Making connections to the Week of Inspirational Math lessons

Resource 2: Mapping to Week 2 2016 lessons

Each year the team at youcubed design a Week of inspirational Math (WIM) with lessons for a range of grades. They have now designed three 'weeks' of tasks over the last three years. Teachers in NSW have been getting hooked on Jo Boaler, her research into Mathematical Growth Mindsets and also the wonderful lesson resources developed by Boaler and her colleagues at www.youcubed.org

This second resource maps the lessons from the Week of Inspirational Math Week 2 in 2016 to the NSW mathematics K-10 syllabus outcomes. I have mapped to the overarching outcomes, sub strands and general content links, not necessarily to the dot point level for all lesson activities. Many of the WIM lessons bring together a number of concepts, these concept connections should also be reflected in your programming where concepts are not taught in isolation. The lessons in this resource are the primary to middle school level lessons (up to grades 6-8), I have not mapped the lessons that link to upper secondary (grades 9-12).

Note: I have linked the tasks directly to the outcomes where that concept or content is addressed. You as the teacher may feel that your students are ready to tackle some of these activities in earlier grades, this decision is up to you e.g. Triangle Designs Day 5 WIM 2016 is for exploration in K-2, however the terminology and properties of isosceles triangles sits within Stage 3 of the NSW mathematics K-10 syllabus, this activity suits the end of Stage 1 and Stage 2.

References

Boaler, J. (2013). Ability and Mathematics: the mindset revolution that is reshaping education. FORUM, 55, 1, 143-152.

NSW Education Standards Authority (NESA). (2012). Mathematics K-6 syllabus. Sydney, NSW.: Author.

Lessons from the Week of Inspirational Math https://www.youcubed.org/week-inspirational-math/

See further papers here https://www.youcubed.org/resource/short-impact-papers/

Week of Inspirational Math 2016

Grades K-2 https://www.youcubed.org/weeks/week-2-grades-k-2/

You may want to visit the website link above to access any videos and PowerPoint presentations that accompany the lessons. The links within this table link directly to the lesson plans.

WIM lesson	NSW syllabus outcomes	Sub strand and content links
Day 1 The Many Ways We See Mathematics Dot card and finger maze, and finger twister activities	MAe-1WM	Communicating Recognise and describe dot patterns
	MAe-4NA	Whole Numbers Subitising small quantities (objects/dot patterns)
	MAe-5NA	Addition and Subtraction use visual representations of numbers to assist with addition and subtraction Recognises combinations to at least 10 (visually)
	MAe-8NA	Patterns and Algebra Describing patterns
	MAe-15MG	Sort, describe and name common shapes
	MA1-1WM	Communicating Describe patterns with reference to position, number or shapes
	MA1-3WM	Reasoning Describes why it is a pattern
	MA1-8NA	Patterns and Algebra 1 Number patterns that increase and decrease

WIM lesson	NSW syllabus outcomes	Sub strand and content links
Day 2 Mistakes are beautiful things Seeing numbers visually (includes similar activity as Number Visuals in Grades 3-4 Day 2 from WIM 2015)	MAe-1WM	Communicating Describing how they see numbers in pattern form
	MAe-4NA	Whole Numbers Recognising numbers in different contexts and representations Recognising dot patterns
	MAe-7NA	Fractions and decimals Recognises two dots of four as 'half'
	MAe-8NA	Patterns and Algebra Recognising groups of objects (dots) can be arranged in different ways
	MA1-1WM	Communicating Describes numbers and number patterns Describes similarities and differences between number representations
	MA1-2WM	Problem solving Uses diagrams to explore mathematical problems
	MA1-3WM	Reasoning Explains how a solution was obtained
	MA1-4NA	Whole Numbers 1 Represents one- and two- digit numbers using pictures and words
	MA1-5NA	Addition and Subtraction 1 Models and records patterns for individual numbers

WIM lesson	NSW syllabus outcomes	Sub strand and content links
Day 3 When you believe, amazing things happen Emoji graphs and other graphing activities	MAe-1WM	Communicating Uses everyday language to describe their graph and the representations they have used Uses some comparative language to discuss similarities and differences between graphs Suggests and poses possible questions the graph may be about
	MAe-2WM	Problem Solving Uses pictorial representations to design their graph
	MAe-3WM	Reasoning Gives reasons to support their choice of emojis
	MAe-17SP	Organises objects (or images) into a simple data display Interprets information in a graph
	MA1-1WM	Communicating Uses mathematical language to describe data displays and graphs Investigate appropriate questions for graphs Describe the value of each picture (emoji) used in the graph
	MA1-2WM	Problem solving Choose images (emojis) that support the topic/ area of interest being explored in the data display
	MA1-3WM	Reasoning Explains their interpretations of data displays Makes predictions about what data might be/is collected Uses comparative language in their description 'more than' 'less than'
	MA1-17SP	Data 1 and 2 Represents data with drawings (or images) Interprets information presented in picture graph

