

## 365 penguins by Jean-Luc Fromental and Joelle Jolivet

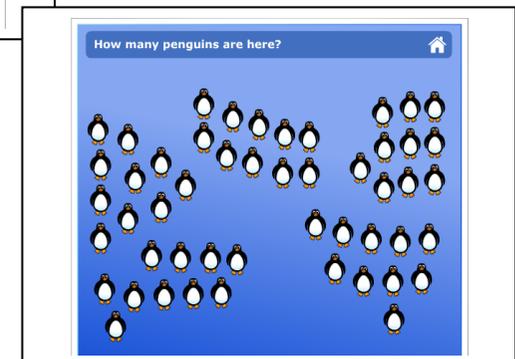
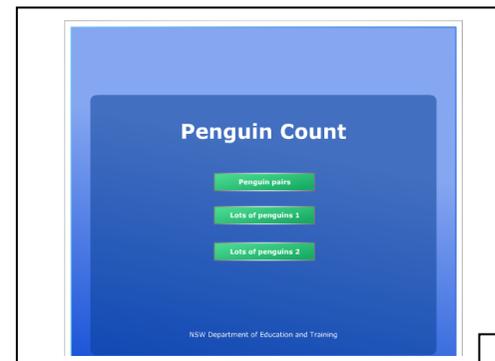
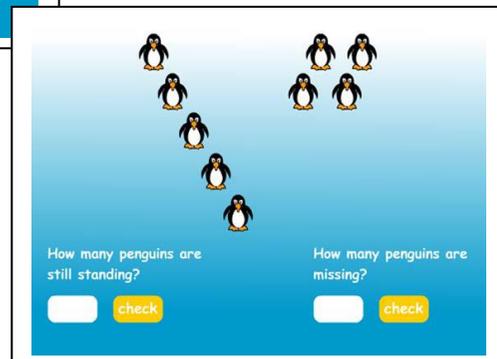
**Overview:** The engaging narrative of this picture book provides a context for learning by presenting word problems that link mathematical ideas to ‘unlikely’ situations through humour and visual representations. There are so many ideas presented in this book that could be used as a springboard for developing conceptual understanding of the key ideas in many strands and substrands or embedded within specific activities in mathematics lessons. Learning objects on the [Count Me In Too](#) website, *Penguins count* and *Penguin pins* can be built in to lessons to support learning in Number and Algebra. Off computer tasks can also be devised to match the activities presented in the Learning Objects. The mathematical content in *365 penguins* is suitable for Early Stage 1 to Stage 3. (My Stage 3 students enjoyed this book enormously. We were participating in an environmental project on penguins at the time).

**Focus Areas:** Problem Solving, Visualisation, Representation, Student Recording

**Syllabus Strands:** Working Mathematically, Number & Algebra, Measurement & Geometry, Statistics & Probability

**Substrands:** Whole Numbers, Addition & Subtraction, Multiplication & Division, Fractions & Decimals, Patterns & Algebra, Time, Chance

**Using 365 penguins as a Learning/Teaching Tool:** *365 penguins* has been ‘mapped out’ on the planning scaffolds provided in this package. Many pages in this picture book offer possibilities to work across strands or integrate learning experiences with other Key Learning Areas. Tables 1 & 3, *365 penguins* – Related Syllabus Outcomes and Key Ideas and Tables 2 & 4, *365 penguins* – Content and Language, provide examples of documentation that could be included in a mathematics program for registration. Selecting an area of focus, planning the learning/teaching sequence and determining the purpose for each lesson is at the discretion of individual teachers based on the learning needs of their students. Refer to the *Mathematics K–10 syllabus* for background information and a complete learning/teaching sequence, in conjunction with a comprehensive list, and further explanation, of the language related to each strand and substrand. The sample lessons for Early Stage 1 and Stage 3 focus on problem solving through visual representation and student recording of investigations. They aim to demonstrate a conceptual approach to learning and teaching within a whole class context that supports student learning through a paired structure. ‘Like ability’ pairings generally work well, except in lessons with high literacy content, when ‘more able with middle’ and ‘middle with less able’ is often more successful.



