Toynbee Curriculum
KS4 Topic Summaries

MATHS (Year 11)

Toynbee School

Scheme of Learning: Year 11 Foundation Autumn Term

Topic Sequence: Graphs

1	2	3
Gradients and Lines	**Non-Linear Graphs**	**Using Graphs**

Topic Overview: Gradients and Lines

In this topic we build on earlier study of straight line graphs. Students plot lines from a given equation, and find and interpret the equation of a straight line from a variety of situations and given information. Students also revisit graphical solutions of simultaneous equations

Learning Sequence:

Equation of a line parallel to the axis
Students should be able to recognise and use the equations of lines parallel to the axis and understand that any point on a line satisfies the equation of that line. Also that all lines in the form $y = a$ are parallel to the x-axis, and all lines in the form $x = b$ are parallel to the y-axis.

Plotting straight line graphs
Students should be able to generate coordinates for a table of values using $y = mx + c$ and plot and join the points to form a straight line

Interpreting y = mx + c
Students recap that the equation of a line is given in the form $y = mx + c$ where m represents the gradient and the graph intercepts the y-axis at (0, c)

Find the equation of a straight line from a graph
Students recap how to find the gradient and also the y-intercept from a graph

Equation of a straight line graph from a point and a given gradient
Students find the equation of a line given the gradient and a point that lies on the line using their knowledge of parallel lines having the same gradient

Equation of a line from two points
Students work out the full equation of a line from two coordinates, finding the gradient first and then using substitution of one of the coordinates to find the y-intercept

Determine whether a point is on a line
Students understand that the equation of a line is a relationship between the x and y coordinates at any point on that line. Any point on a grid that does not satisfy this equation, therefore does not lie on the line.

Solve simultaneous equations graphically
Students should understand that two straight lines will only ever cross at one point, and the coordinates of this point provide the solutions to the pair of simultaneous equations.

Sequence of Learning:	
1	Equation of lines parallel to the axis (recap)
2	Plotting straight line graphs (recap)
R	Interpreting y = mx + c (recap)
4	Find the equation of a straight line from a graph
5	Equation of a straight line from a point and a given gradient
6	Equation of a straight line from two points
7	Determine whether a point is on a line
8	Solve linear simultaneous equations graphically

Topic Resources:	
Knowledge Maps:	Linear Graphs Algebraic Notation and Manipulation
Assessment:	
Knowledge:	End of Topic test
Application of Knowledge:	Termly summative assessment
Supportive Reading:	
	Sparx Maths www.sparxmaths.co.uk
	Corbett Maths : www.corbettmaths.com
	AQA Revision Guide

Scheme of Learning: Year 11 Foundation Autumn Term

Topic Sequence: Graphs

1	2	3
Gradients and Lines	**Non-Linear Graphs**	**Using Graphs**

Topic Overview: Non-Linear Graphs

Students develop their knowledge of non-linear graphs in this topic, looking at quadratic, cubic, and reciprocal graphs. Content includes moving freely between different numerical, algebraic, graphical and diagrammatical representations, recognising, sketching and interpreting graphs of linear functions, quadratic functions and simple cubic and reciprocal functions, plotting and interpreting graphs, finding approximate solutinos and identifying and interpreting roots

Learning Sequence:

Drawing quadratic graphs from a table:
Students must be able to substitute into an expression with an x^2 in it. When plotting the graphs the points are joined with a smooth curve.

Plot and read from quadratic and cubic graphs
Using calculator and non-calculator methods, students plot cubic graphs using a table of values, ensuring they use a smooth curve to join the points

Plot and read from reciprocal graphs
Students investigate the reciprocal function and become familiar with the concept of asymptotes

Recognise graph shapes
Students analyse the similarities and differences of linear, quadratic, cubic and reciprocal graphs

Roots and intercepts of quadratics
Students start by identifying a root from a graph and understand that quadratics can have 0, 1 or 2 roots.

Sequence of Learning:	
1	Plot and read from quadratic and cubic graphs
2	Plot and read from cubic graphs
3	Plot and read from reciprocal graphs
4	Recognise graph shapes
5	Roots and intecepts of quadratics

Topic Resources:	
Knowledge Map:	Non-Linear Graphs quadratic and cubic Non-Linear Graphs other
Assessment:	
Knowledge:	End of Topic test
Application of Knowledge:	Termly summative assessment
Supportive Reading:	
Any supported reading listed here	Sparx Maths www.sparxmaths.co.uk
	Corbett Maths : www.corbettmaths.com
	AQA Revision Guide

Scheme of Learning: Year 11 Foundation Autumn Term

Topic Sequence: Graphs

1	2	3
Gradients and Lines	**Non-Linear Graphs**	**Using Graphs**

Topic Overview: Non-Linear Graphs

Students revise conversion grpahs and reflection in straight lines and also study other real-life graphs, including speed/distance/time, constructing and interpreting these. Content includes plotting and interpreting graphs of non-standard functions in real-life contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration.

