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Content Clusters - Early Stage 1

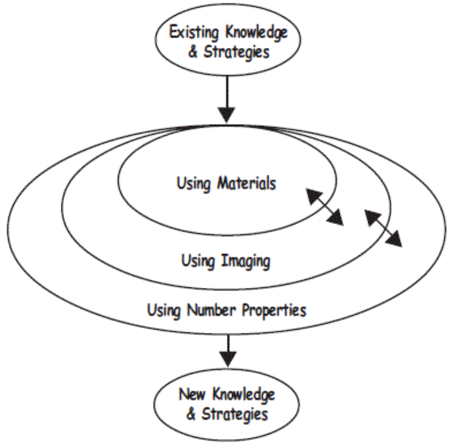
Scope and sequencing by conceptual understanding

This is the scope… you create the sequence.

In this resource I provide possible ways of how groups of outcomes and their key ideas can be sequenced together based on the concepts they address. These are just examples and is not an exhaustive list of the clusters you can use to make connections across mathematics. I have used the syllabus outcomes, sub strands and the mathematics key ideas document. When teaching for conceptual understanding (not just the knowledge of each sub strand) we need to make clear how the pieces of the mathematical puzzle fit together. To do this, our planning needs to reflect this belief- that mathematics is a complex web of interrelated ideas. For ideas on what these links are, see my Linkages across the syllabus document on the resources section of our website.

The scope of what we teach is described in the syllabus (this is the constant), the sequence of what and how we teach mathematics is a decision for individual teachers (this is the variable). These clusters can be used to create meaningful sequences of learning that focus on concepts and programs that still address common sub strands (across grades or classes) but allow for individual teachers to add additional key ideas or focus on specific aspects of the cluster that students either have misconceptions around or are developing conceptual understanding in. The clusters are numbered but are not written in teaching order. These clusters may be added to or updated in the future and newer versions will be released.

These clusters highlight the concept or main idea that ties each group of outcomes together, assisting teachers in making sense and meaning of the mathematics to students. When we think about the concepts or understandings first, we can think about what misconceptions students may have or what aspects of that concept they need next to connect their prior knowledge (the known) to create new knowledge (the unknown). The image to the right sourced from NZMaths, is based on Pirie and Kieren's growth in understanding model of the 'back and forth' nature of how students develop understanding from the known to the unknown.



A (scope and) sequence should:

- reflect the conceptual needs of your students at this point in time (they need to be evaluated and changed constantly)
- show evidence of connections across sub strands
- address connected content strands that deal with similar concepts within a lesson or within a sequence of lessons (e.g. over a few weeks)
- give teachers an overarching structure to guide immediate planning
- where possible, be written to address the upcoming half- term or term teaching and learning cycle

NESA states that for their review process as evidence of compliance schools need to provide "scope and sequence of learning/units of work in relation to outcomes of NESA syllabus for each KLA for each Year" (page 10). **Note:** Most schools have a set, wider grade or school-based scope and sequence, you can use the content clusters within those parameters to guide what conceptual understandings you focus on for your students. They show where you can make connections between the sub strands that are listed in the school's scope and sequence.

