White Rose Maths

Curriculum documentation

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The White Rose Maths schemes of learning

Why small steps?

We know that if too many concepts are covered at once, it can lead to cognitive overload, so we believe it is better to follow a small steps approach to the curriculum. As a result, each block of content in our schemes of learning is broken down into small manageable steps.

It is not the intention that each small step should last a lesson – some will be a short step within a lesson; some will take longer than a lesson. We encourage teachers to spend the appropriate amount of time on each step for their group, and to teach some steps alongside each other if necessary.

Teaching for mastery

Our research-based schemes of learning are designed to support a mastery approach to teaching and learning and are consistent with the aims and objectives of the National Curriculum.

Curriculum structure and sequencing

Key concepts are introduced in a carefully considered logical sequence, allowing students to build a deep and connected understanding. This consistent and coherent approach supports students in making links within and between topics over time, laying secure foundations for future learning. Our curriculum is also aligned with White Rose Science to ensure mathematical concepts are always taught first in maths lessons.

Evidence-informed design

Our curriculum is designed by a team of maths specialists, with an emphasis on how students learn, retain and retrieve knowledge. We incorporate strategies such as retrieval practice and spaced learning to support long-term memory and deepen understanding. The use of models and representations plays a key role in reducing cognitive load and making abstract concepts more accessible. Informed by the latest educational research, each scheme of learning also identifies common misconceptions and provides targeted approaches to address them, supporting effective, evidence-informed teaching in every classroom.

Fluency, reasoning and problem solving

Our schemes develop all three key areas of the National Curriculum, giving students the knowledge and skills they need to become confident mathematicians.

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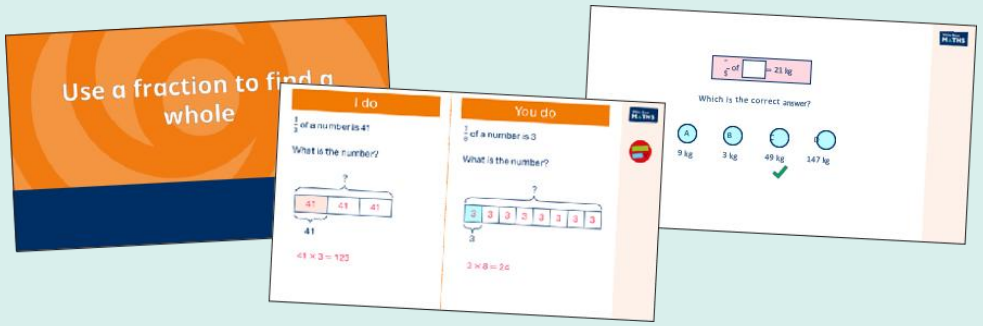
The White Rose Maths premium subscription

Supporting curriculum implementation

White Rose Maths resources help schools deliver a coherent curriculum through consistent representations, planned retrieval, diagnostic assessment opportunities and carefully sequenced examples.

Teaching slides

Our maths specialists have written teaching slides for every small step. They provide worked examples, multiple choice questions and opportunities for discussion helping teachers identify misconceptions and inform their teaching. These are fully animated and editable, so can be adapted to the needs of any class.

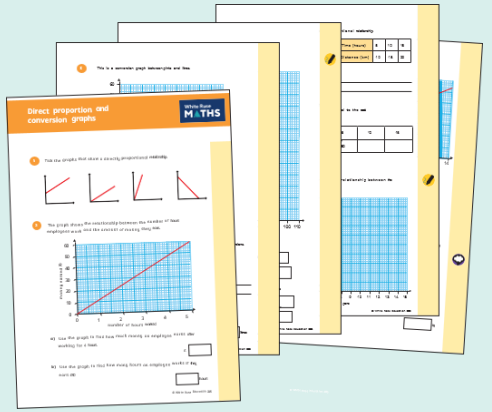


Retrieval

Retrieval opportunities are designed to strengthen long-term retention and support students in connecting new learning with prior knowledge. Our teaching slides include Flashback 4 activities and a recap of prior learning at the start of each small step.

Worksheets

Our worksheets accompany every small step and are carefully designed to provide suitable practice questions for each topic. Similar to our teaching slides, our worksheets indicate to students where a concrete resource or a model may support them in their solution. Answers to all the worksheet questions are provided.



Assessments

Each block includes two end-of-block assessments designed to help teachers evaluate students' understanding of the key concepts and content taught.

End-of-term assessments are also provided to support the evaluation of learning and retention across a broader range of curriculum content. All end-of-term assessments are accompanied by detailed mark schemes and question level analysis (QLA) spreadsheets, enabling teachers to identify misconceptions, track progress and inform future teaching. Together these resources support timely, targeted interventions and help ensure that teaching is responsive to students' needs.

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The White Rose Maths schemes of learning

Concrete – Pictorial – Abstract (CPA)

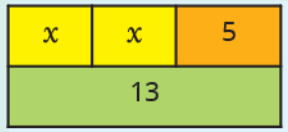
Research shows that a CPA approach helps all students access ambitious mathematical content while maintaining high expectations. This features throughout our schemes of learning.

Concrete

Students should have the opportunity to work with physical objects/concrete resources, to develop conceptual understanding and make abstract ideas more accessible.

Pictorial

Alongside concrete resources, students should work with pictorial representations, making links to the concrete. Visualising a problem in this way can help students to reason and to solve problems.



Abstract

With the support of both the concrete and pictorial representations, students can generalise, reason and work confidently with abstract mathematical representations.

$$2x + 5 = 13$$

Supporting all learners

Representations remove barriers to learning, supporting access to an ambitious curriculum for all.
Carefully chosen models and representations help students develop deep conceptual understanding, address misconceptions and support mathematical reasoning with increasingly abstract mathematics.

Key Stage 3 and 4 symbols

The following symbols are used to indicate:

- concrete resources might be useful to help answer the question
- a bar model might be useful to help answer the question
- drawing a picture might help students to answer the question
- students talk about and compare their answers and reasoning
- a question that should really make students think. The question may be structured differently or require a different approach from others and/or tease out common misconceptions.
- the step has an explicit link to science, helping students to make cross-curricular connections.

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How to use this document

Yearly overviews

The yearly overview demonstrates how learning is sequenced and revisited across the year to support progression, retention and future learning.

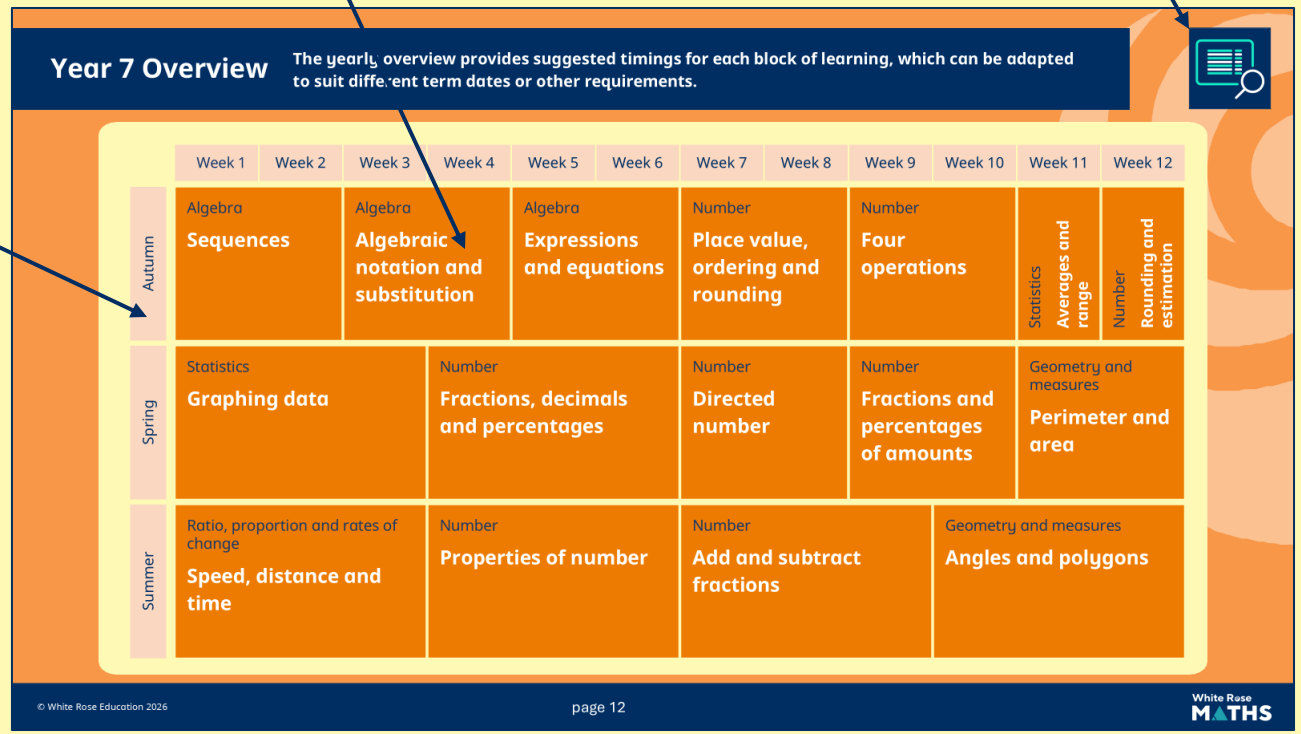
Click on a block to go to the half term overview.

Click the 'Return to contents' button to go back to the contents page.

Click on a term to go to the sequencing rationale for that term.

