Holy Cross
CATHOLIC HIGH SCHOOL

Maths

Scheme of Work

Maths Scheme of Learning Information

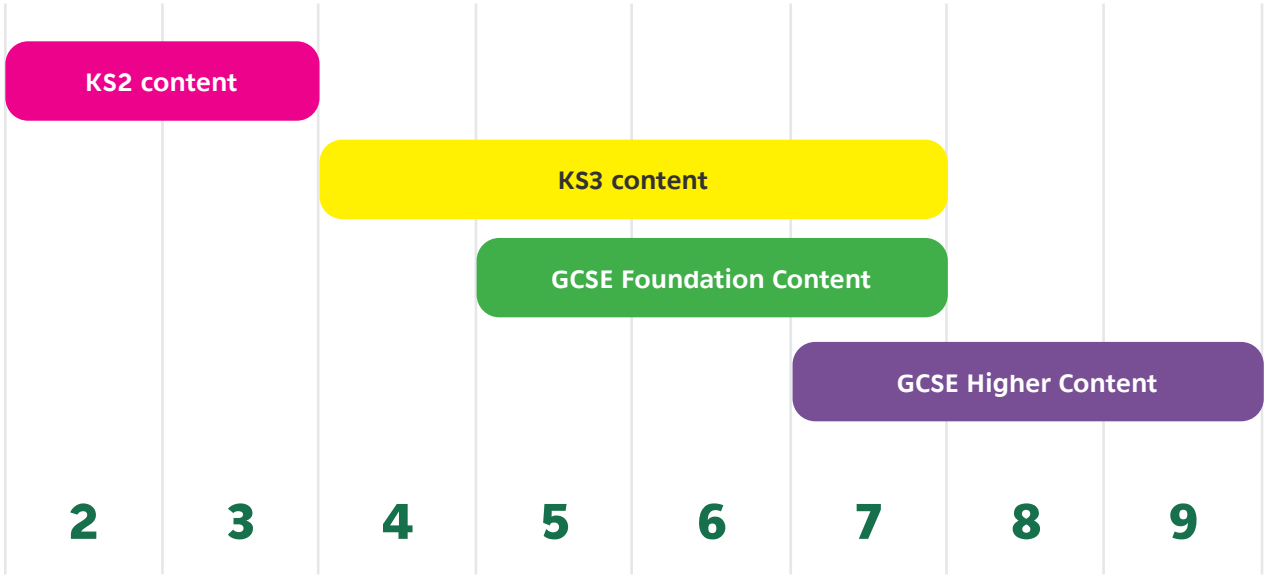
Holy Cross maths scheme of work has been collaboratively developed and is based on a model of progression with fluency, reasoning and problem solving at the heart. Originally created by a working group of local maths teachers under the guidance and with support from the Lancashire Maths Consultant. The scheme is regularly developed and updated to ensure it meets the needs of our pupils. Gaps in pupil's knowledge, and local demographics are considered when updates are made.

Our spiral curriculum model is designed to be ambitious, to stretch and challenge pupils of all backgrounds ensuring pupils master new concepts and ideas whilst building their confidence in maths. We use a spiral curriculum so that pupils revisit each topic area regularly, increasing in complexity, throughout their school life. We incorporate ample opportunities of retrieval practice within our lessons and homeworks, this allows pupils to further develop their understanding of topics in lessons. This is part of our approach of teaching for mastery. Our clear and coherent learning objectives ensure pupils do not repeat work unnecessarily.

The sequence of learning is carefully chosen enabling new learning to be related to prior knowledge. Prior concepts are reviewed to encourage essential learning connections. With the disruption to schooling over the past couple of years, our spiral approach to the curriculum has meant we have been able to meet the needs of our pupils.

Pupils who are working below expected standards begin on a stage appropriate for their learning, giving them the opportunity to consolidate their understanding through additional practice. Similarly, those pupils working above expected standards begin on a suitably challenging higher stage. The majority of our pupils begin the sequence of learning at stage 4. Decisions about when to progress are based on pupil's security of understanding and the readiness to progress. As such classes are working at their own pace through the sequence of learning under the experience and expertise of their subject-specialist teacher. The key aspect of our approach is that every pupil can learn. If a pupil starts at the right place and is given the right amount of time, they can make progress whilst developing a love of maths.