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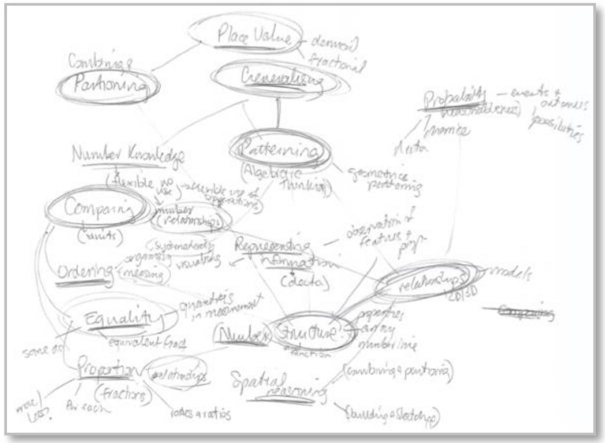
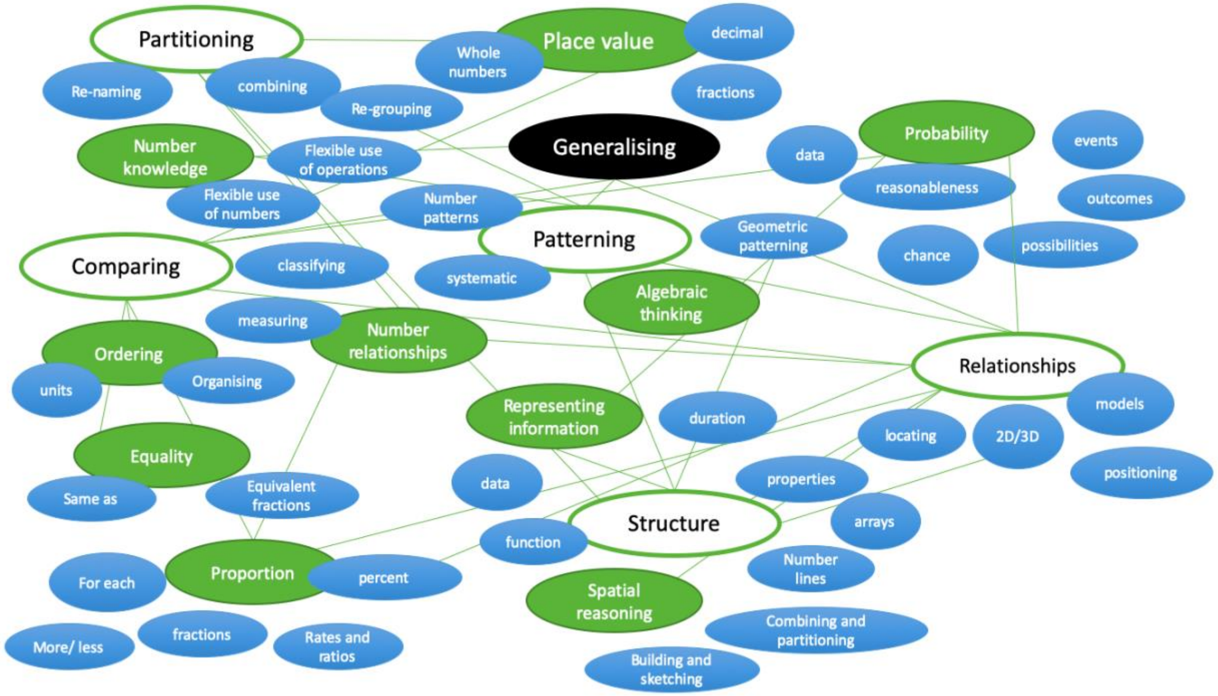
Mind map of big ideas and smaller concept connections

To assist with how these clusters fit into the larger picture of mathematics, what many researchers refer to as 'Big ideas' or important concepts (Askew, 2013; Boaler, 2017; Charles, 2005; Clarke, Clarke & Sullivan, 2012; Hurst & Hurrell, 2014; Siemon, Bleckly & Neal, 2012; Tout & Spithill, 2015), I had a go at thinking holistically about *"What are the main concepts or 'knowledge actions' students need?"* Here is my 'messy' thinking, then a more organised way of linking these ideas together are illustrated on the following pages.





