# Mathematics and Statistics

# Curriculum Years 1-13

**Revised July 2018: G. Lewis & J. Hanlon**

**Overview:** Our vision for our students in Mathematics is that they become enthusiastic learners who are confident about their ability to learn and use Mathematical concepts and express their thinking using appropriate mathematical statements. The table below reflects how we link our practice to our school vision:

| Together | We Ride | The Wave | Of Lifelong | Success |
|---|---|---|---|---|
| We are using pair and group activities and whole class discussions by which learning is shared and becomes enriched. | We base activities (individual/group) on abilities and developmental/learning stages of students to ensure each student is engaged, focused and active participant in their own learning. We accommodate various learning styles and share/expose/demonstrate various thinking strategies to widen horizons and encourage inquiry, innovation and curiosity. | We are building on previous knowledge/skills and striving to have coherence in use of terminology through the school.<br><br>We encourage students to: challenge themselves; have perseverance to see the challenge through;build resilience to deal with difficulties/ disappointments and thus developing personal integrity.<br><br>We also encourage students to have respect: for others' knowledge and contributions; for the different challenges each strand can present and accept both troughs and peaks of the process of learning. | We are creating meaningful and positive learning environments to enable students to find enjoyment and where objectives are also linked to real life for them to see relevance. | We place emphasis on progress to be made by each student and we celebrate both progress and achievement. |

| Level One | Term One | | Term Two | | Term Three | | Term Four | |
|---|---|---|---|---|---|---|---|---|
| **Year A** | **Number and Algebra**<br>**Number strategies**<br><br>· Use a range of counting, grouping, and equal-sharing strategies with whole numbers and fractions. | **Geometry and Measurement**<br>**Measurement**<br><br>· Order and compare objects or events by length, area, volume and capacity, weight (mass), turn (angle), temperature, and time by direct comparison and/or counting whole numbers of units. | **Number and Algebra**<br>**Number knowledge**<br><br>· Know the forward and backward counting sequences of whole numbers to 100.<br><br>· Know groupings with five, within ten and with ten. | **Statistics**<br>**Statistical Investigation**<br><br>· Conduct investigations using the statistical enquiry cycle:<br>– posing and answering questions;<br>– gathering, sorting and counting, and displaying category data;<br>– discussing the results. | **Number and Algebra**<br>**Equations and expressions**<br><br>· Communicate and explain counting, grouping, and equal-sharing strategies, using words, numbers, and pictures. | **Geometry and Measurement**<br>**Shape**<br><br>· Sort objects by their appearance. | **Number and Algebra**<br>**Patterns and relationships**<br><br>· Generalise that the next counting number gives the result of adding one object to a set and that counting the number of objects in a set tells how many.<br><br>· Create and continue sequential patterns. | **Statistics**<br>**Probability**<br><br>· Investigate situations that involve elements of chance, acknowledging and anticipating possible outcomes. |
| **Year A** | **Number and Algebra**<br>**Number strategies**<br><br>· Use a range of counting, grouping, and equal-sharing strategies with whole numbers and fractions. | **Geometry and Measurement**<br>**Position and Orientation**<br><br>· Give and follow instructions for movement that involves distances, directions, and half or quarter turns.<br><br>· Describe their position relative to a person or object. | **Number and Algebra**<br>**Number knowledge**<br><br>Know the forward and backward counting sequences of whole numbers to 100.<br><br>· Know groupings with five, within ten and with ten. | **Statistics**<br>**Statistical Investigation**<br><br>· Conduct investigations using the statistical enquiry cycle:<br>– posing and answering questions;<br>– gathering, sorting and counting, and displaying category data;<br>– discussing the results. | **Number and Algebra**<br>**Equations and expressions**<br><br>· Communicate and explain counting, grouping, and equal-sharing strategies, using words, numbers, and pictures. | **Geometry and Measurement**<br>**Transformation**<br><br>· Communicate and record the results of translations, reflections, and rotations on plane shapes. | **Number and Algebra**<br>**Patterns and relationships**<br><br>· Generalise that the next counting number gives the result of adding one object to a set and that counting the number of objects in a set tells how many.<br><br>· Create and continue sequential patterns. | **Statistics**<br>**Statistical Literacy**<br><br>· Interpret statements made by others from statistical investigations and probability activities. |

