## (no-code)

**recognise the effect of using of in repeated calculations and compare the results when using exact representations**

•

•

### Elaborations

• comparing and contrasting the effect of truncation or on the final result of calculations when using of rather than exact representations

• investigating the impact of approximation on multiple calculations in that involve the of compound involving , the and of compound , and repeated calculations of simple interest where the solutions are not exact cents

Students learn to:

## recognise the effect of using approximations of real numbers in repeated calculatio the results when using exact representations

(AC9M10N01)

### General capabilities and cross-curriculum priorities

This content description connects to the following general capabilities and cross-curriculum priorities.

### Analysing

• Interpret concepts and problems

• Draw conclusions and provide reasons

### Investigating

• Acquire and collate data

• Interpret data

### Elaborations

Content elaborations provide suggestions of ways to teach the content description and connect it to general capabilities and cross-curriculum priorities. Content elaborations are optional .

### Analysing

• Draw conclusions and provide reasons

### Generating

• Consider alternatives

### Number sense and algebra

• Number and place value

### Analysing

• Draw conclusions and provide reasons

### Generating

• Consider alternatives

### Measurement and geometry

• Understanding units of measurement

• Understanding units of measurement

### Related content

This content description can be taught with the following content descriptions from other learning areas.

AC9S10I03

### Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10N01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to

context

## Snapshot – Draw conclusions and provide reasons

### Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

#### Content description

AC9M10N01

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

## Snapshot – Acquire and collate data

### Digital Literacy: Investigating: Acquire and collate data

#### Content description

AC9M10N01

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• collect and access data from a range of sources, using specialised digital tools in response to problems, and evaluate it for relevance

• collect and evaluate quantitative and qualitative data using specialised digital tools and processes in the context of identified problems

## Snapshot – Interpret data

### Digital Literacy: Investigating: Interpret data

#### Content description

AC9M10N01

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• analyse and visualise data by selecting and using a range of digital tools to infer relationships and make predictions

• analyse and visualise multidimensional data by selecting and using a range of interactive tools to draw conclusions and make predictions

## Snapshot – Draw conclusions and provide reasons

### Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

#### Content description

AC9M10N01

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

## Snapshot – Consider alternatives

### Critical and Creative Thinking: Generating: Consider alternatives

#### Content description

AC9M10N01

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

## Snapshot – Number and place value

## Numeracy: Number sense and algebra: Number and place value

### Content description

AC9M10N01

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Numeral recognition and identification**

• reads, represents, interprets and uses negative numbers in computation (e.g. explains that the temperature – 10 10 1 0 °C is colder than the temperature – 2.5 2.5 2 . 5 °C; recognises that negative numbers are less than zero; locates – 12 12 1 2 on a number line)

**Place value**

• identifies that negative numbers are integers that represent both size and direction (e.g. uses a number line to represent position and order negative numbers; uses negative numbers in financial contexts such as to model an overdrawn account)

• understands that multiplying and dividing numbers by 10 , 100 , 1000 10, 100, 1000 1 0 , 1 0 0 , 1 0 0 0 changes the positional value of the digits (e.g. explains that 100 100 1 0 0 times 0.125 0.125 0 . 1 2 5 is 12.5 12.5 1 2 . 5 because each digit value in 0.125 0.125 0 . 1 2 5 is multiplied by 100 100 1 0 0 , so 100 × 0.1 100 \times 0.1 1 0 0 × 0 . 1 is 10 10 1 0 , 100 × 0.02 100 \times 0.02 1 0 0 × 0 . 0 2 is 2 2 2 and 100 × 0.005 100 \times 0.005 1 0 0 × 0 . 0 0 5 is 0.5 0.5 0 . 5 ; converts between units of centimetres and millimetres when planning, measuring and marking materials for cutting)

• rounds decimals to a specified number of decimal places for a purpose (e.g. the mean distance thrown in a school javelin competition was rounded to 2 2 2 decimal places; if the percentage profit was calculated as 12.467921 12.467921 1 2 . 4 6 7 9 2 1 %, rounds the calculation to 12.5 12.5 1 2 . 5 %)

**Numeral recognition and identification**

• identifies, reads and interprets very large numbers and very small numbers (e.g. reads that the world population is estimated to be seven billion and interprets this to mean 7 7 7 000 000 0 0 0 000 000 0 0 0 000 000 0 0 0 or 7 × 1 0 9 7 \times 10^9 7 × 1 0 9 ; interprets the approximate mass of protons and neutrons as 1.67 × 1 0 – 24 1.67 \times10^{-24} 1 . 6 7 × 1 0 – 2 4 g; identifies and interprets the value of national government debt)

**Place value**

• compares and orders very large numbers and very small numbers (e.g. understands the relative size of very large time scales such as a millennium)

• relates place value parts to exponents (e.g. 1000 1000 1 0 0 0 is 100 100 1 0 0 times greater than 10 10 1 0 , and that is why 10 × 1 0 2 = 1 0 3 10 \times 10^2 = 10^3 1 0 × 1 0 2 = 1 0 3 and why 1 0 3 10^3 1 0 3 divided by 10 10 1 0 is equal to 1 0 2 10^2 1 0 2 )

• expresses numbers in scientific notation (e.g. when calculating the distance of the Earth from the sun uses 1.5 × 1 0 8 1.5\times 10^8 1 . 5 × 1 0 8 as an approximation; a nanometre has an order of magnitude of – 9 9 9 and is represented as 1 0 – 9 10^{-9} 1 0 – 9 )

**Snapshot – Draw conclusions and provide reasons**

## Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10N01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

**Snapshot – Consider alternatives**

## Critical and Creative Thinking: Generating: Consider alternatives

### Content description

AC9M10N01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

## Snapshot – Understanding units of measurement

# Numeracy: Measurement and geometry: Understanding units of measurement

### Content description

AC9M10N01

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

#### Using metric units

• calculates perimeter using properties of two-dimensional shapes to determine unknown lengths

• measures and calculates the area of different shapes using metric units and a range of strategies

#### Angles as measures of turn

• estimates and measures angles in degrees up to one revolution (e.g. uses a protractor to measure the size of an angle; estimates angles, such as those formed at the elbows when releasing an object; determines the effect of angles on the trajectory, height and distance of flight during jumps and throws in athletics)

#### Converting units

• converts between metric units of measurement of the same attribute (e.g. converts centimetres into millimetres by multiplying by 10 10 1 0 ; uses the consistent naming of metric prefixes to convert between adjacent units)

• describes and uses the relationship between metric units of measurement and the base- 10 10 1 0 place value system to accurately measure and record measurements using decimals

#### Using metric units and formulas

• establishes and uses formulas and metric units for calculating the area of rectangles and triangles

#### Angles as measures of turn

• measures and uses key angles ( 45 45 4 5 ■, 90 90 9 0 ■, 180 180 1 8 0 ■, 360 360 3 6 0 ■) to define other angles according to their size (e.g. measures a right angle to be 90■ and uses this to determine if 2 2 2 lengths are perpendicular)

#### Using metric units and formulas

• establishes and uses formulas for calculating the area of parallelograms, trapeziums, rhombuses and kites

• establishes and uses formulas for calculating the volume and surface area of a range of right prisms

#### Circle measurements

• informally estimates the circumference of a circle using the radius or diameter

• establishes the relationship between the circumference and the diameter of a circle as the constant π \pi π

• calculates the circumference and the area of a circle using π \pi π and a known diameter or radius

## Snapshot – Understanding units of measurement

# Numeracy: Measurement and geometry: Understanding units of measurement

### Content description

AC9M10N01

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

#### Using metric units and formulas

• establishes and uses formulas for calculating the area of parallelograms, trapeziums, rhombuses and kites

• establishes and uses formulas for calculating the volume and surface area of a range of right prisms

**Circle measurements**

• informally estimates the circumference of a circle using the radius or diameter
• establishes the relationship between the circumference and the diameter of a circle as the constant π \pi π
• calculates the circumference and the area of a circle using π \pi π and a known diameter or radius

**Using metric  units and formulas**

• uses dissection, rearrangement and estimation to calculate or approximate the area and volume of composite shapes and objects
• uses metric units and formulas to calculate the volume and surface area of right prisms, cylinders, cones and pyramids
• uses the conversion between units of volume and capacity to calculate the capacity of objects based on the internal volume and vice versa
• identifies appropriate metric units to use according to the level of precision required (e.g. building plans show measurements in millimetres, but to purchase enough carpet you need to measure the length and width of the room and round up to the nearest whole metre)
• uses and applies Pythagoras' theorem to authentic contexts (e.g. determines the length of a cross brace given the width of a gate is 1050 1050 1 0 5 0 millimetres and its height is 1450 1450 1 4 5 0 millimetres)
• uses and applies properties of congruent and similar triangles to authentic contexts to determine the size of unknown angles and lengths of sides
• uses trigonometry to calculate the unknown lengths or angles in authentic problems
• chooses an appropriate method to solve problems involving right triangles in authentic contexts

## AC9M10A01

**expand, factorise and simplify and solve , applying involving , and powers of , and the**

•

**Elaborations**

• explaining the relationship between factorisation and expansion, including the completed square form for
• applying knowledge of to algebraic terms and using both positive and negative integral to simplifying and solve

Students learn to:

## expand, factorise and simplify expressions and solve equations algebraically, apply involving products, quotients and powers of variables, and the distributive property

(AC9M10A01)

### General capabilities and cross-curriculum priorities

This content description connects to the following general capabilities and cross-curriculum priorities.

**Number sense and algebra**

• Number patterns and algebraic thinking

### Elaborations

Content elaborations provide suggestions of ways to teach the content description and connect it to general capabilities and cross-curriculum priorities. Content elaborations are optional .

**Analysing**

• Interpret concepts and problems
• Draw conclusions and provide reasons

**Number sense and algebra**

• Multiplicative strategies

### Resources

**Work Samples**

## WS01 - Mathematics assignment

**Snapshot – Number patterns and algebraic thinking**

## Numeracy: Number sense and algebra: Number patterns and algebraic thinking

### Content description

AC9M10A01

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

#### Algebraic relationships

• interprets and uses formulas and algebraic equations that describe relationships in various contexts (e.g. uses A = π r 2 \mathrm A=\mathrm{πr}^2 A = π r 2 to calculate the area of a circular space; uses A = P ( 1 + r n ) n t \mathrm A=\mathrm P(1+\frac{\mathrm r}{\mathrm n})^{\mathrm{nt}} A = P ( 1 + n r ■ ) n t when working with compound interest; uses v = u + a t v=u+at v = u + a t to calculate the velocity of an object

• plots relationships on a graph using a table of values representing authentic data (e.g. uses data recorded in a spreadsheet to plot results of a science experiment)

#### Linear and non-linear relationships

• identifies the difference between linear and non-linear relationships in everyday contexts (e.g. explains that in a linear relationship, the rate of change is constant such as the cost of babysitting by the hour, whereas in a non-linear relationship the rate of change will vary and it could grow multiplicatively or exponentially such as a social media post going viral)

• describes and interprets the graphical features of linear and non-linear growth in authentic problems (e.g. compares simple and compound interest graphs; describes the relationship between scientific data plotted on a graph; analyses a graph to identify the inverse relationship between price and quantity demanded or the relationship between Human Development Index (HDI) and standards of living)

## Snapshot – Interpret concepts and problems

# Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10A01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Draw conclusions and provide reasons

# Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10A01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

## Snapshot – Multiplicative strategies

# Numeracy: Number sense and algebra: Multiplicative strategies

### Content description

AC9M10A01

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

#### Flexible strategies for multiplication and division of rational numbers

• expresses a number as a product of its prime factors for a purpose

• expresses repeated factors of the same number in exponent form (e.g. 2 × 2 × 2 × 3 × 3 = 2 3 × 3 2

2 \times 2 \times 2 \times 3 \times 3 = 2^3\times 3^2 2 × 2 × 2 × 3 × 3 = 2 3 × 3 2
• identifies and describes products of the same number as square or cube numbers (e.g. 3 × 3 3 \times 3 3 × 3 is the same as 3 2 3^2 3 2 which is read as 3 3 3 squared)
• describes the effect of multiplication by a decimal or fraction less than one (e.g. when multiplying natural numbers by a fraction or decimal less than one such as 15 × 1 2 = 7.5 15 \times\frac12 = 7.5 1 5 × 2 1 ■ = 7 . 5 )
• connects and converts decimals to fractions to assist in mental computation involving multiplication or division (e.g. to calculate 16 × 0.25 16 \times 0.25 1 6 × 0 . 2 5 , recognises 0.25 0.25 0 . 2 5 as a quarter, and determines a quarter of 16 16 1 6 or determines 0.5 ÷ 0.25 0.5 ÷ 0.25 0 . 5 ÷ 0 . 2 5 , by reading this as "one half, how many quarters?" and gives the answer as 2 2 2 )
• calculates the percentage of a quantity flexibly using multiplication and division (e.g. to calculate 13 13 1 3 % of 1600 1600 1 6 0 0 uses 0.13 × 1600 0.13 \times 1600 0 . 1 3 × 1 6 0 0 or 1600 ÷ 100 × 13 1600 ÷ 100 \times 13 1 6 0 0 ÷ 1 0 0 × 1 3 )
• uses multiplicative strategies efficiently to solve problems involving rational numbers including integers (e.g. calculates the average temperature for Mt Wellington for July to be ■ 1.6 1.6 1 . 6 ■C)

**Flexible strategies for working multiplicatively**

• uses knowledge of place value and multiplicative partitioning to multiply and divide decimals efficiently (e.g. 0.461 × 200 = 0.461 × 100 × 2 = 46.1 × 2 = 92.2 0.461 \times 200 = 0.461 \times 100 \times 2 = 46.1 \times 2 = 92.2 0 . 4 6 1 × 2 0 0 = 0 . 4 6 1 × 1 0 0 × 2 = 4 6 . 1 × 2 = 9 2 . 2 )
• flexibly operates multiplicatively with extremely large or very small numbers expressed in scientific notation (e.g. calculates the area of a computer chip measuring 2.56 × 1 0 – 6 2.56 \times 10^{-6} 2 . 5 6 × 1 0 – 6 m in width by 1.4 × 1 0 – 7 1.4 \times 10^{-7} 1 . 4 × 1 0 – 7 m in length)
• chooses and uses appropriate strategies to solve multi-step problems and model situations involving rational numbers
• represents and solves multifaceted problems in a wide range of multiplicative situations including scientific notation for those involving very small or very large numbers (e.g. chooses to calculate the percentage of a percentage to determine successive discounts; determines the time it takes for sunlight to reach the earth)

## Resource – Optional content for post-Year 10 Mathematics pathways

# Mathematics

## Optional content for post–Year 10 Mathematics pathways

This support resource provides suggestions to support students with additional content to extend and enrich their study of the Year 10 Mathematics curriculum.

Introduction

The Australian Curriculum: Mathematics F–10 provides students with essential mathematical knowledge, skills, procedures and processes in number, algebra, measurement, space, statistics and probability.

It develops the numeracy capabilities that all students need in their personal, work and civic lives, and provides the fundamentals on which mathematical specialties and professional applications of mathematics are built.

In Year 10, students also consider possible pathways to study senior secondary Mathematics.

Preparation for subsequent study of subjects based on ACARA's Mathematical Methods Units 1 and 2 can be supported by further development of aspects of mathematics from Year 10. This provides a basis for building understanding that underpins these and equivalent courses of study.

The following advice provides suggestions for further content and skill development in this regard, with some illustrative examples.

Teachers can draw on these suggestions as applicable to support students with additional content to extend and enrich their study of the Year 10 Mathematics curriculum.
Download

## Resource – WS01 - Mathematics assignment

By the end of Year 10, students recognise the effect of■approximations of■real■ numbers in■repeated■calculations.■They use mathematical modelling to solve problems involving growth and decay in financial and other applied situations, applying linear, quadratic and exponential functions as appropriate, and solve■related equations, numerically and graphically.■Students make and test conjectures involving functions and relations using digital tools. They solve problems involving simultaneous linear equations and linear inequalities in 2 variables graphically and justify solutions. Students interpret and■use■logarithmic scales■representing small or large quantities or change in applied■contexts.

They solve■measurement problems involving surface area and volume of composite objects.■Students apply Pythagoras' theorem and trigonometry to solve practical problems involving right-angled triangles.■They identify the■impact of measurement errors on the accuracy of results.■Students use mathematical modelling to solve practical problems involving ■proportion and scaling, evaluating and modifying models, and reporting assumptions, methods and findings.■They use■deductive reasoning, theorems and algorithms to■solve■ spatial problems.■Students interpret networks used to■represent practical situations and describe connectedness

They plan and■conduct statistical investigations involving bivariate■data.■Students represent the distribution of data involving 2 variables, using tables and■scatter plots,■and■comment on■possible association. They analyse inferences ■and conclusions■in the media, noting potential sources of bias.■Students compare the distribution of■continuous numerical ■data ■using various displays, and discuss distributions in terms of centre, spread, shape and outliers.■They apply conditional probability ■to solve problems involving compound events.■Students design and conduct simulations involving conditional probability, using digital tools.

## AC9M10A01

expand, factorise and simplify expressions and solve equations algebraically, applying exponent laws involving products, quotients and powers of variables, and the distributive property

## AC9M10A04

use mathematical modelling to solve applied problems involving growth and decay, including financial contexts; formulate problems, choosing to apply linear, quadratic or exponential models; interpret solutions in terms of the situation; evaluate and modify models as necessary and report assumptions, methods and findings

## AC9M10ST03

construct scatterplots and comment on the association between the 2 numerical variables in terms of strength, direction and linearity

## AC9M10A02

**solve and simultaneous in 2 ; interpret solutions graphically and communicate solutions in terms of the situation**

•

**Elaborations**

• investigating situations involving in , such as multiple quotes for a job, or profit and loss; solving the graphically, giving solutions in everyday language, such as "break-even or to change providers" for the job
• describing the solution of simultaneous within the of the situation
• graphing regions corresponding to inequalities in the ; for example, graphing 2 x + 3 y < 24 2x+3y<24 2 x + 3 y < 2 4 and verifying using a test such as ( 0 , 0 0, 0 0 , 0 )
• identifying all the combinations of trips to the movies, each costing $ 12 \$12 $ 1 2 , and ice-

skating sessions, each costing $ 21 \$21 $ 2 1 , as the integer solutions for an entertainment budget of up to $ 150 \$150 $ 1 5 0 for the school holidays; expressing as 12 m + 21 s ≤ 150 12m+21s\leq150 1 2 m + 2 1 s ≤ 1 5 0

• testing when a of a specified has a corresponding greater than a given value, or whether a satisfies an ; for example, whether the ( 3 , 5 3, 5 3 , 5 ) satisfies 2 y < x 2 2y<x^2 2 y < x 2

• investigating the strategies inherent in First Nations Australian children's instructive games; for example, Weme from the Warlpiri Peoples of central Australia, and their connection to strategies to solve simultaneous in 2 2 2

Students learn to:

## solve linear inequalities and simultaneous linear equations in 2 variables; interpret s graphically and communicate solutions in terms of the situation

(AC9M10A02)

### General capabilities and cross-curriculum priorities

This content description connects to the following general capabilities and cross-curriculum priorities.

#### Number sense and algebra

• Number patterns and algebraic thinking

### Elaborations

Content elaborations provide suggestions of ways to teach the content description and connect it to general capabilities and cross-curriculum priorities. Content elaborations are optional .

#### Speaking and listening

• Speaking

#### Number sense and algebra

• Understanding money

#### Measurement and geometry

• Understanding geometric properties

#### Country/Place

• The First Peoples of Australia are the Traditional Owners of Country/Place, protected in Australian Law by the Native Title Act 1993 which recognises pre-existing sovereignty, continuing■systems of law and customs, and connection to Country/Place. This recognised legal right provides for economic sustainability and a voice into the development■and management of Country/Place.

### Resources

### Snapshot – Number patterns and algebraic thinking

## Numeracy: Number sense and algebra: Number patterns and algebraic thinking

### Content description

AC9M10A02

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

#### Algebraic relationships

• interprets and uses formulas and algebraic equations that describe relationships in various contexts (e.g. uses A = π r 2 \mathrm A=\mathrm{πr}^2 A = π r 2 to calculate the area of a circular space; uses A = P ( 1 + r n ) n t \mathrm A=\mathrm P(1+\frac{\mathrm r}{\mathrm n})^{\mathrm{nt}} A = P ( 1 + n r ■ ) n t when working with compound interest; uses v = u + a t v=u+at v = u + a t to calculate the velocity of an object

• plots relationships on a graph using a table of values representing authentic data (e.g. uses data recorded in a spreadsheet to plot results of a science experiment)

#### Linear and non-linear relationships

• identifies the difference between linear and non-linear relationships in everyday contexts (e.g. explains that in a linear relationship, the rate of change is constant such as the cost of babysitting by the hour, whereas in a non-linear relationship the rate of change will vary and it could grow multiplicatively or exponentially such as a social media post going viral)

• describes and interprets the graphical features of linear and non-linear growth in authentic

problems (e.g. compares simple and compound interest graphs; describes the relationship between scientific data plotted on a graph; analyses a graph to identify the inverse relationship between price and quantity demanded or the relationship between Human Development Index (HDI) and standards of living)

## Snapshot – Speaking

# Literacy: Speaking and listening: Speaking

### Content description

AC9M10A02

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

#### Crafting ideas

• creates spoken texts which explore and interpret concepts drawn from research or learning area content
• selects voice appropriate to purpose (e.g. third person to create distance and authority or first person to achieve personal connection)
• develops complex ideas or a central theme across a spoken text
• uses language features according to purpose, to impact the audience ( e.g. uses more complex connectives such as "consequently", "accordingly" to explain)
• rephrases or clarifies to repair or refine meaning
• uses language structures and features appropriate to learning area content
• uses technologies and visual and audio resources to enhance meaning and effect in presentations

#### Vocabulary

• selects vocabulary to intensify and sharpen the focus (e.g. "scarcely", "absolutely", "real", "simply")
• uses a range of evaluative language to express opinions or convey emotion (e.g. "significant benefits", "devastating consequences")
• uses a range of emotive language appropriate to topic, purpose and audience
• uses rich, evocative, descriptive language
• uses figurative language (e.g. "hungry for success")

#### Crafting ideas

• creates complex and creative spoken texts which analyse and evaluate issues drawn from research or learning area content
• includes a range of alternative viewpoints in spoken texts, where appropriate
• controls and manipulates a sophisticated range of language features to affect the audience
• uses a range of rhetorical devices and humour to engage an audience
• references and quotes authorities or statistics to add authority (e.g. "according to a recent OECD report")
• delivers spoken text flexibly, allowing for questions and maintaining the flow of ideas

## Snapshot – Understanding money

# Numeracy: Number sense and algebra: Understanding money

### Content description

AC9M10A02

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

#### Working with money proportionally

• calculates the percentage change with and without the use of digital tools (e.g. using GST as 10 10 1 0 % multiplies an amount by 0.1 0.1 0 . 1 to calculate the GST payable or divides the total paid by 11 11 1 1 to calculate the amount of GST charged; calculates the cost after a 25 25 2 5 % discount on items)
• calculates income tax payable using taxation tables
• interprets an interest rate from a given percentage and calculates simple interest payable on a short-term loan (e.g. calculates the total interest payable on a car loan)

#### Working with money proportionally

• applies proportional strategies for decision making, such as determining "best buys", currency conversion, determining gross domestic product (e.g. comparing cost per 100 100 1 0 0 g or comparing the cost of a single item on sale versus a multi-pack at the regular price)
• determines the best payment method or payment plan for a variety of contexts using rates, percentages and discounts (e.g. decides which phone plan would be better based on call rates, monthly data usage, insurance and other upfront costs)
• calculates the percentage change including the profit or loss made on a transaction (e.g. profit made from on-selling second-hand goods through an online retail site)

**Working with money proportionally**

• makes decisions about situations involving compound interest (e.g. compares total outlay and time taken to pay off a credit card debt as soon as possible as opposed to making minimum monthly repayments)
• chooses and uses proportional strategies for decision making (e.g. in purchasing a car calculates the depreciation, ongoing maintenance, insurance and the effect of loan repayments on disposable income; evaluates the benefits of "buy now pay later" schemes)

## Snapshot – Understanding geometric properties

# Numeracy: Measurement and geometry: Understanding geometric properties

## Content description

AC9M10A02

## Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Properties of shapes and objects**

• investigates and uses reasoning to explain the properties of a triangle (e.g. explains why the longest side is always opposite the largest angle in a triangle; recognises that the combined length of 2 2 2 sides of a triangle must always be greater than the length of the third side)
• uses relevant properties of common geometrical shapes to determine unknown lengths and angles

**Transformations**

• enlarges and reduces shapes according to a given scale factor and explains what features change and what stay the same (e.g. says ‘when I double the dimensions of the rectangle, all of the lengths are twice as long as they were, but the size of the angles stay the same)
• applies angle properties to solve problems that involve the transformation of shapes and objects and how they are used in practice (e.g. determines which shapes tessellate)

**Angles**

• uses angle properties to identify perpendicular and parallel lines (e.g. develops a computer-aided design drawing involving the creation of parallel and perpendicular lines)
• demonstrates that the angle sum of a triangle is 180 180 1 8 0 ■ and uses this to solve problems
• identifies interior angles in shapes to calculate angle sum
• uses angle properties to identify and calculate unknown angles in familiar two-dimensional shapes

**Geometric properties**

• uses Pythagoras’ theorem to solve right-angled triangle problems
• determines the conditions for triangles to be similar
• determines the conditions for triangles to be congruent

**Transformations**

• uses the enlargement transformation to explain similarity and develop the conditions for triangles to be similar
• solves problems using ratio and scale factors in similar figures

**Angles**

• uses angle properties to reason geometrically, in order to solve spatial problems (e.g. applies an understanding of the relationship between the base angles of an isosceles triangle to determine the size of a similar shape in order to solve a problem)
• uses trigonometry to calculate the unknown angles and unknown distances in authentic problems (e.g. measures the height of a tree using a clinometer to measure the angle of inclination and trigonometry to approximate the vertical height; calculates the angle of inclination for a ramp)

## AC9M10A03

**recognise the connection between algebraic and graphical representations of exponential and solve related exponential , using where appropriate**

•

•

### Elaborations

• recognising that in a table of values, if the between consecutive values of the dependent variable is constant, then it is an exponential
• investigating the links between algebraic and graphical representations of using graphing software
• using with symbolic manipulation functionality to systematically explore exponential
• investigating First Nations Australian Ranger groups' and other groups' programs that attempt to eradicate feral animals for survival of native animals on , exploring the competition between feral and native animals and their impact on natural resources by formulating exponential for for each animal species

Students learn to:

## recognise the connection between algebraic and graphical representations of expon and solve related exponential equations, using digital tools where appropriate

(AC9M10A03)

### General capabilities and cross-curriculum priorities

This content description connects to the following general capabilities and cross-curriculum priorities.

