Falls Road Primary Independent Public School

Draft Whole School Mathematics Plan 2016

Rationale: To improve the outcomes of students by adopting agreed whole school approaches to the teaching and learning of Mathematics.

Our Beliefs and Understandings about learning Mathematics

Students learn best when:

- They are provided with opportunities to work cooperatively
- They are exposed to mathematics language and concepts every day
- They are grouped heterogeneously and homogenously when required
- They are explicitly taught all aspects of mathematics including processes and strategies
- They are exposed to mathematics in a range of contexts – concrete, representational and abstract
- Their work is valued and displayed
- They are given appropriate teaching and learning adjustments
- They set meaningful goals
- They reflect on their learning
- They feel safe and are in a risk-taking environment

Whole School Approach to learning Mathematical concepts

Students learn best when they are exposed to a mathematical concept in a variety of ways. This can be done through a:

Concrete – Representational – Abstract (CRA) Approach - this is a three step instructional approach that has been found to be highly effective in teaching math concepts. The first step is called the concrete stage. It is known as the "doing" stage and involves physically manipulating objects to solve a math problem. The representational (semi-concrete) stage is the next step. It is known as the "seeing" stage and involves using images to represent objects to solve a math problem. The final step in this approach is called the abstract stage. It is known as the "symbolic" stage and involves using only numbers and symbols to solve a math problem. CRA is a gradual systematic approach. Each stage builds on to the previous stage and therefore must be taught in sequence.

Steps

1. Teach the math concept using manipulatives (concrete level).
2. Allow ample opportunities for students to practise the concept using various manipulatives.
3. Make sure students understand the concept at the concrete level before moving on to the representational level.
4. Introduce pictures to represent objects (representational level). Model the concept.
5. Provide plenty of time for students to practise the concept using drawn or virtual images.
6. Check student understanding. Do not move to the abstract if students haven't mastered the representational level.
7. Teach students the math concept using only numbers and symbols (abstract level). Model the concept.
8. Provide plenty of opportunities for students to practise using only numbers and symbols.
9. Check student understanding. If students are struggling, go back to the concrete and representational levels.
10. Once the concept is mastered at the abstract level, periodically bring back the concept for students to practise and keep their skills fresh.

Modelling the concept and providing lots of opportunities for practice is extremely important at all three levels. Do not rush through the levels - students need time to make connections and build on what they already know. Give them time to process the information before moving on to the next level.

Benefits

- Provides students with a structured way to learn math concepts
- Students are able to build a better connection when moving through the levels of understanding from concrete to abstract
- Makes learning accessible to all learners (including those with math learning disabilities)
- Taught explicitly using a multi-sensory approach
- Follows Universal Design for Learning guidelines
- Research has proven that this method is effective
- Able to use across grade levels, from early elementary through high school
- Aligned with Australian Curriculum standards
- Helps students learn concepts before learning rules
- Can be used in small groups or entire class

Whole School Approach to Numeracy Block (ISTAR Planning and Teaching Framework) – Appendix A

Whole School Approach to Problem Solving – Appendix B

Students will be explicitly taught a range of problem solving strategies from Pre-Primary through to year 6 as per the attached year level guide. The strategies are outlined in more detail in Appendix B:

Australian Curriculum – Proficiency Strands – Appendix C

The Proficiency strands cross over all aspects of the Mathematics Curriculum - Number and Algebra, Measurement and Geometry and Statistics and Probability. They should be kept in mind at all times throughout the teaching and learning process.

Whole School Approach to Tables

At Falls Road Primary School, we believe that the instant recall of tables and other basic facts (addition, subtraction and division) is essential for students to be able to effectively work in the Australian Mathematics curriculum. We endeavour to teach tables and basic facts knowledge in a variety of ways in order for students to develop tables and basic facts to the level of instant recall.

We will teach times tables and basic facts in a variety of ways. These will include through patterning, arrays, jingles and chants, by using concrete materials (eg. dice, cards, dominoes) and by playing a variety of tables and basic facts games.

- PP - Year 2 - Use Skip Counting and learn 2s, 5s &10s as appropriate
  (Year 2s – skip count in 3s)
- Year 1, 2 & 3 - Continue to use concrete materials to develop students' understanding of patterns and counting
- Year 3: - 3 and 4 times tables
- Year 4: - 6, 7, 8 and 9 times tables
- Year 5/ Year 6: - 11 times and 12 times tables as required
- Upper Primary: - extend to Mental Maths strategies, including applying mental maths strategies to real-life problems

Evaluation – To assess students' knowledge of basic facts and tables, we will assess them twice a term to gauge their improvement as per our Maths Operational Plan.

On-line resources to support the Australian Curriculum – Appendix D

There are a range of on-line resources that can be used to add value and complement the Mathematics curriculum. These are the resources that have been specifically identified to support the mathematics teaching and learning program at Falls Road. They include a Mathematics Dictionary as well as links to ready-made Mathematics charts and diagrams.

Whole School Approach to Assessment of Mathematics

At Falls Road Primary School we use the MTS Test to assess students at their year level twice a year (Year 1 – Year 6) and at the end of the year in Pre Primary. This, in addition to NAPLAN results gives us longitudinal data on how students perform at the beginning and end of the year. These assessments are done at the beginning of Term 1 and the beginning of Term 4
Additionally, we will use NAPLAN Tracking and EARS data along with the MTS data to help us identify our mathematics priorities in the Mathematics Operational Plan.

Whole School Approach to the Development of Counting Skills
– **Appendix E**

Whole School Mathematics Curriculum – **Achievement Standards, Numeracy Indicators and Mathematics Content Descriptions by Year Level**
– Appendixes F, G and H

Whole School Approach to Mathematics Vocabulary – **Appendix I**
(Foundation to Year 6 - year specific vocabulary as per attached word lists)
At Falls Road Primary School, we will explicitly teach mathematical vocabulary to develop mathematical literacy across the curriculum. The mathematical vocabulary lists are based around year level groups and vocabulary is built upon from one year to the next year.

Books with a Mathematics Theme – **Appendix J**

APPENDIX A

Numeracy Block-what does it look like?

This is a suggestion of what a Numeracy Block might look like in your classroom. It will differ according to the developmental age of the students that you teach, but the basic outline remains the same. The Numeracy block could last from anywhere from 45 minutes to 90 minutes depending on the concept you are teaching.

The ISTAR Approach

Inform/Inspire

The teacher explicitly informs the students of what the purpose of the lesson is and the intended learning outcomes:

- What they are learning
- What the teacher is looking for
- How the learning will take place

Show/Share

The teacher will explicitly inform the students how they should approach the learning:

- What strategies to use – these can include modelling, demonstrating, analysing, evaluating, describing, scaffolding, sampling, comparing, highlighting, questioning/explaining, imitate, think aloud, process, role playing

Try/Transfer

- The students are given the opportunity to try and practise their learning together
- Students are provided with multiple opportunities to practise their learning of what was taught in the Show/Share stage

Apply/Action

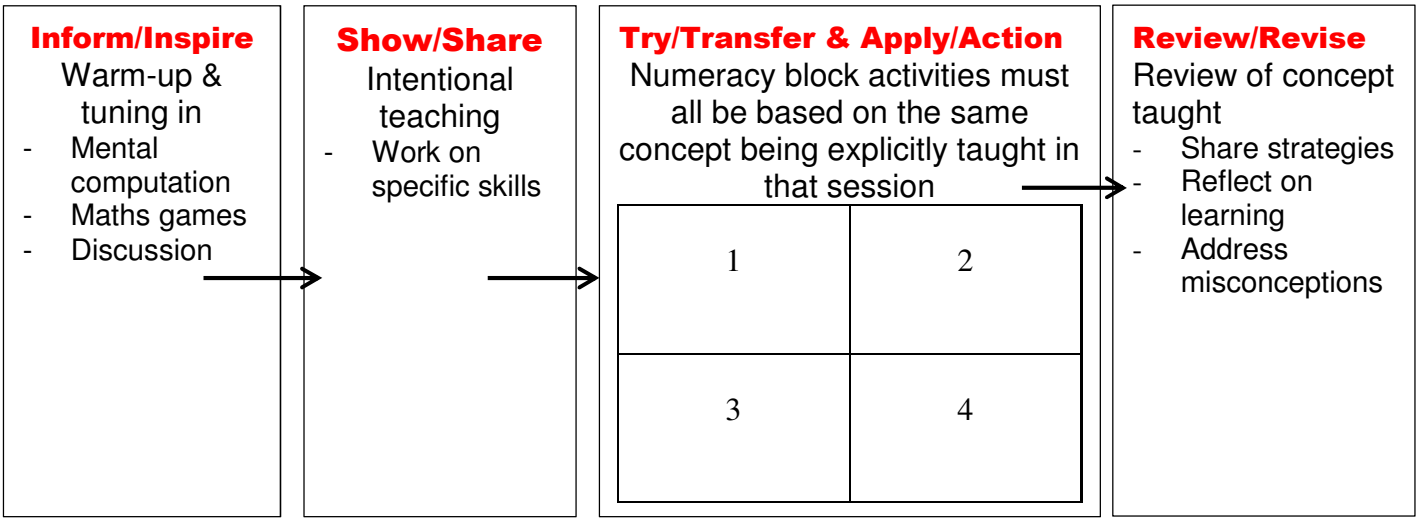
Students are given the opportunity to apply or action their learning independently of the teacher