# Level Two

| Level Three | Term One | | Term Two | | Term Three | | Term Four | |
|---|---|---|---|---|---|---|---|---|
| **Year A** | **Number and Algebra**<br>**Number strategies**<br><br>· Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages. | **Geometry and Measurement**<br>**Measurement**<br><br>· Use linear scales and whole numbers of metric units for length, area, volume and capacity, weight (mass), angle, temperature, and time.<br>· Find areas of rectangles and volumes of cuboids by applying multiplication. | **Number and Algebra**<br>**Number knowledge**<br><br>· Know basic multiplication and division facts.<br>· Know counting sequences for whole numbers. | **Statistics**<br>**Statistical Investigation**<br><br>· Conduct investigations using the statistical enquiry cycle:<br>‐ gathering, sorting, and displaying multivariate category and whole number data and simple time-series data to answer questions;<br>‐ identifying patterns and trends in context, within and between data sets;<br>‐ communicating findings, using data displays. | **Number and Algebra**<br>**Equations and expressions**<br><br>· Record and interpret additive and simple multiplicative strategies, using words, diagrams, and symbols, with an understanding of equality. | **Geometry and Measurement**<br>**Shape**<br><br>· Classify plane shapes and prisms by their spatial features.<br>· Represent objects with drawings and models. | **Number and Algebra**<br>**Patterns and relationships**<br><br>Generalise the properties of addition and subtraction with whole numbers. | **Statistics**<br>**Probability**<br><br>· Investigate simple situations that involve elements of chance by comparing experimental results with expectations from models of all the outcomes, acknowledging that samples vary. |
| **Year B** | **Number and Algebra**<br>**Number strategies**<br><br>· Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages. | **Geometry and Measurement**<br>**Position and Orientation**<br><br>· Use a co-ordinate system or the language of direction and distance to specify locations and describe paths. | **Number and Algebra**<br>**Number knowledge**<br><br>· Know how many tenths, tens, hundreds, and thousands are in whole numbers.<br>· Know fractions and percentages in everyday use. | **Statistics**<br>**Statistical Investigation**<br><br>· Conduct investigations using the statistical enquiry cycle:<br>‐ gathering, sorting, and displaying multivariate category and whole number data and simple time-series data to answer questions;<br>‐ identifying patterns and trends in | **Number and Algebra**<br>**Equations and expressions**<br><br>· Record and interpret additive and simple multiplicative strategies, using words, diagrams, and symbols, with an understanding of equality. | **Geometry and Measurement**<br>**Transformation**<br><br>· Describe the transformations (reflection, rotation, translation, or enlargement) that have mapped one object on to another. | **Number and Algebra**<br>**Patterns and relationships**<br><br>· Connect members of sequential patterns with their ordinal position and use tables, graphs, and diagrams to find relationships between successive elements of number and spatial patterns. | **Statistics**<br>**Statistical Literacy**<br><br>· Evaluate the effectiveness of different displays in representing the findings of a statistical investigation or probability activity undertaken by others. |

| | | | | context, within and between data sets;<br>– communicating findings, using data displays. | | | | |
|---|---|---|---|---|---|---|---|---|

| **Level Four** | **Term One** | | **Term Two** | | **Term Three** | | **Term Four** | |
|---|---|---|---|---|---|---|---|---|
| **Year A** | **Number and Algebra**<br>**Number strategies and knowledge**<br><br>· Use a range of multiplicative strategies when operating on whole numbers.<br>· Understand addition and subtraction of fractions, decimals, and integers. | **Geometry and Measurement**<br>**Measurement**<br><br>· Use appropriate scales, devices, and metric units for length, area, volume and capacity, weight (mass), temperature, angle, and time. Convert between metric units, using whole numbers and commonly used decimals | **Number and Algebra**<br>**Equations and expressions**<br><br>Form and solve simple linear equations. | **Statistics**<br>**Statistical Investigation**<br><br>· Plan and conduct investigations using the statistical enquiry cycle: determining appropriate variables and data collection methods; gathering, sorting, and displaying multivariate category, measurement, and time-series data to detect patterns, variations, relationships, and trends; comparing distributions visually; communicating findings, using appropriate displays. | **Number and Algebra**<br>**Number strategies and knowledge**<br><br>· Find fractions, decimals, and percentages of amounts expressed as whole numbers, simple fractions, and decimals.<br>· Apply simple linear proportions, including ordering fractions. | **Geometry and Measurement**<br>**Shape**<br><br>· Identify classes of two- and three-dimensional shapes by their geometric properties.<br>· Relate three-dimensional models to two-dimensional representations, and vice versa. | **Number and Algebra**<br>**Patterns and relationships**<br><br>Generalise properties of multiplication and division with whole numbers. | **Statistics**<br>**Probability**<br><br>· Investigate situations that involve elements of chance by comparing experimental distributions with expectations from models of the possible outcomes, acknowledging variation and independence.<br>· Use simple fractions and percentages to describe probabilities. |
| **Year B** | **Number and Algebra**<br>**Number strategies and knowledge**<br>· Use a range of multiplicative strategies when operating on whole numbers.<br>· Understand addition and subtraction of fractions, decimals, and integers. | **Geometry and Measurement**<br>**Measurement**<br>· Use side or edge lengths to find the perimeters and areas of rectangles, parallelograms, and triangles and the volumes of cuboids.<br>· Interpret and use scales, timetables, and charts. | **Number and Algebra**<br>**Equations and expressions**<br><br>Form and solve simple linear equations. | **Statistics**<br>**Statistical Investigation**<br><br>· Plan and conduct investigations using the statistical enquiry cycle: determining appropriate variables and data collection methods; gathering, sorting, and displaying multivariate category, measurement, and time-series data to detect patterns, variations, relationships, and trends; comparing distributions visually; communicating findings, using appropriate displays. | **Number and Algebra**<br>**Number strategies and knowledge**<br>· Know the equivalent decimal and percentage forms for everyday fractions.<br>· Know the relative size and place value structure of positive and negative integers and decimals to three places. | **Geometry and Measurement**<br>**Transformation**<br>· Use the invariant properties of figures and objects under transformations (reflection, rotation, translation, or enlargement).<br><br>**Position and Orientation**<br>· Communicate and interpret locations and directions, using compass directions, distances, and grid references. | **Number and Algebra**<br>**Patterns and relationships**<br>Use graphs, tables, and rules to describe linear relationships found in number and spatial patterns. | **Statistics**<br>**Statistical Literacy**<br>· Evaluate statements made by others about the findings of statistical investigations and probability activities. |

