# Learning sequence thinking mathematically 3 Stage 1

**Learning sequence description**

This sequence of lessons provides opportunities to deepen critical aspects of number knowledge through tight, targeted teaching and opportunities to apply skills (contexts for enriching learning such as games and investigations). Students will explore the flexibility of numbers and operations whilst also exploring patterns and aspects of measurement and space and geometry. These tasks are designed to support learning in these areas through Working Mathematically.

## Syllabus outcomes

**The following activities provide opportunities for students to demonstrate progress towards the following outcomes. A student:**

**MA1-1WM – describes mathematical situations and methods using everyday and some mathematical language, actions, materials, diagrams and symbols**

**MA1-2WM – uses objects, diagrams and technology to explore mathematical problems**

**MA1-3WM – supports conclusions by explaining or demonstrating how answers were obtained**

**MA1-4NA – applies place value, informally, to count, order, read and represent two- and three-digit numbers**

**MA1-5NA – uses a range of strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers**

**MA1-6NA – uses a range of mental strategies and concrete materials for multiplication and division**

**MA1-7NA** – represents and models halves, quarters and eighths

**MA1-8WM – uses objects, diagrams and technology to explore mathematical problems**

**MA1-10MG –** measures, records, compares and estimates areas using uniform informal units

**MA1-12MG –** measures, records, compares and estimates the masses of objects using uniform informal units

**MA1-15MG –** manipulates, sorts, represents, describes and explores two-dimensional shapes, including quadrilaterals, pentagons, hexagons and octagons

NSW Mathematics K-10 Syllabus © 2012 NSW Education Standards Authority (NESA) for and on behalf of the Crown in right of the State of New South Wales.

## What’s (some of) the mathematics? (The purpose/learning intention)

* Numbers can be represented in many different ways. You can use things like pictures, words, symbols and concrete materials
* Mathematicians use a range of representations to communicate ideas
* Mathematical representations like diagrams need to include relevant mathematical information
* Different people see and think about numbers and problems in different ways. Listening to other people’s thinking helps us become more flexible in our thinking and reveals mathematical ideas to us.
* Numbers can be broken up into smaller parts (part-part-whole)
  + We can use this as a strategy for mental computation
* Numbers can be related to other numbers in many different ways
  + Some important mathematical relationships that students explore through this sequence include developing confidence with:
  + +/- 1 and 2 more
  + How many less/more are needed to reach the nearest multiple of 5
  + How many less/more are needed to reach the nearest multiple of 10
  + More, less, same
* Usually, you can solve problems in many different ways
* When solving problems we can use a range of strategies and relationships such as:
  + ‘make ten’, ‘bridging to ten’ and using ‘landmark numbers’ (typically multiples of tens and fives)
  + 1 or 2 more and less
  + ‘renaming’ and using knowledge of place value
  + Using known facts such as combinations to 10 and 20, doubles, near doubles, multiplying by fives and tens
  + Using inverse relationships
  + Using skip counting
* You can quantify a collection in different ways. You can use skills in subitising and visual recognition of structures like ten-frames and dice (for example), or you can use counting. You might also use these skills together.
  + When we use groups of 10 we can use our knowledge of place value and numbers (for example we can rename)
  + We can skip count when working with composite units (like fours or twos)
* A pattern has an element (a repeating core) that repeats over and over and over again.
* There are different kinds of patterns, such as repeating patterns (like AB, AAB, ABC, etc.), growing and shrinking patterns (like the counting sequences…10, 9, 8, 7 where you take away 1 each time), patterns like ten-frames and dice patterns have a particular structure that always represents a particular quantity, patterns in combinations, like numbers that combine to make 10. With whole numbers, 7 and 3 is a pattern because when I have 7 of something and I join it with 3 of something, I will have 10 of something. It’s a mathematical regularity.
* The = sign indicates a relationship of equivalence (it doesn’t mean ‘put the answer here’)
* Making reasonable estimates requires us to use evidence (but not to calculate precisely)
* Collections and quantities can look different and have the same value
* We can subitise small collections, up to about 3 or 4 things
  + Once collections get bigger than 3 or 4, we can subitise by combining our knowledge of patterns like part-part-whole number knowledge and structures like ten-frames and dice, to help us determine how many there are in a collection
* Bigger shapes can be made up of smaller shapes
* Shapes (like quadrilaterals) are still the same shape when they’re orientated differently in space or are presented in different sizes
  + The word ‘quadrilateral’ can be used to describe different shapes such as rectangle, oblong, square, etc.
* We can use a pan balance to investigate and compare mass by placing objects on either side of a pan balance to obtain a level balance
* We can describe mass using comparative language such as heavier, heaviest, heavy, etc.

