

## Key indicators for algebra in Years 7 and 8

Towards level 5	Towards level 6
<p><b>From Year 7 yearly teaching programme</b></p> <ul style="list-style-type: none"> <li>• Use letter symbols to represent unknown numbers or variables.</li> <li>• Know and use the order of operations and understand that algebraic operations follow the same conventions and order as arithmetic operations.</li> <li>• Plot the graphs of simple linear functions.</li> </ul> <p><b>From Year 8 yearly teaching programme</b></p> <ul style="list-style-type: none"> <li>• Simplify or transform linear expressions by collecting like terms; multiply a single term over a bracket.</li> <li>• Substitute integers into simple formulae.</li> </ul>	<p><b>From Year 8 yearly teaching programme</b></p> <ul style="list-style-type: none"> <li>• Plot the graphs of linear functions, where <math>y</math> is given explicitly in terms of <math>x</math>; recognise that equations of the form <math>y = mx + c</math> correspond to straight-line graphs.</li> </ul>

## Key indicators for algebra in Year 7

Towards level 5	Probing questions	Examples of what pupils should know and be able to do
Use letter symbols to represent unknown numbers or variables.	<p>Explain the difference between these two expressions... e.g. <math>3y + 1</math>, and <math>3(y + 1)</math>.</p> <p>Give me some expressions that are the same as... e.g. <math>6x</math>, <math>n + 3</math></p>	<p>Understand the difference between expressions such as:</p> <p><math>2n</math> and <math>n + 2</math>    <math>3(c + 5)</math> and <math>3c + 5</math></p> <p><math>n^2</math> and <math>2n</math>    <math>2n^2</math> and <math>(2n)^2</math></p>
Know and use the order of operations and understand that algebraic operations follow the same conventions and order as arithmetic operations.	<p>Two calculators gave different answers to the calculation <math>2 + 4 \times 6</math>. What are the two answers? Can you explain how the different answers were calculated? Which answer is correct? Can you explain why?</p>	<p>Find mentally or use jottings to find the value of:</p> <p><math>16 \div 4 + 8 = 12</math></p> <p><math>16 + 8 \div 4 = 18</math></p> <p><math>14 \times 7 + 8 \times 11 = 186</math></p> <p><math>\frac{100}{4 \times 5} = 5</math></p> <p><math>32 + 13 \times 5 = 97</math></p> <p><math>(3^2 + 4^2)^2 = 625</math></p> <p><math>\frac{(5^2 - 7)}{(2^2 - 1)} = 6</math></p> <p>Recognise that in the expression <math>2 + 5a</math> the multiplication is to be performed first.</p> <p>Know that commutative and associative laws apply to algebraic expressions as they do for arithmetic expressions, for example:</p> <p><math>2 + (3 + 4) = (2 + 3) + 4</math>      <math>a + (b + c) = (a + b) + c</math></p>

## Key indicators for algebra in Year 7

Towards level 5	Probing questions	Examples of what pupils should know and be able to do
Plot the graphs of simple linear functions.	<p>If I wanted to plot the graph <math>y = 2x</math> how should I start?</p> <p>Why is the point (3, 6) not on the line <math>y = x + 2</math>?</p> <p>Can you give me the equations of some graphs that pass through (0, 1)? What about...?</p>	<p>Generate and plot pairs of coordinates for: <math>y = x + 1, y = 2x</math>.</p> <p>Plot graphs such as: <math>y = x, y = 2x, \dots</math></p> <p>Plot and interpret graphs such as <math>y = x, y = 2x, \dots,</math> <math>y = x + 1, y = x - 1, \dots</math></p>

## Key indicators for algebra in Year 8

Towards level 5	Probing questions	Examples of what pupils should know and be able to do
<p>Simplify or transform linear expressions by collecting like terms; multiply a single term over a bracket.</p>	<p>Can you write an expression that would simplify to: e.g. <math>6m - 3n</math>, <math>8(3x + 6)</math>?</p> <p>Are there others?</p> <p>Can you give me an expression that is equivalent to, e.g. <math>4p + 3q - 2</math>?</p> <p>Are there others?</p> <p>What do you look for when you are given an expression to simplify? What are the important stages?</p> <p>What hints and tips would you give to someone about simplifying expressions? ... removing a bracket from an expression?</p> <p>Give pupils examples of multiplying out a bracket with errors. Ask them to identify and talk through the errors and how they should be corrected, e.g.</p> <p><math>4(b + 2) = 4b + 2</math>, <math>3(p - 4) = 3p - 7</math></p> <p><math>-2(5 - b) = -10 - 2b</math>, <math>12 - (n - 3) = 9 - n</math></p> <p>Similarly for simplifying an expression.</p>	<p>Simplify these expressions:</p> <p>a. <math>3a + 2b + 2a - b</math></p> <p>b. <math>4x + 7 + 3x - 3 - x</math></p> <p>c. <math>3(x + 5)</math></p> <p>d. <math>12 - (n - 3)</math></p> <p>e. <math>m(n - p)</math></p> <p>f. <math>4(a + 2b) - 2(2a + b)</math></p>

## Key indicators for algebra in Year 8

Towards level 5	Probing questions	Examples of what pupils should know and be able to do
<p>Substitute integers into simple formulae.</p>	<p>When you substitute <math>x = -1</math> into the formula <math>y = 5x - 2</math> you get <math>-7</math>. Can you make up some more formulae that also give <math>y = -7</math> when <math>x = -1</math> is substituted?</p> <p>When you substitute <math>a = 2</math> and <math>b = 7</math> into the formula <math>t = ab + 2a</math> you get 18. Can you make up some more formulae that also give <math>t = 18</math> when <math>a = 2</math> and <math>b = 7</math> are substituted?</p> <p>Can you explain the difference between the formulae <math>p = 4a^2</math> and <math>p = (4a)^2</math>?</p>	<p>Find the value of these expressions when <math>a = 4</math>.</p> $3a^2 + 4 \qquad 2a^3$ <p>Find the value of <math>y</math> when <math>x = -3</math>:</p> $y = \frac{2x + 3}{x} \qquad y = \frac{x - 1}{x + 1}$

## Key indicators for algebra in Year 8

Towards level 6	Probing questions	Examples of what pupils should know and be able to do
<p>Plot the graphs of linear functions, where <math>y</math> is given explicitly in terms of <math>x</math>; recognise that equations of the form <math>y = mx + c</math> correspond to straight-line graphs.</p>	<p>How do you go about finding a set of coordinates for a straight-line graph, for example <math>y = 2x + 4</math>?</p> <p>How do you decide on the range of numbers to put on the <math>x</math>- and <math>y</math>-axes?</p> <p>How do you decide on the scale you are going to use?</p> <p>What have you noticed about the graphs of functions of the form <math>y = mx + c</math>? What are the similarities? What are the differences?</p>	<p>Plot the graphs of simple linear functions using all four quadrants by generating coordinate pairs or a table of values.</p> <p>e.g. <math>y = 2x - 3</math>                  <math>y = 5 - 4x</math></p> <p>Understand the gradient and intercept in <math>y = mx + c</math>, describe similarities and differences in given straight-line graphs.</p> <p>e.g. <math>y = 2x + 4</math>, <math>y = 2x - 3</math>.</p>