## Values and Key Competencies in the Mathematics and Statistics Curriculum at Collingwood Area School:

We expect students to develop the Values and Key Competencies of the NZ Curriculum

- By providing rich learning tasks that enable them to strive for **excellence** ( pushing the boundaries of their own abilities), to be **innovative** and curious, use **inquiry** techniques in their learning; develop sensitivity towards **ecological sustainability**, and use **language, symbols and texts** in solving problems;

- By providing various learning environments to learn to **relate to others**, to learn to tolerate and accept differing points of views and cultural backgrounds (**diversity, participation**), to encourage them to use **equity** in their conduct, to express their **thinking** and be engaged (**participating and contributing)** with others while solving problems;
- By having clear expectations regarding attendance and equipment, we aid students in developing **self-management** skills.

## What do we want our students to achieve in Mathematics and Statistics at Collingwood Area School?

**Through our teaching and learning programme, we want our students to be able to:**

- Be positive about mathematics;
- Achieve at or beyond the student's curriculum level for their age.
- Use a range of strategies appropriate to their age and stage to solve mathematical problems;
- Apply mathematical strategies and knowledge to a wide range of real life situations;
- Articulate their mathematical thinking using the language of mathematics;
- Solve problems with and without the use of equipment;
- Equip themselves with problem solving capabilities to solve current and future maths problems;
- Develop resilience to persevere with challenges in mathematics;
- Communicate mathematical ideas with others; Discuss and share opinions respectfully using the language of mathematics.
- Accept that mistakes are an integral part of learning; Identify, discuss and resolve errors where possible.

## Our Philosophy:

- At Collingwood Area School we believe that Mathematics is of vital importance to all students.
- Mathematics empowers students to succeed in life beyond school.
- Mathematics skills are becoming increasingly important in today's society.
- Mathematics pedagogy has undergone significant changes that reflect modern research, changes in society and technological advancement.
- Teaching and learning at Collingwood Area School will continue to evolve to reflect these changes.
- We encourage students to continue with learning in Maths and Stats though to Year 13 and beyond.
- We believe that courses should be tailored to individual learning needs and career pathways.
- We cater for students who need to be working at more than one level by offering different standards concurrently within a class.

# References:

The Collingwood Area School Mathematics and Statistics Curriculum is based on aspects of the following documents:

- The New Zealand Curriculum (MOE)
- The New Zealand Curriculum Mathematics Standards for Years 1-8 (MOE)
- Numeracy Project Book 1: Getting Started. (MOE)
- Collingwood Area School Mathematics and Statistics Scheme 2009 - 2010 (K. Milligan, J.Hanlon, M.Barham)

| Year Level | Yr 1-2 |
|---|---|
| SOLO or other thinking tools. (Where applicable) | Prestructural - Unistructural: Define, describe, do simple procedures,- Multistructural list, combine |
| Skills | By the end of Year 2 students should be working at Stage 4 of the Numeracy project<br>**Basic Facts:**<br>● Instant recall of addition and subtraction facts to 10<br>● Instant recall of doubles and halves to 20<br>● Recognise numbers to 100 and patterns to 10<br>● Skip count in 2s to 20, 5s to 50, 10s to 100<br><br>**Number :**For further detail see Numeracy Project Book - The number Framework, P18<br>● Solve problems, group and sequence numbers, communicate and explain strategies, recognise and quantify sets using whole numbers to 100 and simple fractions.<br><br>**Geometry and Measurement**: For a full list of skills (Achievement Objectives) refer to the New Zealand Curriculum charts.<br>● Order and compare, sort, give and follow movement instructions, describe position, communicate and record results of movements.<br>**Statistics**: For a full list of skills (Achievement Objectives) refer to the New Zealand Curriculum charts.<br>● Conduct investigations, interpret statements, predict outcomes of chance. |

| | |
|---|---|
| **Possible Topics**<br><br>**(Over a two year cycle)** | **Number:** Addition / Subtraction strategies; Multiplication / Division strategies; Proportions and Ratios; Equations and expressions; Patterns and relationships.<br><br>**Geometry and Measurement:** Statistical investigations; Statistical literacy; Probability;<br><br>**Statistics:** 2D shapes; Length and distance; Time; Temperature; Weights;<br><br>These topics could be taught within the context of (for example):<br><br>Weather, shops and businesses, seasons, transport, pets and farm animals, hunting and fishing, sports, mathematics in music, travel and holidays, building and construction, growing up, our parents' jobs, gardening, hobbies, cooking … |
| **Curriculum Level Expectations** | **After one year at school:** After one year at school, children will be achieving at <u>early level one</u> in the mathematics and statistics learning area of the New Zealand Curriculum.<br><br>**After two years at school:** After two years at school, children will be achieving at <u>level one</u> in the mathematics and statistics learning area of the New Zealand Curriculum. |