Stages



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Maths

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Averages And Cumulative Frequency

Stage	Objectives
3	Calculate the mean of a set of data
	Solve problems involving the mean
4	Find the mode, median and range of a set of data
	Calculate the mean, median, mode and range from a frequency table
	Solve problems involving averages including reverse mean
6	Understand and calculate the interquartile range of a set of data
	Identify and understand how outliers affect data when finding averages and the range/ interquartile range
	Decide which average is best to use for a given situation
	Using averages, range and interquartile range to describe and compare data sets
	Use lists, tables or diagrams to find averages including stem & leaf diagrams and vertical line charts
7	Calculate an estimate of the mean from a grouped frequency table
	Know why it is an estimate of the mean from a grouped frequency table
	Find the class interval containing the median from a grouped frequency table
	State the modal class from a grouped frequency table
8	Construct a cumulative frequency table and draw a cumulative frequency diagram
	Read off the median, lower and upper quartiles from a cumulative frequency diagram
	Calculate the interquartile range from a cumulative frequency diagram
	Construct a box plot from a set of data and a cumulative frequency diagram
	Calculate the range and inter-quartile range from a box plot and interpret a box plot
	Compare box plots

Algebraic Manipulation

Stage	Objectives
3	Use notation and symbols correctly
	Substitute into expressions
	Form a linear expression
	Substitute into and find missing values in function machines
4	Collect like terms
	Simplify expressions involving multiplying and dividing using correct notation
	Understand that algebraic operations follow the rules of arithmetic
	Expand and simplify expressions involving single brackets
	Know the terminology expression, identity, term and factor
	Factorise a linear expression
	Find equivalent expressions
6	Expand and simplify the product of two linear expressions including squaring a linear expression
	Factorise quadratic expressions when the coefficient of x^2 is 1
	Factorise by finding the difference of two squares
	Form a quadratic expression
	Find equivalent expressions
8	Use simple proofs to show that two expressions are equivalent
	Multiply more than two brackets together
	Factorise quadratic expressions when the coefficient of x^2 is >1
	Complete the square including for expressions when the coefficient of x^2 is >1
	Find the vertex of a parabola
9	Understand, interpret and use composite and inverse functions

Angles

Stage	Objectives
3	Name different types of angles
	Label angles with the correct notation
	Measure angles including angles inside shapes
	Estimate the size of angles
	Find missing angles at a point, at a point on a straight line and vertically opposite angles
4	Label the sides and angles in different ways
	Find missing angles in polygons
	Find the sum of the interior angles of a polygon
	Understand why some shapes tessellate
5	Understand that the exterior angle of a triangle is equal to the sum of the interior angles at the other two vertices
	Find and label alternate, co-interior and corresponding angles in parallel lines
	Solve problems involving angles in parallel lines
	State angle facts when giving reasons for your answers using angle notation
6	Know the sum of the exterior angles of a polygon
	Work out the size of an exterior angle of a regular polygon
	Work out the number of sides of a polygon given information about the angles
	Solve problems involving interior and exterior angles of polygons
	Recall and use the eight points of the compass and their bearings
	Draw and measure bearings
	Work out the bearing to return to a point, given the bearing to leave that point
	Use bearings to solve problems
9	Know and apply each of the circle theorems
	Prove that the angle subtended by an arc at the centre of a circle is twice the angle subtended at any point on the circumference; the angle subtended at the circumference by a semicircle is a right angle; angles in the same segment are equal; opposite angles of a cyclic quadrilateral sum to 180°; and the alternate segment theorem

Area

Stage	Objectives
2	Define the word 'area' and know the units used to measure area
	Find the area of shapes on a grid
	Draw a shape on a grid with a given area
	Solve problems involving a combination of area and perimeter of shapes on a grid
3	Derive formulae for the area of a rectangle, triangle, parallelogram and kite
	Calculate the area of a rectangle, triangle, parallelogram and kite
	Use the properties of shapes to find missing lengths
	Calculate the area of a compound shape made from the above shapes
	Estimate the area of irregular shapes
	Solve worded problems involving area of triangles and quadrilaterals including with mixed units
	Solve problems involving a combination of area and perimeter of triangles and quadrilaterals
5	Derive formulae for the area of a trapezium
	Calculate the area of a trapezium
	Use the properties of trapezium to find missing lengths
	Know the formula for the area of a circle
	Calculate the area of; a circle, semicircle and quarter-circle giving answers as decimals and in terms of Π
	Calculate the radius or diameter of a circle given the area
	Calculate the area of compound shapes involving circles
	Solve worded problems involving finding the area of circles including with mixed units
	Approximate to check answers
	Solve problems involving a combination of area and perimeter of triangles, parallelograms, trapezia and circles
6	Calculate area of sectors of a circle giving answers as decimals and in terms of Π
	Calculate the angle in a sector of a circle given the area and radius or diameter
	Calculate areas of compound shapes including sectors
	Solve worded problems involving the above
7	Calculate the surface area of; cubes, cuboids, triangular prisms, trapezoids, cylinders, spheres, hemispheres, pyramids, and cones, giving answers as decimals and in terms of Π
	Calculate the surface area of irregular prisms and composite solids
	Use the properties of solids to find missing lengths
	Draw the net of a solid given the surface area
	Solve worded problems involving surface area including with mixed units

