(no-code)

recognise that the real number system includes the and the , and solve problems involving using

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Elaborations

• investigating the real number system by representing the relationships between irrationals, rationals, and and discussing the difference between exact representations and representations of

• using a to indicate the solution interval for inequalities of the form $ax + b < c$ ax+b<c $a x + b < c$; for example, $2x + 7 < 0$ 2x+7<0 $2 x + 7 < 0$, or of the form $ax + b > c$ ax+b>c $a x + b > c$; for example, $1.2x - 5.4 > 10.8$ 1.2x-5.4>10.8 $1.2 x - 5.4 > 10.8$

• using positive and negative to solve problems; for example, for financial planning such as budgeting

• solving problems involving the substitution of into formulas, understanding that solutions can be represented in exact form or as a approximation, such as calculating the of a using the formula $A = r^2$ A=\mathrm{ r^2 $A = r^2$ and specifying the answer in terms of as an exact real number; for example, the of a with 5 5 5 is 5 5\mathrm\pi 5 , and the exact is $(5^2)^2 = 254$ \mathrm\pi(\frac52)^2=\frac{25}4\mathrm\pi $(25\blacksquare)^2 = 425\blacksquare$ square which rounds to 19.63 19.63 19.63 square , correct to 2 2 2 places

• investigating the position of rational and on the , using geometric constructions to locate and on a ; for example, $\sqrt2$ \sqrt2 $2\blacksquare$ is located at the intersection of an arc and the , where the of the arc is the length of the of a one-unit square

Students learn to:

recognise that the real number system includes the rational numbers and the irratio solve problems involving real numbers using digital tools

(AC9M9N01)

General capabilities and cross-curriculum priorities

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

Managing and operating

• Select and operate tools

Number sense and algebra

• Interpreting fractions

• Number and place value

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 .

Measurement and geometry

• Understanding units of measurement

Number sense and algebra

• Understanding money

Measurement and geometry

• Understanding units of measurement

Related content

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

AC9S9I03

Snapshot – Select and operate tools

Digital Literacy: Managing and operating: Select and operate tools

Content description

AC9M9N01

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 – Interpreting fractions

Numeracy: Number sense and algebra: Interpreting fractions

Content description

AC9M9N01

Learning progression extract

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

Operating with fractions

• adds or subtracts fractions with the same denominators and justifies the need for a common denominator

• uses strategies to calculate a fraction of a quantity (e.g. to find a time-point two-thirds of the way through a music video or animation, determines one-third then doubles; locates a position a third of the way across the stage by measuring the width of the stage and dividing by 3 3 3)

• explains the difference between multiplying and dividing fractions (e.g. recognises 1 2 × 1 4 $\frac12\times\frac14$ 2 1 ■ × 4 1 ■ as one-half of a quarter and 1 2 $\frac12$ 2 1 ■ divided by 1 4 $\frac14$ 4 1 ■ as how many quarters are in one half)

• expresses one quantity as a fraction of another (e.g. 12 12 1 2 defective items from the 96 96 9 6 that were produced represents one-eighth of all items produced)

• demonstrates why dividing by a fraction can result in a larger number

Operating with fractions proportionally

• demonstrates that a fraction can also be used as a ratio to compare the size of 2 2 2 sets (e.g. if the colour ratio of a black and white pattern is 2 : 3 2:3 2 : 3 , 2 5 $\frac25$ 5 2 ■ is black and 3 5 $\frac35$ 5 3 ■ is white and the representation of black is 2 3 $\frac23$ 3 2 ■ of the white)

Snapshot – Number and place value

Numeracy: Number sense and algebra: Number and place value

Content description

AC9M9N01

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 7×10^9 7 × 1 0 9 ; interprets the approximate mass of protons and neutrons as 1.67 × 1 0 – 24 1.67×10^{-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 $10 \times 10^2 = 10^3$ 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 1.5×10^8 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 – Understanding units of measurement

Numeracy: Measurement and geometry: Understanding units of measurement

Content description

AC9M9N01

Learning progression extract

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

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

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 money

Numeracy: Number sense and algebra: Understanding money

Content description

AC9M9N01

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

AC9M9N01

Learning progression extract

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

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

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

AC9M9A01

apply the to numerical with integer and extend to

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Elaborations

• representing in exponential form; for example, 0.475 0.475 0 . 4 7 5 can be represented as 0.475 = 4 10 + 7 100 + 5 1000 = 4 × 1 0 − 1 + 7 × 1 0 − 2 + 5 × 1 0 − 3 $0.475\;=\;\frac4{10}+\frac7{100}+\frac5{1000}\;=\;4\times10^{-1}+7\times10^{-2}+5\times10^{-3}$ 0 . 4 7 5 = 1 0 4 ■ + 1 0 0 7 ■ + 1 0 0 0 5 ■ = 4 × 1 0 − 1 + 7 × 1 0 − 2 + 5 × 1 0 − 3 and 0.00023 0.00023 0 . 0 0 0 2 3 as 23 × 1 0 − 5 23×10^{-5} 2 3 × 1 0 − 5

• simplifying and evaluating numerical , involving both positive and negative integer , explaining why; for example, 5 − 3 = 1 5 3 = (1 5) 3 = 1 125 $5^{-3}=\frac1{5^3}=(\frac15)^3=\frac1{125}$ 5 − 3 = 5 3 1 ■ = (5 1 ■) 3 = 1 2 5 1 ■ and connecting terms of the sequence 125 , 25 , 5 , 1 , 1 5 125, 25, 5, 1, \frac15 1 2 5 , 2 5 , 5 , 1 , 5 1 ■ , 1 25 \frac1{25} 2 5 1 ■ , 1 125 \frac1{125} 1 2 5 1 ■ … to terms of the sequence 5 3 5^3 5 3 , 5 2 5^2 5 2 , 5 1 5^1 5 1 , 5 0 5^0 5 0 , 5 − 1 5^{-1} 5 − 1 , 5 − 2 5^{-2} 5 − 2 , 5 − 3 5^{-3} 5 − 3 ...

• relating the of numerical involving to the and the definition of an ; for example, 2 3 ÷ 2 5 = 2 − 2 = 1 2 2 = 1 4 $2^3\div2^5\;=\;2^{-2}\;=\;\frac1{2^2}=\frac14$ 2 3 ÷ 2 5 = 2 − 2 = 2 2 1 ■ = 4 1 ■ and (3 × 5) 2 = 3 2 × 5 2 = 9 × 25 = 225 $(3\times5)^2\;=\;3^2\times5^2\;=\;9\times25\;=\;225$ (3 × 5) 2 = 3 2 × 5 2 = 9 × 2 5 = 2 2 5

• recognising in and applying the relevant and corresponding conventions; for example, for any non-zero natural number a a a , a 0 = 1 $a^0\;=\;1$ a 0 = 1 , x 1 = x $x^1\;=\;x$ x 1 = x , r 2 = r × r $r^2\;=\;r\times r$ r 2 = r × r , h 3 = h × h × h $h^3\;=\;h\times h\times h$ h 3 = h × h × h , y 4 = y × y × y × y $y^4\;=\;y\times y\times y\times y$ y 4 = y × y × y × y , and 1 w × 1 w = 1 w 2 = w − 2 $\frac1{w} \times \frac1{w}=\frac1{w^2} = w^{-2}$ w 1 ■ × w 1 ■ = w 2 1 ■ = w − 2

• relating simplification of from first principles and to the use of ; for example, (a 2) 3 = (a × a) × (a × a) × (a × a) = a × a × a × a × a × a = a 6 $(a^2)^3\;=\;(a\times a)\;\times\;(a\times a)\;\times\;(a\times a)\;=\;a\times a\times a\times a\times a\times a\;=\;a^6$ (a 2) 3 = (a × a) × (a × a) × (a × a) = a × a × a × a × a × a = a 6 ; b 2 × b 3 = (b × b) × (b × b × b) = b × b × b × b × b = b 5 $b^2\times b^3\;=\;(b\times b)\times(b\times b\times b)\;=\;b\times b\times b\times b\times b\;=\;b^5$ b 2 × b 3 = (b × b) × (b × b × b) = b × b × b × b × b = b 5 ; y 4 y 2 = y × y × y × y y × y = y 2 1 = y 2 $\frac{y^4}{y^2}\;=\;\frac{y\times y\times y\times y}{y\times y}\;=\;\frac{y^2}1\;=\;y^2$ y 2 y 4 ■ = y × y y × y × y × y ■ = 1 y 2 ■ = y 2 and (5 a) 2 = (5 × a) × (5 × a) = 5 × 5 × a × a = 25 × a 2 = 25 a 2 $(5a)^2\;=\;(5\times a)\times(5\times a)\;=\;5\times5\times a\times a\;=\;25\times a^2\;=\;25a^2$ (5 a) 2 = (5 × a) ×

$(5 \times a) = 5 \times 5 \times a \times a = 25 \times a^2 = 25a^2$

• applying the to simplifying involving , , and powers of constants and ; for example, $(2xy)^3 x y^4 = 8x^3 y^3 x y^4 = 8x^2 y^{-1}$ $\frac{(2xy)^3}{xy^4}\;=\;\frac{8x^3y^3}{xy^4}\;=\;8x^2y^{-1}$ $x y 4 (2xy)3 \blacksquare = x y 4 8x^3y^3 \blacksquare = 8x^2y - 1$

• relating the prefixes for SI from pico- (trillionth) to tera- (trillion) to the corresponding powers of 10 $10^{1}0$; for example, one pico-gram $= 10-12$ 10^{-12} $10-12$ gram and one terabyte $= 10\,12$ 10^{12} $10\,1\,2$ bytes

Students learn to:

apply the exponent laws to numerical expressions with integer exponents and exter

(AC9M9A01)

General capabilities and cross-curriculum priorities

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

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 .