Review/Revise

All students are given the opportunity to demonstrate the progress they have made towards achieving the intentional outcome. This may include through maths journals, partner sharing, mat discussions, demonstration etc…

Suggested Lesson Structure

Numeracy-based table activities



KSAR – Problem Solving Approach

KNOW	Read the question Underline the key information
SELECT	Select a strategy
APPLY	Apply the strategy
REVIEW	Re-read the question to see if you have answered what it is asking

Problem Solving Strategies

Pre primary to Year 2

Locate the key words

- Underline or write these words down
- Read these key words a few times
- Ensure that I know what needs to be done

Make a drawing or a diagram

- Can I draw something useful about the problem
- Will a sketch help me to understand the problem?

Look for a pattern

- Does the question contain a number pattern that I can see?
- Can I predict the next answer that works?
- Will this pattern hold for any possible answer?

Make a model or Use Objects

- Will a model made out of paper or blocks help me to understand the problem?
- Will a model help me to see what needs to be done?
- Will a model make it easier to see a problem?

Year 3 and Year 4

Assume a solution – Guess and Check

- Think of a sensible answer that might work
- Put it into the problem to see if it works.
- If it doesn't, try another.
- Am I getting closer or further from the solution?

Make a list, table or chart

- Will a structure like this help me?
- Does this table help me to see a pattern?

Year 5 and Year 6

Think logically

- What is obvious about the answer to the problem?
- What types of answers are obviously wrong?
- How do I know this?

Work Backwards

- Can I start at the end of the problem and work towards the start?
- Do I need to change the maths operations to get an answer?

Try a similar but simpler problem

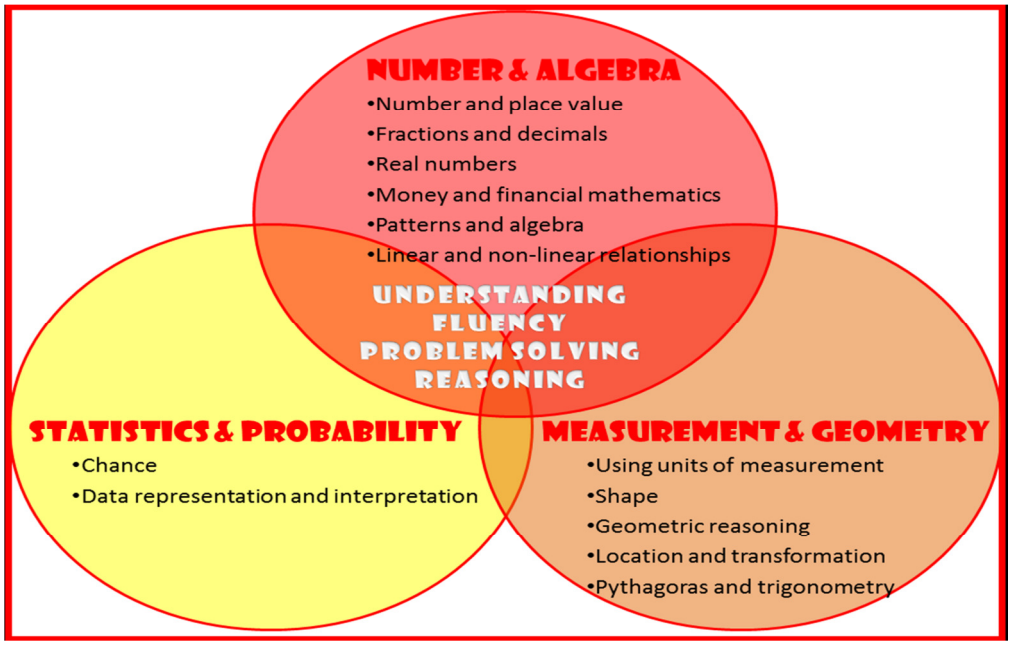
- Can I make the question easier to help me see what needs to be done?
- Will this help me to see a pattern?

NOTE: Teachers to build on strategies from previous years

APPENDIX C

Proficiency Strands – Australian Curriculum

Fluency	Understanding	Problem Solving	Reasoning



APPENDIX C continued

	Understanding
FOUNDATION	**Understanding** includes connecting names, numerals and quantities
YEAR 1	**Understanding** includes connecting names, numerals and quantities, and partitioning numbers in various ways
YEAR 2	**Understanding** includes connecting number calculations with counting sequences, partitioning and combining numbers flexibly, identifying and describing the relationship between addition and subtraction and between multiplication and division
YEAR 3	**Understanding** includes connecting number representations with number sequences, partitioning and combining numbers flexibly, representing unit fractions, using appropriate language to communicate times, and identifying environmental symmetry
YEAR 4	**Understanding** includes making connections between representations of numbers, partitioning and combining numbers flexibly, extending place value to decimals, using appropriate language to communicate times, and describing properties of symmetrical shapes
YEAR 5	**Understanding** includes making connections between representations of numbers, using fractions to represent probabilities, comparing and ordering fractions and decimals and representing them in various ways, describing transformations and identifying line and rotational symmetry
YEAR 6	**Understanding** includes describing properties of different sets of numbers, using fractions and decimals to describe probabilities, representing fractions and decimals in various ways and describing connections between them, and making reasonable estimations

	Fluency
FOUNDATION	**Fluency** includes readily counting numbers in sequences, continuing patterns, and comparing the lengths of objects
YEAR 1	**Fluency** includes counting number in sequences readily forward and backwards, locating numbers on a line, and naming the days of the week
YEAR 2	**Fluency** includes counting numbers in sequences readily, using informal units iteratively to compare measurements, using the language of chance to describe outcomes of familiar chance events and describing and comparing time durations
YEAR 3	**Fluency** includes recalling multiplication facts, using familiar metric units to order and compare objects, identifying and describing outcomes of chance experiments, interpreting maps and communicating positions
YEAR 4	**Fluency** includes recalling multiplication tables, communicating sequences of simple fractions, using instruments to measure accurately, creating patterns with shapes and their transformations, and collecting and recording data
YEAR 5	**Fluency** includes choosing appropriate units of measurement for calculation of perimeter and area, using estimation to check the reasonableness of answers to calculations and using instruments to measure angles
YEAR 6	**Fluency** includes representing integers on a number line, calculating simple percentages, using brackets appropriately, converting between fractions and decimals, using operations with fractions, decimals and percentages, measuring using metric units, and interpreting timetables

	Problem Solving		Reasoning
FOUNDATION	**Problem Solving** includes using materials to model authentic problems, sorting objects, using familiar counting sequences to solve unfamiliar problems, and discussing the reasonableness of the answer	FOUNDATION	**Reasoning** includes explaining comparisons of quantities, creating patterns, and explaining processes for indirect comparison of length
YEAR 1	**Problem Solving** includes using materials to model authentic problems, giving and receiving directions to unfamiliar places, and using familiar counting sequences to solve unfamiliar problems and discussing the reasonableness of the answer	YEAR 1	**Reasoning** includes explaining direct and indirect comparisons of length using uniform informal units, justifying representations of data, and explaining patterns that have been created
YEAR 2	**Problem Solving** includes formulating problems from authentic situations, making models and using number sentences that represent problem situations, and matching transformations with their original shape	YEAR 2	**Reasoning** includes using known facts to derive strategies for unfamiliar calculations, comparing and contrasting related models of operations, and creating and interpreting simple representations of data
YEAR 3	**Problem Solving** includes formulating and modelling authentic situations involving planning methods of data collection and representation, making models of three dimensional objects and using number properties to continue number patterns	YEAR 3	**Reasoning** includes using generalising from number properties and results of calculations, comparing angles, creating and interpreting variations in the results of data collections and data displays
YEAR 4	**Problem Solving** includes formulating, modelling and recording authentic situations involving operations, comparing large numbers with each other, comparing time durations, and using properties of numbers to continue patterns	YEAR 4	**Reasoning** includes using generalising from number properties and results of calculations, deriving strategies for unfamiliar multiplication and division tasks, comparing angles, communicating information using graphical displays and evaluating the appropriateness of different displays
YEAR 5	**Problem Solving** includes formulating and solving authentic problems using whole numbers and measurements and creating financial plans	YEAR 5	**Reasoning** includes investigating strategies to perform calculations efficiently, continuing patterns involving fractions and decimals, interpreting results of chance experiments, posing appropriate questions for data investigations and interpreting data sets
YEAR 6	**Problem Solving** includes formulating and solving authentic problems using fractions, decimals, percentages and measurements, interpreting secondary data displays, and finding the size of unknown angles	YEAR 6	**Reasoning** includes explaining mental strategies for performing calculations, describing results for continuing number sequences, explaining the transformation of one shape into another, explaining why the actual results of chance experiments may differ from expected results