| | |
|---|---|
| **Assessments** | **NumPa** on school entry.<br>**Student Portfolios** (Numeracy project) or **Snapshots** (Add/sub, mult/div and props/rats)<br>**Teacher observation** of demonstrated strategies and bookwork |
| **Teaching Strategies** | ● Daily basic facts and maintenance of prior work<br>● Whole class modelling of new strategies<br>● Needs based / ability based group or individual tasks<br>● Developmental practice (Guided free choice of games and activities) |
| **Community Support Ideas** | ● Regular parent helpers in class<br>● Parent led cross curricular activities and workshops |

| Year Level | Yr 3-4 |
|---|---|
| SOLO or other thinking tools. (Where applicable) | Unistructural: Define, describe, do simple procedures, - Multistructural list, combine, describe, |
| Skills | By the end of Year 4 students should be working at Stage 5 of the Numeracy project<br>**Basic Facts:**<br>● Instant recall of doubles and halves to 20<br>● Instant recall of addition and subtraction problems to 20<br>● Instant recall of 2, 5 and 10 x tables<br>**Number :**For further detail see Numeracy Project Book - The number Framework, P18<br>● Solve problems, group and sequence numbers, communicate and explain strategies, recognise and quantify sets using whole numbers to 1000 and simple fractions.<br>● Communicate and interpret diagrams, classify numbers as odd or even.<br>● Partition numbers, predict sequential patterns.<br>**Geometry and Measurement**: For a full list of skills (Achievement Objectives) refer to the New Zealand Curriculum charts.<br>● Use appropriate units, partition and combine measures.<br>● Sort, justify, identify and describe shapes<br>● Show position and direction, describe views and locations on maps<br>**Statistics**: For a full list of skills (Achievement Objectives) refer to the New Zealand Curriculum charts.<br>● Conduct investigations, pose and answer questions, gather sort and display data, communicate findings.<br>● Compare statements<br>● Predict and trial, recognise likelihoods. |
| Possible Topics<br><br>(Over a two year cycle) | **Number:** Addition / Subtraction strategies; Multiplication / Division strategies; Proportions and Ratios; Equations and expressions; Patterns and relationships.<br><br>**Geometry and Measurement:** Statistical investigations; Statistical literacy; Probability;<br><br>**Statistics:** 2D and 3D shapes; Length and area; Time; Temperature; Position and orientation; Weight and capacity; Transformation;<br><br>These topics could be taught within the context of (for example):<br><br>Weather, shops and businesses, seasons, transport, pets and farm animals, hunting and fishing, sports, mathematics in music, travel and holidays, building and construction, growing up, our parents' jobs, gardening, hobbies, cooking … |

| | |
|---|---|
| **Curriculum Level Expectations** | **After three years at school:** After three years at school, children will be achieving at <u>early level 2</u> in the mathematics and statistics learning area of the New Zealand Curriculum.<br><br>**By the end of Year 4:** By the end of year 4, children will be achieving at <u>level 2</u> in the mathematics and statistics learning area of the New Zealand Curriculum. |

| | |
|---|---|
| **Assessments** | **Student Portfolios** (Numeracy project) or **Snapshots** (Add/sub, mult/div and props/rats): Term 2 and 4<br>**Teacher observation** of demonstrated strategies and bookwork<br>**Basic Facts** assessments: Term 1, 2 and 4<br>**E-Asttle** where appropriate<br>**Diagnostic and summative unit tests** where required<br>**Teacher observation** of learning behaviours and workbooks. |
| **Teaching Strategies** | <ul><li>Daily basic facts and maintenance of prior work</li><li>Whole class modelling of new strategies</li><li>Needs based / ability based group or individual tasks</li><li>Developmental practice (Guided free choice of games and activities)</li></ul> |
| **Community Support Ideas** | <ul><li>Regular parent helpers in class</li><li>Parent led cross curricular activities and workshops</li></ul> |

| Year Level | Yr 5-6 |
|---|---|
| **SOLO or other thinking tools. (Where applicable)** | Multistructural - Relational<br>List, combine, describe, Sequence, classify, relate, apply, formulate questions |
| **Skills** | By the end of Year 6 students should be working at Stage 6 of the Numeracy project<br>**Basic Facts:** Have instant recall of all addition and subtraction facts to 20<br>      Have instant recall of all multiplication tables to 10<br>      Have instant recall of associated division facts<br><br>**Number :**For further detail see Numeracy Project Book - The number Framework, P18<br>  ● Solve problems using whole numbers, use a range of strategies.<br>  ● Recognise and classify fractions, decimals and percentages; Sequence numbers; know 10s, 100s and 100s in whole numbers;<br>  ● record and interpret add/sub and simple multiplicative strategies<br>  ● Partition and combine, find patterns with numbers and shapes.<br><br>**Geometry and Measurement**: For a full list of skills (Achievement Objectives) refer to the New Zealand Curriculum charts.<br>  ● Solve problems, use linear scales, use metric units, find areas and volumes<br>  ● Define shapes and solids; represent objects<br>  ● Create coordinates, specify locations and describe paths.<br>  ● Describe transformation and mapping of objects.<br><br>**Statistics**: For a full list of skills (Achievement Objectives) refer to the New Zealand Curriculum charts.<br>  ● Conduct investigations, gather, sort and display multivariate data; identify patterns and trends; communicate findings.<br>  ● Evaluate displays and findings.<br>  ● Investigate chance situations, compare results with predictions; acknowledge variation. |
| **Possible Topics**<br><br>**(Over a two year cycle)** | **Number:** Addition / Subtraction strategies; Multiplication / Division strategies; Proportions and Ratios; Equations and expressions; Patterns and relationships.<br><br>**Geometry and Measurement:** Statistical investigations; Statistical literacy; Probability;<br><br>**Statistics:** 2D and 3D shapes; Length and area; Time; Temperature; Position and orientation; Weight and capacity; Transformation; Distance.<br><br>**Problem Solving**: Single or multi-strand problem solving.<br>These topics could be taught within the context of (for example):<br>Weather, shops and businesses, seasons, transport, pets and farm animals, hunting and fishing, sports, mathematics in music, travel and holidays, building and construction, growing up, our parents' jobs, gardening, hobbies, cooking … |