There are numerous skills you might observe from students as they participate in these learning experiences. Teachers are encouraged to use the understandings and skills identified above to form the basis of their assessment focus as well as provide focal points for intentional teaching, reflection and feedback.

It is important to note that for each task, it is highly likely that there are a number of mathematical goals (learning intentions) you may like to draw student’s attention to. Teachers should make decisions based on their knowledge of their students.

## Day 1

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Learning experience | Differentiation strategies and/or adjustments | Resources |
| 1.1 | Staircase pattern  Students view videos and complete tasks after each video in their student workbook, using the grid paper to draw their structures.  Staircase patterns 1 – part 1  Staircase pattern 1 – part 2  Staircase pattern 1 – part 3  Students may like to view the episode of Numberbocks step squad.  (Adapted from [AAMT Top Drawer Teachers Making a staircase](https://topdrawer.aamt.edu.au/Patterns/Big-ideas/Growing-patterns/Making-a-staircase) and [AAMT Top Drawer Growing patterns](https://topdrawer.aamt.edu.au/Patterns/Big-ideas/Growing-patterns)) |  | Device to watch video  [Staircase pattern Videos](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-1/targeted-teaching/staircase-pattern)  Student workbook  Colour pencils/ markers  Grid paper  [Numberblocks step squad](https://www.bing.com/videos/search?q=numberblocks+step+squad&qpvt=numberblocks+step+squad&FORM=VDRE) video |
| 1.2 | **Opportunity for monitoring student learning**  **Teachers should use what they know about their students and information at the beginning of this document to make decisions about what they need to focus on as they use these tasks. Some aspects you may like to focus on today include:**   * Can students describe spatial and numerical aspects of the structure? (Do they notice things such as the shape, the number of cubes, changes to quantities in each row and/or each column, different ways of counting/combining collections to determine ‘how many?’, symmetry, and links to multiplicative thinking, etc.?) * Can students represent their ideas on grid paper? How do they draw the structure? For example, do they colour in each square individually? Do they notice the dimensions of each column and represent that as a ‘block’? * To be determined |  |  |

## Day 2

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Learning experience | Differentiation strategies and/or adjustments | Resources |
| 2.1 | Introducing rekenreks  Students view video – Introducing rekenreks and record their response to the task in their student workbook. |  | Device to view video  [Introducing rekenreks video](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-1/targeted-teaching/introducing-rekenreks)  Student workbook  Colour pencils/ markers |
| 2.2 | Balancing numbers 1  (Inspired by the work of Dan Meyer)  Students view videos and respond to the tasks after each video in their student workbook.  Balancing numbers 1 – part 1  Balancing numbers 1 – part 2  Balancing numbers 1 – part 3 |  | Device to view video  [Balancing numbers 1 videos](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-1/targeted-teaching/balancing-numbers-1)  Student workbook  Colour pencils/ markers |
| 2.3 | Staircase pattern follow-up  Students view video – Staircase patterns 1 – part 4.  Students may like to use objects to create their staircase structure and then record their responses to the tasks in their student workbook. |  | Device to view video  [Staircase patterns 1 – part 4 video](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-1/targeted-teaching/staircase-pattern-follow-up)  Student workbook  Colour pencils/ markers  Collection of objects like blocks or unfix cubes |
| 2.4 | **Opportunity for monitoring student learning**  **Some aspects you may like to focus on today include:**   * Do students recognise that a balanced scale represents equivalence? * Do students use evidence to make reasonable estimates (but do not feel the need to calculate precisely)? * What detail do students include in their mathematical drawings? * To be determined |  |  |