APPENDIX D

Starting List of On-Line Resources

http://www.amathsdictionaryforkids.com/dictionary.html

- Jenny Eather's 'A Maths Dictionary'

http://www.amathsdictionaryforkids.com/mathschartsIntro.html

- Jenny Eather's 'Maths Charts'

http://www.nzmaths.co.nz/problem-solving-information

- New Zealand Maths 'Problem Solving' site – Maths Problems from Level 1 – Level 6

http://www.mathplayground.com/

- Maths games and puzzles

http://www.mathletics.com.au/

- Maths on-line activities plus a link to Rainforest Maths

http://www.drpaulswan.com.au/about/

- Dr Paul Swan website

APPENDIX F

Achievement Standards – Foundation to Year 6

Foundation	Year 1	Year 2	Year 3
By the end of the Foundation year, students make connections between number names, numerals and quantities up to 10. They compare objects using mass, length and capacity. Students connect events and the days of the week. They explain the order and duration of events. They use appropriate language to describe location. Students count to and from 20 and order small collections. They group objects based on common characteristics and sort shapes and objects. Students answer simple questions to collect information.	By the end of Year 1, students describe number sequences resulting from skip counting by 2s, 5s and 10s. They identify representations of one half. They recognise Australian coins according to their value. Students explain time durations. They describe two-dimensional shapes and three-dimensional objects. Students describe data displays. Students count to and from 100 and locate numbers on a number line. They carry out simple additions and subtractions using counting strategies. They partition numbers using place value. They continue simple patterns involving numbers and objects. Students order objects based on lengths and capacities using informal units. They tell time to the half hour. They use the language of direction to move from place to place. Students classify outcomes of simple familiar events. They collect data by asking questions and draw simple data displays.	By the end of Year 2, students recognise increasing and decreasing number sequences involving 2s, 3s and 5s. They represent multiplication and division by grouping into sets. They associate collections of Australian coins with their value. Students identify the missing element in a number sequence. Students recognise the features of three-dimensional objects. They interpret simple maps of familiar locations. They explain the effects of one-step transformations. Students make sense of collected information. Students count to and from 1000. They perform simple addition and subtraction calculations using a range of strategies. They divide collections and shapes into halves, quarters and eighths. Students order shapes and objects using informal units. They tell time to the quarter hour and use a calendar to identify the date and the months included in seasons. They draw two- dimensional shapes. They describe outcomes for everyday events. Students collect data from relevant questions to create lists, tables and picture graphs.	By the end of Year 3, students recognise the connection between addition and subtraction and solve problems using efficient strategies for multiplication. They model and represent unit fractions. They represent money values in various ways. Students identify symmetry in the environment. They match positions on maps with given information. Students recognise angles in real situations. They interpret and compare data displays. Students count to and from 10 000. They classify numbers as either odd or even. They recall addition and multiplication facts for single digit numbers. Students correctly count out change from financial transactions. They continue number patterns involving addition and subtraction. Students use metric units for length, mass and capacity. They tell time to the nearest minute. Students make models of three-dimensional objects. Students conduct chance experiments and list possible outcomes. They carry out simple data investigations for categorical variables.

Year 4	Year 5	Year 6
By the end of Year 4, students choose appropriate strategies for calculations involving multiplication and division. They recognise common equivalent fractions in familiar contexts and make connections between fraction and decimal notations up to two decimal places. Students solve simple purchasing problems. They identify unknown quantities in number sentences. They describe number patterns resulting from multiplication. Students compare areas of regular and irregular shapes using informal units. They solve problems involving time duration. They interpret information contained in maps. Students identify dependent and independent events. They describe different methods for data collection and representation, and evaluate their effectiveness. Students use the properties of odd and even numbers. They recall multiplication facts to 10 x 10 and related division facts. Students locate familiar fractions on a number line. They continue number sequences involving multiples of single digit numbers. Students use scaled instruments to measure temperatures, lengths, shapes and objects. They convert between units of time. Students create symmetrical shapes and patterns. They classify angles in relation to a right angle. Students list the probabilities of everyday events. They construct data displays from given or collected data.	By the end of Year 5, students solve simple problems involving the four operations using a range of strategies. They check the reasonableness of answers using estimation and rounding. Students identify and describe factors and multiples. They explain plans for simple budgets. Students connect three-dimensional objects with their two-dimensional representations. They describe transformations of two-dimensional shapes and identify line and rotational symmetry. Students compare and interpret different data sets. Students order decimals and unit fractions and locate them on number lines. They add and subtract fractions with the same denominator. Students continue patterns by adding and subtracting fractions and decimals. They find unknown quantities in number sentences. They use appropriate units of measurement for length, area, volume, capacity and mass, and calculate perimeter and area of rectangles. They convert between 12 and 24 hour time. Students use a grid reference system to locate landmarks. They measure and construct different angles. Students list outcomes of chance experiments with equally likely outcomes and assign probabilities between 0 and 1. Students pose questions to gather data, and construct data displays appropriate for the data.	By the end of Year 6, students recognise the properties of prime, composite, square and triangular numbers. They describe the use of integers in everyday contexts. They solve problems involving all four operations with whole numbers. Students connect fractions, decimals and percentages as different representations of the same number. They solve problems involving the addition and subtraction of related fractions. Students make connections between the powers of 10 and the multiplication and division of decimals. They describe rules used in sequences involving whole numbers, fractions and decimals. Students connect decimal representations to the metric system and choose appropriate units of measurement to perform a calculation. They make connections between capacity and volume. They solve problems involving length and area. They interpret timetables. Students describe combinations of transformations. They solve problems using the properties of angles. Students compare observed and expected frequencies. They interpret and compare a variety of data displays including those displays for two categorical variables. They evaluate secondary data displayed in the media. Students locate fractions and integers on a number line. They calculate a simple fraction of a quantity. They add, subtract and multiply decimals and divide decimals where the result is rational. Students calculate common percentage discounts on sale items. They write correct number sentences using brackets and order of operations. Students locate an ordered pair in any one of the four quadrants on the Cartesian plane. They construct simple prisms and pyramids. Students list and communicate probabilities using simple fractions, decimals and percentages.

MATHEMATICS – Scope and sequence P–6

	Pre-primary	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Number and algebra							
Number and place value	Establish understanding of the language and processes of counting by naming numbers in sequences, initially to and from 20, moving from any starting point	Develop confidence with number sequences to and from 100 by ones from any starting point. Skip count by twos, fives and tens starting from zero	Investigate number sequences, initially those increasing and decreasing by twos, threes, fives and tens from any starting point, then moving to other sequences	Investigate the conditions required for a number to be odd or even and identify odd and even numbers	Investigate and use the properties of odd and even numbers	Identify and describe factors and multiples of whole numbers and use them to solve problems	Identify and describe properties of prime, composite, square and triangular numbers
	Connect number names, numerals and quantities, including zero, initially up to 10 and then beyond	Recognise, model, read, write and order numbers to at least 100. Locate these numbers on a number line	Recognise, model, represent and order numbers to at least 1000	Recognise, model, represent and order numbers to at least 10 000	Recognise, represent and order numbers to at least tens of thousands	Use estimation and rounding to check the reasonableness of answers to calculations	
	Subitise small collections of objects	Count collections to 100 by partitioning numbers using place value	Group, partition and rearrange collections up to 1000 in hundreds, tens and ones to facilitate more efficient counting	Apply place value to partition, rearrange and regroup numbers to at least 10 000 to assist calculations and solve problems	Apply place value to partition, rearrange and regroup numbers to at least tens of thousands to assist calculations and solve problems		
	Compare, order and make correspondences between collections, initially to 20, and explain reasoning	Represent and solve simple addition and subtraction problems using a range of strategies including counting on, partitioning and rearranging parts	Explore the connection between addition and subtraction	Recognise and explain the connection between addition and subtraction	Investigate number sequences involving multiples of 3, 4, 6, 7, 8, and 9		Investigate everyday situations that use integers. Locate and represent these numbers on a number line