Number sense and algebra

• Interpreting fractions
• Number and place value

Number sense and algebra

• Multiplicative strategies

Measurement and geometry

• Understanding units of measurement

Snapshot – Multiplicative strategies

Numeracy: Number sense and algebra: Multiplicative strategies

Content description

AC9M9A01

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. $2 \times 2 \times 2 \times 3 \times 3 = 2^3 \times 3^2$ $2 \times 2 \times 2 \times 3 \times 3 = 2^3\times 3^2$ $2 \times 2 \times 2 \times 3 \times 3 = 2 3 \times 3 2$
• identifies and describes products of the same number as square or cube numbers (e.g. 3×3 3×3 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 $15 \times \frac{1}{2} = 7.5$ $15 \times\frac12 = 7.5$ $1 5 \times 2 1 \blacksquare = 7 . 5$)
• connects and converts decimals to fractions to assist in mental computation involving multiplication or division (e.g. to calculate 16×0.25 16×0.25 $1 6 \times 0 . 2 5$, recognises 0.25 0.25 $0 . 2 5$ as a quarter, and determines a quarter of 16 16 $1 6$ or determines $0.5 \div 0.25$ $0.5 \div 0.25$ $0 . 5 \div 0 . 2 5$, 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 0.13×1600 $0 . 1 3 \times 1 6 0 0$ or $1600 \div 100 \times 13$ $1600 \div 100 \times 13$ $1 6 0 0 \div 1 0 0 \times 1 3$)
• 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 $\blacksquare 1.6$ 1.6 $1 . 6$ $\blacksquare$C)

Flexible strategies for working multiplicatively

• uses knowledge of place value and multiplicative partitioning to multiply and divide decimals efficiently (e.g. $0.461 \times 200 = 0.461 \times 100 \times 2 = 46.1 \times 2 = 92.2$ $0.461 \times 200 = 0.461 \times$

$100 \times 2 = 46.1 \times 2 = 92.2$ ($0.461 \times 200 = 0.461 \times 100 \times 2 = 46.1 \times 2 = 92.2$)

- flexibly operates multiplicatively with extremely large or very small numbers expressed in scientific notation (e.g. calculates the area of a computer chip measuring 2.56×10^{-6} m in width by 1.4×10^{-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 – Interpreting fractions

Numeracy: Number sense and algebra: Interpreting fractions

Content description

AC9M9A01

Learning progression extract

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

Operating with fractions

- adds or subtracts fractions with the same denominators and justifies the need for a common denominator
- uses strategies to calculate a fraction of a quantity (e.g. to find a time-point two-thirds of the way through a music video or animation, determines one-third then doubles; locates a position a third of the way across the stage by measuring the width of the stage and dividing by 3)
- explains the difference between multiplying and dividing fractions (e.g. recognises $\frac{1}{2} \times \frac{1}{4}$ as one-half of a quarter and $\frac{1}{2}$ divided by $\frac{1}{4}$ as how many quarters are in one half)
- expresses one quantity as a fraction of another (e.g. 12 defective items from the 96 that were produced represents one-eighth of all items produced)
- demonstrates why dividing by a fraction can result in a larger number

Operating with fractions proportionally

- demonstrates that a fraction can also be used as a ratio to compare the size of 2 sets (e.g. if the colour ratio of a black and white pattern is $2 : 3$, $\frac{2}{5}$ is black and $\frac{3}{5}$ is white and the representation of black is $\frac{2}{3}$ of the white)

Snapshot – Number and place value

Numeracy: Number sense and algebra: Number and place value

Content description

AC9M9A01

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 $-10\,°C$ is colder than the temperature $-2.5\,°C$; recognises that negative numbers are less than zero; locates -12 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 changes the positional value of the digits (e.g. explains that 100 times 0.125 is 12.5 because each digit value in 0.125 is multiplied by 100, so 100×0.1 is 10, 100×0.02 is 2 and 100×0.005 is 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 7×10^9 7 \times 10^9 7 × 1 0 9 ; interprets the approximate mass of protons and neutrons as 1.67×10^{-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 $10 \times 10^2 = 10^3$ 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 1.5×10^8 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 – Multiplicative strategies

Numeracy: Number sense and algebra: Multiplicative strategies

Content description

AC9M9A01

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. $2 \times 2 \times 2 \times 3 \times 3 = 2^3 \times 3^2$ 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 $15 \times \frac{1}{2} = 7.5$ 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 $0.5 \div 0.25$ 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 $1600 \div 100 \times 13$ 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. $0.461 \times 200 = 0.461 \times 100 \times 2 = 46.1 \times 2 = 92.2$ 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 2.56×10^{-6} 2.56 \times 10^{-6} 2 . 5 6 × 1 0 − 6 m in width by 1.4×10^{-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 – Understanding units of measurement

Numeracy: Measurement and geometry: Understanding units of measurement

Content description

AC9M9A01

Learning progression extract

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

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

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

AC9M9A02

simplify , expand binomial and factorise monic

•

Elaborations

• expanding combinations of binomials such as (x + 7) (x + 8) , (x + 7) (x – 8) , (x – 7) (x + 8) , (x – 7) (x – 8) (x+7)(x+8),\;(x+7)(x-8),\;(x-7)(x+8),\;(x-7)(x-8) (x + 7) (x + 8) , (x + 7) (x – 8) , (x – 7) (x + 8) , (x – 7) (x – 8) to identify expansion and factorisation patterns related to (x + a) (x + b) = x 2 + (a + b) x + a b (x+a)(x+b)\;=\;x^2+(a+b)x+ab (x + a) (x + b) = x 2 + (a + b) x + a b , where a a a and b b b are

• using manipulatives such as tiles or models to expand or factorise with readily identifiable binomial ; for example, (x + 1) (x + 3) = x 2 + 4 x + 3 , (x – 5) 2 = x 2 – 10 x + 25 (x+1)(x+3)\;=\;x^2+4x+3,\;(x-5)^2\;=\;x^2-10x+25 (x + 1) (x + 3) = x 2 + 4 x + 3 , (x – 5) 2 = x 2 – 1 0 x + 2 5 or (x – 3) 2 + 4 = x 2 – 6 x + 9 + 4 = x 2 – 6 x + 13 (x-3)^2+4\;=\;x^2-6x+9+4\;=\;x^2-6x+13 (x – 3) 2 + 4 = x 2 – 6 x + 9 + 4 = x 2 – 6 x + 1 3

• recognising the relationship between expansion and factorisation, and using to systematically explore the factorisation of x 2 + m x + n x^2+mx+n x 2 + m x + n where m m m and n n n are

Students learn to:

simplify algebraic expressions, expand binomial products and factorise monic quad

(AC9M9A02)

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 .

Resources

Work Samples

WS03 - Fencing in the Vegetable Patch

Snapshot – Number patterns and algebraic thinking

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

Content description

AC9M9A02

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 $A = \mathrm{\pi r}^2$ $A = \pi r 2$ to calculate the area of a circular space; uses $A = P(1+\frac{\mathrm r}{\mathrm n})^{\mathrm{nt}}$ $A = P (1 + n r \blacksquare) n t$ when working with compound interest; uses $v = u + at$ $v = u + a t$ 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
AC9M9A03

find the of a , the midpoint of the interval and the distance between 2 distinct on the

•
Elaborations
• recognising■that the of a is calculated using the of a on that and is■ independent of which 2 2 2 distinct on the are used for this calculation
• using and to illustrate that in the have the same and that the relationship between the of pairs of is that their is (- 1 1)
• using to establish the distance between 2 2 2 in the and applying this using horizontal and vertical distances and
• investigating graphical and algebraic techniques for finding the midpoint and of the between 2 2 2
• using dynamic graphing software and superimposed images; for example, playground equipment, ramps and escalators, to investigate in and their relationship to rule of a linear , and interpret as a

constant of change in linear

• investigating how coordinate geometry and aspects of linear play a fundamental role in machine learning and predictive ; for example, detection and navigation by autonomous vehicles

Students learn to:

find the gradient of a line segment, the midpoint of the line interval and the distance distinct points on the Cartesian plane

(AC9M9A03)

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 .

Managing and operating

• Select and operate tools

Measurement and geometry

• Understanding geometric properties
• Understanding units of measurement

Managing and operating

• Select and operate tools

Measurement and geometry

• Understanding geometric properties

Number sense and algebra

• Number patterns and algebraic thinking

Snapshot – Number patterns and algebraic thinking

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

Content description

AC9M9A03

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 $A = \pi r^2$ to calculate the area of a circular space; uses $A = P(1+\frac{r}{n})^{nt}$ when working with compound interest; uses $v = u + at$ 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 – Select and operate tools

Digital Literacy: Managing and operating: Select and operate tools

Content description

AC9M9A03

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

AC9M9A03

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

AC9M9A03

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 – Select and operate tools

Digital Literacy: Managing and operating: Select and operate tools

Content description

AC9M9A03

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

AC9M9A03

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 – Number patterns and algebraic thinking

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

Content description

AC9M9A03

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 $\mathrm{A}=\mathrm{\pi r}^2$ to calculate the area of a circular space; uses $\mathrm{A}=\mathrm{P}(1+\frac{\mathrm{r}}{\mathrm{n}})^{\mathrm{nt}}$ when working with compound interest; uses $v=u+at$ 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)

AC9M9A04

identify and graph , solve graphically and numerically, and solve monic with integer roots , using graphing software and as appropriate

•
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Elaborations

- recognising that in a table of values, if the second difference between consecutive values of the dependent variable is constant, then it is a quadratic
- graphing using and comparing what is the same and what is different between these different and their respective graphs; interpreting features of the graphs such as symmetry, turning , maximum and minimum values, and determining when values of the lie within a given
- solving and comparing these to graphical solutions
- using graphs to determine the solutions of ; recognising that the roots of a correspond to the x x x -intercepts of its graph and that if the graph has no x x x -intercepts, then the corresponding has no real solutions
- relating horizontal axis intercepts of the graph of a to the factorised form of its rule using the null factor law; for example, the graph of the $y = x^2 - 5x + 6$ y=x^2-5x+6 $y = x^2 - 5x + 6$ can be represented as $y = (x-2)(x-3)$ y=(x-2)(x-3) $y = (x-2)(x-3)$ with x x x -axis intercepts where either $(x-2) = 0$ (x-2)=0 $(x-2) = 0$ or $(x-3) = 0$ (x-3)=0 $(x-3) = 0$
- recognising that the $x^2 = a$ x^2=a $x^2 = a$, where $a > 0$ a>0 $a > 0$, has 2 2 2 solutions, $x = \sqrt{a}$ x=\sqrt a $x = a$ ■ and $x = -\sqrt{a}$ x= x = - a \sqrt a a ■ ; for example, if $x^2 = 39$ x^2=39 $x^2 = 39$ then $x = \sqrt{39} = 6.245$ x=\sqrt{39}=6.245 $x = 39$ ■ = 6 . 2 4 5 correct to 3 3 3 places, or $x = -\sqrt{39}$ x= x = - 39 = \sqrt{39}= 3 9 ■ = - 6.245 6.245 6 . 2 4 5 correct to 3 3 3 places, and representing these graphically
- graphing of illumination of moon phases in to First Nations Australians' understandings that describe the different phases of the moon

Students learn to:

identify and graph quadratic functions, solve quadratic equations graphically and n

solve monic quadratic equations with integer roots algebraically, using graphing so

digital tools as appropriate

(AC9M9A04)

General capabilities and cross-curriculum priorities

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

Creating and exchanging

- Create, communicate and collaborate

Managing and operating

- Select and operate tools

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 .

