

# Tamborine Mountain State High School



# Numeracy Policy 2023

# WHOLE SCHOOL POLICY FOR NUMERACY

## RATIONALE

Numeracy underpins the school curriculum by developing students' confidence and capacity to use mathematics to meet the demands of learning at school, home, in the workplace and within the community. Helping students develop numeracy skills enhances and enriches teaching and learning in all subject areas. All faculties and all teachers have a crucial role to play in supporting students' numeracy development.

## Objectives

The objectives of this policy document are to:

- establish a common language and basis for discussion of numeracy within the school.
- improve teacher knowledge of mathematics and how students learn and transfer mathematical knowledge and skills.
- improve teacher knowledge of numeracy across the curriculum to enhance student knowledge.
- develop students' critical thinking and foster behaviours that enable students to make sense of the numerical information in their world.
- identify the numeracy demands and opportunities in all learning areas across the curriculum.
- build positive cultures and high expectations within the school so that all students can succeed in mathematics and be numerate.
- raise students' own expectations of achievement thus raising standards.
- recognise that numeracy is essential in all aspects of everyday life.
- promote knowledge and understanding of the key numeracy indicators that describe the concepts, procedures and skills used to meet the numeracy demands of everyday situations.

## Numeracy Framework

To improve students' outcomes in mathematics and numeracy capabilities, four elements need to be considered. These include understanding numeracy, teacher knowledge and pedagogy, numeracy across the curriculum and numeracy leadership. These elements are interrelated and are not mutually exclusive or hierarchical (see Figure 1).

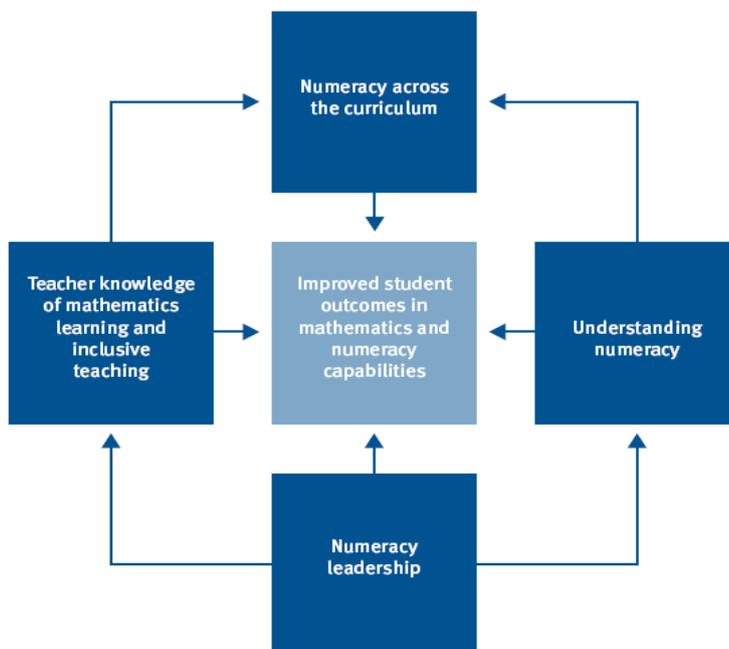


Figure 1: Elements informing the Numeracy Framework for Action.

## Five Numeracy Indicator Organisers

Numeracy indicators describe the concepts, procedures and skills to meet the numeracy demands of everyday situations. These indicators are arranged into five organisers - number, algebra, measurement, space and chance and data.

The following table provides an outline of the knowledge, understanding and skills that students develop as they progress through year level expectations of understanding, fluency, problem solving and reasoning. Data collected about these skills can help identify areas needed for extension and intervention.

