Mathematics and Numeracy: Teaching Learning Sequence

Strand	Number and algebra
Sub-strand	Number and place value
Levels	D E Year 3, Year 4
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Year developed	2016

Use this units with your own student cohort

Teachers are invited to trial and modify this teaching learning sequences. Content may need to be modified to meet the particular learning needs of a student cohort. Designers started with the same template, and while there was broad agreement on the use of the template – there may be some variations between this Teaching Learning Sequence and other Teaching Learning Sequences that were developed by DECD educators.

- differentiated activities may be found in either the activities column or the evidence and differentiation column
- generally, language elements were not repeated once they were recorded in an earlier activity
- cross curriculum priorities are included in some unites but not in others.

A feedback form is available at tiny.cc/IELP-NAP-TLS. Please forward feedback to Erika Vonaspern

Government of South Australia
Department for Education and Child Development

Intensive English Language / New Arrivals Program

Mathematics and Numeracy Teaching Learning Sequence

Anna Kennedy and Rotha Sovann

2016

WHAT DO WE WANT STUDENTS TO LEARN?

Strand: Number & Algebra

Substrand: Number & Place Value

Learning Goals

| Mathematics Levels: / Overarching Ideas	Time Line:	Achievement Standards	Content Descriptions	Proficiencies
Mathematics Levels: D E (Year 3, 4)	Time Line: 4 weeks	**D** **Counts to and from 10 000**	D Recognise, model, represent and order numbers to 10 000 D Apply place value to partition, rearrange and regroup numbers to 10 000 to assist calculations and solve problems	The student demonstrates the following proficiencies. **Understanding** • partitions and combines numbers flexibly • makes connections between representations of numbers • extends place value to large numbers and decimals
Overarching Ideas The Hindu-Arabic numeration system has four important characteristics: 1) *Place value:* the position of a digit represents its value. 2) *Base of ten:* explicit collection rules are defined and consistently followed. 3) *Use of zero:* zero is a place value holder that symbolises the absence of HTU 4) *Additive property:* numbers can be written in expanded notation and summed with respect to place value.		**E**	E Recognise, represent and order numbers to at least tens of thousands E Apply place value to partition, rearrange and regroup numbers to at least tens of thousands to assist calculations and solve problems	**Fluency** • counts forwards and backwards from any starting point • recalls the number name sequence to 10 000 **Reasoning** • begins to describe the base ten system by renaming collections **Problem-solving** • uses number properties to continue number patterns • compares large numbers

WHAT DO WE WANT STUDENTS TO LEARN?

Numeracy General Capability	Other General Capabilities

Numeracy General Capability

Estimating and calculating with whole numbers

Level 3

Understand and use numbers in context:

Model, represent, order and use numbers up to five digits
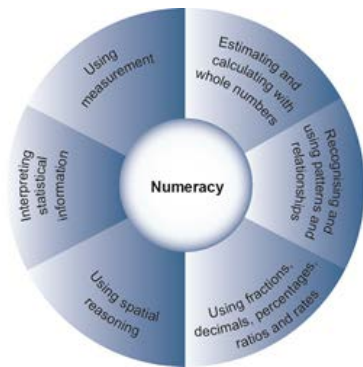
Other General Capabilities

☐ **Literacy**

The literacy capability of *Composing Texts* is guided by and reported in the sequence of the IELP Progress Report. In addition, the following aspects of the *Comprehending Texts* continuum are taught and assessed.

Level 1d
Comprehend texts

Use *conventional behaviours* and/or *abstract symbols* consistently in different contexts and with different people to:
- Work out the meaning of texts with familiar structures
- Respond to questions, sequence events and identify information from texts with familiar structures
- Use information in texts to explore a topic

Level 3
Navigate, read and view learning area texts
Navigate, read and view different types of texts with illustrations and more detailed graphics

Interpret and analyse learning area texts
Interpret literal information and make inferences to expand topic knowledge using comprehension strategies

Listen and respond to learning area texts
Listen to spoken instructions with some detail for undertaking learning area tasks, listen to identify key information in spoken and audio texts, including audio-visual texts, and respond to texts read aloud

☐ **Information and Communication Technology (ICT) Capability**

Level 2
Generate solutions to challenges and learning area tasks
Experiment with ICT as a creative tool to generate simple solutions, modifications or data representations for particular audiences or purposes

Select and use hardware and software
Identify and safely operate a selected range of appropriate devices, software, functions and commands when operating an ICT system and attempt to solve a problem before seeking help

☐ **Intercultural Understanding**

Level 1
Communicate across cultures
Recognise that people use different languages to communicate
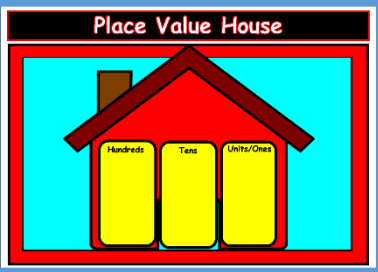
HOW WILL WE KNOW IF THEY'VE LEARNT IT?			
Diagnostic Assessment: (What do the students bring?) Dispositions Children bring together various dispositions such as curiosity, cooperation, enthusiasm, persistence and imagination. They transfer and adapt what they have learned from previous contexts to new learning experiences. Children investigate and explore new ideas by manipulating materials, engaging with ICT, participating in cooperative group work and whole class discussions to develop new knowledge and skills. Knowledge Skills/Understandings Students can apply counting principles: one-to-one correspondence, stable order, cardinality, order irrelevance and abstraction. Students have consolidated counting strategies: counting on, skip counting, bridge to ten, doubles, near doubles	Assessment of Learning Top 5 Assessment Sheet containing photos as evidence of student learning (refer to Appendix 1). Observation of students manipulating objects, completing tasks Update Mathematics and Numeracy Report, Levels DEFG, Number and Place value	Assessment as Learning Students use base ten materials to show different ways to model numbers. Applies an understanding of place value and the role of zero to read, write and order numbers up to four digits Interpret four-digit numbers used in everyday contexts. Record of place value in maths journal	Assessment for Learning Students discuss their findings and through discussion to expand their understandings. Students share their knowledge of other numeric systems Strategies used in games such as The Price is Right.

KEY

Content Descriptions are in plain font

Achievement Standards: Bold font

Numeracy Learning Continuum Description. Underlined font

WHAT DO WE WANT STUDENTS TO LEARN?	WHAT WILL WE DO TO GET THERE?			HOW WILL WE KNOW IF THEY'VE LEARNT IT?
Mathematical Skills and Concepts	Sequenced learning activities	Language Elements	Resources	Evidence and Differentiation
Understands that many cultures invented their own system to count and record how many Identifies that we read and write a numeral from left to right.	**1. Place Value Period Naming Pattern Rules** **Introduction** Shared Reading or YouTube: How much is a million? Prior to text discuss how much children think a million is. Ask what do we have a million of in this school? After reading/viewing, write 1 000 000 000 on whiteboard to aid subsequent activities. **Brief History** Present symbols used in other number systems such as the Babylonians, the Egyptians, Roman Numerals and the development of the Hindu Arabic system. **Digits** Explain that we use ten different digits (mathematical symbols) in our number system. We can arrange these digits in a specific order to represent numeric values. Write these numbers on the board: 0 1 2 3 4 5 6 7 8 9 Introduce place value rules: Rule 1: Read and write numbers from left to right. Build numbers right to left. Hand out a card to each student. Each card should show one digit. Ask students one by one to stand up and place their digits on a whiteboard. Ask students: Where will you place your digit? as they add to the number display. Emphasise the rule that numbers are read from the left to right. The number built on the whiteboard should go up to	**Topic Vocabulary:** numbers, digits, numeral, period, ones/units (scaffolding term), units, tens, hundreds, thousands, millions, billions, trillions, quadrillions, quintillions, renaming, sequence, pattern, symbol **Participants with pointers, numerative and describers:** *big numbers, **name** cards, **first** period, **second** period, **third** period, **first six** digits, **two place** patterns, **second place value** pattern* **Processes:** Action: *order, separate, discuss, continue, sequence, notice, explain, recognise, take, stand, get, show, draw, write, read, place* relational – *is, are, has, have*	Sequenced learning activity resources: How much is a million? book (Schwartz 1985) How much is a million? video (Scholastic 2009) A brief history – Counting and Place Value (AMSI 2011) Appendix 2: Digit Cards	□ I can use and explain the three place value rules when reading and recording large numbers. If NO, then present a pile of MAB units for students to count. How many blocks are there? Have students discuss whether they can think of a faster way to count the blocks e.g. skip count by 2s, 5's and so on. Lead students to realise that counting by groups of tens is a quick and efficient way of counting big numbers. So for many of the following activities we will use MAB blocks to count big numbers. Next, watch a Place Value House video that demonstrates the Second Place Value Pattern rules for HTU with a place value house.