Managing and operating

- Select and operate tools

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

WS03 - Fencing in the Vegetable Patch

Snapshot – Create, communicate and collaborate

Digital Literacy: Creating and exchanging: Create, communicate and collaborate

Content description

AC9M9A04

Continuum extract

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

- select and control advanced features of appropriate digital tools to independently create content

and effectively communicate and collaborate with wider groups
• select and control the features of digital tools to purposefully create content and effectively communicate and collaborate, inclusive of diverse groups

Snapshot – Select and operate tools

Digital Literacy: Managing and operating: Select and operate tools

Content description

AC9M9A04

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 – Number patterns and algebraic thinking

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

Content description

AC9M9A04

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 $A = \pi r^2$ \mathrm A=\mathrm{πr}^2 $A = \pi r^2$ to calculate the area of a circular space; uses $A = P(1 + \frac{r}{n})^{nt}$ \mathrm A=\mathrm P(1+\frac{\mathrm r}{\mathrm n})^{\mathrm{nt}} $A = P(1 + \frac{n}{r} \blacksquare)^{nt}$ when working with compound interest; uses $v = u + at$ v=u+at $v = u + at$ 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 – Select and operate tools

Digital Literacy: Managing and operating: Select and operate tools

Content description

AC9M9A04

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

AC9M9A05

use to solve applied problems involving change including financial ; formulate problems, choosing to use either linear or ; interpret solutions in terms of the situation; evaluate the model and report

methods and findings

•

•

Elaborations

• practical using such as cooking times that include resting or cooling times, or water leakage from water tanks, using tables and graphs or and

• measurement situations and determining the and of where the length, l l l, of the is a linear of its width, w w w ; for example, $l = w$, $l = w + 5$, $l = 3 w$, $l = 2 w + 7$

$l=w,\;l=w+5,\;l=3w,\;l=2w+7$ $l = w$, $l = w + 5$, $l = 3 w$, $l = 2 w + 7$

• practical using simple , tables and graphs (hand drawn or using) and , interpreting features of the graphs such as the turning and intercepts in ; for example, , paths of projectiles, parabolic mirrors, satellite dishes

• and solving problems involving financial using ; for example, combinations of purchases of different items when they have a amount of money to spend, profit/loss situations and trade quotes involving call out fees

• situations involving change; for example, change in daily temperature during the ski season, fluctuation of speed above and below the speed limit, acceleration and deceleration of a car coming to and moving off from a of traffic lights

• the hunting techniques of First Nations Australians using and exploring the effect of increasing the number of hunters to catch more prey

Students learn to:

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

(AC9M9A05)

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

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 .

Measurement and geometry

• Understanding units of measurement

Analysing

• Interpret concepts and problems

• Draw conclusions and provide reasons

Analysing

• Interpret concepts and problems

• Draw conclusions and provide reasons

Reflecting

• Transfer knowledge

Number sense and algebra

• Understanding money

Analysing

• Interpret concepts and problems

• Draw conclusions and provide reasons

Analysing

• Interpret concepts and problems

Inquiring

• Identify, process and evaluate information
Reflecting
• Transfer knowledge
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.
AC9HE9K03
AC9HE9K04
AC9HE9K05
AC9S9I04
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
AC9M9A05
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
AC9M9A05
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 – Number patterns and algebraic thinking
Numeracy: Number sense and algebra: Number patterns and algebraic thinking
Content description
AC9M9A05
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 $A = \pi r^2$ to calculate the area of a circular space; uses $A = P(1+\frac{r}{n})^{nt}$ when working with compound interest; uses $v = u + at$ 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 – Understanding units of measurement

Numeracy: Measurement and geometry: Understanding units of measurement

Content description

AC9M9A05

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 – Interpret concepts and problems

Critical and Creative Thinking: Analysing: Interpret concepts and problems

Content description

AC9M9A05

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

AC9M9A05

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

AC9M9A05

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

AC9M9A05

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 – Transfer knowledge

Critical and Creative Thinking: Reflecting: Transfer knowledge

Content description

AC9M9A05

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 money

Numeracy: Number sense and algebra: Understanding money

Content description

AC9M9A05

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 – Interpret concepts and problems

Critical and Creative Thinking: Analysing: Interpret concepts and problems

Content description

AC9M9A05

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

AC9M9A05

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

AC9M9A05

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 informatio

Content description

AC9M9A05

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

AC9M9A05

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

AC9M9A06

experiment with the effects of the of on graphs of related , using , making connections between graphical and algebraic representations, and generalising emerging patterns

•

•

Elaborations

• investigating of the graph of $y = x$ $y=x$ $y = x$ to the graph of $y = a x + b$ $y=ax+b$ $y = a x + b$ by systematic of a a a and b b b and interpretating the effects of these using ; for example, $y = x \rightarrow y = 2 x$ $y=x\rightarrow y=2x$ $y = x \rightarrow y = 2 x$ (vertical enlargement as $a > 1$ $a>1$ $a > 1$) $\rightarrow y = 2 x - 1$ $\rightarrow y=2x-1$ $\rightarrow y = 2 x - 1$ (vertical translation) and $y = x \rightarrow y = \frac{1}{2} x$ $y=x\rightarrow y=\frac12x$ $y = x \rightarrow y = 2\frac{1}{\blacksquare} x$ (vertical compression as $a < 1$ $a<1$ $a < 1$) $\rightarrow y = \rightarrow y= \rightarrow y = - \frac{1}{2} x$ $\frac12x$ $2\frac{1}{\blacksquare} x$ (reflection in the horizontal axis) $\rightarrow y = \rightarrow y= \rightarrow y = - \frac{1}{2} x + 3$ $\frac12x+3$ $2\frac{1}{\blacksquare} x + 3$ (vertical translation)

• investigating of the parabola $y = x 2$ $y=x^2$ $y = x 2$ in the using to determine the relationship between graphical and algebraic representations of , including the completed square form; for example, $y = x 2 \rightarrow y = \frac{1}{3} x 2$ $y=x^2\rightarrow y=\frac13x^2$ $y = x 2 \rightarrow y = 3\frac{1}{\blacksquare} x 2$ (vertical compression as $a < 1$ $a<1$ $a < 1$) $\rightarrow y = \frac{1}{3} (x - 5) 2$ $\rightarrow y=\frac13(x-5)^2$ $\rightarrow y = 3\frac{1}{\blacksquare} (x - 5) 2$ (horizontal translation) $\rightarrow y = \frac{1}{3} (x - 5) 2 + 7$ $\rightarrow y=\frac13(x-5)^2+7$ $\rightarrow y = 3\frac{1}{\blacksquare} (x - 5) 2 + 7$ (vertical translation) or $y = x 2 \rightarrow y = 2 x 2$ $y=x^2\rightarrow y=2x^2$ $y = x 2 \rightarrow y = 2 x 2$ (vertical enlargement as $a > 1$ $a>1$ $a > 1$) $\rightarrow y = \rightarrow y= \rightarrow y = - 2 x 2$ $2x^2$ $2 x 2$ (reflection in the horizontal axis) $\rightarrow y = \rightarrow y= \rightarrow y = - 2 (x + 6) 2$ $2(x+6)^2$ $2 (x + 6) 2$ (horizontal translation) $\rightarrow y = \rightarrow y= \rightarrow y = - 2 (x + 6) 2 + 10$ $2(x+6)^2+10$ $2 (x + 6) 2 + 1 0$ (vertical translation)

• experimenting with by applying to the graphs of , such as reciprocal $y = \frac{1}{x}$ $y=\frac1x$ $y = x 1 \blacksquare$, $y = x$ $y=\sqrt x$ $y = x \blacksquare$, cube $y = x 3$ $y=x^3$ $y = x 3$ and , $y = 2 x$ $y=2^x$ $y = 2 x$, $y = (\frac{1}{2}) x$ $y=(\frac12)^x$ $y = (2\frac{1}{\blacksquare}) x$, identifying patterns

• investigating how experimenting with the effects of the of of related can provide artificial intelligence researchers insights into the predictive behaviour of artificial intelligence models

Students learn to:

experiment with the effects of the variation of parameters on graphs of related funct

digital tools, making connections between graphical and algebraic representations,

emerging patterns

(AC9M9A06)

General capabilities and cross-curriculum priorities

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

Generating

• Create possibilities

Inquiring

• Identify, process and evaluate information

Investigating

• 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 .

Analysing

• Draw conclusions and provide reasons

Inquiring

• Identify, process and evaluate information

Managing and operating

• Select and operate tools

Analysing

• Draw conclusions and provide reasons

Generating

• Create possibilities

Investigating

• Interpret data

Managing and operating

• Select and operate tools

Analysing

• Draw conclusions and provide reasons

Generating

• Create possibilities

Investigating

• Interpret data

Managing and operating

• Select and operate tools

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.

AC9HE9K05

Snapshot – Create possibilities

Critical and Creative Thinking: Generating: Create possibilities

Content description

AC9M9A06

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 – Identify, process and evaluate information

Critical and Creative Thinking: Inquiring: Identify, process and evaluate informatio

Content description

AC9M9A06

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

AC9M9A06

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

AC9M9A06

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 – Draw conclusions and provide reasons

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

Content description

AC9M9A06

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 information

Content description

AC9M9A06

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

AC9M9A06

Continuum extract

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• 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 – Draw conclusions and provide reasons

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

Content description

AC9M9A06

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 – Create possibilities

Critical and Creative Thinking: Generating: Create possibilities

Content description

AC9M9A06

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 – Interpret data

Digital Literacy: Investigating: Interpret data

Content description

AC9M9A06

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

AC9M9A06

Continuum extract

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• 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 – Draw conclusions and provide reasons

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

Content description

AC9M9A06

Continuum extract

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• 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 – Create possibilities

Critical and Creative Thinking: Generating: Create possibilities

Content description

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Continuum extract

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Snapshot – Interpret data

Digital Literacy: Investigating: Interpret data

Content description

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Continuum extract

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• 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

AC9M9A06

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 – Number patterns and algebraic thinking

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

Content description

AC9M9A06

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 $A = \pi r^2$ $\mathrm A=\mathrm{\pi r}^2$ $A = \pi r 2$ to calculate the area of a circular space; uses $A = P(1+\frac{\mathrm r}{\mathrm n})^{\mathrm{nt}}$ $\mathrm A=\mathrm P(1+\frac{\mathrm r}{\mathrm n})^{\mathrm{nt}}$ 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)

AC9M9M01

solve problems involving the and of and using appropriate

•

Elaborations

• analysing of to generate short cuts and establish formulas for

• determining the amount of material needed to make can-coolers for a class fundraising project and working out the most cost-efficient way to cut out the pieces

• finding different that have the same but different , making as to what type of would have the smallest or largest

• investigating and technologies of First Nations Australians, analysing and connecting and , and exploring their relationship to their

Students learn to:

solve problems involving the volume and surface area of right prisms and cylinders units

(AC9M9M01)

General capabilities and cross-curriculum priorities

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

Measurement and geometry

• 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

• Draw conclusions and provide reasons

Analysing

• Interpret concepts and problems

Measurement and geometry

• Understanding units of measurement

Analysing

• Draw conclusions and provide reasons

Culture

• First Nations Australians' ways of life reflect unique ways of being, knowing, thinking and doing.