Learning Sequence:

Reflect shapes in given lines
Students are familiar with the equations of straight lines and this step reminds about lines of the form $y = a$, $x = a$, $y = x$ in the context of practicing reflection.

Conversion graphs and other graphs
Students recap knowledge of conversion graphs such as direct proportion graphs which go through the origin and other graphs which do not and include inverse proportion graphs

Interpret and construct distance/time graphs
Students discover how the gradient of a distance/time graph represents the speed of travel and read, interpret and construct distance/time graphs.

Speed/Time graphs
Students discover how the gradient on a speed/time graph represents the acceleration and that a negative gradient now represents deceleration. The area under a graph is the distance travelled

Sequence of Learning:

1	Reflect shapes in given lines
2	Conversion graphs and other graphs
3	Interpret and construct distance/time graphs
4	Speed/time graphs

Topic Resources:

Knowledge Map:	Non-Linear Graphs quadratic and cubic Non-Linear Graphs other including circles Circles including Theorems

Assessment:

Knowledge:	End of Topic test
Application of Knowledge:	Termly summative assessment

Supportive Reading:

Any supported reading listed here	Sparx Maths www.sparxmaths.co.uk
	Corbett Maths : www.corbettmaths.com
	AQA Revision Guide

Scheme of Learning: Year 11 Foundation Autumn Term

Topic Sequence: Geometry and Measure

1	2
Pythagoras and Trigonometry recap	3D shapes, plans and elevations

Topic Overview: 3D shapes, plans and elevations

Students recap finding the volume and surface area of 3D shapes – both prisms and pyramids. They also investigate plans, elevations and nets of 3D shapes, sketching the shapes

Learning Sequence:

Plans elevations and nets
Students investigate and draw the different aspects of 3D shapes

Volume of 3D shapes recap
Students recap finding the volume of 3D shapes – including both prisms and pyramids

Surface area of 3D shapes
Students recap finding the surface area of 3D shapes – including both prisms and pyramids

Sequence of Learning:

1	Plans, elevations and nets
2	Volume of 3D shapes
3	Surface area of 3D shapes

Topic Resources:

Knowledge Map:	Constructions 3D shapes

Assessment:

Knowledge:	End of Topic test
Application of Knowledge:	Termly summative assessment

Supportive Reading:

Any supported reading listed here	Sparx Maths www.sparxmaths.co.uk
	Corbett Maths : www.corbettmaths.com
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Scheme of Learning: Year 11 Foundation Autumn Term

Topic Sequence: Geometry and Measure

1	2
Pythagoras and Trigonometry recap	**3D shapes, plans and elevations**

Topic Overview: Pythagoras and Trigonometry recap

Students revisit Pythagoras and Trigonometry

Learning Sequence:

Pythagoras
Students revisit year 9 work on Pythagoras theorem

Trigonometry intro
Explore ratio in similar right-angled triangles

Hypotenuse, Opposite and Adjacent
Students recap naming sides of right angled triangles

Finding a missing side length
Students apply the tan, sin and cosine ratio to find a missing side length of triangles

Finding a missing angle
Students apply the ratio to find a missing angle

Right angled triangle problems
Students make decisions whether to use trigonometric ratio or Pythagoras' Theorem to solve problems

Exact trig values
Students focus on finding the exact trigonometric values of 0, 30, 45, 60 and 90 degrees

Sequence of Learning:	
1	Pythagoras
2	Trigonometry intro
3	Hypotenuse, Opposite and Adjacent
4	Finding a missing side length
5	Finding a missing angle
6	Right angled triangle problems
7	Exact trig values

Topic Resources:	
Knowledge Map:	Trigonometry and Pythagoras

Assessment:	
Knowledge:	End of Topic test
Application of Knowledge:	Termly summative assessment

Supportive Reading:	
Any supported reading listed here	Sparx Maths www.sparxmaths.co.uk
	Corbett Maths : www.corbettmaths.com
	AQA Revision Guide

Scheme of Learning: Year 11 Foundation Spring Term

Topic Sequence: Reasoning

1	2	
Multiplicative Reasoning	**Geometric Reasoning**	**Algebraic Reasoning**

Topic Overview:

Students develop their multiplicative reasoning in a variety of contexts from simple scale factors through to equations involving direct and inverse proportion. There is also a review of ratio problems. Content covered includes extending and formalising their knowledge of ratio and proportion, including trigonometric ratios, in working with measures and geometry and in working with proportional relations algebraically and graphically. Content also includes comparing lengths, areas and volumes using ratio notation and/or scale factors; making links to similarity and understanding the equations that describe direct and inverse proportion

Lesson Sequence:

Ratio problems
This step is an opportunity for students to revisit ratio problems and strategies for solving these. Students can be encouraged to use bar models and two-way tables where appropriate. When combining ratio, students need to consider Lowest Common Multiple situations

Use scale factors
This step reviews the concept of a scale factor. This is a good opportunity to use scale factors between 0 and 1 (reminding students that this is still an enlargement) as well as those above 1. In this step, students practice finding scale factors as well as using them and revisit the definition of a similar shape.