Holy Cross
CATHOLIC HIGH SCHOOL

Maths

Scheme of Work

Calculations A

Stage	Objectives
2	Add and subtract up to three digit integers using a written method
	Use mental methods for addition and subtraction up to two digit integers
	Know and use inverse operations when adding and subtracting integers
	Understand the commutative law and associative law for adding
	Find equivalent calculations
	Use approximation to check answers
	Solve worded and multi-step problems involving adding and subtracting up to three digit integers
3	Add and subtract up to five digit integers using a written method
	Use mental methods for addition and subtraction up to three digit integers
	Know and use inverse operations when adding and subtracting integers
	Find equivalent calculations
	Use approximation to check answers
	Solve worded and multi-step problems involving adding and subtracting up to five digit integers

Calculations B

Stage	Objectives
2	Recall timetables to 12x12
	Mentally multiply and divide integers in the above timetables
	Count up and back in steps of 100, 1000, 10000
	Use written methods for multiplication and division of integers (two digit by one digit)
	Understand the commutative law and associative law for multiplying
	Know and use inverse operations
	Find equivalent calculations
	Use approximation to check answers
	Solve worded and multi-step problems involving the four operations
3	Know the affects of multiplying and dividing numbers by positive powers of ten
	Use short and long division writing remainders as integers
	Mentally multiply and divide up to three digit numbers by one digit
	Know and use inverse operations
	Find equivalent calculations
	Approximate to check answers
	Solve worded and multi-step problems involving the four operations
4	Use written methods to multiply large integers
	Use short and long division writing remainders as fractions and decimals
	Know the distributive law
	Use the order of operations to solve problems
	Know and use inverse operations
	Find equivalent calculations
	Approximate to check answers
	Solve worded and multi-step problems involving the four operations

Data

Stage	Objectives
2	Interpret and present ungrouped data in a frequency table, a single bar chart and a pictogram
	Interpret data from a time table and distance-time table
	Complete missing information from a time table
	Solve comparison, sum and difference problems in frequency tables, single bar charts, pictograms, time tables and distance-time tables
3	Define and recognise discrete and continuous data
	Know the difference between grouped and ungrouped data; and understand the (dis)advantages of grouping data
	Interpret and present discrete data in a grouped frequency table, a dual bar chart and a composite bar chart
	Solve comparison, sum and difference problems in grouped frequency tables, dual bar charts and composite bar charts
4	Interpret and present data in a frequency diagram and a frequency polygon
	Solve comparison, sum and difference problems in frequency diagrams and frequency polygons
	Interpret and present discrete data in a pie chart
	Solve comparison, sum and difference problems using a pie chart
5	Plot and interpret a time series graph and a scatter graph
	Use a time series graph to predict a subsequent value
	Draw and use a line of best fit on a scatter graph understanding the effects of interpolation and extrapolation
	Describe the correlation on a scatter graph including the strength
	Understand correlation and causation
	Identify outliers on a scatter graph
	Solve comparison problems using time series graphs and scatter graphs
	Interpret and present data in a two-way table including finding probabilities
6	Distinguish between primary and secondary data
	Decide whether data is qualitative, quantative, discrete or continuous and use this decision to make sound judgements in choosing suitable diagrams for the data
	Interpret and present data in a range of diagrams, charts and graphs including stem & leaf diagrams
	Find patterns in data that may lead to a conclusion being drawn including commenting on unusual data values
	Understand that the size and construction of a sample will affect how representative it is
	Understand the advantages of and use stratified sampling
7	Understand the structure and notation of a Venn diagram
	Shade and identify areas on a Venn diagram; A B, A B, A', A' B, A' B, (A B)', (A B)'
	Construct and read information from a Venn diagram
	Solve problems using Venn diagrams
8	Construct and interpret a histogram for grouped discrete data and continuous data with equal and unequal class intervals
	Find an estimate of the median or other information from a histogram