Related content

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

AC9TDE10P02

Resources

Work Samples

WS02 - Cylinder volume

Snapshot – Understanding units of measurement
Numeracy: Measurement and geometry: Understanding units of measurement

Content description

AC9M9M01

Learning progression extract

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

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

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

Content description

AC9M9M01

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

AC9M9M01

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

AC9M9M01

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 – Draw conclusions and provide reasons

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

Content description

AC9M9M01

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 – WS02 - Cylinder volume

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.

AC9M9M01

solve problems involving the volume and surface area of right prisms and cylinders using appropriate units

AC9M9M02

solve problems involving very small and very large measurements, time and expressed in

•

Elaborations

• representing very large and small in , converting expressed in into form; for example, the geological age of the earth is 4.6×10^9 4.6\times 10^9 4.6×10^9 years, the of a sugar molecule is 5.68×10^{-21} 5.68\times 10^{-21} 5.68×10^{-21} grams
• using knowledge of and applying to operate with numbers expressed in in applied ; for example, performing calculations involving extremely small numbers in scientific and other
• examining the degree of accuracy that different measurement instruments provide in a science laboratory, such as a measuring compared with a pipette, and recording values to the correct degree of accuracy using appropriate

Students learn to:

solve problems involving very small and very large measurements, time scales and

in scientific notation

(AC9M9M02)

General capabilities and cross-curriculum priorities

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

Measurement and geometry

• Measuring time

Number sense and algebra

• Multiplicative strategies

• Number and place value

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 .

Measurement and geometry

• Measuring time

Number sense and algebra

• Multiplicative strategies

• Number and place value

Number sense and algebra

• Multiplicative strategies

• Number and place value

Number sense and algebra

• Multiplicative strategies

• Number and place value

Related content

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

AC9S9I03

AC9S9I04

Snapshot – Measuring time

Numeracy: Measurement and geometry: Measuring time

Content description

AC9M9M02

Learning progression extract

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

Measuring time with large and small timescales

• uses appropriate metric prefixes to measure both large and small durations of time (e.g. millennia, nanoseconds)

• constructs timelines using an appropriate scale (e.g. chronologically sequences historical events)

Measuring how things change over time

• investigates, describes and interprets data collected over time (e.g. uses a travel graph to describe a journey; interprets data collected over a period of time using a graphical representation and makes a prediction for the future behaviour of the data)

Snapshot – Multiplicative strategies

Numeracy: Number sense and algebra: Multiplicative strategies

Content description

AC9M9M02

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 – Number and place value

Numeracy: Number sense and algebra: Number and place value

Content description

AC9M9M02

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 7×10^9 7 × 1 0 9 ; interprets the approximate mass of protons and neutrons as 1.67×10^{-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 $10 \times 10^2 = 10^3$ 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 1.5×10^8 1 . 5 × 1 0 8 as an approximation; a nanometre has an order of magnitude of − 9 9 9 and is represented as 10^{-9} 1 0 − 9)

Snapshot – Measuring time

Numeracy: Measurement and geometry: Measuring time

Content description

AC9M9M02

Learning progression extract

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

Measuring time with large and small timescales

• uses appropriate metric prefixes to measure both large and small durations of time (e.g. millennia, nanoseconds)

• constructs timelines using an appropriate scale (e.g. chronologically sequences historical events)

Measuring how things change over time

• investigates, describes and interprets data collected over time (e.g. uses a travel graph to describe a journey; interprets data collected over a period of time using a graphical representation and makes a prediction for the future behaviour of the data)

Snapshot – Multiplicative strategies

Numeracy: Number sense and algebra: Multiplicative strategies

Content description

AC9M9M02

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. $2 \times 2 \times 2 \times 3 \times 3 = 2^3 \times 3^2$ 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 × 3 is the same as 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 $15 \times \frac12 = 7.5$ 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 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 $0.5 \div 0.25$ 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% of 1600 uses 0.13×1600 or $1600 \div 100 \times 13$)

• 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■C)

Flexible strategies for working multiplicatively

• uses knowledge of place value and multiplicative partitioning to multiply and divide decimals efficiently (e.g. $0.461 \times 200 = 0.461 \times 100 \times 2 = 46.1 \times 2 = 92.2$)

• flexibly operates multiplicatively with extremely large or very small numbers expressed in scientific notation (e.g. calculates the area of a computer chip measuring 2.56×10^{-6} m in width by 1.4×10^{-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 – Number and place value

Numeracy: Number sense and algebra: Number and place value

Content description

AC9M9M02

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 °C is colder than the temperature -2.5 °C; recognises that negative numbers are less than zero; locates -12 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 $10, 100, 1000$ changes the positional value of the digits (e.g. explains that 100 times 0.125 is 12.5 because each digit value in 0.125 is multiplied by 100, so 100×0.1 is 10, 100×0.02 is 2 and 100×0.005 is 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 decimal places; if the percentage profit was calculated as 12.467921%, rounds the calculation to 12.5%)

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 $7\,000\,000\,000$ or 7×10^9; interprets the approximate mass of protons and neutrons as 1.67×10^{-24} 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 $10 \times 10^2 = 10^3$ 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 1.5×10^8 1 . 5 × 1 0 8 as an approximation; a nanometre has an order of magnitude of -9 9 9 and is represented as 10^{-9} 1 0 – 9)

Snapshot – Multiplicative strategies

Numeracy: Number sense and algebra: Multiplicative strategies

Content description

AC9M9M02

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

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• 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 $15 \times \frac{1}{2} = 7.5$ 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 $0.5 \div 0.25$ 0.5 \div 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 $1600 \div 100 \times 13$ 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. $0.461 \times 200 = 0.461 \times 100 \times 2 = 46.1 \times 2 = 92.2$ 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 2.56×10^{-6} 2.56 \times 10^{-6} 2 . 5 6 × 1 0 – 6 m in width by 1.4×10^{-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 – Number and place value

Numeracy: Number sense and algebra: Number and place value

Content description

AC9M9M02

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 $-10\,°C$ is colder than the temperature $-2.5\,°C$; recognises that negative numbers are less than zero; locates -12 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 $10, 100, 1000$ changes the positional value of the digits (e.g. explains that 100 times 0.125 is 12.5 because each digit value in 0.125 is multiplied by 100, so 100×0.1 is 10, 100×0.02 is 2 and 100×0.005 is 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 decimal places; if the percentage profit was calculated as $12.467921\,\%$, rounds the calculation to $12.5\,\%$)

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 $7\,000\,000\,000$ or 7×10^9; interprets the approximate mass of protons and neutrons as 1.67×10^{-24} 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 is 100 times greater than 10, and that is why $10 \times 10^2 = 10^3$ and why 10^3 divided by 10 is equal to 10^2)

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

Snapshot – Multiplicative strategies

Numeracy: Number sense and algebra: Multiplicative strategies

Content description

AC9M9M02

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. $2 \times 2 \times 2 \times 3 \times 3 = 2^3 \times 3^2$)

• identifies and describes products of the same number as square or cube numbers (e.g. 3×3 is the same as 3^2 which is read as 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 $15 \times \frac{1}{2} = 7.5$)

• connects and converts decimals to fractions to assist in mental computation involving multiplication or division (e.g. to calculate 16×0.25, recognises 0.25 as a quarter, and determines a quarter of 16 or determines $0.5 \div 0.25$, by reading this as "one half, how many quarters?" and gives the answer as 2

2)

• calculates the percentage of a quantity flexibly using multiplication and division (e.g. to calculate 13% of 1600 uses 0.13×1600 or $1600 \div 100 \times 13$)

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• uses knowledge of place value and multiplicative partitioning to multiply and divide decimals efficiently (e.g. $0.461 \times 200 = 0.461 \times 100 \times 2 = 46.1 \times 2 = 92.2$)

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Snapshot – Number and place value

Numeracy: Number sense and algebra: Number and place value

Content description

AC9M9M02

Learning progression extract

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

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AC9M9M03

solve spatial problems, applying properties, , , and trigonometry in right-angled triangles

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Elaborations

- investigating the applications of in authentic problems, including applying and trigonometry to problems in surveying and design
- applying the formula for calculation of distances between on the from their , emphasising the connection to vertical and horizontal displacements between the
- understanding the relationship between the corresponding sides of right-angled triangles and establishing the relationship between of figures and the of corresponding sides, the factor
- using images of proportional relationships to estimate actual measurements; for example, taking a photograph of a person standing in front of a tree and using the image and to estimate the height of the tree, discussing the findings and ways to improve the estimates
- investigating and involving triangles; for example, the triangle , and generalising links between the Pythagorean rule for right-angled triangles, and related inequalities for and triangles; determining the minimal of information for a triangle from which other can all be determined
- using knowledge of triangles, , and to design and a Biltmore stick used to the and height of a tree, and calculating the density and dry to predict how much paper could be manufactured from the tree
- investigating how autonomous vehicles solve spatial problems using based on geometric properties relating to , distances and

Students learn to:

solve spatial problems, applying angle properties, scale, similarity, Pythagoras' the
trigonometry in right-angled triangles

(AC9M9M03)

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

Measurement and geometry

- Understanding geometric properties
- Understanding units of measurement

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 .