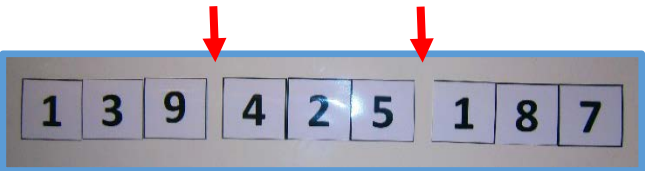|				
	21 digits in order to show the class big numbers (and period names in subsequent rules). Optional diagnostic assessment: children state their digit and what value their digit holds as the number increases with more students. Use a whiteboard for this activity so that students have the opportunity to use commas. This can promote discussion about how we DO NOT use commas and lead to the next rule.	**Prepositional phrases** to explicitly teach circumstances of place*: in groups of three, on the whiteboard, into periods, under the second period, above the numbers, between groups of three*	**Differentiated activity resources:** If NO: Place Value House video (Math Playground 2016) Appendix 3: Place Value Houses Game Board - MAB blocks - Digit cards	Finally, to apply place value knowledge with HTU, reintroduce this place value period as the 'no name period' pattern. Use a concrete example to scaffold understanding by using a Place Value House Game Board, digit cards and MAB blocks.
Identifies and understands the periods within the second place value system (three naming pattern).	**Rule 2: Period Spacing** Explain to students that digits in a big number need to be separated into periods, so that it is easier to read. Ask: *How could you separate our big number on the whiteboard into periods?* Students can volunteer to show how they can separate the digits. Discuss different choices made by students because of different counting systems used in their first language.	**Conjunctions:** Teacher asks: Why do we need a space between periods? Student answers using *Because...*		Have students work in pairs and take turns to create three digit numbers using the digit cards. The other student will then make that number with MAB blocks. The teacher walks around and checks student understanding by asking questions like, Should we use 6 MAB units or 6 MAB tens to represent the 6 digit in 168? Students swap roles.
Identifies that when we write a numeral we group it in periods of three starting from the right.	Explain that there are three digits in each period. So, the second rule is to leave spaces between groups of three. Ask students to stand in groups of three along a line. Refer students to 1 000 000 000 written on whiteboard.	**Print conventions:** from left to right (reading), from right to left (writing numbers), spaces between periods **Reference Items:** *this, that, I, our, these, you*	If YES: Place Value House video (Math Playground 2016) Appendix 4: Place Value Street - MAB blocks - Digit cards	
Generalises the period number names to read a range of numerals.		**Speech functions:** interrogatives, simple statements **Visual literacy:** number symbols, place value chart, abbreviations (HTU), photos, picture book		If YES, then students can do a similar activity as above, but called *Place Value Street*. This activity includes the 'thousand' and 'million' periods. Remind students' to use spaces between the place value houses to represent period spacing.

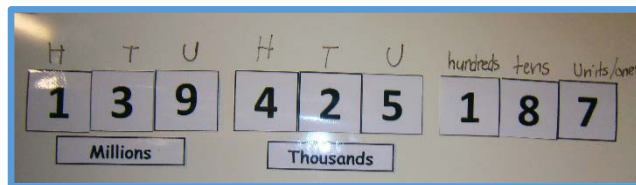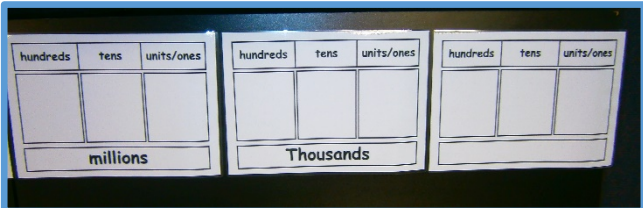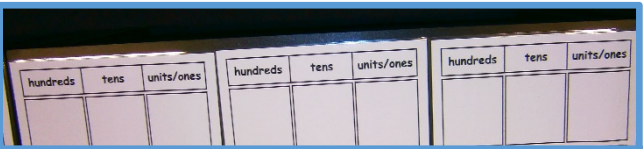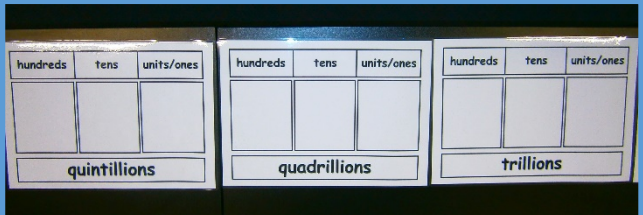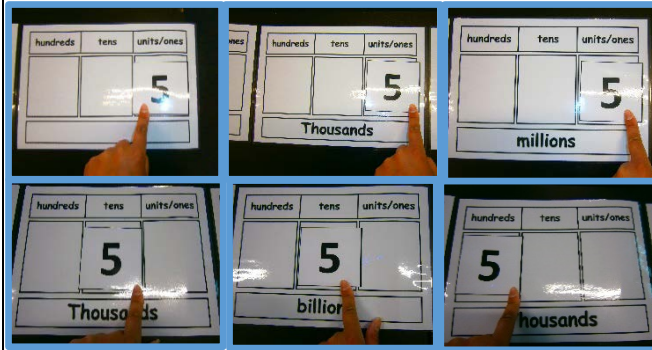|			
Identifies and understands the HTU pattern within the first period.	Rule 3: Each Period has a Name Explain that the first period doesn't have a name, you could refer to it as 'no name' or simply HTU. The second period is called *thousands*. Students will place the card name 'thousands' **under** the second period on the whiteboard. Continue this sequence for millions, billions, trillions, quadrillions and quintillions. Second Place Value Pattern: Teacher shows students how to read big numbers starting from the thousands place value. Draw students' attention the first six digits of the big number. Example: 486 187. Ask Which end do I need to start reading this number from? What period are the first three digits? (no-name or HTU). What period are the second group of three digits? (thousands). Now read the number: four hundred, eighty six thousand, one hundred and eighty seven. As teacher says number, point to each digit and place a label **above** to show hundreds, tens and units.		 Support students to use the same language from the Place Value House video e.g. bedrooms
Generalises the HTU pattern to read a range of numerals.			

	By the end of this teacher directed task, students should be able to recognise the pattern HTU. Ask: What do you notice as we read the digits in each period? (each period has HTU). Thus, our system has two place patterns. The first pattern is the period pattern and the second place value pattern is that each period consists of hundreds, tens and units pattern. Take a photo of these two patterns for future reference and for students to refer back to.			
Renames a numeral using the language of place value position.	**2. Renaming** **Warm-Up**: Refer to photos of place value patterns and use questioning to elicit student understanding. <u>Period Rule Warm Up:</u> Using the Period Card Templates, ask students how they could sequence them on the floor i.e. starting with 'no name, thousands, millions, etc. 	**Technical Language:** *renaming, sequence, pattern, position, number names, zero, regular and irregular number names* **Participants with pointers, numerative, describers and classifiers:** *place value* column, *place value* holder, *pop* sticks, *rubber* bands, position, *'no name'* column, *one* die, *two* dice **Processes:** *repeat, place, build, collect, bundle, reflect, roll, rename* **Conjunctions:** *when* **Speech functions:** 'Invented' language structures to introduce	**Sequenced learning activity resources:** Place value pattern photos (taken during previous activity) Appendix 2: Digit Cards Appendix 5A: Place Value Templates Appendix 5B: Place Value Period Name Labels	□ I can rename a number in terms of place value parts using mathematical language. If NO, then introduce oral and written number names using base ten language. For instance, to scaffold students towards saying, 'twenty nine,' as used in standard conventions, they should begin by saying 'two tens' and 'nine units.' This strategy is more explicit for English language learners. Emphasise the difference between number names such as fifty and fifteen, so students can clearly hear the enunciations. Have students practise counting bundles of pop sticks with base ten language. They should record the number names on whiteboards. As students become more proficient, re-introduce the standard language.

