Mathletics

New Zealand Program of Studies

Skill Quests

Year 9 – 10

May, 2022

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Year 9

1 Number and Algebra

1.1 Number strategies and knowledge

Outcome	Quests	Content
1. Reason with linear proportions.	Use numeracy strategies to multiply	Using numeracy strategies to multiply
	Equivalent fractions	Equivalent fractions: comparing & simplifying
		Converting improper/mixed numbers & vice versa
	Compare decimals	Comparing decimals
2. Use prime numbers, common factors and multiples, and powers (including square roots).	Find the LCM & HCF	Finding the lowest common multiple
		Finding the highest common factor
	Use squares, cubes, roots & exponents	Using squares, cubes & roots
		Understanding the zero exponent rule
		Using negative exponents
3. Understand operations on fractions, decimals, percentages and integers.	Use operations on integers	Adding & subtracting integers
		Multiplying & dividing integers
	Use operations on fractions	Adding & subtracting fractions
		Multiplying fractions
		Dividing fractions
	Use operations on decimals	Adding & subtracting decimals
		Multiplying decimals
		Dividing decimals
	Increase/decrease by a percentage	Increasing/decreasing by a percentage
4. Use rates and ratios.	Solve problems with rates	Understanding & comparing rates
		Solving problems with rates
		Understanding distance/time rates
		Solving problems with speed
	Solve problems with ratios	Understanding ratios
		Solving ratio problems
5. Know commonly used fraction, decimal, and percentage conversions.	Convert fraction, decimal & percentages	Converting fractions to decimals
		Converting fractions to percentages
		Converting percentages to decimals
		Converting fractions, decimals & percentages

6. Know and apply standard form, significant figures, rounding, and decimal place value.	Use standard form/scientific notation	Using standard form/scientific notation
	Round: decimal places	Rounding: decimal places

1.2 Equations and expressions

Outcome	Quests	Content
7. Form and solve linear and simple quadratic equations.	Write algebraic expressions	Writing algebraic expressions from words
	Form linear equations	Forming linear equations
	Solve equations: 2 step	Solving equations: 2 step
		Solving equations: 2 step with integers
		Checking solutions by substitution

1.3 Patterns and relationships

Outcome	Quests	Content
8. Generalise the properties of operations with fractional numbers and integers.	Simplify algebraic expressions	Simplifying algebraic expressions
		Substitution
9. Relate tables, graphs, and equations to linear and simple quadratic relationships found in number and spatial patterns.	Investigate patterns in a table	Investigating patterns in a table

2 Geometry and Measurement

2.1 Measurement

Outcome	Quests	Content
1. Select and use appropriate metric units for length, area, volume and capacity, weight (mass), temperature, angle, and time, with awareness that measurements are approximate.	Choose appropriate units of measure	Choosing appropriate units of measure
2. Convert between metric units, using decimals.	Convert between metric units	Converting measures of time
		Converting metric units of length
		Converting metric units of mass
		Converting metric units of volume
3. Deduce and use formulae to find the perimeters and areas of polygons and the volumes of prisms.	Calculate the perimeter of a polygon	Calculating the perimeter of a polygon
	Calculate the area of polygons	Calculating the area of a triangle
		Calculating the area of quadrilaterals
		Calculating the area of a trapezium
	Calculate the volume of prisms	Calculating volume of triangular prisms
		Calculating volume of rectangular prisms
4. Find the perimeters and areas of circles and composite shapes and the volume of prisms, including cylinders.	Circles: circumference & area	Calculating the circumference of a circle
		Calculating the area of a circle
	Composite shapes: perimeter & area	Calculating the perimeter of composite shapes
		Calculating the area of composite shapes
	Volume: cylinders & composite shapes	Calculating the volume of a cylinder
		Calculating the volume of composite shapes

2.2 Shape

Outcome	Quests	Content
5. Deduce the angle properties of intersecting and parallel lines and the angle properties of polygons and apply these properties.	Use angle properties to solve problems	Using angle properties to solve problems
		Using angle properties in triangles

		Using angle properties in special triangles
		Using angle properties in polygons
6. Create accurate nets for simple polyhedra and connect three-dimensional solids with different two-dimensional representations.	Identify nets for solids & vice versa	Identifying nets for solids & vice versa

2.3 Position and orientation

Outcome	Quests	Content
7. Construct and describe simple loci.	Understand the language with circles	Understanding the language with circles
		Determining if circles are congruent
	Understand distance/time graphs	Understanding distance/time graphs
		Constructing distance/time graphs
	Graph discrete linear patterns	Graphing discrete linear patterns from a table
		Graph discrete linear patterns from an expression
	Identify linear models	Identifying linear models in real life
8. Interpret points and lines on co-ordinate planes including scales and bearings on maps.	Use scales on maps & diagrams	Using scales on maps & diagrams
	Understand compass & true bearings	Understanding compass & true bearings
	Use the coordinate plane	Using the coordinate plane