**Table 1: 365 penguins - Related Syllabus Outcomes and Key Ideas Early Stage 1 & Stage 1**

Early Stage 1	Stage 1
<p><b>Working Mathematically</b>  <b>Communicating</b>                      MAe-1WM describes mathematical situations using everyday language, actions, materials and informal recordings  <b>Problem Solving</b>                      MAe-2WM uses objects, actions, technology and/or trial and error to explore mathematical problems  <b>Reasoning</b>                      MAe-3WM uses concrete materials and/or pictorial representations to support conclusions</p> <p><b>Number and Algebra</b>  <b>Whole Numbers</b>                      MAe-4NA counts to 30, and orders, reads and represents numbers in the range 0 to 20</p> <ul style="list-style-type: none"> <li>• Counts forwards to 30 from a given number</li> <li>• Counts backwards from a given number in the range 0 to 20</li> <li>• Compare, order, read and represent numbers to 20</li> </ul> <p><b>Addition and Subtraction</b>                      MAe-5NA combines, separates and compares collections of objects, describes using everyday language, and records using informal methods</p> <ul style="list-style-type: none"> <li>• Combine two or more groups to model addition</li> <li>• Take part of a group away to model subtraction</li> <li>• Compare two groups to model 'how many more'</li> <li>• Record addition and subtraction informally</li> </ul> <p><b>Multiplication and Division</b></p> <ul style="list-style-type: none"> <li>• Investigate and model equal groups</li> <li>• Record grouping and sharing using informal methods</li> </ul> <p><b>Patterns and Algebra</b>                      MAe-8NA recognises, describes and continues repeating patterns sentences by calculating missing values</p> <ul style="list-style-type: none"> <li>• Sort and classify objects into groups</li> <li>• Recognise, continue, copy, create and describe repeating patterns of objects and drawings</li> </ul> <p><b>Time</b>                      MAe-13MG sequences events, using everyday language to describe the durations of activities, and reads hour time on clocks</p> <ul style="list-style-type: none"> <li>• Compare and order the duration of events using the everyday language of time</li> <li>• Sequence events in time</li> <li>• Connect days of the week to familiar events and actions</li> <li>• Tell time on the hour on digital and analog clocks</li> </ul>	<p><b>Working Mathematically</b>  <b>Communicating</b>                      MA1-1WM describes mathematical situations and methods using everyday and some mathematical language, actions, materials, diagrams and symbols  <b>Problem Solving</b>                      MA1-2WM uses objects, diagrams and technology to explore mathematical problems  <b>Reasoning</b>                      MA1-3WM supports conclusions by explaining or demonstrating how answers were obtained</p> <p><b>Number and Algebra</b>  <b>Whole Numbers</b>                      MA1-4NA applies place value, informally, to count, order, read and represent two- and three-digit numbers</p> <ul style="list-style-type: none"> <li>• Counts forwards and backwards by ones from any starting point</li> <li>• Partition two-digit numbers using place value</li> <li>• Read, write and order two-digit numbers</li> <li>• Count forwards and backwards by twos, threes, fives and tens from any starting point</li> <li>• Partition numbers up to three digits using place value</li> <li>• Read, write and order three-digit numbers</li> </ul> <p><b>Addition and Subtraction</b>                      MA1-5NA uses a range of strategies and informal recording methods for addition and subtraction involving one and two-digit numbers</p> <ul style="list-style-type: none"> <li>• Model addition and subtraction using concrete material</li> <li>• Recognise and recall combinations of numbers that add up to 20</li> <li>• Model and apply the commutative property for addition</li> <li>• Use and record a range of mental strategies for addition and subtraction of one- and two-digit numbers</li> <li>• Use the equals sign to record equivalent number sentences</li> <li>• Make connections between addition and subtraction</li> <li>• Solve word problems involving addition and subtraction</li> </ul> <p><b>Multiplication and Division</b></p> <ul style="list-style-type: none"> <li>• Rhythmic and skip counting by twos, fives and tens from any starting point</li> <li>• Model and use equal groups of objects as a strategy for multiplication</li> <li>• Model division as sharing a collection of objects into equal groups</li> <li>• Model and use arrays described in terms of 'rows' and 'columns' as a strategy for multiplication</li> <li>• Model and use repeated addition as a strategy for multiplication</li> <li>• Model and use groups, arrays and repeated subtraction as a model for division</li> <li>• Record using drawings, words and numerals</li> </ul> <p><b>Patterns and Algebra</b>                      MA1-8NA creates, represents and continues a variety of patterns with numbers and objects</p> <ul style="list-style-type: none"> <li>• Recognise, model and describe increasing and decreasing number patterns</li> <li>• Model and describe odd and even numbers</li> <li>• Describe patterns with numbers and identify missing elements.</li> </ul> <p><b>Time</b>                      MA1-13MG describes, compares and orders durations of events, and reads half- and quarter-hour time</p> <ul style="list-style-type: none"> <li>• Name and order months and seasons</li> <li>• Use a calendar to identify the date and determine the number of days in each month</li> <li>• Describe duration using months, weeks, days and hours</li> </ul> <p><b>Chance</b></p> <ul style="list-style-type: none"> <li>• Use everyday language to describe chance events</li> <li>• Describe events as 'likely' or 'unlikely'</li> <li>• Distinguish between 'possible' and 'impossible' events</li> <li>• Identify some events as 'certain' or 'impossible'</li> </ul> <p><b>Note: Only key ideas related to the mathematical content in 365 Penguins are listed in this table – refer to <i>Mathematics K–10 syllabus</i> for the complete sequence of key ideas in each strand/substrand.</b></p>

