes</li> <li>• Describe simple functions in words (e.g. add 3, multiply by 6, subtract 4)</li> <li>• Generate terms of a simple sequence using term to term rules like +3, -2</li> <li>• Find the next term in a sequence, including negative values</li> <li>• Generate and describe simple integer sequences - square and triangle numbers</li> <li>• Generate terms of a simple sequence arising from practical contexts</li> <li>• Use notation and symbols correctly</li> </ul>	<ul style="list-style-type: none"> <li>• Use fraction notation to describe parts of shapes</li> <li>• Recognise the equivalence of percentages, fractions and decimals</li> <li>• Define percentages as number of parts per hundred</li> <li>• Draw lines and shapes to scale</li> <li>• Use and interpret maps and scale drawings, using a variety of scales and units</li> <li>• Estimate length using a scale diagram</li> </ul>
YEAR 4  26 25 24 (23)	<ul style="list-style-type: none"> <li>• Find outputs of simple functions in words and symbols</li> <li>• Read x and y coordinate in the first quadrant</li> </ul>	<ul style="list-style-type: none"> <li>• Read and construct scale drawings</li> </ul>