2.4 Transformation

Outcome	Quests	Content
9. Define and use transformations and describe the invariant properties of figures and objects under these transformations.	Understand translation	Understanding translation
	Understand reflection	Understanding reflection
	Understand rotation	Understanding rotation
	Congruent polygons & similar figures	Understanding congruent polygons
		Understanding similar figures
	Enlargement & scale factors	Constructing similar triangles by enlargement
		Solving enlargement problems with a scale factor

3 Statistics

3.1 Statistical investigation

Outcome	Quests	Content
1. Plan and conduct surveys and experiments using the statistical enquiry cycle.	Set up statistical investigations	Setting up statistical investigations
	Analysis: data displays	Analysis: data displays for discrete & continuous
		Analysis: data displays - line & pie
		Analysis: data displays for univariate data
		Analysis: interpreting data displays
	Calculate mean, median & range	Calculating mean, median & range from graphs
	Calculate quartiles & IQR	Calculating quartiles & IQR: box-and-whisker plot
	Analysis: describe shape	Analysis: describing shape
	Make conclusions	Making conclusions: about population from a sample

3.2 Statistical literacy

Outcome	Quests	Content
2. Evaluate statistical investigations or probability activities undertaken by others, including data collection methods, choice of measures and validity of findings.	Evaluate reports for validity	Evaluating misleading graphs
		Considering other factors

3.3 Probability

Outcome	Quests	Content
3. Compare and describe the variation between theoretical and experimental distributions in situations that involve elements of chance.	Understand trials & make predictions	Understanding trials & making predictions
4. Calculate probabilities using fractions, percentages, and ratios.	Understand the language of probability	Understanding the language of probability
		Understanding sample spaces
	Understand probability events	Understanding probability: equally likely events
		Assigning probabilities to events

		Understanding probability: unequally likely events

Year 10

1 Number and Algebra

1.1 Number strategies and knowledge

Outcome	Quests	Content
1. Reason with linear proportions.	Compare fractions, decimals & percentage	Comparing & simplifying fractions
		Comparing fractions, decimals & percentages
	Represent calculations in different ways	Representing calculations in different ways
2. Use prime numbers, common factors and multiples and powers (including square roots).	Use squares, cubes, roots & exponents	Using squares, cubes & roots
		Calculating square roots of non-perfect squares
		Applying exponent rules
		Rules for powers of powers
3. Understand operations on fractions, decimals, percentages, and integers.	Perform operations on fractions	Performing operations on proper fractions
		Performing operations on improper fractions
		Performing operations on mixed numbers
		Solving problems with fractions
	Perform operations on decimals	Adding & subtracting decimals
		Multiplying decimals
		Dividing decimals
		Applying order of operations to decimals
	Perform operations on percentages	Performing operations on percentages
4. Use rates and ratios.	Use rates to solve problems	Using rates to solve problems
	Use ratios to solve problems	Using ratios to solve problems
5. Know commonly used fraction, decimal, and percentage conversions.	Convert fraction, decimal & percentages	Converting fractions to percentages
		Equivalence: fractions, decimals & percentages
6. Know and apply standard form, significant figures, rounding and decimal place value.	Round significant figures	Rounding significant figures: whole numbers
		Rounding significant figures: decimals
	Use standard form/scientific notation	Using standard form/scientific notation
		Using a calculator for scientific notation

	Round: scientific notation	Rounding scientific notation: decimal places
	Round scientific notation: sig fig	Rounding scientific notation: significant figures

1.2 Equations and expressions

Outcome	Quests	Content
7. Form and solve linear and simple quadratic equations.	Solve equations: 2 step advanced	Solving equations: 2 step advanced
		Solving word problems: linear equations
	Solve equations: 3 step	Solving equations: 3 step
	Solve equations: letters on both sides	Solving equations: letters on both sides
	Solve equations: expanding required	Solving equations: expanding required
		Solving equations: multiple sets of brackets
	Solve equations: quadratic	Solving equations: quadratic
		Solving word problems: quadratic
	Rearrange formula & equations	Rearranging formula & equations

1.3 Patterns and relationships

Outcome	Quests	Content
8. Generalise the properties of operations with fractional numbers and integers.	Simplify algebraic expressions	Simplifying algebraic fractions
		Simplifying algebraic fractions with pronumerals
	Expand simple algebraic expressions	Expanding simple algebraic expressions
		Expanding algebraic expressions
		Expanding quadratic expressions
	Factorise simple algebraic expressions	Factorising algebraic expressions
		Factorising by taking out HCF: numbers & letters
	Factorise quadratic expressions	Factorising quadratic expressions: monic
		Factorising quadratic expressions: non-monic
9. Relate tables, graphs, and equations to linear and simple quadratic relationships found in number and spatial patterns.	Identify quadratic graphs	Identifying quadratic graphs
	Identify simple exponential graphs	Identifying simple exponential graphs