**Table 2: 365 penguins – Content and Language Early Stage 1 & Stage 1**

Strand/Substrand	Page Reference Where page 1 begins “On New Year’s Day...”	Language Early Stage 1	Language Stage 1
<p><b>Whole Numbers</b> Whole number concepts are embedded in the content of most pages. They can be used as a basis for warm up activities at the beginning of a lesson or as the central idea.</p> <p>Use “teddies” and/or counters to model penguin groupings.</p>	<p>p1 “On New Year’s Day...” – p9 introduces the numbers from 1 – 30. Whole number continues to ‘365’ throughout the book. (p1 -9 especially useful for counting to 30, number before, number after)</p>	<p>count forwards, count backwards, number before, number after, more than, less than, zero, ones, group of ten, tens, is the same as, combines with, joins, take away, how many more, all together, makes, coins, notes, cents, dollars.</p>	<p>count forwards, count backwards, number before, number after, more than, less than, number line, number chart, digit, zero, ones, groups of ten, tens, round to, groups of one hundred, hundreds, coins, notes, cents, dollars.</p>
<p><b>Addition &amp; Subtraction</b> Utilise the Learning Objects “Penguins Count” &amp; “Penguin Pins”.</p> <p>Use “teddies” and/or counters to model penguin groupings.</p>	<p>p10 “February has only...” As the months go by, students are introduced to a range of combinations suitable for mental computation.</p> <p>Addition &amp; subtraction problems can be created at various stages in the book, e.g. p 24 “The days went by...” to p27.</p>	<p>count forwards, combines with, joins, count backwards, take away, how many more, all together, makes.</p>	<p>counting on, counting back, combine, plus, add, take away, minus, the difference between, total, more than, less than, double, equals, is equal to, is the same as, number sentence, empty number line, strategy.</p>
<p><b>Multiplication &amp; Division</b> Use “teddies” and/or counters to model penguin groupings.</p>	<p>Throughout the book, the penguins are presented in varying amounts and formations that provide opportunities to address many of the key ideas for ES1 &amp; S1.</p>	<p>group, share, equal.</p>	<p>group, number of groups, number in each group, sharing, shared between, left over, total, equal, add, take away, group, row, column, array, number of rows, number of columns, number in each row, number in each column, total, equal, is the same as, shared between, shared equally, part left over, empty number line, number chart.</p>
<p><b>Patterns &amp; Algebra</b> Utilise the Learning Objects “Penguins Count” particularly for odd &amp; even and count by twos.</p> <p>Use “teddies” and/or counters to model penguin groupings.</p>	<p>p1 “On New Year’s Day...” – p9 introduces the numbers from 1 – 30. Patterns dealing with number relationships continue throughout the book.</p> <p>p11 – 13 “And number 60...”</p> <p>p16 “On April the...” &amp; p22 – 24”</p> <p>Pages (11 – 24) introduce ‘special’ groupings that could be explored depending on the ability and interest of the students.</p>	<p>group, pattern, repeat.</p>	<p>pattern, number line, number chart, odd, even, missing number, number sentence.</p>
<p><b>Time</b> 365 penguins provides a wealth of ideas for developing concepts of time.</p>	<p>p1 “On New Year’s Day...” – p9 introduces opportunities to ‘compare’ and ‘connect’ time concepts.</p> <p>Throughout the book, students are introduced to days, weeks, months, seasons, etc.</p>	<p>daytime, night-time, yesterday, today, tomorrow, before, after, next, a long time, a short time, week, days, weekdays, weekend days, time, morning, afternoon, clock, analog, digital, hands (of a clock), o’clock.</p>	<p>calendar, days, date, month, year, seasons, time, clock, analog, digital, hour hand, minute hand, o’clock, half past, clockwise, numeral, hour, minute, second, o’clock, half past, quarter past, quarter to.</p>
<p><b>Chance (Stage 1)</b></p>	<p>The experiences introduced throughout the story provide a vehicle for discussion from ‘likely’ to ‘impossible’ for S1 students. It is also appropriate to have a conversation with ES1 students in terms of ‘will, might, won’t happen’ in the context of this story.</p>		<p>will happen, might happen, won’t happen, chance, certain, uncertain, possible, impossible, likely, unlikely. The meaning of ‘uncertain’ is ‘not certain’ – it does not mean ‘impossible’.</p>