## Day 3

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Learning experience | Differentiation strategies and/or adjustments | Resources |
| 3.1 | How to make a rekenrek  This learning experience will need the support of an adult to collect the materials and make a rekenrek.  When we involve children in making mathematical tools, we help them make meaning from them. By making a rekenrek, we can focus attention on the structure of the beads (2 fives in each row) and practise fine-motor skills and skills in counting.  Rekenreks help children recognise the structure of numbers from 0 to 20. They help build relationships to fives and tens, work with number combinations, and build flexible strategies for addition and subtraction with 1- and 2-digit numbers.  Students with an adult view the video – How to make a rekenrek and together they make a rekenrek. |  | Device to view video  [How to make a rekenrek video](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-1/targeted-teaching/how-to-make-a-rekenrek)  Glue (wood or hot glue)  4 pegs  10 red beads and 10 blue beads (or 10 of any 2 colours you like)  2 paddle pop sticks  2 kebab sticks  4 wall plugs  An adult to help |
| 3.2 | Balancing numbers 2  (Inspired by the work of Dan Meyer)  Students view videos and respond to the tasks after each video in their student workbook.  Balancing numbers 2 – part 1  Balancing numbers 2 – part 2  Balancing numbers 2 – part 3  Balancing numbers 2– part 4 |  | Device to view video  [Balancing numbers 2 videos](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-1/targeted-teaching/balancing-numbers-2)  Student workbook  Coloured pencils/ markers |
| 3.3 | Handfuls – thinking multiplicatively  Students view video – Handfuls – multiplicative thinking and record their response to the task in their student workbook. |  | Device to view video  [Handfuls – thinking multiplicatively video](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-1/contexts-for-practise/handfuls-thinking-multiplicatively)  Collection of items like bears, LEGO mini figs or similar alternative like toy cars. |
| 3.4 | **Opportunity for monitoring student learning**  **Some aspects you may like to focus on today include:**   * Do students recognise that a balanced scale represents equivalence? * Do students use evidence to make reasonable estimates (but do not feel the need to calculate precisely)? * Do students reason mathematically to explain 46 paddle pop sticks will be equivalent in mass to 15 teddies as both collections weigh the same as the Hulk? * What knowledge do students use when participating in Handfuls? Do they use familiar structures, doubles facts, derived facts, partitioning of numbers, etc.? * To be determined |  |  |

## Day 4

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Learning experience | Differentiation strategies and/or adjustments | Resources |
| 4.1 | Rekenrek 1  Students view video – Rekenreks 1 and record their responses to the tasks in their student workbook. |  | Device to view video  [Rekenreks 1 video](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-1/targeted-teaching/rekenreks-1)  Rekenrek  Student workbook  Colour pencils/ markers |
| 4.2 | Rekenrek duel: level 2  Students view video – Rekenrek duel: level 2.  Students play rekenrek duel: level 2. |  | Device to view video  [Rekenrek duel: level 2 video](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-1/contexts-for-practise/rekenrek-duel-level-2)  Rekenrek  Student workbook  set of numeral cards 0-20  counters for tokens (you could you use dried pasta)  Colour pencils/ markers |
| 4.3 | How to make a tangram  Students view video – How to make a tangram  This learning experience will need the support of an adult. |  | Device to view video  [How to make a tangram video](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-1/targeted-teaching/how-to-make-a-tangram)  Pair of scissors  Square sheet of paper |
| 4.4 | **Opportunity for monitoring student learning**  **Some aspects you may like to focus on today include:**   * How do students move beads on their rekenreks? Do they move them in chunks or by ones? Do they use ‘left behind’ strategies (1 or 2 less)? Do they explain how they see ‘chunks’ and how they know how many there are by describing part-part-whole relationships and their ability to subitise, etc.? * To be determined |  |  |