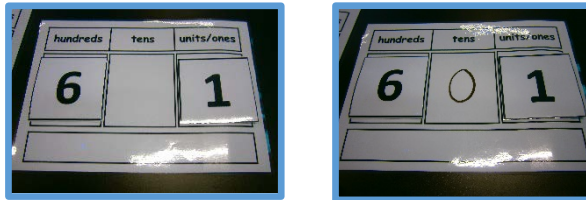|				
Establish regular names before 'irregular' names, emphasise pattern	Choose one digit card (1-9) to display in the units place value column of each period, starting from 'no name' period. Ask students the value of the digit each time it is moved to a new place value holder. Next, place the digit in each of the tens columns of each period asking students for its changing value. Repeat for hundreds columns. The Value of Zero: Explain that a zero within a numeral means that nothing is in that place value position. Example: 601 indicates there is 6 hundreds and 1 unit. So, we would say six hundred and one because there are no tens. Thus, we use 0 (zero) to show this. Without the 0 place holder the number would read differently – 61, which is incorrect. 	decades 'one T, two T, three T', etc. **Connectives**: *first, next, then, after* **Visual literacy:** period chart templates, photos, digit cards, place value charts, subitising (dice), trading board **Simple sentences:** *I have five tens.* **Compound sentences:** *I have five tens, so I know it is fifty.* **Complex sentences:** *I know the value is fifty because the five is in the tens column.*		If YES, then students play the game 999 and over.
Identifies that a zero within a numeral means that nothing is in that place value position.				

Reinforce this understanding of zero by building numbers using the digits cards. Students must include 0 (zero) in a place value position of their number. They say the number.

<u>Hundreds, Tens and Units Rule:</u>

Review the HTU rule. Explain that each place value column can only have one digit. When a digit exceeds 9 the number needs to be renamed. Model this rule to students prior to the game.

Game: 99 and Over (Swan & White 2005)
Aim: To build collections in tens and add single digit numbers to a cumulative total.
In groups of 2-3, students take turns to roll a die and collect that number of pop sticks. These are placed on the units column of the place value game board.

When players have more than nine pop sticks in the units column, they must bundle the ten pop sticks, using rubber bands. The bundle of ten pop sticks is then moved to the tens column

99 and Over resources (Swan & White 2005):
- dice
- pop sticks
- rubber bands
- trading board
- post-it notes

	Number Names: Pause the 99 and Over game. At this point, students need to learn the necessary language for number names. This should be done by modelling a student's place value game board to the whole class. Introducing Regular Number Names: Firstly, have six bundles of pop sticks ready to display. Count the bundles, by touching and pointing, while saying one, two, three, four, five, six tens. Write 'six tens' on the board. Then rub out the word 'tens' and replace with the letter 'T'. Say six-T. Students take turns to say how many bundles of pop sticks they have in their tens columns, saying the number + T (one T, two T, three T, etc.) Teacher says 'four T' and asks 'what does that sound like?' (fourty). Introduce regular names for multiples of ten - ninety, eighty, seventy, sixty, forty Introducing Irregular Number Names: Explain that not all the numbers follow this pattern. For example fifty, thirty, twenty and the teens. These are irregular.		**Differentiated activity resources:** If NO: - Pop sticks - Rubber bands - White boards - Markers If YES: '999 and Over' resources: - dice - pop sticks - rubber bands - trading board - post-it notes	

Children continue playing '99 and Over' game. This time students should say how many tens they have in the tens column of the place value board game as they continue making bundles of ten and are renaming the number.

Reflection: Children each write a 2 digit number (10-99) on post-it notes and then order themselves from smallest to largest in a line. Teacher directed questions could include:
Who has the largest number?
How many tens are in your number?

*Renaming is the preferred technical terminology in place of other commonly used terms including trading, exchanging or borrowing.
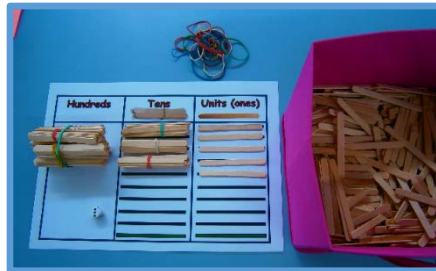
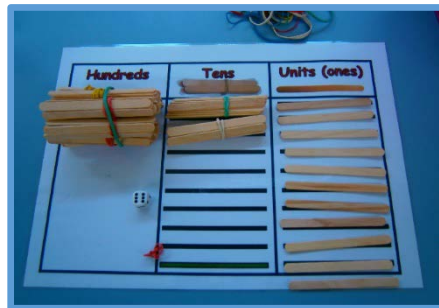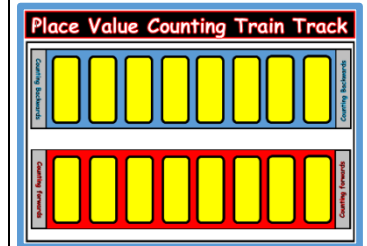|				□ I can count forwards and backwards to 999.
Counts to 999 forwards and backwards. Renames units to tens and tens to hundreds.	**3. Count forwards/backwards to 999 and rename** Warm Up: Place Value Renaming Game Give students 5 minutes to play game using HTU. Teacher observes students are able to rename collections/bundles in tens and hundreds. Ask students: If you have ten bundles of tens, what do you think will happen? (the rule is to rename) Counting Backwards: Teacher demonstrates how to count backwards using place value game. Physically break up bundles and move them across the place value mat and rename. More or Less Game: In pairs, students take turns to roll 3 dice (9 sided) to build a 3 digit number. Students also roll a dice that has '10 more' or '10 less' on the sides. Students will record their 3 digit number as well as 10 more or 10 less. Students need to skip count by 10 and record on the sheet. Extension: change dice to '100 more' and '100 less'	**Technical Language:** regular and irregular number names, *more, less, dice* **Participants with numerative and classifiers:** *three digit* number **Processes**: *roll, skip count, record, change, bundle, group, unbundle, regroup* **Visual literacy**: More or less game template	**Sequenced learning activity resources:** Appendix 6: Place value mat (HTU) - pop sticks - dice - rubber bands Appendix 7: More or Less game template: - 9 sided dice (x3 / pair) - 1 blank dice ('10 more' and '10 less') **Differentiated activity resources:** - Appendix 8: Place Value Counting Train Track (Game board) - 2 counters **If NO:** - 2 dice **If YES:** - 3 dice	If NO, then play Place Value Counting Train Track. In this game students develop fluency as they count forwards and backwards through decades with two digit numbers. If YES, then play Place Value Counting Train Track, using three digits numbers.

				Next, display a three digit number on the whiteboard e.g. 251. What is ten more? Record the answer underneath the first number, then repeat the question. After this process has been repeated a few times, show students the pattern – the digit in the tens column moves up by one each time, and when the tens column digit is greater than nine, the hundreds column is also renamed, and moves up by one. The unit place value column doesn't change. To consolidate this knowledge, play Place Value Counting Train Track, but counting by tens.
Partition large numbers to show their place value. Partition large numbers to make them easier to operate with.	**4. Partitioning 0 – 1000** Warm-up: Give the dog a bone (Oswego City School District Math Games 2002) This is a 100 chart ICT game. The aim is to use counting up and counting down strategies (more or less) to find the location of ten numbers in 1 minute.	**Technical Language:** *partitioning* **Participants with pointer, numerative, describers and classifiers:** *the shaded* rectangles, *valley* fold, *mountain* fold **Processes:** *find, open, fold, unfold, explore* **Prepositional phrases** to explicitly teach **circumstances of place:** *behind the white rectangle*	**Sequenced learning activity resources:** Give the Dog a Bone (Oswego City School District Math Games 2002)	□ I can partition numbers in different ways to show the value of each digit. If NO, then play Three Other Ways (Van de Walle, Karp & Bay-Williams 2013, p. 212). Model how to represent one number in three different ways using the MAB blocks. Then organise students into groups of three, and give each group a 3 digit number to make using MAB blocks. Each group member needs to make their group number in a different way.