**Table 3: 365 penguins - Related Syllabus Outcomes and Key Ideas Stage 2 & Stage 3**

Stage 2	Stage 3
<p><b>Working Mathematically</b>  <b>Communicating</b>                      MA2-1WM uses appropriate terminology to describe, and symbols to represent, mathematical ideas  <b>Problem Solving</b>                      MA2-2WM selects and uses appropriate mental or written strategies, or technology, to solve problems  <b>Reasoning</b>                      MA2-3WM checks the accuracy of a statement and explains the reasoning used</p> <p><b>Number and Algebra</b>  <b>Whole Numbers</b>                      MA2-4NA applies place value to order, read and represent numbers of up to five digits</p> <ul style="list-style-type: none"> <li>Counts forwards and backwards by tens and hundreds from any starting point</li> <li>State the place value of digits in numbers up to four digits</li> <li>Read, write and order numbers to four digits</li> </ul> <p><b>Multiplication &amp; Division</b>                      MA2-6NA uses mental and informal written strategies for multiplication and division</p> <ul style="list-style-type: none"> <li>Link multiplication and division using arrays</li> <li>Model and apply commutative property for multiplication</li> <li>Use and record mental strategies to multiply one-digit numbers by multiples of 10</li> <li>Recall multiplication facts up to 10 x 10 and related division facts</li> <li>Determine multiples and factors for numbers</li> <li>Use the equals sign to record equivalent number sentences</li> <li>Use and record a range of mental and written strategies for multiplication and division of two-digit numbers by a one-digit operator</li> <li>Use mental strategies and informal recording methods for division with remainders</li> </ul> <p><b>Fractions and Decimals</b></p> <ul style="list-style-type: none"> <li>Apply the place value system to represent tenths and hundredths</li> <li>Make connections between fractions and decimal notation</li> <li>Model, compare and represent fractions up to two decimal places</li> </ul> <p><b>Patterns &amp; Algebra</b>                      MA2-8NA generalises properties of odd and even numbers, generates number patterns and completes simple number sentences by calculating missing values</p> <ul style="list-style-type: none"> <li>Recognise, continue, create, describe, and record increasing and decreasing number patterns</li> <li>Identify odd and even numbers of up to four digits</li> <li>Recognise, continue and describe number patterns resulting from performing multiplication</li> <li>Find missing values in number sentences involving one operation from performing multiplication or division</li> </ul>	<p><b>Working Mathematically</b>  <b>Communicating</b>                      MA3-1WM describes and represents mathematical situations in a variety of ways using mathematical terminology and some conventions  <b>Problem Solving</b>                      MA3-2WM selects and applies appropriate problem-solving strategies, including the use of digital technologies, in undertaking investigations  <b>Reasoning</b>                      MA3-3WM gives a valid reason for supporting one possible solution over another</p> <p><b>Number and Algebra</b>  <b>Whole Numbers</b>                      MA3-4NA orders, reads and represents integers of any size and describes properties</p> <ul style="list-style-type: none"> <li>Read, write and order numbers of any size</li> <li>State the place value of digits in numbers of any size</li> <li>Determine factors and multiples of whole numbers</li> </ul> <p><b>Multiplication and Division</b>                      MA3-6NA selects and applies appropriate strategies for multiplication and division, and applies the order of operations to calculations involving more than one operation</p> <ul style="list-style-type: none"> <li>Use and record a range of mental and written strategies to multiply by one and two-digit operators</li> <li>Use and record a range of mental and written strategies to divide by a one-digit operator with and without remainders</li> <li>Select and apply efficient mental, written and calculator strategies to solve word problems and record the strategy used</li> <li>Interpret remainders in division problems</li> </ul> <p><b>Fractions and Decimals</b></p> <ul style="list-style-type: none"> <li>Solve word problems involving fractions and decimals, including money</li> </ul> <p><b>Patterns and Algebra</b>                      MA3-8NA analyses and creates geometric and number patterns, constructs and completes number sentences, and locates points on the Cartesian plane</p> <ul style="list-style-type: none"> <li>Recognise, continue, create and describe increasing and decreasing number patterns with fractions, decimals and whole numbers</li> <li>Create, record and describe geometric and number patterns in words</li> </ul> <p><b>Note: Only key ideas related to the mathematical content in 365 penguins are listed in this table: refer to <i>Mathematics K–10 syllabus</i> for the complete sequence of key ideas in each strand/substrand.</b></p>