Decimals

Stage	Objectives
2	Identify the place value of digits in decimals
	Order decimals up to 2 decimal places in context using the symbols < > = ≤ ≥
	Count up and back in steps of 0.1, 0.01, 0.001
	Add and subtract decimals
	Find equivalent calculations
	Use approximation to check answers
	Solve worded and multi-step problems involving adding and subtracting decimals with and without a calculator
3	Convert between fractions, decimals and percentages (denominators are factors of 100) with and without a calculator
	Compare and order positive and negative integers, fractions, decimals and percentages using the symbols < > = ≤ ≥
	Solve worded and multi-step problems involving fractions, decimals and percentages with and without a calculator
	Use decimals to calculate proportions of shapes that are shaded
	Identify positive and negative decimals on a number line and a scale including in context
	Estimate measures from a scale when between two whole numbers
	Compare and order decimals up to 3 decimal places using the symbols < > = ≤ ≥ (including in context eg metric measures with different units)
4	Convert between less familiar fractions, decimals and percentages (including >1 & easy recurring decimals) with and without a calculator
	Compare and order positive and negative integers, fractions, decimals and percentages (including >1 & easy recurring decimals) using the symbols < > = ≤ ≥
	Solve worded and multi-step problems involving fractions, decimals and percentages with and without a calculator
5	Identify decimals and fractions on more difficult number lines
	Multiply and divide a decimal by an integer and by a decimal
	Add, subtract, multiply and divide using a combination of positive and negative integers, decimals and fractions with and without a calculator
	Understand the effects of multiplying and dividing numbers between 0 and 1
	Know the affects of multiplying and dividing by positive and negative powers of 10 (0.01, 0.1, 10, 100, etc)
	Use a given calculation to find the answers to similar calculations
	Find equivalent calculations
	Use approximation to check answers
	Solve worded and multi-step questions involving the above with and without a calculator including household bills
	Convert between fractions, decimals and percentages to find the most appropriate method of calculation in a question
8	Change recurring decimals into their corresponding fractions using proof
	Change fractions into recurring decimals

Negative Numbers

Stage	Objectives
2	Identify negative numbers on a number line
	Order negative numbers
	Find the difference between a negative and a positive number
	Use negative numbers in context
4	Add, subtract, multiply and divide negative and positive integers including large integers
	Find equivalent calculations
	Solve worded problems involving negative integers

Percentages

Stage	Objectives
3	Recognise and understand the percent symbol
	Shade a percentage of a shape
	Use percentages to calculate proportions of shapes that are shaded
4	Calculate a percentage of an amount with and without a calculator including percentages >100% and non-integer percentages
	Find equivalent calculations
	Use approximation to check answers
	Solve problems involving calculating a percentage of an amount including reverse percentages
5	Express one quantity as a percentage of another
	Compare two amounts using percentages
	Calculate a percentage increase/ decrease given two amounts
	Increase and decrease an amount by a percentage with and without a calculator including percentages >100% and non-integer percentages
	Solve problems involving increasing/ decreasing an amount by a percentage with and without a calculator
7	Solve original value problems including non-integer percentages
	Solve simple interest problems including percentages
	Solve growth and decay problems using compound interest including non-integer percentages
	Solve compound problems involving original value

Fractions

Stage	Objectives
2	Know the names of unit fractions e.g. one half, one twelve
	Compare and order unit fractions to 1/12 and fractions with the same denominator using the symbols < > = ≤ ≥
	Count up and down in tenths
	Recognise and find simple equivalent fractions
3	Simplify fractions
	Identify positive and negative fractions on a number line and a scale including in context
	Estimate measures from a scale when between two whole numbers
	Recognise and convert between improper fractions and mixed numbers
	Use fractions to calculate proportions of shapes that are shaded
	Write a number as a fraction of another number
	Find equivalent fractions
	Compare and order positive and negative fractions using the symbols < > = ≤ ≥ including fractions >1
	Find fractions of an integer which leads to an integer answer
	Use a fraction of a quantity to compare proportions
	Find equivalent calculations
	Use approximations to check answers
	Solve worded problems related to finding fractions of amounts and comparing fractions
4	Identify positive and negative fractions including mixed numbers on a number line
	Add, subtract, multiply and divide positive and negative mixed numbers with different denominators by fractions and integers with and without a calculator
	Find a fraction of a fraction and fraction of an integer which leads to a non-integer answer
	Calculate reverse fractions of amounts
	Increase/decrease an amount by a fraction
	Understand reciprocals
	Find equivalent calculations
	Use approximations to check answers
	Solve worded problems involving the four operations on fractions
9	Simplify algebraic fractions
	Add, subtract, multiply and divide expressions involving algebraic fractions

Indices And Surds

Stage	Objectives
2	
3	
4	Recognise the notation for square, cube, square root and cube root
	Know the squares and square roots of the first fifteen square numbers
	Understand that there are two numbers that will square to give the same answer
	Recall cubes of; 1, 2, 3, 4, 5 and 10
	Know the cube roots of the first five cube numbers and cube root of 1000
	Recognise the first ten powers of 2
	Work out powers of 10
	Calculate with roots and positive integer indices
	Use a calculator to find any positive integer power of a number
	Understand and use the vocab; index, indices, power, root, base
5	Understand the use of standard form
	Write a number in standard form and convert from standard form to a number
	Calculate positive powers of integers and know the value of any number to the power of zero
	Order and compare numbers in standard form Ax10n, where n is positive, negative or zero
6	Understand and apply the three laws of indices for numerical and algebraic expressions
	Use the index laws for positive and negative indices
	Understand that the root of a number squared is the number itself; eg (x)^2 = x
	Calculate with numbers in standard form with and without a calculator
	Solve worded problems involving standard form
	Find equivalent calculations
7	Calculate values using negative indices
	Understand that x^-1 is the reciprocal of x
8	Estimate powers and roots of any given positive number
	Identify between which two integers the square root and cube root of a positive number lies
	Calculate with fractional indices
	Evaluate, order and compare values that require changing the base
9	Identify surds
	Understand why it is more accurate to leave an answer in surd form
	Calculate exactly with surds
	Simplify expressions using the rules of surds including those involving squares
	Expand brackets where the terms may be written in surd form
	Rationalise denominators