National Curriculum Content Strands	Numeracy Organiser	Knowledge, Understanding and Skills
		Years 4 - 9
Number and Algebra	Number	<ul style="list-style-type: none"> <li>order, position, quantity and value</li> <li>representations</li> <li>fractions</li> <li>operations</li> <li>financial knowledge</li> <li>rate and ratio</li> </ul>
	Algebra	<ul style="list-style-type: none"> <li>direct proportion</li> </ul>
Measurement and Geometry	Measurement	<ul style="list-style-type: none"> <li>measurement of attributes</li> <li>estimation</li> <li>time</li> </ul>
	Space	<ul style="list-style-type: none"> <li>properties</li> <li>location and Movement</li> </ul>
Statistics and Probability	Chance and Data	<ul style="list-style-type: none"> <li>probability</li> <li>data collection and analysis</li> </ul>

When planning for numeracy teaching and learning in all key learning areas, the following need to be considered:

- What are the targeted numeracy indicators in this unit of work?
- What explicit teaching can be planned around these indicators?
- How can these indicators be embedded in the teaching and learning sequence?
- How can students' understanding and demonstration of these indicators be monitored and assessed?

## Suggestions For Embedding Numeracy Indicators Into KLAs

KLA	Sample Learning Experiences
<b>English</b>	<p>The use of number underpins many applications involving patterns and algebra, measurement, chance and data and aspects of space.</p> <ul style="list-style-type: none"> <li>• Analyse information presented in data displays.</li> <li>• Derive numeric and spatial concepts from a variety of texts.</li> <li>• Deconstruct information provided in technical reports, for example newspaper article and editorial reports.</li> </ul>
<b>HPE</b>	<ul style="list-style-type: none"> <li>• Interpret and compare a variety of measures including digital time, heart rate and lengths (sporting fields and athletics track).</li> <li>• Use navigational skills in outdoor activities to describe and follow directions, pathways and movement sequences.</li> <li>• Interpret and create data displays related to health issues or patterns of behaviour, for example smoking statistics, drug and alcohol use.</li> </ul>
<b>Languages</b>	<ul style="list-style-type: none"> <li>• Interpret information in tables and maps.</li> <li>• Describe locations using the language of direction and movement on maps and plans.</li> <li>• Interpret different representations of time, for example, dates, 12- and 24- hour time conventions, time zones.</li> <li>• Write characters in scripted languages where order and spacing of strokes is critical.</li> </ul>
<b>Science</b>	<ul style="list-style-type: none"> <li>• Interpret and extrapolate data and predicts outcomes.</li> <li>• Analyse, organise and represent scientific data in a range of forms.</li> <li>• Use measurement, estimation and calculation in scientific inquiry.</li> <li>• Represent and solve equations.</li> <li>• Use formula in a range of situations.</li> <li>• Perform unit conversions, use and interpret rates described in different numeric ways.</li> </ul>
<b>Mathematics</b>	<ul style="list-style-type: none"> <li>• Identify opportunities to use numeracy in daily activities.</li> <li>• Apply the mathematics knowledge, understandings and skills learnt to the community.</li> <li>• Reflect on the efficiency of use of numeracy concepts, knowledge and skills in the community.</li> </ul>

<p style="text-align: center;"><b>History</b></p>	<ul style="list-style-type: none"> <li>• Interpret and represent large numbers and a range of data such as those associated with population statistics and growth, financial data, figures for exports and imports, immigration statistics, mortality rates, war enlistments and casualty figures, chance events, correlation and causation.</li> <li>• Imagine timelines and timeframes to reconcile relativities of related events.</li> <li>• Visualise spatial perspective required for geopolitical considerations such as changes in borders of states and in ecology.</li> </ul>
<p style="text-align: center;"><b>ICT Technology</b></p>	<ul style="list-style-type: none"> <li>• Calculate measurements to inform precise design briefs and production processes, for example total length, area, perimeter, surface area of product.</li> <li>• Use mathematical formula in creating spreadsheets.</li> <li>• Interpret data in tables, graphs and charts to form business decisions about products.</li> </ul>
<p style="text-align: center;"><b>The Arts</b></p>	<ul style="list-style-type: none"> <li>• Understand and apply concepts related to number such as: <ul style="list-style-type: none"> <li>- patterns: motifs, repetition, variation</li> <li>- counting: rhythm, phrasing, sections, round and canon (music and dance).</li> </ul> </li> <li>• Represent real or imaginary objects and situations using time, length, symmetry, shape and movement.</li> </ul>



