





# SYLLABUS RELATIONSHIPS

## Stage 4 - Patterns & Algebra

Workbook activities relate to outcomes of the NSW Syllabus as follows:

OUTCOME	Workbook Activities
<b><u>PAS4.1 - Algebraic Techniques</u></b> <b>Knowledge and skills. Students learn about:</b>	
<ul style="list-style-type: none"> <li>using letters to represent numbers and developing the notion that a letter is used to represent a variable</li> </ul>	2 - 2 3 - 1,2,3
<ul style="list-style-type: none"> <li>using concrete materials such as cups and counters to model:               <ul style="list-style-type: none"> <li>expressions that involve a variable and a variable plus a constant eg <math>a, a + 1</math></li> <li>expressions that involve a variable multiplied by a constant eg <math>2a, 3a</math></li> <li>sums and products eg <math>2a + 1, 2(a + 1)</math></li> <li>equivalent expressions such as <math>x + x + y + y + y = 2x + 2y + y = 2(x + y) + y</math></li> <li>and to assist with simplifying expressions, such as <math>(a + 2) + (2a + 3) = (a + 2a) + (2 + 3)</math> <math>= 3a + 5</math></li> </ul> </li> </ul>	3 - 2 8 - 6 9 - 3
<ul style="list-style-type: none"> <li>recognising and using equivalent algebraic expressions eg <math>y + y + y + y = 4y</math> <math>w \times w = w^2</math> <math>a \times b = ab</math> <math>a \div b = \frac{a}{b}</math></li> </ul>	9 - 1,2,4,5,6,7,8, 9,10,11,13 10 - 1,2,3,4,5,6,7, 8, 9,10,11,12 13, 14,15
<ul style="list-style-type: none"> <li>translating between words and algebraic symbols and between algebraic symbols and words</li> </ul>	2 - 2 3 - 2,3,4,5,6,7,8,9 9 - 1,2,3,4,5,6,7 8,9,10,11,12 10 - 1,2,3,4,5,7,8,9 10,11,12,13,14
<b><u>PAS4.1 – Algebraic Techniques</u></b> <b>Working Mathematically. Students learn to:</b>	
<ul style="list-style-type: none"> <li>generate a variety of equivalent expressions that represent a particular situation or problem (<i>Applying Strategies</i>)</li> </ul>	9 - 1,2,4,5,6,7,8, 9,10,11,13 10 - 1,2,3,4,5,6,7, 8, 9,10,11,12 13, 14,15 13 - 2 14 - 1
<ul style="list-style-type: none"> <li>describe relationships between the algebraic symbol system and number properties (<i>Reflecting, Communicating</i>)</li> </ul>	9 - 1,2,4,5,6,7,8, 9,10,11,13 10 - 1,2,3,4,5,6,7, 8, 9,10,11,12 13, 14,15
<ul style="list-style-type: none"> <li>link algebra with generalised arithmetic eg for the commutative property, determine that <math>a + b = b + a</math> (<i>Reflecting</i>)</li> </ul>	9 - 1,2,4,5,6,7,8, 9,10,11,13 10 - 1,2,3,4,5,6,7, 8, 9,10,11,12 13, 14,15
<ul style="list-style-type: none"> <li>determine equivalence of algebraic expressions by substituting a given number for the letter (<i>Applying Strategies, Reasoning</i>)</li> </ul>	9 - 3,5,6,10 10 - 11,13