Measures

Stage	Objectives
2	Estimate time calculations to the nearest minute
	Tell the time from an analogue clock and a 24 hour digital clock using vocabulary such as o'clock, am and pm, morning and afternoon, noon and midnight
	Solve comparison, sum and difference problems involving time
3	Make an accurate scale drawing from a sketch, diagram or description
	Find the real measurement given a scale drawing
	Work out a scale from a scale drawing given an actual length
	Use a scale on a map to work out an actual length and to estimate a length
	Solve problems involving scale drawings
4	Convert between time given as hours & minutes and decimal hours with and without a calculator
	Convert between time given as hours & minutes and minutes
	Convert between time given as hours & minutes and fractions of an hour
	Compare time written in seconds, minutes and hours
	Solve worded problems involving time
	Solve worded problems involving the Gregorian calendar
5	Estimate lengths using metric units
	Choose appropriate units for estimating measurements
	Convert between metric units of length and mass
	Convert between imperial units of length and mass
	Convert between metric and imperial measurements
	Read information from conversion graphs
	Convert between metric units of area
	Convert between metric units of volume
	Solve problems involving different units
6	Use compound measures for speed, distance and time including those that require a change of units
	Use compound measures for mass, density and volume
	Use compound measures for pressure, force and area
7	Apply the concepts of congruence
	Prove that two shapes are similar
	Know the relationship between length, area and volume scale factors
	Find the ratio of the area or volume of two similar shapes
	Understand the effects of enlargement on angles and perimeter
	Understand and compare the areas and volumes of similar shapes
	Find a missing length given two areas, volumes, ratio or scale factor of similar shapes
	Solve problems involving area and volume of similar shapes

Perimeter

Stage	Objectives
2	Define the word perimeter and know what units to use for perimeter
	Find the perimeter of shapes drawn on a grid
	Measure and calculate the perimeter of a compound shape made from rectangles using mm, cm and m
	Calculate the perimeter of a rectangle, a triangle, a parallelogram and a trapezium
5	Know and identify parts of a circle
	Construct circles or part circles given the radius or diameter
	Know the formula for circumference of a circle
	Calculate the circumference of a circle giving answers as decimals and in terms of $\prod$
	Calculate the perimeter of; a semi-circle and a quarter-circle giving answers as decimals and in terms of $\prod$
	Calculate the radius or diameter of a circle given the circumference
	Calculate the perimeter of compound shapes involving circles
	Use approximation to check answers
	Solve problems involving finding the perimeter of circular shapes
6	Calculate arc lengths giving answers as decimals and in terms of $\prod$
	Calculate the perimeter of a sector of a circle giving answers as decimals and in terms of $\prod$
	Calculate angles in sectors of circles given the arc length and radius/ diameter
	Calculate the perimeter of compound shapes including sectors
	Solve worded problems involving the above

Plotting Linear Equations

Stage	Objectives
2	Draw and label axes
	Plot and read coordinates in all four quadrants
3	Plot horizontal and vertical lines on coordinate grids
	Know the equation of horizontal and vertical lines on coordinate grids
	Find the midpoint of two coordinates graphically and numerically
	Identify coordinates that lie on a graph given the equation
4	Know that y = mx + c is a linear graph; and understand gradient and y-intercept
	Plot linear graphs with and without a calculator
	Understand the effect on a graph of addition of a constant
	Calculate the gradient from a graph
	Find the equation of a linear graph from a graph or from a list of coordinates
	Identify coordinates that lie on a graph given the equation
5	State the y-intercept and gradient from an equation including equations not written in the form y=mx+c
	Find the equation of a linear graph given the gradient and y-intercept as a coordinate
	Find the equation of a linear graph including on different scaled axes
	Identify parallel lines to linear graphs given the equation
	Identify graphs with the same y-intercept given the equation
	Solve linear equations graphically
6	Plot and interpret a linear graph representing a real-life problem from information given in words, in a table or as a formula
	Identify the equation of a real-life linear graph from a drawing of the graph
	Plot and interpret a conversion graph and a distance - time graph
	Interpret the gradient of a linear graph as a rate of change and the y-intercept in context
7	Calculate the gradient given two points
	Find the equation of a linear graph given two points
	Find the equation of a linear graph given one point and the gradient
	Identify parallel lines, gradients and y-intercepts when the equations need rearranging
	Find the equation of a parallel line given either the equation of the linear graph or the gradient and a point on the line
	Solve problems on coordinate axes
8	Identify and find perpendicular lines to linear graphs
	Identify perpendicular lines, gradients and y-intercepts when the equations need rearranging

