# Australian Curriculum: Mathematics Review 2020-2021





# PRESENTATION OVERVIEW

- Background to the review
- Core concepts in mathematics
- Learning area structural changes
- Content description refinement process
- Achievement Standards
- Content Elaborations and GCs and CCPs
- Curriculum key connections
- Consultation website and feedback process
- Q&A



Timing of the review



#### 12 June 2020

**On 12 June 2020**, Education Council endorsed ACARA's proposed terms of reference and tasked ACARA to undertake the review.



#### 29 April – 8 July

Public consultation on all proposed revisions will occur **from 29 April-8 July 2021.** 



#### Start of 2022

ACARA will publish the revised curriculum by the **start of 2022.** 

The first F-10 Australian Curriculum was published in December 2012 for English, mathematics, science and history, followed by geography in May 2013.

#### Background.

By October 2015, the curriculum for these areas had been revised as a result of the 2014 Australian Curriculum Review and republished, along with the other learning areas endorsed in September 2015. The 2015 Australian Government Review of ACARA recommended that ACARA undertake a six-year cycle of review of the Australian Curriculum.

### Current structure for the Australian Curriculum

#### Organisation of content

Achievement standards describe the expected standard of learning students should typically be able to demonstrate by the end of the year or band.

**Content descriptions** specify the essential knowledge, understandings and skills that students are expected to learn, and teachers are expected to teach in each year or band.

**Content elaborations** support the content descriptions and are *optional* elements of the Australian Curriculum. They provide teachers with suggestions and illustrations of ways to teach the content.

**Strands and sub-strands** – This content is organised under strands and in some cases, sub-strands.



#### Three dimensions

# concepts

We identified core concepts to ensure that the Review prioritised what is essential for students to learn in each learning area. In some learning areas, they also helped better organise the curriculum content.



ఫ్లో

Core concepts are the big ideas, understandings, skills or processes that are central to a learning area. They anchor a coherent curriculum and give clarity and direction about what matters. In the curriculum development process, core concepts help identify the essential content students should learn to develop a deep and increasingly sophisticated understanding of the learning area, across the years of schooling.



**Core concepts do not add another structural layer of the curriculum for teachers to understand.** Content descriptions and achievement standards remain the focus for teaching, learning, assessment and reporting.

### PROPOSED MATHEMATICS CORE CONCEPT FRAMEWORK

• Mathematical structures – the fundamental elements of mathematical systems, objects, operations and computations and how they are defined and relate to each other.

• Mathematical approaches – the processes and ways of thinking and working with mathematical objects, ideas, structures to conduct experiments and simulations, carry out investigations, apply mathematics to model situations, make deductions and solve problems.

• **Mathematising** – the process of seeing the world using mathematics by recognising, interpreting and representing situations mathematically.



## Advisory structure for the review





#### New reference groups established for review

F-6 Primary	
English	
Maths	
Science	
Humanities/Social Science	
The Arts	
Health/Physical Education	
Languages	
Technologies	

Curriculum Reference Group

professional associations, academics and other subjectspecific experts and groups



# What would you have listed as a key consideration for the review for Mathematics?

Take a moment to reflect and enter in the chat a key considerations you would have identified.

Essential Content - Determine what is essential content, addressing claims of the overcrowded curriculum and identify content redundancy through cross curriculum overlap. Need to ensure a focus on depth versus breadth resulting in surface learning.

**Proficiency Strands** - More explicit reference to the proficiency strands, especially adaptive reasoning and conceptual understanding within curriculum content and achievement standards. Proficiency strands need to be embedded and not seen as 'stand-alone'. Strong presence in the achievement standards as well as curriculum content descriptions and elaborations.

**Deep Connections** - Make explicit the deeper connections within and between the content strands, content descriptions and proficiency strands for teachers and students through the identification and use of core concepts.

Achievement Standards - Align the AC: M Achievement standards to the AC: M curriculum content descriptions ensuring that the expectations of mathematical proficiency are explicitly included.

Statistics and Probability Strand - Review both the learning sequences and content descriptions to ensure that both the content and achievement standards provide opportunity to develop identified core concepts, using authentic context to explore the statistical investigation process and opportunity to use reasoning rather than a set of disconnected skills.

**Use of technology** - Remove current wording of 'with and without technology' within content descriptions which is limiting and vague. Develop content and/or elaborations that are more explicit about the technology use, its functionality and purpose where appropriate.