What to look for

- How the curriculum has been sequenced across a year group
- The order in which blocks are taught
- The suggested time allocated to each block
- The progression of learning across the academic year



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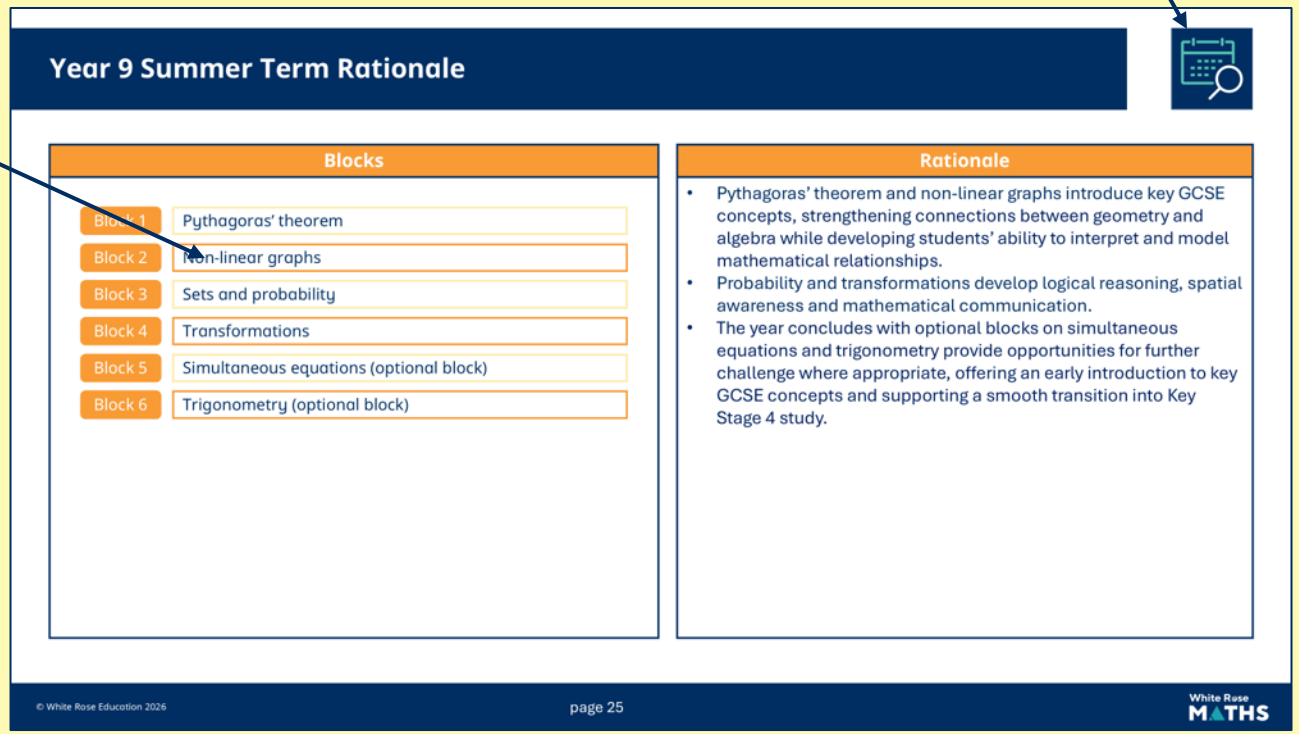
Sequencing rationale

These pages explain the curriculum decisions behind each term, including how new learning builds on prior knowledge, prepares students for future learning and addresses common misconceptions.

Click the 'Return to yearly overview' button to go back to the relevant yearly overview page.

Click on the name of the block (or the tier at KS4) to go to the medium term plan and small steps for that block.



What to look for

- The rationale behind the sequencing of blocks
- How blocks build on prior learning and prepare students for future learning
- Cross-curricular links with White Rose Science
- How mathematical ideas connect across blocks

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Half term overviews

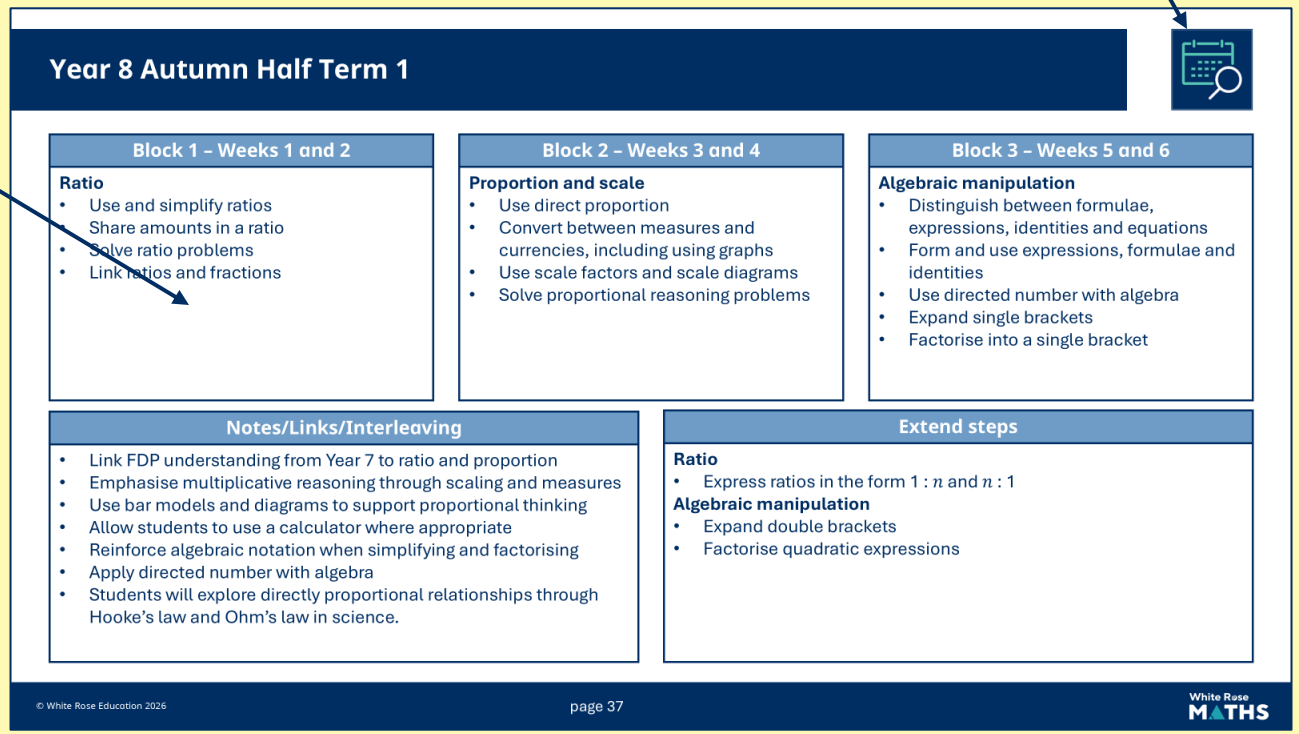
The half term overview highlights the key knowledge, skills, curriculum connections and retrieval opportunities that support progression across the curriculum.

Click the 'Return to yearly overview' button to go back to the relevant yearly overview page.

Click on a block to go to the medium term plan and small steps for that block.

What to look for

- The key learning in each block
- Links to prior and future learning
- Retrieval and interleaving opportunities
- Opportunities to extend/challenge
- Connections between mathematical ideas
- Cross-curricular links with White Rose Science



Year 8 Autumn Half Term 1

Block 1 – Weeks 1 and 2	Block 2 – Weeks 3 and 4	Block 3 – Weeks 5 and 6
Ratio • Use and simplify ratios • Share amounts in a ratio • Solve ratio problems • Link ratios and fractions	**Proportion and scale** • Use direct proportion • Convert between measures and currencies, including using graphs • Use scale factors and scale diagrams • Solve proportional reasoning problems	**Algebraic manipulation** • Distinguish between formulae, expressions, identities and equations • Form and use expressions, formulae and identities • Use directed number with algebra • Expand single brackets • Factorise into a single bracket

Notes/Links/Interleaving	Extend steps
• Link FDP understanding from Year 7 to ratio and proportion • Emphasise multiplicative reasoning through scaling and measures • Use bar models and diagrams to support proportional thinking • Allow students to use a calculator where appropriate • Reinforce algebraic notation when simplifying and factorising • Apply directed number with algebra • Students will explore directly proportional relationships through Hooke's law and Ohm's law in science.	**Ratio** • Express ratios in the form $1 : n$ and $n : 1$ **Algebraic manipulation** • Expand double brackets • Factorise quadratic expressions

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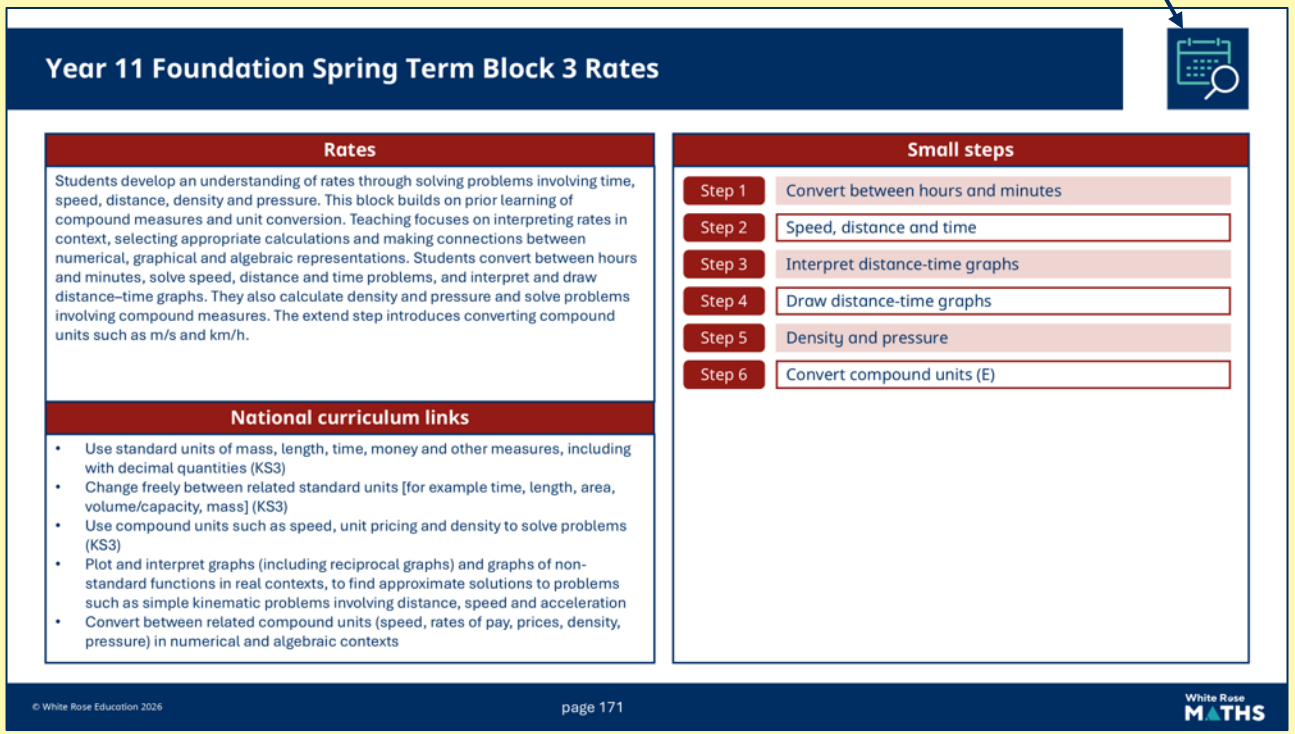
Medium term plans

The medium term plans provide detailed curriculum information, including key knowledge, progression, curriculum links and small-step sequencing.