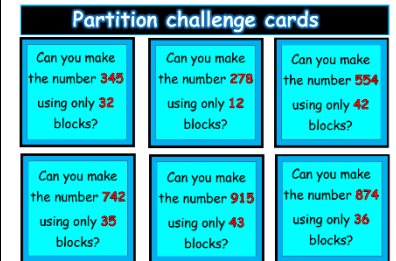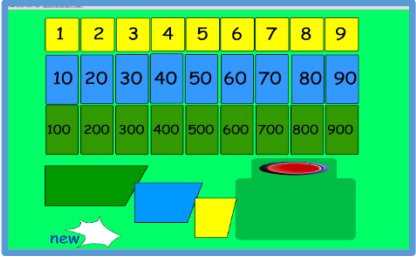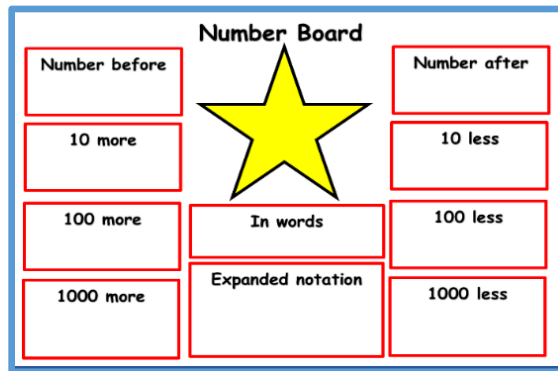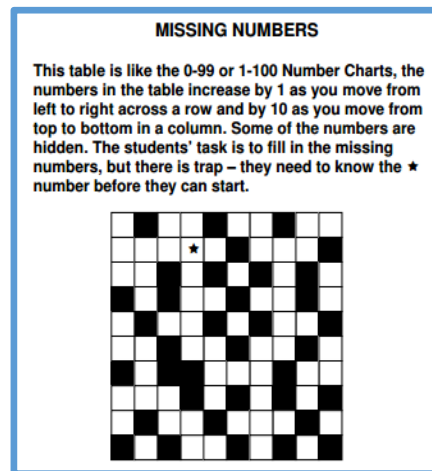|				
	Rename Numbers by Partitioning Teacher writes a 5 digit number on whiteboard and demonstrates how to rename numbers in more than one way – read to place-value parts to say how many. Example: 47092 4 ten thousands 7 thousands 0 hundreds 9 tens 2 ones/units 47 thousands 92 ones/units 4 ten thousands 709 tens 2 ones/units 470 hundreds 9 tens 2 ones/units Number Expanders: Present a number expander to students and demonstrate how to partition and rename the digits. Students write their own four digit whole numbers on the number expander, one digit per blank space. Open the number expander up in many ways to see the possibilities. Show students how to fold the expander: the shaded rectangles are folded in half with a 'valley fold' and then a 'mountain fold' is used to put the shaded rectangle behind the white rectangle on its left. Ask them to fold and unfold at various places to make as many different expansions as they can. Discuss and explore particularly interesting examples such as numbers with zeros. For example, 410 is 41 tens 0 ones/units; 507 is 50 tens 7 ones/units; 700 is 7 hundreds, 70 tens or 700 ones/units. Number expander (Department of Education and Training Victoria 2016)	**Visual literacy**: ICT – Give the Dog a Bone, number expander	[Number Expander templates](#) (Department of Education and Training Victoria 2016) Appendix 9: Base Ten Riddles (Van de Walle, Karp & Bay-Williams 2013, p. 212) **Differentiated activity resources:** If NO: MAB blocks If YES: Appendix 10: Partitioning Challenge Cards (Van de Walle, Karp & Bay-Williams 2013, p. 212).	If YES, then students read Partitioning Challenge Cards (Van De Walle, Karp & Bay-Williams 2013, p. 212). Each card states a number and a set amount of MAB blocks to use to make that number (see below). Students can individually make a number, and then share how they represented the number with others. Students should discuss different ways they were able to make their numbers.

	Cool Down Activity – Base Ten Riddles This is a whole class activity where the teacher presents base ten riddles for students to solve. The riddles should be displayed on a Smart Board and read aloud by the teacher. Then, students use MABs to illustrate the riddle and write their answer on whiteboards. No student is to call out the answer, as everyone needs to have a go.			
Recognise, represent, visualise and work fluently with large numbers.	5. Make, name and record Warm Up: Arrow Cards ICT Aim: to build numbers using partitioning. Students will choose how many hundreds, tens and units they need to make a number. Teacher then asks students to build 3 digit numbers to observe understanding. Arrow Cards (Barrett 2016) Number Board Each child is given a laminated template of the Number Board. Teacher models how to record using a number board using different examples. Initially small digit and moving towards larger digit numbers. Teacher can write on whiteboard a different number for each ability group. Students independently record on their number board and then compare with other students in their group and discuss.	Technical Language: *expanded notation* Participants with describers: *random* number, *missing* number Processes: *choose, observe, record, compare* Circumstances: *forwards, backwards* Speech functions: interrogatives I have…. *What do you have on your number board?* Visual literacy: number board, ICT – Arrow cards, missing numbers template	Sequenced learning activity resources: Arrow Cards (Barrett 2016) Appendix 11: Number Boards (laminated) Missing Numbers (Siemon 2003) Differentiated activity resources: If NO: MAB blocks If YES: Check the clues (Dunstan & Swan 2015) - 120 chart	□ I can make, name and record large numbers. If NO, then get students to make a three digit number using MAB blocks e.g. 251. Ask: How many MAB units (1), tens (5), and hundreds (2) have you used? Most students will use the MAB units, tens and hundred blocks. So to further support them in understanding how to partition and represent numbers in different ways, ask: If there were no MAB hundreds, how many tens and units would you need to make the same number? – *25 tens* Give students time to work out this problem question by using the MABs. Repeat this activity. Ask students if they notice any patterns. Further their thinking by asking, 'What is ten more than this number?'

Extension: large numbers (i.e. billions, trillions, etc.)

Number Board

Number before	★	Number after
10 more		10 less
100 more	In words	100 less
1000 more	Expanded notation	1000 less

Reflection: Missing Numbers

Students are each given a copy of the Missing Numbers template. Teacher will choose a random number for each ability group, which will be their missing number, and thus starting point for counting forwards and backwards independently.

MISSING NUMBERS

This table is like the 0-99 or 1-100 Number Charts, the numbers in the table increase by 1 as you move from left to right across a row and by 10 as you move from top to bottom in a column. Some of the numbers are hidden. The students' task is to fill in the missing numbers, but there is trap – they need to know the ★ number before they can start.

Missing Numbers (Siemon 2003)

If YES, then refer to *Check the Clues* for cooperative group problem solving cards. Model problem solving strategies and handout four clue cards. Students read them out aloud for the whole class to hear. Everyone listens while looking at a 120 chart on the Smart Board. After each clue is read out, check that everyone understands the problem. Discuss a plan that students can use to solve this problem.

Next, have students interact with the Smart Board as they solve the problem – one clue at a time. After the demonstration, form students into cooperative groups of four. Each group is given a clue set of cards to solve place value problems.