MATHEMATICS – Scope and sequence P–6

	Pre-primary	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Number and place value	Represent practical situations to model addition and sharing		Solve simple addition and subtraction problems using a range of efficient mental and written strategies	Recall addition facts for single-digit numbers and related subtraction facts to develop increasingly efficient mental strategies for computation			
			Recognise and represent multiplication as repeated addition, groups and arrays	Recall multiplication facts of two, three, five and ten and related division facts	Recall multiplication facts up to 10 × 10 and related division facts		
			Recognise and represent division as grouping into equal sets and solve simple problems using these representations			Solve problems involving division by a one digit number, including those that result in a remainder	
				Represent and solve problems involving multiplication using efficient mental and written strategies and appropriate digital technologies	Develop efficient mental and written strategies and use appropriate digital technologies for multiplication and for division where there is no remainder	Use efficient mental and written strategies and apply appropriate digital technologies to solve problems Solve problems involving multiplication of large numbers by one- or two-digit numbers using efficient mental, written strategies and appropriate digital technologies	Select and apply efficient mental and written strategies and appropriate digital technologies to solve problems involving all four operations with whole numbers
Fractions and decimals		Recognise and describe one-half as one of two equal parts of a whole	Recognise and interpret common uses of halves, quarters and eighths of shapes and collections	Model and represent unit fractions including 1/2, 1/4, 1/3, 1/5 and their multiples to a complete whole	Investigate equivalent fractions used in contexts	Compare and order common unit fractions and locate and represent them on a number line	Compare fractions with related denominators and locate and represent them on a number line

MATHEMATICS – Scope and sequence P–6

	Pre-primary	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Fractions and decimals					Count by quarters, halves and thirds, including with mixed numerals. Locate and represent these fractions on a number line	Investigate strategies to solve problems involving addition and subtraction of fractions with the same denominator	Solve problems involving addition and subtraction of fractions with the same or related denominators
					Recognise that the place value system can be extended to tenths and hundredths. Make connections between fractions and decimal notation	Recognise that the place value system can be extended beyond hundredths	Find a simple fraction of a quantity where the result is a whole number, with and without digital technologies
						Compare, order and represent decimals	Add and subtract decimals, with and without digital technologies, and use estimation and rounding to check the reasonableness of answers
							Multiply decimals by whole numbers and perform divisions by non-zero whole numbers where the results are terminating decimals, with and without digital technologies
							Multiply and divide decimals by powers of 10
							Make connections between equivalent fractions, decimals and percentages
Real numbers	This sequence starts at Year 7						

MATHEMATICS – Scope and sequence P–6

	Pre-primary	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Money and financial mathematics		Recognise, describe and order Australian coins according to their value	Count and order small collections of Australian coins and notes according to their value	Represent money values in multiple ways and count the change required for simple transactions to the nearest five cents	Solve problems involving purchases and the calculation of change to the nearest five cents with and without digital technologies	Create simple financial plans	Investigate and calculate percentage discounts of 10%, 25% and 50% on sale items, with and without digital technologies
Patterns and algebra	Sort and classify familiar objects and explain the basis for these classifications. Copy, continue and create patterns with objects and drawings	Investigate and describe number patterns formed by skip-counting and patterns with objects	Describe patterns with numbers and identify missing elements	Describe, continue, and create number patterns resulting from performing addition or subtraction	Explore and describe number patterns resulting from performing multiplication	Describe, continue and create patterns with fractions, decimals and whole numbers resulting from addition and subtraction	Continue and create sequences involving whole numbers, fractions and decimals. Describe the rule used to create the sequence
			Solve problems by using number sentences for addition or subtraction		Solve word problems by using number sentences involving multiplication or division where there is no remainder		Explore the use of brackets and order of operations to write number sentences
					Find unknown quantities in number sentences involving addition and subtraction and identify equivalent number sentences involving addition and subtraction	Find unknown quantities in number sentences involving multiplication and division and identify equivalent number sentences involving multiplication and division	
Linear and non-linear relationships	This sequence starts at Year 7						

MATHEMATICS – Scope and sequence P–6

	Pre-primary	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Measurement and geometry							
Using units of measurement	Use direct and indirect comparisons to decide which is longer, heavier or holds more, and explain reasoning in everyday language	Measure and compare the lengths and capacities of pairs of objects using uniform informal units	Compare and order several shapes and objects based on length, area, volume and capacity using appropriate uniform informal units	Measure, order and compare objects using familiar metric units of length, mass and capacity	Use scaled instruments to measure and compare lengths, masses, capacities and temperatures	Choose appropriate units of measurement for length, area, volume, capacity and mass	Connect decimal representations to the metric system
			Compare masses of objects using balance scales		Compare objects using familiar metric units of area and volume	Calculate perimeter and area of rectangles using familiar metric units	Convert between common metric units of length, mass and capacity Solve problems involving the comparison of lengths and areas using appropriate units
							Connect volume and capacity and their units of measurement
	Compare and order duration of events using everyday language of time Connect days of the week to familiar events and actions	Tell time to the half-hour Describe duration using months, weeks, days and hours	Tell time to the quarter-hour, using the language of ‘past’ and ‘to’ Name and order months and seasons Use a calendar to identify the date and determine the number of days in each month	Tell time to the minute and investigate the relationship between units of time	Convert between units of time Use ‘am’ and ‘pm’ notation and solve simple time problems	Compare 12- and 24-hour time systems and convert between them	Interpret and use timetables

MATHEMATICS – Scope and sequence P–6

	Pre-primary	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Shape	Sort, describe and name familiar two-dimensional shapes and three-dimensional objects in the environment	Recognise and classify familiar two-dimensional shapes and three-dimensional objects using obvious features	Describe and draw two-dimensional shapes, with and without digital technologies	Make models of three-dimensional objects and describe key features	Compare the areas of regular and irregular shapes by informal means	Connect three-dimensional objects with their nets and other two-dimensional representations	Construct simple prisms and pyramids
			Describe the features of three-dimensional objects		Compare and describe two-dimensional shapes that result from combining and splitting common shapes, with and without the use of digital technologies		
Location and transformation	Describe position and movement	Give and follow directions to familiar locations	Interpret simple maps of familiar locations and identify the relative positions of key features	Create and interpret simple grid maps to show position and pathways	Use simple scales, legends and directions to interpret information contained in basic maps	Use a grid reference system to describe locations. Describe routes using landmarks and directional language	Investigate combinations of translations, reflections and rotations, with and without the use of digital technologies
			Investigate the effect of one-step slides and flips with and without digital technologies Identify and describe half and quarter turns	Identify symmetry in the environment	Create symmetrical patterns, pictures and shapes with and without digital technologies	Describe translations, reflections and rotations of two-dimensional shapes. Identify line and rotational symmetries	Introduce the Cartesian coordinate system using all four quadrants
						Apply the enlargement transformation to familiar two-dimensional shapes and explore the properties of the resulting image compared with the original	
Geometric reasoning	This sequence starts at Year 3			Identify angles as measures of turn and compare angle sizes in everyday situations	Compare angles and classify them as equal to, greater than, or less than, a right angle	Estimate, measure and compare angles using degrees. Construct angles using a protractor	Investigate, with and without digital technologies, angles on a straight line, angles at a point and vertically opposite angles. Use results to find unknown angles

MATHEMATICS – Scope and sequence P–6

	Pre-primary	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Pythagoras and trigonometry	This sequence starts at Year 9						
Statistics and probability							
Chance		Identify outcomes of familiar events involving chance and describe them using everyday language such as 'will happen', 'won't happen' or 'might happen'	Identify practical activities and everyday events that involve chance. Describe outcomes as 'likely' or 'unlikely' and identify some events as 'certain' or 'impossible'	Conduct chance experiments, identify and describe possible outcomes and recognise variation in results	Describe possible everyday events and order their chances of occurring	List outcomes of chance experiments involving equally likely outcomes and represent probabilities of those outcomes using fractions	Describe probabilities using fractions, decimals and percentages
					Identify everyday events where one cannot happen if the other happens	Recognise that probabilities range from 0 to 1	Conduct chance experiments with both small and large numbers of trials using appropriate digital technologies
					Identify events where the chance of one will not be affected by the occurrence of the other		Compare observed frequencies across experiments with expected frequencies
Data representation and interpretation	Answer yes/no questions to collect information and make simple inferences	Choose simple questions and gather responses and make simple inferences	Identify a question of interest based on one categorical variable. Gather data relevant to the question	Identify questions or issues for categorical variables. Identify data sources and plan methods of data collection and recording	Select and trial methods for data collection, including survey questions and recording sheets	Pose questions and collect categorical or numerical data by observation or survey	Interpret and compare a range of data displays, including side-by-side column graphs for two categorical variables
		Represent data with objects and drawings where one object or drawing represents one data value. Describe the displays	Collect, check and classify data	Collect data, organise into categories and create displays using lists, tables, picture graphs and simple column graphs, with and without the use of digital technologies	Construct suitable data displays, with and without the use of digital technologies, from given or collected data. Include tables, column graphs and picture graphs where one picture can represent many data values	Construct displays, including column graphs, dot plots and tables, appropriate for data type, with and without the use of digital technologies	Interpret secondary data presented in digital media and elsewhere