Understand direct proportion
This step is to understand direct proportion before introducing the algebraic form of $y = kx$. Direct proportion relationships such as diameter and circumference, converting units, currency conversions are revisited. Students are expolse to different representations such as word problems, grphs and equations. The simple direct proportion equation of $y = kx$ is then studied

Calculating with pressure and density
Students revisit rearranging simple equations with an unknown in the denominator in this step. Speed, distance and time is also reviewed, making links to direct proportion. Students consider the similar formulae for pressure and density and should have a good understanding of what these concepts are before progressing onto use of equations. Understanding of the units used is important

Understand inverse proportion
Students now consider the three variables in the speed, distance, time or mass, density, volume relationships to distinguish between direct and inverse proportion. Inverse proportion relationships are explored in different representations such as word problems, graphs and equations. Students then form simple inverse proportion equations in this step ($y = \frac{k}{x}$)

Sequence of Learning:	
1	Ratio problems
2	Using scale factors
3	Understand direct proportion
4	Calculate with pressure and density
5	Understand inverse proportion

Topic Resources:	
Knowledge Map:	Ratio and scale Direct and Inverse proportion

Assessment:	
Knowledge:	End of Topic Test
Application of Knowledge:	Termly Summative Assessments

Supportive Reading:	
Any supported reading listed here	Sparx maths: www.sparxmaths.co.uk
	Corbett Maths: www.corbettmaths.com
	AQA Revision guide

Scheme of Learning: Year 11 Foundation Spring Term

Topic Sequence: Reasoning

1	2	
Multiplicative Reasoning	**Geometric Reasoning**	**Algebraic Reasoning**

Topic Overview: Geometric Reasoning

Students consolidate their knowledge of angle facts and develop increasingly complex chains of reasoning to solve geometric problems.
Students revisit the key topics of Pythagoras and Trigonometry and vectors.
Content covered includes reasoning deductively in geometry, number and algebra using geometrical constructions, revision of bearings in trigonometric situations, applying addition and subtraction of vectors, multiplication of vectors by a scalar and diagrammatical and column representations of vectors.

Lesson Sequence:

Review of Angle facts
This step provides students with opportunity to revise basic angle facts including angles at appoint, in parallel lines and in polygons. As students have already seen these rules several times, interleaving other topics such as ratio and equations is used to maintain the level of challenge whilst securing knowledge

Proving geometric facts
This small step provides opportunity for students to use all the angle facts to prove simple geometric facts. Students should know that (eg) 'angles in a triangle' is not sufficient, but 'angles in a triangle sum to 180 degrees' is sufficient.

Understand and represent vectors
A vector shows both magnitude and direction and students also recognise the role of the arrow to show direction of the vector, considering the start and end points for magnitude. Students can compare vectors of the same magnitude but different directions. Students are familiar with two representations of vectors: column vector and line segment with an arrow and are introduced to the formal notation for labelling vectors and **a** and a. Students develop a deeper understanding of a vector representing movement from one point to another and start comparing different representations.

Vectors multiplied by a scalar
Students explore vectors that are parallel to each other, understanding that when vectors are parallel, one is the multiple of the other and the multiplier is called a scalar. Students identify negative multipliers where vectors are parallel but in opposite directions.

Addition and subtraction of vectors
Students become confident in identifying and drawing representations of vector addition and subtraction and looking at resultant vectors.

Vector journeys in shapes
Students move around shapes from one vertex to the next using the notation etc. They explore quadrilaterals through parallel and non-parallel vectors, making generalisations about different vectors. Students appreciate that a vector is only parallel to another if one is a multiple of the other, realising that the multiplier can be negative or fractional.