Click the 'Return to yearly overview' button to go back to the relevant yearly overview page.

What to look for

- The purpose and content of the block
- The sequence of small steps
- The National Curriculum content covered within the block
- Links to prior and future learning



Year 11 Foundation Spring Term Block 3 Rates

Rates

Students develop an understanding of rates through solving problems involving time, speed, distance, density and pressure. This block builds on prior learning of compound measures and unit conversion. Teaching focuses on interpreting rates in context, selecting appropriate calculations and making connections between numerical, graphical and algebraic representations. Students convert between hours and minutes, solve speed, distance and time problems, and interpret and draw distance–time graphs. They also calculate density and pressure and solve problems involving compound measures. The extend step introduces converting compound units such as m/s and km/h.

National curriculum links

- Use standard units of mass, length, time, money and other measures, including with decimal quantities (KS3)
- Change freely between related standard units [for example time, length, area, volume/capacity, mass] (KS3)
- Use compound units such as speed, unit pricing and density to solve problems (KS3)
- Plot and interpret graphs (including reciprocal graphs) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration
- Convert between related compound units (speed, rates of pay, prices, density, pressure) in numerical and algebraic contexts

Small steps

Step 1	Convert between hours and minutes
Step 2	Speed, distance and time
Step 3	Interpret distance-time graphs
Step 4	Draw distance-time graphs
Step 5	Density and pressure
Step 6	Convert compound units (E)

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Topic progression

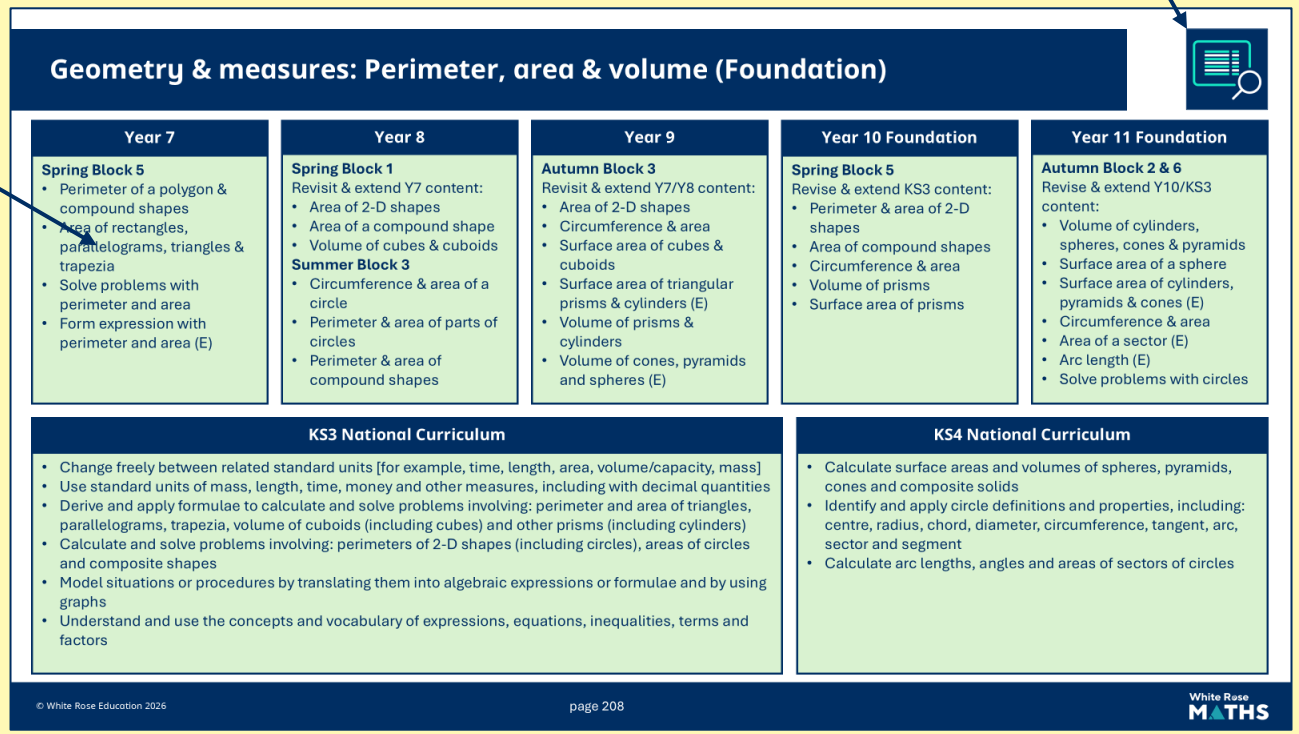
These pages illustrate topic progression across Key Stages 3 and 4, supporting curriculum planning by making it easy to identify where objectives are introduced, revisited, and developed throughout the five-year curriculum.

Click the 'Return to contents' button to go back to the contents page.

Click on an objective to go to the medium term plan and small steps page for that objective.

What to look for

- Where each topic is first introduced
- How knowledge and skills are revisited and developed
- How learning progresses from KS3 to KS4
- Which curriculum blocks each objective is taught in



Geometry & measures: Perimeter, area & volume (Foundation)

Year 7	Year 8	Year 9	Year 10 Foundation	Year 11 Foundation
Spring Block 5 • Perimeter of a polygon & compound shapes • Area of rectangles, parallelograms, triangles & trapezia • Solve problems with perimeter and area • Form expression with perimeter and area (E)	**Spring Block 1** Revisit & extend Y7 content: • Area of 2-D shapes • Area of a compound shape • Volume of cubes & cuboids **Summer Block 3** • Circumference & area of a circle • Perimeter & area of parts of circles • Perimeter & area of compound shapes	**Autumn Block 3** Revisit & extend Y7/Y8 content: • Area of 2-D shapes • Circumference & area • Surface area of cubes & cuboids • Surface area of triangular prisms & cylinders (E) • Volume of prisms & cylinders • Volume of cones, pyramids and spheres (E)	**Spring Block 5** Revise & extend KS3 content: • Perimeter & area of 2-D shapes • Area of compound shapes • Circumference & area • Volume of prisms • Surface area of prisms	**Autumn Block 2 & 6** Revise & extend Y10/KS3 content: • Volume of cylinders, spheres, cones & pyramids • Surface area of a sphere • Surface area of cylinders, pyramids & cones (E) • Circumference & area • Area of a sector (E) • Arc length (E) • Solve problems with circles

KS3 National Curriculum	KS4 National Curriculum
• Change freely between related standard units [for example, time, length, area, volume/capacity, mass] • Use standard units of mass, length, time, money and other measures, including with decimal quantities • Derive and apply formulae to calculate and solve problems involving: perimeter and area of triangles, parallelograms, trapezia, volume of cuboids (including cubes) and other prisms (including cylinders) • Calculate and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes • Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs • Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors	• Calculate surface areas and volumes of spheres, pyramids, cones and composite solids • Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment • Calculate arc lengths, angles and areas of sectors of circles

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Yearly overviews

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Year 7 Overview

The yearly overview provides suggested timings for each block of learning, which can be adapted to suit different term dates or other requirements.

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Algebra **Sequences**		Algebra **Algebraic notation and substitution**		Algebra **Expressions and equations**		Number **Place value, ordering and rounding**		Number **Four operations**		Statistics **Averages and range**	Number **Rounding and estimation**
Spring	Statistics **Graphing data**			Number **Fractions, decimals and percentages**			Number **Directed number**		Number **Fractions and percentages of amounts**		Geometry and measures **Perimeter and area**	
Summer	Ratio, proportion and rates of change **Speed, distance and time**			Number **Properties of number**			Number **Add and subtract fractions**			Geometry and measures **Angles and polygons**		

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Year 8 Overview

The yearly overview provides suggested timings for each block of learning, which can be adapted to suit different term dates or other requirements.

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Ratio, proportion and rates of change **Ratio**		Ratio, proportion and rates of change **Proportion and scale**		Algebra **Algebraic manipulation**		Algebra **Coordinates and graphs**			Number **Multiply and divide fractions**		Geometry and measures **Symmetry and reflection**
Spring	Geometry and measures **Area, volume and density**		Algebra **Equations and inequalities**		Number **Percentages**			Algebra **Indices**		Number **Standard form**	Statistics **Interpret and represent data**	
Summer	Geometry and measures **Angles in parallel lines and polygons**			Probability **Tables and probability**			Geometry and measures **Circles**		Statistics **Graphs and charts**		Algebra **Sequences**	Consolidation

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Year 9 Overview

The yearly overview provides suggested timings for each block of learning, which can be adapted to suit different term dates or other requirements.