**Analysing**

• Interpret concepts and problems

**Generating**

• Consider alternatives

**Managing and operating**

• Select and operate tools

### Elaborations

Content elaborations provide suggestions of ways to teach the content description and connect it to general capabilities and cross-curriculum priorities. Content elaborations are optional .

**Analysing**

• Interpret concepts and problems

**Analysing**

• Interpret concepts and problems

**Generating**

• Consider alternatives

**Investigating**

• Acquire and collate data
• Interpret data

**Managing and operating**

• Select and operate tools

**Analysing**

• Interpret concepts and problems

**Generating**

• Consider alternatives

**Inquiring**

• Identify, process and evaluate information

**Investigating**

• Acquire and collate data
• Interpret data

**Managing and operating**

• Select and operate tools

**Analysing**

• Interpret concepts and problems

**Inquiring**

• Identify, process and evaluate information

**Country/Place**

• The First Peoples of Australia are the Traditional Owners of Country/Place, protected in Australian Law by the Native Title Act 1993 which recognises pre-existing sovereignty, continuing■systems of law and customs, and connection to Country/Place. This recognised legal right provides for economic sustainability and a voice into the development■and management of Country/Place.

## Related content

This content description can be taught with the following content descriptions from other learning areas.

AC9HE10K04

### Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10A03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

### Snapshot – Consider alternatives

## Critical and Creative Thinking: Generating: Consider alternatives

### Content description

AC9M10A03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

### Snapshot – Select and operate tools

## Digital Literacy: Managing and operating: Select and operate tools

### Content description

AC9M10A03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• select and use the advanced or unfamiliar features of digital tools to efficiently complete tasks

• troubleshoot common problems and automate repetitive tasks

• select and operate advanced and emerging digital tools confidently

• troubleshoot common problems systematically and seek to improve efficiency by developing new skills

### Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10A03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

### Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10A03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Consider alternatives**

## Critical and Creative Thinking: Generating: Consider alternatives

### Content description

AC9M10A03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

**Snapshot – Acquire and collate data**

## Digital Literacy: Investigating: Acquire and collate data

### Content description

AC9M10A03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• collect and access data from a range of sources, using specialised digital tools in response to problems, and evaluate it for relevance

• collect and evaluate quantitative and qualitative data using specialised digital tools and processes in the context of identified problems

**Snapshot – Interpret data**

## Digital Literacy: Investigating: Interpret data

### Content description

AC9M10A03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• analyse and visualise data by selecting and using a range of digital tools to infer relationships and make predictions

• analyse and visualise multidimensional data by selecting and using a range of interactive tools to draw conclusions and make predictions

**Snapshot – Select and operate tools**

## Digital Literacy: Managing and operating: Select and operate tools

### Content description

AC9M10A03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• select and use the advanced or unfamiliar features of digital tools to efficiently complete tasks

• troubleshoot common problems and automate repetitive tasks

• select and operate advanced and emerging digital tools confidently

• troubleshoot common problems systematically and seek to improve efficiency by developing new skills

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10A03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Consider alternatives

## Critical and Creative Thinking: Generating: Consider alternatives

### Content description

AC9M10A03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

## Snapshot – Identify, process and evaluate information

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10A03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

## Snapshot – Acquire and collate data

## Digital Literacy: Investigating: Acquire and collate data

### Content description

AC9M10A03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• collect and access data from a range of sources, using specialised digital tools in response to problems, and evaluate it for relevance

• collect and evaluate quantitative and qualitative data using specialised digital tools and processes in the context of identified problems

## Snapshot – Interpret data

## Digital Literacy: Investigating: Interpret data

### Content description

AC9M10A03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• analyse and visualise data by selecting and using a range of digital tools to infer relationships and make predictions

• analyse and visualise multidimensional data by selecting and using a range of interactive tools to draw conclusions and make predictions

## Snapshot – Select and operate tools

## Digital Literacy: Managing and operating: Select and operate tools

### Content description

AC9M10A03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• select and use the advanced or unfamiliar features of digital tools to efficiently complete tasks
• troubleshoot common problems and automate repetitive tasks
• select and operate advanced and emerging digital tools confidently
• troubleshoot common problems systematically and seek to improve efficiency by developing new skills

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10A03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Identify, process and evaluate information**

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10A03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources
• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study
• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources
• evaluate the information selected to determine bias and reliability

# AC9M10A04

**use to solve applied problems involving and , including financial ; formulate problems, choosing to apply linear, quadratic or exponential models; interpret solutions in terms of the situation; evaluate and modify models as necessary and report assumptions, methods and findings**

•
•

**Elaborations**

• situations and choosing between linear, quadratic and exponential models by representing relationships in a table of values and recognising that have constant first differences, have constant second differences and have a constant between consecutive values of the dependent variable
• situations involving exponential and , and contrasting this with linear or ; for example, situations involving constant percentage change and constant ; determining doubling time and half-life and for which the values of the model lie within a given
• situations that involve working with authentic information, and interest to calculate and solve related problems
• and investigating how exponential are used in carbon dating to estimate the age of First Nations Australians' artefacts or material culture
• and formulating situations involving of native animals on with varying reproductive behaviour, using exponential and critiquing their applicability to real-world situations

Students learn to:

## use mathematical modelling to solve applied problems involving growth and decay, contexts; formulate problems, choosing to apply linear, quadratic or exponential mo

## solutions in terms of the situation; evaluate and modify models as necessary and re
## methods and findings

(AC9M10A04)

### General capabilities and cross-curriculum priorities

This content description connects to the following general capabilities and cross-curriculum priorities.

**Analysing**

• Interpret concepts and problems
• Draw conclusions and provide reasons

**Generating**

• Consider alternatives

**Inquiring**

• Identify, process and evaluate information

**Number sense and algebra**

• Number patterns and algebraic thinking

### Elaborations

Content elaborations provide suggestions of ways to teach the content description and connect it to general capabilities and cross-curriculum priorities. Content elaborations are optional .

**Analysing**

• Interpret concepts and problems
• Draw conclusions and provide reasons

**Generating**

• Consider alternatives

**Analysing**

• Interpret concepts and problems

**Generating**

• Consider alternatives

**Analysing**

• Interpret concepts and problems

**Inquiring**

• Identify, process and evaluate information

**Number sense and algebra**

• Proportional thinking
• Understanding money

**Analysing**

• Interpret concepts and problems

**Inquiring**

• Identify, process and evaluate information

**People**

• Australia has 2 distinct First Nations Peoples; each encompasses a diversity of nations across Australia. Aboriginal Peoples are the first peoples of Australia and have occupied the Australian continent for more than 60,000 years. Torres Strait Islander Peoples are the First Nations Peoples of the Torres Strait and have occupied the region for over 4,000 years.

**Analysing**

• Interpret concepts and problems

**Inquiring**

• Identify, process and evaluate information

**Country/Place**

• The First Peoples of Australia are the Traditional Owners of Country/Place, protected in Australian Law by the Native Title Act 1993 which recognises pre-existing sovereignty, continuing■systems of law and customs, and connection to Country/Place. This recognised legal right provides for economic sustainability and a voice into the development■and management of Country/Place.

### Related content

This content description can be taught with the following content descriptions from other learning areas.
AC9HE10K01
AC9HE10K03
AC9HE10K04
AC9HE10S04
AC9S10I04

### Resources

### Work Samples

## WS01 - Mathematics assignment

### Snapshot – Interpret concepts and problems

#### Critical and Creative Thinking: Analysing: Interpret concepts and problems

##### Content description

AC9M10A04

##### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

### Snapshot – Draw conclusions and provide reasons

#### Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

##### Content description

AC9M10A04

##### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made
• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

### Snapshot – Consider alternatives

#### Critical and Creative Thinking: Generating: Consider alternatives

##### Content description

AC9M10A04

##### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option
• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

### Snapshot – Identify, process and evaluate information

#### Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

##### Content description

AC9M10A04

##### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources
• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study
• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources
• evaluate the information selected to determine bias and reliability

## Snapshot – Number patterns and algebraic thinking

# Numeracy: Number sense and algebra: Number patterns and algebraic thinking

### Content description

AC9M10A04

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Algebraic relationships**

• interprets and uses formulas and algebraic equations that describe relationships in various contexts (e.g. uses A = π r 2 \mathrm A=\mathrm{πr}^2 A = π r 2 to calculate the area of a circular space; uses A = P ( 1 + r n ) n t \mathrm A=\mathrm P(1+\frac{\mathrm r}{\mathrm n})^{\mathrm{nt}} A = P ( 1 + n r ■ ) n t when working with compound interest; uses v = u + a t v=u+at v = u + a t to calculate the velocity of an object

• plots relationships on a graph using a table of values representing authentic data (e.g. uses data recorded in a spreadsheet to plot results of a science experiment)

**Linear and non-linear relationships**

• identifies the difference between linear and non-linear relationships in everyday contexts (e.g. explains that in a linear relationship, the rate of change is constant such as the cost of babysitting by the hour, whereas in a non-linear relationship the rate of change will vary and it could grow multiplicatively or exponentially such as a social media post going viral)

• describes and interprets the graphical features of linear and non-linear growth in authentic problems (e.g. compares simple and compound interest graphs; describes the relationship between scientific data plotted on a graph; analyses a graph to identify the inverse relationship between price and quantity demanded or the relationship between Human Development Index (HDI) and standards of living)

## Snapshot – Interpret concepts and problems

# Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10A04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Draw conclusions and provide reasons

# Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10A04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

## Snapshot – Consider alternatives

# Critical and Creative Thinking: Generating: Consider alternatives

### Content description

AC9M10A04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10A04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Consider alternatives**

## Critical and Creative Thinking: Generating: Consider alternatives

### Content description

AC9M10A04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10A04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Identify, process and evaluate information**

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10A04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

**Snapshot – Proportional thinking**

## Numeracy: Number sense and algebra: Proportional thinking

### Content description

AC9M10A04

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Applying proportion**

• recognises that percentages can be greater than 100 100 1 0 0 % (e.g. the entry price to the show has gone up from $ 20 \$20 $ 2 0 last year to $ 25 \$25 $ 2 5 this year, that’s 125 125 1 2 5 % of last year's price; examines food labels and nutritional tables to determine whether the percentage a fast food meal exceeds a recommended daily intake for sugar/fats)
• uses common fractions and decimals for proportional increase or decrease of a given amount
• increases and decreases quantities by a percentage and expresses a percentage increase or decrease using a multiplier (e.g. calculates 70 70 7 0 % or 0.7 0.7 0 . 7 of the original marked price to apply a 30 30 3 0 % discount; multiplies by 1.03 1.03 1 . 0 3 when predicting a 3 3 3 % future capital gain; calculates percentage increase or decrease in international migration in Australia)
• models situations uses percentages, rates and ratios (e.g. calculates interest payable on loans; compares taxation rates and the effect of a pay increase on how much annual income tax is payable; mixes chemical solutions using ratios; uses Mendelian inheritance to predict the ratio of offspring genotypes and phenotypes in monohybrid crosses)
• identifies and interprets situations where direct proportion is involved (e.g. hours worked and payment received; increase in income and increase in demand for branded products; increasing the mass will increase the force provided that acceleration remains constant)
• identifies and interprets situations where inverse proportion is involved (e.g. number of people working on a job and time taken to complete the job; speed and time taken to travel recognising that travelling at a greater speed will mean the journey takes less time; decrease in price and increase in demand)
• uses ratio and scale factors to enlarge or reduce the size of objects (e.g. interprets the scale used on a map and determines the real distance between 2 2 2 locations; draws engineering drawings to scale)

**Flexible proportional thinking**

• identifies proportional relationships in formulas and uses proportional thinking flexibly to explore this relationship (e.g. recognises the proportional relationship between concentration and volume of a solution in the formula c = n v c=\frac nv c = v n ■ and uses this relationship to make decisions when diluting solutions)
• identifies, represents and chooses appropriate strategies to solve percentage problems involving proportional thinking (e.g. percentage of a percentage for calculating successive discounts; uses percentages to calculate compound interest on loans and investments; uses percentage increases or decreases as an operator, such as a 3 3 3 % increase is achieved by multiplying by 1.03 1.03 1 . 0 3 , and 4 4 4 successive increases is achieved by multiplying by ( 1.03 ) 4 (1.03)^4 ( 1 . 0 3 ) 4 to make meaning of the formula

## Snapshot – Understanding money

# Numeracy: Number sense and algebra: Understanding money

## Content description

AC9M10A04

## Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Working with money proportionally**

• applies proportional strategies for decision making, such as determining "best buys", currency conversion, determining gross domestic product (e.g. comparing cost per 100 100 1 0 0 g or comparing the cost of a single item on sale versus a multi-pack at the regular price)
• determines the best payment method or payment plan for a variety of contexts using rates, percentages and discounts (e.g. decides which phone plan would be better based on call rates, monthly data usage, insurance and other upfront costs)
• calculates the percentage change including the profit or loss made on a transaction (e.g. profit made from on-selling second-hand goods through an online retail site)

**Working with money proportionally**

• makes decisions about situations involving compound interest (e.g. compares total outlay and time taken to pay off a credit card debt as soon as possible as opposed to making minimum monthly repayments)
• chooses and uses proportional strategies for decision making (e.g. in purchasing a car calculates the depreciation, ongoing maintenance, insurance and the effect of loan repayments on disposable

income; evaluates the benefits of "buy now pay later" schemes)

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10A04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Identify, process and evaluate information**

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10A04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10A04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Identify, process and evaluate information**

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10A04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

# AC9M10A05

**experiment with and using , making and testing and generalising emerging patterns**

•

•

**Elaborations**

• applying the graphing zoom functionality of and systematically refining to identify location of of intersection of the graphs of 2 2 2 , such as x 2 = 2 x x^2=2^x x 2 = 2 x

• applying a bisection algorithm to determine the location of the horizontal axis intercepts of the graph of a such as f ( x ) = 2 x 2 – 3 x – 7 f(x)=2x^2-3x-7 f ( x ) = 2 x 2 – 3 x – 7
• applying to the graph of x 2 + y 2 = 1 x^2+y^2=1 x 2 + y 2 = 1
• identifying the of any of intersection of the graph of a linear with the graph of a or a
• identifying on the over which a given is positive or negative
• using a table of values to determine when an exponential or exceeds or falls below a given value, such as monitoring the trend in value of a share price in a of exponential or
• investigating how and serve as the mathematical underpinnings of machine learning, allowing to be transformed, models to be defined and optimisation to occur

Students learn to:

## experiment with functions and relations using digital tools, making and testing conj

## generalising emerging patterns

(AC9M10A05)

### General capabilities and cross-curriculum priorities

This content description connects to the following general capabilities and cross-curriculum priorities.

**Analysing**

• Interpret concepts and problems
• Draw conclusions and provide reasons

**Generating**

• Consider alternatives

**Inquiring**

• Identify, process and evaluate information

**Managing and operating**

• Select and operate tools

### Elaborations

Content elaborations provide suggestions of ways to teach the content description and connect it to general capabilities and cross-curriculum priorities. Content elaborations are optional .

**Analysing**

• Interpret concepts and problems
• Draw conclusions and provide reasons

**Generating**

• Consider alternatives

**Managing and operating**

• Select and operate tools

**Generating**

• Consider alternatives

**Investigating**

• Interpret data

**Managing and operating**

• Select and operate tools

**Generating**

• Consider alternatives

**Managing and operating**

• Select and operate tools

**Analysing**

• Interpret concepts and problems
• Draw conclusions and provide reasons

**Inquiring**

• Identify, process and evaluate information

**Analysing**

• Interpret concepts and problems
• Draw conclusions and provide reasons

**Inquiring**

• Identify, process and evaluate information

### Number sense and algebra

• Number patterns and algebraic thinking

### Related content

This content description can be taught with the following content descriptions from other learning areas.

AC9TDI10P02

### Resources

### Work Samples

## WS03 - Fencing in the Vegetable Patch

### Snapshot – Interpret concepts and problems

#### Critical and Creative Thinking: Analysing: Interpret concepts and problems

##### Content description

AC9M10A05

##### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

### Snapshot – Draw conclusions and provide reasons

#### Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

##### Content description

AC9M10A05

##### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

### Snapshot – Consider alternatives

#### Critical and Creative Thinking: Generating: Consider alternatives

##### Content description

AC9M10A05

##### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

### Snapshot – Identify, process and evaluate information

#### Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

##### Content description

AC9M10A05

##### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

## Snapshot – Select and operate tools

### Digital Literacy: Managing and operating: Select and operate tools

#### Content description

AC9M10A05

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• select and use the advanced or unfamiliar features of digital tools to efficiently complete tasks

• troubleshoot common problems and automate repetitive tasks

• select and operate advanced and emerging digital tools confidently

• troubleshoot common problems systematically and seek to improve efficiency by developing new skills

## Snapshot – Interpret concepts and problems

### Critical and Creative Thinking: Analysing: Interpret concepts and problems

#### Content description

AC9M10A05

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Draw conclusions and provide reasons

### Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

#### Content description

AC9M10A05

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

## Snapshot – Consider alternatives

### Critical and Creative Thinking: Generating: Consider alternatives

#### Content description

AC9M10A05

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

## Snapshot – Select and operate tools

### Digital Literacy: Managing and operating: Select and operate tools

#### Content description

AC9M10A05

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• select and use the advanced or unfamiliar features of digital tools to efficiently complete tasks

• troubleshoot common problems and automate repetitive tasks

• select and operate advanced and emerging digital tools confidently

• troubleshoot common problems systematically and seek to improve efficiency by developing new skills

## Snapshot – Consider alternatives

### Critical and Creative Thinking: Generating: Consider alternatives

#### Content description

AC9M10A05

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

## Snapshot – Interpret data

### Digital Literacy: Investigating: Interpret data

#### Content description

AC9M10A05

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• analyse and visualise data by selecting and using a range of digital tools to infer relationships and make predictions

• analyse and visualise multidimensional data by selecting and using a range of interactive tools to draw conclusions and make predictions

## Snapshot – Select and operate tools

### Digital Literacy: Managing and operating: Select and operate tools

#### Content description

AC9M10A05

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• select and use the advanced or unfamiliar features of digital tools to efficiently complete tasks

• troubleshoot common problems and automate repetitive tasks

• select and operate advanced and emerging digital tools confidently

• troubleshoot common problems systematically and seek to improve efficiency by developing new skills

## Snapshot – Consider alternatives

### Critical and Creative Thinking: Generating: Consider alternatives

#### Content description

AC9M10A05

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

## Snapshot – Select and operate tools

### Digital Literacy: Managing and operating: Select and operate tools

#### Content description

AC9M10A05

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• select and use the advanced or unfamiliar features of digital tools to efficiently complete tasks

• troubleshoot common problems and automate repetitive tasks

• select and operate advanced and emerging digital tools confidently

• troubleshoot common problems systematically and seek to improve efficiency by developing new skills

## Snapshot – Interpret concepts and problems

### Critical and Creative Thinking: Analysing: Interpret concepts and problems

#### Content description

AC9M10A05

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Draw conclusions and provide reasons

### Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

#### Content description

AC9M10A05

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

## Snapshot – Identify, process and evaluate information

### Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

#### Content description

AC9M10A05

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

## Snapshot – Interpret concepts and problems

### Critical and Creative Thinking: Analysing: Interpret concepts and problems

#### Content description

AC9M10A05

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Draw conclusions and provide reasons

### Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

#### Content description

AC9M10A05

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

## Snapshot – Identify, process and evaluate information

### Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

#### Content description

AC9M10A05

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

## Snapshot – Number patterns and algebraic thinking

### Numeracy: Number sense and algebra: Number patterns and algebraic thinking

#### Content description

AC9M10A05

#### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Algebraic relationships**

• interprets and uses formulas and algebraic equations that describe relationships in various contexts (e.g. uses A = π r 2 \mathrm A=\mathrm{πr}^2 A = π r 2 to calculate the area of a circular space; uses A = P ( 1 + r n ) n t \mathrm A=\mathrm P(1+\frac{\mathrm r}{\mathrm n})^{\mathrm{nt}} A = P ( 1 + n r ■ ) n t when working with compound interest; uses v = u + a t v=u+at v = u + a t to calculate the velocity of an object

• plots relationships on a graph using a table of values representing authentic data (e.g. uses data recorded in a spreadsheet to plot results of a science experiment)

**Linear and non-linear relationships**

• identifies the difference between linear and non-linear relationships in everyday contexts (e.g. explains that in a linear relationship, the rate of change is constant such as the cost of babysitting by the hour, whereas in a non-linear relationship the rate of change will vary and it could grow multiplicatively or exponentially such as a social media post going viral)

• describes and interprets the graphical features of linear and non-linear growth in authentic problems (e.g. compares simple and compound interest graphs; describes the relationship between scientific data plotted on a graph; analyses a graph to identify the inverse relationship between price and quantity demanded or the relationship between Human Development Index (HDI) and standards of living)

## Resource – WS03 - Fencing in the Vegetable Patch

By the end of Year 9, students recognise and use rational and irrational numbers to solve problems.■They extend and apply the exponent laws with positive integers to variables.■Students expand binomial products, and factorise monic quadratic expressions.■They find the distance between 2 points on the Cartesian plane, and the gradient and midpoint of a line segment.■Students use mathematical modelling to solve problems involving change in financial and other applied contexts , choosing to use linear and quadratic functions. They graph quadratic functions and solve monic quadratic equations with integer roots algebraically.■Students describe the effects of variation of parameters on functions and relations, using digital tools, and make connections between their graphical and algebraic representations.

They apply formulas to solve problems involving the surface area and volume of right prisms and cylinders.■Students solve problems involving ratio, similarity and scale in two-dimensional situations.■They determine percentage errors in measurements.■Students apply Pythagoras' theorem and use trigonometric ratios to solve problems involving right-angled triangles.■They use mathematical modelling to solve practical problems involving direct proportion, ratio and scale, evaluating the

model and communicating their methods and findings.■Students express small and large numbers in scientific notation.■They apply the enlargement transformation to images of shapes and objects, and interpret results.■Students design, use and test algorithms based on geometric constructions or theorems.

They compare and analyse the distributions of multiple numerical data sets, choose representations, describe features of these data sets using summary statistics and the shape of distributions, and consider the effect of outliers.■Students explain how sampling techniques and representation can be used to support or question conclusions or to promote a point of view.■They determine sets of outcomes for compound events and represent these in various ways.■Students assign probabilities to the outcomes of compound events.■They design and conduct experiments or simulations for combined events using digital tools.

## AC9M9A02

simplify algebraic expressions, expand binomial products and factorise monic quadratic expressions

## AC9M9A04

identify and graph quadratic functions, solve quadratic equations graphically and numerically, and solve monic quadratic equations with integer roots algebraically, using graphing software and digital tools as appropriate

## AC9M9A05

use mathematical modelling to solve applied problems involving change including financial contexts; formulate problems, choosing to use either linear or quadratic functions; interpret solutions in terms of the situation; evaluate the model and report methods and findings

## AC9M10M01

**solve problems involving the and of composite using appropriate**

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**Elaborations**

• determining the and of composite solids, formed from a of and , by considering the individual solids from which they are constructed
• estimating the and of composite in practical
• using to provide solutions to problems involving and ; for example, ascertaining the rainfall that can be saved from a roof top and the optimal and dimensions for rainwater storage based on where it will be located on a property; determining whether to hire extra freezer space for the amount of ice cream required at a fundraising for the school or community

Students learn to:

## solve problems involving the surface area and volume of composite objects using a

(AC9M10M01)

### General capabilities and cross-curriculum priorities

This content description connects to the following general capabilities and cross-curriculum priorities.

**Analysing**

• Interpret concepts and problems

**Measurement and geometry**

• Understanding geometric properties

### Elaborations

Content elaborations provide suggestions of ways to teach the content description and connect it to general capabilities and cross-curriculum priorities. Content elaborations are optional .

**Analysing**

• Interpret concepts and problems

**Generating**

• Consider alternatives

**Inquiring**

• Identify, process and evaluate information

**Analysing**

• Interpret concepts and problems

**Inquiring**

• Identify, process and evaluate information

**Analysing**

• Interpret concepts and problems

• Draw conclusions and provide reasons

**Inquiring**

• Identify, process and evaluate information

**Reflecting**

• Transfer knowledge

## Resources

## Snapshot – Interpret concepts and problems

### Critical and Creative Thinking: Analysing: Interpret concepts and problems

#### Content description

AC9M10M01

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Understanding geometric properties

### Numeracy: Measurement and geometry: Understanding geometric properties

#### Content description

AC9M10M01

#### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Properties of shapes and objects**

• investigates and uses reasoning to explain the properties of a triangle (e.g. explains why the longest side is always opposite the largest angle in a triangle; recognises that the combined length of 2 2 2 sides of a triangle must always be greater than the length of the third side)

• uses relevant properties of common geometrical shapes to determine unknown lengths and angles

**Transformations**

• enlarges and reduces shapes according to a given scale factor and explains what features change and what stay the same (e.g. says ‘when I double the dimensions of the rectangle, all of the lengths are twice as long as they were, but the size of the angles stay the same)

• applies angle properties to solve problems that involve the transformation of shapes and objects and how they are used in practice (e.g. determines which shapes tessellate)

**Angles**

• uses angle properties to identify perpendicular and parallel lines (e.g. develops a computer-aided design drawing involving the creation of parallel and perpendicular lines)

• demonstrates that the angle sum of a triangle is 180 180 1 8 0 ■ and uses this to solve problems

• identifies interior angles in shapes to calculate angle sum

• uses angle properties to identify and calculate unknown angles in familiar two-dimensional shapes

**Geometric properties**

• uses Pythagoras’ theorem to solve right-angled triangle problems

• determines the conditions for triangles to be similar

• determines the conditions for triangles to be congruent

**Transformations**

• uses the enlargement transformation to explain similarity and develop the conditions for triangles to be similar

• solves problems using ratio and scale factors in similar figures

**Angles**

• uses angle properties to reason geometrically, in order to solve spatial problems (e.g. applies an understanding of the relationship between the base angles of an isosceles triangle to determine the size of a similar shape in order to solve a problem)

• uses trigonometry to calculate the unknown angles and unknown distances in authentic problems (e.g. measures the height of a tree using a clinometer to measure the angle of inclination and trigonometry to approximate the vertical height; calculates the angle of inclination for a ramp)

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10M01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Consider alternatives**

## Critical and Creative Thinking: Generating: Consider alternatives

### Content description

AC9M10M01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

**Snapshot – Identify, process and evaluate information**

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10M01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10M01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Identify, process and evaluate information**

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10M01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

## Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10M01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Draw conclusions and provide reasons

## Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10M01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

## Snapshot – Identify, process and evaluate information

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10M01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

## Snapshot – Transfer knowledge

## Critical and Creative Thinking: Reflecting: Transfer knowledge

### Content description

AC9M10M01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• transfer knowledge and skills gained in previous experiences to both similar and different contexts, and explain reasons for decisions and choices made

• identify, plan and justify opportunities to transfer knowledge into new contexts

## Resource – Optional content for post-Year 10 Mathematics pathways

# Mathematics

## Optional content for post–Year 10 Mathematics pathways

This support resource provides suggestions to support students with additional content to extend and enrich their study of the Year 10 Mathematics curriculum.
Introduction
The Australian Curriculum: Mathematics F–10 provides students with essential mathematical knowledge, skills, procedures and processes in number, algebra, measurement, space, statistics and probability.

