THE LEARNING ASSESSMENT FRAMEWORK (LAF) AND THE AUSTRALIAN CURRICULUM (ACARA)

LAF ZONES (Siemon et al., 2006)	LINKS TO THE AUSTRALIAN CURRICULUM: MATHEMASTICS (2015)
Zone 1: • **Solves simple multiplication and division problems** involving relatively small whole numbers, but tends to rely on drawing, models and count-all strategies. • **May use skip counting for groups less than five.** • **Makes simple observations from data** and **extends simple number patterns**. • Multiplicative thinking (MT) not really apparent as no indication that groups are perceived as composite units, dealt with systematically, or that the number of groups can be manipulated to support more efficient calculation.	**Foundation Year:** • **Subitise small collections of objects** (ACMNA003) • Represent practical situations to model addition and **sharing** (ACMNA289) ***Problem Solving:*** ***use familiar counting sequences to solve unfamiliar problems.*** **Year 1:** • Develop confidence with number sequences to and from 100 by ones from any starting point. **Skip count by twos, fives and tens starting from zero** (ACMNA012) • **Investigate and describe number patterns** formed by **skip counting** and patterns with objects (ACMNA018) • Recognise, model, read, write and order numbers to at least 100. **Locate these numbers on a number line** (ACMNA013) • **Recognise and describe one-half as one of two equal parts of a whole.** (ACMNA016) ***Problem Solving:*** ***use familiar counting sequences to solve unfamiliar problems.*** **Year 2:** • **Describe patterns with numbers and identify missing elements** (ACMNA035) • **Recognise and represent division as grouping into equal sets and solve simple problems using these representations** (ACMNA032)
Zone 2: • **Counts large collections efficiently** – keeps track of count but needs to see all groups. • **Shares collections equally.** • **Recognises small numbers as composite units (e.g. can count equal groups, skip count by twos, threes and fives).** • **Recognises multiplication needed** but tends not to be able to follow this through to solution. • Lists some of the options in simple Cartesian product situations. • **Some evidence of MT** as equal groups/shares seen as entities that can be counted.	**Year 2:** • **Group, partition and rearrange collections up to 1000 in hundreds, tens and ones to facilitate more efficient counting** (ACMNA028) • **Recognise and represent multiplication as repeated addition, groups and arrays** (ACMNA031) • **Recognise and interpret common uses of halves, quarters and eighths of shapes and collections** (ACMNA033) ***Understanding:*** **connecting number calculations with counting sequences** and **partitioning** and **combining numbers flexibly.** ***Fluency:*** **counting numbers in sequences readily.** **Year 3:** • **Investigate the conditions required for a number to be odd or even and identify odd and even numbers** (ACMNA051)

	• **Model and represent unit fractions including 1/2, 1/4, 1/3, 1/5 and their multiples to a complete whole** (ACMNA058) • **Represent and solve problems involving multiplication using efficient mental and written strategies and appropriate digital technologies** (ACMNA057) • **Recall multiplication facts of two, three, five and ten and related division facts** (ACMNA056) ***Understanding:*** **partitioning** and **combining numbers flexibly** and **representing unit fractions** ***Fluency:*** **recalling multiplication facts**
Zone 3: • Demonstrates intuitive sense of proportion. • **Works with useful numbers such as 2 and 5 and intuitive strategies to count/compare groups (e.g., doubling, or repeated halving to compare simple fractions).** • May list all options in a simple Cartesian product, but cannot explain or justify solutions. • **Beginning to work with larger whole numbers and patterns but tends to rely on count all methods or additive thinking (AT).**	**Year 4:** • **Investigate and use the properties of odd and even numbers** (ACMNA071) • **Apply place value to partition, rearrange and regroup numbers to at least tens of thousands to assist calculations and solve problems** (ACMNA073) • **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) • **Recognise that the place value system can be extended to tenths and hundredths. Make connections between fractions and decimal notation** (ACMNA079) • **Explore and describe number patterns resulting from performing multiplication** (ACMNA081) ***Problem Solving:*** ***using properties of numbers to continue patterns*** ***Reasoning:*** ***using generalising from number properties and results of calculations*** *and* ***deriving strategies for unfamiliar multiplication and division tasks***
Zone 4: • **Solves simple multiplication and division problems involving two-digit numbers.** • Tends to rely on AT, drawings and/or informal strategies to tackle problems involving larger numbers, decimals and/or less familiar situations. • Tends not to explain thinking or indicate working. • **Partitions given number or quantity into equal parts and describes part formally.** • Beginning to work with simple proportion.	**Year 4:** • **Investigate equivalent fractions used in contexts** (ACMNA077) • **Count by quarters halves and thirds, including with mixed numerals. Locate and represent these fractions on a number line** (ACMNA078) • **Solve word problems by using number sentences involving multiplication or division where there is no remainder** (ACMNA082) ***Understanding:*** ***partitioning*** *and* ***combining numbers flexibly*** **Year 5:** • **Identify and describe factors and multiples of whole numbers and use them to solve problems** (ACMNA098)

