1. MATHEMATICS

- **Mathematics**: Study of patterns/relationships, way of thinking/seeing/organising world (systematic organisation numerically, spatially, logically), language (vocab, grammar, symbols), tool (solve problems, make judgements), art, power (access to high-status professions- computing, science, technology, research); Important in real world- problem-solving + numeration

- **Working mathematically**: Requires engagement in various tasks, problems, and investigations using problem-solving skills, authentic contexts, and communication/dialogue in collaborative work (discussing/sharing ideas in a safe environment, extending existing knowledge), all based on logical and mathematical principles

- 2 views: Platonist (maths=pre-existing, discover facts, factual/objective) vs **Constructivist** (knowledge construction, new knowledge to explain/expand ideas, creative/subjective, self-directed learning)

- Constructivist classroom: Collaborative group work and guided discussions; Concrete materials and open-ended problems w/ different strategies, differentiated activities; Problem-solving in authentic contexts; Growth mindset;

- 2 mindsets: Fixed (natural ability/inability, avoid challenges/hide mistakes) vs **Growth** (effort, productive persistence, “yet”- language, learn from mistakes- resilience, fluid intelligence); Research: growth mindset=higher achievement; Growth mindset support strategies in constructivist classroom: Positive reinforcement/Praise effort + Open-ended problems with multiple strategies/solutions + emphasise language, encourage trying + books

- **Maths anxiety**: A fixed mindset where a student has a fear of and unwillingness to attempt maths;

- Support strategies: Positive reinforcement, Collaborative (non-competitive) group work, Hands-on engaging activities, Real-life examples based on their interests so they can contribute (e.g. sport, cooking, building)

- Integration of modern technology (computers/calculators) to support/extend maths understanding

- Books: ‘One is a Snail, Two is a Crab’-April Pulley Sayre/Jeff Sayre (ES1 counting on); ‘The Very Hungry Caterpillar’- Eric Carle (ES1 counting on); ‘Rosie Revere, Engineer’-Andrea Beaty (Growth mindset)

**Syllabus**

- Numeracy is across all NSW syllabuses – important curriculum integration

**Working Mathematically (5 core concepts)**

- **Communicating**: Written/Oral/Graphic representations to formulate/express/describe/explain ideas/situations/concepts/methods/solutions, language/tables/diagrams/graphs/symbols/notation/conventions

- **Problem-solving**: Make choices/interpret/formulate/model/investigate problem situations & communicate solutions; Use maths to represent un/familiar situations, design investigations, plan approaches, apply strategies for solutions, justify answer reasonability

- **Reasoning**: Logical thought/actions- analysing/proving/evaluating/explaining/inferring/justifying/generalising; Reason mathematically when explain thinking/deduce/justify strategies/conclusions/adapt/transfer learning context/prove true/false/compare-contrast related ideas/explain choices

- **Understanding**: Foundation for adapting/transferring concepts; Connections b/w related concepts & apply familiar to new; Relationship b/w why and how; Understanding: connect related ideas, different representations, commonalities/differences, mathematically describe thinking, interpret info

- **Fluency**: Choosing/Undertaking appropriate procedures flexibly/ accurately/ efficiently/appropriately/automatic recall; Fluent when: calculate answers efficiently using appropriate strategies/approximations, recall definitions, regularly use facts, manipulate expressions/equate to find solutions
Strands
- Number & Algebra: Whole numbers, add/subtract, multiply/divide, fractions/decimals, patterns/algebra
- Measurement & Geometry: Length, area, volume/capacity, mass, time, 3D space, 2D space, angles, position
- Statistics & Probability: Chance, data

Numeracy Continuum
- Purpose: Outlines sequential development of key concepts and sophistication of strategies + underpins numeracy programs
- Aspects: Counting sequences, Early arithmetical structure, Pattern and number structure, Place value, Multiplication and division, Fraction units, Unit structure (length, area, volume)
- Uses: Assess/track student progress; Determine teaching sequence; Communicate to students/parents for learning goals; Differentiation

Theories
- Cognitive: Piaget- cognitive development of logio-mathematical knowledge, processes of accommodation/assimilation and schema; Constructivism- people actively construct their knowledge of the world/maths and integrate new knowledge into existing maths schemas, social process needing dialogue and interaction to refine knowledge (negotiation, explanation, justification), teachers must identify constructions and misconceptions
- Sociocultural: Vygotsky- expert teacher poses analytic questions to assess zpd and inform scaffolding, provide language and communication opportunities
- Socially Critical: examine how practices should be adapted for at risk students (disabilities, indigenous, low-ses, eald, girls from certain sociocultural backgrounds)

2. NUMERATION
- Numeracy: Knowledge and skills needed for informed participation and decision-making in particular contexts
- Number sense: A lifelong process of having a level of comfortableness and familiarity with numbers, and a conceptual framework with number info enabling a person to understand number and number relationships to solve mathematical problems; Involves: number meanings, relationships, size, operation effects, regrouping, flexibility; contributes to fluency; Promotes proficiency in mental computation/estimation/problem-solving/recognising relationships/fluency
  - Grouping in arrays (showing commutativity – circling rows and columns)
  - Skip counting using hands
  - Tens frames
- Number: Idea // vs Numeral: name or symbol
  - ES1: Draw numeral on partner’s back and guess
  - Tracing
  - Number of students physically creating the shape of the numeral
- Classifying: Various methods of object classification to then be able to count and use them
  - Buttons by texture, toys by size
- Patterning: Basis of algebraic thinking: copying, identifying, extending, creating, determining missing element in patterns in different contexts
  - String of beads
- Subitising: Automatic recognition of number in a collection – esp. 1-5; Benefits: Saves time, assists basic add/subtract, flexible thinking
  - Dominoes
  - Tens frame flash w/counters
  - Guess what w/tens frame