OUTCOME	Workbook Activities																
<b>PAS4.2 - Number Patterns</b> <b>Knowledge and skills. Students learn about:</b>																	
<ul style="list-style-type: none"> <li>using a process that consists of building a geometric pattern, completing a table of values, describing the pattern in words and algebraic symbols and representing the relationship on a graph: <ul style="list-style-type: none"> <li>- modelling geometric patterns using materials such as matchsticks to form squares eg  ,  ,  ,  , ...</li> <li>- describing the pattern in a variety of ways that relate to the different methods of building the squares, and recording descriptions using words</li> <li>- forming and completing a table of values for the geometric pattern eg <table border="1" data-bbox="229 577 751 701"> <tr> <td>Number of squares</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>10</td> <td>100</td> </tr> <tr> <td>Number of matchsticks</td> <td>4</td> <td>7</td> <td>10</td> <td>13</td> <td>-</td> <td>-</td> <td>-</td> </tr> </table> </li> <li>- representing the values from the table on a number grid and describing the pattern formed by the points on the graph (note – the points should not be joined to form a line because values between the points have no meaning)</li> <li>- determining a rule in words to describe the pattern from the table – this needs to be expressed in function form relating the top-row and bottom-row terms in the table</li> <li>- describing the rule in words, replacing the varying number by an algebraic symbol</li> <li>- using algebraic symbols to create an equation that describes the pattern</li> <li>- creating more than one equation to describe the pattern</li> <li>- using the rule to calculate the corresponding value for a larger number</li> </ul> </li> </ul>	Number of squares	1	2	3	4	5	10	100	Number of matchsticks	4	7	10	13	-	-	-	3 - 3,4,5,6
Number of squares	1	2	3	4	5	10	100										
Number of matchsticks	4	7	10	13	-	-	-										
<ul style="list-style-type: none"> <li>using a process that consists of identifying a number pattern (including decreasing patterns), completing a table of values, describing the pattern in words and algebraic symbols, and representing the relationship on a graph: <ul style="list-style-type: none"> <li>- completing a table of values for the number pattern eg <table border="1" data-bbox="209 1279 683 1368"> <tr> <td><i>a</i></td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>10</td> <td>100</td> </tr> <tr> <td><i>b</i></td> <td>4</td> <td>7</td> <td>10</td> <td>13</td> <td>-</td> <td>-</td> <td>-</td> </tr> </table> </li> <li>- describing the pattern in a variety of ways and recording descriptions using words</li> <li>- representing the values from the table on a number grid and describing the pattern formed by the points on the graph</li> <li>- determining a rule in words to describe the pattern from the table – this needs to be expressed in function form relating the top-row and bottom-row terms in the table</li> <li>- describing the rule in words, replacing the varying number by an algebraic symbol</li> <li>- using algebraic symbols to create an equation that describes the pattern</li> <li>- creating more than one equation to describe the pattern</li> <li>- using the rule to calculate the corresponding value for a larger number</li> </ul> </li> </ul>	<i>a</i>	1	2	3	4	5	10	100	<i>b</i>	4	7	10	13	-	-	-	2 - 1,2,3,4,5,6,7,8,9 3 - 2,7,8,9
<i>a</i>	1	2	3	4	5	10	100										
<i>b</i>	4	7	10	13	-	-	-										

OUTCOME	Workbook Activities
<p><b>PAS4.2 - Number Patterns</b>  <b>Working Mathematically. Students learn to:</b></p>	
<ul style="list-style-type: none"> <li>ask questions about how number patterns have been created and how they can be continued (<i>Questioning</i>)</li> </ul>	1 - 3,6,7,8,9 3 - 1,2,3,4,5,6,7,8,9
<ul style="list-style-type: none"> <li>generate a variety of number patterns that increase or decrease and record them in more than one way (<i>Applying Strategies, Communicating</i>)</li> </ul>	3 - 2,3,4,5 5 - 1
<ul style="list-style-type: none"> <li>model and then record number patterns using diagrams, words and algebraic symbols (<i>Communicating</i>)</li> </ul>	2 - 2,3,4,5,6 3 - 1,2,3,4,5,6,7,8,9
<ul style="list-style-type: none"> <li>check pattern descriptions by substituting further values (<i>Reasoning</i>)</li> </ul>	2 - 2,3,4,5,6,7 3 - 1,2,3,4,5,6,7,8,9
<ul style="list-style-type: none"> <li>describe the pattern formed by plotting points from a table and suggest another set of points that might form the same pattern (<i>Communicating, Reasoning</i>)</li> </ul>	5 - 1,2,3,4,5 6 - 1,2,3,4,5
<ul style="list-style-type: none"> <li>describe what has been learnt from creating patterns, making connections with number facts and number properties (<i>Reflecting</i>)</li> </ul>	1 - 1,2,3,4,5,6,7,8,9
<ul style="list-style-type: none"> <li>play 'guess my rule' games, describing the rule in words and algebraic symbols where appropriate (<i>Applying Strategies, Communicating</i>)</li> </ul>	2 - 10
<ul style="list-style-type: none"> <li>represent and apply patterns and relationships in algebraic forms (<i>Applying Strategies, Communicating</i>)</li> </ul>	2 - 2,3,4,5,6,7,8,9 3 - 1,2,3,4,5,6,7,8,9 5 - 1,2,3,4,5
<ul style="list-style-type: none"> <li>explain why a particular relationship or rule for a given pattern is better than another (<i>Reasoning, Communicating</i>)</li> </ul>	13 - 2 14 - 1
<ul style="list-style-type: none"> <li>distinguish between graphs that represent an increasing number pattern and those that represent a decreasing number pattern (<i>Communicating</i>)</li> </ul>	5 - 4
<ul style="list-style-type: none"> <li>determine whether a particular number pattern can be described using algebraic symbols (<i>Applying Strategies, Communicating</i>)</li> </ul>	6 - 1