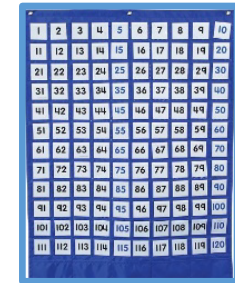|				
Match numerals, number names, pictures and quantities to 1 000.	**6. Ordering and comparing:** <u>Warm Up Activity:</u> The Price is Right (Teaching Ideas 2015). Whole class game, teacher has a secret number that students need to guess. They are given a number range to guess within, which is represented by a number line. Students take turns to guess. After each guess the teacher says 'higher' or 'lower', and records the guess on the number line until the exact number is guessed – the price is right'. Extension: Discuss proportional reasoning. Which numeral guess will halve the range of numerals that the secret number could be? E.g. If the range is between 600 and 1000, why is 800 a better guess than 650? <u>Ordering Activity:</u> Aim: to match numbers, pictures and words that represent the same numbers Whole class activity - each child is given a card with different representations of numbers. Children need to find who has the same number representation as them. Invite two groups (with the same number representation) to write their numbers on the whiteboard. Teacher asks class to compare the two different numbers on the whiteboard. Draw attention to place value by comparing the units and tens for each number. Teacher introduces the symbols: greater than (>), less than (<).	**Technical Language**: *true, false, greater than, less than, numbers, pictures, words* **Comparatives and superlatives:** *greater, smallest, less than, more than, biggest, smallest to greatest* **Participants with numerative and describers**: *two different* numbers **Processes:** *cut, match, order, glue* **Sentence structures:** Simple: *My number is greater than yours/ less than yours.* Compound: *Our numbers are the same, so they are equal.* Complex: *This number sentence is true/false because…*	**Sequenced learning activity resources:** [Number Gators](#) (Brainzy Games 2014) [Compare Numbers Using Signs](#) (EZSchool 2016)	□ I can compare and order numbers up to 1 000. If NO, then display a 120 Pocket Chart that only has some of the numbers (in the correct order). Have a pile of number cards with the range 1 to 120. Students take turns to pick up a number card, and then place it in the 120s chart, in the correct order. To further support children, each number card should have a picture on the reverse of an MAB representation to support children with comparing.

Watch Number Gators (Brainzy Games 2014) to help students remember which way the symbols should be to represent greater than and less than. This can be further reinforced by children standing up and using their arms to represent the greater than and less than symbols, between two numbers.
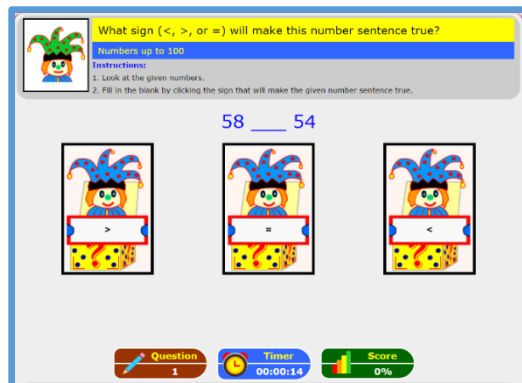

Number Gators (Brainzy Games 2014)

Compare Numbers Using Signs ICT
To consolidate students understanding of the symbols as well as comparing numbers.
Example: What sign (<, >, or =) will make this number sentence true?
                    Compare Numbers Using Signs (EZSchool 2016)

|	
Visual literacy: number board, ICT – compare numbers	**Differentiated activity resources:**
	If NO:
Symbols: <, >, or =	120 Pocket Chart
	Number cards

If YES:
Appendix 12A: Blank 120 Place Value Chart

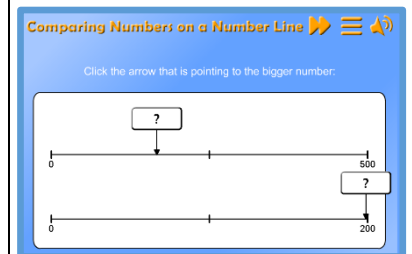Appendix 12B: 120 Place Value Chart Cards

[Compare Numbers on a Number Line](#) (Maths Frame 2012)

If YES, then children can do the same activity as above, but with a different set of number cards. To extend these children, they can order number cards that have been partitioned into tens and units, e.g. 5 tens and 2 units, 11 tens and 9 units.
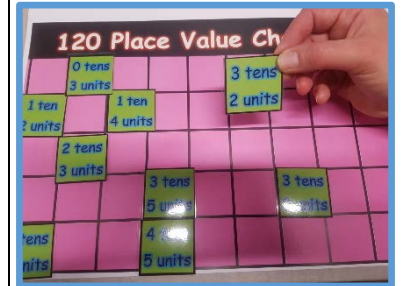
Note: If you don't have a 120s Pocket Chart, you can print out an A3 copy instead.
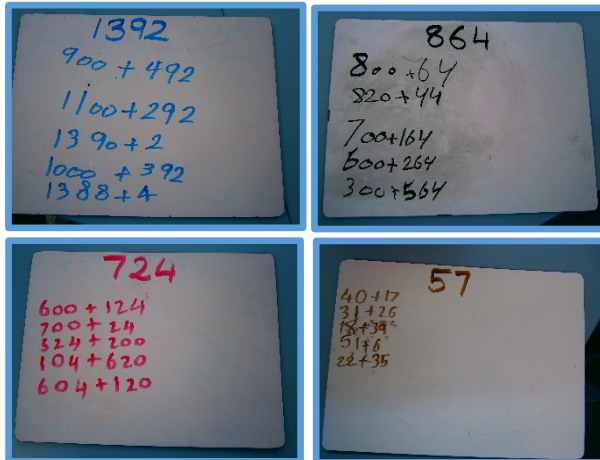
Students then play the interactive game Compare Numbers on a Number Line.

(Maths Frame 2012)

	Reflection: Mix and Match Numbers Child independently cut, match, order and glue a worksheet of cards that represent the same number (numbers, pictures and words). Students should order their cards in order of smallest to greatest numbers.			
Use place value to partition, rearrange and regroup numbers to at least 10 000. Take apart and recombine numbers in flexible ways.	**7. Renaming 1 to 1 000 000** Warm-up: How Many Ways? The aim of this activity is to use open-ended mathematics. Students are given the answer and need to think about what the question could be. This activity begins with the teacher modelling how they can decide what a possible question could be. Explain that there can be more than one question to make the answer true. Example: The answer is 967 What could the question be? Example: 900 + 60 + 7 = 1000 – 33 = Extension: The answer is 27 806 What could the question be? Example: 20 000 + 7000 + 800 + 6 = Extension activity A story could be used as part of this activity. For example: John counted 900 cars in the car park at the shopping center, then he counted 100 more cars that entered the car park and 33 cars left. How many cars are there in the car park now?	**Participants** *question, story, answer, problem, solution* **Processes:** *listen, write, create* **Technical language** Encourage students to use topic specific/ teacher modelled vocabulary to construct questions **Speech functions** Constructs statements and questions **Text knowledge:** Recount	**Sequenced learning activity resources:** - Whiteboards - Markers **Differentiated activity resources:** If NO: MAB blocks	□ I can partition, rearrange and regroup numbers to 10 000. If NO, then students go back to using MAB blocks and make a given number. They need to decide how they want to make this number, and also need to make the number in different ways. Ask, 'How many units, tens and hundreds have you used?' The teacher uses MAB blocks to model how to create a story by allocating a participant (who or what?) to each place value group of MAB blocks. For instance, if the number is 967, then 7 MAB units could be children, 6 MAB tens could be teachers, and 9 MAB hundreds could be students. So, the story created could be: *One day, at school I counted 900 students and 60 teachers. The next day, 7 new children came to the school. How many people are at the school?* Students can then use the same participants (teachers, students, new children) in their own stories. Then as they become more confident, use their own participants in their stories.

	Reflection: Students share their stories and questions with the class. Everyone needs to listen carefully and decide if the stories and questions match the answers. Activity: using large numbers Students work in pairs or small groups to decide possible questions based on the 'answers' given by the teacher. 			If YES, then students can use larger numbers to partition, rearrange and regroup to create stories with accompanying pictures that they can publish. Extension: Stories that include different operations (addition, subtraction, multiplication, division)
Take apart and recombine numbers in flexible ways	**8. Making whole numbers to 100 000** Six students randomly select six single digit cards (0-9) to display at the front of the classroom. Class to discuss where students should stand to build the largest possible number and then the smallest possible number. Ask, what does each digit in the number represent? Example, what value does Student A represent in this number? What value does Student B represent in this number?	**Technical Language:** *represent* **Participants with numerative:** *whole* numbers **Processes:** action - *subtract* relational - *become* **Text knowledge:** Explanation	**Sequenced learning activity resources:** Appendix 2: Digit cards	□ I can make numbers up to 10 000. If NO, then scaffold students with a place value chart. Students place their number card digits in the corresponding positions on the chart. The teacher uses questioning to draw students attention to the different values their digits hold within the number. Ask, *'Can you read this number? How many tens are in the tens place value column? If I were to make this number with only MAB tens blocks and MAB units, how many would I need?'* etc.