**Table 4: 365 penguins – Content and Language Stage 2 & Stage 3**

Strand/Substrand	Page Reference Where page 1 begins “On New Year’s Day...”	Language Stage 2	Language Stage 3
<p><b>Whole Numbers</b> Whole number concepts are embedded in the content of most pages. They can be used as a basis for warm up activities at the beginning of a lesson or as the central idea.</p>	<p>p1 “On New Year’s Day...” – p9 introduces the numbers from 1 – 30. Whole number continues to ‘365’ throughout the book.</p>	<p>number before, number after, more than, greater than, less than, largest number, smallest number, ascending order, descending order, digit, zero, ones, groups of ten, tens, groups of one hundred, hundreds, groups of one thousand, thousands, place value, round to.</p>	<p>ascending order, descending order, zero, ones, tens, hundreds, thousands, tens of thousands, hundreds of thousands, millions, digit, place value, expanded notation, round to, whole number, factor, integer, prime number, composite number.</p>
<p><b>Multiplication &amp; Division</b> <i>“Students may find recording (writing out) informal mental strategies to be more efficient than using formal written algorithms, particularly in the case of multiplication.” Mathematics K – 10 Syllabus 2012</i></p> <p>Throughout the book, the penguins are presented in varying amounts and formations that address many of the key ideas for S2.</p> <p>Several problems are presented in the book linked to volume &amp; capacity and decimals that can be solved through mental computation or algorithms for S3.</p> <p>A select number of problems provide the opportunity to interpret remainders in division problems when grouping the penguins</p>	<p>Modelling with arrays for many of the numbers introduced throughout the story will support understanding of the link between multiplication and division</p> <p>p17 “After the first...” to the end of the story, offer opportunities for students to use mental computation when problem solving. Teachers will need to plan specific ‘stopping points’ in the story for prediction and student investigation.</p> <p>p14, 19, 34</p>	<p>group, row, column, horizontal, vertical, array, multiply, multiplied by, multiplication, multiplication facts, double, shared between, divide, divided by, division, product, tens, ones, multiple, factor, strategy, digit.</p>	<p>multiply, multiplied by, product, multiplication, multiplication facts, area, thousands, hundreds, tens, ones, double, multiple, factor, divide, divided by, quotient, division, halve, remainder, fraction, decimal, equals, strategy, digit, estimate, operations.</p>
<p><b>Fractions and Decimals</b></p>	<p>p17 A small section of the book addresses decimals within multiplication, but provides a great problem solving opportunity using mental computation or algorithms.</p>	<p>whole, part, equal parts, half, fraction, whole number, fractional part, number line, part, tenth, hundredth, one-tenth, one- hundredth, is equal to, equivalent fractions, decimal, decimal point, digit, place value, round to, decimal places, dollars, cents.</p>	<p>whole, equal parts, half, tenth, hundredth, fraction, whole number, number line, decimal, decimal point, digit, place value, decimal places, round to, equivalent, dollars, cents, best buy, discount, sale price.</p>
<p><b>Patterns &amp; Algebra</b> Patterns that focus on number relationships are presented throughout the book. Opportunities to explore pattern within particular groupings are also embedded in the storyline.</p> <p><b>NB: Problem solving is naturally embedded in the narrative. It is the responsibility of teachers to build the other aspects of working mathematically into their lessons.</b></p>	<p>p1 “On New Year’s Day...” – p9 introduces the numbers from 1 – 30.</p> <p>p16 “On April the...” 100 penguins have arrived</p> <p>p11 – 24” These pages (11 – 24) introduce ‘special’ groupings that could be explored depending on the ability and interest of the students: triangular, squared and cubed numbers. Stage 3 students can determine a rule and find values.</p>	<p>pattern, goes up by, goes down by, even, odd, rows, digit, multiplication facts, term, missing number, is the same as, equals.</p>	<p>pattern, increase, decrease, missing number, number sentence, number line, value, table of values, rule, position in pattern, value of term</p>

