

Booragul Public School NSW Syllabus for the Australian Curriculum – Number and Algebra

Stage 2 – Patterns and Algebra 1

Outcome	Teaching and Learning Activities	Notes/ Future Directions/Evaluation	Date
Stage 2 A student: <ul style="list-style-type: none"> › uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM › selects and uses appropriate mental or written strategies, or technology, to solve problems MA2-2WM › checks the accuracy of a statement and explains the reasoning used MA2-3WM › generalises properties of odd and even numbers, generates number patterns, and completes simple number sentences by calculating missing values MA2-8NA 		Language Students should be able to communicate using the following language: pattern, goes up by, goes down by, even, odd, rows, digit, multiplication facts.	
<u>Ignition Activities</u> Skip counting Daily practice of counting forwards and backwards by 3, 4, 6, 7, 8, and 9 from any starting point. Students describe these patterns. Fours and Eights Display the 10 x 10 grid and mark the pattern shown. Ask students: “What can you tell me about the pattern on this grid?” Ask student to help with superimposing the pattern of eights on the same grid. Mark the pattern of eights in a different colour. Ask students: “What do you notice about the pattern now?” On the board list the numbers that are multiples of both 4 and 8: Eg 8, 16, 24, 32, 40 ... Ask students: “Is every multiple of 8 also a multiple of 4?” Is every multiple of 4 also a multiple of 8? Discuss students’ responses.			
Pattern Blocks Students use pattern blocks to explore patterns for threes (triangles), fours (squares), and sixes (hexagons). Ask questions such as: If I had 44 pop sticks, how many squares could I make? Highlight and discuss the terms : pattern, ascending, multiplication			

Explicit Mathematical Teaching

Much of the pattern work at this stage relates to sequences of multiples. Students search for, describe and discuss patterns in sequences of multiples and relationships among the sequences of increasing or decreasing (e.g. relating the sequence of multiples of 4 and the sequence of multiples of 8).

Often when students investigate patterns in number sequences, they do not look beyond finding differences between consecutive numbers in a sequence. Consequently, helping students move beyond looking for differences is an important focus.

For this reason, students will also search for, describe and discuss patterns in sequences where the differences between consecutive numbers are not always the same, including sequences of figurate numbers such as the sequence of square numbers.

Explain patterns as a sequence of numbers that comply to a rule. Explore a variety of patterns and discuss the rule needed to continue and complete the pattern.

Explore/discover the rule or strategy used

- Ascending
- Descending
 - Vacant blocks of land, what will their house numbers be?

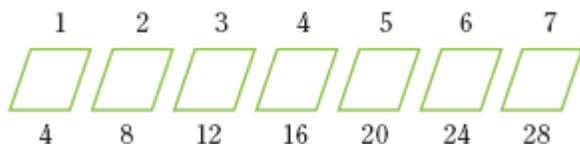
Investigate the conditions required for a number to be even or odd and identify even and odd numbers (ACMNA051)

- model even and odd numbers of up to two digits using arrays with two rows
- ▮ compare and describe the difference between models of even numbers and models of odd numbers (Communicating)
- ▮ recognise the connection between even numbers and the multiplication facts for two (Reasoning)
- describe and generalise the conditions for a number to be even or odd
- ▮ recognise the significance of the final digit of a whole number in determining whether a given number is even or odd (Reasoning)
- identify even or odd numbers of up to four digits

Whole Class Teaching Activities

Generating Sequences by Making Patterns

Another way to generate sequences is to create repeating patterns. For example, to generate the sequence of multiples of four, students make a series of rhombuses from popsticks or matchsticks and keep a record of how many sticks they have used altogether after each rhombus is added. They also record the number of rhombuses.



After constructing some rhombuses, ask students to discuss how they could continue the sequence without making the shapes. As they work, ask students to explain how they are generating the number sequence, and ask them to give the sequence a title.