MATHEMATICS – Scope and sequence P–6

	Pre-primary	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Data representation and interpretation			Create displays of data using lists, table and picture graphs and interpret them	Interpret and compare data displays	Evaluate the effectiveness of different displays in illustrating data features including variability	Describe and interpret different data sets in context	

APPENDIX H

Prep Mathematics: review for balance and coverage of content descriptions

Number and Algebra	1	2	3	4
Number and place value				
Establish understanding of the language and processes of counting by naming numbers in sequences, initially to and from 20, moving from any starting point (ACMNA001)				
Connect number names, numerals and quantities, including zero, initially up to 10 and then beyond (ACMNA002)				
Subitise small collections of objects (ACMNA003)				
Compare, order and make correspondences between collections, initially to 20, and explain reasoning (ACMNA289)				
Represent practical situations to model addition and sharing (ACMNA004)				
Patterns and algebra				
Sort and classify familiar objects and explain the basis for these classifications. Copy, continue and create patterns with objects and drawings (ACMNA005)				

Measurement and Geometry	1	2	3	4
Using units of measurement				
Use direct and indirect comparisons to decide which is longer, heavier or holds more, and explain reasoning in everyday language (ACMMG006)				
Compare and order the duration of events using the everyday language of time (ACMMG007)				
Connect days of the week to familiar events and actions (ACMMG008)				
Shape				
Sort, describe and name familiar two-dimensional shapes and three-dimensional objects in the environment (ACMMG009)				
Location and transformation				
Describe position and movement (ACMMG010)				

Statistics and Probability	1	2	3	4
Data representation and interpretation				
Answer yes/no questions to collect information (ACMSP011)				

APPENDIX I

FOUNDATION

Counting and recognising numbers		
COUNTING	**COMPARING AND ORDERING NUMBERS**	**ADDING AND SUBTRACTING**
number **zero, one, two, three… to twenty and beyond** **zero, ten, twenty… one hundred** **none** **how many…?** **count, count** **(up) to** **count on** **(from, to)** **count back (from, to)** **count in ones, twos… tens…** **more, less, many, few** **odd, even** **every** **other** **how many times?** **pattern, pair** **guess how many, estimate** **nearly, close to, about the same as** **just over, just under** **too many, too few, enough, not enough**	**the same number as, as many as** ***Of two objects/amounts:*** **greater, more, larger, bigger** **less, fewer, smaller** ***Of three or more objects/amounts:*** **greatest, most, biggest, largest** **least, fewest, smallest** **one more, ten more** **one less, ten less** **compare** **order** **size** **first, second, third…tenth** **last, last but one** **before, after** **next** **between** **above, below**	**add, more, and make, sum, total altogether** **score** **double** **one more, two more, ten more…** **how many more to make…?** **how many more is… than…?** **take (away), leave** **how many are left/left over?** **how many have gone?** **one less, two less… ten less…** **how many fewer is… than…?** **difference between** **is the same as**

FOUNDATION

Solving Problems		
REASONING ABOUT NUMBERS OR SHAPES	*2D SHAPES*	*MEASURES (GENERAL)*
pattern puzzle answer right, wrong what could we try next? how did you work it out? count, sort group, set match same, different list	Circle Triangle Square Rectangle star	Measure size compare guess, estimate enough, not enough too much, too little too many, too few nearly, close to, about the same as just over, just under
	PATTERNS AND SYMMETRY	**LENGTH**
	size bigger, larger, smaller symmetrical pattern repeating pattern match	length, width, height, depth long, short, tall high, low wide, narrow deep, shallow thick, thin longer, shorter, taller, higher… and so on longest, shortest, tallest, highest… and so on far, near, close
PROBLEMS INVOLVING 'REAL LIFE' OR MONEY	**TIME**	**MASS**
Compare Double half, halve pair count out, share out left, left over money coin cents, dollars price, cost, buy, sell spend, spent pay, change dear, costs more cheap, costs less, cheaper costs the same as how much…? how many…? total	time days of the week: Monday, Tuesday… day, week birthday, holiday morning, afternoon, evening, night bedtime, dinnertime, playtime today, yesterday, tomorrow before, after next, last now, soon, early, late quick, quicker, quickest, quickly slow, slower, slowest, slowly old, older, oldest new, newer, newest takes longer, takes less time hour, o'clock clock, watch, hands	weigh, weighs, balances heavy/light, heavier/lighter, heaviest/lightest balance, scales, weight
	POSITION, DIRECTION AND MOVEMENT	CAPACITY
EXPLORING PATTERNS, SHAPE AND **SPACE**	Position, over, under above, below top, bottom, side on, in - outside, inside around - in front, behind front, back - before, after beside, next to - opposite apart, between - middle, edge corner - direction left, right - up, down forwards, backwards, sideways across - close, far, near along - through to, from, towards, away from movement – slide - roll turn - stretch, bend	full half full empty holds container
shape, pattern flat curved, straight round hollow, solid corner face, side, edge, end sort make, build, draw		
Measurement, shape & space		
3D SHAPES		
Cube Pyramid Sphere cone		

FOUNDATION

Instructions	General
listen, join in, say think, imagine, remember start from, start with, start at look at, point to, show me put, place, fit, arrange, rearrange, change, change over split, separate carry on, continue, repeat what comes next? Find, choose, collect Use, make, build tell me, describe, pick out, talk about explain, show me read, write, trace, copy, complete finish, end fill in, shade, colour tick, cross draw draw a line between join (up) ring, cost, count work out, answer, check	same number/s different number/s missing number/s number facts number line, number track number square number cards counters, cubes, blocks, rods die, dice dominoes pegs, peg board same way, different way best way, another way in order, in a different order not all, every, each

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Numbers and Number System					
Counting Properties of Numbers and Number Sequences					
Counting numbers Skip count	Number sentences Two hundred… one thousand Threes, fours, fives tall, multiple of, sequence, continue, predict, rule	Hundreds, relationship	Next, consecutive, sort, classify, property	Formula, divisibility, square number, one squared, two square… (1^2, 2^2…)	Prime, prime factor
Place value and ordering			***Place value, ordering and rounding***		
Units, ones, tens, exchange, digit, 'teens' number Equal to Eleventh… twentieth Ordinal number Half-way between	Hundreds One-, two- or three-digit number, place, place value, stands for, represents, exchange Twenty-first, twenty-second	One hundred more One hundred less Division, remainder	Thousands, ten thousand hundred thousand, million, four-digit number, numeral <, one thousand, round to the nearest hundred integer, positive, negative, above/below, zero, minus	Greater than or equal to Less than or equal to Ascending/descending order Is approximately equal to Round to the nearest thousand	
Estimating					
Roughly	Exact, exactly, round, nearest, round to the nearest ten	Approximate, approximately Up or down			
Calculations					
Addition and Subtraction					
Plus, near double How much more is…? - Subtract, minus How much less is…? Half, halve, = equals, sign, groups of, share out	Addition, one hundred more, subtraction, one hundred less, tens boundary	Hundreds boundary	Increase, decrease, inverse		

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	Fractions		***Fractions and Decimals***	***Fractions, decimals, percentages, ratio and proportion***	
	Part, equal parts, fraction, one whole, one half, two halves, one quarter, two…three…four quarters, eights	One third, two thirds, three thirds, one tenth	Eight, sixth, fifth, twentieth, proportion, in every, for every, decimal, decimal fraction, decimal point, decimal place	Proper/improper fraction, mixed number numerator, denominator, equivalent, reduced to, cancel, ninth, twelfth, hundredth, ratio, to every, as many as, percentage, per cent, %	thousandth
Multiplication and Division			***Using a calculator***		
	Lots of, groups of, x, times, multiply, multiplied by, Multiple of, once, twice, three times…ten times…times as (big, long, wide…and so on) repeated addition – array – row, column, share equally, one each, two each, three each…group in pairs, threes…, tens, equal groups of, ÷, divide, divided by, divided into, left, left over - array	Multiplication, product	Factor, quotient, divisible by, inverse	Calculator, display, key, enter, clear constant	Sign, change, recurring, memory, operation key