## Lesson Plan: 365 penguins

### Early Stage 1

### Strand/s: Working Mathematically Number & Algebra Measurement & Geometry Substrand: Whole Numbers Time

Purpose	<ol style="list-style-type: none"> <li>To provide a context for learning by engaging students in the narrative of the picture book "365 Penguins" by Jean-Luc Fromental and Joelle Jolivet</li> <li>To develop conceptual understanding counting in the number range 0 – 30.</li> </ol>		
Quality Teaching Framework	Intellectual Quality	Quality Learning Environment	Significance
	Deep Knowledge Substantive Communication	Engagement High Expectations	Narrative
Outcomes	<b>Working Mathematically Communicating</b> MAe-1WM describes mathematical situations using everyday language, actions, materials and informal recordings <b>Problem Solving</b> MAe-2WM uses objects, actions, technology and/or trial and error to explore mathematical problems <b>Reasoning</b> MAe-3WM uses concrete materials and/or pictorial representations to support conclusions		<b>Number and Algebra Whole Numbers</b> MAe-4NA counts to 30, and orders, reads and represents numbers in the range 0 to 20 <b>Time</b> MAe-13MG sequences events, using everyday language to describe the durations of activities, and reads hour time on clocks
Key Ideas	<b>Whole Numbers</b> <ul style="list-style-type: none"> <li>Counts forwards to 30 from a given number</li> </ul> <b>Time</b> <ul style="list-style-type: none"> <li>Compare and order the duration of events using the everyday language of time</li> </ul>		
Introduction	<ol style="list-style-type: none"> <li>Read the picture book "365 Penguins". Provide an orientation to the text as you would in a literacy lesson. Discuss language and numeracy concepts as you move through the story and remember to focus on enjoying the tale as well. Ask students to make predictions about the story.  <b>Note: The lesson structure from 'concept development' onwards should be introduced once the students are familiar with the story and have had many opportunities to 'discuss, draw and write' about 'time' and penguins related to the ideas presented from pages 1 – 9.</b>                      E.g. Drawing and writing about events over time using the language from the story "The next morning..." "The day after..."                      Drawing/colouring/cutting out and pasting penguins, then labelling with numbers/words/sentences</li> <li>Focus on the language linked to the key ideas for pages 1 - 9 and 'build' a language wall throughout the week to support student learning before introducing specific activities.</li> </ol>		
Concept Development	<ol style="list-style-type: none"> <li>Whole Class:                      Read the story again up to the end of page 9 which begins, "At the end of January..."                      Ask: "How many ways can we count the penguins?"                      Introduce the Learning Object "<b>Penguins Count</b>" from the CMIT website – click on '<b>Penguin Pairs</b>'                      Three tens frames are presented that can be shown vertically or horizontally, grid on or off. <i>Click on the "+" symbol to add a penguin. Click on the "-" symbol to remove a penguin.</i>                      (Each time an odd number appears on the screen, the last penguin faces the side).                      Count the penguins with each click (See notes below)</li> <li>"Off computer" task: Whole Class                      Substitute "teddies" or counters for penguins.                      Provide each pair of students with an A4 sheet of 3 large tens frames placed inside a plastic sleeve.                      Play "Penguins Count" with the teddies: Count forwards as the teddies are placed on the frame. As each odd number appears, the teddy is turned to the side and then back to the front as he gets a 'mate'. Ask 'number before' and 'number after' questions whilst doing this activity.</li> <li>"Off computer" task: In pairs                      One student counts while the other places teddies on the tens frames. Differentiate here by adjusting the number range and /or the method of counting. Pairs of students can work in the range 0 – 5, 0 -10, 0 – 20, 0 – 30 and count by ones or twos. (Make observations whilst pairs of students are working together - see observation grid attached)</li> </ol>		
Strengthening the concept	<ol style="list-style-type: none"> <li>Provide each pair of students with one whiteboard marker. Repeat steps 4 &amp; 5 as a whole class, this time drawing dots in each frame instead of placing teddies. (Make observations whilst pairs of students are working together)</li> </ol>		
Reflection	<ol style="list-style-type: none"> <li><b>Independent Task:</b> Students draw and write about their "favourite number of penguins" in their learning log. (They could draw dots to show one-to-one correspondence, label with numbers or write sentences to describe their number depending on their level of understanding.)                      This work sample provides an assessment opportunity to inform the next step in the teaching/learning cycle.</li> </ol>		
Notes	<ol style="list-style-type: none"> <li>This lesson could be repeated many times for counting forwards or backwards, by ones or twos in the range 0 – 30, depending on the stage of learning of the students. As conceptual understanding develops, any of these activities could be used in subsequent lessons as warm-ups when working with addition and subtraction.                      It could be extended by starting with a given number of penguins/teddies/counters and counting 'on' or 'back'.</li> <li>"Penguin Pairs"                      This learning object provides scope to work in the number range 0 to 30 that is appropriate for the stage of learning of the students, counting forwards and backwards.                      It lends itself to rhythmic counting, stressing the even number with every second click: 1, 2, 3, 4, 5, 6...                      Students could "count with the penguins" daily to reinforce concepts or as a 'warm up' when working with addition and subtraction.</li> <li>Materials: Tens frame sheets, plastic sleeves, markers, teddies/counters, learning logs, student observation grid (e.g. 'uses fingers', 'can count by ones and twos'.)</li> </ol>		

Class:

Teacher:

Term: Week/s:

Focus:

Name: _____ Date: _____ Strategy Observed:					
LFIN:	LFIN:	LFIN:	LFIN:	LFIN:	LFIN:
Name: _____ Date: _____ Strategy Observed:					
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## Lesson Plan: 365 penguins