OUTCOME	Workbook Activities																		
<b>PAS4.3 - Algebraic Techniques</b> <b>Knowledge and skills. Students learn about:</b>																			
<ul style="list-style-type: none"> <li>recognising like terms and adding and subtracting like terms to simplify algebraic expressions eg <math>2n + 4m + n = 4m + 3n</math></li> </ul>	9 - 3,12,13 11 - 3,5,6 12 - 8																		
<ul style="list-style-type: none"> <li>recognising the role of grouping symbols and the different meanings of expressions, such as <math>2a+1</math> and <math>2(a+1)</math></li> </ul>	7 - 6 9 - 1,8,9,10,11,13 10 - 3,5,6,11,12,13,14,15																		
<ul style="list-style-type: none"> <li>simplifying algebraic expressions that involve multiplication and division eg <math>12a \div 3</math> <math>4x \times 3</math> <math>2ab \times 3a</math></li> </ul>	10 - 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15																		
<ul style="list-style-type: none"> <li>simplifying expressions that involve simple algebraic fractions eg <math>\frac{a}{2} + \frac{a}{3}</math> <math>\frac{2x}{5} - \frac{x}{3}</math></li> </ul>	12 - 1,2,3,4,5,6,7,8																		
<ul style="list-style-type: none"> <li>expanding algebraic expressions by removing grouping symbols (the distributive property) eg <math>3(a+2) = 3a+6</math> <math>-5(x+2) = -5x-10</math> <math>a(a+b) = a^2 + ab</math></li> </ul>	11 - 4																		
<ul style="list-style-type: none"> <li>factorising a single term eg <math>6ab = 3 \times 2 \times a \times b</math></li> </ul>	10 - 1,2,3,4,5,6																		
<ul style="list-style-type: none"> <li>factorising algebraic expressions by finding a common factor eg <math>6a+12 = 6(a+2)</math> <math>x^2 - 5x = x(x-5)</math> <math>5ab+10a = 5a(b+2)</math> <math>-4t-12 = -4(t+3)</math></li> </ul>	11 - 1,2,3,4																		
<ul style="list-style-type: none"> <li>distinguishing between algebraic expressions where letters are used as variables, and equations, where letters are used as unknowns</li> </ul>	13 - 1																		
<ul style="list-style-type: none"> <li>substituting into algebraic expressions</li> </ul>	11 - 3																		
<ul style="list-style-type: none"> <li>generating a number pattern from an algebraic expression eg</li> </ul> <table border="1" data-bbox="209 1417 718 1496"> <tr> <td><math>x</math></td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>10</td> <td>100</td> </tr> <tr> <td><math>x+3</math></td> <td>4</td> <td>5</td> <td>6</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> </tr> </table>	$x$	1	2	3	4	5	6	10	100	$x+3$	4	5	6	-	-	-	-	-	6 - 7 7 - 2
$x$	1	2	3	4	5	6	10	100											
$x+3$	4	5	6	-	-	-	-	-											
<ul style="list-style-type: none"> <li>replacing written statements describing patterns with equations written in algebraic symbols eg 'you add five to the first number to get the second number' could be replaced with '<math>y = x+5</math>'</li> </ul>	7 - 3,4,5,6 13 - 2 14 - 4,5,6,7,8																		
<ul style="list-style-type: none"> <li>translating from everyday language to algebraic language and from algebraic language to everyday language</li> </ul>	7 - 3,4,5,6 11 - 1,2,3,5 12 - 2,3,4 13 - 2,3,4,8 14 - 1,2,3,4,5,6,7,8																		

OUTCOME	Workbook Activities
<b>PAS4.3 - Algebraic Techniques</b> <b>Working Mathematically. Students learn to:</b>	
<ul style="list-style-type: none"> <li>generate a variety of equivalent expressions that represent a particular situation or problem (<i>Applying Strategies</i>)</li> </ul>	13 - 2 14 - 1
<ul style="list-style-type: none"> <li>determine and justify whether a simplified expression is correct by substituting numbers for letters (<i>Applying Strategies, Reasoning</i>)</li> </ul>	9 - 6,11 10 - 11,12,13 14 - 2,9
<ul style="list-style-type: none"> <li>check expansions and factorisations by performing the reverse process (<i>Reasoning</i>)</li> </ul>	11 - 4
<ul style="list-style-type: none"> <li>interpret statements involving algebraic symbols in other contexts eg creating and formatting spreadsheets (<i>Communicating</i>)</li> </ul>	8 - 1,2,3,4,5,6,7
<ul style="list-style-type: none"> <li>explain why a particular algebraic expansion or factorisation is incorrect (<i>Reasoning, Communicating</i>)</li> </ul>	13 - 6 14 - 2
<ul style="list-style-type: none"> <li>determine whether a particular pattern can be described using algebraic symbols (<i>Applying Strategies, Communicating</i>)</li> </ul>	6 - 1