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Solving Problems					
Making decisions and reasoning					
Number sentence, sign, operation, word problem, word story	Calculate, calculation, mental calculation, jotting, correct, symbol	Method, equation		Strategy	
Money					
	Notes, ($), bought, sell, sold	Note, more/most expensive, less/least expensive, amount, value, worth		Discount, currency	Profit, loss
Organising and Using Data			***Handling Data***		
Vote, table, picture graph, will happen, won't happen, might happen	Tally, graph, block graph, pictogram, represent, label, title, most popular, most common, least popular, least common, certain, likely, unlikely, possible	Chart, bar chart, table, frequency table, Carroll diagram, Venn diagram, axis, axes, diagram	Survey, questionnaire, data, tally chart	Database, line graph, bar line chart, mode, range, maximum/minimum value, outcome	
Measures, Shape and Space					
Measures (General)					
roughly	Measuring scale, about	Division, approximately	Measurement, unit, standard unit, metric unit, imperial unit		
				Probability	
				Fair, unfair, likely, unlikely, likelihood, certain, uncertain, probable, possible, impossible, chance, good chance, poor chance, no chance, risk, doubt	Equally likely, equal chance, even chance, fifty-fifty chance, biased, random

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Length					
Metre, ruler, metre stick	Further, furthest, metre (m), centimetre (cm), tape measure, area, volume	Distance apart/between, distance to… from…, kilometre (km)	Breadth, edge, perimeter, millimetre (mm)		circumference
Mass					
	Kilogram, (kg), half-kilogram , gram (g)		Mass, big, bigger, small smaller		tonne
Capacity					
	Capacity, contains, litre (l), millilitre (ml), volume		Pint, measuring cylinder		
Area					
			Centimetre (cm)	Square metre (m^2), square millimetre ($mm^{2)}$	
Time					
Seasons: spring, summer, autumn, winter, month, year, weekend, midnight, fast, faster, fastest, half past, how long ago? How long will it be to….? How long will it take to…? How often? Always, never, often, sometimes, usually, once, twice	Months of the year: January, February… fortnight, minute, second, quarter to, quarter past, digital/analogue clock/watch, timer	Century, calendar, date, morning, afternoon, evening, night, midnight, am, pm, earliest, latest	Leap year, millennium, weekend, birthday, holiday, date, date of birth, noon, timetable, arrive, depart	24 hour clock, 12 hour clock	Australian Eastern Standard Time, (AEST), Daylight Saving
Shape and Space			***Measures, shape and space***		
	surface	Right-angled vertex, vertices, layer, diagram	Measurement, unit, standard unit, metric unit, imperial unit		Circumference, concentric, arc, intersecting, intersection plan, tangram

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
3D Shapes					
Prism, rectangular prism		Hemi-sphere	3D, three-dimensional, spherical, cylindrical, tetrahedron, polyhedron	octahedron	dodecahedron
2D Shapes					
hexagon	Circular, triangular, rectangular, pentagon, hexagon, octagon	Semi-circle, pentagonal, hexagonal, octagonal, quadrilateral	2D, two-dimensional, equilateral triangle, isosceles triangle, oblong, heptagon, polygon	Scalene triangle	Kite, parallelogram, trapezium
Patterns and Symmetry					
	Line of symmetry, fold, mirror line, reflection		Reflect, translation, line symmetry		
Position, Direction and Movement					
Underneath, centre, journey, whole turn, half turn, path	Route, higher, lower, clockwise, anti-clockwise, quarter turn right, angle, straight line, flip, bird's eye view, top view, front view, side view	Map, plan, ascend, descend, grid, row, column, compass point, north, south, east, west (N,S,E,W), horizontal, vertical, diagonal, angle, …is a greater/smaller angle than	Origin, co-ordinates, north-east, north-west, south-east, south-west (NE, NW,SE,SW), degree, ruler, set square, angle measurer, compasses	Parallel, perpendicular, x-axis, y-axis, quadrant, rotation, acute, obtuse, protractor	Reflex degree
Instructions					
	Write in figures, present, represent, label, tally, calculate, solve	Show your working, interpret, sketch, investigate, question	Construct, justify, make a statement, plot	Bisect, identify, reasoning, convert	Adjust, adjusting, define, interrogate (data), prove
General					
abacus	Number pairs, number bonds, hundred square, number grid, geo-strips	Greatest value, least value	Pin board	spinner	identical

APPENDIX J

Children's literature that incorporates a mathematics theme

These books have been grouped under various themes in alphabetical order. Brief comments have been made for each publication.

Number and Counting:

Allum, M., & Watson, J.	(2005). *How many peas in a pod?* Surry Hills, NSW: Little Hare Books.
A counting book from 1 – 12 using flaps to be lifted to reveal the answers to each question.	
Base, G.	(2006). *Uno's garden*. Australia: Penguin Group.
A beautiful counting book; counting down, square numbers, doubling (balance).	
* Base, G.	(1995). *The waterhole*. Camberwell, Victoria: Puffin Penguin.
Counting book based on a diminishing water hole; rain at the end!	
Birch, D.	(1988). *The king's chessboard*. New York: Puffin Books.
Number, pre-algebra, exponential growth.	
Boynton, S.	(2000). *Hippos go berserk*. New York: Simon & Schuster.
A humorous rhyme that counts Hippos up to 10, and back down again.	
Burningham, J.	(1980). *The shopping basket*. London: Red Fox Books.
Steven goes shopping and buys 6 eggs, 5 bananas, etc. On the way home, animals wanting his goods meet him.	
Carle, E.	(2005). *10 little rubber ducks*. London: HarperCollins Publishers Ltd.
A beautifully illustrated book that looks at 10 ducks washed from a boat. Uses 1st, 2nd, 3rd, etc to tell the story of each duck.	
Carle, E.	(1995). *Rooster's off to see the world*. London: Puffin Books.
Rooster decides to travel and meets up with two cats, three frogs, etc. Later they return to their homes, counting back down from 5 fish to one Rooster.	
Cave, K.	(2002). *One child one seed: A South African counting book*. Great Britain: Frances Lincoln Ltd.
A multicultural look at counting.	
Dale, P.	(1988). *Ten in the bed*. London: Walker Books.
Counts down from 10 according to the rhyme.	
Fisher, D., & Sneed, D	(2006). *One odd day*. Sylvan Dell Publishing.
The first of a series of "… day" books, this one focuses on the concept of odd numbers. The calendar only shows odd days, his dog has five legs and so on. Visit Sylvandell.com for ebooks to use on your IWB	
Fisher, D., & Sneed, D	*My even day*. Sylvan Dell Publishing.
The sequel to My odd day. A boy awakens to find that everything is even – including the fact that his mum has two heads!	
Fisher, D., & Sneed, D	*My half day*. Sylvan Dell Publishing.
The third in the My … day series. As the name implies the focus of this book is on fractions from the moment the boy in the story wakes up with half and half hair.	
* Franco, B., & Salerno, S.	(2003). *Mathematickles!* NY: Margaret K. McElderry Books.
Operations, symbols, equations, graphs in strange settings.	
* Fromental, J., & Jolivet, J.	(2006). *365 penguins*. [English translation] JY: Harry N. Abrams, Inc.
A fantastic number book with patterns for days throughout the year.	
Hutchins, P.	(2000). *Ten red apples*. London: Red Fox.
Counts down from 10 suing repetitive language that the children can join in with,	
* Landstrom, L., & O.	(2005). Four hens and a rooster. Stockholm: Raben & Sjorgren Bokforlag.
Fraction tale.	
* Milborne, A. & Riglietti, S.	(2007). *How big is a million?* London: Usborne Publishing Ltd.
A journey of discovery to find a million.	
Neuschwander, C.	(2009). *Sir Cumference and all the king's tens*. MA: Charlesbridge.
Number, counting in tens, place value	
Oliver, N.	(2003). *The very blue thingamajig*. Sydney: Scholastic.
A delightful and unusual counting book that would really appeal to children's imaginations.	
Parish, S.	(1998). *123 of Australian wildlife*. Queensland: Steve Parish Publishing Pty Ltd
A beautiful Australian book featuring colour photos of native Australian wildlife.	
Parker, V., & Bolam, E.	(2002). *Bearum scarum*. London: Hodder Children's Books.
A book where the hunter becomes the hunted. An amusing counting back from ten book.	
Pinczes, E.	(1993). *One hundred hungry ants*. Boston: Houghton Mifflin.
Number, factors, division	
* Puttock, S.	(2006). Don't count your chickens. London: Macmillan Children' Books.
Doubling (counting by twos).	
Root, P.	(1999). *One duck stuck*. London: Walker Books.
Counts up to 10 using beautiful descriptive language.	
Ross, T.	(2002). *Centipede's 100 shoes*. London: Andersen Press Ltd.
An amusing story with addition and subtraction using shoes and socks.	
Sayre, A., & Sayre, J.	(2003). *One is a snail ten is a crab*. London: Walker Books.
A counting book to 100, using feet. Shows different combinations for many numbers eg 30 is 3 crabs or 10 people and a crab.	