### Stage: 3 Strand/s: Working Mathematically Number & Algebra Substrand: Multiplication & Division Fractions & Decimals

Purpose	<ol style="list-style-type: none"> <li>To provide a context for solving word problems by engaging students in the narrative of the picture book “365 Penguins” by Jean-Luc Fromental and Joelle Jolivet</li> <li>To represent word problems in different ways and use mental computation as a strategy for solving multiplication problems.</li> </ol>		
Quality Teaching Framework	Intellectual Quality	Quality Learning Environment	Significance
	Problematic Knowledge Substantive Communication	Engagement High Expectations	Narrative
Outcomes	<p><b>Communicating</b> MA3-1WM describes and represents mathematical situations in a variety of ways using mathematical terminology and some conventions</p> <p><b>Problem Solving</b> MA3-2WM selects and applies appropriate problem-solving strategies, including the use of digital technologies, in undertaking investigations</p> <p><b>Reasoning</b> MA3-3WM gives a valid reason for supporting one possible solution over another</p>	<p><b>Whole Numbers</b> MA3-4NA orders, reads and represents integers of any size and describes properties</p> <p><b>Multiplication and Division</b> MA3-6NA selects and applies appropriate strategies for multiplication and division, and applies the order of operations to calculations involving more than one operation</p>	
Key Ideas	<p><b>Whole Numbers</b></p> <ul style="list-style-type: none"> <li>Read, write and order numbers of any size</li> <li>State the place value of digits in numbers of any size</li> </ul> <p><b>Multiplication &amp; Division</b></p> <ul style="list-style-type: none"> <li>Use and record a range of mental and written strategies to multiply by one and two-digit operators</li> <li>Solve word problems and record the strategy used</li> </ul>		
Introduction	<ol style="list-style-type: none"> <li>Read the picture book “365 Penguins” (up to the end of page 17). Provide an orientation to the text as you would at the beginning of a literacy lesson. Discuss language and numeracy concepts as you move through the story and remember to focus on enjoying the tale as well. Ask students to make predictions about the story.</li> <li>Provide opportunities for students to discuss and suggest possible solutions for some of the numeracy problems presented in the book up to page 17. Focus on the language linked to the key ideas for this lesson and ‘build’ a language wall as the lesson progresses.</li> </ol>		
Concept Development	<ol style="list-style-type: none"> <li>Read up to the end of page 17 which begins, “<b>After the first three-digit number, our problems really began</b>”</li> <li>Ask the students to predict what some of these might be.</li> <li>Pose the problem on the following page “<u>Feeding the penguins: Each penguin ate 2.5kilograms of fish per day....</u>” (Problem could be presented in notebook on the smart board. In the book it refers to ‘pounds’)</li> <li>Ask: “<i>How could we represent this problem using pictures or diagrams and solve it without using an algorithm?</i>”</li> <li>Provide pairs of students with a mini-whiteboard or large sheet of paper and marker (only one set of materials). Ask each pair to draw a picture or diagram to represent the problem. Working with their numeracy partner, students then solve the problem. Encourage students to write a number sentence that identifies the ‘missing element’ and then solve the problem using mental computation. Ask students to record all steps on their whiteboards. Provide Newman’s Prompts scaffold (attached), individual hundreds charts and/or Base 10 material for students needing learning support.</li> <li>Students share pictures/diagrams, strategies and solutions with the pair opposite.</li> <li>Invite pairs of students to share their pictures/diagrams, number sentences and strategies with the whole class. Through effective feedback, highlight knowledge and skills that reflect an understanding of place value when students are explaining the strategies they used for mental computation.</li> </ol>		
Strengthening the concept	<ol style="list-style-type: none"> <li>Provide ‘post-it’ notes or small card for each pair of students.</li> <li>Each pair of students creates a problem about feeding the penguins that involves decimals, writes it on a ‘post-it’ note/piece of card, including their names and ‘posts’ it on the board. Share some of the problems with the whole class. Invite pairs of students to come and choose one of the problems from the board to solve and repeat steps 4 – 7 above.</li> <li>Recording of investigations can be on mini whiteboards or in student learning logs.</li> </ol>		
Reflection 2	<p>Think/Pair/Share: “What was the most efficient strategy you used today and why?” or <b>Written: “In your learning log, imagine you are talking to a friend and explain the most efficient strategy you used today.”</b> Finish reading the story, save it for another part of the day or to explore a new concept in the next maths lesson.</p>		
Notes	<p>In a follow up lesson, students could explore the problem that links volume and multiplication (from page 29) using the same lesson sequence outlined above:</p> <ol style="list-style-type: none"> <li>Continue reading the story up to the end of page 29.</li> <li>Present the problem on the following page: “<b>On the fourth of August, a gleam of hope: Daddy found a new way of storing the penguins! A cube = <math>6 \times 6 \times 6 = ???</math>”</b></li> <li><b>Provide unifix cubes for each pair of students and ask them to start building the cube (look and listen).</b> They will soon realise the need to join with other pairs to reach their goal.</li> <li>Using the language of volume and capacity, discuss layers, dimensions, cubic measurement, link to multiplication, etc. (fairly informal discussion at this stage)</li> <li><b>Students could solve the question independently in their learning logs or with a partner and record on mini whiteboards.</b></li> <li>Materials: Mini whiteboards, markers, ‘post-it’ notes/small card, hundreds charts/base 10 material, learning logs.</li> </ol>		

Programming format adapted from The Maths Unit, DEC 2012

Targeted for assessment

### A Problem Solving Approach using Newman's Prompts

<b>Read the problem. What is it about? (In my own words)</b>	<b>What is the question asking me to do? (In my own words)</b>	<b>How am I going to find the answer?</b>	<b>Do the calculation</b>
<b>Important facts</b>	<b>A drawing or diagram may help</b>		<b>Write the answer to the question</b>  <b>How did I check it?</b>



Feeding the Penguins

21<sup>st</sup> May  
281R

Each penguin eats 2.5kg of fish per day. There are 101 penguins, and 1kg of fish costs \$3.00. How much does it cost to feed 101 penguins?