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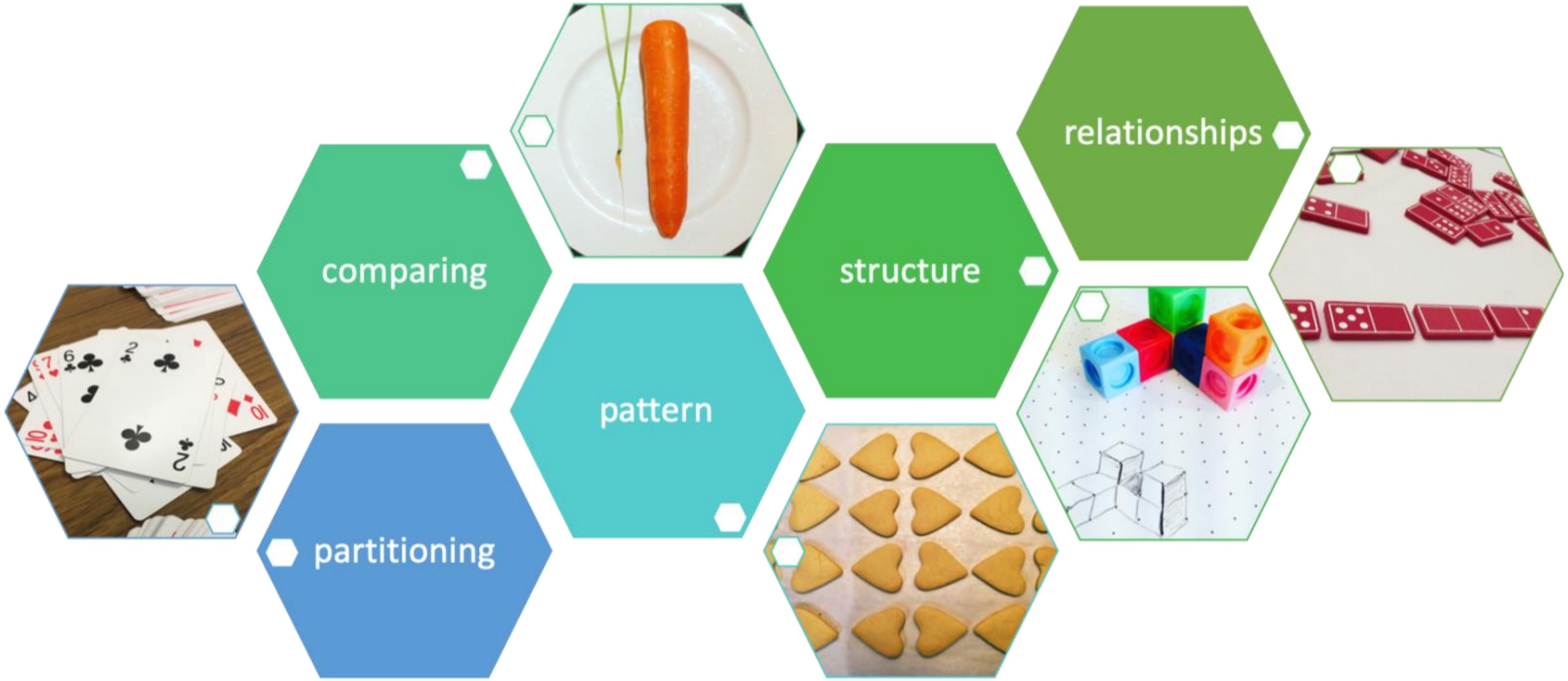
Big ideas simplified



I then thought about these important concepts ‘big ideas’, the smaller ‘knowledge actions’ within them, and how the Content Clusters fit under each of these concepts, noting that some clusters align with more than one big idea.

Big ideas and smaller ‘knowledge actions’

Partitioning	Pattern	Comparing	Structure	Relationships
• Combining • Part-whole • Place value • Modelling • Whole numbers • Decimals • Fractions	• Geometric • Number • Algebraic • Generalising • Predicting	• Equality (with numbers and measurement) • Ordering • Proportion (fractions, percent, rates, ratios) • Magnitude • Estimating	• Number • Arrays • Shape • Measuring • Spatial • Building and sketching • Representing features (shape, data)	• Number • Additive and multiplicative • 2D and 3D • Probability • Possibilities (chance) • Data • Locating, positioning • Part-whole

These are just my ideas, Charles (2005) in his paper recognises that in developing deeper understanding of big ideas it might be helpful for teachers to “decide to modify or build your own” (p. 11). He also stated that:

> *“In working with colleagues on the development of this paper I am rather certain that it is not possible to get one set of Big Ideas and Understandings that all mathematicians and mathematics educators can agree on. Fortunately, I do not think it’s necessary to reach a consensus in this regard. Use the Big Mathematical Ideas and Understandings presented here as a starting point for the conversations they are intended to initiate”* (p. 9)

Organisation of Early Stage 1 clusters (updated)