Reflecting

- Transfer knowledge

Measurement and geometry

- Understanding geometric properties
- Understanding units of measurement

Number sense and algebra

- Proportional thinking

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

Measurement and geometry

• Understanding geometric properties
• Understanding units of measurement

Number sense and algebra

• Proportional thinking

Generating

• Consider alternatives

Reflecting

• Transfer knowledge

Measurement and geometry

• Understanding geometric properties
• Understanding units of measurement

Number sense and algebra

• Proportional thinking

Analysing

• Draw conclusions and provide reasons

Measurement and geometry

• Understanding geometric properties
• Understanding units of measurement

Number sense and algebra

• Proportional thinking

Measurement and geometry

• Understanding geometric properties
• Understanding units of measurement

Number sense and algebra

• Proportional thinking

Measurement and geometry

• Understanding geometric properties
• Understanding units of measurement

Number sense and algebra

• Proportional thinking

Related content

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

AC9TDE10P02

Resources

Work Samples

WS01 - Similar triangles

Snapshot – Interpret concepts and problems

Critical and Creative Thinking: Analysing: Interpret concepts and problems

Content description

AC9M9M03

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

AC9M9M03

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

AC9M9M03

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

AC9M9M03

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

AC9M9M03

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 $c = \frac{n}{v}$ $\blacksquare$ 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 . 0 3) 4 to make meaning of the formula

Snapshot – Transfer knowledge

Critical and Creative Thinking: Reflecting: Transfer knowledge

Content description

AC9M9M03

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 geometric properties

Numeracy: Measurement and geometry: Understanding geometric properties

Content description

AC9M9M03

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 $\blacksquare$ 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

AC9M9M03

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

AC9M9M03

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 $c = \frac{n}{v}$ 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 (1.03)^4 (1 . 0 3) 4 to make meaning of the formula

Snapshot – Understanding geometric properties

Numeracy: Measurement and geometry: Understanding geometric properties

Content description

AC9M9M03

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

AC9M9M03

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

AC9M9M03

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 $c = \frac{n}{v}$ 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

AC9M9M03

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

AC9M9M03

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

AC9M9M03

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

AC9M9M03

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

AC9M9M03

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 $c = \frac{n}{v}$ $c = \frac{n}{v}$ ■ 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 – Consider alternatives

Critical and Creative Thinking: Generating: Consider alternatives

Content description

AC9M9M03

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 – Transfer knowledge

Critical and Creative Thinking: Reflecting: Transfer knowledge

Content description

AC9M9M03

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 geometric properties

Numeracy: Measurement and geometry: Understanding geometric properties

Content description

AC9M9M03

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

AC9M9M03

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

AC9M9M03

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 $c = \frac{n}{v}$ 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 – Draw conclusions and provide reasons
Critical and Creative Thinking: Analysing: Draw conclusions and provide reasons
Content description
AC9M9M03
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
AC9M9M03
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

AC9M9M03

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

AC9M9M03

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 $c = \frac{n}{v}$ c=\frac nv $c = \frac{n}{v}$ ■ 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 geometric properties

Numeracy: Measurement and geometry: Understanding geometric properties

Content description

AC9M9M03

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

AC9M9M03

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 millimetres and its height is 1450 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

AC9M9M03

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 % (e.g. the entry price to the show has gone up from $\$20$ last year to $\$25$ this year, that's 125 % 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 % or 0.7 of the original marked price to apply a 30 % discount; multiplies by 1.03 when predicting a 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 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 $c=\frac{n}{v}$ ■ 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 % increase is achieved by multiplying by 1.03, and 4 successive increases is achieved by multiplying by $(1.03)^4$ to make meaning of the formula

Snapshot – Understanding geometric properties

Numeracy: Measurement and geometry: Understanding geometric properties

Content description

AC9M9M03

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

AC9M9M03

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
AC9M9M03

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 $c = \frac{n}{v}$ c=\frac nv $c = \frac{n}{v}$ ∎ 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

Resource – WS01 - Similar triangles

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.

AC9M9M03

solve spatial problems, applying angle properties, scale, similarity, Pythagoras' theorem and trigonometry in right-angled triangles

AC9M9M04

calculate and interpret absolute, relative and percentage in measurements, recognising that all measurements are estimates

•

Elaborations

• investigating as a percentage of the exact value; for example, comparing an of the number of people expected to come to an by subtracting the actual number that turned up to give an , then converting this into a percentage
• using absolute value in a percentage formula; considering when they would use the absolute value and when they would not, depending upon the
• calculating the percentage in expected budgets to actual expenditure
• estimating the accuracy of measurements in practical and giving suitable lower and upper bounds for measurement values
• investigating how calculating and interpreting absolute, relative and percentage in measurements relates to artificial intelligence systems such as regression models, estimating uncertainty and recommendation systems
Students learn to:

calculate and interpret absolute, relative and percentage errors in measurements, re all measurements are estimates

(AC9M9M04)

General capabilities and cross-curriculum priorities

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

Measurement and geometry

• Understanding units of measurement

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 .

Number sense and algebra

• Understanding money

Measurement and geometry

• Understanding units of measurement

Number sense and algebra

• Proportional thinking

Related content

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

AC9HE9K05

AC9S9I06

Snapshot – Understanding units of measurement

Numeracy: Measurement and geometry: Understanding units of measurement

Content description

AC9M9M04

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

AC9M9M04

Learning progression extract

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

Proportionality and the whole

• determines the whole given a percentage (e.g. given 20 20 2 0 % is 13 13 1 3 millilitres, determines the whole is 65 65 6 5 millilitres; given 20 20 2 0 % is 1300 1300 1 3 0 0 kilojoules, determines the whole is 6500 6500 6 5 0 0 kilojoules when calculating the amount of energy consumed as part of a daily recommended intake)
• identifies the common unit rate to compare rates expressed in different units (e.g. calculates best buys; compares the relative speed of 2 2 2 vehicles)
• identifies, compares, represents and solves problems involving different rates in real world contexts (e.g. measures heart rate and breathing rate to monitor the body's reaction to a range of physical activities)
• determines the equivalence between 2 2 2 rates or ratios by expressing them in their simplest form
• describes how the proportion is preserved when using a ratio (e.g. uses the ratio 1 : 4 : 15 1:4:15 1 : 4 : 1 5 for the composition of silver, copper and gold to determine the mass of copper in a rose gold ring that weighs 8 8 8 grams; applies an aspect ratio when resizing images of an artwork such as if the aspect ratio is 3 : 2 3:2 3 : 2 then a picture that is 600 600 6 0 0 pixels wide would be 400 400 4 0 0 pixels tall)

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)
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• 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 $c = \frac{n}{v}$ 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 1.03 , and 4 4 4 successive increases is achieved by multiplying by $(1.03)^4$ $(1.03)^4$ $(1.03)^4$ to make meaning of the formula

Snapshot – Understanding money

Numeracy: Number sense and algebra: Understanding money

Content description

AC9M9M04

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 10 % multiplies an amount by 0.1 0.1 0.1 to calculate the GST payable or divides the total paid by 11 11 11 to calculate the amount of GST charged; calculates the cost after a 25 25 25 % 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 100 100 100 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

AC9M9M04

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 π π

• calculates the circumference and the area of a circle using π π 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

AC9M9M04

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 $c = \frac{n}{v}$ c=\frac nv c = v n ■ and uses this relationship to make decisions when diluting solutions)

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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

AC9M9M05

use to solve practical problems involving , , and , including financial ; formulate the problems and interpret solutions in terms of the situation; evaluate the model and report methods and findings

•

•

Elaborations

• situations involving such as pro rata pay , exchange , multiple quotes for a job, conversion between or other appropriate science ; for example, Hooke's law and other science involving wave lengths and frequencies

• situations that impact on image editing used in social media and how may not be maintained and can result in distorted images

• situations involving compliance with building and construction standards in design and construction, such as the rise and tread of staircases, and vertical and horizontal components of escalators

• situations involving the application of in practical ; for example, density, birth, flow or heartbeats

• exploring fire techniques in land management practices used by First Nations Australians that use relationships, including the of fire in different fuel types to wind speed, temperature and relative humidity

Students learn to:

use mathematical modelling to solve practical problems involving direct proportion scale, including financial contexts; formulate the problems and interpret solutions i situation; evaluate the model and report methods and findings

(AC9M9M05)

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

Measurement and geometry

• Understanding geometric properties

Number sense and algebra

• Number patterns and algebraic thinking
• Proportional thinking
• Understanding money

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 .

Number sense and algebra

• Proportional thinking
• Understanding money

Managing and operating

• Select and operate tools

Responding to ethical issues

• Making and reflecting on ethical decisions

Understanding ethical concepts and perspectives

• Recognise influences on ethical behaviour and perspectives

Analysing

• Draw conclusions and provide reasons

Measurement and geometry

• Understanding geometric properties

Number sense and algebra

• Proportional thinking

Number sense and algebra

• Proportional thinking

Number sense and algebra

• Proportional thinking

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.

AC9HE9K05

AC9HE9S04

AC9HG9S05

AC9HP10P10

Snapshot – Interpret concepts and problems

Critical and Creative Thinking: Analysing: Interpret concepts and problems

Content description

AC9M9M05

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

AC9M9M05

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

AC9M9M05

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 – Number patterns and algebraic thinking

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

Content description

AC9M9M05

Learning progression extract

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

Algebraic expressions

• creates and identifies algebraic equations from word problems involving one or more operations (e.g. if a taxi charges $ 5 \$5 $ 5 call out fee then a flat rate of $ 2.30 \$2.30 $ 2 . 3 0 per km travelled, represents this algebraically as C = 5 + 2.3 d C=5+2.3d C = 5 + 2 . 3 d where d d d is the distance travelled in km and C C C is the total cost of the trip)
• identifies and justifies equivalent algebraic expressions
• interprets a table of values in order to plot points on a graph

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 – Proportional thinking

Numeracy: Number sense and algebra: Proportional thinking

Content description

AC9M9M05

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 $c = \frac{n}{v}$ 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 (1.03)^4 (1 . 0 3) 4 to make meaning of the formula

Snapshot – Understanding money

Numeracy: Number sense and algebra: Understanding money

Content description

AC9M9M05

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 – Proportional thinking

Numeracy: Number sense and algebra: Proportional thinking

Content description

AC9M9M05

Learning progression extract

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- 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)
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- 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)
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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 $c = \frac{n}{v}$ 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

AC9M9M05

Learning progression extract

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

Working with money proportionally

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• 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 – Select and operate tools

Digital Literacy: Managing and operating: Select and operate tools

Content description

AC9M9M05

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 – Making and reflecting on ethical decisions

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

Content description

AC9M9M05

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

AC9M9M05

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 – Draw conclusions and provide reasons

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

Content description

AC9M9M05

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

AC9M9M05

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
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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

AC9M9M05

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)
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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 $c = n v$ $c=\frac{n}{v}$ $c = \frac{n}{v}$ ■ and uses this relationship to make decisions when diluting solutions)
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Snapshot – Proportional thinking

Numeracy: Number sense and algebra: Proportional thinking

Content description

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Snapshot – Proportional thinking

Numeracy: Number sense and algebra: Proportional thinking

Content description

AC9M9M05
Learning progression extract

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

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capital gain; calculates percentage increase or decrease in international migration in Australia)
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AC9M9SP01

recognise the constancy of the , and for a given in right-angled triangles using properties of

•

Elaborations

• understanding the terms "base", "altitude", "hypotenuse", and "adjacent" and "opposite" sides to an , in a right-angled triangle, and identifying these for a given right-angled triangle
• investigating patterns to reason about nested triangles that are aligned on a coordinate plane, connecting ideas of parallel sides and identifying the constancy of of corresponding sides for a given
• establishing an understanding that the of an can be considered as the length of the altitude of a right-angled triangle with a hypotenuse of length one unit and similarly the as the length of the base of the same triangle, and relating this to enlargement and triangles
• relating the of an to the altitude and base of nested right-angled triangles, and connecting the of the at which the graph of a straight meets the positive direction of the horizontal coordinate axis to the of the straight

