YuMi Deadly Maths

Year 4 Teacher Resource:

NA – How many quads?

Prepared by the YuMi Deadly Centre

Faculty of Education, QUT

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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 4   Number and Algebra

How many quads?

Learning goal	Students will: • revise and extend fluency of recall of the 4× facts • solve multiplication and division problems • describe and continue patterns created from multiplication.
Content description	Number and Algebra – Number and place value • Investigate number sequences involving multiples of 3, 4, 6, 7, 8, and 9 (ACMNA074) • Recall multiplication facts up to 10 × 10 and related division facts (ACMNA075) • Develop efficient mental and written strategies and use appropriate digital technologies for multiplication and for division where there is no remainder (ACMNA076) Number and Algebra – Patterns and algebra • Explore and describe number patterns resulting from performing multiplication (ACMNA081) • Solve word problems by using number sentences involving multiplication or division where there is no remainder (ACMNA082)
Big idea	Number – multiplication and division; Algebra – patterns
Resources	99 board, calculators, highlighters

Reality	
Local knowledge	Discuss families with sets of twins, triplets, quads to establish that quads come in groups of four; four players in tennis doubles; relay teams of four; cars run on four wheels; dogs, cats, horses and other animals have four legs.
Prior experience	Check that students know the fours fact family and related division facts.
Kinaesthetic	Game: How many legs? Teacher calls out numbers, 1–10, randomly and students then get into groups of that number, e.g. 5. Teacher then nominates an animal with four legs: *You are koalas. How many legs in your group?* Where the class does not divide evenly into the number called (e.g. class of 27 into groups of 5), there will be 5 groups of 5 students with 5 × 4 koala legs in each group = 20 legs in each group, and a group of 2 students with 2 × 4 koala legs = 8 legs. Repeat process using different numbers and different four-legged animals.

Abstraction	
Body	Starting at 0 on an outside 99 board, students skip count in fours and a student stands on each of the multiples of four. Students call out the numbers that are multiples of four. Look at the multiples of four. *What are the digits in the ones place?* Students say the fours pattern starting from 4, e.g. 4, 8, 2, 6, 0, 4, 8, 2, 6, 0 ... to establish that the ones pattern always ends in 0 or 4 or 8 or 2 or 6. Working down the vertical columns starting at the column ending in 0, students say the multiples of 4, e.g. 20, 40, 60, 80, 100; 12, 32, 52, 72, 92; 4, 24, 44, 64, 84; 16, 36, 56, 76, 96; 8, 28, 48, 68, 88. Students explore and describe the tens when the ones are 0, 4, 8 (the tens are even). *What is the tens pattern when ones are 2 or 6?* [the tens are odd]. Extend the 99 board to include numbers to 300. Investigate whether the above pattern continues. Formulate a generalisation regarding the multiples of four. Reverse: *How can you tell whether a number can be divided into groups of four?* [The even

tens will end in 0, 4 or 8 and the odd tens will end in 2 or 6.] *Does this remain true for any number with digits extending beyond two/three/four … digits?* Check with calculators.

Act out the double-double strategy to find fours facts; e.g. 2 lines of 8 students = 16 students. Another 2 lines of 8 students (16 students) make 16 + 16 students = 32 students altogether. (*Notice the pattern: odd tens end in 2 or 6*.)

Reverse using the halve-halve strategy.

Set multiplication and division word problems for students to solve by acting the problems. Always restate the pattern for multiplication/division by four.

Hand	1. Calculator practice with multiplication and division by four that consolidates the kinaesthetic examples in the Abstraction section above. Record the number sentences of examples given.
	2. Colour the fours pattern on a hundreds board to 300 using two different highlighters, one colour for multiples ending in 0, 4, 8 and a different colour for multiples ending in 2 or 6.
Mind	Students visualise a given number and then double-double/halve-halve it to make it four times bigger/smaller.
Creativity	Students design a poster that shows multiples of four.

Mathematics

Language/ symbols	multiply, divide, fact family, double, halve, multiples, extended facts, fluency, patterns, repetition, strategy, part, whole, number sentence, operation
Practice	1. Complete number patterns based on multiples of four:
	• List multiples of four in ascending and descending order.
	• List 10 to 20 three-digit and four-digit numbers from any starting point – circle the ones that are multiples of four; make a different list and underline the numbers that are divisible by four. (Students need to look only at the tens and ones, e.g. 7926 – even tens must end in 0, 4, 8 so 7926 is not divisible by 4; 3176 – odd tens must end in 2 or 6 so 3176 is divisible by 4.)
	• Discuss strategies used to complete patterns.
	2. Investigate multiplication and division word problems, identifying the parts, the whole, missing elements and the operation required to solve the problem.
	3. Match or write number sentences required to solve word problems.
Connections	Compare the fours pattern with the twos pattern.

Reflection

Validation	Students check where groups of four are seen in their world, e.g. players for Ludo and other games; families of four.
Application/ problems	Provide applications and problems for students to apply to different real-world contexts independently; e.g. Sending out 34 invitations for a party and then doubling the number of guests, doubling again because both girls and boys are now invited. *Camp cabins have four beds in each cabin, how many cabins will be needed to accommodate 112 students? If another school with 352 students came to the campsite, how many extra cabins would be required?*
Extension	**Flexibility**. Students have a number of methods to multiply by four and can recognise whether a number is a multiple of four; e.g. Give any number: *What do I need to do to make the number a multiple of four/divisible by four? (Look for both addition and subtraction, e.g. 3857: add 3 or subtract 1; justify your reason and check the answers with a calculator.)*

Reversing. Students are able to multiply and divide by four and given a multiple find how many fours it contains. Students can tell stories about four and its multiples, act out the stories, model, use appropriate language and symbols starting from any given point.

Generalising. *The multiples of four end in 0, 4, 8 when the tens are even and 2 or 6 when the tens are odd.*

Doubling and then doubling the answer is the same as multiplying by four. Halving the given number and halving it again is the same as dividing by four.

Changing parameters. Students investigate and identify the visual patterns created by multiplying combinations of two- or three-digit number sets by four.

Describe, predict and continue visual and number patterns.

Investigate the numbers that are multiplied by four to give 2, 4, 6, 8, 0 as ones in the answer; e.g. numbers ending in 1 will have 4 in the ones place.

Students practise multiplying larger numbers by four in their heads using the double-the-double strategy.

Teacher's notes

- Ensure students are fluent in the fours facts to 4 × 10 before extending to related facts.
- 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.