In this update I have reduced the repetition of clusters and now simply have all the clusters included once (they are no longer repeated under substrand headings). A few clusters have been revised (Cluster 1, 8 and 16) to add in other connections that have arisen. The names of some clusters have also been revised to align with the naming format used in the other stages (focusing on concept knowledge instead of the 'doing'). Where appropriate, clusters have been given the same or similar names as concepts from other Stages to help make connections, show concepts that develop, and to assist with multi-stage planning. This version also includes a visual overview of the clusters mapped to the NSW outcomes they address to assist with planning and programming. A list of cluster titles is also included so teachers can see 'at a glance' the types of concepts the clusters explore. There is no set time for how long each cluster may take to explore with students, it could be 2 weeks per cluster or 3-4 weeks. Clusters may be repeated, merged or omitted (please see these are examples). Decisions about how the clusters are arranged and implemented should be made by teachers at a school/grade/classroom level based on students' needs, abilities, and interests.

References

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Charles, R. I., & Carmel, C. A. (2005). Big ideas and understandings as the foundation for elementary and middle school mathematics. *Journal of Mathematics Education*, *7*(3), 9-24.

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Hurst, C., & Hurrell, D. (2014). Developing the big ideas of number. *International Journal of Educational Studies in Mathematics*, *1*(2), 1-18.

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

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Tout, D. & Spithill, J. (2015). Big Ideas in Mathematics Teaching. *The Research Digest, QCT, 2015 (11*)

What is mathematical beauty Jo Boaler (Youcubed)

Clusters mapped to big ideas

Early Stage 1 Clusters

Partitioning	Pattern	Comparing	Structure	Relationships
• Cluster 1: Counting (developing principles of number sense) • Cluster 3: Sharing (division) can be used to represent fractions • Cluster 11: Numerals and their representations can be compared	• Cluster 2: Counting to form groups • Cluster 6: Units can be sequenced through counting • Cluster 12: Repeating patterns continue	• Cluster 2: Counting to form groups • Cluster 4: Quantities can be compared through counting • Cluster 5: Counting can be used to sequence events • Cluster 6: Units can be sequenced through counting • Cluster 9: Features of objects and shapes can be compared • Cluster 10: Equal means 'the same as' • Cluster 11: Numerals and their representations can be compared • Cluster 14: Quantities can be compared (linear) using estimation • Cluster 15: Quantities can be compared (objects) using estimation	• Cluster 8: Quantities can be represented (oral, image/drawing, number, symbol) • Cluster 12: Repeating patterns continue • Cluster 13: Objects can be identified by size, space and location • Cluster 16: Information can be represented visually • Cluster 18: Duration relates time to events and representations (e.g. clock)	• Cluster 2: Counting to form groups • Cluster 7: Items or objects can be classified and described (sorting) • Cluster 10: Equal means 'the same as' • Cluster 13: Objects can be identified by size, space and location • Cluster 17: Number sense can be applied to count and compare money • Cluster 18: Duration relates time to events and representations (e.g. clock)

Overview of Early Stage 1 Content Clusters

Content Cluster 1: Counting (developing principles of number sense)

Content Cluster 2: Counting to form groups (combining amounts and building number relationships)

Content Cluster 3: Sharing (division) can be used to represent fractions

Content Cluster 4: Quantities can be compared through counting

Content Cluster 5: Counting can be used to sequence events

Content Cluster 6: Units can be sequenced through counting

Content Cluster 7: Items or objects can be classified and described (sorting)

Content Cluster 8: Quantities can be represented (oral, image/drawing, number, symbol)

Content Cluster 9: Features of objects and shapes can be compared (e.g. size, shape)

Content Cluster 10: Equal means 'the same as'

Content Cluster 11: Numerals and their representations can be compared

Content Cluster 12: Repeating patterns continue (starting with visual: shapes and objects)

Content Cluster 13: Objects can be identified by size, space and location

Content Cluster 14: Quantities can be compared (linear) using estimation

Content Cluster 15: Quantities can be compared (objects) using estimation

Content Cluster 16: Information can be represented visually

Content Cluster 17: Number sense can be applied to count and compare money

Content Cluster 18: Duration relates time to events and representations (e.g. clock)

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Early Stage 1 Content Cluster outcome mapping