**Computational Thinking** - The refinement of the Australian Curriculum: Mathematics provides the opportunity to introduce new content in this area, in line with contemporary international directions and repurpose existing curriculum content emphasising computational thinking process.

Year 10A Curriculum Content - Revisit the rationale for the inclusion of specific 10A content and look at the feasibility of embedding the content within the AC: M through detailed content choices aimed at all Senior Pathways.

Numeracy, AC: M and cross discipline Numeracy Demands - Provide clarity for teachers and consistency between the AC: GC Numeracy, Numeracy Continua, NAPLAN, NNLPs and Numeracy in the AC: M

AC: M Content Elaborations - Content elaborations need to support the content and exemplify best practice for ways of addressing general capabilities and cross curricula priorities through Mathematics.

Inclusion within the AC: M - Acknowledgement for the need for better inclusion within the AC: M through language use, representations used and exemplars/elaborations.

AC: M Glossary - AC: M glossary needs review in both content and functionality to provide better support for the interpretation and implementation for the curriculum.

**Cognitive Framework and Alignment** 

Consideration of cognitive developmental stages when sequencing content within years.

OFFICIAL

## PROPOSED EMBEDDING OF THE MATHEMATICAL PROFICIENCIES



Mathematical proficiency is the interplay between the interdependent strands of proficiency. Current strand structure:

- promotes thinking that they are independent from one another and from the content strands
- adds an additional layer to the curriculum that teachers must unpack
- not reflected in the Achievement Standards
- has led to misinterpretation that mathematical proficiency is not an expectation for all students

"The most important observation we make here, one stressed throughout this report, is that *the five strands are interwoven and interdependent in the development of proficiency in mathematics"* 

National Research Council. (2001). Adding it Up: Helping Children Learn Mathematics. Washington, DC: National Academy Press.(Page 116) Initial findings from the OECD Education 2030: MCDA project have ranked Australia poorly in its **explicit** expectation of Mathematical reasoning in the Australian Curriculum: Mathematics Content descriptions and Achievement Standards. OFFICIAL

## **REVIEW OF THE AC: MATHEMATICS STRUCTURAL FRAMEWORK**

<b>CURRENT FRAMEWORK</b>	STRANDS and SUB-STRANDS	Total
CONTENT STRANDS	Number and Algebra Measurement and Geometry Statistic and Probability	3
PROFICIENCY STRANDS	Understanding Fluency Problem Solving Reasoning	4
SUB-STRANDS	Number and place value Fractions and decimals Real numbers Money and financial mathematics Patterns and algebra Linear and non-linear relationships Using units of measurement Shape Geometric reasoning Location and transformation Pythagoras and trigonometry Chance Data representation and interpretation	13
Total		20



Figure 1: Gives an overview of the relationship between the 6 strands and the 3 core concept organisers in Mathematics



Streamline and declutter the structural framework AC: MATHEMATICS

# Refinement of Content Descriptions



## Content descriptions Refinement

Improve the quality of content descriptions within each learning area or subject to:

- remove ambiguity and ensure meaning is clear to teachers
- remove unnecessary duplication or repetition within a learning area and across learning areas
- ensure consistency and clarity of language across each lyear level and across learning areas
- align the cognitive performance demand of content descriptions within and across learning areas and year levels
- reflect new evidence and research developments in the learning area



#### **Refinement of content descriptions**

ఫ్లో

Embed the opportunity for students to learn and develop the identified core concepts in mathematics and embed the proficiency strands into content descriptions Clarity of expectation for teachers of what students are expected to learn ensuring the consistency of language and drawing on latest evidence and research into learning mathematics



Explicit reference to technology use building digital literacy and to financial literacy contexts where appropriate

# RESEARCH BASE FOR CONTENT REFINEMENT

- ACARA International Curriculum Comparative Studies, Finland, New Zealand, Singapore, British Columbia (Canada)
- Further Curriculum reviews, Sweden, Hong Kong, Japan, UK and US
- University of Cambridge Mathematics Framework
- OECD Education 2030 Project
  - Curriculum Content Mapping
  - Mathematics Curriculum Document Analysis
- AAMT
  - Growing Mathematically Project Prof. Di Siemon SNMY, RMFII
- MERGA
  - Australasian research in Mathematics Ed.
- National Numeracy Learning Progressions
- - Online Formative Assessment Initiative
- ReSolve Learning Progressions
  - Fractions, Proportional Reasoning and Statistical Variation
- International Learning progressions/trajectories
   Prof. Jere Confrey, Prof. Doug Clements and Prof. Julie Sarama
- Centre for Curriculum Redesign (CCR)