Schwartz, D.	(1989). *If you made a million*. New York: Mulberry Books
Number, large numbers, percentages, interest.	
* Schwartz, D.	(1985). *How much is a million?* NY: Scholastic Inc.
One million, large numbers.	
Straw, W.	(2001). *5 little ducks*. Melbourne: Borghesi and Adam Publishers.
Counts down from 5 according to the popular song. Big, clear illustrations.	
* Trinka, R., & Argent, K.	(1999). One woolly wombat. SA: Omnibus Books.
Basic counting book.	
Wells, R.	(2000). *Can you count to a googol?* Illinois: Albert Whitman & Company.
Number, counting to large numbers	
* Whatley, B.	(2001). Little white dogs can't jump. NSW: Harper Collins.
Weights, pulleys, ramps to help dog jump.	
Wood, A., & Wood, B.	(2004). *Ten little fish*. New York: Scholastic Inc.
Counts colourful fish from 10 to 1 and back. Leaves each answer to the following page.	

Operations and Computation:

Anno, M., & Anno, M.	(1983). *Anno's mysterious multiplying jar*. New York: Putnam & Grosser Group.
A comprehensive lesson plan outlining how this book may be used to encourage mathematical thinking may be found in Lovitt and Clarke (1988). A beautifully illustrated book that covers the topic of factorials ie 5x4x3x2x1.	
Calvert, P.	(2006). *Multiplying menace: The revenge of Rumpelstiltskin*. MA: Charlesbridge.
Number, multiplying, division, fractions.	
Clement, R.	(1990). *Counting on Frank*. North Ryde, NSW: Bluegum.
A very popular book that involves estimation and encourages children to work mathematically.	
Dodds, D. A., & Mitchell, T.	(2000). *The great divide: A mathematical marathon*. London: Walker.
As the name implies this book involves the division concept – especially halving.	
Hutchins, P.	(1986). *The doorbell rang*. London: Penguin.
This story involves sharing cookies among a group of children. For a comprehensive discussion of this book being used in a classroom setting and how children solved problems associated with this book see Griffiths and Clyne (1986). For a detailed lesson plan on how this book may be used to stimulate mathematical thought see Lovitt and Clarke (1988).	
Neuschwander, C.	(2007). *Patterns in Peru: An adventure in patterning*. New York: Henry Holt.
Pre-algebra	
Neuschwander, C.	(1998). *Amanda Bean's amazing dream: A mathematical story*. New York: Scholastic.
Multiplication, repeated addition, arrays	
Pinczes, E.	(1995). *A remainder of one*. Boston: Houghton Mifflin.
Number, division, remainders	
Tang, G.	(2003). *Math appeal: Mind stretching math riddles*. New York: Scholastic.
This book follows on from The Grapes of Math and is aimed at children moving from addition to multiplication.	
Tang, G.	(2003). *Math-terpieces: The art of problem-solving*. New York: Scholastic.
Uses well-known works of art to motivate children to find different ways to add.	
Tang, G.	(2002). *The best of times: Math strategies that multiply*. New York: Scholastic.
Uses problem rhymes to show better ways to multiply numbers from zero to ten,	
Tang, G.	(2001). *The grapes of math: Mind-stretching math riddles*. New York: Scholastic.
Uses problem rhymes to look at simple computations in a different way, looking at some interesting strategies..	

Measurement:

Alborough, J.	(1997). *Watch out! Big Bro's coming*. London: Walker Books.
A humorous tale about a mouse's big brother who appears to grow according to who describes him.	
* Allen, P.	(1994). *Alexander's outing*. Victoria: Puffin Books.
Story about a duck falling in a hole; possibilities for volume.	
Allen, P.	(1982). *Who sank the boat?* London: Puffin.
A group of animals decide to go for a row in a boat. As each animal jumps into the boat, it sits a little lower in the water. The ideas of balance as well mass are mentioned, as well as the fact that it is the smallest animal that finally sinks the boat.	
Allen, P.	(1980). *Mr Archimedes' bath*. Sydney: William Collins.
Mr Archimedes notices that when he and his animal friends get in and out of the bath, the water lever changes.	
Anolt, L.	(2001). *Knee high Nigel*. London: Walker Books.
The story of five giants, one of whom, though still a giant, is considerably smaller than the others. They argue over the building of castles, and go their separate ways with unsuccessful results.	
Billington, J., & Smee, N.	(1999). *Six feet long and three feet wide*. London: Walker Books.
This story illustrates the need for standard units.	
Briggs, Raymond.	(1970). *Jim and the beanstalk*. London: Penguin.
This book can be used to give an intuitive idea of scale.	
Burns, M.	(1997). *Spaghetti and meatballs for all! A mathematical story*. New York: Scholastic Inc.
Measurement, Area and perimeter	

Carle, E.	(1977). *The bad tempered ladybird*. London: Puffin Books.
A ladybird works its way through different times of the day. Shows the time on analogue clocks.	
Carle, E.	(1970). *The very hungry caterpillar*. London: Penguin.
A caterpillar eats its way through the week.	
Dunbar, James.	(2004). *Tick-tock*. London: Franklin Watts.
This book provides an opportunity to talk about units of time (seconds, minutes, hours, days, weeks, months, years, decades, seasons), time passed and time still to come.	
Hawkins, C.	(2003). *Mr Wolf's week*. London: Egmont Books Ltd.
The cycle of the days of the week shown through Mr Wolf's amusing antics	
Hindley, J., & Chamberlain, M.	(1993). *A piece of string is a wonderful thing*. London: Walker
Traces the idea that in different eras of human history string would have been a useful tool. Times lines could be made from the information. So, how long is a piece of string? Twice as long as half its length.	
* Hughes, N.	(2004). *Colossal machines*. Mascot, Australia: Koala Books.
Comparison of large machines to dinosaurs;length and mass.	
Hutchins, P.	(1974). *Clocks and more clocks*. London: Penguin.
As the name implies this book involves problem solving and time.	
Hutchins, P.	(1997). *Shrinking mouse*. London: Red Fox.
Deals with perspective – things look smaller from a distance.	
* Jenkins, S.	(2006). *Actual size*. London Frances Lincoln Children's Books.
Fantastic drawings of animals, actual size (large and small); get the English edition in centimetres.	
Matthews, P., & McLean, A.	(2002). *A year on our farm*. Norwood, SA: Omnibus Books.
At last, a book illustrating months of the year and the 4 seasons in a distinctly Australian setting.	
Myller, R.	(1962). *How big is a foot?* New York: Dell Yearling.
This story illustrates the need for standard units.	
Nakano, H.	(2003). *Elephee's walk*. Perth: R.I.C. Publications.
The idea of mass is highlighted, where the smallest creature finally causes a downfall	
Nakaya, M.	(2004). *Big Beanie's bed*. Perth: R.I.C. Publications.
Language of size and suitability and an opportunity to integrate with science.	
Nishiuchi, M.	(2003). *Groompa's kindergarten*. Perth: R.I.C. Publications.
As well as comparative sizing, notions of sequence are also developed through the pages of the book.	
Pipe, J.	(2001). *Big and small*. London: Aladdin Books
Looks at big, bigger, biggest; small, smaller, smallest; and growing.	
* Princzes, E.	(2001). *Inchworm and a half*. NY: Houghton Mifflin Company.
Fractions also embedded in story.	
Schwartz, D.M.	(1999). *If you hopped like a frog*. NY: Scholastic Press
Units of measurement; activities in the back.	
* Slater, T.	(1996). *Just a minute!* UAS: Scholastic Inc.
What is a minute?	
Wells, R E.	(1995). *Is the blue whale the biggest thing there is?* London: Watts Books.
A book of comparisons. The sizes of various things are compared.	