	1 Counting (developing principles of number sense)	**2** Counting to form groups	**3** Sharing (division) can be used to represent fractions	**4** Quantities can be compared through counting	**5** Counting can be used to sequence events	**6** Units can be sequenced through counting	**7** Items or objects can be classified and described (sorting)	**8** Quantities can be represented (oral, image/drawing, number	**9** Features of objects and shapes can be compared	**10** Equal means 'the same as'	**11** Numerals and their representations	**12** Repeating patterns continue	**13** Objects can be identified by size, space	**14** Quantities can be compared (linear)	**15** Quantities can be compared (objects)	**16** Information can be represented visually	**17** Number sense can be applied to money	**18** Duration relates time to events
Whole Number MAe-4NA																		
Add & Sub MAe-5NA																		
Multi & Division MAe-6NA																		
Frac & Decimals MAe-7NA																		
Pat & Algebra MAe-8NA																		
Length MAe-9MG																		
Area MAe-10MG																		
Vol & Capacity MAe-11MG																		
Mass MAe-12MG																		
Time MAe-13MG																		
3D Space MAe-14MG																		
2D Space MAe-15MG																		
Position MAe-16MG																		
Data MAe-17SP																		

Early Stage 1 Content Clusters

Content Cluster 1: Counting (developing principles of number sense)		
Whole Numbers MAe-4NA Count forwards to 30 from a given number Count backwards from a given number in the range 0 to 20	**Addition and Subtraction MAe-5NA** Combine two or more groups of objects to model addition	**Patterns and Algebra MAe-8NA** Recognise, copy, continue, create and describe repeating patterns of objects and drawings

Content Cluster 2: Counting to form groups (combining amounts and building number relationships)		
Addition and Subtraction MAe-5NA Combine two or more groups of objects to model addition Subitise small collections of objects	**Multiplication and Division MAe-6NA** Investigate and model equal groups Record grouping and sharing using informal methods	**Patterns and Algebra MAe-8NA** Sort and classify objects into groups

Content Cluster 3: Sharing (division) can be used to represent fractions			
Addition and Subtraction MAe-5NA Take part of a group away to model subtraction	**Fractions and Decimals MAe-7NA** Establish the concept of one-half Record halves of objects using drawings	**Multiplication and Division MAe-6NA** Investigate and model equal groups Record grouping and sharing using informal methods	**Two-Dimensional Space MAe-15MG** Sort, manipulate, make and draw circles, squares, triangles and rectangles

Early Stage 1 Content Clusters

Content Cluster 4: Quantities can be compared through counting	
Addition and Subtraction MAe-5NA Combine two or more groups of objects to model addition Take part of a group away to model subtraction Compare two groups to determine 'how many more'	**Volume and Capacity MAe-11MG** Describe capacity and volume using everyday language, including comparatives Compare volumes and capacities using direct comparison

Content Cluster 5: Counting can be used to sequence events	
Whole Numbers MAe-4NA Compare, order, read and represent numbers to at least 20 Read and use the ordinal names to at least 'tenth'	**Time MAe-13MG** Compare and order the duration of events using everyday language Sequence events in time

Content Cluster 6: Units can be sequenced through counting	
Whole Numbers MAe-4NA Compare, order, read and represent numbers to at least 20	**Length MAe-9MG** Identify the attribute of 'length' as a measure of an object from end to end Describe length and distance using everyday language, including comparatives Compare lengths using direct comparison

Early Stage 1 Content Clusters

Content Cluster 7: Items or objects can be classified and described (sorting)			
Three-Dimensional Space MAe-14MG Sort and manipulate three-dimensional objects found in the environment	**Two-Dimensional Space MAe-15MG** Sort, manipulate, make and draw circles, squares, triangles and rectangles	**Position MAe-16MG** Describe position using everyday language Use the terms 'left' and 'right' to describe position in relation to self	**Patterns and Algebra MAe-8NA** Sort and classify objects into groups

Content Cluster 8: Quantities can be represented (oral, image/drawing, number, symbol)		
Whole Numbers MAe-4NA Compare, order, read and represent numbers to at least 20	**Data MAe-17SP** Collect information about themselves and their environment Organise actual objects into data displays	**Time MAe-13MG** Connect days of the week to familiar events and actions Tell time on the hour on digital and analog clocks