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number **Properties of number**		Number **Percentages**		Geometry and measures **Area and volume**		Algebra **Equations, inequalities and formulae**		Number **Fractions**	Ratio, proportion and rates of change **Rates**		Number **Standard form**
Spring	Number **Maths and money**			Algebra **Straight line graphs**		Ratio, proportion and rates of change **Ratio and proportion**		Geometry and measures **Constructions and congruence**		Geometry and measures **Similarity**		Algebra **Algebraic manipulation**
Summer	Geometry and measures **Pythagoras' theorem**		Algebra **Non-linear graphs**		Probability **Sets and probability**		Geometry and measures **Transformations**		Algebra **Simultaneous equations** (optional block)		Geometry and measures **Trigonometry** (optional block)	

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Year 10 Foundation Overview

The yearly overview provides suggested timings for each block of learning, which can be adapted to suit different term dates or other requirements.

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Algebra **Algebraic manipulation**		Algebra **Equations, inequalities and formulae**		Algebra **Quadratic expressions and equations**		Number **Percentages**		Ratio, proportion and rates of change **Ratio and scale**		Number **Work with fractions**	
Spring	Number **Non-calculator methods**		Algebra **Straight line graphs**		Probability **Probability**		Number **Rounding and estimation**	Geometry and measures **Perimeter, area and volume**		Statistics **Interpret and represent data**		Algebra **Non-linear graphs**
Summer	Geometry and measures **Angles**		Statistics **Graphs and diagrams**		Geometry and measures **Vectors**		Number **Factors, powers and surds**		Geometry and measures **Pythagoras and trigonometry**		Algebra **Simultaneous equations**	

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Year 10 Higher Overview

The yearly overview provides suggested timings for each block of learning, which can be adapted to suit different term dates or other requirements.

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Algebra **Algebraic manipulation**	Algebra **Equations, inequalities and formulae**		Algebra **Quadratic expressions and equations**			Number **Percentages**		Ratio, proportion and rates of change **Ratio and scale**		Number **Work with fractions**	
Spring	Number **Non-calculator methods**	Algebra **Straight line graphs**		Probability **Probability**		Number **Rounding and estimation**	Geometry and measures **Perimeter, area and volume**		Statistics **Interpret and represent data**		Algebra **Non-linear graphs**	
Summer	Geometry and measures **Angles**		Statistics **Graphs and diagrams**		Geometry and measures **Vectors**		Number **Factors, powers and surds**		Geometry and measures **Pythagoras and trigonometry**		Algebra **Simultaneous equations**	

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Year 11 Foundation Overview

The yearly overview provides suggested timings for each block of learning, which can be adapted to suit different term dates or other requirements.

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Ratio, proportion and rates of change **Ratio and proportion**		Geometry and measures **Area and volume**		Geometry and measures **Similarity and congruence**		Algebra **Sequences and proof**		Number **Standard form**	Geometry and measures **Work with circles**		Probability **Set notation and Venn diagrams**
Spring	Algebra **Functions and graphs**		Algebra **Equations and formulae**		Ratio, proportion and rates of change **Rates**		Geometry and measures **Angles, bearings and trigonometry**		Geometry and measures **Constructions and loci**		Geometry and measures **Transformations**	
Summer	Revision and exams											

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Year 11 Higher Overview

The yearly overview provides suggested timings for each block of learning, which can be adapted to suit different term dates or other requirements.

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Ratio, proportion and rates of change **Ratio and proportion**		Geometry and measures **Area and volume**	Geometry and measures **Similarity and congruence**		Algebra **Sequences and proof**		Number **Standard form**	Geometry and measures **Circle theorems**		Probability **Set notation and Venn diagrams**	Geometry and measures **Vectors**
Spring	Algebra **Functions and graphs**		Algebra **Equations and formulae**			Ratio, proportion and rates of change **Rates**	Geometry and measures **Angles, bearings and trigonometry**		Geometry and measures **Constructions and loci**		Geometry and measures **Transformations**	
Summer	Revision and exams											

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Sequencing rationale

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Year 7 Autumn Term Rationale

Blocks

Block 1	Sequences
Block 2	Algebraic notation and substitution
Block 3	Expressions and equations
Block 4	Place value, ordering and rounding
Block 5	Four operations
Block 6	Averages and range
Block 7	Rounding and estimation

Rationale

- The year begins with algebra to develop abstract thinking, pattern recognition and mathematical reasoning, establishing strong foundations for Key Stage 3.
- The algebra sequence builds understanding gradually from sequences through to expressions and equations.
- Number topics then strengthen core fluency, focusing on place value, rounding and calculation skills that underpin success across the curriculum.
- Averages and range provide opportunities to apply number knowledge in context, developing students' ability to interpret and analyse data while supporting statistical thinking in science.
- Rounding and estimation consolidate numerical reasoning and support application in both maths and science.

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Year 7 Spring Term Rationale

Blocks

Block 1	Graphing data
Block 2	Fractions, decimals and percentages
Block 3	Directed number
Block 4	Fractions and percentages of amounts
Block 5	Perimeter and area

Rationale

- Statistics is revisited through graphing data enabling students to develop confidence in representing and interpreting information. This supports links with the White Rose Science curriculum, where these skills are applied in a range of scientific contexts.
- Fractions, decimals and percentages are grouped together to strengthen understanding of equivalent forms and deepen students' proportional reasoning.
- Directed number is introduced once core number concepts are secure, extending students' understanding of the number system and preparing them for more advanced algebraic thinking.
- Fractions and percentages of amounts provide meaningful opportunities to apply prior number learning in different contexts.
- Drawing on their prior learning of the four operations, they calculate perimeter and area in a range of contexts and apply their understanding to solve problems, strengthening connections between number and geometry.

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Year 7 Summer Term Rationale

Blocks

Block 1	Speed, distance and time
Block 2	Properties of number
Block 3	Add and subtract fractions
Block 4	Angles and polygons

Rationale

- Speed, distance and time are introduced before students meet these concepts in the White Rose Science curriculum, providing a strong foundation for future scientific applications and supporting cross-curricular connections.
- Properties of number revisits and deepens core numerical concepts, deepening understanding while strengthening fluency and reasoning.
- Adding and subtracting fractions builds on prior learning of fractions, decimals and percentages from the spring term.
- Angles and polygons conclude the year by broadening geometric understanding and preparing students for future geometry topics.

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Year 8 Autumn Term Rationale

Blocks

Block 1	Ratio
Block 2	Proportion and scale
Block 3	Algebraic manipulation
Block 4	Coordinates and graphs
Block 5	Multiply and divide fractions
Block 6	Symmetry and reflection

Rationale

- Ratio, proportion and scale are introduced first to strengthen multiplicative reasoning and problem-solving skills, providing a foundation for many of the mathematical concepts students will encounter throughout Key Stages 3 and 4.
- Consecutive algebra blocks build fluency with manipulating expressions and representing relationships graphically in the Cartesian plane, allowing understanding to develop in a coherent and connected way.
- Fractions are revisited and extended, building on Year 7 foundations to deepen understanding of multiplication and division while strengthening proportional reasoning.
- Symmetry and reflection develop spatial reasoning and prepare students for future transformations work.

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Year 8 Spring Term Rationale

Blocks	
Block 1	Area, volume and density
Block 2	Equations and inequalities
Block 3	Percentages
Block 4	Indices
Block 5	Standard form
Block 6	Interpret and represent data

Rationale

- Area, volume and density are introduced early in the term, ensuring students develop the mathematical understanding needed before applying these concepts in the White Rose Science curriculum.
- Algebra is revisited through equations and inequalities, deepening students' reasoning skills and strengthening their ability to model and solve mathematical problems.
- Percentages and multipliers extend proportional reasoning and support application in real-life contexts.
- Indices leads naturally into standard form, developing fluency with powers and scientific notation that are widely used in both mathematics and science.
- Statistics builds students' confidence in representing, interpreting and analysing data, while supporting essential skills needed for maths, science and wider data literacy.

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Year 8 Summer Term Rationale

Blocks	
Block 1	Angles in parallel lines and polygons
Block 2	Tables and probability
Block 3	Circles
Block 4	Graphs and charts
Block 5	Sequences

Rationale

- Geometry is revisited to deepen understanding and strengthen spatial reasoning skills developed earlier in Key Stage 3.
- Students are introduced to probability for the first time. They draw on their prior learning of fractions, decimals and percentages to describe the likelihood of events occurring, developing a deeper understanding of probability and its applications.
- Circles and statistics build on prior learning while extending students' ability to interpret and apply mathematical information.
- Sequences conclude the year by linking pattern recognition with increasingly sophisticated algebraic thinking, extending the foundations covered in Year 7.

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Year 9 Autumn Term Rationale

Blocks	
Block 1	Properties of number
Block 2	Percentages
Block 3	Area and volume
Block 4	Equations, inequalities and formulae
Block 5	Fractions
Block 6	Rates
Block 7	Standard form

Rationale

- Properties of number strengthen confidence and fluency before introducing more complex GCSE-style content, balancing consolidation of Key Stage 3 knowledge with preparation for GCSE study.
- Multipliers, percentages and proportional reasoning are prioritised as they underpin a wide range of mathematical ideas and have important applications.
- Students develop and build on their understanding of perimeter, area and volume from Years 7 and 8, exploring surface area and volume of a range of shapes.
- Building on prior learning, students deepen their understanding of equations, inequalities and formulae, including the more advanced skill of changing the subject of a formula.
- Fractions, rates and standard form are revisited to strengthen proportional thinking and support links with science, building confidence with scientific notation commonly used in both maths and science.

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Year 9 Spring Term Rationale

Blocks

Block 1	Maths and money
Block 2	Straight line graphs
Block 3	Ratio and proportion
Block 4	Constructions and congruence
Block 5	Similarity
Block 6	Algebraic manipulation

Rationale

- Maths and money provides meaningful financial contexts that develop numeracy, decision-making and problem-solving skills while highlighting the relevance of mathematics in everyday life.
- Straight line graphs, ratio and proportion build algebraic reasoning and strengthen problem-solving skills.
- Constructions, congruence and similarity deepen geometric understanding, developing spatial reasoning and students' ability to justify and communicate mathematical arguments.
- Algebraic manipulation prepares students for the demands of GCSE mathematics.