2 Geometry and Measurement

2.1 Measurement

Outcome	Quests	Content
1. Select and use appropriate metric units for length, area, volume and capacity, weight (mass), temperature, angle, and time with awareness that measurements are approximate.	Use limits of accuracy	Using limits of accuracy
2. Convert between metric units, using decimals.	Convert measures of time	Converting measures of time
	Convert metric units of area	Converting metric units of area
	Convert speeds	Converting speeds
3. Deduce and use formulae to find the perimeters and areas of polygons and the volumes of prisms.	Calculate the perimeter of a polygon	Calculating the perimeter of a polygon
	Calculate the area of a polygon	Calculating the area of a polygon
		Calculating surface area of prisms
		Calculating surface area of triangular prisms
	Calculate the volume of prisms	Calculating the volume of prisms
		Finding dimensions of cubes given the volume
		Finding dimensions of rectangular prisms: volume
		Finding dimensions of a triangular prism: volume
		Finding dimensions of a prism given the volume
4. Find the perimeters and areas of circles and composite shapes and the volume of prisms, including cylinders.	Calculate special parts of a circle	Calculating special parts of a circle
	Calculate the area of a circle	Calculating the area of a circle
	Calculate perimeter: composite shapes	Calculating the perimeter of composite shapes
	Calculate area: composite shapes	Calculating the area of composite shapes
	Calculate the surface area of solids	Calculating the surface area of a cylinder
		Calculate the surface area of parts of a cylinder
		Calculating the surface area of pyramids
		Calculating the surface area of cones
		Calculating the surface area of spheres

		Calculating the surface area of composite solids
		Calculating surface area: composite solids & parts
	Calculate volume of solids	Finding dimensions of a cylinder given volume
		Solving problems: surface area & volume cylinder
		Calculating the volume of pyramids
		Calculating the volume of spheres
		Calculating the volume of cones
		Comparing surface area & volume of prisms
	Calculate volume of composite solids	Calculating the volume of composite solids
		Solving problems: volume of composite solids

2.2 Shape

Outcome	Quests	Content
5. Deduce the angle properties of intersecting and parallel lines and the angle properties of polygons and apply these properties.	Use angle properties to solve problems	Using angle properties to solve problems
6. Create accurate nets for simple polyhedra and connect three-dimensional solids with different two-dimensional representations.	Use a net to find the surface area	Using a net to find the surface area

2.3 Position and orientation

Outcome	Quests	Content
7. Construct and describe simple loci.	Investigate linear relationships	Investigating linear relationships
		Forming & graphing linear models from a table
	Linear equations in the form y=mx+c	Introducing y=mx+c
		Graphing y=mx+c
		Finding intercepts
		Solidifying understanding of y=mx+c
	Graph horizontal & vertical lines	Graphing horizontal lines
		Graphing vertical lines
	Solve linear equations by graphing	Solving linear equations by graphing

	Transformations of a parabola	Understanding the transformation of a parabola
		Understanding how y=ax^2 changes the parabola
		Transformations of the parabola
	Solve simultaneous equations graphically	Solving simultaneous equations graphically
		Solving simultaneous equations: real life

2.4 Transformation

Outcome	Quests	Content
9. Define and use transformations and describe the invariant properties of figures and objects under these transformations.	Combinations of transformations	Understanding combinations of transformations
		Solving problems with transformations
	Understand area & volume scale factors	Understanding area scale factors
		Understanding volume scale factors
10. Apply trigonometric ratios and Pythagoras' theorem in two dimensions.	Use Pythagoras' theorem	Identifying the hypotenuse
		Using the proof of Pythagoras' theorem
		Calculating length: hypotenuse
		Calculating length: short side or hypotenuse
		Calculating length: in context
		Solving problems involving Pythagoras' theorem
		Identifying a Pythagorean triad
	Use trigonometry to solve problems	Labelling triangles in relation to an angle
		Establishing trigonometric ratios
		Choosing the appropriate trigonometric ratio
		Calculate the trigonometric ratio given the angle
		Calculating the length of a missing side
		Calculating the angle in trigonometry
		Solving problems with Pythagoras & trigonometry

3 Statistics

3.1 Statistical investigation

Outcome	Quests	Content
1. Plan and conduct surveys and experiments using the statistical enquiry cycle.	Set up statistical investigations	Setting up statistical investigations
	Analysis: data displays & calculations	Calculating mean, median & range from graphs
	Bivariate data	Understanding bivariate data
		Interpreting bivariate data
	Make conclusions	Making conclusions
		Understanding sampling

3.2 Statistical literacy

Outcome	Quests	Content
2. Evaluate statistical investigations or probability activities undertaken by others, including data collection methods, choice of measures, and validity of findings.	Evaluate statistical reports in media	Evaluating statistical reports in the media

3.3 Probability

Outcome	Quests	Content
4. Calculate probabilities, using fractions, percentages, and ratios.	Probability: 2-step experiments	2-step experiments with replacement
		2-step experiments without replacement
		Understanding 2-way tables
		Calculating probabilities in 2-way tables
		2-way tables with missing values
		Calculating probabilities in arrays
		Calculating probabilities in tree diagrams
		Using the counting principle
		3-step experiments with replacement
		3-step experiments without replacement

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