It develops the numeracy capabilities that all students need in their personal, work and civic lives, and provides the fundamentals on which mathematical specialties and professional applications of mathematics are built.

In Year 10, students also consider possible pathways to study senior secondary Mathematics.

Preparation for subsequent study of subjects based on ACARA's Mathematical Methods Units 1 and 2 can be supported by further development of aspects of mathematics from Year 10. This provides a basis for building understanding that underpins these and equivalent courses of study.

The following advice provides suggestions for further content and skill development in this regard, with some illustrative examples.

Teachers can draw on these suggestions as applicable to support students with additional content to extend and enrich their study of the Year 10 Mathematics curriculum.
Download

## AC9M10M02

**interpret■and use in applied involving small and large■quantities■and■change**

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**Elaborations**

• understanding that the logarithmic is calibrated in terms of order of magnitude; for example, doubling or powers of 10
• identifying and interpreting representations (charts and graphs) that use and discussing when it is appropriate to use this type of and when it is not appropriate; for example, graphs representing percentage change, a wide of values or exponential
• investigating and interpreting used in real-world ; for example, Richter, decibel and sensitivity or in investments, timescales and the of micro-organisms and disease and describing reasons for choosing to use a logarithmic rather than a linear
• investigating how logarithmic scaling can be used in machine learning to compress large values while preserving small ones, allowing the to efficiently work on problems with a wide of values
• investigating dating methods of geological sites to provide evidence of First Peoples of Australia's human presence in Australia, including the Madjedbebe dig in the Northern Territory, that use ( ) and measurement accuracy in the dating

Students learn to:

## interpret■and use logarithmic scales■■in applied contexts involving small and large■quantities■and■change

(AC9M10M02)

### General capabilities and cross-curriculum priorities

This content description connects to the following general capabilities and cross-curriculum priorities.

**Analysing**

• Interpret concepts and problems

**Number sense and algebra**

• Multiplicative strategies

### Elaborations

Content elaborations provide suggestions of ways to teach the content description and connect it to general capabilities and cross-curriculum priorities. Content elaborations are optional .

**Analysing**

• Interpret concepts and problems

**Analysing**

• Interpret concepts and problems
• Draw conclusions and provide reasons

**Generating**

• Consider alternatives

**Analysing**

• Interpret concepts and problems
• Draw conclusions and provide reasons

**Generating**

• Consider alternatives

**Number sense and algebra**

• Number and place value

**Analysing**

• Interpret concepts and problems
• Draw conclusions and provide reasons

**Generating**

• Consider alternatives

**People**

• Australia has 2 distinct First Nations Peoples; each encompasses a diversity of nations across Australia. Aboriginal Peoples are the first peoples of Australia and have occupied the Australian continent for more than 60,000 years. Torres Strait Islander Peoples are the First Nations Peoples of the Torres Strait and have occupied the region for over 4,000 years.

### Related content

This content description can be taught with the following content descriptions from other learning areas.

AC9HC10S02

AC9S10I04

### Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10M02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

### Snapshot – Multiplicative strategies

## Numeracy: Number sense and algebra: Multiplicative strategies

### Content description

AC9M10M02

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Flexible strategies for multiplication and division of rational numbers**

• expresses a number as a product of its prime factors for a purpose
• expresses repeated factors of the same number in exponent form (e.g. 2 × 2 × 2 × 3 × 3 = 2 3 × 3 2 2 \times 2 \times 2 \times 3 \times 3 = 2^3\times 3^2 2 × 2 × 2 × 3 × 3 = 2 3 × 3 2

• identifies and describes products of the same number as square or cube numbers (e.g. 3 × 3 3 \times 3 3 × 3 is the same as 3 2 3^2 3 2 which is read as 3 3 3 squared)
• describes the effect of multiplication by a decimal or fraction less than one (e.g. when multiplying natural numbers by a fraction or decimal less than one such as 15 × 1 2 = 7.5 15 \times\frac12 = 7.5 1 5 × 2 1 ■ = 7 . 5 )
• connects and converts decimals to fractions to assist in mental computation involving multiplication or division (e.g. to calculate 16 × 0.25 16 \times 0.25 1 6 × 0 . 2 5 , recognises 0.25 0.25 0 . 2 5 as a quarter, and determines a quarter of 16 16 1 6 or determines 0.5 ÷ 0.25 0.5 ÷ 0.25 0 . 5 ÷ 0 . 2 5 , by reading this as "one half, how many quarters?" and gives the answer as 2 2 2 )
• calculates the percentage of a quantity flexibly using multiplication and division (e.g. to calculate 13 13 1 3 % of 1600 1600 1 6 0 0 uses 0.13 × 1600 0.13 \times 1600 0 . 1 3 × 1 6 0 0 or 1600 ÷ 100 × 13 1600 ÷ 100 \times 13 1 6 0 0 ÷ 1 0 0 × 1 3 )
• uses multiplicative strategies efficiently to solve problems involving rational numbers including integers (e.g. calculates the average temperature for Mt Wellington for July to be ■ 1.6 1.6 1 . 6 ■C)

**Flexible strategies for working multiplicatively**

• uses knowledge of place value and multiplicative partitioning to multiply and divide decimals efficiently (e.g. 0.461 × 200 = 0.461 × 100 × 2 = 46.1 × 2 = 92.2 0.461 \times 200 = 0.461 \times 100 \times 2 = 46.1 \times 2 = 92.2 0 . 4 6 1 × 2 0 0 = 0 . 4 6 1 × 1 0 0 × 2 = 4 6 . 1 × 2 = 9 2 . 2 )
• flexibly operates multiplicatively with extremely large or very small numbers expressed in scientific notation (e.g. calculates the area of a computer chip measuring 2.56 × 1 0 – 6 2.56 \times 10^{-6} 2 . 5 6 × 1 0 – 6 m in width by 1.4 × 1 0 – 7 1.4 \times 10^{-7} 1 . 4 × 1 0 – 7 m in length)
• chooses and uses appropriate strategies to solve multi-step problems and model situations involving rational numbers
• represents and solves multifaceted problems in a wide range of multiplicative situations including scientific notation for those involving very small or very large numbers (e.g. chooses to calculate the percentage of a percentage to determine successive discounts; determines the time it takes for sunlight to reach the earth)

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10M02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10M02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Draw conclusions and provide reasons**

## Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10M02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

## Snapshot – Consider alternatives

## Critical and Creative Thinking: Generating: Consider alternatives

### Content description

AC9M10M02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

## Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10M02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Draw conclusions and provide reasons

## Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10M02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

## Snapshot – Consider alternatives

## Critical and Creative Thinking: Generating: Consider alternatives

### Content description

AC9M10M02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

## Snapshot – Number and place value

## Numeracy: Number sense and algebra: Number and place value

### Content description

AC9M10M02

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Numeral recognition and identification**

• reads, represents, interprets and uses negative numbers in computation (e.g. explains that the temperature – 10 10 1 0 °C is colder than the temperature – 2.5 2.5 2 . 5 °C; recognises that negative numbers are less than zero; locates – 12 12 1 2 on a number line)

**Place value**

• identifies that negative numbers are integers that represent both size and direction (e.g. uses a number line to represent position and order negative numbers; uses negative numbers in financial contexts such as to model an overdrawn account)

• understands that multiplying and dividing numbers by 10 , 100 , 1000 10, 100, 1000 1 0 , 1 0 0 , 1 0 0 0 changes the positional value of the digits (e.g. explains that 100 100 1 0 0 times 0.125 0.125 0 . 1 2 5 is 12.5 12.5 1 2 . 5 because each digit value in 0.125 0.125 0 . 1 2 5 is multiplied by 100 100 1 0 0 , so 100 × 0.1 100 \times 0.1 1 0 0 × 0 . 1 is 10 10 1 0 , 100 × 0.02 100 \times 0.02 1 0 0 × 0 . 0 2 is 2 2 2 and 100 × 0.005 100 \times 0.005 1 0 0 × 0 . 0 0 5 is 0.5 0.5 0 . 5 ; converts between units of centimetres and millimetres when planning, measuring and marking materials for cutting)

• rounds decimals to a specified number of decimal places for a purpose (e.g. the mean distance thrown in a school javelin competition was rounded to 2 2 2 decimal places; if the percentage profit was calculated as 12.467921 12.467921 1 2 . 4 6 7 9 2 1 %, rounds the calculation to 12.5 12.5 1 2 . 5 %)

**Numeral recognition and identification**

• identifies, reads and interprets very large numbers and very small numbers (e.g. reads that the world population is estimated to be seven billion and interprets this to mean 7 7 7 000 000 0 0 0 000 000 0 0 0 000 000 0 0 0 or 7 × 1 0 9 7 \times 10^9 7 × 1 0 9 ; interprets the approximate mass of protons and neutrons as 1.67 × 1 0 – 24 1.67 \times10^{-24} 1 . 6 7 × 1 0 – 2 4 g; identifies and interprets the value of national government debt)

**Place value**

• compares and orders very large numbers and very small numbers (e.g. understands the relative size of very large time scales such as a millennium)

• relates place value parts to exponents (e.g. 1000 1000 1 0 0 0 is 100 100 1 0 0 times greater than 10 10 1 0 , and that is why 10 × 1 0 2 = 1 0 3 10 \times 10^2 = 10^3 1 0 × 1 0 2 = 1 0 3 and why 1 0 3 10^3 1 0 3 divided by 10 10 1 0 is equal to 1 0 2 10^2 1 0 2 )

• expresses numbers in scientific notation (e.g. when calculating the distance of the Earth from the sun uses 1.5 × 1 0 8 1.5\times 10^8 1 . 5 × 1 0 8 as an approximation; a nanometre has an order of magnitude of – 9 9 9 and is represented as 1 0 – 9 10^{-9} 1 0 – 9 )

## Snapshot – Interpret concepts and problems

# Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10M02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Draw conclusions and provide reasons

# Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10M02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and

arguments before making recommendations

### Snapshot – Consider alternatives

## Critical and Creative Thinking: Generating: Consider alternatives

### Content description

AC9M10M02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

# AC9M10M03

**solve practical problems applying and trigonometry of right-angled triangles, including problems involving direction and of and**

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### Elaborations

• applying right-angled trigonometry to solve navigation problems involving bearings; for example, determining the bearing and estimating the distance of the final leg of an orienteering course

• applying and trigonometry to problems in surveying and design, where problems are decomposed into problems; for example, investigating the dimensions of the smallest box needed to package an of a particular length

• using a clinometer to of inclination, and applying trigonometry, and proportional reasoning to determine the height of buildings in practical

• applying and trigonometry, and using , to design models of practical situations involving of and ; for example, a crime scene

• investigating how autonomous vehicles use that use Pythagoras' and trigonometry to calculate distance and navigate spaces; for example, if an autonomous vehicle knows its current position ( x , y ) (x, y) ( x , y ) and the of a target location ( x ′ , y ′ ) (x', y') ( x ′ , y ′ ) , it can determine the straight-line distance between them using the formula distance = ( x ′ – x ) 2 + ( y ′ – y ) 2 =\sqrt{(x'-x)^2 + (y'-y)^2} = ( x ′ – x ) 2 + ( y ′ – y ) 2 ■

• exploring navigation, design of technologies or surveying by First Nations Australians, investigating geometric and spatial reasoning, and how these connect to trigonometry

Students learn to:

## solve practical problems applying Pythagoras’ theorem and trigonometry of right-an including problems involving direction and angles of elevation and depression

(AC9M10M03)

### General capabilities and cross-curriculum priorities

This content description connects to the following general capabilities and cross-curriculum priorities.

### Analysing

• Interpret concepts and problems

### Inquiring

• Identify, process and evaluate information

### Measurement and geometry

• Understanding geometric properties

• Understanding units of measurement

### Elaborations

Content elaborations provide suggestions of ways to teach the content description and connect it to general capabilities and cross-curriculum priorities. Content elaborations are optional .

### Analysing

• Interpret concepts and problems

### Generating

• Consider alternatives

**Analysing**

• Interpret concepts and problems

**Analysing**

• Interpret concepts and problems

• Draw conclusions and provide reasons

**Analysing**

• Interpret concepts and problems

**Inquiring**

• Identify, process and evaluate information

**Managing and operating**

• Select and operate tools

**Measurement and geometry**

• Understanding geometric properties

• Understanding units of measurement

**Analysing**

• Interpret concepts and problems

• Draw conclusions and provide reasons

**Generating**

• Consider alternatives

**Inquiring**

• Identify, process and evaluate information

**Country/Place**

• First Nations communities of Australia maintain a deep connection to, and responsibility for, Country/Place and have holistic values and belief systems that are connected to the land, sea, sky and waterways.

## Resources

## Work Samples

# WS02 - Proof and conjecture

### Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10M03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

### Snapshot – Identify, process and evaluate information

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10M03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

### Snapshot – Understanding geometric properties

## Numeracy: Measurement and geometry: Understanding geometric properties

### Content description

AC9M10M03

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

#### Properties of shapes and objects

• investigates and uses reasoning to explain the properties of a triangle (e.g. explains why the longest side is always opposite the largest angle in a triangle; recognises that the combined length of 2 2 2 sides of a triangle must always be greater than the length of the third side)
• uses relevant properties of common geometrical shapes to determine unknown lengths and angles

#### Transformations

• enlarges and reduces shapes according to a given scale factor and explains what features change and what stay the same (e.g. says 'when I double the dimensions of the rectangle, all of the lengths are twice as long as they were, but the size of the angles stay the same)
• applies angle properties to solve problems that involve the transformation of shapes and objects and how they are used in practice (e.g. determines which shapes tessellate)

#### Angles

• uses angle properties to identify perpendicular and parallel lines (e.g. develops a computer-aided design drawing involving the creation of parallel and perpendicular lines)
• demonstrates that the angle sum of a triangle is 180 180 1 8 0 ■ and uses this to solve problems
• identifies interior angles in shapes to calculate angle sum
• uses angle properties to identify and calculate unknown angles in familiar two-dimensional shapes

#### Geometric properties

• uses Pythagoras' theorem to solve right-angled triangle problems
• determines the conditions for triangles to be similar
• determines the conditions for triangles to be congruent

#### Transformations

• uses the enlargement transformation to explain similarity and develop the conditions for triangles to be similar
• solves problems using ratio and scale factors in similar figures

#### Angles

• uses angle properties to reason geometrically, in order to solve spatial problems (e.g. applies an understanding of the relationship between the base angles of an isosceles triangle to determine the size of a similar shape in order to solve a problem)
• uses trigonometry to calculate the unknown angles and unknown distances in authentic problems (e.g. measures the height of a tree using a clinometer to measure the angle of inclination and trigonometry to approximate the vertical height; calculates the angle of inclination for a ramp)

## Snapshot – Understanding units of measurement

# Numeracy: Measurement and geometry: Understanding units of measurement

### Content description

AC9M10M03

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

#### Using metric units and formulas

• establishes and uses formulas for calculating the area of parallelograms, trapeziums, rhombuses and kites
• establishes and uses formulas for calculating the volume and surface area of a range of right prisms

#### Circle measurements

• informally estimates the circumference of a circle using the radius or diameter
• establishes the relationship between the circumference and the diameter of a circle as the constant π \pi π
• calculates the circumference and the area of a circle using π \pi π and a known diameter or radius

#### Using metric units and formulas

• uses dissection, rearrangement and estimation to calculate or approximate the area and volume of

composite shapes and objects
• uses metric units and formulas to calculate the volume and surface area of right prisms, cylinders, cones and pyramids
• uses the conversion between units of volume and capacity to calculate the capacity of objects based on the internal volume and vice versa
• identifies appropriate metric units to use according to the level of precision required (e.g. building plans show measurements in millimetres, but to purchase enough carpet you need to measure the length and width of the room and round up to the nearest whole metre)
• uses and applies Pythagoras' theorem to authentic contexts (e.g. determines the length of a cross brace given the width of a gate is 1050 1050 1 0 5 0 millimetres and its height is 1450 1450 1 4 5 0 millimetres)
• uses and applies properties of congruent and similar triangles to authentic contexts to determine the size of unknown angles and lengths of sides
• uses trigonometry to calculate the unknown lengths or angles in authentic problems
• chooses an appropriate method to solve problems involving right triangles in authentic contexts

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10M03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Consider alternatives**

## Critical and Creative Thinking: Generating: Consider alternatives

### Content description

AC9M10M03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option
• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10M03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10M03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

### Snapshot – Draw conclusions and provide reasons

## Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10M03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

### Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10M03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

### Snapshot – Identify, process and evaluate information

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10M03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

### Snapshot – Select and operate tools

## Digital Literacy: Managing and operating: Select and operate tools

### Content description

AC9M10M03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• select and use the advanced or unfamiliar features of digital tools to efficiently complete tasks

• troubleshoot common problems and automate repetitive tasks

• select and operate advanced and emerging digital tools confidently

• troubleshoot common problems systematically and seek to improve efficiency by developing new skills

### Snapshot – Understanding geometric properties

## Numeracy: Measurement and geometry: Understanding geometric properties

### Content description

AC9M10M03

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

### Properties of shapes and objects

• investigates and uses reasoning to explain the properties of a triangle (e.g. explains why the longest side is always opposite the largest angle in a triangle; recognises that the combined length of 2 2 2 sides of a triangle must always be greater than the length of the third side)
• uses relevant properties of common geometrical shapes to determine unknown lengths and angles

### Transformations

• enlarges and reduces shapes according to a given scale factor and explains what features change and what stay the same (e.g. says ‘when I double the dimensions of the rectangle, all of the lengths are twice as long as they were, but the size of the angles stay the same)
• applies angle properties to solve problems that involve the transformation of shapes and objects and how they are used in practice (e.g. determines which shapes tessellate)

### Angles

• uses angle properties to identify perpendicular and parallel lines (e.g. develops a computer-aided design drawing involving the creation of parallel and perpendicular lines)
• demonstrates that the angle sum of a triangle is 180 180 1 8 0 ■ and uses this to solve problems
• identifies interior angles in shapes to calculate angle sum
• uses angle properties to identify and calculate unknown angles in familiar two-dimensional shapes

### Geometric properties

• uses Pythagoras’ theorem to solve right-angled triangle problems
• determines the conditions for triangles to be similar
• determines the conditions for triangles to be congruent

### Transformations

• uses the enlargement transformation to explain similarity and develop the conditions for triangles to be similar
• solves problems using ratio and scale factors in similar figures

### Angles

• uses angle properties to reason geometrically, in order to solve spatial problems (e.g. applies an understanding of the relationship between the base angles of an isosceles triangle to determine the size of a similar shape in order to solve a problem)
• uses trigonometry to calculate the unknown angles and unknown distances in authentic problems (e.g. measures the height of a tree using a clinometer to measure the angle of inclination and trigonometry to approximate the vertical height; calculates the angle of inclination for a ramp)

## Snapshot – Understanding units of measurement

# Numeracy: Measurement and geometry: Understanding units of measurement

## Content description

AC9M10M03

## Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

### Using metric units and formulas

• establishes and uses formulas for calculating the area of parallelograms, trapeziums, rhombuses and kites
• establishes and uses formulas for calculating the volume and surface area of a range of right prisms

### Circle measurements

• informally estimates the circumference of a circle using the radius or diameter
• establishes the relationship between the circumference and the diameter of a circle as the constant π \pi π
• calculates the circumference and the area of a circle using π \pi π and a known diameter or radius

### Using metric units and formulas

• uses dissection, rearrangement and estimation to calculate or approximate the area and volume of composite shapes and objects
• uses metric units and formulas to calculate the volume and surface area of right prisms, cylinders, cones and pyramids
• uses the conversion between units of volume and capacity to calculate the capacity of objects

based on the internal volume and vice versa
• identifies appropriate metric units to use according to the level of precision required (e.g. building plans show measurements in millimetres, but to purchase enough carpet you need to measure the length and width of the room and round up to the nearest whole metre)
• uses and applies Pythagoras' theorem to authentic contexts (e.g. determines the length of a cross brace given the width of a gate is 1050 1050 1 0 5 0 millimetres and its height is 1450 1450 1 4 5 0 millimetres)
• uses and applies properties of congruent and similar triangles to authentic contexts to determine the size of unknown angles and lengths of sides
• uses trigonometry to calculate the unknown lengths or angles in authentic problems
• chooses an appropriate method to solve problems involving right triangles in authentic contexts

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10M03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Draw conclusions and provide reasons**

## Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10M03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made
• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

**Snapshot – Consider alternatives**

## Critical and Creative Thinking: Generating: Consider alternatives

### Content description

AC9M10M03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option
• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

**Snapshot – Identify, process and evaluate information**

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10M03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources
• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study
• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources
• evaluate the information selected to determine bias and reliability

## Resource – WS02 - Proof and conjecture

By the end of Year 10, students recognise the effect of■approximations of■real■ numbers in■repeated■calculations.■They use mathematical modelling to solve problems involving growth and decay in financial and other applied situations, applying ■linear,■ quadratic■and exponential functions as appropriate, and solve■related equations, numerically and graphically.■Students make and test conjectures involving functions and relations using digital tools.■They solve problems involving simultaneous linear equations and linear inequalities in 2 variables graphically and justify solutions. Students interpret and■use■logarithmic scales■representing small or large quantities or change in applied■contexts.

They solve■measurement problems involving surface area and volume of composite objects.■Students apply Pythagoras' theorem and trigonometry to solve practical problems involving right-angled triangles. They identify the■impact of measurement errors on the accuracy of results.■Students use mathematical modelling to solve practical problems involving ■proportion and scaling, evaluating and modifying models, and reporting assumptions, methods and findings. They use■deductive reasoning, theorems and algorithms to■solve■ spatial problems. Students interpret networks used to■represent practical situations and describe connectedness

They plan and■conduct statistical investigations involving bivariate■data.■Students represent the distribution of data involving 2 variables, using tables and■scatter plots,■and■comment on■possible association.■They analyse inferences ■and conclusions■in the media, noting potential sources of bias.■Students compare the distribution of■continuous numerical ■data ■using various displays, and discuss distributions in terms of centre, spread, shape and outliers.■They apply conditional probability ■to solve problems involving compound events.■Students design and conduct simulations involving conditional probability, using digital tools.

## AC9M10M03

solve practical problems applying Pythagoras' theorem and trigonometry of right-angled triangles, including problems involving direction and angles of elevation and depression

## AC9M10SP01

apply deductive reasoning to proofs involving shapes in the plane and use theorems to solve spatial problems

## AC9M10SP03

design, test and refine solutions to spatial problems using algorithms and digital tools; communicate and justify solutions

## AC9M10M04

### identify the impact of measurement on the accuracy of results in practical

•
•

### Elaborations

• describing settings where measurement may impact research results and how measurement impacted by can result in biased findings
• analysing instruments and methods for measuring in investigations and activities
• determining the impact that have on financial calculations; for example, considering the effect of truncation on money amounts for large customer
• investigating the impact of measurement in the perception and control systems of autonomous vehicles, such as measurement due to sensor limitations
• investigating scientific measuring techniques, including dating methods and genetic sequencing, applied to First Peoples of Australia and their artefacts, and the social impact of measurement
Students learn to:

## identify the impact of measurement errors on the accuracy of results in practical co

(AC9M10M04)

### General capabilities and cross-curriculum priorities

This content description connects to the following general capabilities and cross-curriculum priorities.

**Analysing**

• Interpret concepts and problems

**Inquiring**

• Identify, process and evaluate information

**Reflecting**

• Transfer knowledge

**Measurement and geometry**

• Understanding units of measurement

**Number sense and algebra**

• Multiplicative strategies

## Elaborations

Content elaborations provide suggestions of ways to teach the content description and connect it to general capabilities and cross-curriculum priorities. Content elaborations are optional .

**Analysing**

• Interpret concepts and problems
• Draw conclusions and provide reasons

**Responding to ethical issues**

• Explore ethical issues

**Understanding ethical concepts and perspectives**

• Explore ethical concepts

**Analysing**

• Interpret concepts and problems
• Draw conclusions and provide reasons
• Evaluate actions and outcomes

**Analysing**

• Interpret concepts and problems
• Draw conclusions and provide reasons
• Evaluate actions and outcomes

**Number sense and algebra**

• Multiplicative strategies
• Proportional thinking
• Understanding money

**Measurement and geometry**

• Understanding units of measurement

**Responding to ethical issues**

• Explore ethical issues
• Making and reflecting on ethical decisions

**Country/Place**

• First Nations communities of Australia maintain a deep connection to, and responsibility for, Country/Place and have holistic values and belief systems that are connected to the land, sea, sky and waterways.

## Related content

This content description can be taught with the following content descriptions from other learning areas.