OUTCOME	Workbook Activities
<b>PAS4.4 - Algebraic Techniques</b>	
<b>Knowledge and skills. Students learn about:</b>	
<ul style="list-style-type: none"> <li>solving simple linear equations using concrete materials, such as the balance model or cups and counters, stressing the notion of doing the same thing to both sides of an equation</li> </ul>	13 - 3
<ul style="list-style-type: none"> <li>solving linear equations using strategies such as guess, check and improve, and backtracking (reverse flow charts)</li> </ul>	7 - 1,2,7,8
<ul style="list-style-type: none"> <li>solving equations using algebraic methods that involve up to and including three steps in the solution process and have solutions that are not necessarily whole numbers</li> </ul> eg $3x + 4 = 13$ $5(a + 3) = 14$ $\frac{3t - 2}{5} = 6$ $3g - 5 = g + 7$	7 - 3,4,5,6,7,8 13 - 2,3,4,5,6,7
<ul style="list-style-type: none"> <li>checking solutions to equations by substituting</li> </ul>	7 - 5,6,7 13 - 3,4,5 14 - 2
<ul style="list-style-type: none"> <li>translating a word problem into an equation, solving the equation and translating the solution into an answer to the problem</li> </ul>	7 - 3,4,5,6,7,8 13 - 2,3,4,5,6,7
<ul style="list-style-type: none"> <li>solving equations arising from substitution into formulae eg given <math>P = 2l + 2b</math> and <math>P = 20</math>, <math>l = 6</math>, solve for <math>b</math></li> </ul>	13 - 5,7
<ul style="list-style-type: none"> <li>finding a range of values that satisfy an inequality using strategies such as 'guess and check'</li> </ul>	13 - 8
<ul style="list-style-type: none"> <li>solving simple inequalities such as               <math display="block">6a \leq 18</math> <math display="block">5y &lt; 14</math> <math display="block">\frac{t}{5} \geq -2</math> </li> </ul>	13 - 8
<ul style="list-style-type: none"> <li>representing solutions to simple inequalities on the number line</li> </ul>	13 - 8
<b>PAS4.4 - Algebraic Techniques</b>	
<b>Working Mathematically. Students learn to:</b>	
<ul style="list-style-type: none"> <li>compare and contrast different methods to solve a range of linear equations (<i>Reasoning</i>)</li> </ul>	7 - 1,2 8 - 6 13 - 2
<ul style="list-style-type: none"> <li>create equations to solve a variety of problems, clearly stating the meaning of introduced letters as 'the number of ...', and verify solutions (<i>Applying Strategies, Reasoning</i>)</li> </ul>	7 - 3,4,5,6,7,8 13 - 3,4,5,6,7 14 - 5,6,7,8
<ul style="list-style-type: none"> <li>use algebraic techniques as a tool for problem solving (<i>Applying Strategies</i>)</li> </ul>	7 - 3,4,5,6,7,8 13 - 3,4,5,6,7 14 - 5,6,7,8
<ul style="list-style-type: none"> <li>construct formulae for finding areas of common geometric figures eg area of a triangle (<i>Applying Strategies</i>)</li> </ul>	6 - 5 8 - 7 13 - 7
<ul style="list-style-type: none"> <li>determine equations that have a given solution eg find equations that have the solution <math>x = 5</math> (<i>Applying Strategies</i>)</li> </ul>	14 - 3
<ul style="list-style-type: none"> <li>substitute into formulae used in other strands of the syllabus or in other key learning areas and interpret the solutions</li> </ul> eg $c^2 = a^2 + b^2$ $S = \frac{D}{T}$ $C = \frac{5}{9}(F - 32)$ ( <i>Applying Strategies, Communicating</i> )	13 - 5,7
<ul style="list-style-type: none"> <li>describe the process of solving simple inequalities and justifying solutions (<i>Communicating, Reasoning</i>)</li> </ul>	13 - 8