Teacher directed questions to develop concepts of more than and less than.

Example, 'What is ten more than 308 621. Can you tell me which place value column changes? (Tens column). What does it change to? (3 because it is one tens more). Then increase the difficulty of more than questions, so that 2 columns will need to be renamed. Example: What is 90 more than 308 621? What place value column changes? (tens and hundreds columns). 'Why?' (because 90 is nine tens + 2 tens is 11 tens. This require the hundreds column to be renamed to 7 hundreds and 1 tens).

'What is ten less than 308 621. Can you tell me which place value column changes (tens column) and what does it change to? (1 because it is one tens less).' Then increase the difficulty of less than questions, so that 2 columns will need to be renamed. Example: 'What is 40 less than 308 621?' (40 is 4 tens and we can't subtract this from 2 tens, so we need to rename from the hundreds column. This will become 5 hundreds and 12 tens. Subtract 4 tens from 12 tens, which will leave us 8 tens. Thus, 308 581.)

Differentiated activity resources:

If NO:
Appendix 5A: Place Value Templates

If YES:
Six Digit Traveller
(Watkins 2010)
- deck of cards
- dice
- paper
- pencil

Handout copies of the place value chart to each student. Have students work together and each pick a digit card from a pile. Students place their digit cards side by side on the floor in any order. Once each student has had a turn, they record the number created into their place value charts. Think Pair Share – 'What is this number, can you read it aloud? What is ten less? What is ten more?'

In pairs, students individually make-up a 6 digit number in their place value charts. They then reveal their numbers to each other, to compare who has the largest number. Use the language, 'xxx is greater than xxx.' AND 'xxx is less than xxx.'

If YES, then play *Six Digit Traveller*, a place value card game that works with 6 digit numbers.

Comparing and sequencing big numbers.	9. Comparing and sequencing big numbers	Technical Language: *world population, data, information, country names, food production, consumption*	Sequenced learning activity resources:	☐ I can compare and sequence big numbers.

9. Comparing and sequencing big numbers

Poodwaddle ICT
As a whole class, show students' the world population clock. Explain that this shows data that has been collected to provide us with information about how many people live around the world.

Draw attention to the different numbers between countries. Ask students if they can name the population numbers. Students may need to write these numbers down so that they can look closely at the periods to identify the big numbers.
Ask students to compare the populations of Australia and another country. The teacher needs to show the population of these two countries from the start of the day, week, month and year. Students discuss which country has the greater population.

(Poodwaddle 2016)

Extension: Looking at '[food production](#)' data. Students consider which animal is consumed the most. Students can record and order the names and relevant numbers of these animals from smallest to greatest.

Technical Language:
world population, data, information, country names, food production, consumption

Nominalisation:
consumption, population, production, information

Circumstances:
of time - *day, week, month, year*
of place - Australia

Processes:
action – *subtract, increase decrease, reduce*
relational - *become*

Visual literacy: ICT
Poodwaddle – using simple maps, tables and graphs; interpreting, analyzing and recording of data

Oral language:
Small group presentation of findings, incorporating topic specific language

Text knowledge:
Exposition (Discussion)

Sequenced learning activity resources:

[Poodwaddle](#)
(Poodwaddle 2016)

Differentiated activity resources:

If NO:
Appendix 13A: Place Value with Pool Noodles
- pool noodles
- wooden rods
- markers

If YES:
Appendix 13B: Place Value with Pool Noodles Extension
- pool noodles
- wooden rods
- markers

☐ I can compare and sequence big numbers.

If NO, then play *Place Value with Pool Noodles.* Students make a two digit number using pool noodles. 'What is your number? How many units and tens are there?'

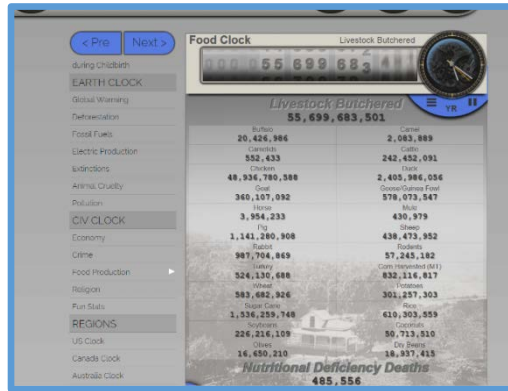Tell the students to add another pool noodle digit to the left or right.
'How has this changed your number? What are is the value of each digit now?'
Repeat this process.

Then, students make six digit numbers, leaving spaces for place value periods.

In pairs, students consider, 'Which number is larger? How many thousands do you have? What is the value of xxx in your number?'
Challenge one student in each pair to make a number greater than their partner's number, and then another number that is less than their partner's number.

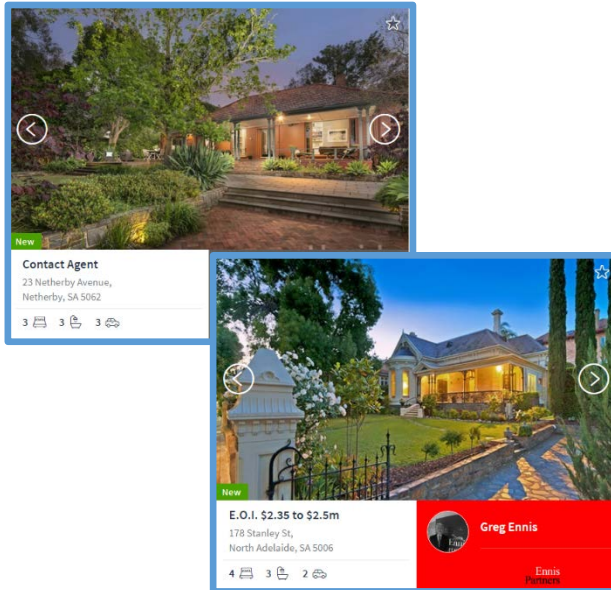|				
	Reflection: Class discussion about what children learnt and how this will affect them. (Poodwaddle 2016)			If YES, then do the same activity as above with the inclusion of a pool noodle 'greater than/ less than' pieces. In pairs, students make new numbers, and place them side by side. They should move the 'greater than/ less than' piece to compare the values of the two numbers. Students can combine their digits to make one big number, and rename each place value column if needed. Alternatively, students could add their numbers together.
Making connections to real world mathematics (big numbers).	**10. Big Numbers in the Real World** Show real estate classifieds. Students look at the dollar amounts to identify what is the most expensive housing. How much is it? This activity helps to give students a greater understanding of how big numbers are used in real life situations.	**Technical Language:** *afford, real life situations, calculate, purchase* **Participants with pointer, describers and classifiers**: *the real estate* classifieds, *modern* kitchen, *spacious lounge* room, *heated swimming* pool, *weekly* salary **Processes**: *calculate, consider*	**Sequenced learning activity resources:** - real estate classifieds - calculators **Differentiated activity resources:** Appendix 14: Cars, cars, cars –car guide	□ I can use big numbers in the real world. If NO, then present *Cars, cars cars,* and discuss the monetary amounts.

	In groups, students choose a house from the real estate classifieds. Based on a weekly salary of $500. Properties for sale (Domain Group 2016) Students need to calculate how long it would take them to be able to afford the house. Extension: Students consider the effects of amenity fees (food, petrol, transport, insurance, leisure, utility bills) and how long it would now take them to purchase their house.	**Visual literacy: ICT** real estate websites, newspapers, home addresses **Symbols:** real estate – bedrooms, bathrooms, carparks money – dollar sign **Print conventions:** Address conventions		The children should record the amounts of each car into place value charts to support them in reading the large numbers. Students should then compare and order the amount of each car from largest to smallest. Ask, 'Which car has the greatest value? Which car has the smallest value' Have the children cut out the pictures of these cars (with their monetary amounts) and order them in their math books. Help the children find the difference between the least and most expensive cars. If YES, then students do a similar activity to above, but also consider the effects of fees (petrol, insurance, on-road costs, and licence fees) and how much it would cost them to have a car for one year.

Overview of language and examples used in the teaching, learning and assessing program

A summary of the language mostly pertaining to this sub-strand as used in the following teaching, learning and assessing program.