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Year 9 Summer Term Rationale

Blocks

Block 1	Pythagoras' theorem
Block 2	Non-linear graphs
Block 3	Sets and probability
Block 4	Transformations
Block 5	Simultaneous equations (optional block)
Block 6	Trigonometry (optional block)

Rationale

- Pythagoras' theorem and non-linear graphs introduce key GCSE concepts, strengthening connections between geometry and algebra while developing students' ability to interpret and model mathematical relationships.
- Probability and transformations develop logical reasoning, spatial awareness and mathematical communication.
- The year concludes with optional blocks on simultaneous equations and trigonometry, which provide opportunities for further challenge where appropriate, offering an early introduction to key GCSE concepts and supporting a smooth transition into Key Stage 4 study.

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Year 10 Autumn Term Rationale

Blocks			
Block 1	Algebraic manipulation	F	H
Block 2	Equations, inequalities and formulae	F	H
Block 3	Quadratic expressions and equations	F	H
Block 4	Percentages	F	H
Block 5	Ratio and scale	F	H
Block 6	Work with fractions	F	H

Rationale

- Year 10 begins with a strong focus on algebra, recognising its central role within the GCSE curriculum and establishing the foundations needed for success across both Foundation and Higher pathways.
- Algebraic manipulation, equations, and quadratic algebra are carefully sequenced to build fluency and confidence with increasingly complex reasoning and problem solving.
- Percentages, ratio, scale and fractions strengthen and extend multiplicative reasoning that underpins much of GCSE mathematics.
- These core concepts are introduced early to secure essential knowledge and create opportunities for retrieval, interleaving and deeper consolidation throughout Years 10 and 11.

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Year 10 Spring Term Rationale

Blocks

Block 1	Non-calculator methods	F	H
Block 2	Straight line graphs	F	H
Block 3	Probability	F	H
Block 4	Rounding and estimation	F	H
Block 5	Perimeter, area and volume	F	H
Block 6	Interpret and represent data	F	H
Block 7	Non-linear graphs	F	H

Rationale

- Non-calculator methods are revisited to strengthen number fluency, resilience and confidence with efficient calculation strategies.
- Straight line graphs extend prior algebraic learning, deepening students' understanding of mathematical relationships and providing a foundation for later work with non-linear graphs and inequalities.
- Probability develops reasoning skills through interpretation and representation of outcomes.
- Rounding and estimation reinforce accuracy and support problem solving across a range of contexts.
- Perimeter, area and volume builds on students' knowledge of KS3 geometry, solving a wider range of problems including calculating the area and perimeter of circles, sectors and compound shapes.
- Students develop their knowledge of averages and range in the interpret and represent data block and extend their existing understanding to grouped data.

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Year 10 Summer Term Rationale

Blocks			
Block 1	Angles	F	H
Block 2	Graphs and diagrams	F	H
Block 3	Vectors	F	H
Block 4	Factors, powers and surds	F	H
Block 5	Pythagoras and trigonometry	F	H
Block 6	Simultaneous equations	F	H

Rationale

- Students develop their understanding of angles in polygons and parallel lines with a focus on selecting the appropriate angle facts and justifying reasoning using clear mathematical notation.
- Statistics is revisited to reinforce data representation and interpretation skills through increasingly complex and unfamiliar contexts.
- Vectors strengthen connections between algebra and geometry, developing mathematical reasoning and formal problem-solving skills.
- Number work, including surds for Higher tier, deepens numerical fluency and prepares students for more advanced algebraic manipulation.
- The last two blocks of the year reinforce the learning from the optional Year 9 blocks, developing students' confidence in preparation for Year 11 GCSE study.

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Year 11 Autumn Term Rationale

Blocks			
Block 1	Ratio and proportion	F	H
Block 2	Area and volume	F	H
Block 3	Similarity and congruence	F	H
Block 4	Sequences and proof	F	H
Block 5	Standard form	F	H
Block 6	Work with circles/Circle theorems	F	H
Block 7	Set notation and Venn diagrams	F	H
Block 8	Vectors (Higher only)		H

Rationale

- Ratio and proportion revisits and extends multiplicative reasoning skills that underpin more sophisticated GCSE problem solving.
- Students consolidate their understanding of area and volume including finding the volume and surface area of spheres, cones and pyramids.
- Similarity and congruence develop students' ability to reason, justify and apply geometric relationships in preparation for later work on trigonometry and proof.
- Sequences and proof strengthen algebraic thinking and introduce more formal mathematical justification.
- Standard form is revisited and extended from Key Stage 3, deepening students' understanding of large and small numbers.
- Circles build on prior geometry learning, developing a deeper understanding of circle properties and relationships, including circle theorems for Higher tier students.
- Set notation and Venn diagrams strengthen logical reasoning and links with probability.
- For Higher tier students, vectors bring together algebraic and geometric reasoning while preparing students for more advanced GCSE content.

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Year 11 Spring Term Rationale

Blocks

Block 1	Functions and graphs	F	H
Block 2	Equations and formulae	F	H
Block 3	Rates	F	H
Block 4	Angles, bearings and trigonometry	F	H
Block 5	Constructions and loci	F	H
Block 6	Transformations	F	H

Rationale

- Algebra is revisited to strengthen understanding of relationships, graphs and algebraic structure ahead of GCSE exams.
- Equations and formulae consolidate and extend key algebraic methods, helping students to develop greater fluency and confidence.
- The rates block develops students' proportional reasoning through meaningful contexts such as speed, density and compound measures.
- The term concludes with a sequence of geometry blocks, revisiting and extending prior learning through increasingly complex reasoning and problem solving.

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Half term overviews

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Year 7 Autumn Half Term 1

Block 1 – Weeks 1 and 2

Sequences

- Describe and continue linear and non-linear sequences
- Represent sequences in diagram and number forms
- Term-to-term rules
- Compare numerical and graphical sequences

Block 2 – Weeks 3 and 4

Algebraic notation and substitution

- Use function machines
- Use algebraic notation
- Substitute into expressions
- Use inverse operations

Block 3 – Weeks 5 and 6

Expressions and equations

- Understand equality and equivalence
- Collect like terms
- Solve 1-step and 2-step equations

Notes/Links/Interleaving

- Revisit arithmetic strategies from KS2 when substituting and solving equations
- Allow students to use a calculator where appropriate
- Build on inverse operations for 1-step equations
- Link sequence patterns to algebraic rules
- Use diagrams, tables and algebraic representations
- Students need to be able to work with a variety of scientific formulae and solve 1-step and 2-step equations

Extend steps

Sequences

- Find missing terms

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Year 7 Autumn Half Term 2

Block 4 – Weeks 7 and 8

Place value, ordering and rounding

- Order integers and decimals
- Use place value to compare integers and decimals
- Use number lines with integers and decimals
- Round integers and decimals

Block 5 – Weeks 9 and 10

Four operations

- Use the four operations with integers and decimals
- Apply written and mental methods
- Use estimation and related calculations
- Use the order of operations

Block 6 – Week 11

Averages and range

- Find the mean, median, mode and range
- Interpret averages and range

Block 7 – Week 12

Rounding and estimation

- Round to significant figures
- Estimate calculations
- Use approximation to check answers
- Identify overestimates and underestimates

Notes/Links/Interleaving

- Revisit place value, four operations and order of operations from KS2
- Order of operations will be revisited with directed numbers
- Build on arithmetic and inverse operations for estimation and checking
- Choose when to use mental, written or calculator methods
- Link powers of 10 and standard form to place value
- Students calculate the mean and use rounding and estimations throughout science

Extend steps

Place value, ordering and rounding

- Powers of 10, Numbers greater than 1 in standard form, Negative powers of 10, Numbers between 0 and 1 in standard form

Four operations

- Multiply by 0.1 and 0.01, Divide by a decimal

Rounding and estimation

- Understand and use error interval notation

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Year 7 Spring Half Term 1

Block 1 – Weeks 1, 2 and 3

Graphing data

- Represent data in charts and graphs
- Plot and interpret coordinates in the first quadrant
- Use scatter graphs and lines of best fit
- Interpret trends and patterns in data

Block 2 – Weeks 4, 5 and 6

Fractions, decimals and percentages

- Compare fractions, decimals and percentages
- Use FDP equivalence
- Order fractions and decimals
- Use fractions as operators

Notes/Links/Interleaving

- Revisit place value and calculation strategies from earlier in Year 7 to support with FDP understanding
- Build on KS2 coordinate and graph skills
- Link FDP equivalence to fraction and percentage work from KS2
- Link representing data and using graphs in other areas of the curriculum
- Students interpret and draw bar charts and scatter graphs in a variety of scientific contexts

Extend steps

Fractions, decimals and percentages

- Fractions, decimals and percentages greater than 1

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Year 7 Spring Half Term 2

Block 3 – Weeks 7 and 8

Directed number

- Represent directed numbers on a number line
- Compare and order positive and negative numbers
- Calculate with directed numbers
- Use the order of operations
- Use a calculator with directed numbers

Block 4 – Weeks 9 and 10

Fractions and percentages of amounts

- Find fractions of amounts
- Find percentages of amounts
- Calculate percentage increase and decrease
- Find whole amounts from a fractional part

Block 5 – Weeks 11 and 12

Perimeter and area

- Convert metric units of length
- Find the perimeter of polygons and compound shapes
- Find the area of rectangles, parallelograms and triangles
- Find the area of trapezia and compound shapes
- Solve problems with perimeter and area

Notes/Links/Interleaving

- Revisit FDP equivalence and calculation strategies from earlier in Year 7
- Build on directed number, area and perimeter from KS2
- Use perimeter problems to build on equations and collecting like terms
- Revisit rounding from earlier in Year 7
- Choose when to use mental, written or calculator methods
- Students apply their understanding of directed number in science to calculations with boiling points, charge of particles and velocity

Extend steps

Fractions and percentages of amounts

- Use a percentage to find the whole
- Solve problems with fractions and percentages greater than 1

Perimeter and area

- Form expressions with perimeter and area

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Year 7 Summer Half Term 1

Block 1 – Weeks 1, 2 and 3

Speed, distance and time

- Convert between units of time
- Solve problems involving speed, distance and time
- Calculate speed, distance and time
- Interpret and draw distance–time graphs