Students learn to:

recognise the constancy of the sine, cosine and tangent ratios for a given angle in r triangles using properties of similarity

(AC9M9SP01)

General capabilities and cross-curriculum priorities

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

Measurement and geometry

• Understanding geometric properties

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

• Draw conclusions and provide reasons

Analysing

• Interpret concepts and problems

• Draw conclusions and provide reasons

Analysing

• Draw conclusions and provide reasons

Snapshot – Understanding geometric properties

Numeracy: Measurement and geometry: Understanding geometric properties

Content description

AC9M9SP01

Learning progression extract

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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)

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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

AC9M9SP01

Learning progression extract

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

Applying proportion

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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 $c = \frac{n}{v}$ ■ 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 . 0 3) 4 to make meaning of the formula

Snapshot – Draw conclusions and provide reasons

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

Content description

AC9M9SP01

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

AC9M9SP01

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

AC9M9SP01

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 – Draw conclusions and provide reasons

AC9M9SP02

apply the to and using dynamic geometry software as appropriate; identify and explain aspects that remain the same and those that change

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Elaborations

• comparing the of lengths of corresponding sides of triangles and
• using the properties of to solve problems involving enlargement
• investigating and generalising patterns in length, , and when side lengths of and are enlarged or dilated by whole and ; for example, comparing an enlargement of a square and a cube of side length 2 2 2 by a factor of 3 3 3 increases the of the square, $2\ 2\ 2^2\ 2\ 2$, to $(3 \times 2) 2 = 9 \times 2\ 2 = 9$ $(3\times2)^2 = 9\times 2^2=9$ $(3 \times 2) 2 = 9 \times 2\ 2 = 9$ times the original and the of the cube, 2 3 $2^3\ 2\ 3$, to $(3 \times 2) 3 = 27 \times 2\ 3 = 27$ $(3\times2)^3=27\times 2^3=27$ $(3 \times 2) 3 = 2\ 7 \times 2\ 3 = 2\ 7$ times the

Students learn to:

apply the enlargement transformation to shapes and objects using dynamic geomet appropriate; identify and explain aspects that remain the same and those that chang

(AC9M9SP02)

General capabilities and cross-curriculum priorities

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

Analysing

• Draw conclusions and provide reasons

Managing and operating

• Select and operate tools

Measurement and geometry

• Understanding geometric properties

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

Related content

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

AC9TDE10P02

Snapshot – Draw conclusions and provide reasons

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

Content description

AC9M9SP02

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

AC9M9SP02

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

AC9M9SP02

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

AC9M9SP02

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 % (e.g. the entry price to the show has gone up from $\$20$ last year to $\$25$ this year, that's 125 % 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 % or 0.7 of the original marked price to apply a 30 % discount; multiplies by 1.03 when predicting a 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 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 $c=\frac{n}{v}$ ■ 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 % increase is achieved by multiplying by 1.03 , and 4 successive increases is achieved by multiplying by $(1.03)^4$ to make meaning of the formula

Snapshot – Interpret concepts and problems

Critical and Creative Thinking: Analysing: Interpret concepts and problems

Content description

AC9M9SP02

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

AC9M9SP02

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

AC9M9SP03

design, test and refine involving a sequence of steps and decisions based on geometric constructions and ; discuss and evaluate refinements

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Elaborations

• creating an algorithm using pseudocode or flow charts to apply the triangle , or an algorithm to generate Pythagorean triples
• creating and testing designed to or bisect , using pseudocode or flow charts
• developing an algorithm for an animation of a geometric construction, or a visual , evaluating the algorithm using test cases

Students learn to:

design, test and refine algorithms involving a sequence of steps and decisions base constructions and theorems; discuss and evaluate refinements

(AC9M9SP03)

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

• Create possibilities

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 .

Generating

• Create possibilities
• Consider alternatives

Measurement and geometry

• Understanding geometric properties
• Understanding units of measurement

Analysing

• Draw conclusions and provide reasons

Generating

• Create possibilities
• Consider alternatives
• Put ideas into action

Measurement and geometry

• Understanding geometric properties

Analysing

• Draw conclusions and provide reasons

Generating

• Create possibilities
• Consider alternatives
• Put ideas into action

Measurement and geometry

• Understanding geometric properties

Related content

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

AC9TDI10P05

AC9TDI10P06

Snapshot – Interpret concepts and problems

Critical and Creative Thinking: Analysing: Interpret concepts and problems

Content description

AC9M9SP03

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

AC9M9SP03

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 – Create possibilities

Critical and Creative Thinking: Generating: Create possibilities

Content description

AC9M9SP03

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 – Understanding geometric properties

Numeracy: Measurement and geometry: Understanding geometric properties

Content description

AC9M9SP03

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 – Create possibilities

Critical and Creative Thinking: Generating: Create possibilities

Content description

AC9M9SP03

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

AC9M9SP03

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

AC9M9SP03

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

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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

AC9M9SP03

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 – Draw conclusions and provide reasons

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

Content description

AC9M9SP03

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 – Create possibilities

Critical and Creative Thinking: Generating: Create possibilities

Content description

AC9M9SP03

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

AC9M9SP03

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

AC9M9SP03

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 – Understanding geometric properties

Numeracy: Measurement and geometry: Understanding geometric properties

Content description

AC9M9SP03

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 – Draw conclusions and provide reasons

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

Content description

AC9M9SP03

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 – Create possibilities

Critical and Creative Thinking: Generating: Create possibilities

Content description

AC9M9SP03

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

AC9M9SP03

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

AC9M9SP03

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 – Understanding geometric properties

Numeracy: Measurement and geometry: Understanding geometric properties

Content description

AC9M9SP03

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)
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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)

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Geometric properties

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• 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)

AC9M9ST01

analyse reports of in digital media and elsewhere for information on how was obtained to estimate and

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Elaborations

• investigating and evaluating statistical reports in the media and other places by linking claims to displays, statistics and representative

• investigating the use of statistics in reports regarding the of Australia's trade with other countries of the Asia region

• exploring how natural language processing (NLP) tools can be used to help analyse large of reports in digital media, expediting various processes, and discussing the benefits or limitations of using these tools

• investigating a of and its sources; for example, the age of residents in Australia, Cambodia and Tonga; the number of subjects studied at school in a year by 14 14 1 4 -year-old students in Australia, Singapore, Japan, South Korea and Timor-Leste

• analysing reports of public opinion on environmental issues, such as land clearing, wind farms or single use plastics; discussing methods of collection and the of any made

Students learn to:

analyse reports of surveys in digital media and elsewhere for information on how da to estimate population means and medians

(AC9M9ST01)

General capabilities and cross-curriculum priorities

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

Investigating

• Interpret data

Responding to ethical issues

• Explore ethical issues

Understanding ethical concepts and perspectives

• Explore ethical concepts

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 .

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

Reflecting on culture and cultural diversity

• Explore the influence of cultures on interactions

Growing Asia-Australia engagement

• Australia's developing and deepening relationships with the peoples of Asia influence both mutual understandings and expressions of citizenship and culture nationally, regionally and globally.

• Australia and Asia are interdependent through a range of historical and contemporary connections.

Understanding Asia's global significance

• The nations of Asia influence historical and contemporary global relationships, including international responses to global developments and events.

Responding to ethical issues

• Making and reflecting on ethical decisions

Understanding ethical concepts and perspectives

• Examine values, rights and responsibilities and ethical norms

Statistics and probability

• Interpreting and representing data

• Interpreting and representing data

Knowing Asia and its diversity

• People of the Asia region are diverse in backgrounds, experiences, stories, religions, beliefs and perspectives.

Understanding Asia's global significance

• The peoples of Asia shape human endeavour through aesthetic, creative, political, sporting, economic, technological and scientific domains.

Analysing

• Interpret concepts and problems

• Draw conclusions and provide reasons

Responding to ethical issues

• Making and reflecting on ethical decisions

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.

World views

• World views that recognise the interdependence of Earth's systems, and value diversity, equity and social justice, are essential for achieving sustainability.

Related content

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

Snapshot – Interpret data

Digital Literacy: Investigating: Interpret data

Content description

AC9M9ST01

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 – Explore ethical issues

Ethical Understanding: Responding to ethical issues: Explore ethical issues

Content description

AC9M9ST01

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: Explore

Content description

AC9M9ST01

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

AC9M9ST01

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

AC9M9ST01

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

AC9M9ST01

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

AC9M9ST01

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: Explore

Content description

AC9M9ST01

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 – Explore the influence of cultures on interactions

Intercultural Understanding: Reflecting on culture and cultural diversity: Explore cultures on interactions

Content description

AC9M9ST01

Continuum extract

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

• explain the influence of cultural and linguistic diversity on unfamiliar interactions, identifying
opportunities to show respect for cultural traditions

• analyse the influence of culture on interactions within and across cultural and linguistic groups,
developing opportunities for exchange and collaboration

Snapshot – Making and reflecting on ethical decisions

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

Content description

AC9M9ST01

Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• consider alternative■ethical responses■to an issue when making and reflecting on ethical decisions
• 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 – Examine values, rights and responsibilities and ethical norms

Ethical Understanding: Understanding ethical concepts and perspectives: Examir responsibilities and ethical norms

Content description

AC9M9ST01

Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• describe how the relationships between values, rights and responsibilities, and ethical norms influence responses and decisions related to ethical issues
• describe the relationship between the role of individual and community values, rights and responsibilities, and ethical norms when responding to ethical issues
• describe the importance of values, rights and responsibilities when reaching a position on an ethical issue, and evaluate their role in challenging and defending ethical norms

Snapshot – Interpreting and representing data

Numeracy: Statistics and probability: Interpreting and representing data

Content description

AC9M9ST01

Learning progression extract

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

Interpreting graphical representations

• uses features of graphical representations to make predictions (e.g. predicts audience numbers based on historical data; interprets a range of graphs to identify possible trends and make predictions such as economic growth, stock prices, interest rates, population growth)
• summarises data using fractions, percentages and decimals (e.g. 2 3 \frac23 3 2 ■ of a class live in the same suburb; represents road safety and sun safety statistics as a percentage of the Australian population)
• explains that continuous variables depicting growth or change often vary over time (e.g. creates growth charts to illustrate impacts of financial decisions; describes patterns in inflation rates, employment rates, migration rates over time; represents changes to fitness levels following the implementation of a personal fitness plan; interprets temperature charts)
• interprets graphs depicting motion such as distance–time and velocity–time graphs
• interprets and describes patterns in graphical representations of data from real-life situations such as the motion of a rollercoaster, flight trajectory of a basketball shot and the spread of disease
• investigates the association of 2 2 2 numerical variables through the representation and interpretation of bivariate data (e.g. uses scatter plots to represent bivariate data when investigating the relationship between 2 2 2 variables, such as income per capita, population density and life expectancy for different socio-economic groups)
• investigates, represents and interprets time series data (e.g. interrogates a time series graph showing the change in costs over time; uses a maximum daily temperature chart to determine the average temperature for the month)
• interprets the impact of changes to data (e.g. recognises the impact of outliers on a data set such as the income of a world-class professional athlete on the average income of players at the state/territory level; uses digital tools to enhance the quality of data in a science investigation)