Primary Learning

WIM lesson	NSW syllabus outcomes	Sub strand and content links
Day 4 Conjectures, creativity and uncertainty Shape origami	MAe-1WM	Communicating Asks and responds to questions when convincing others Explains how they solved the problem using everyday words to describe the shape's features
	MAe-2WM	Problem solving Solves problems involving shapes and uses paper to show their strategy
	MAe-3WM	Reasoning Provides reasons why their new shape is a rectangle, or triangle or square
	MAe-15MG	Two-Dimensional Space Manipulates (folds) rectangles and describes their features Make representations of two-dimensional shapes
	MA1-1WM	Communicating Uses mathematical terms to describe shapes eg vertical and horizontal lines, parallel, side, vertex
	MA1-2WM	Problem solving Uses objects and diagrams to solve mathematical problems
	MA1-3WM	Reasoning Recognises features of shapes in different orientations Gives reasons why shapes remain the same in different sizes or orientations Makes connections between shapes based on features
	MA1-15MG	Two-Dimensional Space 1 and 2 Manipulate and compare features of shapes Makes representations of shapes using paper Combines and splits shapes to form new shapes

Primary Learning

WIM lesson	NSW syllabus outcomes	Sub strand and content links
Day 5 Engaging our visual pathways Triangle Designs	MA1-1WM	Communicating Describes resulting shapes when they are combined, flipped, turned etc Discusses symmetry of triangles and patterns Uses amount of tern (half, full) in describing their shapes
	MA1-3WM	Reasoning Provides reasons to explain why their shape fits the criteria, using mathematical language
	MA1-15MG	Two-Dimensional Space 1 and 2 Manipulate and compare triangles and other shapes Makes representations of shapes using paper (in various orientations) Combines and splits shapes to form new shapes Investigates flips, slides and turns with triangles Makes patterns and designs with triangles
	MA1-16MG	Position 2 Describe the position of an object (or image)
	MA2-2WM	Problem Solving Follows written instructions (criteria) to create shapes from other shapes Record the arrangements of common shapes (triangles) used to create other shapes
	MA2-15MG	Two-Dimensional Space 2 Compares and describes shapes that result from combining and splitting other shapes (triangles) Creates and records tessellating designs using triangles

Week of Inspirational Math 2016

Grades 3-5 https://www.youcubed.org/weeks/week-2-grades-3-5/

You may want to visit the website link above to access any videos and PowerPoint presentations that accompany the lessons. The links within this table link directly to the lesson plans.

WIM lesson	NSW syllabus outcomes	Sub strand links
Day 1 The Many Ways We See Mathematics Dot Card and Fewest Squares activities (Dot Card has same links as for Grades K-2 as well as those listed here)	**Links for Dot Cards**	
	MA2-1WM	Communicating Discuss and compare different methods for solving problems Compares solutions discussing similarities and differences Asks questions about how a pattern was formed or described
	MA2-2WM	Problem Solving Choose and apply efficient strategies to solve problems
	MA2-3WM	Reasoning Explains how an answer was obtained and checks solution Uses knowledge of visual patterns to support conclusions
	MA2-5NA	Addition and Subtraction 1 Adding and subtracting three or more single-digit numbers
	MA2-6NA	Multiplication and Division 1 Links visual patterns with array structure
	MA2-8NA	Patterns and Algebra 1 Model, describes and records number patterns using diagrams, words and/ or symbols Link patterns to odd and even numbers

WIM lesson	NSW syllabus outcomes	Sub strand links
	MA3-1WM	Communicating Describes and represents mathematical situations in a variety of ways using mathematical terminology and some conventions
	MA3-2WM	Problem solving Selects and applies appropriate strategies in undertaking investigations
	MA3-3WM	Reasoning Gives valid reasons for supporting one possible solution over another
	Links for Fewest Squares	
	MA2-1WM	Communicating Compare areas of shapes when combined in comparison to the whole (rectangle) Uses mathematical terminology to describe and represent mathematical ideas Discuss strategies used to estimate and solve area problems, visualising the units (repeated units)
	MA2-2WM	Problem solving Uses appropriate mental and written strategies to solve problems involving area
	MA2-3WM	Reasoning Explains reasoning used to solve problems Explains problem solving strategies using language, actions, materials and drawings
	MA2-6NA	Multiplication and Division 1 and 2 Links multiplication facts to array structure in area Uses mental strategies to recall multiples Represents and solves problems involving multiplication Uses a range of strategies to solve multiplication problems, such as doubling, repeated doubling, factorising