Sequence of Learning:	
1	Review of angle facts
2	Proving geometric facts
3	Understand and represent vectors
4	Vectors multiplied by a scalar
5	Addition and subtraction of vectors
6	Vector journeys in shapes

Topic Resources:	
Knowledge Map:	Angles Pythagoras and Trigonometry – right angled triangles Vectors
Assessment:	
Knowledge:	End of Topic Test
Application of Knowledge:	Termly Summative Assessments
Supportive Reading:	
Any supported reading listed here	Sparx maths: www.sparxmaths.co.uk
	Corbett Maths: www.corbettmaths.com
	AQA Revision guide

Scheme of Learning: Year 11 Foundation Spring Term

Topic Sequence: Reasoning

1	2	
Multiplicative Reasoning	**Geometric Reasoning**	**Algebraic Reasoning**

Topic Overview: Algebraic Reasoning

As well as introducing formal function notation, this topic builds on previous work looking at functions. Content includes interpreting simple expressions as functions with inputs and outputs and interpreting the reverse process as the 'inverse function' and interpreting the succession of two functions as 'composite functions'. Students build on previous work looking at solving equations and simultaneous equations. Looking at the difference between equations and inequalities, students establish the difference between a solution and a solution set or range of solutions. Students solve linear inequalities in one or two variables, representing the solution set on a number. Students recap their work on sequences,

Learning Sequence:

Use function notation
Students are introduced to formal function notation such as *f(x)* which is a function applied to x. Students should be aware that other letters can be used, with different letters used to distinguish between different functions within the same question.

Composite functions and inverse functions
Students learn that a composite function is a function made from other functions, where the output of one is the input of the other. Students are introduced to inverse functions and make the link to inverse operations, ensuring they are secure with rearranging formula in advance

Simplify complex expressions
Students revise algebraic notation and rules for collecting like terms and indices, particularly with algebraic fractions

Sequences
Students revise finding the nth term of a linear sequence and investigate other sequences

Simultaneious Equations
Students recap simultaneous equations from year 10

Solving inequalities
Students study inequalities both on a number line and algebraically.

Sequence of Learning:	
1	Using function notation
2	Composite and inverse functions
3	Simplify complex expressions
4	Sequences
5	Simultaneous equations
6	Inequalities

Topic Resources:	
Knowledge Map:	Algebraic proof and functions Algebraic manipulation and notation Functions Sequences Iteration

Assessment:	
Knowledge:	End of Topic Test
Application of Knowledge:	Termly Summative Assessments

Supportive Reading:	
Any supported reading listed here	Sparx maths: www.sparxmaths.co.uk
	Corbett Maths: www.corbettmaths.com
	AQA Revision guide

Scheme of Learning: Year 11 Higher Autumn Term

Topic Sequence:

1	2	3	4
Gradients and Lines	**Non-Linear Graphs**	**Using Graphs**	**Graph Transformations**

Topic Overview: Gradients and Lines

In this topic we build on earlier study of straight line graphs. Students plot lines from a given equation, and find and interpret the equation of a straight line from a variety of situations and given information. Students also revisit graphical solutions of simultaneous equations and study the equations of perpendicular lines.

Learning Sequence:

Equation of a line parallel to the axis
Students should be able to recognise and use the equations of lines parallel to the axis and understand that any point on a line satisfies the equation of that line. Also that all lines in the form $y = a$ are parallel to the x-axis, and all lines in the form $x = b$ are parallel to the y-axis.

Plotting straight line graphs
Students should be able to generate coordinates for a table of values using $y = mx + c$ and plot and join the points to form a straight line

Interpreting y = mx + c
Students recap that the equation of a line is given in the form $y = mx + c$ where m represents the gradient and the graph intercepts the y-axis at (0, c)

Find the equation of a straight line from a graph
Students recap how to find the gradient and also the y-intercept from a graph

Equation of a straight line graph from a point and a given gradient
Students find the equation of a line given the gradient and a point that lies on the line using their knowledge of parallel lines having the same gradient

Equation of a line from two points
Students work out the full equation of a line from two coordinates, finding the gradient first and then using substitution of one of the coordinates to find the y-intercept

Determine whether a point is on a line
Students understand that the equation of a line is a relationship between the x and y coordinates at any point on that line. Any point on a grid that does not satisfy this equation, therefore does not lie on the line.

Solve simultaneous equations graphically
Students should understand that two straight lines will only ever cross at one point, and the coordinates of this point provide the solutions to the pair of simultaneous equations.