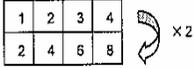
# NUMERACY FOCUS AREAS

## Focus Areas

In order to ensure that the introduction of a whole school numeracy policy is successful, the importance of the following activities should be recognised.

1. Explicit teaching of numeracy strategies to occur where applicable in a lesson.
2. Numeracy focus areas in each unit are faculty determined and recorded on unit plans.
3. Unit planning is to reflect differentiation at three levels as well as EAP/NCCD identified students. Differentiation is to be specific for Years 7, 8 and 9 in terms of three groups, student name and differentiation strategy.
4. Implementation of PD in unit preparation.
5. Establish assessment procedures to monitor and evaluate students' progress (faculties each owning data gathering and reporting accountabilities).

		By the end of Year 4	By the end of Year 5	By the end of Year 6	By the end of Year 7	By the end of Year 8	By the end of Year 9	
Number	Order, position, quantity & value	<b>Students:</b> <b>N:4</b> i. Order and position whole numbers, commonly used fractions (half, quarter), mixed numbers and decimals to tenths, identifying the pattern of place value	<b>Students:</b> <b>N:5</b> i. Order and position whole numbers, commonly used fractions (half, quarter, eighth, third, sixth, fifth, tenth), mixed numbers and decimals to hundredths, identifying the pattern of place value	<b>Students:</b> <b>N:6</b> i. Order and position whole numbers, commonly used fractions (including decimals) to thousandths, identifying the pattern of place value	<b>Students:</b> <b>N:7</b> i. Order and position whole numbers, fractions (including decimals), and numbers using technical and electronic terminology, e.g. terabyte, megabyte	<b>Students:</b> <b>N:8</b> i. Order and position positive and negative numbers, fractions (including decimals), percentages, and numbers given in scientific/index notation	<b>Students:</b> <b>N:9</b> i. Order and position positive and negative numbers, fractions, percentages, and numbers represented in whole powers, scientific/index notation, roots and ratios	
	Representations	ii. Read and represent in numerals and words, whole numbers, commonly used fractions and combinations of whole numbers and decimals to tenths	ii. Read and represent in numerals and words, whole numbers, commonly used fractions and combinations of whole numbers and decimals to hundredths	ii. Read and represent in numerals and words, whole numbers, commonly used fractions (including decimals to thousandths) and key percentages (10%, 20%, 25%, 50%, 75%)	ii. Read and represent in numerals and words, positive and negative numbers, fractions (including decimals), percentages, and square and cube numbers iii. Describe the meaning of prefixes used for very large and very small numbers, e.g. tera-, mega-, micro-, nano-	ii. Read and represent in numerals and words, positive and negative numbers, fractions (including decimals), percentages, and scientific notation, e.g. $7200 = 3 \times 1000 + 42 \times 100$ , $89,345 = 70 + 19 + 0.1 + 0.24 + 0.005$	ii. Read and make connections among different representations of numerals and words, whole powers, positive and negative numbers, percentages, scientific notation, roots and ratios	
	Fractions	iii. Identify different representations (symbols, diagrams, materials, words) of the same fraction for different purposes, e.g. $\frac{1}{2}$ , $\frac{2}{4}$ , $\frac{4}{8}$ , 0.5, or $\frac{3}{2}$ , $1\frac{1}{2}$ , 1.5	iii. Justify fraction equivalents using different representations, e.g. $\frac{6}{8}$ is equivalent to $\frac{3}{4}$ and to 0.75	iii. Translate between key percentages and commonly used fractions, including decimals	iv. Translate between percentages, proper fractions, mixed numbers and their equivalent improper fractions and decimal fractions, e.g. $3\frac{3}{4} = 15$ quarters, or $3\frac{3}{4} = 3.75$	iii. Translate between equivalent representations of fractions, decimals and percentages to suit personally preferred strategies for calculating, e.g. 20% is one-fifth, or double 10%	iii. Interpret fractions, decimals, ratios and percentages, including their equivalent values, to assist with calculations or estimations	
	Operations	iv. Identify whether addition, subtraction, multiplication or division is required to solve problems and estimate a possible range of solutions v. Recall and select basic facts and their extensions and describe mental or written procedures to add, subtract, multiply or divide to calculate solution/s to everyday problems, justify the method and record it in numbers vi. Solve addition and subtraction problems involving whole numbers and decimals (to tenths) vii. Solve multiplication and division problems involving up to three-digit whole numbers with single-digit multipliers and divisors as the reverse of the multiplication viii. Check the reasonableness of solutions, using strategies including matching to the original estimate ix. Create word problems involving one of the four operations with whole numbers, using visuals