Content Cluster 9: Features of objects and shapes can be compared (e.g. size, shape)		
Three-Dimensional Space MAe-14MG Describe features of common three-dimensional objects using everyday language	**Two-Dimensional Space MAe-15MG** Identify, name and describe circles, squares, triangles and rectangles presented in different orientations, in pictures and the environment	**Patterns and Algebra MAe-8NA** Sort and classify objects into groups

Early Stage 1 Content Clusters

Content Cluster 10: Equal means 'the same as'		
Whole Numbers MAe-4NA Use the term 'is the same as' to express equality of groups	**Multiplication and Division MAe-6NA** Investigate and model equal groups Record grouping and sharing using informal methods	**Fractions and Decimals MAe-7NA** Establish the concept of one-half Record halves of objects using drawings

Content Cluster 11: Numerals and their representations can be compared		
Whole Numbers MAe-4NA Compare, order, read and represent numbers to at least 20	**Addition and Subtraction Mae-5NA** Combine two or more groups of objects to model addition Record addition and subtraction informally	**Multiplication and Division MAe-6NA** Record grouping and sharing using informal methods

Content Cluster 12: Repeating patterns continue (starting with visual: shapes and objects)			
Patterns and Algebra MAe-8NA Recognise, copy, continue, create and describe repeating patterns of objects and drawings	**Whole Numbers MAe-4NA** Subitise small collections of objects Use the term 'is the same as' to express equality of groups	**Two-Dimensional Space MAe-15MG** Sort, manipulate, make and draw circles, squares, triangles and rectangles	**Position MAe-16MG** Describe position using everyday language

Early Stage 1 Content Clusters

Content Cluster 13: Objects can be identified by size, space and location			
Area MAe-10MG Identify the attribute of 'area' as a measure of the amount of surface	**Volume and Capacity MAe-11MG** Identify the attribute of 'capacity' as a measure of the amount of substance a container can hold Identify the attribute of 'volume' as a measure of the amount of space an object occupies	**Mass MAe-12MG** Identify the attribute of 'mass' as a measure of the amount of matter in an object	**Position MAe-16MG** Give and follow simple directions Describe position using everyday language

Content Cluster 14: Quantities can be compared (linear) using estimation			
Whole Numbers MAe-4NA Count forwards to 30 from a given number Count backwards from a given number in the range 0 to 20	**Length MAe-9MG** Describe length and distance using everyday language, including comparatives Compare lengths using direct comparison Record comparisons of length informally	**Area MAe-10MG** Describe area using everyday language, including comparatives Compare areas using direct comparison Record comparisons of area informally	**Position MAe-16MG** Describe position using everyday language

Content Cluster 15: Quantities can be compared (objects) using estimation			
Whole Numbers MAe-4NA Count forwards to 30 from a given number Count backwards from a given number in the range 0 to 20	**Area MAe-10MG** Describe area using everyday language, including comparatives Compare areas using direct comparison	**Volume and Capacity MAe-11MG** Describe capacity and volume using everyday language, including comparatives Compare volumes and capacities using direct comparison Record comparisons of capacity and volume informally	**Mass MAe-12MG** Describe mass using everyday language, including comparatives Compare masses directly by hefting Record comparisons of mass informally

Early Stage 1 Content Clusters

Content Cluster 16: Information can be represented visually			
Data MAe-17SP Organise actual objects into data displays Interpret data displays made from objects	**Whole Numbers MAe-4NA** Compare, order, read and represent numbers to at least 20 Use the term 'is the same as' to express equality of groups	**Three-Dimensional Space MAe-14MG** Sort and manipulate three-dimensional objects found in the environment	**Time MAe-13MG** Tell time on the hour on digital and analog clocks

Content Cluster 17: Number sense can be applied to count and compare money	
Whole Numbers MAe-4NA Compare, order, read and represent numbers to at least 20 Use the language of money	**Addition and Subtraction Mae-5NA** Combine two or more groups of objects to model addition Take part of a group away to model subtraction Compare two groups to determine 'how many more'

Content Cluster 18: Duration relates time to events and representations (e.g. clock)		
Whole Numbers MAe-4NA Compare, order, read and represent numbers to at least 20	**Time MAe-13MG** Connect days of the week to familiar events and actions Tell time on the hour on digital and analog clocks	**Fractions and Decimals MAe-7NA** Establish the concept of one-half