Oral Texts	Visual Texts and Symbols	Text Knowledge	Grammar Knowledge	Word Knowledge
Spoken Texts Participation in oral texts to explore understandings about our number system and place value **Verbal elements** Emphasize each decade when counting – '1, 2, 3, 4, 5, 6, 7, 8, 9, **decade**.' **Speech functions** Appropriately using simple statements, questions, and commands when required. **Social exchanges** Explaining strategies in small group settings/ whole class. Reflecting on strategies used.	**Visuals in Multimodal texts** **Symbolism** Symbols to represent arithmetic Number symbols Use of zero +, -, <, >, = **Semiotics** Place value chart 0-100 chart ICTs Word wall	**Written texts:** Exposition: *Discussion of different strategies.* Explanation: *Students will explain how they placed digits in different periods to make smaller or bigger numbers.* Narrative Recount *Worded problems* **Text organisers / connectives** Sentence openers, using text connectives *first, next, then* **Reference items** *It, their, they, I, our, this, these*	**Simple sentences**: *I have five tens.* **Compound sentences:** *I have five tens, so I know it is fifty.* **Complex sentences**: *I know the value is fifty because the five is in the tens column.* **Print Conventions** Read/write – left to right. Place value – right to left Use of commas - Australia/International standards Spaces between periods Addresses **Processes** Action, relational, mental **Tense** Present **Noun and Noun Groups** Pointers, counters, describers and classifiers **Common Nominalisations** Suffixes *-tion (population, notation, etc.)* **Circumstances** *Of place*	**Topic Vocabulary** *Place value* *Digit* *Numeral* *period* *6 digit numbers* *ones*/units, *tens, hundreds, thousands, ten thousands, hundred thousands, millions, trillions, billions, quadrillions, quintillions* *Position* *Partition, regrouping, grouping, renaming* *Fewer/more than/less than, greater* *Counting, number line* *Multiplied by 10 or multiples of ten* *Count on/count back* *Value, highest/lowest* *Sequence/ Order* **Spelling** Abbreviations *HTU* Spell topic words, new words with regular letter patterns, and some common irregular words, and recognise meaning relationships between words such as '*digit*', '*number*', '*numeral*'

Appendices

Appendix 1:	Top 5 Assessment Sheet

Appendix 2:	Digit Cards

Appendix 3:	Place Value Houses Game Board

Appendix 4:	Place Value Street

Appendix 5A:	Place Value Templates

Appendix 5B:	Place Value Period Name Labels

Appendix 6:	Place value mat (HTU)

Appendix 7:	More or Less game template:

Appendix 8:	Place Value Counting Train Track (Game board)

Appendix 9:	Base Ten Riddles (Van de Walle, Karp & Bay-Williams 2013, p. 212)

Appendix 10:	Partitioning Challenge Cards

Appendix 11:	Number Boards

Appendix 12A:	Blank 120 Place Value Chart

Appendix 12B:	120 Place Value Chart Cards

Appendix 13:	Place Value with Pool Noodles

Appendix 13B:	Place Value with Pool Noodles (Extension)
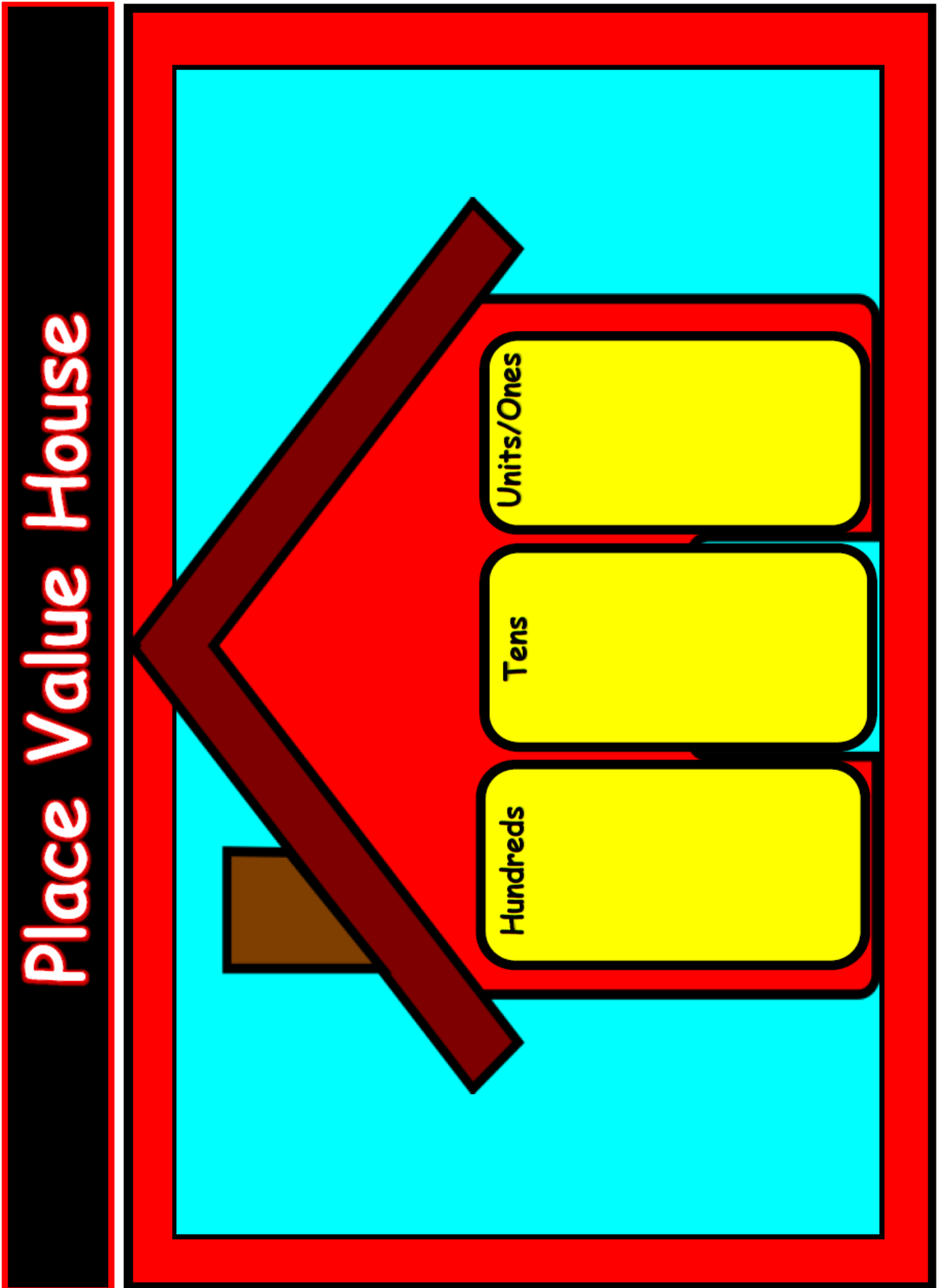
Appendix 14:	Cars, cars, cars guide

Place Value Top 5		
	Learning Goal	**Evidence of Learning**
⭐	I can read, write and order numbers to 100 000.	
⭐	I can partition large numbers to show their place value.	
⭐	I can explain how large numbers are organised in groups of three and why this pattern helps to read them.	
⭐	I can partition large numbers to make them easier to operate with.	
⭐	I can solve problems involving large numbers.	