AC9S10I03
AC9S10I06
AC9TDE10P02

## Snapshot – Interpret concepts and problems

### Critical and Creative Thinking: Analysing: Interpret concepts and problems

#### Content description

AC9M10M04

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Identify, process and evaluate information

# Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10M04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources
• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study
• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources
• evaluate the information selected to determine bias and reliability

## Snapshot – Transfer knowledge

# Critical and Creative Thinking: Reflecting: Transfer knowledge

### Content description

AC9M10M04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• transfer knowledge and skills gained in previous experiences to both similar and different contexts, and explain reasons for decisions and choices made
• identify, plan and justify opportunities to transfer knowledge into new contexts

## Snapshot – Understanding units of measurement

# Numeracy: Measurement and geometry: Understanding units of measurement

### Content description

AC9M10M04

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Using metric units and formulas**

• establishes and uses formulas for calculating the area of parallelograms, trapeziums, rhombuses and kites
• establishes and uses formulas for calculating the volume and surface area of a range of right prisms

**Circle measurements**

• informally estimates the circumference of a circle using the radius or diameter
• establishes the relationship between the circumference and the diameter of a circle as the constant $\pi$ \pi $\pi$
• calculates the circumference and the area of a circle using $\pi$ \pi $\pi$ and a known diameter or radius

**Using metric  units and formulas**

• uses dissection, rearrangement and estimation to calculate or approximate the area and volume of composite shapes and objects
• uses metric units and formulas to calculate the volume and surface area of right prisms, cylinders, cones and pyramids
• uses the conversion between units of volume and capacity to calculate the capacity of objects based on the internal volume and vice versa
• identifies appropriate metric units to use according to the level of precision required (e.g. building plans show measurements in millimetres, but to purchase enough carpet you need to measure the length and width of the room and round up to the nearest whole metre)
• uses and applies Pythagoras' theorem to authentic contexts (e.g. determines the length of a cross

brace given the width of a gate is 1050 1050 1 0 5 0 millimetres and its height is 1450 1450 1 4 5 0 millimetres)
• uses and applies properties of congruent and similar triangles to authentic contexts to determine the size of unknown angles and lengths of sides
• uses trigonometry to calculate the unknown lengths or angles in authentic problems
• chooses an appropriate method to solve problems involving right triangles in authentic contexts

## Snapshot – Multiplicative strategies

# Numeracy: Number sense and algebra: Multiplicative strategies

### Content description

AC9M10M04

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

#### Flexible strategies for multiplication and division of rational numbers

• expresses a number as a product of its prime factors for a purpose
• expresses repeated factors of the same number in exponent form (e.g. 2 × 2 × 2 × 3 × 3 = 2 3 × 3 2 2 \times 2 \times 2 \times 3 \times 3 = 2^3\times 3^2 2 × 2 × 2 × 3 × 3 = 2 3 × 3 2
• identifies and describes products of the same number as square or cube numbers (e.g. 3 × 3 3 \times 3 3 × 3 is the same as 3 2 3^2 3 2 which is read as 3 3 3 squared)
• describes the effect of multiplication by a decimal or fraction less than one (e.g. when multiplying natural numbers by a fraction or decimal less than one such as 15 × 1 2 = 7.5 15 \times\frac12 = 7.5 1 5 × 2 1 ■ = 7 . 5 )
• connects and converts decimals to fractions to assist in mental computation involving multiplication or division (e.g. to calculate 16 × 0.25 16 \times 0.25 1 6 × 0 . 2 5 , recognises 0.25 0.25 0 . 2 5 as a quarter, and determines a quarter of 16 16 1 6 or determines 0.5 ÷ 0.25 0.5 ÷ 0.25 0 . 5 ÷ 0 . 2 5 , by reading this as "one half, how many quarters?" and gives the answer as 2 2 2 )
• calculates the percentage of a quantity flexibly using multiplication and division (e.g. to calculate 13 13 1 3 % of 1600 1600 1 6 0 0 uses 0.13 × 1600 0.13 \times 1600 0 . 1 3 × 1 6 0 0 or 1600 ÷ 100 × 13 1600 ÷ 100 \times 13 1 6 0 0 ÷ 1 0 0 × 1 3 )
• uses multiplicative strategies efficiently to solve problems involving rational numbers including integers (e.g. calculates the average temperature for Mt Wellington for July to be ■ 1.6 1.6 1 . 6 ■C)

#### Flexible strategies for working multiplicatively

• uses knowledge of place value and multiplicative partitioning to multiply and divide decimals efficiently (e.g. 0.461 × 200 = 0.461 × 100 × 2 = 46.1 × 2 = 92.2 0.461 \times 200 = 0.461 \times 100 \times 2 = 46.1 \times 2 = 92.2 0 . 4 6 1 × 2 0 0 = 0 . 4 6 1 × 1 0 0 × 2 = 4 6 . 1 × 2 = 9 2 . 2 )
• flexibly operates multiplicatively with extremely large or very small numbers expressed in scientific notation (e.g. calculates the area of a computer chip measuring 2.56 × 1 0 – 6 2.56 \times 10^{-6} 2 . 5 6 × 1 0 – 6 m in width by 1.4 × 1 0 – 7 1.4 \times 10^{-7} 1 . 4 × 1 0 – 7 m in length)
• chooses and uses appropriate strategies to solve multi-step problems and model situations involving rational numbers
• represents and solves multifaceted problems in a wide range of multiplicative situations including scientific notation for those involving very small or very large numbers (e.g. chooses to calculate the percentage of a percentage to determine successive discounts; determines the time it takes for sunlight to reach the earth)

## Snapshot – Interpret concepts and problems

# Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10M04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements

necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Draw conclusions and provide reasons**

## Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10M04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made
• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

**Snapshot – Explore ethical issues**

## Ethical Understanding: Responding to ethical issues: Explore ethical issues

### Content description

AC9M10M04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• analyse■the relationships between values, ethical perspectives■and ethical frameworks when responding to ethical issues
• apply knowledge of ethical concepts, values, perspectives and frameworks when responding to ethical issues

**Snapshot – Explore ethical concepts**

## Ethical Understanding: Understanding ethical concepts and perspectives: Explor

### Content description

AC9M10M04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• analyse■the similarities and differences between ethical concepts, such as integrity, loyalty and equality, in a range of situations and contexts
• evaluate■the consistency in meaning of ethical concepts, such as trust, freedom and rights and responsibilities, in a range of situations and contexts

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10M04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Draw conclusions and provide reasons**

## Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10M04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made
• draw conclusions and make choices when completing tasks, using analysis of complex evidence and

arguments before making recommendations

## Snapshot – Evaluate actions and outcomes

### Critical and Creative Thinking: Analysing: Evaluate actions and outcomes

#### Content description

AC9M10M04

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• evaluate the effectiveness of a course of action or the outcome of a task and account for expected and unexpected results, including using a given or co-developed set of criteria to support decisions

• evaluate the effectiveness of a course of action to achieve desired outcomes and suggest improvements, including using a personally developed set of criteria to support judgements and decisions

## Snapshot – Interpret concepts and problems

### Critical and Creative Thinking: Analysing: Interpret concepts and problems

#### Content description

AC9M10M04

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Draw conclusions and provide reasons

### Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

#### Content description

AC9M10M04

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

## Snapshot – Evaluate actions and outcomes

### Critical and Creative Thinking: Analysing: Evaluate actions and outcomes

#### Content description

AC9M10M04

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• evaluate the effectiveness of a course of action or the outcome of a task and account for expected and unexpected results, including using a given or co-developed set of criteria to support decisions

• evaluate the effectiveness of a course of action to achieve desired outcomes and suggest improvements, including using a personally developed set of criteria to support judgements and decisions

## Snapshot – Multiplicative strategies

### Numeracy: Number sense and algebra: Multiplicative strategies

#### Content description

AC9M10M04

#### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Flexible strategies for multiplication and division of rational numbers**

• expresses a number as a product of its prime factors for a purpose

• expresses repeated factors of the same number in exponent form (e.g. 2 × 2 × 2 × 3 × 3 = 2 3 × 3 2 2 \times 2 \times 2 \times 3 \times 3 = 2^3\times 3^2 2 × 2 × 2 × 3 × 3 = 2 3 × 3 2
• identifies and describes products of the same number as square or cube numbers (e.g. 3 × 3 3 \times 3 3 × 3 is the same as 3 2 3^2 3 2 which is read as 3 3 3 squared)
• describes the effect of multiplication by a decimal or fraction less than one (e.g. when multiplying natural numbers by a fraction or decimal less than one such as 15 × 1 2 = 7.5 15 \times\frac12 = 7.5 1 5 × 2 1 ■ = 7 . 5 )
• connects and converts decimals to fractions to assist in mental computation involving multiplication or division (e.g. to calculate 16 × 0.25 16 \times 0.25 1 6 × 0 . 2 5 , recognises 0.25 0.25 0 . 2 5 as a quarter, and determines a quarter of 16 16 1 6 or determines 0.5 ÷ 0.25 0.5 ÷ 0.25 0 . 5 ÷ 0 . 2 5 , by reading this as "one half, how many quarters?" and gives the answer as 2 2 2 )
• calculates the percentage of a quantity flexibly using multiplication and division (e.g. to calculate 13 13 1 3 % of 1600 1600 1 6 0 0 uses 0.13 × 1600 0.13 \times 1600 0 . 1 3 × 1 6 0 0 or 1600 ÷ 100 × 13 1600 ÷ 100 \times 13 1 6 0 0 ÷ 1 0 0 × 1 3 )
• uses multiplicative strategies efficiently to solve problems involving rational numbers including integers (e.g. calculates the average temperature for Mt Wellington for July to be ■ 1.6 1.6 1 . 6 ■C)

### Flexible strategies for working multiplicatively

• uses knowledge of place value and multiplicative partitioning to multiply and divide decimals efficiently (e.g. 0.461 × 200 = 0.461 × 100 × 2 = 46.1 × 2 = 92.2 0.461 \times 200 = 0.461 \times 100 \times 2 = 46.1 \times 2 = 92.2 0 . 4 6 1 × 2 0 0 = 0 . 4 6 1 × 1 0 0 × 2 = 4 6 . 1 × 2 = 9 2 . 2 )
• flexibly operates multiplicatively with extremely large or very small numbers expressed in scientific notation (e.g. calculates the area of a computer chip measuring 2.56 × 1 0 – 6 2.56 \times 10^{-6} 2 . 5 6 × 1 0 – 6 m in width by 1.4 × 1 0 – 7 1.4 \times 10^{-7} 1 . 4 × 1 0 – 7 m in length)
• chooses and uses appropriate strategies to solve multi-step problems and model situations involving rational numbers
• represents and solves multifaceted problems in a wide range of multiplicative situations including scientific notation for those involving very small or very large numbers (e.g. chooses to calculate the percentage of a percentage to determine successive discounts; determines the time it takes for sunlight to reach the earth)

## Snapshot – Proportional thinking

# Numeracy: Number sense and algebra: Proportional thinking

## Content description

AC9M10M04

## Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

### Applying proportion

• recognises that percentages can be greater than 100 100 1 0 0 % (e.g. the entry price to the show has gone up from $ 20 \$20 $ 2 0 last year to $ 25 \$25 $ 2 5 this year, that’s 125 125 1 2 5 % of last year's price; examines food labels and nutritional tables to determine whether the percentage a fast food meal exceeds a recommended daily intake for sugar/fats)
• uses common fractions and decimals for proportional increase or decrease of a given amount
• increases and decreases quantities by a percentage and expresses a percentage increase or decrease using a multiplier (e.g. calculates 70 70 7 0 % or 0.7 0.7 0 . 7 of the original marked price to apply a 30 30 3 0 % discount; multiplies by 1.03 1.03 1 . 0 3 when predicting a 3 3 3 % future capital gain; calculates percentage increase or decrease in international migration in Australia)
• models situations uses percentages, rates and ratios (e.g. calculates interest payable on loans; compares taxation rates and the effect of a pay increase on how much annual income tax is payable; mixes chemical solutions using ratios; uses Mendelian inheritance to predict the ratio of offspring genotypes and phenotypes in monohybrid crosses)
• identifies and interprets situations where direct proportion is involved (e.g. hours worked and payment received; increase in income and increase in demand for branded products; increasing the

mass will increase the force provided that acceleration remains constant)
• identifies and interprets situations where inverse proportion is involved (e.g. number of people working on a job and time taken to complete the job; speed and time taken to travel recognising that travelling at a greater speed will mean the journey takes less time; decrease in price and increase in demand)
• uses ratio and scale factors to enlarge or reduce the size of objects (e.g. interprets the scale used on a map and determines the real distance between 2 2 2 locations; draws engineering drawings to scale)

**Flexible proportional thinking**

• identifies proportional relationships in formulas and uses proportional thinking flexibly to explore this relationship (e.g. recognises the proportional relationship between concentration and volume of a solution in the formula c = n v c=\frac nv c = v n ■ and uses this relationship to make decisions when diluting solutions)
• identifies, represents and chooses appropriate strategies to solve percentage problems involving proportional thinking (e.g. percentage of a percentage for calculating successive discounts; uses percentages to calculate compound interest on loans and investments; uses percentage increases or decreases as an operator, such as a 3 3 3 % increase is achieved by multiplying by 1.03 1.03 1 . 0 3 , and 4 4 4 successive increases is achieved by multiplying by ( 1.03 ) 4 (1.03)^4 ( 1 . 0 3 ) 4 to make meaning of the formula

## Snapshot – Understanding money

# Numeracy: Number sense and algebra: Understanding money

## Content description

AC9M10M04

## Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Working with money proportionally**

• applies proportional strategies for decision making, such as determining "best buys", currency conversion, determining gross domestic product (e.g. comparing cost per 100 100 1 0 0 g or comparing the cost of a single item on sale versus a multi-pack at the regular price)
• determines the best payment method or payment plan for a variety of contexts using rates, percentages and discounts (e.g. decides which phone plan would be better based on call rates, monthly data usage, insurance and other upfront costs)
• calculates the percentage change including the profit or loss made on a transaction (e.g. profit made from on-selling second-hand goods through an online retail site)

**Working with money proportionally**

• makes decisions about situations involving compound interest (e.g. compares total outlay and time taken to pay off a credit card debt as soon as possible as opposed to making minimum monthly repayments)
• chooses and uses proportional strategies for decision making (e.g. in purchasing a car calculates the depreciation, ongoing maintenance, insurance and the effect of loan repayments on disposable income; evaluates the benefits of "buy now pay later" schemes)

## Snapshot – Understanding units of measurement

# Numeracy: Measurement and geometry: Understanding units of measurement

## Content description

AC9M10M04

## Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Using metric units and formulas**

• establishes and uses formulas for calculating the area of parallelograms, trapeziums, rhombuses and kites
• establishes and uses formulas for calculating the volume and surface area of a range of right prisms

**Circle measurements**

• informally estimates the circumference of a circle using the radius or diameter
• establishes the relationship between the circumference and the diameter of a circle as the constant π \pi π
• calculates the circumference and the area of a circle using π \pi π and a known diameter or radius

**Using metric  units and formulas**

• uses dissection, rearrangement and estimation to calculate or approximate the area and volume of composite shapes and objects
• uses metric units and formulas to calculate the volume and surface area of right prisms, cylinders, cones and pyramids
• uses the conversion between units of volume and capacity to calculate the capacity of objects based on the internal volume and vice versa
• identifies appropriate metric units to use according to the level of precision required (e.g. building plans show measurements in millimetres, but to purchase enough carpet you need to measure the length and width of the room and round up to the nearest whole metre)
• uses and applies Pythagoras' theorem to authentic contexts (e.g. determines the length of a cross brace given the width of a gate is 1050 1050 1 0 5 0 millimetres and its height is 1450 1450 1 4 5 0 millimetres)
• uses and applies properties of congruent and similar triangles to authentic contexts to determine the size of unknown angles and lengths of sides
• uses trigonometry to calculate the unknown lengths or angles in authentic problems
• chooses an appropriate method to solve problems involving right triangles in authentic contexts

**Snapshot – Explore ethical issues**

## Ethical Understanding: Responding to ethical issues: Explore ethical issues

### Content description

AC9M10M04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• analyse■the relationships between values, ethical perspectives■and ethical frameworks when responding to ethical issues
• apply knowledge of ethical concepts, values, perspectives and frameworks when responding to ethical issues

**Snapshot – Making and reflecting on ethical decisions**

## Ethical Understanding: Responding to ethical issues: Making and reflecting on et

### Content description

AC9M10M04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• consider how values and beliefs influence approaches to ethical issues, and■analyse■how these affect■outcomes
• analyse■biases■when applying ethical concepts,■values■and ethical frameworks,■in order to explore and evaluate ethical decisions

# AC9M10M05

**use to solve practical problems involving and scaling of ; formulate problems and interpret solutions in terms of the situation; evaluate and modify models as necessary, and report assumptions, methods and findings**

•
•

**Elaborations**

• using plans and drawings to investigate making changes to building designs, employing appropriate and converting to actual measurements within the to make decisions about changes
• analysing and applying and in situations such as production prototypes and 3D printing; for example, using a 3D printer to produce scaled versions of actual
• estimating the of an , such as a toy car, by measuring a linear dimension and using a typical car dimension to work out the factor

• investigating compliance with building codes and standards in design and construction, such as for escalators in shopping
• investigating how artificial intelligence  image generators use and scaling techniques, such as aspect preservation, to ensure that the generated content adheres to realistic visual principles and maintains appropriate relationships between and within the scene

Students learn to:

## use mathematical modelling to solve practical problems involving proportion and sc formulate problems and interpret solutions in terms of the situation; evaluate and m necessary, and report assumptions, methods and findings

(AC9M10M05)

### General capabilities and cross-curriculum priorities

This content description connects to the following general capabilities and cross-curriculum priorities.

**Analysing**

• Interpret concepts and problems
• Draw conclusions and provide reasons
• Evaluate actions and outcomes

**Generating**

• Consider alternatives

**Inquiring**

• Identify, process and evaluate information

**Number sense and algebra**

• Proportional thinking

### Elaborations

Content elaborations provide suggestions of ways to teach the content description and connect it to general capabilities and cross-curriculum priorities. Content elaborations are optional .

**Analysing**

• Interpret concepts and problems
• Draw conclusions and provide reasons

**Generating**

• Consider alternatives

**Measurement and geometry**

• Understanding geometric properties
• Understanding units of measurement

**Number sense and algebra**

• Proportional thinking

**Analysing**

• Interpret concepts and problems
• Draw conclusions and provide reasons
• Evaluate actions and outcomes

**Measurement and geometry**

• Understanding geometric properties
• Understanding units of measurement

**Number sense and algebra**

• Proportional thinking

**Analysing**

• Interpret concepts and problems

**Measurement and geometry**

• Understanding units of measurement

**Number sense and algebra**

• Proportional thinking

**Analysing**

• Interpret concepts and problems

**Inquiring**

• Identify, process and evaluate information

**Measurement and geometry**

• Understanding units of measurement

**Measurement and geometry**

• Understanding geometric properties

**Number sense and algebra**

• Proportional thinking

## Related content

This content description can be taught with the following content descriptions from other learning areas.

AC9HP10P10

## Resources

### Snapshot – Interpret concepts and problems

#### Critical and Creative Thinking: Analysing: Interpret concepts and problems

##### Content description

AC9M10M05

##### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

### Snapshot – Draw conclusions and provide reasons

#### Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

##### Content description

AC9M10M05

##### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

### Snapshot – Evaluate actions and outcomes

#### Critical and Creative Thinking: Analysing: Evaluate actions and outcomes

##### Content description

AC9M10M05

##### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• evaluate the effectiveness of a course of action or the outcome of a task and account for expected and unexpected results, including using a given or co-developed set of criteria to support decisions

• evaluate the effectiveness of a course of action to achieve desired outcomes and suggest improvements, including using a personally developed set of criteria to support judgements and decisions

### Snapshot – Consider alternatives

#### Critical and Creative Thinking: Generating: Consider alternatives

##### Content description

AC9M10M05

##### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when

circumstances change

## Snapshot – Identify, process and evaluate information

### Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

#### Content description

AC9M10M05

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

## Snapshot – Proportional thinking

### Numeracy: Number sense and algebra: Proportional thinking

#### Content description

AC9M10M05

#### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Applying proportion**

• recognises that percentages can be greater than 100 100 1 0 0 % (e.g. the entry price to the show has gone up from $ 20 \$20 $ 2 0 last year to $ 25 \$25 $ 2 5 this year, that’s 125 125 1 2 5 % of last year's price; examines food labels and nutritional tables to determine whether the percentage a fast food meal exceeds a recommended daily intake for sugar/fats)

• uses common fractions and decimals for proportional increase or decrease of a given amount

• increases and decreases quantities by a percentage and expresses a percentage increase or decrease using a multiplier (e.g. calculates 70 70 7 0 % or 0.7 0.7 0 . 7 of the original marked price to apply a 30 30 3 0 % discount; multiplies by 1.03 1.03 1 . 0 3 when predicting a 3 3 3 % future capital gain; calculates percentage increase or decrease in international migration in Australia)

• models situations uses percentages, rates and ratios (e.g. calculates interest payable on loans; compares taxation rates and the effect of a pay increase on how much annual income tax is payable; mixes chemical solutions using ratios; uses Mendelian inheritance to predict the ratio of offspring genotypes and phenotypes in monohybrid crosses)

• identifies and interprets situations where direct proportion is involved (e.g. hours worked and payment received; increase in income and increase in demand for branded products; increasing the mass will increase the force provided that acceleration remains constant)

• identifies and interprets situations where inverse proportion is involved (e.g. number of people working on a job and time taken to complete the job; speed and time taken to travel recognising that travelling at a greater speed will mean the journey takes less time; decrease in price and increase in demand)

• uses ratio and scale factors to enlarge or reduce the size of objects (e.g. interprets the scale used on a map and determines the real distance between 2 2 2 locations; draws engineering drawings to scale)

**Flexible proportional thinking**

• identifies proportional relationships in formulas and uses proportional thinking flexibly to explore this relationship (e.g. recognises the proportional relationship between concentration and volume of a solution in the formula c = n v c=\frac nv c = v n ■ and uses this relationship to make decisions when diluting solutions)

• identifies, represents and chooses appropriate strategies to solve percentage problems involving proportional thinking (e.g. percentage of a percentage for calculating successive discounts; uses percentages to calculate compound interest on loans and investments; uses percentage increases or decreases as an operator, such as a 3 3 3 % increase is achieved by multiplying by 1.03 1.03 1 . 0 3 , and 4 4 4 successive increases is achieved by multiplying by ( 1.03 ) 4 (1.03)^4 ( 1 . 0 3 ) 4 to make meaning of the formula

## Snapshot – Interpret concepts and problems

# Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10M05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Draw conclusions and provide reasons

# Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10M05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

## Snapshot – Consider alternatives

# Critical and Creative Thinking: Generating: Consider alternatives

### Content description

AC9M10M05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

## Snapshot – Understanding geometric properties

# Numeracy: Measurement and geometry: Understanding geometric properties

### Content description

AC9M10M05

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Properties of shapes and objects**

• investigates and uses reasoning to explain the properties of a triangle (e.g. explains why the longest side is always opposite the largest angle in a triangle; recognises that the combined length of 2 2 2 sides of a triangle must always be greater than the length of the third side)

• uses relevant properties of common geometrical shapes to determine unknown lengths and angles

**Transformations**

• enlarges and reduces shapes according to a given scale factor and explains what features change and what stay the same (e.g. says ‘when I double the dimensions of the rectangle, all of the lengths are twice as long as they were, but the size of the angles stay the same)

• applies angle properties to solve problems that involve the transformation of shapes and objects and how they are used in practice (e.g. determines which shapes tessellate)

**Angles**

• uses angle properties to identify perpendicular and parallel lines (e.g. develops a computer-aided design drawing involving the creation of parallel and perpendicular lines)

• demonstrates that the angle sum of a triangle is 180 180 1 8 0 ■ and uses this to solve problems

• identifies interior angles in shapes to calculate angle sum

• uses angle properties to identify and calculate unknown angles in familiar two-dimensional shapes

**Geometric properties**

• uses Pythagoras' theorem to solve right-angled triangle problems
• determines the conditions for triangles to be similar
• determines the conditions for triangles to be congruent

**Transformations**

• uses the enlargement transformation to explain similarity and develop the conditions for triangles to be similar
• solves problems using ratio and scale factors in similar figures

**Angles**

• uses angle properties to reason geometrically, in order to solve spatial problems (e.g. applies an understanding of the relationship between the base angles of an isosceles triangle to determine the size of a similar shape in order to solve a problem)
• uses trigonometry to calculate the unknown angles and unknown distances in authentic problems (e.g. measures the height of a tree using a clinometer to measure the angle of inclination and trigonometry to approximate the vertical height; calculates the angle of inclination for a ramp)

## Snapshot – Understanding units of measurement

# Numeracy: Measurement and geometry: Understanding units of measurement

## Content description

AC9M10M05

## Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Using metric units and formulas**

• establishes and uses formulas for calculating the area of parallelograms, trapeziums, rhombuses and kites
• establishes and uses formulas for calculating the volume and surface area of a range of right prisms

**Circle measurements**

• informally estimates the circumference of a circle using the radius or diameter
• establishes the relationship between the circumference and the diameter of a circle as the constant $\pi$ \pi $\pi$
• calculates the circumference and the area of a circle using $\pi$ \pi $\pi$ and a known diameter or radius

**Using metric  units and formulas**

• uses dissection, rearrangement and estimation to calculate or approximate the area and volume of composite shapes and objects
• uses metric units and formulas to calculate the volume and surface area of right prisms, cylinders, cones and pyramids
• uses the conversion between units of volume and capacity to calculate the capacity of objects based on the internal volume and vice versa
• identifies appropriate metric units to use according to the level of precision required (e.g. building plans show measurements in millimetres, but to purchase enough carpet you need to measure the length and width of the room and round up to the nearest whole metre)
• uses and applies Pythagoras' theorem to authentic contexts (e.g. determines the length of a cross brace given the width of a gate is 1050 1050 1 0 5 0 millimetres and its height is 1450 1450 1 4 5 0 millimetres)
• uses and applies properties of congruent and similar triangles to authentic contexts to determine the size of unknown angles and lengths of sides
• uses trigonometry to calculate the unknown lengths or angles in authentic problems
• chooses an appropriate method to solve problems involving right triangles in authentic contexts

## Snapshot – Proportional thinking

# Numeracy: Number sense and algebra: Proportional thinking

## Content description

AC9M10M05

## Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Applying proportion**

• recognises that percentages can be greater than 100 100 1 0 0 % (e.g. the entry price to the show has gone up from $ 20 \$20 $ 2 0 last year to $ 25 \$25 $ 2 5 this year, that’s 125 125 1 2 5 % of last year's price; examines food labels and nutritional tables to determine whether the percentage a fast food meal exceeds a recommended daily intake for sugar/fats)
• uses common fractions and decimals for proportional increase or decrease of a given amount
• increases and decreases quantities by a percentage and expresses a percentage increase or decrease using a multiplier (e.g. calculates 70 70 7 0 % or 0.7 0.7 0 . 7 of the original marked price to apply a 30 30 3 0 % discount; multiplies by 1.03 1.03 1 . 0 3 when predicting a 3 3 3 % future capital gain; calculates percentage increase or decrease in international migration in Australia)
• models situations uses percentages, rates and ratios (e.g. calculates interest payable on loans; compares taxation rates and the effect of a pay increase on how much annual income tax is payable; mixes chemical solutions using ratios; uses Mendelian inheritance to predict the ratio of offspring genotypes and phenotypes in monohybrid crosses)
• identifies and interprets situations where direct proportion is involved (e.g. hours worked and payment received; increase in income and increase in demand for branded products; increasing the mass will increase the force provided that acceleration remains constant)
• identifies and interprets situations where inverse proportion is involved (e.g. number of people working on a job and time taken to complete the job; speed and time taken to travel recognising that travelling at a greater speed will mean the journey takes less time; decrease in price and increase in demand)
• uses ratio and scale factors to enlarge or reduce the size of objects (e.g. interprets the scale used on a map and determines the real distance between 2 2 2 locations; draws engineering drawings to scale)

**Flexible proportional thinking**

• identifies proportional relationships in formulas and uses proportional thinking flexibly to explore this relationship (e.g. recognises the proportional relationship between concentration and volume of a solution in the formula c = n v c=\frac nv c = v n ■ and uses this relationship to make decisions when diluting solutions)
• identifies, represents and chooses appropriate strategies to solve percentage problems involving proportional thinking (e.g. percentage of a percentage for calculating successive discounts; uses percentages to calculate compound interest on loans and investments; uses percentage increases or decreases as an operator, such as a 3 3 3 % increase is achieved by multiplying by 1.03 1.03 1 . 0 3 , and 4 4 4 successive increases is achieved by multiplying by ( 1.03 ) 4 (1.03)^4 ( 1 . 0 3 ) 4 to make meaning of the formula

## Snapshot – Interpret concepts and problems

# Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10M05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Draw conclusions and provide reasons

# Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10M05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

## Snapshot – Evaluate actions and outcomes

# Critical and Creative Thinking: Analysing: Evaluate actions and outcomes

### Content description

AC9M10M05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• evaluate the effectiveness of a course of action or the outcome of a task and account for expected and unexpected results, including using a given or co-developed set of criteria to support decisions