#### CAMBRIDGE √Mathematics







# ASSESSMENT FRAMEWORKS

- OECD PISA 2022
- TIMSS 2019
- NAPLAN
- ACER Learning Progression Explorer (LPE)
- Learning and Assessment Framework (LAF)
- NZ Learning Progression Framework (LPF)
- Maths Pathways



OFF

Percer	ntages	
Percer	ntages	
E		
50	)%	
30	0%	
20	0%	
Percer	ntages	
30	0%	
30	)%	
20	)%	
20	0%	
Percer	ntages	
Fourth Grade	Eighth Grade	
40%	35%	
40%	40%	
20%	25%	
		M
Education Services	aite	na na
	22 Percer 30 20 20 Fourth Grade 40% 20%	20%         30%         30%         20%

SS

**Online Formative Assessment Initiative** 

# refinement and clarity of expectation







### Content What's now explicit in the content



## **INQUIRY AND PROBLEM-SOLVING PROCESSES IN MATHEMATICS**

- Mathematical Modelling Process
- Computational Thinking Process
- Statistical Investigation Process
- Mathematical Experimentation
- Probability Simulations



embedding the proficiencies through explicit reference to mathematical processes



#### Mathematics – Mathematical modelling examples in *Number*

Foundation	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
model practical situations and solve problems involving addition and subtraction with physical and virtual materials, using counting or subitising strategies to determine the total or the number of objects remaining (AC9MFN04)	model situations (including money transactions) and solve problems involving one- digit and two-digit addition and subtraction using physical or virtual materials, diagrams and a range of strategies (AC9M1N04)	model situations (including money transactions) and solve problems involving addition and subtraction of two-digit numbers using part-w hole reasoning, number sentences, physical or virtual materials, diagrams and efficient strategies. Explain the results in terms of the situation (AC9M2N04)	model situations and solve problems (including representing money in different w ays) involving addition and subtraction of tw o-digit and three-digit numbers, applying know ledge of partitioning, place value and basic facts. Explain results in terms of the situation (AC9M3N05)	model situations (including financial contexts) and solve problems involving addition and subtraction of numbers to at least 10 000, by formulating expressions and choosing efficient strategies, including digital tools w here appropriate. Justify choices and explain results in terms of the situation (AC9M4N07)		
model practical situations and solve problems that involve equal sharing, through role play and games using physical and virtual materials (AC9MFN05)	model situations and solve problems that involve equal sharing and grouping using physical or virtual materials (including money) and diagrams, counting or subitising to find the number in each share or the combined total of the groups (AC9M1N05)	model situations (including money transactions) and solve problems involving multiplication and division, representing the situation as repeated addition, equal groups and arrays. Use a range of efficient strategies to find a solution. Explain the results in terms of the situation (AC9M2N05)	model situations (including financial contexts) and solve problems involving multiplication and division using diagrams, equal groups and arrays. Represent the situation as a number sentence and solve using digital tools w here appropriate. Explain the results in terms of the situation (AC9M3N06)	model situations (including financial contexts) and solve problems involving multiplication and division w here there is no remainder, using diagrams, arrays and number sentences choosing efficient strategies and using digital tools w here appropriate. Explain results in terms of the situation (AC9M4N08)	model situations (including financial contexts) formulating expressions using addition, subtraction, multiplication and/or division. Choose efficient strategies using the properties of operations and digital tools w here appropriate. Justify choices and explain results in terms of the situation (AC9M5N09)	model situations (including financial contexts) by identifying and describing a mathematical problem and formulating expressions using combinations of all four operations and brackets as appropriate. Choose efficient strategies, using digital tools w here appropriate. Justify choices and explain results in terms of the situation (AC9M6N09)

embedding the proficiencies through explicit reference to mathematical processes



#### Mathematics – Mathematical modelling examples in Algebra



# New content description

use linear functions to model and interpret situations. Represent these using tables, graphs on the Cartesian plane and algebra to interpolate, extrapolate and solve equations. Interpret solutions in the modelling context (AC9M8A03)