WIM lesson	NSW syllabus outcomes	Sub strand links
	MA2-10MG	Area 1 and 2 Uses grids to find the areas of squares Measures areas of squares and rectangles Compare two or more areas using tiles or a grid overlay
	MA2-15MG	Two-Dimensional Space 1 and 2 Manipulates, compares and describes shapes (rectangles and squares) Uses measurement to establish side properties Combines shapes (squares) to form other shapes (rectangle) Records arrangements of shapes used
	MA3-1WM	Communicating Describes and represents mathematical situations in a variety of ways using mathematical terminology and some conventions
	MA3-2WM	Problem solving Selects and applies appropriate strategies in undertaking investigations
	MA3-3WM	Reasoning Gives valid reasons for supporting one possible solution over another
	MA3-4NA	Whole Numbers 2 Explore square numbers using arrays or grid paper (linked to area)
Day 2 Mistakes are beautiful things Emoji graphs, creating and interpreting graphs activities Note: students are not required to define the term 'variable' until Stage 4.	MA3-1WM	Communicating Describes and represents mathematical situations in a variety of ways using mathematical terminology and some conventions Discuss and justify the choice of data display

WIM lesson	NSW syllabus outcomes	Sub strand links
	MA3-2WM	Problem solving Selects and applies appropriate strategies in undertaking investigations
	MA3-3WM	Reasoning Gives valid reasons for supporting one possible solution over another Determines and justifies scale used to construct graph Identify and describe relationships that can be observed in data displays
	MA3-8NA	Patterns and Algebra 2 Recognises the number plane (Cartesian plane with 4 quadrants) as a visual way of describing location (and for using as a graphic display)
	MA3-18SP	Data 1 and 2 Construct displays Describe and interprets data presented in graphs Recognise that line graphs (in this case 4 quadrants) are used to display continuous data Compare different data displays
Day 3 When you believe, amazing things happen Square to stairs	MA2-1WM	Communicating Asks questions about how number patterns have been increased or decreased Describes patterns in more than one way
	MA2-2WM	Problem solving Investigates visual number patterns
	MA2-3WM	Reasoning Justifies solutions to pattern problems Makes and justifies generalisations for patterns

WIM lesson	NSW syllabus outcomes	Sub strand links
	MA2-8NA	Patterns and Algebra 1 and 2 Describes and continues number patterns (referring to each term) Models and records number patterns using diagrams, words or symbols Finds higher terms in a pattern
	MA3-1WM	Communicating Describes patterns using the terms increase and decrease Describes the rule used to create a sequence Describes patterns in a variety of ways Interprets explanations written by peers that describe patterns
	MA3-3WM	Reasoning Explain why it is useful to describe the rule for a pattern (making connection between the position in the pattern and the value of the term)
	MA3-4NA	Whole Numbers 2 Explores triangular number patterns
	MA3-8NA	Patterns and Algebra 1 and 2 Continues patterns involving addition Creates simple geometric patterns and describes the pattern in words Makes generalisations about number relationships
	MA4-1WM	Communicating Translates from everyday language to algebraic language
	MA4-3WM	Reasoning Verifies where a simple expression is correct by substituting numbers for pronumerals
	MA4-8NA	Algebraic Techniques 1 and 2 Develops the use of pronumerals to represent numerical values (in a pattern) Generate number patterns from algebraic expressions

Primary Learning

WIM lesson	NSW syllabus outcomes	Sub strand links
Day 4 Conjectures, creativity and uncertainty Hailstone sequences	MA2-1WM	Communicating Discusses how number patterns have been created Describes how the next term is calculated
	MA2-2WM	Problem solving Uses the four operations to solve pattern problems Represent and solves problems using multiplication and division
	MA2-3WM	Reasoning Suggests reasons why number patterns work Explains how an answer was obtained and compares methods with methods of other students
	MA2-5NA	Addition and Subtraction 1 Applies known single-digit addition and subtraction facts Explains and checks solutions to problems, including by using inverse operations
	MA2-6NA	Multiplication and Division 1 Uses mental strategies to recall multiples of 2s and 3s Uses mental or informal written strategies to multiply one-digit by two-digit numbers (eg factorising, doubles and halving, inverse relationships) Uses mental or informal written strategies to divide two-digit by one-digit numbers
	MA2-8NA	Patterns and Algebra 1 and 2 Describes and investigates number patterns resulting from addition and subtraction, multiplication and division Model and record number patterns using words and diagrams Continues number patterns that increase and decrease Explores odd and even numbers within patterns Generates number patterns involving multiples