| | |
|---|---|
| **Curriculum Level Expectations** | **By the end of Year 5:** By the end of year 5, children will be achieving at <u>early level 3</u> in the mathematics and statistics learning area of the New Zealand Curriculum.<br><br>**By the end of Year 6:** By the end of year 6, children will be achieving at <u>level 3</u> in the mathematics and statistics learning area of the New Zealand Curriculum. |
| **Assessments** | Term 1 - **IKan, PAT, Basic Fact**s (Add/ Sub, Mult/Div) **e-Asttle Maths** (If necessary)<br>Term 2 - **Snapshots** (Add/Sub, Mult/Div, Props / Ratios) (Strategies)**Basic Facts** (Add/ Sub, Mult/Div<br>Term 4 - Update **Snapshots** (Add/Sub, Mult/Div, Props / Ratios), **Basic Facts** (Add/ Sub, Mult/Div<br>Ongoing: Diagnostic and summative assessments (Unit based)<br>**Teacher observation** of learning behaviours and workbooks. |
| **Teaching Strategies** | ● Daily basic facts and maintenance of prior work<br>● Whole class modelling of new strategies<br>● Needs based / ability based group or individual tasks<br>● Mixed ability problem solving tasks<br>● Developmental practice (Guided free choice of games and activities) |
| **Community Support Ideas** | ● Parent led cross curricular activities and workshops<br>● School based workshops for parents on strategies, content and how to help. |

| Year Level | Yr 7-8 |
|---|---|
| **SOLO or other thinking tools. (Where applicable)** | Relational - Extended Abstract<br>Sequence, classify, relate, apply, formulate questions, Evaluate, theorise, generalise, predict, hypothesise, reflect |
| **Skills** | By the end of Year 8 students should be working at Stage 7 of the Numeracy project<br>**Basic Facts:** Have instant recall of all addition and subtraction facts to 20<br>Have instant recall of all multiplication tables to 12<br>Have instant recall of associated division facts<br>Know equivalent fractions, decimals and percentages<br>Recognise factors and multiples of tables to 12<br>Classify numbers as positive or negative and know primes<br><br>**Number:** For further detail see Numeracy Project Book - The number Framework, P18<br>● Solve problems with integers, fractions, decimals, ratios and exponents; use multiplicative and simple proportional strategies; use sensible estimates.<br>● Communicate and interpret strategies; represent and solve problems with unknowns.<br>● Partition and combine multiplicatively; create rules and graphs to describe relationships.<br><br>**Geometry and Measurement**: For a full list of skills (Achievement Objectives) refer to the New Zealand Curriculum charts.<br>● Select and use appropriate standard; convert between units; find perimeters, area and volume of cuboids; interpret times tables and charts.<br>● Define classes of shapes and objects; relate 3D and 2D models.<br>● Communicate and interpret locations; use bearings and grid references.<br>● Identify symmetries of objects and properties of these objects under transformation.<br><br>**Statistics**: For a full list of skills (Achievement Objectives) refer to the New Zealand Curriculum charts.<br>● Conduct investigations; determine variables, select best methods; gather sort and display data; detect patterns and trends; compare distributions; communicate findings.<br>● Make and evaluate statements including causes of variation; investigate chance situations, use simple fractions to describe probabilities. |
| **Possible topics**<br><br>**(Over a two year cycle)** | **Number:** Addition / Subtraction strategies; Multiplication / Division strategies; Proportions and Ratios; Equations and expressions; Patterns and relationships; Financial literacy.<br><br>**Geometry and Measurement:** Statistical investigations; Statistical literacy; Probability;<br><br>**Statistics:** 2D and 3D shapes; Length and area; Time; Temperature; Position and orientation; Weight and capacity; Transformation; Distance. |