#### New

YEAR

O

#### content description

use linear and simple quadratic functions to model a variety of different situations involving change and represent these using tables, graphs on the Cartesian plane and algebra. Interpolate, extrapolate and solve equations, interpreting solutions in the modelling context (AC9M9A05)

embedding the proficiencies through explicit reference to mathematical processes

>





#### Mathematics – Statistical Investigation process examples in Statistics



## New content description

use the statistical investigation process to conduct guided statistical investigations involving the collection of categorical or discrete numerical data with respect to contexts and problems of interest (AC9M3ST03)

## New content description

plan and conduct statistical investigations, collecting and recording categorical data through survey responses and other means using digital tools (including spreadsheets) as appropriate. Interpret, compare and communicate findings within the context of the investigation (AC9M4ST03)





## New content description

plan and conduct statistical investigations by posing investigative questions or identifying a problem and collecting data relevant to the question or problem using surveys and digital tools. Select and use appropriate displays or visualisations, interpret and communicate findings or solutions within the context (AC9M5ST03

## New content description

plan and conduct statistical investigations by posing and refining investigative questions, collecting and recording sample sets of categorical or discrete numerical data using digital tools (including spreadsheets). Interpret and analyse the data and communicate findings within the context (AC9M6ST03)

embedding the proficiencies through explicit reference to mathematical processes





investigations that produce numerical data sets. Represent the data using appropriate displays. Analyse and interpret data distributions reporting results in terms of summary statistics (AC9M7ST04)

#### Mathematics – Statistical Investigation process examples in Statistics



relationship between samples and a

population and consideration of the

context. Use ethical, fair, and efficient

methods for gathering

relevant data (AC9M8ST04)

## YEAR 9



## New content description

plan, conduct and review statistical investigations involving comparative analysis of multiple univariate data sets collected directly or from secondary sources (AC9M9ST04)

# New content description

plan, conduct and review statistical investigations of association and trend in bivariate numerical data. Discuss association in terms of strength, direction and linearity (AC9M10ST05)

embedding the proficiencies through explicit reference to mathematical processes





### Content new ways of exploring content





# New content description

describe, follow and create algorithms involving a investigate numbers including odd and even numbers and multiples of 2, 3, 5 and 10 using computational thinking to recognise, describe and explain emerging patterns (AC9M3A04)

#### Mathematics – Computational thinking examples in Algebra



## New content description

>

describe, follow and create algorithms that numbers resulting from performing multiplication and use computational thinking to recognise, describe and explain emerging patterns (AC9M4A04)





# New content description

use algorithms and digital tools to explore factors and multiples and apply computational thinking to recognise, interpret and explain emerging patterns (AC9M5A03)

# New content description

use function machines and rules to generate sets of numbers and apply computational thinking to recognise, interpret and explain emerging patterns (AC9M6A04)

# **Revision of Achievement Standards**





By the end of Year 3, students recognise the connection between addition and subtraction and solve problems using efficient strategies for multiplication. They model and represent unit fractions. They represent money values in various ways. Students identify symmetry in the environment. They match positions on maps with given information. Students recognise angles in real situations. They interpret and compare data displays.

Students count to and from 10 000. They classify numbers as either odd or even. They recall addition and multiplication facts for single-digit numbers. Students correctly count out change from financial transactions. They continue number patterns involving addition and subtraction. Students use metric units for length, mass and capacity. They tell time to the nearest minute. Students make models of three-dimensional objects. Students conduct chance experiments and list possible outcomes. They conduct simple data investigations for categorical variables.

Achievement Standards Current misalignment between content and achievement standards e.g. Year 3



By the end of Year 3, students recognise the connection between addition and subtraction and solve problems using efficient strategies for multiplication. They model and represent unit fractions. They represent money values in various ways. Students identify symmetry in the environment. They match positions on maps with given information. Students recognise angles in real situations. They interpret and compare data displays.

Students count to and from 10 000. They classify numbers as either odd or even. They recall addition and multiplication facts for single-digit numbers. Students correctly count out change from financial transactions. They continue number patterns involving addition and subtraction. Students use metric units for length, mass and capacity. They tell time to the nearest minute. Students make models of three-dimensional objects. Students conduct chance experiments and list possible outcomes. They conduct simple data investigations for categorical variables.

#### CONTENT DESCRIPTIONS

- 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)

Achievement Standards Current cognitive expectation misaligned e.g. Year 3



By the end of Year 3, students recognise the connection between addition and subtraction and solve problems using efficient strategies for multiplication. They model and represent unit fractions. They represent money values in various ways. Students identify symmetry in the environment. They match positions on maps with given information. Students recognise angles in real situations. They interpret and compare data displays.