WIM lesson	NSW syllabus outcomes	Sub strand links
	MA3-1WM	Communicating Describes strategies for completing number patterns and justifies solutions Describe number patterns in a variety of ways Interpret explanations written by peers
	MA3-2WM	Problem solving Solves problems involving patterns and selects and applies appropriate strategies for the investigation
	MA3-3WM	Reasoning Make generalisations about number patterns and provide reasons Reflects on the chosen method of solution for a problem, considering how it can be improved
	MA3-5NA	Addition and Subtraction 1 Selects and applies known strategies for addition and subtraction where needed to solve pattern problems
	MA3-6NA	Multiplication and Division 1 Solves problems involving multiplication of large numbers by one-digit numbers
	MA3-8NA	Patterns and Algebra 1 and 2 Continue and explores number patterns involving addition and subtraction Describe patterns using the terms increase and decrease Use the rule of a pattern to calculate values for larger numbers

WIM lesson	NSW syllabus outcomes	Sub strand links
Day 5 Engaging our visual pathways Shape origami This task has the same links as Shape Origami on Day 4 K-2, as well as the links listed here	MA2-1WM	Communicating Discuss shapes made by combining or splitting shapes Compares solutions using appropriate terminology
	MA2-2WM	Problem solving Uses knowledge of shape properties when solving problems involving shapes
	MA2-3WM	Reasoning Explains reasoning used to solve problems involving shapes
	MA2-15MG	Two-Dimensional Space 1 and 2 Manipulate, compare and describe features of squares, rectangles and triangles Construct shapes from a variety of materials (eg paper folding) Draw representations of shapes Combining shapes to form other shapes Record different combinations of shapes and shape arrangements
	MA3-1WM	Communicating Recognise that shapes can be classified in more than one way
	MA3-2WM	Problem solving Selects and applies appropriate problem-solving strategies in investigations
	MA3-3WM	Reasoning Explain the difference between shapes (eg regular and irregular shapes) Recognise that triangles can be both right-angled and isosceles or right-angled and scalene
	MA3-15MG	Two-Dimensional Space 1 Manipulate triangles Compare and describe features of shapes eg side properties Explore and compare representations of shapes in student drawings

Week of Inspirational Math 2016

Grades 6-8 https://www.youcubed.org/weeks/week-2-grades-6-8/

You may want to visit the website link above to access any videos and PowerPoint presentations that accompany the lessons. The links within this table link directly to the lesson plans.

Note: Days 1 through 4 for Grades 6-8 are identical to lesson activities for Grades 3-5 above therefore have not been repeated here. Links can be extended into Stage 4 outcomes- particularly for working mathematically.

WIM lesson	NSW syllabus outcomes	Sub strand links
Day 5 Engaging our visual pathways Painted Cube	MA3-1WM	Communicating Describes arrangements of blocks in terms of layers Uses a table or similar to organise and record methods used to solve problems Describe how number patterns have been created and how they can be continued
	MA3-2WM	Problem Solving Uses the appropriate operation when solving problems Uses knowledge of faces, edges and vertices to solve problems
	MA3-3WM	Reasoning Estimate solutions to problems and check to justify solutions
	MA3-6NA	Multiplication and Division 1 Solves problems involving multiplication
	MA3-8NA	Patterns and Algebra 1 Identify, continue and create number patterns Complete a table of values to describe patterns Describe number patterns in a variety of ways Determine a rule for patterns

WIM lesson	NSW syllabus outcomes	Sub strand links
	MA3-11MG	Volume (and Capacity) 1 Establish the relationship between the number of cubes in one layer and the number of layers
	MA3-14MG	Three-Dimensional Space1 and 2 Identify, describe and compare the properties of prisms (cube) Visualise and sketch three-dimensional objects
	MA4-1WM	Communicating Communicates and connects mathematical ideas using appropriate terminology, diagrams and symbols
	MA4-2WM	Problem Solving Recognises and explains mathematical relationships using reasoning
	MA4-3WM	Reasoning Investigate the rules associated with multiplying integers Generalises number properties to operate with algebraic expressions
	MA4-4NA	Computation with integers Carry out the four operations using efficient mental and written strategies
	MA4-8NA	Algebraic Techniques 1 and 2 Use algebraic symbols to represent simple situations eg patterns Generate a number pattern from an algebraic expression

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