Block 2 – Weeks 4, 5 and 6

Properties of number

- Identify multiples, factors and primes
- Use prime factorisation
- Use square, cube and triangular numbers
- Find the HCF and LCM

Notes/Links/Interleaving

- Revisit directed number and calculation strategies from earlier in Year 7
- Choose when to use mental, written or calculator methods
- Build on learning from KS2 factors, multiples and primes
- Link factors and multiples to earlier fraction work and prepare for adding and subtracting fractions later in Year 7
- Students apply their understanding of speed, distance and time in a variety of scientific contexts through substituting into formulae and drawing and interpreting distance-time graphs

Extend steps

Speed, distance and time

- Calculate speed from a distance-time graph

Properties of number

- Explore higher powers and roots
- HCF and LCM from a Venn diagram
- Use factors to simplify calculations

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Year 7 Summer Half Term 2

Block 3 – Weeks 7, 8 and 9

Add and subtract fractions

- Simplify fractions and find equivalent fractions
- Convert between mixed numbers and improper fractions
- Add and subtract fractions
- Calculate with improper fractions and mixed numbers

Block 4 – Weeks 10, 11 and 12

Angles and polygons

- Use angle notation
- Apply angle facts
- Classify polygons
- Solve problems with angles
- Calculate angles in polygons

Notes/Links/Interleaving

- Revisit equivalent fractions from earlier in Year 7
- Build on understanding of factors, multiples, primes, HCF and LCM
- Build on understanding of angle facts from KS2
- Choose when to use mental, written or calculator methods

Extend steps

Add and subtract fractions

- Use equivalence to add and subtract decimals and fractions
- Add and subtract simple algebraic fractions
- Substitution and solving equations with fractions

Angles and polygons

- Investigate angles in parallel lines
- Angles in a polygon
- Simple proofs

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Year 8 Autumn Half Term 1

Block 1 – Weeks 1 and 2

Ratio

- Use and simplify ratios
- Share amounts in a ratio
- Solve ratio problems
- Link ratios and fractions

Block 2 – Weeks 3 and 4

Proportion and scale

- Use direct proportion
- Convert between measures and currencies, including using graphs
- Use scale factors and scale diagrams
- Solve proportional reasoning problems

Block 3 – Weeks 5 and 6

Algebraic manipulation

- Distinguish between formulae, expressions, identities and equations
- Form and use expressions, formulae and identities
- Use directed number with algebra
- Expand single brackets
- Factorise into a single bracket

Notes/Links/Interleaving

- Link FDP understanding from Year 7 to ratio and proportion
- Emphasise multiplicative reasoning through scaling and measures
- Use bar models and diagrams to support proportional thinking
- Allow students to use a calculator where appropriate
- Reinforce algebraic notation when simplifying and factorising
- Apply directed number with algebra
- Students will explore directly proportional relationships through Hooke's law and Ohm's law in science.

Extend steps

Ratio

- Express ratios in the form $1 : n$ and $n : 1$

Algebraic manipulation

- Expand double brackets
- Factorise quadratic expressions

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Year 8 Autumn Half Term 2

Block 4 – Weeks 7, 8 and 9

Coordinates and graphs

- Plot and interpret coordinates in four quadrants
- Understand and use equations of a straight line, including lines parallel to the axes
- Identify gradients and intercepts

Block 5 – Weeks 10 and 11

Multiply and divide fractions

- Multiply and divide a fraction by an integer
- Multiply and divide a fraction by a fraction
- Understand and use reciprocals
- Calculate with improper fractions and mixed numbers

Block 6 – Week 12

Symmetry and reflection

- Recognise line symmetry in polygons and other shapes
- Identify rotational symmetry
- Reflect shapes in horizontal, vertical and diagonal lines
- Describe reflections using mathematical notation

Notes/Links/Interleaving

- Build on Year 7 sequences and graph work when introducing linear graphs
- Revisit calculations with directed numbers
- Reinforce FDP fluency and fractions of amounts when multiplying and dividing fractions
- Revisit converting improper fractions and mixed numbers
- Compare and contrast rotational symmetry with line symmetry
- Revisit properties of shapes and build on equations of straight lines when reflecting

Extend steps

Coordinates and graphs

- Link $y = mx$ to direct proportion
- Find the midpoint of a line segment
- Solve problems with coordinates and graphs
- Quadratic graphs

Multiply and divide fractions

- Multiply and divide algebraic fractions

Symmetry and reflection

- Reflect a shape given the equation of a line, Describe a reflection

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Year 8 Spring Half Term 1

Block 1 – Weeks 1 and 2

Area, volume and density

- Recognise and name 2-D and 3-D shapes
- Calculate the area of 2-D shapes
- Calculate the volume of cubes and cuboids
- Convert metric units of mass and capacity
- Understand and use density, mass and volume

Block 2 – Weeks 3 and 4

Equations and inequalities

- Solve linear equations
- Solve equations with brackets and fractions
- Solve equations with unknowns on both sides
- Understand and solve inequalities including on number lines
- Form and solve equations and inequalities

Block 3 – Weeks 5, 6 and 7

Percentages

- Convert between percentages and decimals
- Find percentage increase and decrease
- Use multipliers to solve percentage problems
- Express one quantity as a percentage of another
- Find original amounts and percentage change

Notes/Links/Interleaving

- Connect proportional reasoning to percentages and density
- Revisit measure conversion skills and rounding from Year 7
- Revisit the use of directed number
- Solve equations in the context of earlier blocks e.g. shapes, angles etc.
- Choose when to use mental, written or calculator methods
- Students work with density calculations and calculate percentages of amounts in a variety of scientific contexts

Extend steps

Equations and inequalities

- Solve inequalities with unknowns on both sides

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Year 8 Spring Half Term 2

Block 4 – Weeks 8 and 9

Indices

- Use index notation
- Simplify expressions with indices
- Apply index laws
- Use powers and roots

Block 5 – Week 10

Standard form

- Understand and use positive and negative powers of 10
- Convert between numbers in ordinary and standard form
- Compare numbers in standard form
- Use a calculator with standard form

Block 6 – Weeks 11 and 12

Interpret and represent data

- Interpret different types of data
- Understand and calculate averages and range
- Understand outliers
- Compare distributions
- Use and interpret frequency tables and grouped data

Notes/Links/Interleaving

- Revisit the use of directed numbers
- Reinforce powers of 10 and place value when introducing indices and standard form
- Use calculators alongside mental estimation strategies
- Revisit finding the averages and range from Year 7
- Link to data collection and representation in other areas of the curriculum
- Students will apply their understanding of standard form in science and use a calculator when solving problems

Extend steps

Indices

- Powers of powers
- Negative indices
- Fractional indices

Interpret and represent data

- Mean and mode from a grouped frequency table

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Year 8 Summer Half Term 1

Block 1 – Weeks 1, 2 and 3

Angles in parallel lines and polygons

- Apply angle facts
- Understand and find angles in parallel lines
- Solve problems with angles
- Use properties of polygons
- Find interior and exterior angles of polygons

Block 2 – Weeks 4, 5 and 6

Tables and probability

- Understand and use probability language and notation
- Calculate probabilities of single events
- Use the fact the sum of probabilities of an event is 1
- Compare theoretical and experimental probability
- List outcomes and use sample spaces for 1 or more events
- Find probabilities using sample spaces for 1 or more events
- Find probabilities using two-way tables and frequency trees

Notes/Links/Interleaving

- Revisit angle facts and geometric reasoning from Year 7
- Revisit forming and solving equations
- Use diagrams and dynamic geometry software to support reasoning with parallel lines
- Reinforce FDP equivalence and fraction arithmetic when working with probability
- Allow students to use a calculator where appropriate
- Encourage explanation and justification alongside answers

Extend steps

Angles in parallel lines and polygons

- Prove simple geometric facts

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Year 8 Summer Half Term 2

Block 3 – Weeks 7 and 8

Circles

- Understand and use circle vocabulary and notation
- Find the circumference and area of a circle and parts of a circle
- Find area and lengths using arcs and sectors
- Solve problems with circles and compound shapes

Block 4 – Weeks 9 and 10

Graphs and charts

- Draw and interpret graphs and charts
- Choose appropriate representations
- Compare and interpret data
- Identify misleading graphs and charts

Block 5 – Week 11

Sequences

- Continue and describe linear and non-linear sequences
- Use term-to-term rules
- Generate sequences algebraically
- Find and use nth term rules

Notes/Links/Interleaving

- Link fractional parts of a circle to proportional reasoning
- Choose when to use mental, written or calculator methods
- Build on graph interpretation skills when working with charts and sequences
- Compare different graphical representations and discuss reliability
- Revisit the use of directed numbers
- Reinforce algebraic thinking through nth term patterns
- Students collect discrete and continuous data in science experiments and choose an appropriate representation

Extend steps

Sequences

- Generate a sequence given a complex algebraic rule

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Year 9 Autumn Half Term 1

Block 1 – Weeks 1 and 2

Properties of number

- Understand and use factors, multiples, primes, HCF and LCM
- Draw and interpret Venn diagrams
- Use Venn diagrams to find the HCF and LCM
- Understand types of number

Block 2 – Weeks 3 and 4

Percentages

- Calculate percentage increase and decrease
- Find percentage changes
- Find the original value after a percentage change
- Calculate simple and compound interest
- Solve problems with percentages

Block 3 – Weeks 5 and 6

Area and volume

- Draw and interpret nets
- Find the area of 2-D shapes
- Find the circumference and area of a circle
- Calculate the surface area of cubes and cuboids
- Calculate the volume of prisms and cylinders

Notes/Links/Interleaving

- Build on learning from Year 7 properties of number
- Revisit proportional reasoning and FDP equivalence and revisit the use of multipliers from Year 8 when exploring percentages
- Allow students to use a calculator where appropriate and encourage estimation before calculator methods
- Link area and volume to earlier geometry and scale factor work
- Revisit metric unit conversions and rounding from Year 7
- Students calculate percentage increase or decrease in a variety of scientific contexts

Extend steps

Properties of number

- Use prime factors
- Introduction to surds

Area and volume

- Surface area of a triangular prism
- Surface area of a cylinder
- Volume of cones, pyramids and spheres
- Convert metric units of area and volume