| | |
|---|---|
| | **Problem Solving**: Single or multi-strand problem solving.<br><br>These topics could be taught within the context of (for example):<br><br>Weather, shops and businesses, seasons, transport, pets and farm animals, hunting and fishing, sports, mathematics in music, travel and holidays, building and construction, growing up, our parents' jobs, gardening, hobbies, cooking ... |
| **Curriculum Level Expectations** | **By the end of Year 7:** By the end of year 5, children will be achieving at <u>early level 4</u> in the mathematics and statistics learning area of the New Zealand Curriculum.<br><br>**By the end of Year 8:** By the end of year 5, children will be achieving at <u>level 4</u> in the mathematics and statistics learning area of the New Zealand Curriculum. |
| **Assessments** | Term 1 - **IKan, PAT, Basic Fact**s (Add/ Sub, Mult/Div, fractions, roots, squares) **e-Asttle Maths** (If necessary) Term 2 - **Snapshots** (Add/Sub, Mult/Div, Props / Ratios) (Strategies)<br>Term 4 - Update **Snapshots** (Add/Sub, Mult/Div, Props / Ratios), **Basic Facts** (Add/ Sub, Mult/Div<br>**Diagnostic and summative unit tests** where required<br>**Teacher observation** of learning behaviours and workbooks. |
| **Teaching Strategies** | ● Daily basic facts and maintenance of prior work<br>● Whole class modelling of new strategies<br>● Needs based / ability based group or individual tasks<br>● Mixed ability problem solving tasks<br>● Developmental practice (Guided free choice of games and activities) |
| **Community Support Ideas** | ● Parent led cross curricular activities and workshops<br>● School based workshops for parents on strategies, content and how to help.<br>● Business mentors<br>● Guest speakers - experts in their field. (Maths in the workplace) |

| Year Level | Yr 9-10 |
|---|---|
| **SOLO or other thinking tools. (Where applicable)** | Unistructural: Define, Multi structural: describe, list, do algorithm, Relational: relate, apply, use analogy, formulate questions, Extended Abstract:Evaluate, generalise within a concept, predict, |
| **Skills (as linked to A.O.s)** | By the end of Year 10 students will be able to understand and apply concepts relating to:<br>**Number:** linear proportion; fractions, decimals, percentages; standard form, powers, roots; rounding to significant figures and decimal place values; solve simple linear and quadratic equations; generalise properties of operations, link various representations of patterns (numeric and geometric representations);<br>**Geometry and Measurement:** understanding of and use of metric units; use of formulae regarding perimeters and areas of shapes including polygons, circles and composite shapes; angles and their properties in intersecting lines, polygons, use of nets and different geometric representations, including isometric drawing, for polyhedra; simple loci, use of bearings, scales and introduction to co-ordinate systems; simple transformations;<br>**Statistics:** practical surveys, experiments; evaluating others' investigations; introduction to different distributions and comparing them; understanding difference of and calculating hypothetical and experimental probabilities;<br>**Basic facts knowledge:** Students by the end of the year 10 will have to have a proficiency in their times tables up to 12, know square numbers up to 20 and 25; be competent users of family of facts relating to the additive and multiplicative operations.<br>For further detail see Numeracy Project Book - The number Framework,<br>**Numeracy Project book 8**<br>**Numeracy project book 9**<br>For a full list of skills (Achievement Objectives) refer to the New Zealand Curriculum charts. |
| **Possible Topics** | **Number:** trading, markets, populations, fund raiser events, sporting events, cultures across the ages (different number systems),<br>**Algebra:** speed-distance-time, agriculture (areas, fencing needs, irrigations, ..), calendars, number charts (triangular numbers, square numbers), sequences, symbolisms (road signs, sign language, braille, codes, war stories, transportation logistics)<br>**Geometry:** orienteering, mapping, navigation, logistics and pathways<br>**Trigonometry:** building, environment,<br>**Statistics:** environment, human biology, fashion trends, technology, road sense,<br>**Probability:** coins, gambling games, card games, board games |
| **NCEA Requirements / Terminology** | Students will be consolidating their curriculum level 4 achievement targets over year 9-10 if they were unable to reach it by the end of year 8.<br><br>During year 9-10 students will start preparation for NCEA requirements and will consolidate National Standard requirements.<br><br>By the end of year 10 student will be achieving at curriculum level 5 demonstrating knowledge and application of: thinking mathematically and statistically, solve problems and model situations.<br>Terminology: increased vocabulary, concepts and precision. Students are required to use deducting skills at all fields of mathematics and to use related vocabulary. ( organise, analyse, synthesize, conclude, deduct, explain, compare and contrast, etc) |

| | |
|---|---|
| **Assessments** | PAT, Numeracy diagnostic testing, Numeracy Knowledge test, topic/ unit assessments ensuring at least on in each of the fields: Number, Basic Algebra, Geometry and Shapes, Probability, Statistics<br>AS are found in the Mathematics and Statistics Matrix available from here |
| **Teaching Strategies** | Still a lot of kinaesthetic activities, but increasing amount of note taking (digital or otherwise) creating their own learning resources/references for NCEA years, increased use of symbols and texts in classroom and for revision tasks, modelling problem solving, modelling use of vocabulary, incorporate activities regularly where students having to express themselves verbally in full sentences making use of terminus technicus, insist on correct setting out of problems, equations, solutions with symbols to develop correct communication mathematically on paper; |
| **Community Support Ideas** | Visits to shops regarding running a business where stock-taking and delivery happens frequently (organising, use of symbols, charts, budgeting needs, bookkeeping)<br>invite tradesmen to talk about their use of mathematical skills in their everyday work (builders, Sollys, Takaka mill, IT technicians, Surveyors, skippers, land developers)<br>invite Irene to class to talk about budgeting, bookkeeping, financial administration and related skills, |