The data is later recorded in a table. [See PAS3.1a]

'Talking About Patterns and Algebra' pg 72

Making rhombuses out of popsticks

Number of rhombuses	1	2	3	4	5	6	7	8	9	10
Number of popsticks	4	8	12	16	20	24	28	32	36	40

Ask students *Can you work out how many popsticks you would need if you wanted to make 15 rhombuses? What are some different ways you can work this out? Does the table help you work this out?*

And: *If I used 80 popsticks, how many rhombuses could I make?*

Initiating Activities

On a hundreds chart, students colour all the multiples of 3 in yellow, the multiples of 6 in blue and the multiples of 9 in green.

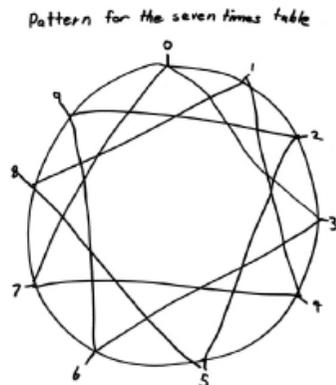
Students make a number chart using only the multiples of 3 and cut it into a jigsaw for another student to complete.

Talking About Patterns And Algebra CD ROM pg 101

Hundreds charts, yellow, blue and green coloured pencils

Relating Multiples Sequences

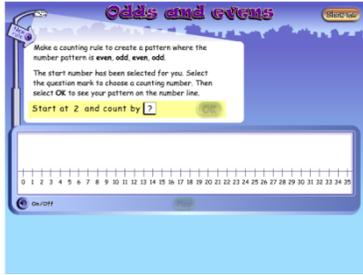
Students investigate relationships among sequences of multiples, such as relationships among the multiples of two, four and eight, relationships between the multiples of three and six, and relationships among the multiples of three, four and twelve. Multiples of one and nine produce the same wheel pattern, as do the multiples of two and eight, the multiples of three and seven and the multiples of four and six. Students observe that each pair with the same pattern (e.g. one and nine) adds to ten, and the patterns of the two are drawn in opposite directions.



<p>Investigation: Tell students that all multiples of 3 have a strange coincidence: when the digits are added the result is also a multiple of 3. Students use common multiples of 3 and then look at larger multiples of 3 eg 4152 (3 x 1384), 6711 (3 x 2237)</p> <p>How could we use this knowledge to see which numbers are divisible by 3? How could we use this knowledge to see which numbers are divisible by 6? (must be even <i>and</i> divisible by 3)</p> <p>Students may look at the same investigation for multiples of 9. What other relationships can students find with other numbers?</p> <p>Show students that different number charts can present different patterns for multiples. Students complete an 11 x 9 chart (attached). Colour in the multiples of 3, 6 and 9. Compare the pattern with the original hundreds chart pattern. Repeat with a 12 x 8 number chart inserting the numbers for the 3x, 6x and 9x tables. Discuss the patterns on the chart.</p>		
<p>Models of the Multiplication Facts</p> <p>Students construct models of the multiplication facts using interlocking cubes. They build a staircase eg with 3 blocks in the first step, 6 in the second etc, to represent the multiplication facts for 3. Students use a 10 × 10 grid to record their answers.</p>		
<p><u>Guided Group/Independent Activities</u></p> <p>Continuing the patterns Start a pattern on the floor with concrete materials. Explain the rule used in the pattern and ask them to continue it. After a thorough understanding of the given rule, allow some students to tell you what the rule is and apply it to a new situation.</p>		
<p>House Numbers</p> <ul style="list-style-type: none"> • There are 19 houses along Beachfront Drive. • As all face the sea they are only on 1 side of the road. • Each house has its number painted brightly on the gate-post. All 'odd' numbers are red and all 'even' numbers are blue. • What is the colour of the number: <ul style="list-style-type: none"> ○ on the first house ○ on the 4th last house ○ on the last house ○ on the house 3 to the left of number 16 ○ on the middle house ○ on the house 5 to the right of number 8 • What is the sum of all 'red' numbers along Beachfront Drive? 		