Students count to and from 10 000. They classify numbers as either odd or even. They recall addition and multiplication facts for single-digit numbers. Students correctly count out change from financial transactions. They continue number patterns involving addition and subtraction. Students use metric units for length, mass and capacity. They tell time to the nearest minute. Students make models of three-dimensional objects. Students conduct chance experiments and list possible outcomes. They conduct simple data investigations for categorical variables.

#### CONTENT DESCRIPTIONS

- Recognise and explain the connection between addition and subtraction (ACMNA054)
- Recall addition facts for single digit numbers and related subtraction facts to develop increasingly efficient mental strategies for computation (ACMNA055)

#### **Achievement Standards**

Revised achievement standards better aligned and structured e.g. Year 3

By the end of Year 3 students apply an understanding of place value and the structure of numbers when partitioning, rearranging, regrouping and renaming numbers to at least 10 000 in different ways. They use addition and subtraction as inverse operations. Students establish and use single-digit addition and related subtraction facts to construct equivalent number sentences and to develop additive strategies for modelling and solving problems involving two-digit and three-digit numbers. They round numbers to make estimates for financial and other calculations. Students model situations and solve problems involving single-digit multiplication and division using diagrams, equal groups and arrays. They apply partwhole understanding to represent unit fractions and their multiples in different ways. Students identify, create and continue patterns formed by multiplying or dividing by two. They create and use algorithms to investigate the properties of odd and even numbers and to identify patterns and develop facts for single-digit multiplication of two, three, five and ten.



Students use known measurements of familiar items to compare and make estimates and use familiar metric units when measuring attributes of objects and events. They identify angles as measures of turn. Students communicate estimates and measures of duration using formal units of time. They identify key features of objects and connect them to how the objects are used and classified. Students create twodimensional representations of environments that show the positions of objects relative to each other. They identify and describe line symmetry in the environment.

Students communicate with reasons, results and conclusions from guided statistical investigations involving categorical and discrete numerical data. Students record, represent and compare collected data using appropriate methods. Students identify all possible outcomes of chance events and report on variation observed when chance events are repeated.

Algebra





#### **Achievement Standards**

Revised achievement standards better aligned and structured e.g. Year 3



#### Year 3

By the end of Year 3 students apply an understanding of place value and the structure of numbers when partitioning, rearranging, regrouping and renaming numbers to at least 10 000 in different ways. They use addition and subtraction as inverse operations. Students establish and use single-digit addition and related subtraction facts to construct equivalent number sentences and to develop additive strategies for modelling and solving problems involving two-digit and three-digit numbers. They round numbers to make estimates for financial and other calculations. Students model situations and solve problems involving single-digit multiplication and division using diagrams, equal groups and arrays. They apply part-whole understanding to represent unit fractions and their multiples in different ways. Students identify, create and continue patterns formed by multiplying or dividing by two. They create and use algorithms to investigate the properties of odd and even numbers and to identify patterns and develop facts for single-digit multiplication of two, three, five and ten.

Students use known measurements of familiar items to compare and make estimates and use familiar metric units when measuring attributes of objects and events. They identify angles as measures of turn. Students communicate estimates and measures of duration using formal units of time. They identify key features of objects and connect hem to how the objects are used and classified. Students create two-dimensional representations of environments that show the positions of objects relative to each other. They identify and describe line symmetry in the environment.

Students communicate with reasons, results and conclusions from guided statistical investigations involving categorical and discrete numerical data. Students record, represent and compare collected data using appropriate methods. Students identify all possible outcomes of chance events and report on variation observed when chance events are epeated.