| Year Level | Yr 11 |
|---|---|
| SOLO or other thinking tools. (Where applicable) | Unistructural: Define, do simple procedure, Multi structural: describe, list, do algorithm, combine Relational: compare/contrast, explain causes, relate, link, apply, formulate questions, Extended Abstract: Evaluate, generalise, predict, create, imagine |
| Skills | By the end of Year 11 students will be able to understand and apply concepts relating to:<br>**Number/Algebra:** direct and inverse linear proportion; fractional and negative powers; rates and ratio; optimal solutions; linear, quadratic and simple exponential equations; generalise properties of operations including exponents, link various representations of patterns (numeric and spatial); rates of change in linear relations; linear simultaneous equations;<br>**Geometry and Measurement:** apply appropriate metric units in context, use of derived measures; use of formulae regarding 3D objects; apply geometric reasoning techniques including circle geometry, similar shapes, trigonometric ratios and Pythagoras, co-ordinate systems; loci overlaps, combined transformations, symmetrical patterns;<br>**Statistics:** use of PPDAC = Statistical Inquiry cycle; evaluating statistical reports in media; focus on the role of sample size, understanding difference of and calculating hypothetical and experimental probabilities;<br>**Basic facts knowledge:** Students by the end of the year 11 will have to have a working knowledge of the properties of operations with fractions (intro to algebraic fractions), use of scientific calculators are increased at this level.<br>For a full list of skills (Achievement Objectives) refer to the New Zealand Curriculum charts. |
| Possible Topics | **As in year 9-10 plus:**<br>**Number:** everyday scenarios relating to cooking, selling-buying, organising peoples and events, abstract contexts in the field of number systems, software programming,<br>**Algebra:** designs, algorithms, space sciences, IT, economy, policy makers<br>**Geometry:** orienteering, optimal packing (use of available space), shape properties for visually appealing architecture (Greeks), natural environment, Earth, navigation at sea, in space, on land, forensic science (scale reductions, photographic evidence and real life sizes), archaeology (growth curves, decay, real life sizes deducted from fossil measurements, etc.),<br>**Trigonometry:** Pythagoras and trig ratios in practical applications,<br>**Statistics:** economy, retail, population inferences,<br>**Probability:** distributions, LOTTO, use of iNZight and CensusatSchools software programs, online data gathering for contexts such as road statistics, Earth population, death rates, etc. |
| NCEA Requirements / Terminology | By the end of year 11 student will be achieving at curriculum level 6 demonstrating knowledge and application of: thinking mathematically and statistically, solve problems and model situations.<br><br>Terminology: increased vocabulary and expanded concepts, selecting appropriate precision to the context. Students are required to use and build on previous levels and start using reasoning and analysing skills to link different concepts and their varying representations. |

| Assessments | NCEA Achievement Standards will vary among students as they can select the most appropriate ones that benefit their proposed career paths.<br>**Internal**<br>91026 Apply numeric reasoning in solving problems, 91029 Apply linear algebra in solving problems, 91030 Apply measurement in solving problems, 91032 apply right angled triangles in solving measurement problems, 91033 Apply knowledge of geometric representations in solving problems, 91038 Investigate a situation involving elements of chance.<br>**External**<br>91027 Apply algebraic procedures in solving problems, 91031 Apply geometric reasoning in solving problems, 91037 Demonstrate understanding of chance and data. |
| --- | --- |

| Teaching Strategies | Increased use of symbols when note taking, increased use of notes (own notes, pre-formulated and textbook) and written references, coding -decoding activities, re-structuring scrambled texts, ordering scrambled instructions or steps of solutions, interactive activities with written information, verbal discussions encouraging use of full sentences and terminus technicus, listening-describing activities to develop understanding and precise use of terminus technicus, us of practical tools in trigonometry, geometry, measurement, use of software programmes in statistics, graphs, some practical activities in the teaching-learning of trigonometry, measurement and loci. |
| --- | --- |
| Community Support Ideas | As in year 9-10 |