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 – Interpreting and representing data

Numeracy: Statistics and probability: Interpreting and representing data

Content description

AC9M9ST01

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

AC9M9ST01

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

AC9M9ST01

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 – Making and reflecting on ethical decisions

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

Content description

AC9M9ST01

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

AC9M9ST02

**analyse how different methods can affect the results of and how choice of representation can be used
to support a particular of view**

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•

Elaborations

• investigating and analysing different of such as infographics found in the media and commenting on
the strengths, weaknesses and possible of particular examples
• discussing the impact of decreased landline usage or an increased aversion to answering calls from
unknown numbers on
• exploring potential cultural relating to First Nations Australians by critically analysing
techniques in statistical reports

Students learn to:

analyse how different sampling methods can affect the results of surveys and how representation can be used to support a particular point of view

(AC9M9ST02)

General capabilities and cross-curriculum priorities

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

Analysing

• Draw conclusions and provide reasons

Responding to ethical issues

• Making and reflecting on ethical decisions

Understanding ethical concepts and perspectives

• Recognise influences on ethical behaviour and perspectives

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

• Acquire and collate data

• Interpret data

Responding to ethical issues

• Making and reflecting on ethical decisions

Responding to ethical issues

• Making and reflecting on ethical decisions

Culture

• First Nations Australian societies are diverse and have distinct cultural expressions such as language, customs and beliefs. As First Nations Peoples of Australia, they have the right to maintain, control, protect and develop their cultural expressions, while also maintaining the right to control, protect and develop culture as Indigenous Cultural and Intellectual Property.

Related content

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

AC9HE9S02

AC9HG9S02

AC9S9I06

AC9TDI10P01

Snapshot – Draw conclusions and provide reasons

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

Content description

AC9M9ST02

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 – Making and reflecting on ethical decisions

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

Content description

AC9M9ST02

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

AC9M9ST02

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 – Interpreting and representing data

Numeracy: Statistics and probability: Interpreting and representing data

Content description

AC9M9ST02

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 – Acquire and collate data

Digital Literacy: Investigating: Acquire and collate data

Content description

AC9M9ST02

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

AC9M9ST02

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 – Making and reflecting on ethical decisions

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

Content description

AC9M9ST02

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 – Making and reflecting on ethical decisions

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

Content description

AC9M9ST02

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

AC9M9ST03

represent the distribution of multiple for using comparative representations; compare with consideration of , and , and the effect of on these

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Elaborations

• describing the of the distribution of using terms such as "positive skew", "negative skew" and "symmetric" and "bi-modal"
• using to compare 2 2 2 like of such as the heights of girls and the heights of boys in a class
• constructing grouped that show trends in health issues such as lung cancer, leukemia, stroke and diabetes, and using the graph to justify, verify or invalidate claims
• exploring comparative presented in reports by National Indigenous Australians Agency in regard to "Closing the Gap", discussing the comparative distributions within the of the ; for example, comparative presented in the "Closing the Gap – Prime Minister's Report"
Students learn to:

represent the distribution of multiple data sets for numerical variables using compa representations; compare data distributions with consideration of centre, spread an effect of outliers on these measures

(AC9M9ST03)

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

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 .

Speaking and listening

• Speaking

Analysing

• Draw conclusions and provide reasons

Investigating

• Acquire and collate data
• Interpret data

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.

AC9HC9S02

AC9HE9S02

AC9HG9S02

AC9S9I05

Snapshot – Interpret concepts and problems

Critical and Creative Thinking: Analysing: Interpret concepts and problems

Content description

AC9M9ST03

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

AC9M9ST03

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 – Interpreting and representing data

Numeracy: Statistics and probability: Interpreting and representing data

Content description

AC9M9ST03

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 – Speaking

Literacy: Speaking and listening: Speaking

Content description

AC9M9ST03

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 – Draw conclusions and provide reasons

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

Content description

AC9M9ST03

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

AC9M9ST03

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

AC9M9ST03

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

AC9M9ST04

choose appropriate forms of display or visualisation for a given type of ; justify selections and interpret displays for a given

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Elaborations

• comparing using , and to describe and interpret in terms of and using , , or
• choosing the type of representations based on the type: categorical (nominal or ordinal) or numerical (discrete or continuous)
• using different of , including non-standard representations such as infographics, and discussing their purpose, intended audience; evaluating how well they communicate responses to statistical questions of interest
• comparing and interpreting stacked bar charts, charts and , discussing how they represent larger categories that can be subdivided into smaller categories and how information that can be obtained from these displays can be used for comparison
• using , including generative artificial intelligence, to generate different and using existing , and discussing which form is more appropriate for the given

Students learn to:

choose appropriate forms of display or visualisation for a given type of data; justify and interpret displays for a given context

(AC9M9ST04)

General capabilities and cross-curriculum priorities

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

Analysing

• Draw conclusions and provide reasons

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 .

Analysing

• Interpret concepts and problems

Reading and viewing

• Understanding texts

Speaking and listening

• Interacting
Statistics and probability

• Interpreting and representing data
Investigating

• Interpret data
Speaking and listening

• Interacting
Investigating

• Interpret data
Statistics and probability

• Interpreting and representing data

• Interpreting and representing data
Related content

This content description can be taught with the following content descriptions from other learning
areas.
AC9HC9S02
AC9HE9S02
AC9HG9S02
AC9S9I04
AC9TDI10P02

Snapshot – Draw conclusions and provide reasons

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

Content description

AC9M9ST04
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 – Interpreting and representing data

Numeracy: Statistics and probability: Interpreting and representing data

Content description

AC9M9ST04
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

AC9M9ST04

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 texts

Literacy: Reading and viewing: Understanding texts

Content description

AC9M9ST04

Learning progression extract

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

Comprehension

• reads and views elementary texts (see Text complexity)
• locates information or details embedded in the text
• identifies the main idea in an elementary text
• identifies the purpose of a broad range of informative, imaginative and persuasive texts (e.g. advertisements, diary entry)
• draws inferences and identifies supporting evidence in the text
• monitors the development of ideas using language and visual features (e.g. topic sentences, key verbs, graphs)
• recognises that texts can present different points of view
• distinguishes between fact and opinion in texts
• compares and contrasts texts on the same topic to identify how authors represent the same ideas differently

Processes

• integrates phonic knowledge, word recognition skills, grammatical and contextual knowledge to read elementary texts (see Phonic knowledge and word recognition and Fluency)
• identifies language features that signal purpose in an elementary text (e.g. diagrams, dialogue)
• uses strategies to predict and confirm meaning (e.g. uses sentence structure to predict how ideas will be developed)
• navigates texts using common signposting devices such as headings, subheadings, paragraphs, navigation bars and links

Vocabulary

• interprets creative use of figurative language (e.g. metaphor, simile, onomatopoeia)
• interprets unfamiliar words using grammatical knowledge, morphological knowledge and etymological knowledge
• describes the language and visual features of texts using metalanguage (e.g. grammatical terms such as "cohesion", "tense", "noun groups/phrases")
• recognises how synonyms are used to enhance a text (e.g. "transport", "carry", "transfer")
• draws on knowledge of word origin to work out meaning of discipline-specific terms (e.g. "universe")
• recognises how evaluative and modal words are used to influence the reader (e.g. "important", "should", "dirty")

Comprehension

• reads and views some moderately complex texts (see Text complexity)
• accurately retells a text including most relevant details
• identifies main idea and related or supporting ideas in moderately complex texts (see Text complexity)
• evaluates the accuracy within and across texts on the same topic
• explains how authors use evidence and supporting detail to build and verify ideas
• draws inferences and verifies using textual evidence

Processes

• monitors reading for meaning using grammatical and contextual knowledge (see Fluency)
• explains how textual features support the text's purpose
• identifies and explains techniques used to present perspective (e.g. emotive or descriptive language, order in which ideas are presented)
• predicts the development of ideas based on a partial read (e.g. predicts the final chapter of a narrative, drawing on understanding of the textual features in the previous chapters)
• uses prior knowledge and context to read unknown words (e.g. uses morphemic knowledge of "explosion" to decode "explosive" and uses context and knowledge of metaphorical use of language to understand "explosive outburst")
• uses knowledge of cohesive devices to track meaning throughout a text (e.g. connectives such as "however", "on the other hand") (see Grammar)
• uses knowledge of the features and conventions of the type of text to build meaning (e.g. recognises that the beginning of a persuasive text may introduce the topic and the line of argument)
• identifies language features used to present opinions or points of view
• skims and scans texts for key words to track the development of ideas
• uses sophisticated punctuation to support meaning (e.g. commas to separate clauses in complex sentences)

Vocabulary

• uses knowledge of prefixes and suffixes to read and interpret unfamiliar words
• identifies how technical and discipline-specific words develop meaning in texts
• analyses the effect of antonyms, synonyms and idiomatic language
• understands precise meaning of words with similar connotations (e.g. "generous", "kind-hearted", "charitable")

Comprehension

• reads and views complex texts (see Text complexity)
• identifies the main themes or concepts in complex texts by synthesising key ideas or information
• summarises the text, identifying key details only
• draws inferences, synthesising clues and evidence across a text
• builds meaning by actively linking ideas from a number of texts or a range of digital sources
• distils information from a number of texts according to task and purpose (e.g. uses graphic organisers)
• identifies different interpretations of the text citing evidence from a text
• evaluates language features for relevance to purpose and audience
• analyses texts that have more than one purpose and explains how parts of the text support a particular purpose
• analyses the use of language appropriate to different types of texts (e.g. compare the use of pun in imaginative and persuasive texts)
• identifies techniques used to obscure author's purpose (e.g. inclusion or omission of content)

Processes

• uses processes such as predicting, confirming predictions, monitoring, and connecting relevant elements of the text to build or repair meaning
• uses knowledge of a broader range of cohesive devices to track meaning (e.g. word associations) (see Grammar)
• selects reading or viewing strategies appropriate to reading purpose (e.g. scans text for evidence)
• judiciously selects texts for learning area tasks and purposes

Vocabulary

• identifies language used to create tone or atmosphere

• analyses language and visual features in texts using metalanguage (e.g. cohesion, interpretation, figurative)
• applies knowledge of base words and word origins to understand the meaning of unfamiliar, discipline-specific words
• uses a range of context and grammatical cues to understand unfamiliar words
• interprets complex figurative language (e.g. euphemisms, hyperbole)

Snapshot – Interacting

Literacy: Speaking and listening: Interacting

Content description

AC9M9ST04

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 – Interpreting and representing data