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Year 9 Autumn Half Term 2

Block 4 – Weeks 7 and 8

Equations, inequalities and formulae

- Solve equations and inequalities
- Substitute into formulae and equations
- Solve problems with equations and inequalities
- Change the subject of a formula

Block 5 – Week 9

Fractions

- Four operations with fractions and mixed numbers
- Calculate fractions of amounts
- Solve problems with fractions

Block 6 – Weeks 10 and 11

Rates

- Work with speed, distance and time
- Draw and interpret distance–time graphs
- Work with rates of change and their graphs

Block 7 – Week 12

Standard form

- Convert between numbers in ordinary and standard form
- Compare numbers in standard form
- Four operations with standard form

Notes/Links/Interleaving

- Reinforce algebraic manipulation when solving equations and changing the subject of a formula
- Solve equations in the context of earlier blocks e.g. area, angles, probability etc.
- Reinforce FDP equivalence
- Reinforce laws of indices to explain standard form calculations
- Choose when to use mental, written or calculator methods
- Students encounter many examples of rates of change and their units in science

Extend steps

Equations, inequalities and formulae

- Inequalities with negative numbers
- Change the subject of a complex formula

Rates

- Convert compound units

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Year 9 Spring Half Term 1

Block 1 – Weeks 1, 2 and 3

Maths and money

- Use percentages in financial maths
- Interpret bills, payslips and tariffs
- Use exchange rates
- Solve budgeting problems
- Explore investments, borrowing and insurance

Block 2 – Weeks 4 and 5

Straight line graphs

- Draw and interpret straight line graphs
- Use and calculate gradients and intercepts
- Understand and use graphs of the form $y = mx + c$
- Find the equation of a straight line
- Interpret real-life graphs

Block 3 – Weeks 6 and 7

Ratio and proportion

- Solve ratio problems
- Work with direct proportion problems and graphs
- Interpret conversion graphs
- Work with inverse proportion

Notes/Links/Interleaving

- Use real-world financial examples to support proportional reasoning
- Revisit rounding to the nearest integer, decimal places and significant figures
- Allow students to use a calculator where appropriate and encourage estimation before calculator methods
- Link equations of graphs to solving equations
- Reinforce multiplicative thinking through ratio and proportion
- Revisit unit pricing when solving direct proportion problems

Extend steps

Straight line graphs

- Rearrange equations to the form $y = mx + c$
- Graph inequalities

Ratio and proportion

- Inverse proportion graphs
- Solve problems with ratio and algebra

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Year 9 Spring Half Term 2

Block 4 – Weeks 8 and 9

Constructions and congruence

- Draw and measure angles
- Accurately draw triangles and polygons
- Construct angle bisectors and perpendicular bisectors
- Identify congruent triangles
- Use congruence conditions

Block 5 – Week 10

Similarity

- Identify similar shapes
- Use scale factors
- Calculate lengths in similar shapes

Block 6 – Weeks 11 and 12

Algebraic manipulation

- Expand and factorise into single brackets
- Understand and use identities
- Expand double brackets
- Factorise quadratic expressions
- Solve quadratic equations by factorising

Notes/Links/Interleaving

- Encourage precise mathematical communication in accurate drawings and constructions
- Revisit scale factors and proportional reasoning in congruence and similarity
- Reinforce proportional reasoning in geometry
- Revisit the use of directed number

Extend steps

Similarity

- Solve problems with similar triangles
- Ratio in right-angled triangles

Algebraic manipulation

- Solve quadratic equations
- Expand triple brackets

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Year 9 Summer Half Term 1

Block 1 – Weeks 1 and 2

Pythagoras' theorem

- Identify the hypotenuse of a right-angled triangle
- Determine whether a triangle is right-angled
- Use Pythagoras' theorem to find unknown lengths in right-angled triangles
- Use Pythagoras' theorem on coordinate axes

Block 2 – Weeks 3 and 4

Non-linear graphs

- Substitute into quadratic expressions
  Draw and interpret quadratic graphs
- Draw and interpret reciprocal and exponential graphs
- Link graphs and equations

Block 3 – Weeks 5 and 6

Sets and probability

- Understand and use set notation
- Calculate probabilities of single and combined events
- Find probabilities using table and Venn diagrams
- Work with relative frequency
- Explore expected outcomes
- Understand independent events

Notes/Links/Interleaving

- Build on earlier graph work when introducing quadratic and exponential graphs
- Encourage comparison between graphical and algebraic methods
- Revisit probability representations including Venn diagrams, two-way tables and sample spaces
- Reinforce FDP equivalence and fraction arithmetic when working with probability
- Allow students to use a calculator where appropriate

Extend steps

Pythagoras' theorem

- Proofs of Pythagoras' theorem
- Pythagoras' theorem in 3-D shapes

Non-linear graphs

- Draw cubic graphs
- Interpret cubic graphs
- Interpret roots, intercepts and turning points

Sets and probability

- Complement of a set

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Year 9 Summer Half Term 2

Block 4 – Weeks 7 and 8

Transformations

- Reflect, rotate, translate and enlarge shapes
- Describe transformations
- Combine transformations

Block 5 – Weeks 9 and 10

Simultaneous equations (optional block)

- Solve simultaneous equations graphically
- Solve simultaneous equations algebraically
- Interpret solutions in context

Block 6 – Weeks 11 and 12

Trigonometry (optional block)

- Identify the hypotenuse, opposite and adjacent sides in a right-angled triangle
- Understand and use sine, cosine and tangent ratios
- Find unknown lengths and angles in right-angled triangles

Notes/Links/Interleaving

- Revisit coordinates, scale factors and similarity in transformation work
- Use multiple representations for simultaneous equations
- Revisit the use of directed number
- Connect trigonometry to earlier ratio and geometry understanding

Extend steps

Transformations

- Enlargement (negative scale factor)
- Find the result of a series of transformations

Simultaneous equations

- Solve simultaneous equations (adjust both)
- Solve simultaneous equations by substitution

Trigonometry

- Key angles in right-angled triangles
- Trigonometry in 3-D shapes

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Year 10 Foundation Autumn Half Term 1

Block 1 – Weeks 1 and 2

Algebraic manipulation

- Substitute into expressions and formulae
- Simplify expressions
- Understand and use index laws
- Expand and factorise into single brackets

Block 2 – Weeks 3 and 4

Equations, inequalities and formulae

- Solve equations including with unknowns on both sides
- Understand and solve inequalities
- Represent inequalities on a number line
- Change the subject of a formula

Block 3 – Weeks 5 and 6

Quadratic expressions and equations

- Expand double brackets
- Factorise quadratic expressions
- Solve quadratic equations by factorising
- Draw quadratic graphs

Notes/Links/Interleaving

- Revisit directed number and fraction arithmetic when solving equations and quadratic equations
- Solve equations in the context of earlier blocks e.g. ratio, probability etc.
- Reinforce links between quadratic equations and graphs
- Encourage checking solutions through substitution and graphing
- In science students may manipulate formulae to solve for variables, usually after substituting in given values

Extend steps

Equations, inequalities and formulae

- Change the subject of a complex formula

Quadratic expressions and equations

- Difference of two squares

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Year 10 Foundation Autumn Half Term 2

Block 4 – Weeks 7 and 8

Percentages

- Calculate percentages of amounts
- Calculate percentage increase and decrease
- Find original amounts
- Express one number as a fraction or percentage of another
- Express a change as a percentage
- Understand and use simple interest
- Solve problems with percentages

Block 5 – Weeks 9 and 10

Ratio and scale

- Understand and use equivalent ratios
- Share amounts in a ratio
- Link ratios and fractions
- Solve ratio problems
- Understand and use ratios and scales

Block 6 – Weeks 11 and 12

Work with fractions

- Find fractions of amounts
- Increase or decrease an amount by a fraction
- Understand and use equivalent fractions and mixed numbers
- Add, subtract, multiply and divide fractions
- Solve problems with fractions

Notes/Links/Interleaving

- Revisit using multipliers when working with percentages
- Solve problems involving financial maths and reinforce learning from KS3
- Allow students to use a calculator where appropriate and encourage estimation before calculator methods
- Revisit scale and measure conversion from KS3
- Reinforce fractions as operators
- Reinforce links between fractions, percentages and ratio
- Knowledge of percentages is required in various areas of science

Extend steps

Percentages

- Repeated percentage change
- Compound interest

Ratio and scale

- Combine a set of ratios
- Share in a ratio (algebraically)

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Year 10 Foundation Spring Half Term 1

Block 1 – Weeks 1 and 2

Non-calculator methods

- Understand place value for integers and decimals
- Compare and order numbers
- Use the four operations with integers, decimals and directed numbers
- Apply the order of operations
- Work with related calculations
- Solve multi-step problems

Block 2 – Weeks 3 and 4

Straight line graphs

- Draw and interpret straight line graphs
- Use graphs of the form $y = mx + c$
- Find and use gradients and intercepts
- Find the midpoint of a line segment
- Find the equation of a straight line given one point and the gradient

Block 3 – Weeks 5 and 6

Probability

- Calculate probabilities of single events
- Use the fact that probabilities sum to 1
- List outcomes
- Work with relative frequency
- Use and interpret sample spaces, two-way tables and frequency trees
- Understand independent events
- Use and interpret tree diagrams

Notes/Links/Interleaving

- Reinforce estimation to check answers
- Link straight line graphs to earlier coordinate work
- Reinforce algebraic fluency and solving equations when working with graphs
- Encourage interpretation of gradients and graphical solutions
- Reinforce theoretical and experimental probability
- Reinforce fraction arithmetic when calculating probability

Extend steps

Straight line graphs

- Find the equation of a line from a graph
- Equation of a straight line graph given two points
- Real-life straight line graphs

Probability

- Tree diagrams for dependent events

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Year 10 Foundation Spring Half Term 2

Block 4 – Week 7

Rounding and estimation

- Round integers and decimals
- Estimate calculations
- Use calculators efficiently
- Choose appropriate accuracy