| Year Level | Yr 12 |
|---|---|
| SOLO or other thinking tools. (Where applicable) | Unistructural: Define, do simple procedure, Multi structural: describe, list, do algorithm, combine Relational: analyse, compare/contrast, explain causes, relate, link, apply, formulate questions, Extended Abstract: Evaluate, generalise, predict, theorise, create, hypothesise, reflect |
| Skills | By the end of Year 12 students will be able to  understand and apply concepts relating to:<br>**Mathematics:** apply co-ordinate geometry techniques to points and lines, apply graphical methods, use sequences, apply trigonometry techniques in 2D and 3D situations, apply network methods, use equations and algebraic expressions (rational, exponential, logarithmic); use an apply linear, quadratic and trigonometric equations and graphs;<br>**Calculus:** sketch the graphs of functions, gradient functions, and properties/special features; apply differentiation and integration techniques to polynomials;<br>**Statistics:** use of PPDAC = Statistical Inquiry cycle;  evaluating statistical reports;  make inferences;<br>**Probability:** compare theoretical and experimental distributions; calculate probabilities using multiple techniques;<br><br>**Basic facts knowledge:** Students by the end of the year 12 will have to have mastery of the properties of operations with algebraic fractions and a confident knowledge of basic algebraic techniques, use of graphics calculators is a must at this level as without it students **are** disadvantaged;<br>For a full list of skills (Achievement Objectives) refer to the New Zealand Curriculum charts. |
| Possible Topics | all go: i.e.: tides, waves, history of mathematics, space crafts and universe, current affairs topics, share market, policy makers, government, population measures, abstract patterns in geometry and number, information technology, engineering, research fields, architecture, roading, carrier companies, logistical operations (transport, retail, supply-demand, military), humanitarian missions, natural environment (oceans, volcanos, tsunamis, earthquakes, etc.), imaginary contexts (science fiction, made up cultures), …. |
| NCEA Requirements / Terminology | By the end of year 12 student will be achieving at curriculum level 7 demonstrating knowledge and application of: thinking mathematically and statistically, solve problems and model situations.<br><br>Terminology: highly subject specific in all fields, increased expectation of their application and understanding of, increased expectation of use of symbols. |
| Assessments | NCEA Achievement Standards will vary among students as they can select the most appropriate ones that benefit their proposed career paths.<br>**Internal**<br>91256 Coordinate geometric methods in solving problems, 91258 Apply sequences and series in solving problems, 91259 Apply trigonometric relationships in solving problems, 91260 Apply networks in solving problems, 91262 Apply calculus methods in solving problems,**External**<br>91267 Apply probability methods in solving problems, 91261 Apply algebraic methods in solving problems, 91269 Apply systems of equations in solving |

| | |
|---|---|
| | problems |
| **Teaching Strategies** | Some practical approach in the teaching and learning of trigonometry and gradient functions, software applications in statistics and graphical methods to aid self-discovery of rules, comprehension and provide visual support to link different concepts, mostly use of written texts and symbols to facilitate the abstract nature of Mathematical modelling, listening activities to aid thinking, conceptualisation, visualisation and use of terminus technicus, use of graphics calculators and technology to focus learning on concepts rather than number manipulation; |
| **Community Support Ideas** | Invited speakers from the fields of analysts, surveyors, tertiary professors, |

| | |
|---|---|
| **Year Level** | **Yr 13** |
| **SOLO or other thinking tools. (Where applicable)** | <span style="color:red">Unistructural: Define, do simple procedure,</span> <span style="color:orange">Multi structural: describe, list, do algorithm, combine</span> <span style="color:green">Relational: sequence, classify, analyse, compare/contrast, explain causes, relate, link, apply, analogy, formulate questions,</span> <span style="color:blue">Extended Abstract: Evaluate, generalise, predict, theorise, create, hypothesise, reflect, imagine</span> |
| **Skills** | By the end of Year 13 students will be able to understand and apply concepts relating to:<br>**Calculus:** apply and use complex numbers, conic sections, apply and use differentiation techniques and integration techniques on various function types and on conic sections,<br>**Trigonometry:** use and application of trigonometric techniques in different representations (graphical and algebraic), use of trig identities in the contexts of geometry and real life situations,<br>**Statistics:** use of PPDAC cycle, evaluate statistically based reports, critique causal-relationships, interpret margin of errors, make inferences, use of confidence intervals, sampling variability, etc.<br>**Probability:** use of distributions (concrete and continuous) in calculating probabilities, understanding of and use of central limit theorem and related concepts, knowledge and use of combinatorics;<br>For a full list of skills (Achievement Objectives) refer to the New Zealand Curriculum charts. |
| **Possible Topics** | As in y12 |
| **NCEA Requirements / Terminology** | By the end of year 12 student will be achieving at curriculum level 8 demonstrating knowledge and application of: thinking mathematically and statistically, solve problems, model situations and communicate with correct mathematical statements.<br><br>Terminology: highly subject specific and heavily loaded |
| **Assessments** | NCEA Achievement Standards, Scholarship Examinations<br>NCEA Achievement Standards will vary among students as they can select the most appropriate ones that benefit their proposed career paths.<br>**Statistic**<br>**Internal**<br>91574 Apply linear programming methods in solving problems, 91587 Apply systems of simultaneous equations in solving problems, |

| | |
|---|---|
| | 91580 Investigate time series data, 91581 Investigate bivariate measurement data,<br>**External**<br> 91586 Apply probability distributions in solving problems<br>**Calculus**<br>**Internal**<br> 91574 Apply linear programming methods in solving problems, 91587 Apply systems of simultaneous equations in solving problems,<br> 91575 Apply trigonometric methods in solving problems, 91576 use critical path analysis in solving problems<br>**External**<br> 91577 Apply the algebra of complex numbers in solving problems |
| **Teaching Strategies** | Modelling, use of analogies, expanded concepts; linking various contexts to deepen understanding, linking all types of possible representations within studied concepts and fields, linking concepts across fields, use of highly symbolised spoken and written language, use of technology (software and graphics calculators); |
| **Community Support Ideas** | As in year 12 plus invited experts in various fields from across the country or online real time conferences, |