• evaluate the effectiveness of a course of action to achieve desired outcomes and suggest improvements, including using a personally developed set of criteria to support judgements and decisions

## Snapshot – Understanding geometric properties

# Numeracy: Measurement and geometry: Understanding geometric properties

### Content description

AC9M10M05

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Properties of shapes and objects**

• investigates and uses reasoning to explain the properties of a triangle (e.g. explains why the longest side is always opposite the largest angle in a triangle; recognises that the combined length of 2 2 2 sides of a triangle must always be greater than the length of the third side)

• uses relevant properties of common geometrical shapes to determine unknown lengths and angles

**Transformations**

• enlarges and reduces shapes according to a given scale factor and explains what features change and what stay the same (e.g. says ‘when I double the dimensions of the rectangle, all of the lengths are twice as long as they were, but the size of the angles stay the same)

• applies angle properties to solve problems that involve the transformation of shapes and objects and how they are used in practice (e.g. determines which shapes tessellate)

**Angles**

• uses angle properties to identify perpendicular and parallel lines (e.g. develops a computer-aided design drawing involving the creation of parallel and perpendicular lines)

• demonstrates that the angle sum of a triangle is 180 180 1 8 0 ■ and uses this to solve problems

• identifies interior angles in shapes to calculate angle sum

• uses angle properties to identify and calculate unknown angles in familiar two-dimensional shapes

**Geometric properties**

• uses Pythagoras’ theorem to solve right-angled triangle problems

• determines the conditions for triangles to be similar

• determines the conditions for triangles to be congruent

**Transformations**

• uses the enlargement transformation to explain similarity and develop the conditions for triangles to be similar

• solves problems using ratio and scale factors in similar figures

**Angles**

• uses angle properties to reason geometrically, in order to solve spatial problems (e.g. applies an understanding of the relationship between the base angles of an isosceles triangle to determine the size of a similar shape in order to solve a problem)

• uses trigonometry to calculate the unknown angles and unknown distances in authentic problems (e.g. measures the height of a tree using a clinometer to measure the angle of inclination and trigonometry to approximate the vertical height; calculates the angle of inclination for a ramp)

## Snapshot – Understanding units of measurement

# Numeracy: Measurement and geometry: Understanding units of measurement

## Content description

AC9M10M05

## Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

### Using metric units and formulas

• establishes and uses formulas for calculating the area of parallelograms, trapeziums, rhombuses and kites

• establishes and uses formulas for calculating the volume and surface area of a range of right prisms

### Circle measurements

• informally estimates the circumference of a circle using the radius or diameter

• establishes the relationship between the circumference and the diameter of a circle as the constant $\pi$ \pi $\pi$

• calculates the circumference and the area of a circle using $\pi$ \pi $\pi$ and a known diameter or radius

### Using metric  units and formulas

• uses dissection, rearrangement and estimation to calculate or approximate the area and volume of composite shapes and objects

• uses metric units and formulas to calculate the volume and surface area of right prisms, cylinders, cones and pyramids

• uses the conversion between units of volume and capacity to calculate the capacity of objects based on the internal volume and vice versa

• identifies appropriate metric units to use according to the level of precision required (e.g. building plans show measurements in millimetres, but to purchase enough carpet you need to measure the length and width of the room and round up to the nearest whole metre)

• uses and applies Pythagoras' theorem to authentic contexts (e.g. determines the length of a cross brace given the width of a gate is 1050 1050 1 0 5 0 millimetres and its height is 1450 1450 1 4 5 0 millimetres)

• uses and applies properties of congruent and similar triangles to authentic contexts to determine the size of unknown angles and lengths of sides

• uses trigonometry to calculate the unknown lengths or angles in authentic problems

• chooses an appropriate method to solve problems involving right triangles in authentic contexts

## Snapshot – Proportional thinking

# Numeracy: Number sense and algebra: Proportional thinking

## Content description

AC9M10M05

## Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

### Applying proportion

• recognises that percentages can be greater than 100 100 1 0 0 % (e.g. the entry price to the show has gone up from $ 20 \$20 $ 2 0 last year to $ 25 \$25 $ 2 5 this year, that's 125 125 1 2 5 % of last year's price; examines food labels and nutritional tables to determine whether the percentage a fast food meal exceeds a recommended daily intake for sugar/fats)

• uses common fractions and decimals for proportional increase or decrease of a given amount

• increases and decreases quantities by a percentage and expresses a percentage increase or decrease using a multiplier (e.g. calculates 70 70 7 0 % or 0.7 0.7 0 . 7 of the original marked price to apply a 30 30 3 0 % discount; multiplies by 1.03 1.03 1 . 0 3 when predicting a 3 3 3 % future capital gain; calculates percentage increase or decrease in international migration in Australia)

• models situations uses percentages, rates and ratios (e.g. calculates interest payable on loans; compares taxation rates and the effect of a pay increase on how much annual income tax is payable; mixes chemical solutions using ratios; uses Mendelian inheritance to predict the ratio of offspring genotypes and phenotypes in monohybrid crosses)

• identifies and interprets situations where direct proportion is involved (e.g. hours worked and payment received; increase in income and increase in demand for branded products; increasing the

mass will increase the force provided that acceleration remains constant)
• identifies and interprets situations where inverse proportion is involved (e.g. number of people working on a job and time taken to complete the job; speed and time taken to travel recognising that travelling at a greater speed will mean the journey takes less time; decrease in price and increase in demand)
• uses ratio and scale factors to enlarge or reduce the size of objects (e.g. interprets the scale used on a map and determines the real distance between 2 2 2 locations; draws engineering drawings to scale)

**Flexible proportional thinking**

• identifies proportional relationships in formulas and uses proportional thinking flexibly to explore this relationship (e.g. recognises the proportional relationship between concentration and volume of a solution in the formula c = n v c=\frac nv c = v n ■ and uses this relationship to make decisions when diluting solutions)
• identifies, represents and chooses appropriate strategies to solve percentage problems involving proportional thinking (e.g. percentage of a percentage for calculating successive discounts; uses percentages to calculate compound interest on loans and investments; uses percentage increases or decreases as an operator, such as a 3 3 3 % increase is achieved by multiplying by 1.03 1.03 1 . 0 3 , and 4 4 4 successive increases is achieved by multiplying by ( 1.03 ) 4 (1.03)^4 ( 1 . 0 3 ) 4 to make meaning of the formula

## Snapshot – Interpret concepts and problems

# Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10M05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Understanding units of measurement

# Numeracy: Measurement and geometry: Understanding units of measurement

### Content description

AC9M10M05

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Using metric units and formulas**

• establishes and uses formulas for calculating the area of parallelograms, trapeziums, rhombuses and kites
• establishes and uses formulas for calculating the volume and surface area of a range of right prisms

**Circle measurements**

• informally estimates the circumference of a circle using the radius or diameter
• establishes the relationship between the circumference and the diameter of a circle as the constant π \pi π
• calculates the circumference and the area of a circle using π \pi π and a known diameter or radius

**Using metric  units and formulas**

• uses dissection, rearrangement and estimation to calculate or approximate the area and volume of composite shapes and objects
• uses metric units and formulas to calculate the volume and surface area of right prisms, cylinders, cones and pyramids
• uses the conversion between units of volume and capacity to calculate the capacity of objects based on the internal volume and vice versa
• identifies appropriate metric units to use according to the level of precision required (e.g. building plans show measurements in millimetres, but to purchase enough carpet you need to measure

the length and width of the room and round up to the nearest whole metre)
• uses and applies Pythagoras' theorem to authentic contexts (e.g. determines the length of a cross brace given the width of a gate is 1050 1050 1 0 5 0 millimetres and its height is 1450 1450 1 4 5 0 millimetres)
• uses and applies properties of congruent and similar triangles to authentic contexts to determine the size of unknown angles and lengths of sides
• uses trigonometry to calculate the unknown lengths or angles in authentic problems
• chooses an appropriate method to solve problems involving right triangles in authentic contexts

## Snapshot – Proportional thinking

# Numeracy: Number sense and algebra: Proportional thinking

### Content description

AC9M10M05

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

#### Applying proportion

• recognises that percentages can be greater than 100 100 1 0 0 % (e.g. the entry price to the show has gone up from $ 20 \$20 $ 2 0 last year to $ 25 \$25 $ 2 5 this year, that's 125 125 1 2 5 % of last year's price; examines food labels and nutritional tables to determine whether the percentage a fast food meal exceeds a recommended daily intake for sugar/fats)
• uses common fractions and decimals for proportional increase or decrease of a given amount
• increases and decreases quantities by a percentage and expresses a percentage increase or decrease using a multiplier (e.g. calculates 70 70 7 0 % or 0.7 0.7 0 . 7 of the original marked price to apply a 30 30 3 0 % discount; multiplies by 1.03 1.03 1 . 0 3 when predicting a 3 3 3 % future capital gain; calculates percentage increase or decrease in international migration in Australia)
• models situations uses percentages, rates and ratios (e.g. calculates interest payable on loans; compares taxation rates and the effect of a pay increase on how much annual income tax is payable; mixes chemical solutions using ratios; uses Mendelian inheritance to predict the ratio of offspring genotypes and phenotypes in monohybrid crosses)
• identifies and interprets situations where direct proportion is involved (e.g. hours worked and payment received; increase in income and increase in demand for branded products; increasing the mass will increase the force provided that acceleration remains constant)
• identifies and interprets situations where inverse proportion is involved (e.g. number of people working on a job and time taken to complete the job; speed and time taken to travel recognising that travelling at a greater speed will mean the journey takes less time; decrease in price and increase in demand)
• uses ratio and scale factors to enlarge or reduce the size of objects (e.g. interprets the scale used on a map and determines the real distance between 2 2 2 locations; draws engineering drawings to scale)

#### Flexible proportional thinking

• identifies proportional relationships in formulas and uses proportional thinking flexibly to explore this relationship (e.g. recognises the proportional relationship between concentration and volume of a solution in the formula c = n v c=\frac nv c = v n ■ and uses this relationship to make decisions when diluting solutions)
• identifies, represents and chooses appropriate strategies to solve percentage problems involving proportional thinking (e.g. percentage of a percentage for calculating successive discounts; uses percentages to calculate compound interest on loans and investments; uses percentage increases or decreases as an operator, such as a 3 3 3 % increase is achieved by multiplying by 1.03 1.03 1 . 0 3 , and 4 4 4 successive increases is achieved by multiplying by ( 1.03 ) 4 (1.03)^4 ( 1 . 0 3 ) 4 to make meaning of the formula

## Snapshot – Interpret concepts and problems

# Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10M05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Identify, process and evaluate information

# Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10M05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources
• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study
• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources
• evaluate the information selected to determine bias and reliability

## Snapshot – Understanding units of measurement

# Numeracy: Measurement and geometry: Understanding units of measurement

### Content description

AC9M10M05

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Using metric units and formulas**

• establishes and uses formulas for calculating the area of parallelograms, trapeziums, rhombuses and kites
• establishes and uses formulas for calculating the volume and surface area of a range of right prisms

**Circle measurements**

• informally estimates the circumference of a circle using the radius or diameter
• establishes the relationship between the circumference and the diameter of a circle as the constant $\pi$ \pi $\pi$
• calculates the circumference and the area of a circle using $\pi$ \pi $\pi$ and a known diameter or radius

**Using metric  units and formulas**

• uses dissection, rearrangement and estimation to calculate or approximate the area and volume of composite shapes and objects
• uses metric units and formulas to calculate the volume and surface area of right prisms, cylinders, cones and pyramids
• uses the conversion between units of volume and capacity to calculate the capacity of objects based on the internal volume and vice versa
• identifies appropriate metric units to use according to the level of precision required (e.g. building plans show measurements in millimetres, but to purchase enough carpet you need to measure the length and width of the room and round up to the nearest whole metre)
• uses and applies Pythagoras' theorem to authentic contexts (e.g. determines the length of a cross brace given the width of a gate is 1050 1050 1 0 5 0 millimetres and its height is 1450 1450 1 4 5 0 millimetres)
• uses and applies properties of congruent and similar triangles to authentic contexts to determine the size of unknown angles and lengths of sides
• uses trigonometry to calculate the unknown lengths or angles in authentic problems
• chooses an appropriate method to solve problems involving right triangles in authentic contexts

## Snapshot – Understanding geometric properties

# Numeracy: Measurement and geometry: Understanding geometric properties

### Content description

AC9M10M05

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

#### Properties of shapes and objects

• investigates and uses reasoning to explain the properties of a triangle (e.g. explains why the longest side is always opposite the largest angle in a triangle; recognises that the combined length of 2 2 2 sides of a triangle must always be greater than the length of the third side)
• uses relevant properties of common geometrical shapes to determine unknown lengths and angles

#### Transformations

• enlarges and reduces shapes according to a given scale factor and explains what features change and what stay the same (e.g. says 'when I double the dimensions of the rectangle, all of the lengths are twice as long as they were, but the size of the angles stay the same)
• applies angle properties to solve problems that involve the transformation of shapes and objects and how they are used in practice (e.g. determines which shapes tessellate)

#### Angles

• uses angle properties to identify perpendicular and parallel lines (e.g. develops a computer-aided design drawing involving the creation of parallel and perpendicular lines)
• demonstrates that the angle sum of a triangle is 180 180 1 8 0 ■ and uses this to solve problems
• identifies interior angles in shapes to calculate angle sum
• uses angle properties to identify and calculate unknown angles in familiar two-dimensional shapes

#### Geometric properties

• uses Pythagoras' theorem to solve right-angled triangle problems
• determines the conditions for triangles to be similar
• determines the conditions for triangles to be congruent

#### Transformations

• uses the enlargement transformation to explain similarity and develop the conditions for triangles to be similar
• solves problems using ratio and scale factors in similar figures

#### Angles

• uses angle properties to reason geometrically, in order to solve spatial problems (e.g. applies an understanding of the relationship between the base angles of an isosceles triangle to determine the size of a similar shape in order to solve a problem)
• uses trigonometry to calculate the unknown angles and unknown distances in authentic problems (e.g. measures the height of a tree using a clinometer to measure the angle of inclination and trigonometry to approximate the vertical height; calculates the angle of inclination for a ramp)

## Snapshot – Proportional thinking

# Numeracy: Number sense and algebra: Proportional thinking

### Content description

AC9M10M05

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

#### Applying proportion

• recognises that percentages can be greater than 100 100 1 0 0 % (e.g. the entry price to the show has gone up from $ 20 \$20 $ 2 0 last year to $ 25 \$25 $ 2 5 this year, that's 125 125 1 2 5 % of last year's price; examines food labels and nutritional tables to determine whether the percentage a fast food meal exceeds a recommended daily intake for sugar/fats)
• uses common fractions and decimals for proportional increase or decrease of a given amount
• increases and decreases quantities by a percentage and expresses a percentage increase or decrease using a multiplier (e.g. calculates 70 70 7 0 % or 0.7 0.7 0 . 7 of the original marked price to apply a 30 30 3 0 % discount; multiplies by 1.03 1.03 1 . 0 3 when predicting a 3 3 3 % future capital gain; calculates percentage increase or decrease in international migration in Australia)
• models situations uses percentages, rates and ratios (e.g. calculates interest payable on loans; compares taxation rates and the effect of a pay increase on how much annual income tax is payable;

mixes chemical solutions using ratios; uses Mendelian inheritance to predict the ratio of offspring genotypes and phenotypes in monohybrid crosses)
• identifies and interprets situations where direct proportion is involved (e.g. hours worked and payment received; increase in income and increase in demand for branded products; increasing the mass will increase the force provided that acceleration remains constant)
• identifies and interprets situations where inverse proportion is involved (e.g. number of people working on a job and time taken to complete the job; speed and time taken to travel recognising that travelling at a greater speed will mean the journey takes less time; decrease in price and increase in demand)
• uses ratio and scale factors to enlarge or reduce the size of objects (e.g. interprets the scale used on a map and determines the real distance between 2 2 2 locations; draws engineering drawings to scale)

**Flexible proportional thinking**

• identifies proportional relationships in formulas and uses proportional thinking flexibly to explore this relationship (e.g. recognises the proportional relationship between concentration and volume of a solution in the formula c = n v c=\frac nv c = v n ■ and uses this relationship to make decisions when diluting solutions)
• identifies, represents and chooses appropriate strategies to solve percentage problems involving proportional thinking (e.g. percentage of a percentage for calculating successive discounts; uses percentages to calculate compound interest on loans and investments; uses percentage increases or decreases as an operator, such as a 3 3 3 % increase is achieved by multiplying by 1.03 1.03 1 . 0 3 , and 4 4 4 successive increases is achieved by multiplying by ( 1.03 ) 4 (1.03)^4 ( 1 . 0 3 ) 4 to make meaning of the formula

## AC9M10SP01

**apply deductive reasoning to involving in the plane and use to solve spatial problems**

•

**Elaborations**

• distinguishing between a practical demonstration and a ; for example, demonstrating that triangles are by placing them on top of each other, as compared to using congruence tests to establish that triangles are
• developing involving and properties, communicating the using a sequence of logically connected statements
• applying an understanding of relationships to deduce properties of geometric figures; for example, the base of an isosceles triangle are equal
• investigating of geometric and using them to solve spatial problems; for example, applying logical reasoning and to and numerical exercises involving plane ; using visual to justify solutions
• using to investigate the shortest path that touches 3 sides of a , starting and finishing at the same and proving that the path forms a parallelogram
• investigating how automated provers (ATP) and interactive assistants (IPA) allow mathematicians and artificial intelligence systems to work collaboratively to or test formal

Students learn to:

## apply deductive reasoning to proofs involving shapes in the plane and use theorem problems

(AC9M10SP01)

### General capabilities and cross-curriculum priorities

This content description connects to the following general capabilities and cross-curriculum priorities.

**Analysing**

• Interpret concepts and problems
• Draw conclusions and provide reasons

### Elaborations

Content elaborations provide suggestions of ways to teach the content description and connect it to general capabilities and cross-curriculum priorities. Content elaborations are optional .

**Analysing**

• Interpret concepts and problems

• Draw conclusions and provide reasons

**Measurement and geometry**

• Understanding geometric properties

**Analysing**

• Interpret concepts and problems

• Draw conclusions and provide reasons

**Measurement and geometry**

• Understanding units of measurement

**Analysing**

• Interpret concepts and problems

• Draw conclusions and provide reasons

**Managing and operating**

• Select and operate tools

**Measurement and geometry**

• Understanding geometric properties

**Analysing**

• Interpret concepts and problems

• Draw conclusions and provide reasons

**Measurement and geometry**

• Understanding geometric properties

**Analysing**

• Interpret concepts and problems

• Draw conclusions and provide reasons

**Measurement and geometry**

• Understanding geometric properties

**Measurement and geometry**

• Understanding geometric properties

**Resources**

**Work Samples**

## WS02 - Proof and conjecture

**Snapshot – Interpret concepts and problems**

### Critical and Creative Thinking: Analysing: Interpret concepts and problems

#### Content description

AC9M10SP01

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Draw conclusions and provide reasons**

### Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

#### Content description

AC9M10SP01

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

**Snapshot – Interpret concepts and problems**

### Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10SP01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Draw conclusions and provide reasons

## Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10SP01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

## Snapshot – Understanding geometric properties

## Numeracy: Measurement and geometry: Understanding geometric properties

### Content description

AC9M10SP01

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

#### Properties of shapes and objects

• investigates and uses reasoning to explain the properties of a triangle (e.g. explains why the longest side is always opposite the largest angle in a triangle; recognises that the combined length of 2 2 2 sides of a triangle must always be greater than the length of the third side)

• uses relevant properties of common geometrical shapes to determine unknown lengths and angles

#### Transformations

• enlarges and reduces shapes according to a given scale factor and explains what features change and what stay the same (e.g. says ‘when I double the dimensions of the rectangle, all of the lengths are twice as long as they were, but the size of the angles stay the same)

• applies angle properties to solve problems that involve the transformation of shapes and objects and how they are used in practice (e.g. determines which shapes tessellate)

#### Angles

• uses angle properties to identify perpendicular and parallel lines (e.g. develops a computer-aided design drawing involving the creation of parallel and perpendicular lines)

• demonstrates that the angle sum of a triangle is 180 180 1 8 0 ■ and uses this to solve problems

• identifies interior angles in shapes to calculate angle sum

• uses angle properties to identify and calculate unknown angles in familiar two-dimensional shapes

#### Geometric properties

• uses Pythagoras’ theorem to solve right-angled triangle problems

• determines the conditions for triangles to be similar

• determines the conditions for triangles to be congruent

#### Transformations

• uses the enlargement transformation to explain similarity and develop the conditions for triangles to be similar

• solves problems using ratio and scale factors in similar figures

#### Angles

• uses angle properties to reason geometrically, in order to solve spatial problems (e.g. applies an understanding of the relationship between the base angles of an isosceles triangle to determine the size of a similar shape in order to solve a problem)

• uses trigonometry to calculate the unknown angles and unknown distances in authentic problems (e.g. measures the height of a tree using a clinometer to measure the angle of inclination and trigonometry to approximate the vertical height; calculates the angle of inclination for a ramp)

## Snapshot – Interpret concepts and problems

# Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10SP01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Draw conclusions and provide reasons

# Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10SP01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

## Snapshot – Understanding units of measurement

# Numeracy: Measurement and geometry: Understanding units of measurement

### Content description

AC9M10SP01

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Using metric units and formulas**

• establishes and uses formulas for calculating the area of parallelograms, trapeziums, rhombuses and kites

• establishes and uses formulas for calculating the volume and surface area of a range of right prisms

**Circle measurements**

• informally estimates the circumference of a circle using the radius or diameter

• establishes the relationship between the circumference and the diameter of a circle as the constant $\pi$ \pi $\pi$

• calculates the circumference and the area of a circle using $\pi$ \pi $\pi$ and a known diameter or radius

**Using metric  units and formulas**

• uses dissection, rearrangement and estimation to calculate or approximate the area and volume of composite shapes and objects

• uses metric units and formulas to calculate the volume and surface area of right prisms, cylinders, cones and pyramids

• uses the conversion between units of volume and capacity to calculate the capacity of objects based on the internal volume and vice versa

• identifies appropriate metric units to use according to the level of precision required (e.g. building plans show measurements in millimetres, but to purchase enough carpet you need to measure the length and width of the room and round up to the nearest whole metre)

• uses and applies Pythagoras' theorem to authentic contexts (e.g. determines the length of a cross brace given the width of a gate is 1050 1050 1 0 5 0 millimetres and its height is 1450 1450 1 4 5 0 millimetres)

• uses and applies properties of congruent and similar triangles to authentic contexts to determine

the size of unknown angles and lengths of sides
• uses trigonometry to calculate the unknown lengths or angles in authentic problems
• chooses an appropriate method to solve problems involving right triangles in authentic contexts

## Snapshot – Interpret concepts and problems

# Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10SP01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Draw conclusions and provide reasons

# Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10SP01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made
• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

## Snapshot – Select and operate tools

# Digital Literacy: Managing and operating: Select and operate tools

### Content description

AC9M10SP01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• select and use the advanced or unfamiliar features of digital tools to efficiently complete tasks
• troubleshoot common problems and automate repetitive tasks
• select and operate advanced and emerging digital tools confidently
• troubleshoot common problems systematically and seek to improve efficiency by developing new skills

## Snapshot – Understanding geometric properties

# Numeracy: Measurement and geometry: Understanding geometric properties

### Content description

AC9M10SP01

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Properties of shapes and objects**

• investigates and uses reasoning to explain the properties of a triangle (e.g. explains why the longest side is always opposite the largest angle in a triangle; recognises that the combined length of 2 2 2 sides of a triangle must always be greater than the length of the third side)
• uses relevant properties of common geometrical shapes to determine unknown lengths and angles

**Transformations**

• enlarges and reduces shapes according to a given scale factor and explains what features change and what stay the same (e.g. says ‘when I double the dimensions of the rectangle, all of the lengths are twice as long as they were, but the size of the angles stay the same)
• applies angle properties to solve problems that involve the transformation of shapes and objects and how they are used in practice (e.g. determines which shapes tessellate)

**Angles**

• uses angle properties to identify perpendicular and parallel lines (e.g. develops a computer-aided design drawing involving the creation of parallel and perpendicular lines)
• demonstrates that the angle sum of a triangle is 180 180 1 8 0 ■ and uses this to solve problems
• identifies interior angles in shapes to calculate angle sum
• uses angle properties to identify and calculate unknown angles in familiar two-dimensional shapes

**Geometric properties**

• uses Pythagoras' theorem to solve right-angled triangle problems
• determines the conditions for triangles to be similar
• determines the conditions for triangles to be congruent

**Transformations**

• uses the enlargement transformation to explain similarity and develop the conditions for triangles to be similar
• solves problems using ratio and scale factors in similar figures

**Angles**

• uses angle properties to reason geometrically, in order to solve spatial problems (e.g. applies an understanding of the relationship between the base angles of an isosceles triangle to determine the size of a similar shape in order to solve a problem)
• uses trigonometry to calculate the unknown angles and unknown distances in authentic problems (e.g. measures the height of a tree using a clinometer to measure the angle of inclination and trigonometry to approximate the vertical height; calculates the angle of inclination for a ramp)

## Snapshot – Interpret concepts and problems

### Critical and Creative Thinking: Analysing: Interpret concepts and problems

#### Content description

AC9M10SP01

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Draw conclusions and provide reasons

### Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

#### Content description

AC9M10SP01

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made
• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

## Snapshot – Understanding geometric properties

### Numeracy: Measurement and geometry: Understanding geometric properties

#### Content description

AC9M10SP01

#### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Properties of shapes and objects**

• investigates and uses reasoning to explain the properties of a triangle (e.g. explains why the longest side is always opposite the largest angle in a triangle; recognises that the combined length of 2 2 2 sides of a triangle must always be greater than the length of the third side)
• uses relevant properties of common geometrical shapes to determine unknown lengths and angles

**Transformations**

• enlarges and reduces shapes according to a given scale factor and explains what features change and what stay the same (e.g. says ‘when I double the dimensions of the rectangle, all of the lengths are twice as long as they were, but the size of the angles stay the same)
• applies angle properties to solve problems that involve the transformation of shapes and objects and how they are used in practice (e.g. determines which shapes tessellate)

**Angles**

• uses angle properties to identify perpendicular and parallel lines (e.g. develops a computer-aided design drawing involving the creation of parallel and perpendicular lines)
• demonstrates that the angle sum of a triangle is 180 180 1 8 0 ■ and uses this to solve problems
• identifies interior angles in shapes to calculate angle sum
• uses angle properties to identify and calculate unknown angles in familiar two-dimensional shapes

**Geometric properties**

• uses Pythagoras’ theorem to solve right-angled triangle problems
• determines the conditions for triangles to be similar
• determines the conditions for triangles to be congruent

**Transformations**

• uses the enlargement transformation to explain similarity and develop the conditions for triangles to be similar
• solves problems using ratio and scale factors in similar figures