Explore and find equations of perpendicular lines
Students should be aware that perpendicular lines intercept at right angles and the product of a pair of perpendicular lines will always by -1. Using this knowledge, they will find the gradient of a line perpendicular to another and then find the y intercept to give the full equation of $y = mx + c$

Sequence of Learning:	
1	Equation of lines parallel to the axis (recap)
2	Plotting straight line graphs (recap)
R	Interpreting y = mx + c (recap)
4	Find the equation of a straight line from a graph
5	Equation of a straight line from a point and a given gradient
6	Equation of a straight line from two points
7	Determine whether a point is on a line
8	Solve linear simultaneous equations graphically
9	Explore and find equations of perpendicular lines

Topic Resources:	
Knowledge Maps:	Linear Graphs Algebraic Notation and Manipulation
Assessment:	
Knowledge:	End of Topic test
Application of Knowledge:	Termly summative assessment
Supportive Reading:	
	Sparx Maths www.sparxmaths.co.uk
	Corbett Maths : www.corbettmaths.com
	AQA Revision Guide

Scheme of Learning: Year 11 Higher Autumn Term

Topic Sequence: Graphs

1	2	3	4
Gradients and Lines	Non-Linear Graphs	Using Graphs	Graph Transformations

Topic Overview: Non-Linear Graphs

Students develop their knowledge of non-linear graphs in this topic, looking at quadratic, cubic, reciprocal, exponential graphs as well as the equation of a circle

Learning Sequence:

Plot and read from quadratic and cubic graphs
Using calculator and non-calculator methods, students plot quadratic and cubic graphs using a table of values, ensuring they use a smooth curve to join the points

Plot and read from reciprocal graphs
Students investigate the reciprocal function and become familiar with the concept of asymptotes

Recognise graph shapes
Students analyse the similarities and differences of linear, quadratic, cubic and reciprocal graphs

Roots and intercepts of quadratics
Students start by identifying a root from a graph and understand that quadratics can have 0, 1 or 2 roots.

Exponential graphs
Students explore exponential graphs

Equation of a circle centre (0, 0)
Students find the radii of circles with centre (0, 0) and make the connection to Pythagoras' Theorem. This reveals the general equation of a circle centre (0, 0)

Equation of the radius of a circle centre (0, 0)
Students use their knowledge of finding the gradient of a line from two points to find the equation of a radius of a circle

Equation of the tangent to a circle centre (0, 0)
Students use their knowledge of perpendicular lines t find the equation of a tangent to a circle

Tangent to a curve
Students practice drawing tangents to a curve at a point and then finding the equation of the tangent using the gradient and the given point

Sequence of Learning:

1	Plot and read from quadratic and cubic graphs
2	Plot and read from reciprocal graphs
R	Recognise graph shapes
4	Exponential graphs
5	Equation of a circle centre (0, 0)
6	Equation of the radius of a circle centre (0, 0)
7	Equation of the tangent to a circle centre (0, 0)
8	Tangent to a curve

Topic Resources:

Knowledge Map:	Non-Linear Graphs quadratic and cubic Non-Linear Graphs other including circles Circles including Theorems

Assessment:

Knowledge:	End of Topic test
Application of Knowledge:	Termly summative assessment

Supportive Reading:

Any supported reading listed here	Sparx Maths www.sparxmaths.co.uk
	Corbett Maths : www.corbettmaths.com
	AQA Revision Guide

Scheme of Learning: Year 11 Higher Autumn Term

Topic Sequence: Graphs

1	2	3	4
Gradients and Lines	Non-Linear Graphs	Using Graphs	Graph Transformations

Topic Overview: Non-Linear Graphs

Students revise conversion grpahs and reflection in straight lines and also study other real-life graphs, including speed/distance/time, constructing and interpreting these and also investigate the area under a curve and its relationship to rates of change graphs. Content includes plotting and interpreting graphs of non-standard functions in real-life contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration. Students also interpret the gradient at a point on a curve as the instantaneous rate of change; apply the concepts of instantaneous and average rate of change (gradients of tangents and chords) in different contexts. Students calculate or estimate gradients of graphs and areas under graphs (including quadratic and other non-linear) and interpret results in cases such as distance-time graphs, velocity-time graphs and graphs in financial contexts.

Learning Sequence:

Interpret and construct distance/time graphs
Students discover how the gradient of a distance/time graph represents the speed of travel and read, interpret and construct distance/time graphs.

Speed/Time graphs
Students discover how the gradient on a speed/time graph represents the acceleration and that a negative gradient now represents deceleration. The area under a graph is the distance travelled

Calculate the area under a graph
Students calculate areas under graphs consisting of straight lines, by creating shapes under the graph such as rectangles, triangles and trapezia. Students should know that the area under a speed-time graph represents distance.

Estimate the gradient at a point on a curve
Students estimate the gradient at a point on a curve by drawing a tangent at that point and working out its gradient. Students also interpre the meaning of the gradient given the concept of the graph. Students should know that if the vertical axis represents distance on a distance-time graph, then the gradient will represent speed. Also that if the vertical axis represents veolocity on a velocity-time graph, then the gradient will represent acceleration. Student investigate that the rate of change at a particular instant in time is represented by the gradient of the tangent to the curve at that point

Estimate the area under a curve
Students use the area of trapezia, triangles and rectangles to estimate the area under a curve and interpret the meaning of the area in relation to the graph itself

Calculate the average rate of change
Students construct chords between two points on a curve to calculate the average rate of change over time which is represented by the gradient of the chord.