<p>Odd or even Students will model even and odd numbers of up to two digits using arrays with two rows ▮ compare and describe the difference between models of even numbers and models of odd numbers (Communicating) ▮ recognise the connection between even numbers and the multiplication facts for two</p>		
<p>Final digit of a number Students are given a number of cards up to four digits they then are to identify even or odd numbers by using the final digit of the whole number. Students are then to describe and generalise before placing in the odd or even pile of numbers.</p>		
<p>Interactive Technology Sites2See-Patterns and Algebra Selected links to a range of interactive and print resources for the Patterns and Algebra strand for K-6 Mathematics. Resources are grouped for Early Stage 1 and Stage 1, Stage 2 and 3 and Teachers.(Click on link below) http://lrrpublic.cli.det.nsw.edu.au/lrrSecure/Sites/LRRView/10286/10286_00.htm?Signature=(5a3ad8cf-1d93-4806-a1b3-524e9f471830)</p> <p>Lots of Interactive Activities from this site-Click on Patterns and Algebra up the top http://www.yowiebay-p.schools.nsw.edu.au/math.htm</p> <p>A Maths Dictionary for Kids(Click on link below) http://www.teachers.ash.org.au/jeather/maths/dictionary.html</p> <p>Hopper: Whole Numbers-Years 3-4 TaLe Reference Number : L1084 The Hopper series of learning objects enables students to investigate patterns in whole numbers and decimals.</p>  <p>Musical Number Patterns:Odds and Evens TaLe Reference Number :L1064 Make some music by building up rhythms for chimes. Complete a counting rule that matches a pattern on a number line. Select the start number or select a number to count by. For example, start at 1 on a number line; then choose which number to count by (4, 5 or 6) to alternate between odd and even</p>		

numbers. Add a second number pattern for more chimes. Then play all of the sound patterns together to hear your music. This learning object is one in a series of five objects.



Musical Number Patterns :Counting Rules

TaLe Reference Number: L9834

Students make counting patterns by following given rules, or use the musical patterns to work out what the counting rules in place are.

Reflection

Encouraging students to ask questions about patterns builds on understanding and stimulates curiosity and interest in mathematics.

I wonder if and ***what if*** type questions encourage students to make conjectures and predictions. Patterns and algebra activities provide opportunities to develop **deep knowledge** and **substantive communication** among students.

Through discussion, students will develop and use appropriate language to formulate generalisations that are at the heart of algebraic thinking.

Patterning activities provide opportunities for exploring number relationships, checking solutions and giving reasons to support conclusions. Students use logical reasoning, proof and justification to apply ideas and form generalisations. Some teacher prompts to develop mathematical thinking include:

How did you work this out?

Why would you do that?

What other patterns can you find?

Can this be done a different way?

Can you predict what the 10th or the 20th number in the pattern might be?

Does your pattern always work?

Assessment

Party (Talking About Patterns and Algebra pg 89)

Write the following problem on a large sheet of paper. Imagine a party with four people sharing 1 pizza, 5 cupcakes, 9 sausages and 13 jelly snakes. How much would each person have if they shared everything fairly and there was nothing left over?

Students use their own strategies for sharing the party items. Drawings are a common method of recording.

Assessment strategy

The teacher:

- works through the first part of the task with the class
- observes students
- analyses drawings and student work

Assessment criteria

The student:

- records a strategy, using drawings, for sharing the party items
- recognises and describes a pattern sequence
- produces a sequence of mixed numbers involving a quarter.

Students give five multiplication or division facts relating to 3, 6 or 9 and one other number to 10.

Provide students with a copy of a calendar. Students describe and record horizontal, vertical and diagonal patterns. Highlight a 3 x 3 grid of nine numbers. Students describe the patterns.

Classroom observation and discussion notes.

Hundred chart patterns

Provide students with a blank hundreds chart. Students complete the chart and describe patterns.

Find my pattern

Repeatedly adding 10 and multiples of 10 Students work in groups to explore: *What happens when you begin with 7 and keep adding ten?* Groups present their findings to the class. (p. 80 *Talking about Patterns and Algebra*). Investigating computation patterns (p. 87, p. 102 *Talking about Patterns and Algebra*) Students choose a question to investigate and write an explanation of findings.