**Angles**

• uses angle properties to reason geometrically, in order to solve spatial problems (e.g. applies an understanding of the relationship between the base angles of an isosceles triangle to determine the size of a similar shape in order to solve a problem)
• uses trigonometry to calculate the unknown angles and unknown distances in authentic problems (e.g. measures the height of a tree using a clinometer to measure the angle of inclination and trigonometry to approximate the vertical height; calculates the angle of inclination for a ramp)

## Snapshot – Interpret concepts and problems

### Critical and Creative Thinking: Analysing: Interpret concepts and problems

#### Content description

AC9M10SP01

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Draw conclusions and provide reasons

### Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

#### Content description

AC9M10SP01

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made
• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

## Snapshot – Understanding geometric properties

### Numeracy: Measurement and geometry: Understanding geometric properties

#### Content description

AC9M10SP01

#### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Properties of shapes and objects**

• investigates and uses reasoning to explain the properties of a triangle (e.g. explains why the longest side is always opposite the largest angle in a triangle; recognises that the combined length of 2 2 2 sides of a triangle must always be greater than the length of the third side)
• uses relevant properties of common geometrical shapes to determine unknown lengths and angles

**Transformations**

• enlarges and reduces shapes according to a given scale factor and explains what features change and what stay the same (e.g. says ‘when I double the dimensions of the rectangle, all of the lengths are twice as long as they were, but the size of the angles stay the same)
• applies angle properties to solve problems that involve the transformation of shapes and objects and how they are used in practice (e.g. determines which shapes tessellate)

**Angles**

• uses angle properties to identify perpendicular and parallel lines (e.g. develops a computer-aided design drawing involving the creation of parallel and perpendicular lines)
• demonstrates that the angle sum of a triangle is 180 180 1 8 0 ■ and uses this to solve problems
• identifies interior angles in shapes to calculate angle sum
• uses angle properties to identify and calculate unknown angles in familiar two-dimensional shapes

**Geometric properties**

• uses Pythagoras’ theorem to solve right-angled triangle problems
• determines the conditions for triangles to be similar
• determines the conditions for triangles to be congruent

**Transformations**

• uses the enlargement transformation to explain similarity and develop the conditions for triangles to be similar
• solves problems using ratio and scale factors in similar figures

**Angles**

• uses angle properties to reason geometrically, in order to solve spatial problems (e.g. applies an understanding of the relationship between the base angles of an isosceles triangle to determine the size of a similar shape in order to solve a problem)
• uses trigonometry to calculate the unknown angles and unknown distances in authentic problems (e.g. measures the height of a tree using a clinometer to measure the angle of inclination and trigonometry to approximate the vertical height; calculates the angle of inclination for a ramp)

## Snapshot – Understanding geometric properties

# Numeracy: Measurement and geometry: Understanding geometric properties

## Content description

AC9M10SP01

## Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Properties of shapes and objects**

• investigates and uses reasoning to explain the properties of a triangle (e.g. explains why the longest side is always opposite the largest angle in a triangle; recognises that the combined length of 2 2 2 sides of a triangle must always be greater than the length of the third side)
• uses relevant properties of common geometrical shapes to determine unknown lengths and angles

**Transformations**

• enlarges and reduces shapes according to a given scale factor and explains what features change and what stay the same (e.g. says ‘when I double the dimensions of the rectangle, all of the lengths are twice as long as they were, but the size of the angles stay the same)
• applies angle properties to solve problems that involve the transformation of shapes and objects and how they are used in practice (e.g. determines which shapes tessellate)

**Angles**

• uses angle properties to identify perpendicular and parallel lines (e.g. develops a computer-aided design drawing involving the creation of parallel and perpendicular lines)
• demonstrates that the angle sum of a triangle is 180 180 1 8 0 ■ and uses this to solve problems
• identifies interior angles in shapes to calculate angle sum
• uses angle properties to identify and calculate unknown angles in familiar two-dimensional shapes

**Geometric properties**

• uses Pythagoras' theorem to solve right-angled triangle problems
• determines the conditions for triangles to be similar
• determines the conditions for triangles to be congruent

**Transformations**

• uses the enlargement transformation to explain similarity and develop the conditions for triangles to be similar
• solves problems using ratio and scale factors in similar figures

**Angles**

• uses angle properties to reason geometrically, in order to solve spatial problems (e.g. applies an understanding of the relationship between the base angles of an isosceles triangle to determine the size of a similar shape in order to solve a problem)
• uses trigonometry to calculate the unknown angles and unknown distances in authentic problems (e.g. measures the height of a tree using a clinometer to measure the angle of inclination and trigonometry to approximate the vertical height; calculates the angle of inclination for a ramp)

## Resource – Optional content for post-Year 10 Mathematics pathways

# Mathematics

## Optional content for post–Year 10 Mathematics pathways

This support resource provides suggestions to support students with additional content to extend and enrich their study of the Year 10 Mathematics curriculum.

Introduction

The Australian Curriculum: Mathematics F–10 provides students with essential mathematical knowledge, skills, procedures and processes in number, algebra, measurement, space, statistics and probability.

It develops the numeracy capabilities that all students need in their personal, work and civic lives, and provides the fundamentals on which mathematical specialties and professional applications of mathematics are built.

In Year 10, students also consider possible pathways to study senior secondary Mathematics.

Preparation for subsequent study of subjects based on ACARA's Mathematical Methods Units 1 and 2 can be supported by further development of aspects of mathematics from Year 10. This provides a basis for building understanding that underpins these and equivalent courses of study.

The following advice provides suggestions for further content and skill development in this regard, with some illustrative examples.

Teachers can draw on these suggestions as applicable to support students with additional content to extend and enrich their study of the Year 10 Mathematics curriculum.

Download

## Resource – WS02 - Proof and conjecture

By the end of Year 10, students recognise the effect of■approximations of■real■ numbers in■repeated■calculations.■They use mathematical modelling to solve problems involving growth and decay in financial and other applied situations, applying ■linear,■ quadratic■and exponential functions as appropriate, and solve■related equations, numerically and graphically.■Students make and test conjectures involving functions and relations using digital tools.■They solve problems involving simultaneous linear equations and linear inequalities in 2 variables graphically and justify solutions. Students interpret and■use■logarithmic scales■representing small or large quantities or change in applied■contexts.

They solve■measurement problems involving surface area and volume of composite objects.■Students apply Pythagoras' theorem and trigonometry to solve practical problems involving right-angled

triangles. They identify the■impact of measurement errors on the accuracy of results.■Students use mathematical modelling to solve practical problems involving ■proportion and scaling, evaluating and modifying models, and reporting assumptions, methods and findings. They use■deductive reasoning, theorems and algorithms to■solve■ spatial problems. Students interpret networks used to■represent practical situations and describe connectedness

They plan and■conduct statistical investigations involving bivariate■data.■Students represent the distribution of data involving 2 variables, using tables and■scatter plots,■and■comment on■possible association.■They analyse inferences ■and conclusions■in the media, noting potential sources of bias.■Students compare the distribution of■continuous numerical ■data ■using various displays, and discuss distributions in terms of centre, spread, shape and outliers.■They apply conditional probability ■to solve problems involving compound events.■Students design and conduct simulations involving conditional probability, using digital tools.

## AC9M10M03

solve practical problems applying Pythagoras' theorem and trigonometry of right-angled triangles, including problems involving direction and angles of elevation and depression

## AC9M10SP01

apply deductive reasoning to proofs involving shapes in the plane and use theorems to solve spatial problems

## AC9M10SP03

design, test and refine solutions to spatial problems using algorithms and digital tools; communicate and justify solutions

## AC9M10SP02

**interpret and diagrams used to represent relationships in practical situations and describe connectedness**

•

**Elaborations**

• investigating how and diagrams can be used to model authentic situations, recognising what real world quantity is represented by the nodes (vertices), and what real world quantity is represented by the links between them (edges)
• investigating the use of graphs to represent a , analysing connectedness; for example, investigating the "The Seven Bridges of Königsberg" problem
• investigating how can be represented as a using edges, vertices, interior and exterior faces; representing the number of edges, vertices and faces in a table and demonstrating how Euler's formula F + V = E + 2 F + V = E + 2 F + V = E + 2 applies
• investigating how a social , intranet, local (LAN), electrical wiring or wireless of a home can be represented as a diagram to specify relationships; for example, using diagrams to investigate practical problems involving connections, power overload or the need for routers
• investigating the use of to represent authentic situations; for example, rail or air travel between or within London, Paris, Hong Kong; a food web representing a simple eco-system; metabolic and other chemical or biological structures
• representing First Nations Australians' systems using diagrams and exploring the significance of relationships to

Students learn to:

## interpret networks and network diagrams used to represent relationships in practica describe connectedness

(AC9M10SP02)

### General capabilities and cross-curriculum priorities

This content description connects to the following general capabilities and cross-curriculum priorities.

**Analysing**

• Interpret concepts and problems

**Generating**

• Consider alternatives

### Elaborations

Content elaborations provide suggestions of ways to teach the content description and connect it to general capabilities and cross-curriculum priorities. Content elaborations are optional .

**Analysing**

• Interpret concepts and problems

**Inquiring**

• Identify, process and evaluate information

**Analysing**

• Interpret concepts and problems

**Inquiring**

• Identify, process and evaluate information

**Investigating**

• Interpret data

**Managing and operating**

• Select and operate tools

**Analysing**

• Interpret concepts and problems

**Generating**

• Consider alternatives

**Analysing**

• Interpret concepts and problems

**Inquiring**

• Identify, process and evaluate information

**Managing and operating**

• Select and operate tools

**Analysing**

• Interpret concepts and problems

**Inquiring**

• Identify, process and evaluate information

**Analysing**

• Interpret concepts and problems

**Inquiring**

• Identify, process and evaluate information

**People**

• First Nations Australians have sophisticated political, economic and social organisation systems, which include family and kinship structures, laws, traditions, customs, land tenure systems, and protocols for strong governance and authority.

### Related content

This content description can be taught with the following content descriptions from other learning areas.

AC9TDI10K01

### Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10SP02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

### Snapshot – Consider alternatives

## Critical and Creative Thinking: Generating: Consider alternatives

### Content description

AC9M10SP02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

## Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10SP02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Identify, process and evaluate information

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10SP02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

## Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10SP02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Identify, process and evaluate information

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10SP02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

## Snapshot – Interpret data

## Digital Literacy: Investigating: Interpret data

### Content description

AC9M10SP02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• analyse and visualise data by selecting and using a range of digital tools to infer relationships and make predictions

• analyse and visualise multidimensional data by selecting and using a range of interactive tools to draw conclusions and make predictions

**Snapshot – Select and operate tools**

## Digital Literacy: Managing and operating: Select and operate tools

### Content description

AC9M10SP02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• select and use the advanced or unfamiliar features of digital tools to efficiently complete tasks

• troubleshoot common problems and automate repetitive tasks

• select and operate advanced and emerging digital tools confidently

• troubleshoot common problems systematically and seek to improve efficiency by developing new skills

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10SP02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Consider alternatives**

## Critical and Creative Thinking: Generating: Consider alternatives

### Content description

AC9M10SP02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10SP02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Identify, process and evaluate information**

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10SP02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

## Snapshot – Select and operate tools

## Digital Literacy: Managing and operating: Select and operate tools

### Content description

AC9M10SP02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• select and use the advanced or unfamiliar features of digital tools to efficiently complete tasks

• troubleshoot common problems and automate repetitive tasks

• select and operate advanced and emerging digital tools confidently

• troubleshoot common problems systematically and seek to improve efficiency by developing new skills

## Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10SP02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Identify, process and evaluate information

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10SP02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

## Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10SP02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Identify, process and evaluate information**

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10SP02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

# AC9M10SP03

**design, test and refine solutions to spatial problems using and ; communicate and justify solutions**

•

•

### Elaborations

• designing and making models of using ; for example, making components of a puzzle using a printer, planning and designing the puzzle using principles of

• applying a approach to solving problems involving ; for example, connectedness, coverage and weighted ; taking different routes and choosing the most efficient route to take when travelling by car using virtual map software

• defining and decomposing spatial problems, creating and applying to generate solutions, evaluating and communicating solutions in terms of the problem; for example, designing a floor plan for a department store that limits congestion at key such as checkouts, changing rooms and popular sale items

• designing, creating and testing using pseudocode or flow charts for producing self-similar patterns; validating using a of test cases to compare their output

• exploring geospatial technologies used by First Nations Australians' communities to consider spatial problems including position and

Students learn to:

## design, test and refine solutions to spatial problems using algorithms and digital to

## communicate and justify solutions

(AC9M10SP03)

### General capabilities and cross-curriculum priorities

This content description connects to the following general capabilities and cross-curriculum priorities.

**Analysing**

• Interpret concepts and problems

• Draw conclusions and provide reasons

• Evaluate actions and outcomes

**Generating**

• Consider alternatives

**Inquiring**

• Identify, process and evaluate information

**Investigating**

• Acquire and collate data

• Interpret data

**Managing and operating**

• Select and operate tools

### Elaborations

Content elaborations provide suggestions of ways to teach the content description and connect it to general capabilities and cross-curriculum priorities. Content elaborations are optional .

**Generating**

• Consider alternatives
• Put ideas into action

**Reflecting**

• Transfer knowledge

**Managing and operating**

• Select and operate tools

**Measurement and geometry**

• Understanding geometric properties

**Analysing**

• Interpret concepts and problems

**Generating**

• Consider alternatives

**Inquiring**

• Identify, process and evaluate information

**Investigating**

• Interpret data

**Managing and operating**

• Select and operate tools

**Analysing**

• Interpret concepts and problems
• Draw conclusions and provide reasons
• Evaluate actions and outcomes

**Generating**

• Consider alternatives

**Analysing**

• Interpret concepts and problems
• Draw conclusions and provide reasons
• Evaluate actions and outcomes

**Generating**

• Create possibilities
• Consider alternatives

**Analysing**

• Interpret concepts and problems

**Inquiring**

• Identify, process and evaluate information

**People**

• Australia has 2 distinct First Nations Peoples; each encompasses a diversity of nations across Australia. Aboriginal Peoples are the first peoples of Australia and have occupied the Australian continent for more than 60,000 years. Torres Strait Islander Peoples are the First Nations Peoples of the Torres Strait and have occupied the region for over 4,000 years.

## Related content

This content description can be taught with the following content descriptions from other learning areas.

AC9HG10S03
AC9TDE10P02
AC9TDI10P06

## Resources

### Work Samples

# WS02 - Proof and conjecture

### Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10SP03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

### Snapshot – Draw conclusions and provide reasons

## Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10SP03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

### Snapshot – Evaluate actions and outcomes

## Critical and Creative Thinking: Analysing: Evaluate actions and outcomes

### Content description

AC9M10SP03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• evaluate the effectiveness of a course of action or the outcome of a task and account for expected and unexpected results, including using a given or co-developed set of criteria to support decisions

• evaluate the effectiveness of a course of action to achieve desired outcomes and suggest improvements, including using a personally developed set of criteria to support judgements and decisions

### Snapshot – Consider alternatives

## Critical and Creative Thinking: Generating: Consider alternatives

### Content description

AC9M10SP03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

### Snapshot – Identify, process and evaluate information

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10SP03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

### Snapshot – Acquire and collate data

## Digital Literacy: Investigating: Acquire and collate data

### Content description

AC9M10SP03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• collect and access data from a range of sources, using specialised digital tools in response to problems, and evaluate it for relevance

• collect and evaluate quantitative and qualitative data using specialised digital tools and processes in the context of identified problems

## Snapshot – Interpret data

## Digital Literacy: Investigating: Interpret data

### Content description

AC9M10SP03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• analyse and visualise data by selecting and using a range of digital tools to infer relationships and make predictions

• analyse and visualise multidimensional data by selecting and using a range of interactive tools to draw conclusions and make predictions

## Snapshot – Select and operate tools

## Digital Literacy: Managing and operating: Select and operate tools

### Content description

AC9M10SP03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• select and use the advanced or unfamiliar features of digital tools to efficiently complete tasks

• troubleshoot common problems and automate repetitive tasks

• select and operate advanced and emerging digital tools confidently

• troubleshoot common problems systematically and seek to improve efficiency by developing new skills

## Snapshot – Consider alternatives

## Critical and Creative Thinking: Generating: Consider alternatives

### Content description

AC9M10SP03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

## Snapshot – Put ideas into action

## Critical and Creative Thinking: Generating: Put ideas into action

### Content description

AC9M10SP03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• put ideas into action by making predictions, testing and evaluating options, and reconsidering approaches in complex or unfamiliar situations

• put ideas into action by making predictions, testing and evaluating options, proposing modifications and adapting approaches in complex or unfamiliar situations

## Snapshot – Transfer knowledge

## Critical and Creative Thinking: Reflecting: Transfer knowledge

### Content description

AC9M10SP03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• transfer knowledge and skills gained in previous experiences to both similar and different contexts, and explain reasons for decisions and choices made

• identify, plan and justify opportunities to transfer knowledge into new contexts

## Snapshot – Select and operate tools

# Digital Literacy: Managing and operating: Select and operate tools

### Content description

AC9M10SP03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• select and use the advanced or unfamiliar features of digital tools to efficiently complete tasks

• troubleshoot common problems and automate repetitive tasks

• select and operate advanced and emerging digital tools confidently

• troubleshoot common problems systematically and seek to improve efficiency by developing new skills

## Snapshot – Understanding geometric properties

# Numeracy: Measurement and geometry: Understanding geometric properties

### Content description

AC9M10SP03

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Properties of shapes and objects**

• investigates and uses reasoning to explain the properties of a triangle (e.g. explains why the longest side is always opposite the largest angle in a triangle; recognises that the combined length of 2 2 2 sides of a triangle must always be greater than the length of the third side)

• uses relevant properties of common geometrical shapes to determine unknown lengths and angles

**Transformations**

• enlarges and reduces shapes according to a given scale factor and explains what features change and what stay the same (e.g. says ‘when I double the dimensions of the rectangle, all of the lengths are twice as long as they were, but the size of the angles stay the same)

• applies angle properties to solve problems that involve the transformation of shapes and objects and how they are used in practice (e.g. determines which shapes tessellate)

**Angles**

• uses angle properties to identify perpendicular and parallel lines (e.g. develops a computer-aided design drawing involving the creation of parallel and perpendicular lines)

• demonstrates that the angle sum of a triangle is 180 180 1 8 0 ■ and uses this to solve problems

• identifies interior angles in shapes to calculate angle sum

• uses angle properties to identify and calculate unknown angles in familiar two-dimensional shapes

**Geometric properties**

• uses Pythagoras’ theorem to solve right-angled triangle problems

• determines the conditions for triangles to be similar

• determines the conditions for triangles to be congruent

**Transformations**

• uses the enlargement transformation to explain similarity and develop the conditions for triangles to be similar

• solves problems using ratio and scale factors in similar figures

**Angles**

• uses angle properties to reason geometrically, in order to solve spatial problems (e.g. applies an understanding of the relationship between the base angles of an isosceles triangle to determine the size of a similar shape in order to solve a problem)

• uses trigonometry to calculate the unknown angles and unknown distances in authentic problems (e.g. measures the height of a tree using a clinometer to measure the angle of inclination and trigonometry to approximate the vertical height; calculates the angle of inclination for a ramp)

## Snapshot – Interpret concepts and problems

### Critical and Creative Thinking: Analysing: Interpret concepts and problems

#### Content description

AC9M10SP03

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Consider alternatives

### Critical and Creative Thinking: Generating: Consider alternatives

#### Content description

AC9M10SP03

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

## Snapshot – Identify, process and evaluate information

### Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

#### Content description

AC9M10SP03

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

## Snapshot – Interpret data

### Digital Literacy: Investigating: Interpret data

#### Content description

AC9M10SP03

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• analyse and visualise data by selecting and using a range of digital tools to infer relationships and make predictions

• analyse and visualise multidimensional data by selecting and using a range of interactive tools to draw conclusions and make predictions

## Snapshot – Select and operate tools

### Digital Literacy: Managing and operating: Select and operate tools

#### Content description

AC9M10SP03

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• select and use the advanced or unfamiliar features of digital tools to efficiently complete tasks

• troubleshoot common problems and automate repetitive tasks

• select and operate advanced and emerging digital tools confidently

• troubleshoot common problems systematically and seek to improve efficiency by developing new

skills

## Snapshot – Interpret concepts and problems

### Critical and Creative Thinking: Analysing: Interpret concepts and problems

#### Content description

AC9M10SP03

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Draw conclusions and provide reasons

### Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

#### Content description

AC9M10SP03

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

## Snapshot – Evaluate actions and outcomes

### Critical and Creative Thinking: Analysing: Evaluate actions and outcomes

#### Content description

AC9M10SP03

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• evaluate the effectiveness of a course of action or the outcome of a task and account for expected and unexpected results, including using a given or co-developed set of criteria to support decisions

• evaluate the effectiveness of a course of action to achieve desired outcomes and suggest improvements, including using a personally developed set of criteria to support judgements and decisions

## Snapshot – Consider alternatives

### Critical and Creative Thinking: Generating: Consider alternatives

#### Content description

AC9M10SP03

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

## Snapshot – Interpret concepts and problems

### Critical and Creative Thinking: Analysing: Interpret concepts and problems

#### Content description

AC9M10SP03

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Draw conclusions and provide reasons

### Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

#### Content description

AC9M10SP03

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

## Snapshot – Evaluate actions and outcomes

### Critical and Creative Thinking: Analysing: Evaluate actions and outcomes

#### Content description

AC9M10SP03

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• evaluate the effectiveness of a course of action or the outcome of a task and account for expected and unexpected results, including using a given or co-developed set of criteria to support decisions

• evaluate the effectiveness of a course of action to achieve desired outcomes and suggest improvements, including using a personally developed set of criteria to support judgements and decisions

## Snapshot – Create possibilities

### Critical and Creative Thinking: Generating: Create possibilities

#### Content description

AC9M10SP03

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• create possibilities by adapting, combining or elaborating on new and known ideas, and proposing a range of different or creative combinations

• create possibilities by connecting or adapting complex ideas and proposing innovative and detailed variations or combinations

## Snapshot – Consider alternatives

### Critical and Creative Thinking: Generating: Consider alternatives

#### Content description

AC9M10SP03

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

## Snapshot – Interpret concepts and problems

### Critical and Creative Thinking: Analysing: Interpret concepts and problems

#### Content description

AC9M10SP03

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Identify, process and evaluate information

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10SP03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

# AC9M10ST01

**analyse claims, and conclusions of statistical reports in the media, including ethical considerations and identification of potential sources of**

•

•

### Elaborations

• identifying potentially misleading representations in the media such as graphs with broken axes and that do not start at or are nonlinear; recognising when is not related to the claim, not representative of the or is deliberately being used to mislead, or support a claim or biased of view

• investigating the source and size of the from which the was collected and deciding whether the is appropriately representative of the

• investigating and discussing potential ethical considerations when presenting statistical involving infection , and the number of cases per head of

• using secondary to predict the number of people likely to be infected with a strain of flu or experience side effects with a certain medication, discussing the ethical considerations of reporting of such to the wider public, considering validity claims and sizes

• recognising how the identification of is a critical aspect of machine learning and deep learning because can significantly impact the fairness, accuracy and ethical implications of artificial intelligence systems

• using the concept of Indigenous sovereignty to critique and evaluate the Australian Government's "Closing the Gap" report

Students learn to:

# analyse claims, inferences and conclusions of statistical reports in the media, inclu considerations and identification of potential sources of bias

(AC9M10ST01)

### General capabilities and cross-curriculum priorities

This content description connects to the following general capabilities and cross-curriculum priorities.

### Responding to ethical issues

• Explore ethical perspectives and frameworks

• Explore ethical issues

• Making and reflecting on ethical decisions

### Statistics and probability

• Interpreting and representing data

### Elaborations

Content elaborations provide suggestions of ways to teach the content description and connect it to general capabilities and cross-curriculum priorities. Content elaborations are optional .