Sequence of Learning:	
1	Interpret and construct distance/time graphs
2	Speed/time graphs
R	Area under a graph
4	Gradient at a point on a curve
5	Estimate the area under a curve
6	Calculate the average rate of change

Topic Resources:	
Knowledge Map:	Non-Linear Graphs quadratic and cubic Non-Linear Graphs other including circles Circles including Theorems

Assessment:	
Knowledge:	End of Topic test
Application of Knowledge:	Termly summative assessment

Supportive Reading:	
Any supported reading listed here	Sparx Maths www.sparxmaths.co.uk
	Corbett Maths : www.corbettmaths.com
	AQA Revision Guide

Scheme of Learning: Year 11 Higher Autumn Term

Topic Sequence: Graphs

1	2	3	4
Gradients and Lines	**Non-Linear Graphs**	**Using Graphs**	**Graph Transformations**

Topic Overview: Non-Linear Graphs

Students extend their learning of transformations of shapes to sketch and recognise translations and reflections of the graph of a given function, including the trigonometric graphs

Learning Sequence:

Translations of Graphs

Students explore translations and make generalisations of graphs of the functions $f(x) + a$, $f(x + b)$ where a and b are integers. Translations horizontally and vertically are considered separately. Trigonometric graphs are also used in this step

Reflections of Graphs

Students transform the graph of reflections of functions $-f(x)$ and $f(-x)$. Students recongnise these transformations of functions and are able to write down the function of a transformation given the original function. Trigonometric graphs are also used in this step.

Sequence of Learning:

1	Translations of graphs
2	Reflections of graphs

Topic Resources:

Knowledge Map:	Graph transformatoins

Assessment:

Knowledge:	End of Topic test
Application of Knowledge:	Termly summative assessment

Supportive Reading:

Any supported reading listed here	Sparx Maths www.sparxmaths.co.uk
	Corbett Maths : www.corbettmaths.com
	AQA Revision Guide

Scheme of Learning: Year 11 Higher Autumn Term

Topic Sequence:

1

Further Trigonometry

Topic Overview: Further Trigonometry

Students extend their previous work on Right Angled Trigonometry and Pythagoras to three dimensional figures before exploring the area of a triangle using the formula *Area = ½ ab sinC* and the sine and cosine rules being applied to non-right angled triangles

Learning Sequence:

Use trigonometry and Pythagoras in 3D shapes
Students start by recognising 3D right angled triangles in a 3D shape before applying the trigonometric ratio and also Pythagoras' theorem to triangles to find identified unknown sides or angles

Area of a Triangle
Students use the trigonometric ratio to explore and derive the formula for the area of non-right angled triangles (*Area = ½ ab sinC)* and then apply this formula to problems to find the area of non-right angled triangles

Sine Rule – finding lengths
Students derive the sine rule which allows them to make connections to previous learning. They then consider correct substitution into the formula, particularly focussing on using the correct angle. Finally, students begin to explore problems involving the sine rule.

Sine Rule – finding angles
Students start by exploring different ways of writing the sine rule, understanding which arrangement is more efficient depending on what they are trying to find and applying the formula to problems

Cosine rule – finding lengths
Students are guided through steps to derive the cosine rule. It is important that students understand that this formula can be used for any missing length. After practising correct substitution to find a missing length using a calculator students can revisit exact values to ensure familiarity of non-calculator use.

Cosine rule – finding angles
Students are introduced to finding angles both by substituting into the original formula and also rearranging the formula before substituting. Students apply both finding angles and sides using the cosine rule

Choosing sine or cosine rule
Students explore which rule is most appropriate to use, breaking complex problems into small steps. This is then extended to problem solving where application of other mathematical concepts such as ratio is necessary

Bearings and right angled geometry
Students revisit work on bearings and apply it to problems requiring right angled trigonometry and also Pythagoras' theorem. Adding auxiliary lines and drawing separate triangles helps students decide which trigonometric ratio to use

Bearings: sine and cosine rule
Students revisit work on bearings and apply it to problems requiring non-right angled trigonometry. Adding auxiliary lines and drawing separate triangles helps students decide which rule to use

Sequence of Learning:	
1	Use trigonometry and Pythagoras in 3D shapes
2	Area of a Triangle – ½ ab sin C
3	Sine rule – finding lengths
4	Sine rule – finding angles
5	Cosine rule – finding lengths

Topic Resources:	
Knowledge Map:	Further Trigonometry
Assessment:	
Knowledge:	End of Topic test
Application of Knowledge:	Termly summative assessment