Plotting Non-Linear Equations

Stage		Objectives
6		Sketch and interpret graphs showing real life situations in geometry such as the depth of water in containers as they are filled at a steady rate
		Interpret non-linear graphs showing real-life situations, such as the height of a ball plotted against time
7		Plot graphs of quadratic and cubic equations and functions with and without a calculator including those not written in the form $y=ax^2+bx+c$
		Identify coordinates that lie on a quadratic or cubic graph
		Recognise graphs of quadratic and cubic equations
		Solve an equation from a quadratic or cubic graph
		Identify and interpret roots, intercepts and turning points on a quadratic graph
		Plot graphs of reciprocal functions with and without using a calculator
		Recognise graphs of reciprocal functions
		Identify coordinates that lie on a reciprocal graph
8		Sketch and draw a velocity/ time graph
		Understand the difference between positive and negative gradients as rates of change
		Estimate the gradient at a point on a curve by drawing a tangent at a given point and working out its gradient (instantaneous rate of change)
		Calculate and interpret the meaning of the gradient and area under a velocity-time graph and a distance-time graph (average rate of change)
9	A	Plot, sketch, interpret and recognise exponential graphs; y = kx for positive values of k
	B	Plot, sketch, interpret and recognise trigonometric graphs
		Know the minimum and maximum values for cos and sin
		Apply trigonometric graphs in context
	C	Recognise and write down the equation of a circle with centre at the origin and radius r
		Work out the coordinates of points of intersection of a given circle and a given straight line
		Find the equation of a tangent to a circle at a given point
	D	Sketch and recognise transformations of linear functions, quadratic functions and trigonometric functions based on $y=\sin x$ and $y=\cos x$ for $0 \leq x \leq 360^0$
		Write down the function following a reflection or translation of a given function

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Probability

Stage	Objectives
4	Understand and use words associated with probability
	Understand and use the 0 - 1 probability scale using simple fractions, decimals and percentages
	Apply systematic listing strategies to show all possible outcomes and find probabilities (sample space diagrams)
	Calculate the probability of a single event including from a given ratio
	Understand that experiments rarely give the same results
	Solve comparison probability problems
5	Understand the terms mutually exclusive and exhaustive
	Understand that the probabilities of all possible outcomes sum to 1
	Find the probability of an event not happening
	Construct and use a frequency tree to solve problems
	Understand the difference between theoretical probability and relative frequency
	Know how the number of trials in an experiment effects the accuracy of the results
	Estimate probabilities using relative frequency
	Draw and interpret a relative frequency diagram
	Use probability to solve problems including finding the number of expected outcomes
6	Calculate probabilities when events are independent
	Construct/ complete a tree diagram to show outcomes and probabilities with replacement
	Solve problems involving tree diagrams and other representations
8	Know the difference between independent events and dependent events
	Calculate probabilities when events are dependent
	Calculate probabilities when events are not mutually exclusive
	Construct/ complete a tree diagram to show outcomes and probabilities without replacement
	Use tree diagrams to solve problems
	Understand the notation P(A), P (A'), P(A B), P(A ∩ B) when calculating probabilities from Venn diagrams
	Apply the use of the product rule for counting
	Understand and apply the Petersen Capture-Recapture method

Pythagoras' Theorem And Trigonometry

Stage	Objectives
5	Use Pythagoras' Theorem in 2D to find missing side lengths
	Know that the hypotenuse is the longest side
	Find the distance between two coordinates Pythagoras' Theorem in 2D
	Use Pythagoras' Theorem in 2D to prove that a triangle is right angled
	Solve worded problems involving Pythagoras' Theorem
7	Use trigonometry in 2D to find missing side lengths and angles
	Solve worded problems using trigonometry in 2D including bearings
	Know the exact values of sin θ and cos θ for θ = 0°, 30°, 45°, 60°; and 90° and tan θ for θ = 0°, 30°, 45° and 60°
	Solve right-angled triangle problems with angles of 30°, 45°or 60° without a calculator
	Solve problems involving a combination of Pythagoras' Theorem and trigonometry
8	Use Pythagoras' Theorem and trigonometry in 3D to find missing side lengths and angles
9	Apply the sine rule and cosine rule to find unknown lengths and angles in 2D and 3D shapes
	Apply Area = 1/2absinC to calculate the missing side length, angles or the area of any triangle
	Solve problems involving the above including finding the area of a segment