and words to represent a given number sentence	iv. Identify the information and the operation required in a single-step problem and estimate a possible range of solutions v. Select a strategy or procedure to add, subtract, multiply or divide to calculate solution/s to everyday problems, justify the method and record it in numbers vi. Solve single-step and two-step addition, subtraction and multiplication problems involving whole numbers and decimals (to tenths), and solve division problems with whole-number divisors vii. Check the reasonableness of solutions with and without decimals, using strategies including reversing the operation viii. Create word problems involving one of the four operations with whole numbers and decimals to tenths using materials, visuals and words to represent a given number sentence	iv. Identify the relevant information and the operation/s required in a multi-step problem and estimate a possible range of solutions v. Select or combine strategies and procedures, including rounding, to calculate solution/s to everyday problems, justify the method and record it in numbers vi. Solve multi-step addition and subtraction or multiplication and division problems with whole numbers and decimals (to hundredths) vii. Check the reasonableness of solutions, using strategies including using another method viii. Create word problems involving one or more calculations with whole numbers and decimals to hundredths using materials, visuals and words to represent a given number sentence	v. Identify the relevant information, the calculations and the order of operations to be used to solve problems, and estimate a possible range of solutions vi. Select or combine strategies and procedures, including order of operations, to calculate solution/s to everyday problems, justify the method and record it in numbers vii. Solve problems involving combinations of calculations using positive whole numbers and decimals, and addition and subtraction of negative numbers viii. Check the reasonableness of solutions, using strategies including order of operations ix. Create word problems involving combinations of calculations (order of operations) with whole numbers and decimals using materials, visuals and words to represent a given number sentence	iv. Identify various ways to solve everyday problems, including those that use combinations of calculations, and estimate a possible range of solutions v. Combine strategies and procedures to calculate solution/s to everyday problems, justify the method and record it in numbers vi. Solve problems involving combinations of calculations using positive and negative numbers and decimals vii. Check the reasonableness of solutions, using strategies including approximations of very large and very small numbers viii. Create word problems involving combinations of calculations, positive and negative numbers and decimals using materials, visuals and words to represent a given number sentence	iv. Identify personally preferred methods and combinations of strategies to solve problems, and estimate and explain a possible range of solutions v. Combine strategies and procedures to calculate solution/s to everyday problems, justify the method and record it in numbers vi. Solve problems involving combinations of calculations using positive and negative numbers and decimals, including ratio, rate and percentage vii. Check the reasonableness of solutions and review assumptions and methods of working viii. Create word problems involving combinations of calculations, including ratio, rate and percentage, with positive and negative numbers and decimals, using materials, visuals and words to represent a given number sentence	
		Financial knowledge	x. Create simple savings plans to reach personally significant financial goals	ix. Create simple budgets, comparing savings with expenditure	ix. Compare prices for items before and after discounts involving key percentages, and identify savings	x. Analyse the elements of personal financial records to identify income and expenses	ix. Compare and evaluate fees linked to consumer products, e.g. mobile phone plans	ix. Evaluate personally significant financial situations involving interest rates and savings, purchasing and investing
		Rate & ratio	xi. Describe the difference between multiplicative and additive situations, e.g. tripling as opposed to adding	x. Use multiplicative thinking to solve directly proportional problems, e.g. I am 10 years old. Dad is triple my age. How old is Dad?	x. Describe simple, directly comparable relationships between two variables using rate or ratio, e.g. km/L (rate), 4:1 cordial mix (ratio)	xi. Use rates and ratios between two variables, e.g. scale used on maps and plans, magnification factors, ingredients	x. Identify, interpret and use rates for comparing parts of different units, and ratios for comparing parts with the same units	x. Convert rates and ratios to fractions (common, decimal) or percentages to assist with calculations, e.g. population growth, goods and services tax (GST)