Scheme of Learning: Year 11 Higher Spring Term

Topic Sequence: Reasoning

1	2	
Multiplicative Reasoning	**Geometric Reasoning**	**Algebraic Reasoning**

Topic Overview:

Students develop their multiplicative reasoning in a variety of contexts from simple scale factors through to equations involving direct and inverse proportion. There is also a review of ratio problems. Content covered includes extending and formalising their knowledge of ratio and proportion, including trigonometric ratios, in working with measures and geometry and in working with proportional relations algebraically and graphically. Content also includes comparing lengths, areas and volumes using ratio notation and/or scale factors; making links to similarity and understanding the equations that describe direct and inverse proportion

Lesson Sequence:

Direct and Inverse Proportion – scale factors
This step is a recap of the concept of proportion and ratio, including scale factor, using fractional scale factors as well as those above
1. Students revisit the definition of a similar shape and higher tier students revisit the concept of area and volume scale factors

Direct and Inverse Proportion – graphs
The idea of constant multiplier and constant product is further explored here, with students exploring the graphs of both types of proportion, with direct being more familiar. Students can compare the graphs of inverse proportion relationships with that of the reciprocal function

Understand Algebraic Direct Proportion
The aim of this step is to understand direct proportion before introducing $y = kx$. Direct proportion relationships such as diameter and currency conversions are revisited. Students are exposed to different representations, such as word problems, graphs and equations. Students studying for foundation tier also form direct simple equations in this step ($y = kx$)

Direct Proportion Equations
Students are introduced to the proportionality symbol α, and the constant of proportionality k. Knowledge of constant ratios in a direct proportion relationship leads to the general equation $y = kx$. A common mistake is to find k but then forget to substitute it into the equation.

Understand Algebraic Inverse Proportion
Students use different examples (such as speed, distance time or mass, density volume) to distinguish between direct and inverse proportion. Students studying for foundation tier also form simple inverse proportion equations in this step ($y = k/x$)

Inverse Proportion Equations
Students are now familiar with both direct and inverse proportion relationships. This leads to more complex inverse proportion equations, working in the abstract.

Sequence of Learning:	
1	Use Scale Factors for Direct and Inverse Proportion
2	Direct and Inverse Proportion Graphs
3	Understand Algebraic Direct Proportion
4	Direct Proportion Equations
5	Understand Algebraic Inverse proportion
6	Inverse Proportion Equations

Topic Resources:	
Knowledge Map:	Ratio and scale Direct and Inverse proportion

Assessment:	
Knowledge:	End of Topic Test
Application of Knowledge:	Termly Summative Assessments

Supportive Reading:	
Any supported reading listed here	Sparx maths: www.sparxmaths.co.uk
	Corbett Maths: www.corbettmaths.com
	AQA Revision guide

Scheme of Learning: Year 11 Higher Spring Term

Topic Sequence: Reasoning

1	2	
Multiplicative Reasoning	**Geometric Reasoning**	**Algebraic Reasoning**

Topic Overview: Geometric Reasoning

Students have previously met vectors to describe translations. This is revisited and used as a basis for looking more formally at vectors, discovering the meaning of **–a** compared to **a** to make sense of operations such as addition, subtraction and multiplication of vectors. This will extend to exploring journeys within shapes, linking the notation with **b** – **a** etc. Students use this understanding as the basis for developing geometric proof, making links to their knowledge of properties of shape and parallel lines. Within Circle Theorems, students are introduced to the 8 circle theorems, identifying and applying circle definitions and properties, including centre, radius, chord, diameter, circumference, tangent, arc, sector and segment and building on these to apply and prove circle theorems concerning angles, radii, tangents and chords and use them to prove related results

Lesson Sequence:

Understand and represent vectors

A vector shows both magnitude and direction and students also recognise the role of the arrow to show direction of the vector, considering the start and end points for magnitude. Students can compare vectors of the same magnitude but different directions. Students are familiar with two representations of vectors: column vector and line segment with an arrow and are introduced to the formal notation for labelling vectors and **a** and a. Students develop a deeper understanding of a vector representing movement from one point to another and start comparing different representations.

Vectors multiplied by a scalar

Students explore vectors that are parallel to each other, understanding that when vectors are parallel, one is the multiple of the other and the multiplier is called a scalar. Students identify negative multipliers where vectors are parallel but in opposite directions.

Addition and subtraction of vectors

Students become confident in identifying and drawing representations of vector addition and subtraction and looking at resultant vectors.

Vector journeys in shapes

Students move around shapes from one vertex to the next using the notation etc. They explore quadrilaterals through parallel and non-parallel vectors, making generalisations about different vectors. Students appreciate that a vector is only parallel to another if one is a multiple of the other, realising that the multiplier can be negative or fractional.