## Day 5

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Learning experience | Differentiation strategies and/or adjustments | Resources |
| 5.1 | Rekenrek noticing doubles and near doubles  Students view video – Rekenrek 2 to notice doubles and near doubles.  Students play Rekenrek doubles and near doubles and record their games in their student workbook. |  | Device to view video  [Rekenrek 2 video](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-1/targeted-teaching/rekenreks-2)  Rekenrek  Pencil  [Printed copies of 10-frame cards](https://drive.google.com/open?id=1Y8r7c5bcBduyuI1vI68st1DAH9ofKxRB)  Pair of scissors  Student workbook |
| 5.2 | For each game  Students view video – For each game.  Students play For each game.  How to play  Make a spinner with 4, 6, 8, 10, 12 and14.  Spin the spinner to determine how many legs you need in total.  Imagine and then collect the number of figurines you need to make that many legs.  The player with the most figurines each round wins a token.  The first person to win 5 tokens wins the game.  Another way to play:  Use teddy bears instead of the figurines and find out how many teddy bears are needed to have that many paws. You could also use toy cards, trains, other animal figures or pictures of animals. |  | Device to view video  [For each game video](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-1/contexts-for-practise/for-each-game)  Spinner (appendix of student workbook)  Paperclip  Pen  Figurines for example LEGO mini figs or teddy bears  Counters for example dried pasta |
| 5.3 | Tangram puzzle challenge  Students use their tangram pieces to make the formations in their student workbook. |  | Device to visit [Tangram puzzle](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-1/contexts-for-practise/tangram-puzzles)  [Tangram puzzles](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-1/contexts-for-practise/tangram-puzzles)  Tangram  Student workbook |
| 5.4 | **Opportunity for monitoring student learning**  **Some aspects you may like to focus on today include:**   * How do students move the tangram pieces around to create the shapes? Do they apply knowledge of sliding, flipping and turning the puzzle pieces when combining shapes? * How well do students persevere when trying to solve problems they find tricky? * To be determined |  |  |

## Day 6

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Learning experience | Differentiation strategies and/or adjustments | Resources |
| 6.1 | Balancing numbers 3  (Inspired by the work of Dan Meyer and Graham Fletcher)  Students view videos and respond to the tasks after each video in their student workbook.  Balancing numbers 3 – part 1  Balancing numbers 3 – part 2  Balancing numbers 3 – part 3 |  | Device to view video  [Balancing numbers 3 videos](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-1/targeted-teaching/balancing-numbers-3)  Student workbook  Pattern block set with hexagons, triangles and trapeziums  Colour pencils/ markers |
| 6.2 | Tangrams 1.1: exploring quadrilaterals  Students view videos and respond to the tasks after each video in their student workbook.  Quadrilaterals– part 1  Quadrilaterals– part 2 |  | Device to view video  [Tangrams: exploring quadrilaterals videos](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-1/targeted-teaching/tangrams-exploring-quadrilaterals)  Colour pencils/ markers  Tangram  Student workbook |
| 6.3 | **Opportunity for monitoring student learning**  **Some aspects you may like to focus on today include:**   * Are students able to identify shapes (such as quadrilaterals) presented in different orientations according to their features? * Can they describe how they can combine and split shapes to form new shapes? * To be determined |  |  |

## Day 7

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Learning experience | Differentiation strategies and/or adjustments | Resources |
| 7.1 | Let’s talk 4 – part 1  Students view video – Let’s talk 4 – part 1 |  | Device to view video  [Let’s talk 4 – part 1 video](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-1/targeted-teaching/lets-talk-4-part-1) |
| 7.2 | Order! Order! (from Mike Askew)  Students view video – Order! Order! and respond to task in their workbook.  Students play Order! Order! |  | Device to view video  [Order! Order! video](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-1/contexts-for-practise/order-order)  Student workbook |
| 7.3 | **Opportunity for monitoring student learning**  **Some aspects you may like to focus on today include:**   * How do students record, name and order numbers? Do they explain that the place a digit has determines its value? Do they use place value knowledge and reasoning to order numbers? * Do students select and use select and use a variety of strategies when solving problems? Do they use strategies such as ‘breaking apart to make ten” (using ‘landmark numbers’ and/or ‘bridging to ten’)? Do they use visual representations of numbers to support their thinking and explaining of mathematical ideas? * To be determined |  |  |

