LEVEL: Year 6	CONTENT: Number & Algebra	FOCUS: Pattern
In the Classroom		
PURPOSE	• Count forwards and backwards using fractions, e.g. ½, 1, 1½ , 2, etc. • Use fractions to represent information • Identify, continue and create simple number patterns involving adding fractions • Solve word problems that involve addition and subtraction of fractions with the same denominator and denominators that are a multiple • Represent and recognise equivalent fractions • Use what is known about a pattern to develop a rule or generalisation	
WARM UP	**Pass the Count** Students get into groups of 4 or 5. A starting number is chosen, as well as a number to count forwards (or backwards) by. Students stand in a circle and use "pass the count" around the circle. The direction of the count travels is determined by students placing their hand on their opposite shoulder. To pass the count left you place your right hand across your body on your left shoulder. To pass the count right you place your left hand across your body and onto your right shoulder. Introduce the game by playing with whole numbers and familiar counting patterns, then move to fractions.	
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	**Keep it Simple** **Unit fractions (fractions which have numerators of 1) can be written as the sum of two different unit fractions.** For example: $\frac{1}{2}=\frac{1}{3}+\frac{1}{6}$ Charlie thought he had spotted a rule and made up some more examples. $\frac{1}{2}=\frac{1}{10}+\frac{1}{20}$ $\frac{1}{3}=\frac{1}{4}+\frac{1}{12}$ $\frac{1}{3}=\frac{1}{7}+\frac{1}{21}$ $\frac{1}{4}=\frac{1}{5}+\frac{1}{20}$ Are all his examples correct? What do you notice about the equations that are correct? **Challenge** Can you find some more correct examples? How would you explain to Charlie how to generate lots of correct examples?	
DISCUSSION/KEY QUESTIONS	• What is a unit fraction? How do you read/record fractions? • How can we use equivalent fractions to check if the equation makes sense and is correct? • What do you notice about the equations Charlie has written? • Do you notice any patterns? • How can you check these are correct? • What happens when we add fractions? • Why is the denominator important? • Can we use a diagram to show what is happening?	
DELIBERATIVE PRACTICE	The focus of this activity to challenge students to unpack a rule and see if it is being used correctly. Often students will just learn a rule and blindly use it. This task gets students to stop and think and then make corrections to ensure the rule works in all cases (generalise).	

REFLECTION	Help students unpack what they have discovered and encourage students to see that to be correct, one of the unit fractions must have a denominator which is 1 more than the denominator of the original unit fraction, and the other unit fraction must have a denominator which is the product of the other two denominators. Also reflect as a class on students who were a Good Mathematician and why – have students nominate one another. Remind students of list created at the beginning of the lesson.
RESOURCES	1cm x 1cm grid paper (may be useful to represent the different amounts) NRICH problem – Keep it Simple https://nrich.maths.org/6540/solution
Curriculum Connections	
CONTENT	**NSW Syllabus Mathematics K-10 – Stage 3.2** **Patterns & Algebra 2** Continue and create sequences involving whole numbers, fractions and decimals; describe the rule used to create the sequence (ACMNA133) • continue and create number patterns, with and without the use of digital technologies, using whole numbers, fractions and decimals, e.g. 14, 18, 116, … or 1.25, 2.5, 5, … **Fractions and Decimals 2** Compare fractions with related denominators and locate and represent them on a number line (ACMNA125) • record equivalent fractions using diagrams and numerals • develop mental strategies for generating equivalent fractions, such as multiplying or dividing the numerator and the denominator by the same number, e.g. $\frac{1}{4} = \frac{1\times2}{4\times2} = \frac{1\times3}{4\times3} = \frac{1\times4}{4\times4} = \ldots$, ie $\frac{1}{4} = \frac{2}{8} = \frac{3}{12} = \frac{4}{16} = \ldots$ • explain or demonstrate why two fractions are or are not equivalent (Communicating, Reasoning) • write fractions in their 'simplest form' by dividing the numerator and the denominator by a common factor, e.g. $\frac{4}{16} = \frac{4\div4}{16\div4} = \frac{1}{4}$ • recognise that a fraction in its simplest form represents the same value as the original fraction (Reasoning) Solve problems involving addition and subtraction of fractions with the same or related denominators(ACMNA126) • add and subtract fractions, including mixed numerals, where one denominator is the same as, or a multiple of, the other, e.g. $\frac{2}{3}+\frac{1}{6},\ 2\frac{3}{8}-1\frac{1}{2},\ 2\frac{3}{8}-\frac{3}{4}$ • convert an answer that is an improper fraction to a mixed numeral (Communicating) • use knowledge of equivalence to simplify answers when adding and subtracting fractions (Communicating, Reasoning)
WHAT CAME BEFORE	Students may be able to add fractions with the same denominator and may be aware of how to create equivalent fractions but the challenge here will be to combine this information in order to check if the rule holds.
WHAT COMES NEXT	Developing generalisations is really the key goal in higher order math. In this problem students need to interpret and check a rule created by someone else. Hopefully this experience will remind students that good mathematicians check their work and learn from their mistakes.
VOCABULARY	Repeating pattern, growing pattern, next, before, after, ordinal numbers, first, second, last, copy, continue, create, explain, unit of repeat, objects, rule or function of the pattern (e.g. 2, 4, 6, 8 the function is add 2 or + 2), skip counting, table, analyse, systematic, fraction, numerator, denominator, equation, equivalent, represent, factors, multiplication and division, lowest common denominator.
MISCONCEPTIONS	Some students, when adding fractions, will add the numerators and the denominators or add the numerators even with the denominators are not equivalent.

WHAT PROFICIENCIES ARE TO BE UTILISED? **Understanding** **Fluency** **Problem Solving** **Reasoning** **Communicating (NSW)** **Justifying (NSW)**	**Year 6 (Australian Curriculum)** **Understanding** includes describing properties of different sets of numbers, using fractions and decimals to describe probabilities, representing fractions and decimals in various ways and describing connections between them, and making reasonable estimations **Fluency** includes representing integers on a number line, calculating simple percentages, using brackets appropriately, converting between fractions and decimals, using operations with fractions, decimals and percentages, measuring using metric units and interpreting timetables **Problem-solving** includes formulating and solving authentic problems using fractions, decimals, percentages and measurements, interpreting secondary data displays and finding the size of unknown angles **Reasoning** includes explaining mental strategies for performing calculations, describing results for continuing number sequences, explaining the transformation of one shape into another and explaining why the actual results of chance experiments may differ from expected results. **NSW Syllabus Mathematics K-10 – Stage 3.2 Outcomes** • describes and represents mathematical situations in a variety of ways using mathematical terminology and some conventions • selects and applies appropriate problem-solving strategies, including the use of digital technologies, in undertaking investigations • gives a valid reason for supporting one possible solution over another • analyses and creates geometric and number patterns, constructs and completes number sentences, and locates points on the Cartesian plane
ASSESSMENT	Check whether students can use their knowledge of equivalent fractions to check the addition equations. Are students able to identify and apply the rule and explain and justify their thinking.