Geometry:

Burns, M,	(nd). *The greedy triangle*. New York: Scholastic Inc.
Geometry: 2D Shape	
Ellis, J.	(2004). *What's your angle, Pythagoras?* Watertown, MA: Charlesbridge Publishing
Written as a story of Pythoragas' discovery of the properties of right-angled triangles.	
* Harvey, R.	(2007). *In our city: Our scrapbook of souvenirs*. Crows Nest, NSW: Allen & Unwin.
Mapping, space, measurement; Australian context.	
Hennessy, B., & Joyce, P.	(2004). *The once upon a time map book*. London: Walker Books.
A wonderful trip to 6 different story lands with maps, coordinates, routes, hidden objects and points of interest.	
Hutchins, Pat.	(1968). *Rosie's walk*. London: Red Fox.
This book can be used to encourage the language of direction.	
* Jenkins, S.	(1995). *Looking down*. NY: Houghton Mifflin.
Closer and closer views of the earth from space; created in paper (nice to relate to Google Earth).	
Micklethwait, L.	(2004). *I spy shapes in art*. London: Harper Collins.
A wonderful book that features real pieces of art. Uses paintings from Matisse to Warhol to look at geometric shapes.	
* Mitchell, A.	(1998). *Twice my size*. London: Bloomsbury. [Republished Igloo 2007]
Comparative size of objects starting with a lady bird; roughly doubling each time,	
Neuschwander, C.	(2001). *Sir Cumference and the great knight of angleland*. MA: Charlesbridge.
Geometry, angle	
Neuschwander, C.	(1999). *Sir Cumference and the dragon of Pi*. MA: Charlesbridge.
Geometry, discovering Pi	
Neuschwander, C.	(2003). *Sir Cumference and Sword in the cone*. MA: Charlesbridge.

Geometry 3D shapes	
Neuschwander, C.	(1997). *Sir Cumference and the first round table*. MA: Charlesbridge.
Geometry, 2D shape	
Neuschwander, C.	(2005). *Mummy math: An adventure in geometry*. New York: Square Fish
Geometry 3D shape	
* Werner Zimmerman, H.	(1990). *A circle is not a valentine*. Ontario: Oxford University Press.
Basic shapes.	
Whybrow, I., & Reynolds, A.	(2002). *Harry and the dinosaur have a very busy day*. Mascot, NSW: Koala Books
This book looks at 5 different shapes, and could lead to discussion about different shapes in the classroom, in the playground, and in the environment generally	

Probability and Statistics:

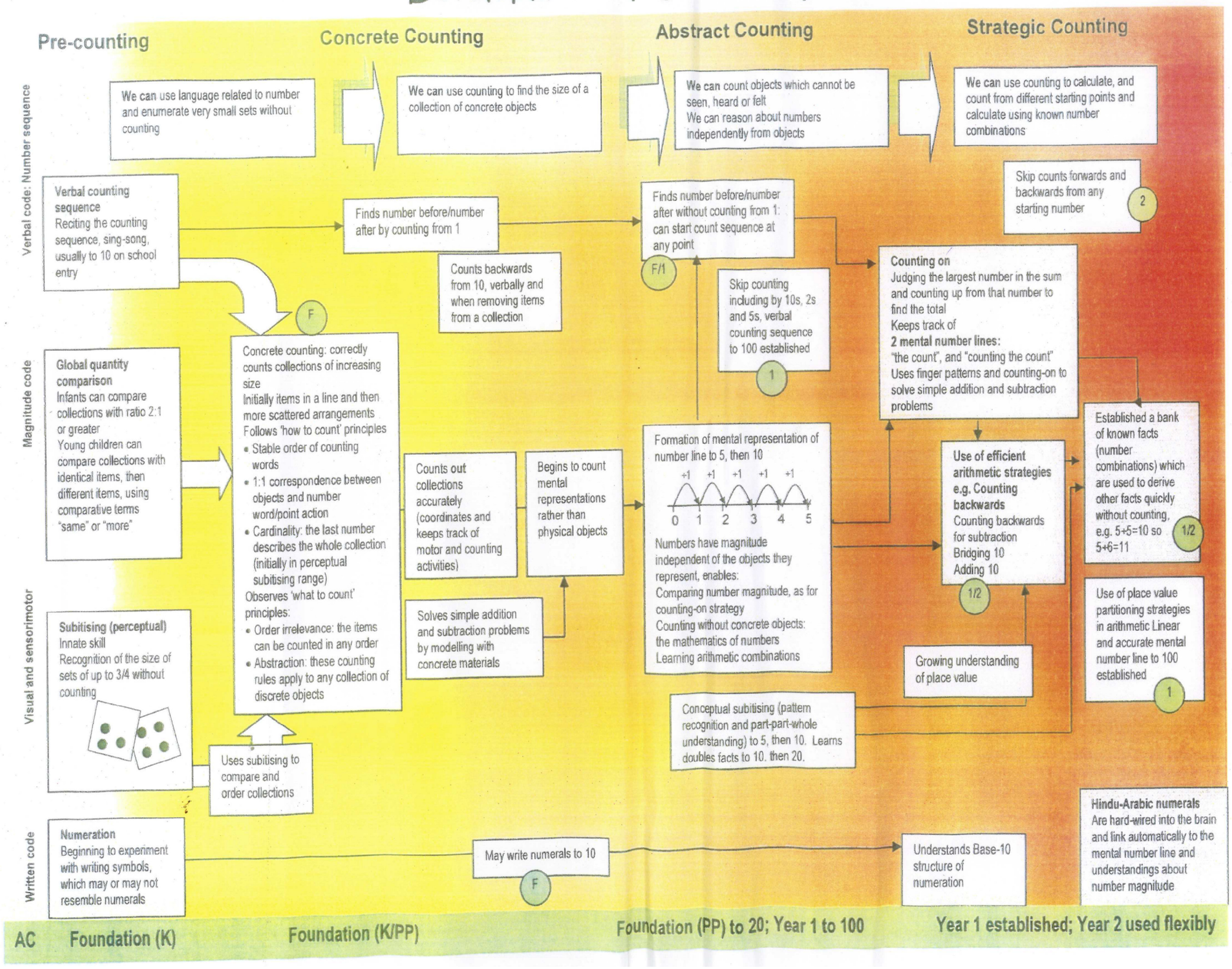
* Anno, M., & Mori, T.	(1985). Anno's three little pigs. London: the Bodley Head Ltd.
Permutations and combinations specifically in story.	
Einhorn, E.	(2008). *A very improbable story*. MA: Charlesbridge.
Probability	
Rodda, E.	(1986). *Pigs might fly*. Sydney: Harper Collins.
A novel designed for middle to upper primary aged children. Contains wonderful language associated with chance.	
* Smith, D.J.	(2006). If the world were a village. NSW: Allen & Unwin.
Comparative data about the world and its people. Also You tube video clip available.	

Anthologies and Books with Many Mathematical Ideas:

Dunn, O., & Gon, A.	(2003). *Number rhymes to say and play*. London: Frances Lincoln Limited.
Heap, S.	(1999). *What's in a number? A collection of poems*. London: Walker Books
Newcome, Z.	(2003). *Five little monkeys: Over 50 action and counting rhymes*. London: Walker Books Limited
Newcome, Z.	(2004). *Ten in the bed and other counting rhymes*. London: Walker Books Limited
Vulliamy, C.	(1999). *If I were bigger than anyone and other poems*. London: Walker Books

Others:

Agard, J., & Kitamura, S.	(2002). *Einstein: The girl who hated maths*. Great Britain: Hodder Wayland.
Poems that inspire various mathematical corcepts. Could be used as the starting pint for maths investigations.	
Ayers, K., & Tusa, T	(2003). *A long way*. Massachusetts: Candlewick Press.
A young girl investigates different ways to take a gift to Grandma.	
Burningham, John.	(1978). *Would you rather…* London: Red Fox.
Although this is not strictly a 'mathematics' storybook, it can be used to stimulate mathematical discussion and problem solving.	
Enzensberger, H.	(1997). *The Number Devil*. London: Granta Books.
An excellent book to use as a class novel.	
* Hadden, M.	(2003). *The curious incident of the dog in the night-time*. NY: Doubleday.
Novel of an autistic boy with mathematical talent. Note some language used in this book is quite strong.	
Juster, N.	(1999). *The Phantom Tollbooth*. London. Collins
A great class novel.	
* Magnus Enzenberger, H.	(2000). *The number devil*. London: Granta Books.
Colourfully illustrated book of mathematical dreams.	
Scieszka, J., & Smith, L.	(1995). *Maths curse*. New York: Viking.
For anyone who has an aversion to mathematics	
Wells, R.	(2000). *How do you lift a lion?* Illinois: Albert Whitman & Company.
Science, simple machines	

Development of Counting Skills

Norris & Swan, 2011