	represent, read, write, rename and order natural numbers to at least 10 000 using naming and writing conventions for larger numbers and relate these representations to place value in the base 10 number system (AC9M3N01)
	apply place value to partition, rearrange and regroup numbers to at least 10 000 to assist in calculations when solving problems (AC9M3N02)
-	round natural numbers to the nearest multiple of five or ten to make estimates for financial transactions and to solve other practical problems (AC9M3N03)
Numbe	recognise and use different models to represent the unit fractions $\frac{1}{2}$ , $\frac{1}{a}$ , $\frac{1}{a}$ , $\frac{1}{a}$ , $\frac{1}{a}$ and their multiples. Combine fractions with the same denominator to complete the whole using part-whole understanding (AC9M3N04)
	model situations and solve problems (including representing money in different ways) involving addition and subtraction of two-digit and three-digit numbers, applying knowledge of partitioning, place value and basic facts. Explain results in terms of the situation (AC9M3N06)
	model situations (including financial contexts) and solve problems involving multiplication and division using diagrams, equal groups and arrays. Represent the situation as a number sentence and solve using digital tools where appropriate. Explain the results in terms of the situation (AC9M3N07)
	identify, continue and create extended number sequences formed by doubling and halving using technology to assist where appropriate. Identify and describe emerging patterns (AC9M3A01)
ebra	recognise and explain the connection between addition and subtraction as inverse operations and apply to partition numbers when generating equivalent number sentences (AC9M3A02)
Alge	recognise and explain patterns in basic addition facts up to 10 + 10 and related subtraction facts. Extend apply these patterns to develop efficient mental strategies for computation with larger numbers (AC9M3A03)
	describe, follow and create algorithms involving a sequence of steps and decisions to investigate numbers including odd and even numbers and multiples of 2, 3, 5 and 10 using computational thinking to recognise, describe and explain emerging patterns (AC9M3A04)

order and compare objects using familiar metric units of length, mass and capacity to solve practical problems (AC9M3M01

ecognise which metric units are used to measure everyday items and use known measures and related units as a benchmark to make, improve and check the easonableness of estimates (AC9M3M02)

ent

Measure

lentify angles as measures of turn such as a right angle (quarter turn) and compare angle sizes in everyday situations (AC9M3M04)

Space eate, use and interpret models of familiar environments positioning representations of key landmarks and objects relative to each other (AC9M3SP02)

entify line symmetry in the environment, using terms such as vertical, horizontal and diagonal to describe the lines (AC9M3SP03)

equire categorical or discrete numerical data by observing, collecting and accessing existing data sets. Record and represent it using appropriate methods (including requency tables and spreadsheets) and use total frequencies to compare data (AC9M3ST01)

Statistics interpret and compare various displays using software to construct graphs where appropriate. Interpret, describe and explain them in the context they represent (AC9M3ST02)

use the statistical investigation process to conduct guided statistical investigations involving the collection of categorical or discrete numerical data with respect to contexts and problems of interest (AC9M3ST03)

duct chance experiments, involving repetitions of an activity, experiment or game. List and describe the set of all possible outcomes, recognising and recording variation in results using digital tools as appropriate (AC9M3P01)

# Other considerations during the review



## A coherent and clear Foundation year

	English	t = X ÷ Maths	Science	HASS	<b>X</b> o HPE	The Arts	Technologies	Languages
Achievement standards								
	1	1	1	1	1	1	1	1
	2	2	2	2	2	2	2	2
	3	3	3	3	3	3	3	3
	4	4	4	4	4	4	4	
	5	5	5	5	5		5	
	6	6	6	6	6			
Content	7	7	7	7				
descriptions	8	8	8	8				
	9	9	9	9				
	10	10		10				
	11	11						
	12	12						
	32							

## **F-6 INTENSIVE ENGAGEMENT PROJECT**

- 17 May to 9 July 2021
- 50+ schools in metro, regional, remote and very remote locations
- The aims of the project are to:
  - > use the revised Australian Curriculum (AC) to create a scope and sequence
  - ➢ test out the manageability of the revised AC
  - > evaluate current planning practices and consider your school's unique situation
  - > collaborate with others to share ideas for developing a scope and sequence
  - > evaluate current plans to identify what works and what could be improved
- Schools will undertake either option A or B:
  - > Option A: Plan a whole school scope and sequence plan across all learning areas and all year levels F–6.
  - > Option B: Plan a scope and sequence across all learning areas for either one year level or one band.

### Pathways to senior secondary

#### AUSTRALIAN CURRICULUM, ASSESSMENT AND REPORTING AUTHORITY



Year 10

Optional content that will support pathways to senior secondary mathematics (Mathematical Methods and Specialist Mathematics)

In Year 10, students will consider possible pathways to senior secondary mathematics study. Preparation for subsequent study of Units 1 and 2 of Mathematical Methods and Specialist Mathematics can be strengthened by further exploring some aspects of mathematics content in Year 10 as a basis for building understanding that underpins formal treatment in Mathematical Methods and/or Specialist Mathematics subjects in senior secondary.

Suggestions for this content are provided below. Illustrative examples provide some suggestions of what might be appropriate for students to explore within the broad content showing links to relevant Year 10 content descriptions. Teachers may choose to draw on these suggestions to support students who may require additional content to enrich and extend their mathematical study whilst completing the Year 10 curriculum in preparation for senior secondary mathematics.