## Day 8

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Learning experience | Differentiation strategies and/or adjustments | Resources |
| 8.1 | Let’s talk 4 – part 2  Students view video – Let’s talk 4 – part 2 and respond to the task after in their student workbook. |  | Device to view video  [Let’s talk 4 – part 2 video](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-1/targeted-teaching/lets-talk-4-part-2)  Student workbook  Colour pencils/ markers |
| 8.2 | Mastermind  Students view video – Mastermind  Students play Mastermind within a number range that suits them. |  | Device to view video  [Mastermind video](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-1/contexts-for-practise/mastermind)  Student workbook  Colour pencils/ markers |
| 8.3 | **Opportunity for monitoring student learning**  **Some aspects you may like to focus on today include:**   * Do students recognise ‘=’ means ‘is equivalent to’ or ‘is the same as’ (rather than ‘put the answer here’) * Do student use place value knowledge to read, write and reason with 3-digit numbers? * To be determined * To be determined |  |  |

## Day 9

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Learning experience | Differentiation strategies and/or adjustments | Resources |
| 9.1 | Splat!  (Adapted from Steve Wyborney)  Students view video Splat! and complete the tasks as they watch in their student workbook. |  | Device to view video  [Splat! video](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-1/targeted-teaching/splat)  Student workbook  Colour pencils/ markers |
| 9.2 | Circle and stars  (From Marilyn Burns)  Students view – Circle and stars.  Students play Circle and stars.  How to play  Divide your paper into eighths.  Roll a dice to determine how many circles (groups) you need to make.  Turn over a playing card (or roll the dice again) to determine how many stars to add into each circle.  Determine how many stars there are in total. You can draw all or some of the stars in each circle – you only need to draw what you need to help you work out the product.  Continue taking turns until each player has had 6 turns each.  Work together to work out who has the most stars altogether. |  | Device to view video  [Circle and stars video](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-1/contexts-for-practise/circles-and-starts)  A4 paper  Colour pencils/ markers |
| 9.3 | **Opportunity for monitoring student learning**  **Some aspects you may like to focus on today include:**   * Do they subitise (perceptually and conceptually)? * Do students use a range of efficient strategies when solving problems? Do they use related addition and subtraction facts? Do they use mental imagery? * Do students explain their thinking when solving problems * To be determined |  |  |

## Day 10

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Learning experience | Differentiation strategies and/or adjustments | Resources |
| 10.1 | ABC educational resources  ABC TV Education, in collaboration with the NSW Department of Education, have planned a daily schedule of free to air educational programs.  Select a resource to use from [Lower primary (Years K-2)](https://education.nsw.gov.au/teaching-and-learning/learning-from-home/teaching-at-home/teaching-and-learning-resources/non-department-resources/abc-educational-resources/lower-primary-). |  | [Lower primary (Years K-2)](https://education.nsw.gov.au/teaching-and-learning/learning-from-home/teaching-at-home/teaching-and-learning-resources/non-department-resources/abc-educational-resources/lower-primary-). webpage |
| 10.2 | 3 tens in a row  Students view video – 3 tens in a row.  Students play 3 tens in a row.  How to play  Draw a 3x3 grid as a game board (like noughts and crosses game board).  Players take turns to roll the dice and write the number in one of their boxes.  The goal is to be able to write two numbers in each box that combine to make 10.  Players continue taking turns until a player has been the first to make 3 tens in a row |  | Device to view video  [3 tens in a row video](https://sites.google.com/education.nsw.gov.au/get-mathematical-stage-1/contexts-for-practise/3-tens-in-a-row)  Student workbook  Colour pencils/ markers |
| 10.3 | **Opportunity for monitoring student learning**  **Some aspects you may like to focus on today include:**   * To be determined |  |  |

**Reflection and evaluation**

These simple questions may help you reflect on your students’ learning and plan for next steps.

What worked well and why?

What didn’t work and why?

What might I do differently next time?

What are the next steps for student learning based on the evidence gathered?