	• **Solve problems involving multiplication of large numbers by one- or two-digit numbers using efficient mental, written strategies and appropriate digital technologies** (ACMNA100) • **Solve problems involving division by a one digit number, including those that result in a remainder** (ACMNA101) • **Compare and order common unit fractions and locate and represent them on a number line** (ACMNA102) • **Use equivalent number sentences involving multiplication and division to find unknown quantities** (ACMNA121) ***Understanding:*** ***comparing and ordering fractions and decimals and representing them in various ways*** ***Problem Solving:*** ***formulating and solving authentic problems using whole numbers***
Zone 5: • Solves whole number proportion and array problems systematically. • **Solves simple, 2-step problems using a recognised rule/relationship but finds this difficult for larger numbers.** • Determines all options in Cartesian product situations involving relatively small numbers, but tends to do this additively. • **Beginning to work with decimal numbers and percent.** • **Some evidence MT being used to support partitioning.** • **Beginning to approach a broader range of multiplicative situations more systematically**	**Year 5:** • **Use efficient mental and written strategies and apply appropriate digital technologies to solve problems** (ACMNA291) • **Compare, order and represent decimals** (ACMNA105) ***Reasoning:*** ***investigating strategies to perform calculations efficiently*** *and* ***continuing patterns involving fractions and decimals*** **Year 6:** • **Identify and describe properties of prime, composite, square and triangular numbers** (ACMNA122) • **Select and apply efficient mental and written strategies and appropriate digital technologies to solve problems involving all four operations with whole numbers** (ACMNA123) • **Find a simple fraction of a quantity where the result is a whole number, with and without digital technologies** (ACMNA127) • **Multiply decimals by whole numbers and perform divisions by non-zero whole numbers where the results are terminating decimals, with and without digital technologies** (ACMNA129) • **Multiply and divide decimals by powers of 10** (ACMNA130) • **Make connections between equivalent fractions, decimals and percentages** (ACMNA131) • **Investigate and calculate percentage discounts of 10%, 25% and 50% on sale items, with and without digital technologies** (ACMNA132) • **Continue and create sequences involving whole numbers, fractions and decimals. Describe the rule used to create the sequence** (ACMNA133) ***Fluency:*** ***calculating simple percentages, converting between fractions and decimals, and using operations with fractions, decimals and percentages***

