YuMi Deadly Maths

Year 3 Teacher Resource:

NA – Flying high

Prepared by the YuMi Deadly Centre
Faculty of Education, QUT

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Growing community through education

ACKNOWLEDGEMENT

We acknowledge the traditional owners and custodians of the lands
in which the mathematics ideas for this resource were developed,
refined and presented in professional development sessions.

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Year 3 Number and Algebra

Flying high

Learning goal	Students will partition four-digit numbers into place-value parts.
Content description	Number and Algebra – Number and place value • Recognise, model, represent and order numbers to at least 10 000 (ACMNA052) • Apply place value to partition, rearrange and regroup numbers to at least 10 000 to assist calculations and solve problems (ACMNA053)
Big idea	Number – place value; additive principle
Resources	Key-ring digit cards, Place Value Expander (PVE), Place Value (PV) cards, Place Value Chart (PVC), Montessori number cards to 10 000, strip mat, pattern-of-threes expander, Blu Tack, number line and pegs, calculators, brightly coloured velour strips

Reality

Local knowledge	Discuss where large numbers are found in the local environment, e.g. crowds at sporting events; distances between towns; cost of luxury cars, caravans, jewellery.
Prior experience	Revise representing three-digit numbers using the PVE, PVC, MAB blocks or arrow cards. Emphasise the HTO pattern of threes.
Kinaesthetic	Students are given PV cards to order on the strip mat. Then have students place the HTO of ones and the ones of thousands to indicate the pattern of threes. Students with key-ring digit cards (starting at 0) sit in front of each place. Reinforce face/place value. Flying high (whole to parts): Read four-digit numbers using the pattern of threes from a signpost showing distances from Brisbane to other capital cities in Australia. Students with key-ring digits flip the digits over to correspond with the distance shown. Other students stand behind with another set of PV cards. Continue pattern of threes (HTO): read, say, make different numbers from other distances with key-ring digit cards. Emphasise the flexibility in the numbers' representation. Each time, students take a Montessori card and Blu Tack it in the correct column, e.g. a student who is asked to make 2 thousand takes the 2000 card and places it in the thousands column. Other students record 2000 on calculators, 2 × 1000. Similarly students fill the other places. After they have made a four-digit number, all students state the recorded number with its standard place-value parts, e.g. 9950 = 9000 + 900 + 50 + 0. Peg the number made on the number line. Repeat process with other numbers. Students stand and hold the PV cards at chest height so that they can be seen above the seated students. Students with key-ring digit cards sit on a chair in front of each place and continue to flip the digits over to correspond with the number being considered in their place value in each example. This activity includes strip mat with PV words, key-ring digit cards, Montessori numbers, the number line and calculators being used simultaneously. Reverse (parts to whole): Key-rings start at zeros. One place at a time – *The distance from Brisbane to Melbourne in kilometres has 1 thousand, 7 hundreds, 7 ones, and 8 tens. How far is this?* [1787 km]. Use the key-ring cards and calculators. Say the number, record it in standard place-value parts, discuss and peg on the number line. *The distance from Brisbane to Sydney and back ("return distance") in kilometres has 4 hundreds, 1 thousand, 6 ones, and 6 tens. How far is this?* [1466 km]. Give other examples, all starting from Brisbane, and then arrange in ascending or descending order (Adelaide – 2049 km, Perth – 4339 km, Canberra – 1197 km, Darwin – 3425 km, Cairns – 1703 km, Mt Isa – 1824 km, Longreach – 1177 km, Uluru – 3240 km, Rockhampton return distance – 1268 km).

Abstraction

Body

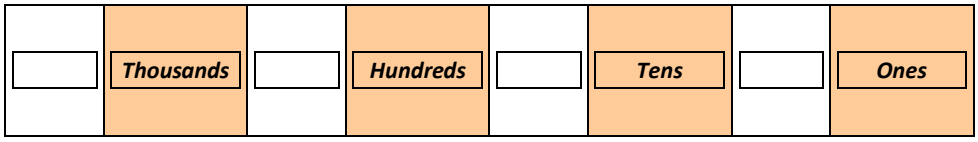
Whole to parts: Set the strip mat up in HTO of ones and ones of thousands. Students stand in squares to show the distance from Brisbane to Adelaide, 2049 km. *How many hundreds are there in this number?* (Note that students may say 0. That is the **digit** in the hundreds place.) The teacher gives one end of a velour strip to the student standing in the thousands place to hold, and the other end to the student standing in the hundreds place. *How many hundreds have been looped together?* [20] *So the distance from Brisbane to Adelaide is 20 hundreds and forty-nine kilometres. 2049 = 20 hundreds + forty + nine ones.* Repeat the process using other distances and linking different places.

Demonstrate other non-standard place-value parts by looping velour strips to the designated parts, e.g. Brisbane to Perth is 4339 = 433 whole tens and 9 ones (students with 4, 3, and 3 are looped together with a velour strip and the 9 stands alone).

Reverse: Give the parts, make the whole using single digit cards on strip mat, key-ring digit cards, Montessori numbers and calculators. Read the numbers. Repeat with more examples.

Hand

1. Number expander: Use a number expander to relate, in both directions, numbers to expanded form (e.g. 4326 → 4 thousands 3 hundreds 2 tens 6 ones, AND 4 thousands 3 hundreds 2 tens 6 ones → 4326). Pleat fold the expander at the coloured section so that it becomes, when folded, just four spaces and when opened the four spaces plus the expansion; you can also fold or open some sections at a time. Go from PVE → calculator → MAB → PVC and reverse, PVC → MAB → calculator → PVE.