Strand	Suggested content	Illustrative examples	Connected Year 10 content descriptions	Rationale for inclusion
	operations on numbers involving surds and fractional exponents	explaining that <i>n</i> th root of <i>a</i> , is the same as the $\frac{1}{n}$ exponent i.e $\sqrt[n]{a} = a^{\frac{1}{n}}$	expand and factorise expressions and apply exponent laws involving products, quotients and powers of variables. Apply to solve equations algebraically (AC9M10A02)	Surds and fractional exponents are representations used in both Methods and Specialist. Surd form provides exact answers when solving quadratic equations with
hber		simplifying expressions such as $\sqrt{96} = 96^{\frac{1}{2}}$ ,	recognise the connection between algebraic and graphical representations of exponential relations and solve simple related exponential	irrational roots and in some measurement contexts in senior secondary mathematics.
NUN		$\left(\sqrt{5}\right)^2 = (5^{\frac{1}{2}})^2$	equations using digital tools as appropriate (AC9M10A05)	Surds provide exact values for certain arguments of circular
		= 5 <sup>1</sup>	use formulas involving exponents and real numbers to model practical problems	(trigonometric) functions Fractional exponents arise in
		$(\sqrt[3]{8})^2 = (8)^{\frac{2}{3}}$	(including financial contexts) involving growth and decay and solve using digital tools as appropriate (AC9M10A01)	calculus where power functions with rational exponents are used in modelling contexts or in
		$=\sqrt[3]{8^2}$		composition with other functions

Australian Curriculum: Mathematics – All elements 7–10 Consultation curriculum

#### General

## capabilities and CCPs

#### We have improved the relationship of the general capabilities and cross-curriculum priorities to learning area content.



## We have embedded them into the learning area content where they best fit:

Through teaching the content of specific learning areas, students will develop capabilities.



**In Mathematics** attention has been paid to numeracy, literacy, critical and creative thinking, ethical understanding and digital literacy when refining content descriptions and content elaborations.

## **Content elaborations** revised and improved

#### **Mathematics Content elaborations**



#### We have improved the content elaborations:

So they provide authentic illustrations of how the general capabilities and crosscurriculum priorities can support the teaching and learning of the learning area content.



#### In Mathematics we have written specific content elaborations for the cross curriculum priority of Aboriginal and Torres Strait Islander histories and cultures Numeracy applications and

Financial Literacy contexts



#### Elaborations

drafted a new suite of elaborations



YEAR 8

## Revised content description

model situations (including financial contexts) using proportional thinking to indirectly measure quantities and solve problems involving rates, interpreting the results in terms of the situation (AC9M8M05)





#### **Revised content elaboration**

- planning a driving trip and performing calculations about speed, distance and time, emphasising estimation and correct units (AC9M8M05\_E1)
- applying rates to calculate solutions to problems in different contexts including shopping, units of measure from different countries such as kilometres to miles, household expenses, sport such as required run rates in cricket, chemicals such as dilution of concentrates, petrol consumption rates (AC9M8M05\_E2)
- investigating the benefits of different investment plans using different interest rates, associated fees and long-term gain to determine the best investment (AC9M8M05\_E3)
- investigating examples of rates in the real world, including constant rates, rate of pay, cost per kilogram, recipes, or simple interest and average rates (AC9M8M05\_E4)
- investigating income tax and the use of taxation rates on annual income, comparing different taxation brackets and rates of pay (AC9M8M05\_E5)
- investigating different exchange rates and applying them when planning and budgeting for overseas travel (AC9M8M05\_E6)
- connecting the rate of the Earth's rotation on its axis, as 15 degrees every 60 minutes, to time zones (AC9M8M05\_E7)
- exploring the application of rates in First Nations Australians' land management practices, including the rate of fire spread under different environmental conditions such as fuel types, wind speed, temperature, and relative humidity (AC9M8M05\_E8)
- investigating the use of proportional thinking to conserve water by First Nations Australians by estimating rates of water evaporation based on surface area and climatic conditions (AC9M8M05\_E9)

## Key connections Cross curriculum links

Identification of content links across other Learning Areas in the curriculum currently being mapped within a year level

Identification of the Numeracy demands across the curriculum currently mapping to the NNLP and Mathematics Curriculum

**Q**∎

Reduced overall curriculum content for Primary teachers through identifying content overlap, duplication and redundancy