### Responding to ethical issues

• Making and reflecting on ethical decisions

### Understanding ethical concepts and perspectives

• Recognise influences on ethical behaviour and perspectives

### Responding to ethical issues

• Making and reflecting on ethical decisions

### Responding to ethical issues
• Explore ethical perspectives and frameworks
• Making and reflecting on ethical decisions
### Understanding ethical concepts and perspectives
• Explore ethical concepts
### Reflecting
• Transfer knowledge
### Responding to ethical issues
• Explore ethical perspectives and frameworks
• Explore ethical issues
• Making and reflecting on ethical decisions
### Understanding ethical concepts and perspectives
• Explore ethical concepts
### Responding to ethical issues
• Making and reflecting on ethical decisions
### Understanding ethical concepts and perspectives
• Explore ethical concepts
### Statistics and probability
• Interpreting and representing data
### Responding to ethical issues
• Explore ethical issues
• Making and reflecting on ethical decisions
### Understanding ethical concepts and perspectives
• Explore ethical concepts
### People
• Australia has 2 distinct First Nations Peoples; each encompasses a diversity of nations across Australia. Aboriginal Peoples are the first peoples of Australia and have occupied the Australian continent for more than 60,000 years. Torres Strait Islander Peoples are the First Nations Peoples of the Torres Strait and have occupied the region for over 4,000 years.
### Related content
This content description can be taught with the following content descriptions from other learning areas.
AC9HC10S02
AC9S10I07
AC9TDI10P01
### Resources
### Work Samples
## WS03 - Predict a winner
### Snapshot – Explore ethical perspectives and frameworks
#### Ethical Understanding: Responding to ethical issues: Explore ethical perspective
#### Content description
AC9M10ST01
#### Continuum extract
The following continuum extract shows the alignment of the continuum with this content.
• explain how different ethical frameworks support developing ethical perspectives and inform ethical decision-making
• analyse and utilise different ethical frameworks when responding to ethical issues and making ethical decisions
### Snapshot – Explore ethical issues
#### Ethical Understanding: Responding to ethical issues: Explore ethical issues
#### Content description
AC9M10ST01
#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• analyse■the relationships between values, ethical perspectives■and ethical frameworks when responding to ethical issues

• apply knowledge of ethical concepts, values, perspectives and frameworks when responding to ethical issues

## Snapshot – Making and reflecting on ethical decisions

# Ethical Understanding: Responding to ethical issues: Making and reflecting on et

## Content description

AC9M10ST01

## Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider how values and beliefs influence approaches to ethical issues, and■analyse■how these affect■outcomes

• analyse■biases■when applying ethical concepts,■values■and ethical frameworks,■in order to explore and evaluate ethical decisions

## Snapshot – Interpreting and representing data

# Numeracy: Statistics and probability: Interpreting and representing data

## Content description

AC9M10ST01

## Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

### Sampling

• considers the context when determining whether to use data from a sample or a population

• determines what type of sample to use from a population (e.g. decides to use a representative sample when conducting targeted market research or when researching beliefs about a health-related issue)

• makes reasonable statements about a population based on evidence from samples (e.g. considers accuracy of representation of marginalised individuals or population groups)

• plans, executes and reports on sampling-based investigations, taking into account validity of methodology and consistency of data, to answer questions formulated by the student

### Recognising bias

• applies an understanding of distributions to evaluate claims based on data (e.g. recognises that the accuracy of using a sample for predicting population values depends on both the relative size of the sample and how well the characteristics of the sample reflect the characteristics of the population; critically analyses statistics that reinforce stereotypes; evaluates claims made by the media regarding young people in relation to drugs and/or risk-taking behaviours)

• identifies and explains bias as a possible source of error in media reports of survey data (e.g. uses data to evaluate veracity of review headlines such as "everybody's favourite game"; investigates media claims on attitudes to government responses to market failure or income redistribution)

• justifies criticisms of data sources that include biased statistical elements (e.g. inappropriate sampling from populations; identifying sources of uncertainty in a scientific investigation; checks the authenticity of a data set)

## Snapshot – Making and reflecting on ethical decisions

# Ethical Understanding: Responding to ethical issues: Making and reflecting on et

## Content description

AC9M10ST01

## Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider how values and beliefs influence approaches to ethical issues, and■analyse■how these affect■outcomes

• analyse■biases■when applying ethical concepts,■values■and ethical frameworks,■in order to explore and evaluate ethical decisions

**Snapshot – Recognise influences on ethical behaviour and perspectives**

## Ethical Understanding: Understanding ethical concepts and perspectives: Recog
## ethical behaviour and perspectives

### Content description

AC9M10ST01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• explain how different traits, such as■honesty, trust, courage and selfishness interact with responsibilities or duties to determine ethically appropriate responses

• explore and analyse examples of the tensions between conflicting positions on issues of personal, social and global importance

**Snapshot – Making and reflecting on ethical decisions**

## Ethical Understanding: Responding to ethical issues: Making and reflecting on et

### Content description

AC9M10ST01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider how values and beliefs influence approaches to ethical issues, and■analyse■how these affect■outcomes

• analyse■biases■when applying ethical concepts,■values■and ethical frameworks,■in order to explore and evaluate ethical decisions

**Snapshot – Explore ethical perspectives and frameworks**

## Ethical Understanding: Responding to ethical issues: Explore ethical perspective

### Content description

AC9M10ST01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• explain how different ethical frameworks support developing ethical perspectives and inform ethical decision-making

• analyse and utilise different ethical frameworks when responding to ethical issues and making ethical decisions

**Snapshot – Making and reflecting on ethical decisions**

## Ethical Understanding: Responding to ethical issues: Making and reflecting on et

### Content description

AC9M10ST01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider how values and beliefs influence approaches to ethical issues, and■analyse■how these affect■outcomes

• analyse■biases■when applying ethical concepts,■values■and ethical frameworks,■in order to explore and evaluate ethical decisions

**Snapshot – Explore ethical concepts**

## Ethical Understanding: Understanding ethical concepts and perspectives: Explor

### Content description

AC9M10ST01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• analyse■the similarities and differences between ethical concepts, such as integrity, loyalty and equality, in a range of situations and contexts

• evaluate■the consistency in meaning of ethical concepts, such as trust, freedom and rights and responsibilities, in a range of situations and contexts

**Snapshot – Transfer knowledge**

## Critical and Creative Thinking: Reflecting: Transfer knowledge

### Content description

AC9M10ST01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• transfer knowledge and skills gained in previous experiences to both similar and different contexts, and explain reasons for decisions and choices made

• identify, plan and justify opportunities to transfer knowledge into new contexts

**Snapshot – Explore ethical perspectives and frameworks**

## Ethical Understanding: Responding to ethical issues: Explore ethical perspective

### Content description

AC9M10ST01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• explain how different ethical frameworks support developing ethical perspectives and inform ethical decision-making

• analyse and utilise different ethical frameworks when responding to ethical issues and making ethical decisions

**Snapshot – Explore ethical issues**

## Ethical Understanding: Responding to ethical issues: Explore ethical issues

### Content description

AC9M10ST01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• analyse the relationships between values, ethical perspectives and ethical frameworks when responding to ethical issues

• apply knowledge of ethical concepts, values, perspectives and frameworks when responding to ethical issues

**Snapshot – Making and reflecting on ethical decisions**

## Ethical Understanding: Responding to ethical issues: Making and reflecting on et

### Content description

AC9M10ST01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider how values and beliefs influence approaches to ethical issues, and analyse how these affect outcomes

• analyse biases when applying ethical concepts, values and ethical frameworks, in order to explore and evaluate ethical decisions

**Snapshot – Explore ethical concepts**

## Ethical Understanding: Understanding ethical concepts and perspectives: Explor

### Content description

AC9M10ST01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• analyse the similarities and differences between ethical concepts, such as integrity, loyalty and equality, in a range of situations and contexts

• evaluate the consistency in meaning of ethical concepts, such as trust, freedom and rights and responsibilities, in a range of situations and contexts

**Snapshot – Making and reflecting on ethical decisions**

## Ethical Understanding: Responding to ethical issues: Making and reflecting on et

### Content description

AC9M10ST01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider how values and beliefs influence approaches to ethical issues, and■analyse■how these affect■outcomes

• analyse■biases■when applying ethical concepts,■values■and ethical frameworks,■in order to explore and evaluate ethical decisions

## Snapshot – Explore ethical concepts

## Ethical Understanding: Understanding ethical concepts and perspectives: Explor

### Content description

AC9M10ST01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• analyse■the similarities and differences between ethical concepts, such as integrity, loyalty and equality, in a range of situations and contexts

• evaluate■the consistency in meaning of ethical concepts, such as trust, freedom and rights and responsibilities, in a range of situations and contexts

## Snapshot – Interpreting and representing data

## Numeracy: Statistics and probability: Interpreting and representing data

### Content description

AC9M10ST01

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Sampling**

• considers the context when determining whether to use data from a sample or a population

• determines what type of sample to use from a population (e.g. decides to use a representative sample when conducting targeted market research or when researching beliefs about a health-related issue)

• makes reasonable statements about a population based on evidence from samples (e.g. considers accuracy of representation of marginalised individuals or population groups)

• plans, executes and reports on sampling-based investigations, taking into account validity of methodology and consistency of data, to answer questions formulated by the student

**Recognising bias**

• applies an understanding of distributions to evaluate claims based on data (e.g. recognises that the accuracy of using a sample for predicting population values depends on both the relative size of the sample and how well the characteristics of the sample reflect the characteristics of the population; critically analyses statistics that reinforce stereotypes; evaluates claims made by the media regarding young people in relation to drugs and/or risk-taking behaviours)

• identifies and explains bias as a possible source of error in media reports of survey data (e.g. uses data to evaluate veracity of review headlines such as "everybody's favourite game"; investigates media claims on attitudes to government responses to market failure or income redistribution)

• justifies criticisms of data sources that include biased statistical elements (e.g. inappropriate sampling from populations; identifying sources of uncertainty in a scientific investigation; checks the authenticity of a data set)

## Snapshot – Explore ethical issues

## Ethical Understanding: Responding to ethical issues: Explore ethical issues

### Content description

AC9M10ST01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• analyse■the relationships between values, ethical perspectives■and ethical frameworks when responding to ethical issues

• apply knowledge of ethical concepts, values, perspectives and frameworks when responding to ethical issues

### Snapshot – Making and reflecting on ethical decisions

## Ethical Understanding: Responding to ethical issues: Making and reflecting on et

### Content description

AC9M10ST01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider how values and beliefs influence approaches to ethical issues, and■analyse■how these affect■outcomes

• analyse■biases■when applying ethical concepts,■values■and ethical frameworks,■in order to explore and evaluate ethical decisions

### Snapshot – Explore ethical concepts

## Ethical Understanding: Understanding ethical concepts and perspectives: Explor

### Content description

AC9M10ST01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• analyse■the similarities and differences between ethical concepts, such as integrity, loyalty and equality, in a range of situations and contexts

• evaluate■the consistency in meaning of ethical concepts, such as trust, freedom and rights and responsibilities, in a range of situations and contexts

### Resource – WS03 - Predict a winner

By the end of Year 10, students recognise the effect of■approximations of■real■ numbers in■repeated■calculations.■They use mathematical modelling to solve problems involving growth and decay in financial and other applied situations, applying ■linear,■ quadratic■and exponential functions as appropriate, and solve■related equations, numerically and graphically.■Students make and test conjectures involving functions and relations using digital tools.■They solve problems involving simultaneous linear equations and linear inequalities in 2 variables graphically and justify solutions.

Students interpret and■use■logarithmic scales■representing small or large quantities or change in applied■contexts.■They solve■measurement problems involving surface area and volume of composite objects.■Students apply Pythagoras' theorem and trigonometry to solve practical problems involving right-angled triangles.■They identify the■impact of measurement errors on the accuracy of results.■Students use mathematical modelling to solve practical problems involving ■proportion and scaling, evaluating and modifying models, and reporting assumptions, methods and findings.■They use■deductive reasoning, theorems and algorithms to■solve■ spatial problems.■Students interpret networks used to■represent practical situations and describe connectedness

They plan and■conduct statistical investigations involving bivariate■data.■Students represent the distribution of data involving 2 variables, using tables and■scatter plots,■and■comment on■possible association.■They analyse inferences ■and conclusions■in the media, noting potential sources of bias.■Students compare the distribution of■continuous numerical ■data ■using various displays, and discuss distributions in terms of centre, spread, shape and outliers. They apply conditional probability ■to solve problems involving compound events.■Students design and conduct simulations involving conditional probability, using digital tools.

## AC9M10ST01

analyse claims, inferences and conclusions of statistical reports in the media, including ethical considerations and identification of potential sources of bias

## AC9M10ST02

compare data distributions for continuous numerical variables using appropriate data displays including boxplots; discuss the shapes of these distributions in terms of centre, spread, shape and outliers in the context of the data

## AC9M10ST03

construct scatterplots and comment on the association between the 2 numerical variables in terms of strength, direction and linearity

## AC9M10ST04

construct two way tables and discuss possible relationship between categorical variables

## AC9M10ST05

plan and conduct statistical investigations of situations that involve bivariate data; evaluate and report findings■with consideration of limitations of any inferences

# AC9M10ST02

**compare for using appropriate including ; discuss the of these distributions in terms of , , and in the of the**

•

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### Elaborations

• constructing and interpreting box plots and using them to compare , understanding that box plots are an efficient and common way of representing and summarising and can facilitate comparisons between

• comparing of distributions using box plots, , cumulative graphs and , discussing symmetry, skew and modality

• using to compare and as displays of the same in the light of the statistical questions being addressed and the effectiveness of the display in helping to answer the question

• finding the five-number summary (minimum and maximum values, , and upper and lower quartiles) and using its graphical representation, the box plot, as tools for both numerically and visually comparing the and of

• comparing the information that can be extracted and the stories that can be told about continuous and that have been displayed in different ways, including , , box plots and cumulative graphs

• exploring how the identification and appropriate handling of is an important step in machine learning to ensure that they don't unduly influence the model

Students learn to:

# compare data distributions for continuous numerical variables using appropriate da including boxplots; discuss the shapes of these distributions in terms of centre, sp outliers in the context of the data

(AC9M10ST02)

### General capabilities and cross-curriculum priorities

This content description connects to the following general capabilities and cross-curriculum priorities.

### Speaking and listening

• Speaking

### Statistics and probability

• Interpreting and representing data

### Elaborations

Content elaborations provide suggestions of ways to teach the content description and connect it to general capabilities and cross-curriculum priorities. Content elaborations are optional .

### Investigating

• Interpret data

### Managing and operating

• Select and operate tools

### Generating

• Consider alternatives

### Responding to ethical issues

• Making and reflecting on ethical decisions

### Understanding ethical concepts and perspectives

• Explore ethical concepts

### Statistics and probability

• Interpreting and representing data

### Related content

This content description can be taught with the following content descriptions from other learning areas.

AC9HC10S02
AC9S10I06
AC9TDI10P02

### Resources

### Work Samples

## WS03 - Predict a winner

### Snapshot – Speaking

## Literacy: Speaking and listening: Speaking

### Content description

AC9M10ST02

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

#### Crafting ideas

• creates spoken texts which explore and interpret concepts drawn from research or learning area content
• selects voice appropriate to purpose (e.g. third person to create distance and authority or first person to achieve personal connection)
• develops complex ideas or a central theme across a spoken text
• uses language features according to purpose, to impact the audience ( e.g. uses more complex connectives such as "consequently", "accordingly" to explain)
• rephrases or clarifies to repair or refine meaning
• uses language structures and features appropriate to learning area content
• uses technologies and visual and audio resources to enhance meaning and effect in presentations

#### Vocabulary

• selects vocabulary to intensify and sharpen the focus (e.g. "scarcely", "absolutely", "real", "simply")
• uses a range of evaluative language to express opinions or convey emotion (e.g. "significant benefits", "devastating consequences")
• uses a range of emotive language appropriate to topic, purpose and audience
• uses rich, evocative, descriptive language
• uses figurative language (e.g. "hungry for success")

#### Crafting ideas

• creates complex and creative spoken texts which analyse and evaluate issues drawn from research or learning area content
• includes a range of alternative viewpoints in spoken texts, where appropriate
• controls and manipulates a sophisticated range of language features to affect the audience
• uses a range of rhetorical devices and humour to engage an audience
• references and quotes authorities or statistics to add authority (e.g. "according to a recent OECD report")
• delivers spoken text flexibly, allowing for questions and maintaining the flow of ideas

### Snapshot – Interpreting and representing data

## Numeracy: Statistics and probability: Interpreting and representing data

### Content description

AC9M10ST02

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Sampling**

• considers the context when determining whether to use data from a sample or a population
• determines what type of sample to use from a population (e.g. decides to use a representative sample when conducting targeted market research or when researching beliefs about a health-related issue)
• makes reasonable statements about a population based on evidence from samples (e.g. considers accuracy of representation of marginalised individuals or population groups)
• plans, executes and reports on sampling-based investigations, taking into account validity of methodology and consistency of data, to answer questions formulated by the student

**Recognising bias**

• applies an understanding of distributions to evaluate claims based on data (e.g. recognises that the accuracy of using a sample for predicting population values depends on both the relative size of the sample and how well the characteristics of the sample reflect the characteristics of the population; critically analyses statistics that reinforce stereotypes; evaluates claims made by the media regarding young people in relation to drugs and/or risk-taking behaviours)
• identifies and explains bias as a possible source of error in media reports of survey data (e.g. uses data to evaluate veracity of review headlines such as "everybody's favourite game"; investigates media claims on attitudes to government responses to market failure or income redistribution)
• justifies criticisms of data sources that include biased statistical elements (e.g. inappropriate sampling from populations; identifying sources of uncertainty in a scientific investigation; checks the authenticity of a data set)

**Snapshot – Interpret data**

## Digital Literacy: Investigating: Interpret data

### Content description

AC9M10ST02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• analyse and visualise data by selecting and using a range of digital tools to infer relationships and make predictions
• analyse and visualise multidimensional data by selecting and using a range of interactive tools to draw conclusions and make predictions

**Snapshot – Select and operate tools**

## Digital Literacy: Managing and operating: Select and operate tools

### Content description

AC9M10ST02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• select and use the advanced or unfamiliar features of digital tools to efficiently complete tasks
• troubleshoot common problems and automate repetitive tasks
• select and operate advanced and emerging digital tools confidently
• troubleshoot common problems systematically and seek to improve efficiency by developing new skills

**Snapshot – Consider alternatives**

## Critical and Creative Thinking: Generating: Consider alternatives

### Content description

AC9M10ST02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option
• consider alternatives by creatively revising and modifying ideas and recommendations when

circumstances change

**Snapshot – Making and reflecting on ethical decisions**

## Ethical Understanding: Responding to ethical issues: Making and reflecting on et

### Content description

AC9M10ST02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider how values and beliefs influence approaches to ethical issues, and■analyse■how these affect■outcomes

• analyse■biases■when applying ethical concepts,■values■and ethical frameworks,■in order to explore and evaluate ethical decisions

**Snapshot – Explore ethical concepts**

## Ethical Understanding: Understanding ethical concepts and perspectives: Explor

### Content description

AC9M10ST02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• analyse■the similarities and differences between ethical concepts, such as integrity, loyalty and equality, in a range of situations and contexts

• evaluate■the consistency in meaning of ethical concepts, such as trust, freedom and rights and responsibilities, in a range of situations and contexts

**Snapshot – Interpreting and representing data**

## Numeracy: Statistics and probability: Interpreting and representing data

### Content description

AC9M10ST02

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Sampling**

• considers the context when determining whether to use data from a sample or a population

• determines what type of sample to use from a population (e.g. decides to use a representative sample when conducting targeted market research or when researching beliefs about a health-related issue)

• makes reasonable statements about a population based on evidence from samples (e.g. considers accuracy of representation of marginalised individuals or population groups)

• plans, executes and reports on sampling-based investigations, taking into account validity of methodology and consistency of data, to answer questions formulated by the student

**Recognising bias**

• applies an understanding of distributions to evaluate claims based on data (e.g. recognises that the accuracy of using a sample for predicting population values depends on both the relative size of the sample and how well the characteristics of the sample reflect the characteristics of the population; critically analyses statistics that reinforce stereotypes; evaluates claims made by the media regarding young people in relation to drugs and/or risk-taking behaviours)

• identifies and explains bias as a possible source of error in media reports of survey data (e.g. uses data to evaluate veracity of review headlines such as "everybody's favourite game"; investigates media claims on attitudes to government responses to market failure or income redistribution)

• justifies criticisms of data sources that include biased statistical elements (e.g. inappropriate sampling from populations; identifying sources of uncertainty in a scientific investigation; checks the authenticity of a data set)

**Resource – Optional content for post-Year 10 Mathematics pathways**

# Mathematics

## Optional content for post–Year 10 Mathematics pathways

This support resource provides suggestions to support students with additional content to extend and enrich their study of the Year 10 Mathematics curriculum.
Introduction
The Australian Curriculum: Mathematics F–10 provides students with essential mathematical knowledge, skills, procedures and processes in number, algebra, measurement, space, statistics and probability.

It develops the numeracy capabilities that all students need in their personal, work and civic lives, and provides the fundamentals on which mathematical specialties and professional applications of mathematics are built.

In Year 10, students also consider possible pathways to study senior secondary Mathematics.

Preparation for subsequent study of subjects based on ACARA's Mathematical Methods Units 1 and 2 can be supported by further development of aspects of mathematics from Year 10. This provides a basis for building understanding that underpins these and equivalent courses of study.

The following advice provides suggestions for further content and skill development in this regard, with some illustrative examples.

Teachers can draw on these suggestions as applicable to support students with additional content to extend and enrich their study of the Year 10 Mathematics curriculum.
Download

# AC9M10ST03

### scatterplots and comment on the between the 2 in terms of strength, direction and linearity

•

### Elaborations

• discussing the difference between and cause and effect, and relating this to situations such as health, diversity of species and climate control
• using statistical evidence to make, justify and critique claims about between , such as in of climate change, migration, online shopping and social media
• informally using a of good fit by eye to discuss reliability of any predictions
• exploring how and help scientists gain insights into the , identify relationships, and can be applied to machine learning to make informed decisions about feature engineering and assess model performance
• investigating artificial intelligence  systems that analyse to forecast or make predictions based on using correlation analysis and discussing limitations; for example, the artificial intelligence may not capture the causality between or account for the contextual or ethical implications
• investigating the relationship between 2 2 2 of spear throwers used by First Peoples of Australia by using to scatterplots, make comparisons and draw conclusions
Students learn to:

# construct scatterplots and comment on the association between the 2 numerical va strength, direction and linearity

(AC9M10ST03)

## General capabilities and cross-curriculum priorities

This content description connects to the following general capabilities and cross-curriculum priorities.

### Analysing

• Interpret concepts and problems

### Generating

• Consider alternatives

## Elaborations

Content elaborations provide suggestions of ways to teach the content description and connect it to general capabilities and cross-curriculum priorities. Content elaborations are optional .

**Analysing**

• Interpret concepts and problems

**Speaking and listening**

• Interacting

**Futures**

• Sustainable futures are achieved through informed individual, community, business and political action that values local, national and global equity and fairness across generations into the future.

• Sustainable futures require individuals to seek information, identify solutions, reflect on and evaluate past actions, and collaborate with and influence others as they work towards a desired change.

**Systems**

• All life forms, including human life, are connected through Earth's systems (geosphere, biosphere, hydrosphere and atmosphere) on which they depend for their wellbeing and survival.

• Sustainable patterns of living require the responsible use of resources, maintenance of clean air, water and soils, and preservation or restoration of healthy environments.

• Social, economic and political systems influence the sustainability of Earth's systems.

**Analysing**

• Interpret concepts and problems

• Draw conclusions and provide reasons

**Responding to ethical issues**

• Explore ethical issues

• Making and reflecting on ethical decisions

**Futures**

• Sustainable futures require individuals to seek information, identify solutions, reflect on and evaluate past actions, and collaborate with and influence others as they work towards a desired change.

**Systems**

• All life forms, including human life, are connected through Earth's systems (geosphere, biosphere, hydrosphere and atmosphere) on which they depend for their wellbeing and survival.

• Social, economic and political systems influence the sustainability of Earth's systems.

**Analysing**

• Interpret concepts and problems

• Draw conclusions and provide reasons

• Evaluate actions and outcomes

**Inquiring**

• Identify, process and evaluate information

**Investigating**

• Interpret data

**Statistics and probability**

• Interpreting and representing data

**Responding to ethical issues**

• Explore ethical issues

• Making and reflecting on ethical decisions

**Statistics and probability**

• Interpreting and representing data

**Analysing**

• Interpret concepts and problems

• Draw conclusions and provide reasons

**Country/Place**

• The First Peoples of Australia are the Traditional Owners of Country/Place, protected in Australian Law by the Native Title Act 1993 which recognises pre-existing sovereignty, continuing■systems of law and customs, and connection to Country/Place. This recognised legal right provides for economic sustainability and a voice into the development■and management of Country/Place.

### Related content

This content description can be taught with the following content descriptions from other learning areas.
AC9HC10S02
AC9S10I05
AC9TDI10P02

### Resources

### Work Samples

## WS01 - Mathematics assignment

## WS03 - Predict a winner

### Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10ST03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

### Snapshot – Consider alternatives

## Critical and Creative Thinking: Generating: Consider alternatives

### Content description

AC9M10ST03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option
• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

### Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10ST03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

### Snapshot – Interacting

## Literacy: Speaking and listening: Interacting

### Content description

AC9M10ST03

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.
• interacts within school context or the broader community, adjusting language and responses to suit purpose and audience
• synthesises ideas from group discussion into a common theme or hypothesis
• poses problems, hypothesises and formulates questions about abstract ideas in group situations
• restates different views and makes suggestions to negotiate agreement

• poses questions to clarify assumptions made by the speaker
• questions others to evaluate accuracy of thinking or problem-solving processes
• uses language to align the listener with personal position (e.g. "of course", "as you can imagine", "obviously")
• interacts strategically and confidently with a broad range of interactional partners
• gives an extended explanation and evaluation of a complex concept, issue or process
• justifies a personal stance, after analysis of arguments on a particular issue, using evidence and elaboration in a group situation
• uses language strategically to subtly align others to own perspective as appropriate to audience and purpose

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10ST03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Draw conclusions and provide reasons**

## Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10ST03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made
• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

**Snapshot – Explore ethical issues**

## Ethical Understanding: Responding to ethical issues: Explore ethical issues

### Content description

AC9M10ST03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• analyse the relationships between values, ethical perspectives and ethical frameworks when responding to ethical issues
• apply knowledge of ethical concepts, values, perspectives and frameworks when responding to ethical issues

**Snapshot – Making and reflecting on ethical decisions**

## Ethical Understanding: Responding to ethical issues: Making and reflecting on et

### Content description

AC9M10ST03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• consider how values and beliefs influence approaches to ethical issues, and analyse how these affect outcomes
• analyse biases when applying ethical concepts, values and ethical frameworks, in order to explore and evaluate ethical decisions

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10ST03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Draw conclusions and provide reasons

## Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10ST03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

## Snapshot – Evaluate actions and outcomes

## Critical and Creative Thinking: Analysing: Evaluate actions and outcomes

### Content description

AC9M10ST03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• evaluate the effectiveness of a course of action or the outcome of a task and account for expected and unexpected results, including using a given or co-developed set of criteria to support decisions

• evaluate the effectiveness of a course of action to achieve desired outcomes and suggest improvements, including using a personally developed set of criteria to support judgements and decisions

## Snapshot – Identify, process and evaluate information

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10ST03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

## Snapshot – Interpret data

## Digital Literacy: Investigating: Interpret data

### Content description

AC9M10ST03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• analyse and visualise data by selecting and using a range of digital tools to infer relationships and make predictions

• analyse and visualise multidimensional data by selecting and using a range of interactive tools to draw conclusions and make predictions

## Snapshot – Interpreting and representing data

## Numeracy: Statistics and probability: Interpreting and representing data

### Content description

AC9M10ST03

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Sampling**

• considers the context when determining whether to use data from a sample or a population
• determines what type of sample to use from a population (e.g. decides to use a representative sample when conducting targeted market research or when researching beliefs about a health-related issue)
• makes reasonable statements about a population based on evidence from samples (e.g. considers accuracy of representation of marginalised individuals or population groups)
• plans, executes and reports on sampling-based investigations, taking into account validity of methodology and consistency of data, to answer questions formulated by the student

**Recognising bias**

• applies an understanding of distributions to evaluate claims based on data (e.g. recognises that the accuracy of using a sample for predicting population values depends on both the relative size of the sample and how well the characteristics of the sample reflect the characteristics of the population; critically analyses statistics that reinforce stereotypes; evaluates claims made by the media regarding young people in relation to drugs and/or risk-taking behaviours)
• identifies and explains bias as a possible source of error in media reports of survey data (e.g. uses data to evaluate veracity of review headlines such as "everybody's favourite game"; investigates media claims on attitudes to government responses to market failure or income redistribution)
• justifies criticisms of data sources that include biased statistical elements (e.g. inappropriate sampling from populations; identifying sources of uncertainty in a scientific investigation; checks the authenticity of a data set)

## Snapshot – Explore ethical issues

## Ethical Understanding: Responding to ethical issues: Explore ethical issues

### Content description

AC9M10ST03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• analyse■the relationships between values, ethical perspectives■and ethical frameworks when responding to ethical issues
• apply knowledge of ethical concepts, values, perspectives and frameworks when responding to ethical issues

## Snapshot – Making and reflecting on ethical decisions

## Ethical Understanding: Responding to ethical issues: Making and reflecting on et

### Content description

AC9M10ST03

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider how values and beliefs influence approaches to ethical issues, and■analyse■how these affect■outcomes
• analyse■biases■when applying ethical concepts,■values■and ethical frameworks,■in order to explore and evaluate ethical decisions

## Snapshot – Interpreting and representing data

## Numeracy: Statistics and probability: Interpreting and representing data

### Content description

AC9M10ST03

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Sampling**

• considers the context when determining whether to use data from a sample or a population
• determines what type of sample to use from a population (e.g. decides to use a representative sample when conducting targeted market research or when researching beliefs about a health-related issue)
• makes reasonable statements about a population based on evidence from samples (e.g. considers accuracy of representation of marginalised individuals or population groups)
• plans, executes and reports on sampling-based investigations, taking into account validity of methodology and consistency of data, to answer questions formulated by the student

**Recognising bias**

• applies an understanding of distributions to evaluate claims based on data (e.g. recognises that the accuracy of using a sample for predicting population values depends on both the relative size of the sample and how well the characteristics of the sample reflect the characteristics of the population; critically analyses statistics that reinforce stereotypes; evaluates claims made by the media regarding young people in relation to drugs and/or risk-taking behaviours)
• identifies and explains bias as a possible source of error in media reports of survey data (e.g. uses data to evaluate veracity of review headlines such as "everybody's favourite game"; investigates media claims on attitudes to government responses to market failure or income redistribution)
• justifies criticisms of data sources that include biased statistical elements (e.g. inappropriate sampling from populations; identifying sources of uncertainty in a scientific investigation; checks the authenticity of a data set)

## Snapshot – Interpret concepts and problems

### Critical and Creative Thinking: Analysing: Interpret concepts and problems

#### Content description

AC9M10ST03

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Draw conclusions and provide reasons

### Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

#### Content description

AC9M10ST03

#### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made
• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

## Resource – WS01 - Mathematics assignment

By the end of Year 10, students recognise the effect of■approximations of■real■ numbers in■repeated■calculations.■They use mathematical modelling to solve problems involving growth and decay in financial and other applied situations, applying linear, quadratic and exponential functions as appropriate, and solve■related equations, numerically and graphically.■Students make and test conjectures involving functions and relations using digital tools. They solve problems involving simultaneous linear equations and linear inequalities in 2 variables graphically and justify solutions. Students interpret and■use■logarithmic scales■representing small or large quantities or change in applied■contexts.