		By the end of Year 4	By the end of Year 5	By the end of Year 6	By the end of Year 7	By the end of Year 8	By the end of Year 9
Algebra	Direct proportion	<b>Students:</b> <b>A:4</b> i. Identify and describe everyday situations that involve a constant change and represent them as tables of values, e.g. cost of one stamp, cost of two stamps, cost of three stamps	<b>Students:</b> <b>A:5</b> i. Identify the pattern of change in situations where one part is directly proportional to another part by a constant factor, e.g. 	<b>Students:</b> <b>A:6</b> i. Explain that problems involving direct proportion require that the parts change by the same factor, e.g. modifying recipes by the same factor, e.g. modifying recipes to increase or decrease the number of servings	<b>Students:</b> <b>A:7</b> i. Identify the multiplicative factor to solve proportion involving relationships between variables, e.g. a factor of 0.5 kg of sugar to 1 kg fruit, so 3.5 kg of sugar requires 7 kg of fruit	<b>Students:</b> <b>A:8</b> i. Use proportional reasoning to solve unknowns in situations involving relationships between variables, e.g. for concrete — cement:sand:water, for a paint mix — base colour:red:yellow	<b>Students:</b> <b>A:9</b> i. Find unknown values, describes generalisations, and interpret relationships between different units, e.g. if 5 L is used in 200 km, 7 L will be used in ? km
	Measurement of attributes	<b>M:4</b> i. Identify the attribute to be measured (length, area, volume, mass, angle, temperature), select and use relevant units and instruments for measuring, and record calculations using appropriate conventions	<b>M:5</b> i. Analyse situations to determine the appropriate unit to use to measure the attribute (length, area, volume, mass, angle, temperature), compare and order measurements, select and use the relevant instruments, and record calculations using appropriate conventions	<b>M:6</b> i. Justify the efficiency of selected units for measuring an attribute (length, area, volume, mass, angle, temperature) in a range of contexts, and record measurements using appropriate conventions	<b>M:7</b> i. Convert between metric units to suit the attribute to be measured (length, area, volume, mass, angle, temperature), purpose of situation and to simplify calculations, and record measurements using appropriate conventions	<b>M:8</b> i. Justify the use of a variety of measuring instruments and methods based on the level of accuracy required	<b>M:9</b> i. Use known measures of attributes and relevant formulas to derive unknown measurements that cannot be directly measured
	Estimation	ii. Justify whether an estimation is sufficient, or if measuring is required	ii. Refine estimates by providing the outer limits of the measurement, e.g. it weighs between 1 and 2 kilograms	ii. Estimate by relating personal referents to a range of standard units	ii. Evaluate the reasonableness of an estimate by comparing it to known measurement units, and converting between units as required	ii. Evaluate the level of accuracy for an estimation based on the margin for error acceptable for the situation	ii. Describe the effect of compounding errors in calculations involving measurements
Time	iii. Calculate durations involving 5-minute intervals, half- and quarter-hours (digital and analog), days, weeks, fortnights and months	iii. Calculate durations involving hours and minutes, and calculate the difference between times on timetables and timelines	iii. Calculate durations in both 12-hour and 24-hour time, and interpret representations, including calendars and daylight-saving time, in tables, timetables and timelines	iii. Calculate and compare durations in 12-hour and 24-hour time and make adjustments as required across Australian time zones	iii. Calculate, compare and order durations in 12-hour and 24-hour time and make adjustments as required across international time zones	iii. Compare, calculate and order durations of events involving hundredths of a minute	