ÐE

#### Cross curriculum links

## Measurement Year 3-4

#### **Content description**

YEAR

measure, order and compare objects using familiar metric units of length, mass and capacity to solve practical problems (AC9M3M01)

#### Elaboration

YEAR

3

making a measuring tape using metric units of length and using it to measure and compare things, for example, the girth of a tree; explaining that the lines on a ruler show the beginning and end of each unit (AC9M3M01\_E1)

#### **Content description**

YEAR

use scaled instruments and appropriate units to measure and compare attributes of length, mass, capacity and temperature and solve practical problems (AC9M4M01)

#### Elaboration

YEAR

using scaled instruments such as tape measures, measuring jugs, kitchen scales and thermometers, recording measures using whole units (560 millimetres) or whole and part units, for example, 5.25 metres, 1.75 litres, 2.5 kilograms, 28.5° C (AC9M4M01 E3) OFFICIAL

# There's a lot going on here



#### Cross curriculum links

## Measurement Year 3-4

## YEAR 3

Mathematics

measure, order and compare objects using familiar metric units of length, mass and capacity to solve practical problems (AC9M3M01)

making a measuring tape using metric units of length and using it to measure and compare things, for example, the girth of a tree; explaining that the lines on a ruler show the beginning and end of each unit (AC9M3M01\_E1)



#### Mathematics

use scaled instruments and appropriate units to measure and compare attributes of length, mass, capacity and temperature and solve practical problems (AC9M4M01)

### Band 3-4

#### Design and technology

select and use materials, components, tools, equipment and techniques to safely make designed solutions (AC9TDE4P03) using tools and equipment accurately when measuring, marking and cutting, for example when creating a template, measuring ingredients in a recipe or sowing seeds (AC9TDE4P03\_E3)



#### Science

follow procedures to make and record observations, including making formal measurements using familiar scaled instruments and using digital technologies as appropriate (AC9S4I03)

>

using appropriate equipment to make and record observations, such as digital cameras, video, voice recorders and scaled instruments with appropriate increments (AC9S4I03 E1)

# Consultation website pages https://www.australiancurriculum.edu.au/consultation



## Consultation Mathematics documents

https://www.australiancurriculum.edu.au/consultation

Mathematics F-10	All elements consultatio	חכ	
Mathematics F-6	All elements consultatio	on on Scope and sequence consultation Scope and sequence consultation	Comparative information
Mathematics 7-10	All elements consultatio	on profit Scope and sequence consultation Consultation Scope and sequence consultation	comparative information
Y	You can access the primary level scope areas and are	rriculum view	all the learning

OFFICIAL

# WHAT ARE THE KEY CONTENT CHANGES



#### Number

Emphasis on building number sense – Place value and structure of numbers
Properties of numbers and operations
Modelling with operations

#### Algebra

•Pattern recognition and generalization

- •Reduced a bstract symbolic manipulation
- •Computational thinking and modelling processes

#### Measurement

•Clear connected developmental sequence - Attributes

- Estimation, approximation and error
- Concepts for perimeter, a rea and volume and establishing formulas

#### Space

• Position and location expanded beyond the use of maps

- $\bullet {\tt Concept}\, of \, dimension \, e \, {\tt mphasized}$
- •Computational thinking process used to experiment, explore proof and logic

#### Statistics

Statistical investigation process
Distributions and variation

#### Probability

Probability simulationsLaw of large numbers

WHAT ARE THE KEY CURRICULUM CHANGES



• Changes to the LA structure – 6 single strands

- Content curated and refined to give better clarity of expectation for teachers, embed proficiencies and to provide opportunity for students to develop the core concepts across F-10
- Achievement standards have been revised to have clear alignment to content, embedded the proficiency strands with explicit reference to processes of mathematics and technology use.
- Elaborations fully reworked to include exemplars of how to approach the content, AC: GC's and AC: CCP examples especially Numeracy, Critical and Creative Thinking and Aboriginal and Torres Strait Islander Histories and Cultures along with Financial Literacy contexts wherever relevant
- Year level descriptions re-written to capture what you can expect students to be doing at this year level
- Identification of key connections across LAs
- Improved curriculum website
- Revised Glossary

OFFICIAL

# Questions about the review and proposed refinements?



# **THANK YOU**

For more info please visit acara.edu.au/curriculum/curriculum-review



#### AUSTRALIAN CURRICULUM, ASSESSMENT AND REPORTING AUTHORITY