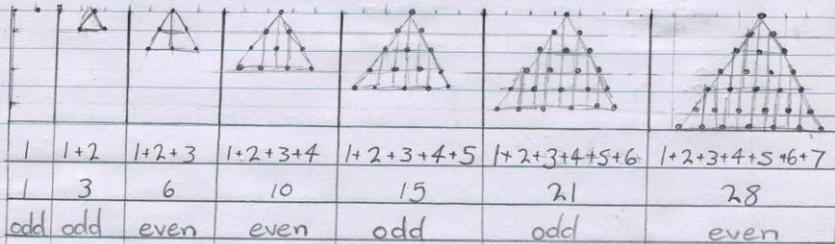
~My Strategy~

To feed 1 penguin,  $2.5(\text{kg}) \times \$3.00 = 7.50$ , because  $3 \times 2 = 6 + (3 \times \frac{1}{2}) = 1.5 = 7.5$ . To find out how much it would cost for 101 penguins, I calculated:  $(3 \times 2 [2 \times 3] = 6) \times 100$  (I took of one penguin to make it easier) = 600. I still have to add on the half a kg, so I added 150 ( $600 + 150 = 750$ ). I still have to add another penguin ( $750 + 7.5 = \$757.50$ ) so the answer is \$757.50. Oh my goodness!

Brackets and all - how clever!

Triangular Numbers

4<sup>th</sup> June 2012



Excellent method!

The triangles formed are all equilateral triangles.

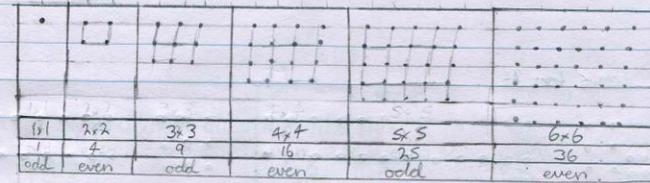
To make a new layer, you add 1 to the layer before it, e.g. 6, 7, 8, and to make a new layer, add 1 to the 8, to make 9, the new layer.

Number Sentence

For 10<sup>th</sup> sequence -  $1+2+3+4+5+6+7+8+9+10=55$

Square Numbers

8<sup>th</sup> June 2012



What is a Square Number?

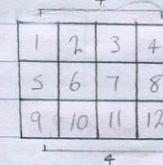
A square number is the product of a number multiplied by itself. For example:  $6 \times 6 = 36$ , 36 being the square number. Not bad!

What Makes a Square Number?

A square number's sides are all equal length. For example; 16 is a square number, all of its sides are of equal length - so each side is of 4 (cm, mm, whatever it is).

What Makes a Rectangular Number?

A rectangular number is nearly the exact same as a rectangle - the opposite sides are of equal length. For example; 12 is a rectangular number. 2 of the sides are 4, and they are opposite each other.



Wow! Such precise descriptions, Tshunta.

# Feeding the penguins

21.

Year 5 Work Samples

Before I explain the penguin feeding, I'll first tell you the important facts about it.

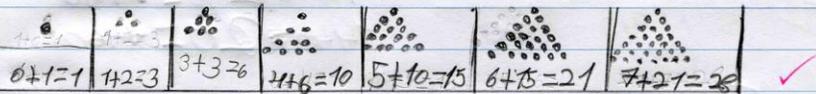
Firstly, Each penguin eats 2.5 kilograms of fish per day!  
 Each kilogram of fish costs \$3.00  
 And there is 101 penguins.

now what me (Pedro), claudia and nyah did

A great start.

## Triangular numbers

4.6.12



$$1+2+3+4+5+6+7+8+9+10 = 55 \quad / \quad 5 \times 10 + 5 = 55 \quad \checkmark$$

I think triangular are so special because when you are making them to do each new layer you need to add one more than the one before it.

The work sample on the left comes from a 2<sup>nd</sup> Phase ESL learner

Investigating pattern – triangular, square and rectangular numbers:

Stimulus from pages 11 – 24 of "365 Penguins"

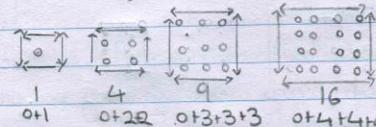
7.6.12

Square and rectangular numbers

$$0+5+5+5+5+5 = 25$$

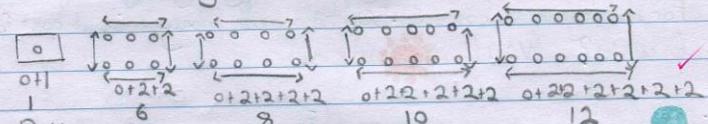
Square numbers

Patterns



Each opposite, or, parallel side has an equal amount of rectangular numbers counters.

rectangular numbers



Patterns

To make the next square number you add one to each of the two parallel rows.

Patterns: The first square number is odd, then the next, even, odd, even, odd.

For a square number, all of the different sides have the same amount of counters.

Accurate observations, Lily.