Explore colinear points using vectors

In this small point, students consider 'collinear' and its meaning. Students need to give the complete reason – that lines are parallel and that they share a point top be on the same line

Use vectors to construct geometric arguments and proofs

Students use key command words, 'show, justify, prove'. Students find vectors for parts of line segments, given the vector for a whole line segment, applying knowledge of ratio and fractions where necessary

Circle theorems

Studying the circle theorems also requires basic understanding of circle parts and basic rules in triangles. Circle theorems must be proven and the topic can be linked to Pythagoras and also Trigonometry. The 8 Circle theorems are: Angles at the centre are twice the angle at the circumference; Angles in a semicircle; Angles in the same segment; Angles in a cyclic quadrilateral; Angle between a radius and a chord; Angle between radius and tangent; Two tangents from a point; Alternate Segment theorem.

Sequence of Learning:

1	Understand and represent vectors
2	Vectors multiplied by a scalar
3	Addition and subtraction of vectors
4	Vector journeys in shapes
5	Collinear points
6	Use vectors to construct geometric arguments and proofs
7	Circle Theorems

Topic Resources:

Knowledge Map:	Vectors Circle Theorems
Assessment:	
Knowledge:	End of Topic Test
Application of Knowledge:	Termly Summative Assessments
Supportive Reading:	
Any supported reading listed here	Sparx maths: www.sparxmaths.co.uk
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Scheme of Learning: Year 11 Higher Spring Term

Topic Sequence: Reasoning

1	2	
Multiplicative Reasoning	Geometric Reasoning	Algebraic Reasoning

Topic Overview: Algebraic Reasoning

As well as introducing formal function notation, this topic builds on previous work looking at functions and graphs and develops students'. algebraic reasoning by looking at algebraic proof. Content includes interpreting simple expressions as functions with inputs and outputs and interpreting the reverse process as the 'inverse function' and interpreting the succession of two functions as 'composite functions'. Students build on previous work looking at solving inequalities and also linear and quadratic graphs to explore how number lines and graphs can be used to represent the solutions to inequalities. Looking at the difference between equations and inequalities, students establish the difference between a solution and a solution set or range of solutions. Students solve linear inequalities in one or two variables and quadratic inequalities in one variable, representing the solution set on a number line using set notation and on a graph and need to recognise, sketch and interpret graphs of quadratic functions. Students extend their work on sequences, finding the nth term of quadratic sequences and investigating iteration

Learning Sequence:

Use function notation

Students are introduced to formal function notation such as *f(x)* which is a function applied to x. Students should be aware that other letters can be used, with different letters used to distinguish between different functions within the same question.

Composite functions and inverse functions

Students learn that a composite function is a function made from other functions, where the output of one is the input of the other. Students are introduced to inverse functions and make the link to inverse operations, ensuring they are secure with rearranging formula in advance

Graphs of quadratic functions

This step revisits work in year 10 on recognising and plotting quadratic graphs, including identifying the turning point of a quadratic by completing the square

Solving quadratic inequalities

Students consolidate factorising quadratics and link their factorisation to the solution set. Solutions are represented on a graph, and number line and using set notation.

Inequalties in two variables

Students extend previous work solving simultaneous equations to solving inequalities and explore inequalities in more than one variable, using a graphical approach.

Formal algebraic proof

Students build on previous knowledge of algebraic manipulation to complete formal algebraic proof. They should also know the meaning of the word counterexample and how to show a conjecture is false

Quadratic Sequences

Students learn how to find the nth term of a quadratic sequence when the coefficient of n^2 is both 1 and above

Iteration and notation

Students are introduced to the iterative process as a recurrence relationship and its notation

Rearrange equations to a given form

Students find possible rearrangements of equations that can lead to an iterative formula.

Use the iterative process to find approximate solutions to equations

Students learn how to find approximate solutions to equations using the iterative process

Use the iterative process to identify if there is a root between two values

Students investigate the fact that a root happens when a graph crosses the x-axis so when the graph goes from a positive y value to a negative, or vice versa and use the iterative process to identify if there is a solution to an equation between two points

Sequence of Learning:

1	Using function notation
2	Composite and inverse functions
3	Graphs of quadratic functions
4	Solving quadratic inequalities
5	Inequalities in two variables
6	Formal algebraic proof
7	Quadratic Sequences
8	Iteration

Topic Resources:

Knowledge Map:	Algebraic proof and functions Algebraic manipulation and notation Functions Sequences Iteration

Assessment:

Knowledge:	End of Topic Test
Application of Knowledge:	Termly Summative Assessments

Supportive Reading:

Any supported reading listed here	Sparx maths: www.sparxmaths.co.uk
	Corbett Maths: www.corbettmaths.com
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