Space	Properties	<b>S:4</b> i. Identify and describe geometric features and nets used to develop models and sketches of 3D shapes and drawings of 2D shapes	<b>S:5</b> i. Identify geometric features, including symmetry, used to categorise families of 2D and 3D shapes and recognise shapes in different orientations	<b>S:6</b> i. Identify and draw 2D and 3D shapes and describe side and angle properties	<b>S:7</b> i. Use and apply properties of angles, symmetry and similarity to describe, draw and construct accurate 2D and 3D shapes	<b>S:8</b> i. Compare sides and angles when constructing models and creating enlargements and reductions to a given scale factor	<b>S:9</b> i. Apply properties of angles and geometric features, including similarity, to draw and construct models involving 2D and 3D compound, truncated, and embedded shapes
	Location & movement	ii. Interpret and use symbols and legends on grids, plans and maps, and develop simple keys to represent locations and scales to represent distances, e.g. 1 square = 1 step iii. Give and follow directions involving turns from due north	ii. Use simple keys and scales to identify locations and interpret scales to estimate distances when using alphanumeric grids, plans and maps, e.g. 1 grid-square length = 5 km iii. Give and follow directions involving turns (half, quarter, three-quarter, full) using the four major compass points and familiar locations	ii. Use keys to identify locations and interpret scales to calculate distances on plans and maps, e.g. 1 cm = 100 m iii. Give and follow directions using coordinates and the eight compass points	ii. Interpret and use scale, coordinates, and compass points to interpret and identify a given route and location, and to specify locations when constructing accurate maps or plans	ii. Interpret and use scale, keys and bearing equivalents for all compass points and degrees of turn to identify locations and describe movement with precision on plans and maps	ii. Interpret plans, maps and navigation displays, including electronic displays, to identify locations and describe movements
	Probability	<b>CD:4</b> i. Order the likelihood of events from certain to impossible, using the language of chance, e.g. "certain", "more likely", "likely", "unlikely", "never"	<b>CD:5</b> i. Interpret and order probability values expressed as verbal descriptions and colloquialisms, e.g. "fifty-fifty", "Buckley's"	<b>CD:6</b> i. Assign numerical values (fractions, key percentages) to the likelihood of simple events occurring	<b>CD:7</b> i. Explain the difference between everyday experimental probability (what happened) and theoretical probability (what was expected)	<b>CD:8</b> i. Interpret the expected (theoretical) probability of independent events, and describe the effect of environmental effects or bias on the experimental probability	<b>CD:9</b> i. Recognise and represent the probability of compound events, e.g. tossing two or more coins
Data collection & analysis	ii. Collect relevant data to respond to a question, issue or problem, construct displays such as tables and graphs, and critically analyse the results	ii. Collect or use others' data in response to a question, construct displays to summarise discrete data, and critically analyse and interpret the results to answer the original question	ii. Collect, construct displays, critically analyse and infer trends from both discrete and continuous datasets using a range of displays, including line graphs	ii. Collect, represent and summarise data using mean, median and mode; and critically analyse and interpret different types of data, including grouped data	ii. Collect, represent and summarise data using mean, median, mode and range; interpret different types of data; and analyse claims	ii. Evaluate and analyse data (census, sample) using measures of location and range, and by reviewing sample sizes and the reliability of the data	