OUTCOME	Workbook Activities
<b>PAS4.5 - Linear Relationships</b> <b>Knowledge and skills. Students learn about:</b>	
<ul style="list-style-type: none"> <li>interpreting the number plane formed from the intersection of a horizontal x - axis and vertical y -axis and recognising similarities and differences between points located in each of the four quadrants</li> </ul>	4 - 1,2,3,
<ul style="list-style-type: none"> <li>identifying the point of intersection of the two axes as the origin, having coordinates (0,0)</li> </ul>	4 - 3
<ul style="list-style-type: none"> <li>reading, plotting and naming ordered pairs on the number plane including those with values that are not whole numbers</li> </ul>	4 - 3,4,5,6
<ul style="list-style-type: none"> <li>graphing points on the number plane from a table of values, using an appropriate scale</li> </ul>	4 - 6 5 - 1,3,5 6 - 2,3,4,5
<ul style="list-style-type: none"> <li>extending the line joining a set of points to show that there is an infinite number of ordered pairs that satisfy a given linear relationship</li> </ul>	4 - 6 5 - 1,3,5 6 - 2,3,4,5
<ul style="list-style-type: none"> <li>interpreting the meaning of the continuous line joining the points that satisfy a given number pattern</li> </ul>	4 - 6 5 - 1,2 8 - 5
<ul style="list-style-type: none"> <li>reading values from the graph of a linear relationship to demonstrate that there are many points on the line</li> </ul>	5 - 3
<ul style="list-style-type: none"> <li>deriving a rule for a set of points that has been graphed on a number plane by forming a table of values or otherwise</li> </ul>	2 - 9 8 - 3,4,6
<ul style="list-style-type: none"> <li>forming a table of values for a linear relationship by substituting a set of appropriate values for either of the letters and graphing the number pairs on the number plane eg given <math>y = 3x + 1</math>, forming a table of values using <math>x = 0, 1</math> and <math>2</math> and then graphing the number pairs on a number plane with appropriate scale</li> </ul>	5 - 2,5 8 - 5,6
<ul style="list-style-type: none"> <li>graphing more than one line on the same set of axes and comparing the graphs to determine similarities and differences eg parallel, passing through the same point</li> </ul>	5 - 1,3,5
<ul style="list-style-type: none"> <li>graphing two intersecting lines on the same set of axes and reading off the point of intersection</li> </ul>	5 - 4 8 - 6,7

<b>PAS4.5 - Linear Relationships</b>	
<b>Working Mathematically. Students learn to:</b>	
<ul style="list-style-type: none"> <li>relate the location of points on a number plane to maps, plans, street directories and theatre seating and note the different recording conventions eg 15°E (<i>Communicating, Reflecting</i>)</li> </ul>	4 - 1,2
<ul style="list-style-type: none"> <li>compare similarities and differences between sets of linear relationships (<i>Reasoning</i>) eg <math>y = 3x</math>, <math>y = 3x + 2</math>, <math>y = 3x - 2</math> <math>y = x</math>, <math>y = 2x</math>, <math>y = 3x</math> <math>y = -x</math>, <math>y = x</math></li> </ul>	2 - 8 5 - 1,3,5
<ul style="list-style-type: none"> <li>sort and classify equations of linear relationships into groups to demonstrate similarities and differences (<i>Reasoning</i>)</li> </ul>	2 - 8
<ul style="list-style-type: none"> <li>question whether a particular equation will have a similar graph to another equation and graph the line to check (<i>Questioning, Applying Strategies, Reasoning</i>)</li> </ul>	6 - 3,4
<ul style="list-style-type: none"> <li>recognise and explain that not all patterns form a linear relationship (<i>Reasoning</i>)</li> </ul>	6 - 1,2,3
<ul style="list-style-type: none"> <li>determine and explain differences between equations that represent linear relationships and those that represent non-linear relationships (<i>Applying Strategies, Reasoning</i>)</li> </ul>	5 - 1
<ul style="list-style-type: none"> <li>explain the significance of the point of intersection of two lines in relation to it being a solution of each equation (<i>Applying Strategies, Reasoning</i>)</li> </ul>	5 - 4 8 - 6,7
<ul style="list-style-type: none"> <li>question if the graphs of all linear relationships that have a negative <math>x</math> term will decrease (<i>Questioning</i>)</li> </ul>	2 - 8 8 - 3
<ul style="list-style-type: none"> <li>reason and explain which term affects the slope of a graph, making it either increasing or decreasing (<i>Reasoning, Communicating</i>)</li> </ul>	2 - 8 8 - 3
<ul style="list-style-type: none"> <li>use a graphics calculator and spreadsheet software to graph and compare a range of linear relationships (<i>Applying Strategies, Communicating</i>)</li> </ul>	8 - 3