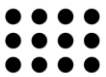
AMSI SCHOOLS LESSON OUTLINE

LEVEL: Year 2	CONTENT: Number & Algebra	FOCUS: Arrays
In the Classroom		
PURPOSE	• Use materials to create an array • Read, draw. label and interpret arrays • Use skip counting and known facts to find the total in an array • Make connection between arrays and factors • Use arrays to show commutativity in multiplication	
WARM UP	**What do you see?** Introduce arrays to students by showing them a 3 x 4 array of dots. Ask students to explain what they see – record any ideas. Then tell the students that in maths we call this an array. Again, ask students to explain what they see. Compare responses. Explain to students how we read and label arrays.	
INTRODUCTION	Brief introduction to Good Mathematicians – make a list and place on the board, include teamwork, asking questions, sharing ideas, recording ideas, explaining thinking, persistence, checking solutions, working systematically and learning from mistakes.	
EXPLICIT TEACHING & LEARNING	**Apple Trees** Fred wants to plant a field of apple trees. He can get 24 trees at a cheap price. How many different ways can he plant his trees? How many rows should he plant? How many trees should be in each row? Use arrays to show all the different ways Fred can plant his trees **Challenge** Using your knowledge of the arrays for 24 apple trees can you find a number that has… Less arrays; Only 2 arrays; The same number of arrays; More arrays	
DISCUSSION/KEY QUESTIONS	• Can you use materials to model a possible array for 24 trees? • How could you draw and label this array? • Can you describe the array using words and symbols? • How so you know you have found all the possible arrays? • What do we call the numbers that make up the array? • Do all numbers have the same number of arrays or factors?	
DELIBERATIVE PRACTICE	The focus of this activity is to discover if students read, interpret and create arrays to represent different amounts. Students may need some explicit teaching in regard to being able to correctly label and interpret arrays. A solid understanding of arrays will help students to identify factors for numbers and will also assist with students being able to use the area model to solve multi-digit multiplication problems.	
REFLECTION	Reflect on how to read, label, draw and interpret arrays. Link arrays to factors of numbers. Also reflect as a class on students who were a Good Mathematician and why – have students nominate one another.	
RESOURCES	Counters (preferable square tiles) More information https://nzmaths.co.nz/resource/arrays-hooray	

Curriculum Connections	
CONTENT	**NSW Syllabus Mathematics K-10 – Stage 2** **Multiplication and Division 1** Recall multiplication facts of two, three, five and ten and related division facts (ACMNA056) count by twos, threes, fives or tens using skip counting • use mental strategies to recall multiplication facts for multiples of two, three, five and ten • relate 'doubling' to multiplication facts for multiples of two, e.g. 'Double three is six' (Reasoning) • recognise and use the symbols for multiplied by (×), divided by (÷) and equals (=) • link multiplication and division facts using groups or arrays, e.g.  3 rows of 4 is 12 $3 \times 4 = 12$ 4 columns of 3 is 12 $4 \times 3 = 12$ 12 shared into 3 rows is 4 $12 \div 3 = 4$ 12 shared into 4 columns is 3 $12 \div 4 = 3$ • explain why a rectangular array can be read as a division in two ways by forming vertical or horizontal groups, e.g. 12 ÷ 3 = 4 or 12 ÷ 4 = 3 (Communicating, Reasoning) • model and apply the commutative property of multiplication, e.g. 5 × 8 = 8 × 5 **Multiplication and Division 2** Recall multiplication facts up to 10 × 10 and related division facts (ACMNA075) count by fours, sixes, sevens, eights and nines using skip counting • use the term 'product' to describe the result of multiplying two or more numbers, e.g. 'The product of 5 and 6 is 30' • use mental strategies to build multiplication facts to at least 10 × 10, including: ○ using the commutative property of multiplication, e.g. 7 × 9 = 9 × 7 ○ using known facts to work out unknown facts, e.g. 5 × 7 is 35, so 6 × 7 is 7 more, which is 42 ○ using doubling and repeated doubling as a strategy to multiply by 2, 4 and 8, e.g. 7 × 8 is double 7, double again and then double again ○ using the relationship between multiplication facts, e.g. the multiplication facts for 6 are double the multiplication facts for 3 ○ factorising one number, e.g. 5 × 8 is the same as 5 × 2 × 4, which becomes 10 × 4 • recall multiplication facts up to 10 × 10, including zero facts, with automaticity • find 'multiples' for a given whole number, e.g. the multiples of 4 are 4, 8, 12, 16, … • relate multiplication facts to their inverse division facts, e.g. 6 × 4 = 24, so 24 ÷ 6 = 4 and 24 ÷ 4 = 6 • determine 'factors' for a given whole number, e.g. the factors of 12 are 1, 2, 3, 4, 6, 12 • use the equals sign to record equivalent number relationships involving multiplication, and to mean 'is the same as', rather than to mean to perform an operation, e.g. 4 × 3 = 6 × 2 ○ connect number relationships involving multiplication to factors of a number, e.g. 'Since 4 × 3 = 6 × 2, then 4, 3, 2 and 6 are factors of 12' (Communicating, Reasoning)
WHAT CAME BEFORE	Students may be familiar with representing numbers as piles of equals groups, say 3 groups of 4 counters. Often, when counting this type of arrangement students will revert to counting all. We need to shift students onto the more practical arrays representation and encourage students to use skip counting and known facts to help them find the total. Using square tiles helps to link arrays with grids and grids are a precursor to areas and the area model.
WHAT COMES NEXT	Arrays are a precursor to grids and the area model. Many students will favour the traditional multiplication algorithm as it may be the first method they have been shown. This model, although effective at solving multiplication problems involving numbers, has no further applications. The area model can be linked with quadratic equations.
VOCABULARY	Array, count all, skip count, number facts, multiplication, division, factors, multiples, representation, groups of, rows, commutativity, turn around facts
MISCONCEPTIONS	Although arrays are useful at showing commutativity, such as 3 x 4 = 4 x 3, the array is a 90-degree turn. Although the total is the same, we label the array differently – many students have trouble with this, thinking that if the total is the same the array does not matter. It does matter for future applications of arrays.

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WHAT PROFICIENCIES ARE TO BE UTILISED? **Understanding** **Fluency** **Problem Solving** **Reasoning** **Communicating (NSW)** **Justifying (NSW)**	**Year 4 (Australian Curriculum)** **Understanding** includes making connections between representations of numbers, partitioning and combining numbers flexibly, extending place value to decimals, using appropriate language to communicate times and describing properties of symmetrical shapes **Fluency** includes recalling multiplication tables, communicating sequences of simple fractions, using instruments to measure accurately, creating patterns with shapes and their transformations and collecting and recording data **Problem-solving** includes formulating, modelling and recording authentic situations involving operations, comparing large numbers with each other, comparing time durations and using properties of numbers to continue patterns **Reasoning** includes using generalising from number properties and results of calculations, deriving strategies for unfamiliar multiplication and division tasks, comparing angles, communicating information using graphical displays and evaluating the appropriateness of different displays. **NSW Syllabus Mathematics K-10 – Stage 2 Outcomes** uses appropriate terminology to describe, and symbols to represent, mathematical ideas selects and uses appropriate mental or written strategies, or technology, to solve problems checks the accuracy of a statement and explains the reasoning used uses mental and informal written strategies for multiplication and division
ASSESSMENT	Name a lower number, say 6 and have students draw and label all the possible arrays