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CATHOLIC HIGH SCHOOL

Maths

Scheme of Work

Ratio and Proportion

Stage	Objectives
3	Understand ratio notation
	Simplify ratios and find equivalent ratios
	Use proportion to solve simple problems
	Interpret ratio as a fraction or a percentage
4	Compare two quantities and represent them as a ratio
	Use ratio and proportion to solve worded problems including recipe style questions
	Write a ratio in the form 1:n or n:1 with and without a calculator
	Solve simple best buy problems
5	Use equality of ratios to solve problems
	Divide a quantity in a given ratio
6	Draw and recognise graphs of two quantities in a given ratio
	Write the ratio of x:y as an equation in terms of x or y
	Given the ratio of a:b and b:c find the ratio of a:b:c
	Solve worded problems involving ratio including 'changing ratio problems'
	Solve more difficult best buy problems and currency conversions which involve changes of units
7	Solve numerical problems involving direct and inverse proportion
	Recognise and interpret graphs which represent direct proportion and inverse proportion
	Understand that X is inversely proportional to Y is equivalent to X is proportional to 1/Y
8	Write and use equations of the form y = kx representing direct proportion y = k/x representing inverse proportion; understanding that k is the constant of proportionality
	Recognise and construct equations and graphs which represent direct proportion and inverse proportion

Rounding And Limits

Stage	Objectives
3	Round integers and decimals to the nearest 10, 100, 1000
	Read and write integers to 10 000 000
	Know the place value of each digit up to 10 000 000
	Order and compare numbers to 10 000 000 using =, , <, >, ≤, ≥
5	Round decimals to a given number of decimal places
	Round numbers to a given number of significant figures
	Round numbers in context such as measures and money
7	Estimate answers by rounding to 1 significant figure
	Understand over or under estimating
	Use inequalities to specify error intervals when a number has been rounded or truncated
	Interpret limits of accuracy when rounding or truncating
8	Calculate with upper and lower bounds

Sequences

Stage	Objectives
2	Describe a number sequence using the term to term rule
	Write a sequence of numbers given the term to term rule
	Continue sequences shown in diagrams
4	Understand the terminology associated with sequences (term to term rule and position to term rule/ nth term)
	Recognise and complete missing terms in sequences of triangular, square and cube numbers; and arithmetic sequences
	Understand and recognise an arithmetic sequence
	Work out the nth term and a given term in an arithmetic sequence
	Generate an arithmetic sequence from the nth term or a diagram
	Justify if a number is in an arithmetic sequence
	Complete a table of results which describe the pattern shown in diagrams
	Solve simple problems involving arithmetic sequences
6	Work with Fibonacci-type sequences (rule given)
	Recognise and complete missing terms in geometric progressions
	Find the common ratio in a geometric progression and use this to continue a sequence
	Understand and recognise a quadratic sequence
	Know how to continue the terms of a quadratic sequence
	Identify different types of sequences including triangular numbers
8	Work out the nth term and a given term in a quadratic sequence
	Find the equation of a linear graph given two points
	Generate a quadratic sequence from the nth term or a diagram with and without a calculator
	Solve simple problems involving quadratic sequences
9	Recognise and solve problems based on Fibonacci-type sequences, involving geometric progressions and other sequences
	Work out the value of a term in a geometrical progression of the form r^n where n is an integer and r is a positive rational number or a surd

Shape and Construction

Stage	Objectives
2	Name and sketch shapes (polygons with up to 12 sides & triangles)
	Know the difference between regular and irregular polygons
	Draw a shape with a given order of rotational symmetry and/ or lines of symmetry
	Identify the order of rotational symmetry of a shape
	Name solids and describe their properties (faces, vertices, edges)
	Understand that cubes, cuboids and triangular prisms are prisms
	Draw and identify nets of solids
	Build 3D shapes using nets
	Identify planes of symmetry in 3D shapes
4	Construct a plan view, front and side elevation of a solid
	Recognise a solid from its plan and elevations
	Understand and use isometric drawings
	Solve problems involving 2D representations of a solid
5	Identify pairs of parallel and perpendicular lines including on a shape
	Construct a triangle given SSS, SAS or ASA, a quadrilateral and a regular hexagon
	Construct an angle of 60°
	Know and use the properties of triangles and quadrilaterals
	Identify a shape given its properties
6	Construct a perpendicular bisector of a line segment, a perpendicular to a given line from a point, a perpendicular to a given line at a point and an angle bisector
	Recognise and use the perpendicular distance from a point to a line as the shortest distance to the line
	Construct loci equidistant from; a point, two points, a line, two lines and a shape
	Construct and shade regions using circles and lines
	Solve worded problems involving loci including bearings
7	Calculate the resultant of two vectors
	Understand and use the commutative and associative properties of vector addition
	Solve simple geometrical problems in 2D using vector methods
	Understand and use vector notation
	Calculate and represent graphically the; sum of two vectors, difference of two vectors and scale multiple of a vector
8	Calculate the surface area and volume of a frustum writing answers as decimals and in terms of Π
	Solve problems involving frustums including with mixed units
9	Apply vector methods for simple geometric proofs
	Recognise when; lines are parallel, and three or more points are co-linear, using vectors
	Use vectors to show three or more points are collinear