Numeracy: Statistics and probability: Interpreting and representing data

Content description

AC9M9ST04

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

AC9M9ST04

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 – Interacting

Literacy: Speaking and listening: Interacting

Content description

AC9M9ST04

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 data

Digital Literacy: Investigating: Interpret data

Content description

AC9M9ST04

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

AC9M9ST04

Learning progression extract

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

Interpreting graphical representations

• uses features of graphical representations to make predictions (e.g. predicts audience numbers

based on historical data; interprets a range of graphs to identify possible trends and make predictions such as economic growth, stock prices, interest rates, population growth)
• summarises data using fractions, percentages and decimals (e.g. 2 3 \frac23 3 2 ■ of a class live in the same suburb; represents road safety and sun safety statistics as a percentage of the Australian population)
• explains that continuous variables depicting growth or change often vary over time (e.g. creates growth charts to illustrate impacts of financial decisions; describes patterns in inflation rates, employment rates, migration rates over time; represents changes to fitness levels following the implementation of a personal fitness plan; interprets temperature charts)
• interprets graphs depicting motion such as distance–time and velocity–time graphs
• interprets and describes patterns in graphical representations of data from real-life situations such as the motion of a rollercoaster, flight trajectory of a basketball shot and the spread of disease
• investigates the association of 2 2 2 numerical variables through the representation and interpretation of bivariate data (e.g. uses scatter plots to represent bivariate data when investigating the relationship between 2 2 2 variables, such as income per capita, population density and life expectancy for different socio-economic groups)
• investigates, represents and interprets time series data (e.g. interrogates a time series graph showing the change in costs over time; uses a maximum daily temperature chart to determine the average temperature for the month)
• interprets the impact of changes to data (e.g. recognises the impact of outliers on a data set such as the income of a world-class professional athlete on the average income of players at the state/territory level; uses digital tools to enhance the quality of data in a science investigation)

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)
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• 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 – Interpreting and representing data

Numeracy: Statistics and probability: Interpreting and representing data

Content description

AC9M9ST04

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)

AC9M9ST05

plan and conduct involving the collection and analysis of different kinds of ; report findings and discuss the strength of evidence to support any conclusions

•

•

•

Elaborations

• planning and conducting an investigation using questions together with analysis of secondary collected from online bases such as the Australian Bureau of Statistics

• planning and conducting an investigation relating to consumer spending habits; market research on what teenagers are prepared to spend on technology compared to clothing, with consideration of techniques and potential sources of

• investigating where would be the best location for a tropical fruit plantation by conducting a statistical investigation comparing different such as the annual rainfall in various parts of Australia, Indonesia, New Guinea and Malaysia, land prices and associated farming costs

• posing statistical questions, collecting, representing and interpreting from different sources in to reconciliation, considering the relationships between

Students learn to:

plan and conduct statistical investigations involving the collection and analysis of of data; report findings and discuss the strength of evidence to support any conclu

(AC9M9ST05)

General capabilities and cross-curriculum priorities

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

Inquiring

• Develop questions

• Identify, process and evaluate information

Responding to ethical issues

• Explore ethical issues

Understanding ethical concepts and perspectives

• Explore ethical concepts

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

• Acquire and collate data
• Interpret data

Statistics and probability

• Interpreting and representing data

Responding to ethical issues

• Making and reflecting on ethical decisions

Number sense and algebra

• Understanding money

Statistics and probability

• Interpreting and representing data

Analysing

• Interpret concepts and problems
• Draw conclusions and provide reasons

Number sense and algebra

• Understanding money

Statistics and probability

• Interpreting and representing data

Analysing

• Interpret concepts and problems
• Draw conclusions and provide reasons

Statistics and probability

• Interpreting and representing data

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.
AC9HC9S02
AC9HE9S03
AC9HG9S02
AC9S9I02
AC9S9I05
AC9TDI10P01
AC9TDI10P02

Snapshot – Develop questions

Critical and Creative Thinking: Inquiring: Develop questions

Content description

AC9M9ST05

Continuum extract

The following continuum extract shows the alignment of the continuum with this content.
• develop questions to investigate complex issues and topics
• questions developed assist in forming an understanding of why phenomena or issues arise
• develop questions to investigate complex issues and topics
• questions developed facilitate increasing understanding of abstract ideas and concepts

Snapshot – Identify, process and evaluate information

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

Content description

AC9M9ST05

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

AC9M9ST05

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

AC9M9ST05

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

AC9M9ST05

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 – Acquire and collate data

Digital Literacy: Investigating: Acquire and collate data

Content description

AC9M9ST05

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

AC9M9ST05

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

AC9M9ST05

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)
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• 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)
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• 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

AC9M9ST05

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 – Understanding money

Numeracy: Number sense and algebra: Understanding money

Content description

AC9M9ST05

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 – Interpreting and representing data

Numeracy: Statistics and probability: Interpreting and representing data

Content description

AC9M9ST05

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

AC9M9ST05

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

AC9M9ST05

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 money

Numeracy: Number sense and algebra: Understanding money

Content description

AC9M9ST05

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 – Interpreting and representing data

Numeracy: Statistics and probability: Interpreting and representing data

Content description

AC9M9ST05

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)

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• 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

AC9M9ST05

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

AC9M9ST05

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 – Interpreting and representing data

Numeracy: Statistics and probability: Interpreting and representing data

Content description

AC9M9ST05

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)
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• 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)
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• 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)

AC9M9P01

list all outcomes for both with and without replacement, using lists, , tables or ; to outcomes
•

Elaborations

• discussing two-step , such as the game of Heads and Tails, describing the different outcomes and their related probabilities
• using systematic methods such as lists or to record outcomes and , such as drawing the names of students from a bag to appoint 2 2 2 team leaders
• using a tree diagram to represent a three-stage and assigning probabilities to these ; for example, selecting 3 3 3 cards from a deck, assigning the of drawing an ace, then a king, then a queen of the same suit, with and without replacing the cards after every draw
• assigning probabilities to involving the random selection of people from a given ; for example, selecting 2 2 2 names at random from all of the students at a high school and assigning the that they are both in Year 9

Students learn to:

list all outcomes for compound events both with and without replacement, using lis

tables or arrays; assign probabilities to outcomes

(AC9M9P01)

General capabilities and cross-curriculum priorities

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

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 .

Speaking and listening

• Interacting

Related content

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

AC9TDI10P05

Snapshot – Understanding chance

Numeracy: Statistics and probability: Understanding chance

Content description

AC9M9P01

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 $\frac{1}{6}$ 6 1 ■ and the probability of not rolling a 3 3 3 is 5 6 $\frac{5}{6}$ 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 – Interacting

Literacy: Speaking and listening: Interacting

Content description

AC9M9P01

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

AC9M9P02

calculate relative frequencies from given or collected to estimate probabilities of involving "and", inclusive "or" and exclusive "or"

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Elaborations

- understanding that relative frequencies from large or long-run experiments can provide reliable of and can be used to make predictions of decisions
- using or to estimate frequencies of involving "and", "or" questions
- designing, testing and refining an algorithm used to determine relative frequencies from a generated , to estimate different probabilities

Students learn to:

calculate relative frequencies from given or collected data to estimate probabilities involving "and", inclusive "or" and exclusive "or"

(AC9M9P02)

General capabilities and cross-curriculum priorities

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

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 .

Investigating

- Acquire and collate data
- Interpret data

Statistics and probability

- Interpreting and representing data

Investigating

- Acquire and collate data

Statistics and probability

- Understanding chance

Related content

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

AC9TDI10P05

Snapshot – Understanding chance

Numeracy: Statistics and probability: Understanding chance

Content description

AC9M9P02

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 $\frac{1}{6}$ 6 1 ■ and the probability of not rolling a 3 3 3 is 5 6 $\frac{5}{6}$ 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 – Acquire and collate data

Digital Literacy: Investigating: Acquire and collate data

Content description

AC9M9P02

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

AC9M9P02

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

AC9M9P02

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 – Acquire and collate data

Digital Literacy: Investigating: Acquire and collate data

Content description

AC9M9P02

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 – Understanding chance

Numeracy: Statistics and probability: Understanding chance

Content description

AC9M9P02

Learning progression extract

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

Probabilities

• expresses the theoretical probability of an event as the number of ways an event can happen out of the total number of possibilities

• identifies a range of chance events that have a probability from $0 - 1$ $0 - 1$ $0 - 1$ (e.g. you have zero probability of rolling a 7 7 7 with one roll of a standard 6 6 6 -sided dice; the probability that tomorrow is Wednesday given today is Tuesday is one)

• describes probabilities as fractions of one (e.g. the probability of an even number when rolling a dice is $3 6$ $\frac36$ $6 3$ ■)

• expresses probabilities as fractions, decimals, percentages and ratios recognising that all probabilities lie on a measurement scale of zero to one (e.g. uses numerical representations such as 75 75 7 5 % chance of rain or 4 4 4 out 5 5 5 people liked the story; explains why you can't have a probability less than zero)

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

AC9M9P03

design and conduct repeated and , using to compare probabilities of simple to related , and describe results

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Elaborations

• using to conduct that demonstrate the relationship between the of and the individual probabilities

• comparing experiments which differ only by being undertaken with replacement or without replacement

• conducting two-step using systematic methods to list outcomes of experiments and to list outcomes favourable to an

• using repeated of First Nations Australian children's instructive games; for example, Gorri from all parts of Australia, to calculate the probabilities of winning and not winning

Students learn to:

design and conduct repeated chance experiments and simulations, using digital too probabilities of simple events to related compound events, and describe results

(AC9M9P03)

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

• Create possibilities

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

Managing and operating

• Select and operate tools

Analysing

• Interpret concepts and problems
• Draw conclusions and provide reasons

Analysing

• Interpret concepts and problems
• Draw conclusions and provide reasons

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.

AC9HE9S03
AC9HG9S02
AC9S9I04
AC9TDI10P02

Snapshot – Interpret concepts and problems

Critical and Creative Thinking: Analysing: Interpret concepts and problems

Content description

AC9M9P03

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

AC9M9P03

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 – Create possibilities

Critical and Creative Thinking: Generating: Create possibilities

Content description

AC9M9P03

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 – Acquire and collate data

Digital Literacy: Investigating: Acquire and collate data

Content description

AC9M9P03

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

AC9M9P03

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

AC9M9P03

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

AC9M9P03

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 $\frac{1}{6}$ 6 1 ■ and the probability of not rolling a 3 3 3 is 5 6 $\frac{5}{6}$ 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

AC9M9P03

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 – Select and operate tools

Digital Literacy: Managing and operating: Select and operate tools

Content description

AC9M9P03

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

AC9M9P03

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

AC9M9P03

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

AC9M9P03

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

AC9M9P03

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