	Problem Solving: ***formulating and solving authentic problems using fractions, decimals and percentages***
Zone 6: • Systematically lists/determines the number of options in Cartesian product situation. • **Solves a broader range of multiplication and division problems** involving 2-digit numbers, patterns and/or proportion but may not be able to explain or justify solution strategy. • **Renames and compares fractions in the halving family, uses partitioning strategies to locate simple fractions.** • Developing sense of proportion, but unable to explain or justify thinking. • **Developing capacity to work mentally with multiplication and division facts**	**Year 6:** • **Compare fractions with related denominators and locate and represent them on a number line** (ACMNA125) ***Understanding:*** ***representing fractions and decimals in various ways and describing connections between them*** ***Reasoning:*** ***explaining mental strategies for performing calculations*** **Year 7:** • **Investigate index notation and represent whole numbers as products of powers of prime numbers** (ACMNA149) • **Investigate and use square roots of perfect square numbers** (ACMNA150) • **Apply the associative, commutative and distributive laws to aid mental and written computation** (ACMNA151) • **Compare fractions using equivalence. Locate and represent positive and negative fractions and mixed numbers on a number line** (ACMNA152) • **Multiply and divide fractions and decimals using efficient written strategies and digital technologies** (ACMNA154) • **Express one quantity as a fraction of another, with and without the use of digital technologies** (ACMNA155) • **Connect fractions, decimals and percentages and carry out simple conversions** (ACMNA157) • **Find percentages of quantities and express one quantity as a percentage of another, with and without digital technologies.** (ACMNA158) • **Recognise and solve problems involving simple ratios** (ACMNA173) ***Fluency***: ***calculating accurately with integers*** *and* ***representing fractions and decimals in various ways*** ***Problem Solving***: ***formulating and solving authentic problems using numbers***
Zone 7: • **Solves and explains one-step problems involving multiplication and division with whole numbers using informal strategies and/or formal recording.** • **Solves and explains solutions to problems involving simple patterns, percent and proportion.** • May not be able to show working and/or explain strategies for situations involving larger numbers or less familiar problems. • **Constructs/locates fractions using efficient partitioning strategies.**	**Year 7:** • **Compare fractions using equivalence. Locate and represent positive and negative fractions and mixed numbers on a number line** (ACMNA152) ***Understanding:*** ***describing patterns in uses of indices with whole numbers,*** *and* ***connecting the laws and properties of numbers to algebraic terms and expressions*** ***Fluency:*** ***calculating accurately with integers*** *and* ***representing fractions and decimals in various ways***

• **Beginning to make connections between problems and solution strategies** and how to communicate this mathematically	***Problem Solving:*** ***formulating and solving authentic problems using numbers*** ***Reasoning*****:** ***applying the number laws to calculations*** *and* ***applying an understanding of ratio*** **Year 8:** • **Use index notation with numbers to establish the index laws with positive integral indices and the zero index** (ACMNA182) • **Carry out the four operations with rational numbers and integers, using efficient mental and written strategies and appropriate digital technologies** (ACMNA183) • **Solve problems involving the use of percentages, including percentage increases and decreases,** with and without digital technologies (ACMNA187) • **Solve a range of problems involving rates and ratios,** with and without digital technologies (ACMNA188) • **Simplify algebraic expressions involving the four operations** (ACMNA192) ***Understanding:*** ***identifying commonalities between operations with algebra and arithmetic.***
Zone 8: • **Uses appropriate representations, language and symbols to solve and justify a wide range of problems involving unfamiliar multiplicative situations,** fractions and decimals. • Can justify **partitioning**, and formally **describe patterns in terms of general rules.** • Beginning to **work more systematically** with complex, open-ended problems.	**Year 8:** • **Extend and apply the distributive law to the expansion of algebraic expressions** (ACMNA190) • **Factorise algebraic expressions by identifying numerical factors** (ACMNA191) ***Understanding:*** ***describe patterns involving indices, connecting rules for linear relations and their graphs.*** ***Fluency:*** ***includes formulating, and modelling practical situations involving ratios, profit and loss, and areas and perimeters of common shapes.*** **Year 9:** • **Solve problems involving direct proportion. Explore the relationship between graphs and equations corresponding to simple rate problems** (ACMNA208) • **Apply index laws** to numerical expressions with integer indices (ACMNA209) • **Extend and apply the index laws** to variables, using positive integer indices and the zero index (ACMNA212) • **Apply the distributive law to the expansion of algebraic expressions,** including binomials, and **collect like terms** where appropriate (ACMNA213) ***Understanding:*** ***describe the relationship between graphs and equations.*** ***Fluency:*** ***applying the index laws to expressions with integer indices.***