Simultaneous Equations

Stage	Objectives
7	Solve simultaneous linear equations by elimination, substitution and graphically including equations that need rearranging
	Solve worded problems involving simultaneous equations
9	Solve simultaneous equations with one linear equation and one quadratic equation, algebraically and graphically (including a line and a circle)

Solving Linear Equations

Stage	Objectives
3	Solve one and two step linear equations with positive integer solutions using function machine and balancing methods
	Write an equation to represent a number problem
4	Solve linear equations with positive or negative; integer and fractional solutions, using function machine and balancing methods including equations with brackets
	Know the terminology; expression, equation, formula, term and factor
5	Write and solve linear equations
	Solve linear equations with unknowns on both sides with positive or negative; integer and fractional solutions, using function machine and balancing methods
6	Solve linear inequalities with positive or negative; integer and fractional solutions including representing the solution set on a number line and as a list of integers
	Understand the effect of multiplying or dividing a linear inequality by a negative number
	Represent linear inequalities on a number line and write the inequality given on a number line
	Write down all the integers in a given range
	Work out the smallest or largest integer solution when solving an inequality
7	Solve more difficult linear equations with positive and negative; integer and fractional solutions
	Solve linear equations with fractional and negative coefficients of x
	Write and solve linear equations with integer coefficients
	Solve simple linear equations where the numbers are written in standard form
	Solve linear equations that use function notation
9	Write and solve worded linear inequalities
	Write linear inequalities from a coordinate grid
	Represent linear inequalities on a given coordinate grid and shade out the boundary which does NOT satisfy the inequalities
	Use the unshaded region to find the solution(s) including identifying the maximum and minimum values
	Understand the solution(s) in context

Solving Non-Linear Equations

Stage	Objectives
6	Solve quadratic equations such as $2x^2 = 50$, giving both the positive and negative roots
	Solve quadratic equations when the coefficient of x^2 is 1 by factorising
	Understand the solutions are the roots of the quadratic graph
8	Solve quadratic equations by; factorising, using the formula, and completing the square including when the coefficient of $x^2 > 1$
	Use trial and improvement to solve equations
	Solve quadratic equations that use function notation
	Construct and solve quadratic equations and interpret solutions in context
9	Solve quadratic equations that require rearrangement by; factorising, using the formula, and completing the square including when the coefficient of $x^2 > 1$
	Identify roots, turning points and intercepts of an equation by completing the square and sketch the graph
	Solve quadratic inequalities in one variable including representing the solution set on a number line and as a list of integers
	Find approximate solutions to equations numerically using iteration (suffix notation)
	Solve equations written in surd form
	Solve equations involving algebraic fractions

Transformations

Stage	Objectives
2	Translate a shape on a grid when given the number of squares left/ right and up/ down; and describe a translation
3	Reflect a shape in a given line on a coordinate grid; and describe a reflection on a coordinate grid stating the equation of the horizontal or vertical line of reflection
4	Translate a shape on a coordinate grid using vector notation; and describe a translation
	Rotate a shape on a coordinate grid; and describe a rotation
	Reflect a shape in a given line on a coordinate grid; and describe a reflection on a coordinate grid stating the equation of the diagonal, horizontal or vertical line of reflection
5	Translate more difficult shapes on a coordinate grid using vector notation; and describe a translation
	Rotate more difficult shapes on a coordinate grid; and describe a rotation
	Reflect more difficult shapes in a given line on a coordinate grid; and describe a reflection on a coordinate grid stating the equation of the diagonal, horizontal or vertical line of reflection
	Enlarge a shape on a grid and on a coordinate grid by a positive integer scale factor; and describe an enlargement including fractional
	Understand and recognise congruent and similar shapes
8	Enlarge a shape on a grid and on a coordinate grid by a given negative scale factor; and describe an enlargement including fractional
	Identify and use invariant points
	Describe a combination of transformations as a single transformation

Volume

Stage	Objectives
4	Estimate volume and capacity
	Understand the definition of volume and know the units of measurement are cm^3, m^3 etc
	Find the volume and surface area by counting cubes
	Calculate the volume of a cube and cuboid
	Compare volumes of cubes and cuboids
5	Calculate the volume of a trapezoid, triangular prism, cylinder and compound prisms, writing answers as decimals and in terms of $\prod$
	Use the properties of prisms to find missing lengths
	Solve worded problems involving finding the volume of prisms including with mixed units
7	Calculate the volume of spheres, hemispheres, cones, pyramids and composite solids, writing answers as decimals and in terms of $\prod$
	Use the properties of solids to find missing lengths
	Solve worded problems involving the above
	Solve problems involving a combination of surface area and volume of solids