2. Read-write calculator: Call digits, students enter on calculator and say number; say number, students enter on calculator and then say digits they used. Play "Wipe-out" – give a number and call out a digit – students enter number on calculator and reduce digit to zero with a single subtraction.
3. Calculator activity, "What is my number?": *My return distance from Brisbane is made up of these place-value parts to enter into the calculator: (a) 42 hundreds km and 83 km; (b) 619 tens km and 5 km; (c) 4298 km but I want to get rid of the digit 2, what is my distance now? What operation did you use?*
4. Use a number expander to find non-standard place-value parts, e.g.
   - 1354 as 

   - 1354 as 

Mind

Close your eyes and partition this distance: a four-digit number into standard/non-standard place-value parts; visualise a distance made up of 40 km and 52 hundreds km.

Creativity

Research and compile a list of places and their distances from Brisbane that students would like to visit.

Mathematics

Language/ symbols

count, place, ones, tens, hundreds, thousands, next, after, before, more, less, digit, value, partition, standard place-value parts, non-standard place-value parts, distance, return distance

Practice

1. Worksheets: Prepare column worksheets with one column filled in (students fill in others) as follows.

Picture (MAB on PVC)	Language	Symbol
	One thousand three hundred and seven	
		5302

Practise with virtual materials.

2. Given four-digit numbers, write:
   (a) the numeral and its name;
   (b) numbers one/ten/hundred/thousand smaller/bigger than;
   (c) numbers that come after/before.
3. Game "Close, closer, closest": Put 200 on PVC with MAB for each player. Each player enters 200 on calculator. Remove tens, Jacks, Queens, Kings from a card deck. Shuffle cards. Deal three cards to each player. Players, in turn, form a three-digit number from their cards, add this MAB to PVC (completing all trading) and add number to calculator. They read the number and say how many hundreds, tens and ones at each play. The game ends when the first player passes 6000 or the winner is the player closest to 6000 at that point. Option: Start at 6000 and remove the three-digit number at each turn. Closest player to 200 wins. (This activity can reinforce for the players that making the biggest number from the three cards will accelerate progress either towards 6000 or back to 200.)
4. For virtual activities, search: www.apples4theteacher.com/math.html; www.ixl.com/math/

Connections Relate to early grouping, money, measurement (metres, grams, litres).

Reflection

Validation Students check where thousands are used in the world, e.g. crowds attending a sporting event, some in the members' stand, others around the ring; cost of equipment for a home theatre, TV and sound equipment, furniture.

Application/ problems Provide applications and problems for students to apply to different real-world contexts independently; e.g. *From your search of places you would like to visit, find the closest and farthest from Brisbane. Arrange the other cities in order as stopovers on the way.*

Extension **Flexibility**. Students explain the ways they partition four-digit numbers and justify their explanations by reversing the process to re-establish the given number. Discuss how many ways there are to get 862 – 8 hundreds 6 tens 2 ones, 900 minus 38, 850 + 12, 2 × 400 + 62 and so on. Think of everywhere numbers are used (money, cards, addresses, imaginary things, on the back of footballers, board games, measuring tapes, codes on goods bought in shops, credit cards, names of TV stations/channels, and so on). Try to think of every possible use.

Reversing. Reverse everything. You say/write numbers, ask students to show material; you show material, ask students to write/say numbers. Reverse with many materials, for example, lead students through MAB on 1000s-100s-10s-1s PVC → saying thousands, hundreds, tens, ones → saying number properly → recording on small PVC → entering on calculator; then reverse and go from calculator → small PVC → proper language → saying thousands-hundreds-tens-ones → MAB on PVC. Then go backwards and forwards between materials ↔ digits giving examples that have zeros and teens. Students should be able to

move between telling a thousands story to acting it out to writing the whole number, partitioning it, starting from and moving between any given point.

Generalising. *A whole number is made up of the sum of its parts that may be arranged in many different ways to display the same whole number. The number system is based on groups of ten. Any group of ten is moved over to the next place. In any place, the digits start at 0 and go to 9, then back to 0 again, while the digit in the next column increases by one.*

Changing parameters. Give the place values in wrong order: *What number is 6 tens, 8 hundreds, 7 ones and 3 thousands?* Do a lot of these – it is important that students see that a number is determined by 1000s, 100s, 10s and 1s and it does not matter in what order the place-value positions are given. Reverse this – get students to give all the different ways that 2587 could be given – 2 thousands, 5 hundreds, 8 tens, 7 ones; 8 tens, 7 ones, 5 hundreds, 2 thousands; 7 ones, 8 tens, 2 thousands, 5 hundreds; and so on.

Extend students to five-digit numbers and relate five-digit numbers to measurement in kilograms, litres, money. Students should be able to partition numbers to thousands and ten thousands using money or measurement.

Teacher's notes

- Ensure that students have a sound understanding of standard partitioning before introducing non-standard partitioning.
- Students need to be taught the skill of visualising: closing their eyes and seeing pictures in their minds, making mental images; e.g. show a picture of a kookaburra, students look at it, remove the picture, students then close their eyes and see the picture in their mind; then make a mental picture of a different bird.
- Suggestions in Local Knowledge are only a guide. It is very important that examples in Reality are taken from the local environment that have significance to the local culture and come from the students' experience of their local environment.
- Useful websites for resources: www.rrr.edu.au; https://www.qcaa.qld.edu.au/3035.html
- Explicit teaching that **aligns with students' understanding** is part of every section of the RAMR cycle and has particular emphasis in the Mathematics section. The RAMR cycle is not always linear but may necessitate revisiting the previous stage/s at any given point.
- Reflection on the concept may happen at any stage of the RAMR cycle to reinforce the concept being taught. Validation, Application, and the last two parts of Extension should not be undertaken until students have mastered the mathematical concept as students need the foundation in order to be able to validate, apply, generalise and change parameters.