Student Comment:

Teacher Comment:

Learning goals A: Read, write and order numbers to 100 000 B: Recognise, represent, visualise and work fluently with large numbers C: Take apart and recombine numbers in flexible ways D: Solve problems involving addition and subtraction that demonstrate understanding of place value	Ngo A B C D	Abdi A B C D	Thuy A B C D	Walter A B C D
Rosa A B C D	Suliman A B C D	Branislav A B C D	Olga A B C D	Fatima A B C D

Note: The bottom row also continues with Anna: A B C D

Appendix 2: Digit Cards

1	2
3	4
5	6

4	5
6	7
8	9

7	8
9	1
2	3

0	0
0	0
0	0

Appendix 3: Place Value Houses (Game board)

Place Value House

Units/Ones

Tens

Hundreds

Place Value Street

Quadrillion			Trillion			Billion		
Hundreds of quadrillion	Tens of quadrillion	Units/Ones of quadrillion	Hundreds of trillions	Tens of trillions	Units/Ones of trillions	Hundreds of Billions	Tens of Billions	Units/Ones of Billions

Place Value Street

Million			Thousand			No Name		
Hundreds of millions	Tens of millions	Units/Ones of millions	Hundreds of thousands	Tens of thousands	Units/Ones of thousands	Hundreds	Tens	Units/Ones

Appendix 5A: Place Value Period Cards

hundreds	tens	units/ones

hundreds	tens	units/ones

thousands

hundreds	tens	units/ones

millions

hundreds	tens	units/ones

billions

hundreds	tens	units/ones

trillions

hundreds	tens	units/ones

quadrillions

hundreds	tens	units/ones

quintillions

Thousands

Millions
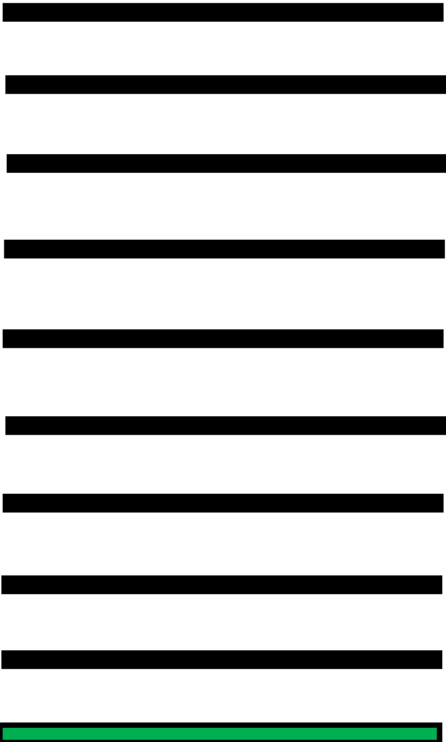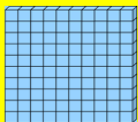
Billions

Trillions

Quadrillions

Quintillions

Appendix 6: Place Value Mats (HTU)

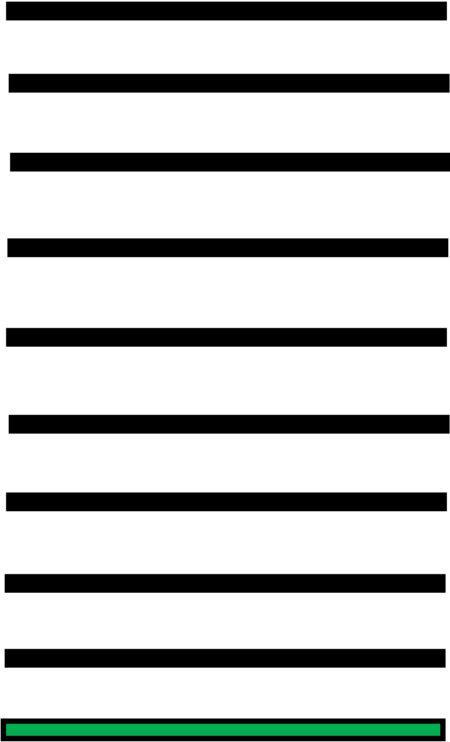| Hundreds	Tens	Units (ones)

Hundreds	Tens	Units

Appendix 7: More or Less Game Template

More or Less

Number Rolled	More or Less							
Example: 126	10 More							
136								
146								
156								
166								
176								
186								
196								
206								
216								

Appendix 8: Place Value Counting Train Track (Game board)

Place Value Counting Ladders

Counting Backwards

Counting forwards

Counting Backwards

Counting forwards

Appendix 9: Base Ten Riddles.

Base-Ten Riddles

Base-ten riddles can be presented orally or in written form. In either case, students should use base-ten materials to help solve them. The examples here illustrate a variety of different levels of difficulty. Have students write new riddles when they complete these.

I have 23 ones and 4 tens. Who am I?

I have 4 hundreds, 12 tens, and 6 ones. Who am I?

I have 30 ones and 3 hundreds. Who am I?

I am 45. I have 25 ones. How many tens do I have?

I am 341. I have 22 tens. How many hundreds do I have?

I have 13 tens, 2 hundreds, and 21 ones. Who am I?

If you put 3 more tens with me, I would be 115. Who am I?

I have 17 ones. I am between 40 and 50. Who am I? How many tens do I have?

These questions come directly from the teacher resource book, *Elementary and Middle School Mathematics Teaching Developmentally* (Van de Walle, Karp & Bay-Williams 2013, p. 212).

Appendix 10: Partitioning Challenge Cards

Partition challenge cards

Can you make the number **345** using only **32** blocks?

Can you make the number **278** using only **12** blocks?

Can you make the number **554** using only **42** blocks?

Can you make the number **742** using only **35** blocks?

Can you make the number **915** using only **43** blocks?

Can you make the number **874** using only **36** blocks?

Appendix 11: Number Board

Number Board

| Number after | 10 less | 100 less | 1000 less |
| Number before | 10 more | 100 more | 1000 more |

In words

Expanded notation

Appendix 12A: Blank 120 Place Value Chart

120 chart

Appendix 12B: Blank 120 Place Value Chart Cards

Note: Magnify this page to A3, and then laminate. Cut along the lines. Use these cards for the 120s chart.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120

Appendix 13A: Place Value with Pool Noodles

Place Value with Pool Noodles 1

Activity # 1- Creating and Comparing big numbers:

Teacher will model activity to the students to begin with.

Make a 2 digit number on the stick using the pool noodle number pieces.

Teacher will pose questions to the students.

For example:
- Which one is the units column?
- Which one is the tens column?
- What is the value of the number in the tens column?
- What is the value of the number in the units column?

Next teacher will place another pool noodle on the left handside of the stick and pose questions again.


For example:
- How has the number changed?
- What place value column is the new number?
- What is the value of the new number?
- Has the number become bigger or smaller?

Repeat this process until the number gets to 6 digits long.

Teacher may then get the students to place periods in. Once there are 6 digits on the stick teacher will ask the students what can we do to make it easier to read the number? Prompt students to think about where the different periods are. Pick a student to come up and place a space between the 2 periods.
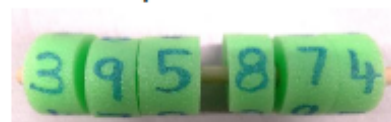
Change some digits by turning a few pool noodles. Question the students: What has happened to our number?, Is it greater or less than the previous number? Explain how you figured this out. Get students to have a go with creating their own numbers then sequencing them by comparing and lining up in order.

Place Value with Pool Noodles 2

Activity # 2- Creating and Comparing big numbers using processes and symbols (<, >, =, +)

Teacher will model activity to the students to begin with.

Make a 6 digit number on the stick using the pool noodle number pieces.

Teacher will pose questions to the students.

For example:
- Which one is the units column?
- Which one is the hundreds column?
- Which one is the hundred thousand column?
- What is the value of the number in the ten thousands column?
- What is the value of the number in the hundreds column?

Prompt students to think about where the different periods are. Pick a student to come up and place a space between the 2 periods.

Next teacher will create another 6 digit number using the pool noodles on another stick. Pose some questions to the students.

For example:
- Can you read the 2 numbers?
- Which one is the greater number?
- How do we know this?
- What can we place between the 2 numbers to show which one is greater?

Place the red pool noodle with the symbols inbetween the 2 numbers. Ask students, "Which symbol would be correct?", "What if I changed the symbol to less than what can I do to make this math sentence true?"

Get a student to change one of the 6 digit numbers to make the math sentence true.

What if I change the (<, >) symbol to (+) what would I have to do now?

Get students to have a go adding the 2 numbers using a white board and white board marker. Teacher will walk around and observe each student. This will give them an opportunity to walk around and see who is able to add the 2 numbers, who is able to grasp the concept of renaming once it is greater than 9 and who is able to recognise and name big numbers.

Students can have a go with a partner creating new numbers and comparing it with a partner or small group.

Adelaide Cars Guide

Column A

$16 990

$20 990

$22 880

$18 490

$21 990

Column B

$449 990

$55 990

$55 000

$76 295

$408 200

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