They solve■measurement problems involving surface area and volume of composite objects.■Students apply Pythagoras' theorem and trigonometry to solve practical problems involving right-angled triangles.■They identify the■impact of measurement errors on the accuracy of results.■Students use mathematical modelling to solve practical problems involving ■proportion and scaling, evaluating and modifying models, and reporting assumptions, methods and findings.■They use■deductive reasoning, theorems and algorithms to■solve■ spatial problems.■Students interpret networks used to■represent practical situations and describe connectedness

They plan and■conduct statistical investigations involving bivariate■data.■Students represent the distribution of data involving 2 variables, using tables and■scatter plots,■and■comment on■possible association. They analyse inferences ■and conclusions■in the media, noting potential sources of bias.■Students compare the distribution of■continuous numerical ■data ■using various displays, and discuss distributions in terms of centre, spread, shape and outliers.■They apply conditional probability ■to solve problems involving compound events.■Students design and conduct simulations involving conditional probability, using digital tools.

## AC9M10A01

expand, factorise and simplify expressions and solve equations algebraically, applying exponent laws involving products, quotients and powers of variables, and the distributive property

## AC9M10A04

use mathematical modelling to solve applied problems involving growth and decay, including financial contexts; formulate problems, choosing to apply linear, quadratic or exponential models; interpret solutions in terms of the situation; evaluate and modify models as necessary and report assumptions, methods and findings

## AC9M10ST03

construct scatterplots and comment on the association between the 2 numerical variables in terms of strength, direction and linearity

## AC9M10ST04

**and discuss possible relationship between**

•

**Elaborations**

• using to investigate and comparing the responses to questions involving five-point Likert against 2 2 2 different categories of respondents; for example, junior compared to senior students' responses to a question

• recording in and using and to identify patterns and in the

• conducting a litter around the school, considering the relationship between different such as the day of the week as canteen specials might lead to different types of litter or the weather due to hot days leading to more ice blocks and cold drinks being sold

Students learn to:

## construct two-way tables and discuss possible relationship between categorical va

(AC9M10ST04)

### General capabilities and cross-curriculum priorities

This content description connects to the following general capabilities and cross-curriculum priorities.

**Analysing**

• Interpret concepts and problems

• Draw conclusions and provide reasons

**Inquiring**

• Identify, process and evaluate information

### Elaborations

Content elaborations provide suggestions of ways to teach the content description and connect it to general capabilities and cross-curriculum priorities. Content elaborations are optional .

**Analysing**

• Interpret concepts and problems

**Generating**

• Consider alternatives

**Inquiring**

• Identify, process and evaluate information

**Analysing**

• Interpret concepts and problems

• Draw conclusions and provide reasons

**Number sense and algebra**

• Proportional thinking

**Systems**

• Sustainable patterns of living require the responsible use of resources, maintenance of clean air, water and soils, and preservation or restoration of healthy environments.

### Related content

This content description can be taught with the following content descriptions from other learning areas.

AC9TDI10P02

### Resources

### Work Samples

## WS03 - Predict a winner

### Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10ST04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

### Snapshot – Draw conclusions and provide reasons

## Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10ST04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

### Snapshot – Identify, process and evaluate information

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10ST04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10ST04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Consider alternatives**

## Critical and Creative Thinking: Generating: Consider alternatives

### Content description

AC9M10ST04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

**Snapshot – Identify, process and evaluate information**

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10ST04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10ST04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Draw conclusions and provide reasons**

## Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10ST04

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made

• draw conclusions and make choices when completing tasks, using analysis of complex evidence and

arguments before making recommendations

## Snapshot – Proportional thinking

# Numeracy: Number sense and algebra: Proportional thinking

## Content description

AC9M10ST04

## Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

### Applying proportion

• recognises that percentages can be greater than 100 100 1 0 0 % (e.g. the entry price to the show has gone up from $ 20 \$20 $ 2 0 last year to $ 25 \$25 $ 2 5 this year, that’s 125 125 1 2 5 % of last year's price; examines food labels and nutritional tables to determine whether the percentage a fast food meal exceeds a recommended daily intake for sugar/fats)
• uses common fractions and decimals for proportional increase or decrease of a given amount
• increases and decreases quantities by a percentage and expresses a percentage increase or decrease using a multiplier (e.g. calculates 70 70 7 0 % or 0.7 0.7 0 . 7 of the original marked price to apply a 30 30 3 0 % discount; multiplies by 1.03 1.03 1 . 0 3 when predicting a 3 3 3 % future capital gain; calculates percentage increase or decrease in international migration in Australia)
• models situations uses percentages, rates and ratios (e.g. calculates interest payable on loans; compares taxation rates and the effect of a pay increase on how much annual income tax is payable; mixes chemical solutions using ratios; uses Mendelian inheritance to predict the ratio of offspring genotypes and phenotypes in monohybrid crosses)
• identifies and interprets situations where direct proportion is involved (e.g. hours worked and payment received; increase in income and increase in demand for branded products; increasing the mass will increase the force provided that acceleration remains constant)
• identifies and interprets situations where inverse proportion is involved (e.g. number of people working on a job and time taken to complete the job; speed and time taken to travel recognising that travelling at a greater speed will mean the journey takes less time; decrease in price and increase in demand)
• uses ratio and scale factors to enlarge or reduce the size of objects (e.g. interprets the scale used on a map and determines the real distance between 2 2 2 locations; draws engineering drawings to scale)

### Flexible proportional thinking

• identifies proportional relationships in formulas and uses proportional thinking flexibly to explore this relationship (e.g. recognises the proportional relationship between concentration and volume of a solution in the formula c = n v c=\frac nv c = v n ■ and uses this relationship to make decisions when diluting solutions)
• identifies, represents and chooses appropriate strategies to solve percentage problems involving proportional thinking (e.g. percentage of a percentage for calculating successive discounts; uses percentages to calculate compound interest on loans and investments; uses percentage increases or decreases as an operator, such as a 3 3 3 % increase is achieved by multiplying by 1.03 1.03 1 . 0 3 , and 4 4 4 successive increases is achieved by multiplying by ( 1.03 ) 4 (1.03)^4 ( 1 . 0 3 ) 4 to make meaning of the formula

# AC9M10ST05

**plan and conduct of situations that involve ; evaluate and report findings■with consideration of limitations of any**

•
•

## Elaborations

• designing that collect over time through observation, experiment or measurement; graphing, interpreting and analysing ; and reporting within the of the statistical investigation question
• investigating anecdotal claims including those concerning climate, housing affordability and natural resources, with consideration of validity and limitations of interpolation or extrapolation
• using a statistical investigation to address the question, “Is there a relationship between vaccines and immunity from a virus”

• investigating biodiversity changes in Australia before and after by comparing related bivariate , discussing and reporting on

Students learn to:

## plan and conduct statistical investigations of situations that involve bivariate data; report findings■with consideration of limitations of any inferences

(AC9M10ST05)

### General capabilities and cross-curriculum priorities

This content description connects to the following general capabilities and cross-curriculum priorities.

**Analysing**

• Interpret concepts and problems
• Draw conclusions and provide reasons
• Evaluate actions and outcomes

**Generating**

• Consider alternatives

**Inquiring**

• Identify, process and evaluate information

**Responding to ethical issues**

• Explore ethical issues

**Understanding ethical concepts and perspectives**

• Explore ethical concepts

### Elaborations

Content elaborations provide suggestions of ways to teach the content description and connect it to general capabilities and cross-curriculum priorities. Content elaborations are optional .

**Analysing**

• Interpret concepts and problems
• Draw conclusions and provide reasons

**Inquiring**

• Identify, process and evaluate information

**Analysing**

• Interpret concepts and problems
• Draw conclusions and provide reasons
• Evaluate actions and outcomes

**Generating**

• Consider alternatives

**Responding to ethical issues**

• Explore ethical issues

**Understanding ethical concepts and perspectives**

• Explore ethical concepts

**Systems**

• All life forms, including human life, are connected through Earth’s systems (geosphere, biosphere, hydrosphere and atmosphere) on which they depend for their wellbeing and survival.
• Social, economic and political systems influence the sustainability of Earth’s systems.

**Analysing**

• Interpret concepts and problems
• Draw conclusions and provide reasons

**Inquiring**

• Identify, process and evaluate information

**Investigating**

• Locate information
• Acquire and collate data
• Interpret data

**Systems**

• Sustainable patterns of living require the responsible use of resources, maintenance of clean air,

water and soils, and preservation or restoration of healthy environments.

### Analysing

• Interpret concepts and problems
• Draw conclusions and provide reasons

### Generating

• Consider alternatives

### Country/Place

• The First Peoples of Australia are the Traditional Owners of Country/Place, protected in Australian Law by the Native Title Act 1993 which recognises pre-existing sovereignty, continuing■systems of law and customs, and connection to Country/Place. This recognised legal right provides for economic sustainability and a voice into the development■and management of Country/Place.

## Related content

This content description can be taught with the following content descriptions from other learning areas.

AC9HE10S02
AC9HG10K05
AC9HG10S03
AC9S10I02
AC9S10I04
AC9S10I05
AC9S10I07
AC9TDI10P02

## Resources

## Work Samples

# WS03 - Predict a winner

### Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

### Snapshot – Draw conclusions and provide reasons

## Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made
• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

### Snapshot – Evaluate actions and outcomes

## Critical and Creative Thinking: Analysing: Evaluate actions and outcomes

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• evaluate the effectiveness of a course of action or the outcome of a task and account for expected

and unexpected results, including using a given or co-developed set of criteria to support decisions
• evaluate the effectiveness of a course of action to achieve desired outcomes and suggest improvements, including using a personally developed set of criteria to support judgements and decisions

**Snapshot – Consider alternatives**

## Critical and Creative Thinking: Generating: Consider alternatives

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option
• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

**Snapshot – Identify, process and evaluate information**

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources
• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study
• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources
• evaluate the information selected to determine bias and reliability

**Snapshot – Explore ethical issues**

## Ethical Understanding: Responding to ethical issues: Explore ethical issues

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• analyse■the relationships between values, ethical perspectives■and ethical frameworks when responding to ethical issues
• apply knowledge of ethical concepts, values, perspectives and frameworks when responding to ethical issues

**Snapshot – Explore ethical concepts**

## Ethical Understanding: Understanding ethical concepts and perspectives: Explor

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• analyse■the similarities and differences between ethical concepts, such as integrity, loyalty and equality, in a range of situations and contexts
• evaluate■the consistency in meaning of ethical concepts, such as trust, freedom and rights and responsibilities, in a range of situations and contexts

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Draw conclusions and provide reasons**

## Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made
• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

**Snapshot – Identify, process and evaluate information**

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources
• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study
• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources
• evaluate the information selected to determine bias and reliability

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Draw conclusions and provide reasons**

## Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made
• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

**Snapshot – Evaluate actions and outcomes**

## Critical and Creative Thinking: Analysing: Evaluate actions and outcomes

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• evaluate the effectiveness of a course of action or the outcome of a task and account for expected and unexpected results, including using a given or co-developed set of criteria to support decisions
• evaluate the effectiveness of a course of action to achieve desired outcomes and suggest improvements, including using a personally developed set of criteria to support judgements and decisions

**Snapshot – Consider alternatives**

## Critical and Creative Thinking: Generating: Consider alternatives

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option
• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

**Snapshot – Explore ethical issues**

## Ethical Understanding: Responding to ethical issues: Explore ethical issues

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• analyse■the relationships between values, ethical perspectives■and ethical frameworks when responding to ethical issues
• apply knowledge of ethical concepts, values, perspectives and frameworks when responding to ethical issues

**Snapshot – Explore ethical concepts**

## Ethical Understanding: Understanding ethical concepts and perspectives: Explor

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• analyse■the similarities and differences between ethical concepts, such as integrity, loyalty and equality, in a range of situations and contexts
• evaluate■the consistency in meaning of ethical concepts, such as trust, freedom and rights and responsibilities, in a range of situations and contexts

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Draw conclusions and provide reasons**

## Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• draw conclusions and make choices when completing tasks by connecting evidence from within and

across discipline areas to provide reasons and evaluate arguments for choices made
• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

**Snapshot – Identify, process and evaluate information**

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources
• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study
• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources
• evaluate the information selected to determine bias and reliability

**Snapshot – Locate information**

## Digital Literacy: Investigating: Locate information

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• locate, select and retrieve relevant information from multiple sources, exploring advanced search functions and targeted criteria
• locate relevant information by applying advanced search functions across multiple sources involving purposefully selected and contextually specific terms and criteria

**Snapshot – Acquire and collate data**

## Digital Literacy: Investigating: Acquire and collate data

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• collect and access data from a range of sources, using specialised digital tools in response to problems, and evaluate it for relevance
• collect and evaluate quantitative and qualitative data using specialised digital tools and processes in the context of identified problems

**Snapshot – Interpret data**

## Digital Literacy: Investigating: Interpret data

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• analyse and visualise data by selecting and using a range of digital tools to infer relationships and make predictions
• analyse and visualise multidimensional data by selecting and using a range of interactive tools to draw conclusions and make predictions

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements

necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Draw conclusions and provide reasons**

## Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• draw conclusions and make choices when completing tasks by connecting evidence from within and across discipline areas to provide reasons and evaluate arguments for choices made
• draw conclusions and make choices when completing tasks, using analysis of complex evidence and arguments before making recommendations

**Snapshot – Consider alternatives**

## Critical and Creative Thinking: Generating: Consider alternatives

### Content description

AC9M10ST05

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option
• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

# AC9M10P01

**use the language of “if ... then”, “given”, “of”, “knowing that” to describe and interpret situations involving**

•
•

**Elaborations**

• using and to understand conditional statements using the language of “if ... then ...”, “given”, “of”, “knowing that” and identifying common mistakes in interpreting such language
• using and to represent, interpret and compare probabilities of dependent and independent
• investigating how is used in natural language processing tasks like text or image generation, language translation, augmentation and recommendation systems

Students learn to:

## use the language of “if ... then”, “given”, “of”, “knowing that” to describe and interp situations involving conditional probability

(AC9M10P01)

### General capabilities and cross-curriculum priorities

This content description connects to the following general capabilities and cross-curriculum priorities.

**Analysing**

• Interpret concepts and problems

**Statistics and probability**

• Understanding chance

### Elaborations

Content elaborations provide suggestions of ways to teach the content description and connect it to general capabilities and cross-curriculum priorities. Content elaborations are optional .

**Analysing**

• Interpret concepts and problems

**Analysing**

• Interpret concepts and problems

**Statistics and probability**

• Understanding chance

### Related content

This content description can be taught with the following content descriptions from other learning areas.

AC9TDI10P05

### Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10P01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

### Snapshot – Understanding chance

## Numeracy: Statistics and probability: Understanding chance

### Content description

AC9M10P01

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

#### Calculating probabilities

• determines the probability of compound events and explains why some results have a higher probability than others (e.g. the results from tossing 2 2 2 coins)

• represents diagrammatically all possible outcomes (e.g. tree diagrams, two-way tables, Venn diagrams)

• measures and compares expected results to the actual results of a chance event over a number of trials, and compares and explains the variation in results (e.g. uses probability to determine expected results of a spinner prior to trial)

• recognises that the chance of something occurring or its complement has a total probability of one (e.g. the probability of rolling a 3 3 3 is 1 6 \frac16 6 1 ■ and the probability of not rolling a 3 3 3 is 5 6 \frac56 6 5 ■

• calculates and explains the difference between the probabilities of chance events with and without replacement (e.g. "if we put all of the class names in a hat and draw them out one at a time without putting the name back in, the probability of your name getting called out increases each time because the total number of possible outcomes decreases")

• calculates the probabilities of future events based on historical data (e.g. uses historical rainfall data to plan the date for an outdoor event)

#### Probabilistic reasoning

• recognises combinations of events and the impact they have on assigning probabilities (e.g. and, or, not, if not, at least)

• solves conditional probability problems informally using data in two-way tables and authentic contexts

• evaluates chance data reported in media for meaning and accuracy

• applies probabilistic/chance reasoning to data collected in statistical investigations when making decisions acknowledging uncertainty

### Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10P01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements

necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

### Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10P01

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

### Snapshot – Understanding chance

## Numeracy: Statistics and probability: Understanding chance

### Content description

AC9M10P01

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

#### Calculating probabilities

• determines the probability of compound events and explains why some results have a higher probability than others (e.g. the results from tossing 2 2 2 coins)
• represents diagrammatically all possible outcomes (e.g. tree diagrams, two-way tables, Venn diagrams)
• measures and compares expected results to the actual results of a chance event over a number of trials, and compares and explains the variation in results (e.g. uses probability to determine expected results of a spinner prior to trial)
• recognises that the chance of something occurring or its complement has a total probability of one (e.g. the probability of rolling a 3 3 3 is 1 6 \frac16 6 1 ■ and the probability of not rolling a 3 3 3 is 5 6 \frac56 6 5 ■
• calculates and explains the difference between the probabilities of chance events with and without replacement (e.g. "if we put all of the class names in a hat and draw them out one at a time without putting the name back in, the probability of your name getting called out increases each time because the total number of possible outcomes decreases")
• calculates the probabilities of future events based on historical data (e.g. uses historical rainfall data to plan the date for an outdoor event)

#### Probabilistic reasoning

• recognises combinations of events and the impact they have on assigning probabilities (e.g. and, or, not, if not, at least)
• solves conditional probability problems informally using data in two-way tables and authentic contexts
• evaluates chance data reported in media for meaning and accuracy
• applies probabilistic/chance reasoning to data collected in statistical investigations when making decisions acknowledging uncertainty

# AC9M10P02

### design and conduct■repeated and using to model and interpret results

•
•
•

### Elaborations

• using of different sizes with and without replacement from a to identify when the difference in methods becomes negligible
• recognising that an can be dependent on another and that this will affect the way its is

calculated
• using to gather on frequencies for situations involving chance that appear to be counter-intuitive, such as the three-door problem or the birthday problem
• identifying situations in real-life where are used for decision-making, such as supply and demand of , insurance risk and queueing
• using to predict the number of people likely to be infected with a strain of flu or virus
Students learn to:

## design and conduct■repeated chance experiments and simulations using digital to conditional probability and interpret results

(AC9M10P02)

### General capabilities and cross-curriculum priorities

This content description connects to the following general capabilities and cross-curriculum priorities.

**Analysing**

• Interpret concepts and problems

**Generating**

• Consider alternatives

**Investigating**

• Acquire and collate data
• Interpret data

**Managing and operating**

• Select and operate tools

**Statistics and probability**

• Understanding chance

### Elaborations

Content elaborations provide suggestions of ways to teach the content description and connect it to general capabilities and cross-curriculum priorities. Content elaborations are optional .

**Analysing**

• Interpret concepts and problems

**Inquiring**

• Identify, process and evaluate information

**Analysing**

• Interpret concepts and problems

**Inquiring**

• Identify, process and evaluate information

**Analysing**

• Interpret concepts and problems

**Inquiring**

• Identify, process and evaluate information

**Managing and operating**

• Select and operate tools

**Analysing**

• Interpret concepts and problems

**Inquiring**

• Identify, process and evaluate information

**Responding to ethical issues**

• Making and reflecting on ethical decisions

**Analysing**

• Interpret concepts and problems

**Inquiring**

• Identify, process and evaluate information

**Responding to ethical issues**

• Making and reflecting on ethical decisions

**Understanding ethical concepts and perspectives**

• Explore ethical concepts

### Related content

This content description can be taught with the following content descriptions from other learning areas.

AC9TDI10P05

### Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10P02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context

• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

### Snapshot – Consider alternatives

## Critical and Creative Thinking: Generating: Consider alternatives

### Content description

AC9M10P02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider alternatives by creatively adapting ideas when information is limited or conflicting and recommend a preferred option

• consider alternatives by creatively revising and modifying ideas and recommendations when circumstances change

### Snapshot – Acquire and collate data

## Digital Literacy: Investigating: Acquire and collate data

### Content description

AC9M10P02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• collect and access data from a range of sources, using specialised digital tools in response to problems, and evaluate it for relevance

• collect and evaluate quantitative and qualitative data using specialised digital tools and processes in the context of identified problems

### Snapshot – Interpret data

## Digital Literacy: Investigating: Interpret data

### Content description

AC9M10P02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• analyse and visualise data by selecting and using a range of digital tools to infer relationships and make predictions

• analyse and visualise multidimensional data by selecting and using a range of interactive tools to draw conclusions and make predictions

### Snapshot – Select and operate tools

## Digital Literacy: Managing and operating: Select and operate tools

### Content description

AC9M10P02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• select and use the advanced or unfamiliar features of digital tools to efficiently complete tasks

• troubleshoot common problems and automate repetitive tasks
• select and operate advanced and emerging digital tools confidently
• troubleshoot common problems systematically and seek to improve efficiency by developing new skills

**Snapshot – Understanding chance**

## Numeracy: Statistics and probability: Understanding chance

### Content description

AC9M10P02

### Learning progression extract

The following learning progression extract shows the alignment of the learning progression with this content.

**Calculating probabilities**

• determines the probability of compound events and explains why some results have a higher probability than others (e.g. the results from tossing 2 2 2 coins)
• represents diagrammatically all possible outcomes (e.g. tree diagrams, two-way tables, Venn diagrams)
• measures and compares expected results to the actual results of a chance event over a number of trials, and compares and explains the variation in results (e.g. uses probability to determine expected results of a spinner prior to trial)
• recognises that the chance of something occurring or its complement has a total probability of one (e.g. the probability of rolling a 3 3 3 is 1 6 \frac16 6 1 ■ and the probability of not rolling a 3 3 3 is 5 6 \frac56 6 5 ■
• calculates and explains the difference between the probabilities of chance events with and without replacement (e.g. "if we put all of the class names in a hat and draw them out one at a time without putting the name back in, the probability of your name getting called out increases each time because the total number of possible outcomes decreases")
• calculates the probabilities of future events based on historical data (e.g. uses historical rainfall data to plan the date for an outdoor event)

**Probabilistic reasoning**

• recognises combinations of events and the impact they have on assigning probabilities (e.g. and, or, not, if not, at least)
• solves conditional probability problems informally using data in two-way tables and authentic contexts
• evaluates chance data reported in media for meaning and accuracy
• applies probabilistic/chance reasoning to data collected in statistical investigations when making decisions acknowledging uncertainty

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10P02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Identify, process and evaluate information**

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10P02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study
• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources
• evaluate the information selected to determine bias and reliability

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10P02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Identify, process and evaluate information**

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10P02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources
• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study
• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources
• evaluate the information selected to determine bias and reliability

**Snapshot – Interpret concepts and problems**

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10P02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

**Snapshot – Identify, process and evaluate information**

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10P02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources
• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study
• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources
• evaluate the information selected to determine bias and reliability

**Snapshot – Select and operate tools**

## Digital Literacy: Managing and operating: Select and operate tools

### Content description

AC9M10P02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• select and use the advanced or unfamiliar features of digital tools to efficiently complete tasks
• troubleshoot common problems and automate repetitive tasks
• select and operate advanced and emerging digital tools confidently
• troubleshoot common problems systematically and seek to improve efficiency by developing new skills

## Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10P02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Identify, process and evaluate information

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10P02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources
• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study
• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources
• evaluate the information selected to determine bias and reliability

## Snapshot – Making and reflecting on ethical decisions

## Ethical Understanding: Responding to ethical issues: Making and reflecting on et

### Content description

AC9M10P02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• consider how values and beliefs influence approaches to ethical issues, and■analyse■how these affect■outcomes
• analyse■biases■when applying ethical concepts,■values■and ethical frameworks,■in order to explore and evaluate ethical decisions

## Snapshot – Interpret concepts and problems

## Critical and Creative Thinking: Analysing: Interpret concepts and problems

### Content description

AC9M10P02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• identify the relevant aspects of a concept or problem, recognising gaps or missing elements necessary for understanding by using approaches and strategies suitable for the context
• identify the objective and subjective aspects of a complex concept or problem, with sensitivity to context

## Snapshot – Identify, process and evaluate information

## Critical and Creative Thinking: Inquiring: Identify, process and evaluate informati

### Content description

AC9M10P02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the accuracy, validity and relevance of the information and opinion to the topic of study

• identify and clarify significant information and opinion from a range of sources, including visual information and digital sources

• evaluate the information selected to determine bias and reliability

## Snapshot – Making and reflecting on ethical decisions

## Ethical Understanding: Responding to ethical issues: Making and reflecting on et

### Content description

AC9M10P02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• consider how values and beliefs influence approaches to ethical issues, and■analyse■how these affect■outcomes

• analyse■biases■when applying ethical concepts,■values■and ethical frameworks,■in order to explore and evaluate ethical decisions

## Snapshot – Explore ethical concepts

## Ethical Understanding: Understanding ethical concepts and perspectives: Explor

### Content description

AC9M10P02

### Continuum extract

The following continuum extract shows the alignment of the continuum with this content.

• analyse■the similarities and differences between ethical concepts, such as integrity, loyalty and equality, in a range of situations and contexts

• evaluate■the consistency in meaning of ethical concepts, such as trust, freedom and rights and responsibilities, in a range of situations and contexts