Block 5 – Weeks 8 and 9

Perimeter, area and volume

- Name 2-D and 3-D shapes
- Calculate the perimeter and area of 2-D shapes
- Calculate the circumference and area of circles
- Calculate the volume and surface area of prisms
- Interpret nets of 3-D shapes

Block 6 – Weeks 10 and 11

Interpret and represent data

- Calculate averages and the range
- Interpret ungrouped and grouped data
- Explore types of data
- Use sampling methods
- Draw and interpret scatter graphs

Block 7 – Week 12

Non-linear graphs

- Use tables of values
- Draw quadratic and cubic graphs
- Estimate values from graphs
- Compare non-linear graphs

Notes/Links/Interleaving

- Encourage estimation and checking when using calculators
- Use real contexts to support understanding of accuracy
- Revisit metric unit conversions
- Connect probability and statistics through interpretation of data
- Reinforce equations e.g. solving problems about the mean
- Choose when to use mental, written or calculator methods
- Revisit graph skills and algebraic manipulation
- Students draw and interpret scatter graphs in a variety of scientific contexts

Extend steps

Rounding and estimation

- Error intervals (including truncation)

Interpret and represent data

- Use data to compare distributions
- Interpolation and extrapolation

Non-linear graphs

- Intercepts and roots of quadratic graphs
- Approximate solutions to equations using graphs

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Year 10 Foundation Summer Half Term 1

Block 1 – Weeks 1 and 2

Angles

- Use angle facts in lines and polygons
- Find interior and exterior angles
- Understand and use angles in parallel lines
- Use geometric reasoning to solve problems

Block 2 – Weeks 3 and 4

Graphs and diagrams

- Draw and interpret statistical diagrams including pictograms, bar charts and pie charts
- Draw and interpret frequency polygons
- Draw and interpret time series graphs
- Draw and interpret stem-and-leaf diagrams
- Compare data from graphs and charts

Block 3 – Weeks 5 and 6

Vectors

- Understand and use vector notation
- Interpret vector movement and journeys
- Multiply vectors by scalars
- Add and subtract vectors

Notes/Links/Interleaving

- Revisit angle facts and geometric reasoning from KS3 when solving problems involving polygons and parallel lines
- Choose when to use mental, written or calculator methods
- Connect statistical diagrams to prior work on probability and data interpretation
- Reinforce coordinate skills and transformations when introducing vectors
- Students will use a variety of graphs and diagrams to present scientific data

Extend steps

Angles

- Solve problems with angles in polygons
- Prove geometric facts

Vectors

- Solve problems with vectors

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Year 10 Foundation Summer Half Term 2

Block 4 – Weeks 7 and 8

Factors, powers and surds

- Understand and use factor, multiples, primes, HCF and LCM
- Use prime factorisation
- Understand and use powers and roots
- Understand types of number including rational and irrational numbers

Block 5 – Weeks 9 and 10

Pythagoras and trigonometry

- Use Pythagoras' theorem to find unknown lengths in right-angled triangles
- Identify the hypotenuse, opposite and adjacent sides of a right-angled triangle
- Explore ratios in right-angled triangles
- Use trigonometric ratios to find unknown lengths and angles
- Solve problems with trigonometry

Block 6 – Weeks 11 and 12

Simultaneous equations

- Solve simultaneous equations graphically
- Solve simultaneous equations algebraically
- Interpret solutions in context

Notes/Links/Interleaving

- Build on learning from KS3 properties of number
- Reinforce algebraic manipulation and index laws alongside the factors, powers and surds block
- Connect trigonometry to earlier ratio and geometry work
- Use both graphical and algebraic approaches for simultaneous equations
- Encourage students to choose efficient solution methods
- Reinforce directed number calculations

Extend steps

Factors, powers and surds

- Negative indices
- Simplify expressions with surds
- Expand brackets with surds

Pythagoras' theorem and trigonometry

- Exact trigonometric values

Simultaneous equations

- Solve simultaneous equations by substitution

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Year 10 Higher Autumn Half Term 1

Block 1 – Week 1

Algebraic manipulation

- Substitute into expressions and formulae
- Simplify expressions
- Understand and use index laws
- Expand and factorise into single brackets

Block 2 – Weeks 2 and 3

Equations, inequalities and formulae

- Solve equations including with unknowns on both sides
- Understand and solve inequalities
- Represent inequalities on a number line
- Change the subject of a formula

Block 3 – Weeks 4, 5 and 6

Quadratic expressions and equations

- Expand double and triple brackets
- Factorise quadratic expressions
- Understand and use the difference of two squares
- Solve quadratic equations
- Complete the square
- Understand and use the quadratic formula

Notes/Links/Interleaving

- Revisit directed number and fraction arithmetic when solving equations and quadratic equations
- Solve equations in the context of earlier blocks e.g. ratio, probability etc.
- Reinforce links between quadratic equations and graphs
- Encourage comparisons between factorising, completing the square and quadratic formula methods to solve quadratic equations
- Encourage checking solutions through substitution and graphing

Extend steps

Equations, inequalities and formulae

- Represent solutions to inequalities using set notation
- Change the subject of a formula where the subject appears more than once

Quadratic expressions and equations

- Factorise more complex quadratic expressions
- Solve more complex quadratic equations by factorisation
- Complete the square with more complex quadratic expressions
- Solve quadratic equations by completing the square

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Year 10 Higher Autumn Half Term 2

Block 4 – Weeks 7 and 8

Percentages

- Calculate percentage increase and decrease
- Find original amounts
- Express one number as a fraction or percentage of another
- Express a change as a percentage
- Understand and use simple and compound interest
- Solve problems with percentages

Block 5 – Weeks 9 and 10

Ratio and scale

- Understand and use equivalent ratios
- Share amounts in a ratio
- Link ratios and fractions
- Solve ratio problems
- Understand and use ratios and scales
- Combine ratios
- Solve algebraic ratio problems

Block 6 – Weeks 11 and 12

Work with fractions

- Four operations with fractions and mixed numbers
- Solve problems with fractions
- Understand and use algebraic fractions
- Four operations with algebraic fractions
- Simplify algebraic fractions

Notes/Links/Interleaving

- Revisit multipliers when working with percentages
- Solve problems involving financial maths and reinforce learning from KS3
- Allow students to use a calculator where appropriate and encourage estimation before calculator methods
- Revisit scale and measure conversion from KS3
- Reinforce fractions as operators
- Reinforce links between fractions, percentages and ratio
- Knowledge of percentages is required in various areas of science

Extend steps

Work with fractions

- Add and subtract more complex algebraic fractions
- Multiply and divide more complex algebraic fractions
- Solve equations with algebraic fractions

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Year 10 Higher Spring Half Term 1

Block 1 – Week 1

Non-calculator methods

- Use the four operations with integers, decimals and directed numbers
- Apply the order of operations
- Work with related calculations
- Solve multi-step problems
- Convert recurring decimals to fractions

Block 2 – Weeks 2 and 3

Straight line graphs

- Draw and interpret straight line graphs
- Use graphs of the form $y = mx + c$
- Find the equation of a line
- Midpoint of a line segment
- Solve inequalities graphically
- Explore real-life straight line graphs

Block 3 – Weeks 4 and 5

Probability

- Calculate probabilities of combined events
- List and count outcomes
- Work with relative frequency
- Use and interpret tables and tree diagrams
- Understand independent and dependent events
- Apply the product rule

Block 4 – Week 6

Rounding and estimation

- Round numbers
- Estimate calculations
- Use calculators efficiently
- Use upper and lower bounds
- Interpret error intervals
- Choose appropriate accuracy
- Calculate bounds in calculations

Notes/Links/Interleaving

- Reinforce estimation to check answers
- Revisit directed number calculations
- Link straight line graphs to earlier coordinate work
- Reinforce algebraic fluency and solving equations when working with graphs
- Encourage interpretation of gradients and graphical solutions
- Reinforce theoretical and experimental probability
- Reinforce fraction arithmetic when calculating probability
- Encourage estimation and interpretation

Extend steps

Non-calculator methods

- Convert more complex recurring decimals to fractions

Straight line graphs

- Represent solutions to multiple inequalities on a graph
- Equations of perpendicular lines

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Year 10 Higher Spring Half Term 2

Block 5 – Weeks 7 and 8

Perimeter, area and volume

- Calculate the perimeter and area of 2-D shapes
- Calculate the circumference and area of circles
- Calculate arc lengths and sector areas
- Calculate the volume and surface area of prisms and cylinders

Block 6 – Weeks 9 and 10

Interpret and represent data

- Calculate averages and the range
- Interpret ungrouped and grouped data
- Use data to compare distributions
- Explore types of data
- Use sampling methods
- Draw and interpret scatter graphs
- Understand and use capture and recapture
- Interpolation and extrapolation

Block 7 – Weeks 11 and 12

Non-linear graphs

- Draw quadratic, cubic and reciprocal graphs
- Estimate values from graphs
- Compare non-linear graphs
- Interpret roots, intercepts and turning points
- Estimate the gradient of a curve
- Use tangents and gradients
- Use equations of circles and tangents

Notes/Links/Interleaving

- Revisit metric unit conversions
- Connect probability and statistics through interpretation of data
- Reinforce equations e.g. solving problems about the mean
- Choose when to use mental, written or calculator methods
- Revisit graph skills and algebraic manipulation
- Encourage comparison of graphical representations and distributions
- Students draw and interpret scatter graphs in a variety of scientific contexts

Extend steps

Non-linear graphs

- Estimate the area under a curve
- Equation of a tangent to a circle

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Year 10 Higher Summer Half Term 1

Block 1 – Weeks 1 and 2

Angles

- Use angle facts in lines and polygons
- Find interior and exterior angles
- Understand and use angles in parallel lines
- Solve problems with parallel lines
- Use geometric reasoning to solve problems

Block 2 – Weeks 3 and 4

Graphs and diagrams

- Draw and interpret statistical diagrams including pie charts, time series graphs, frequency polygons and stem-and-leaf diagrams
- Draw and interpret histograms
- Draw and interpret cumulative frequency diagrams
- Draw and interpret box plots
- Compare data from graphs and charts

Block 3 – Weeks 5 and 6

Vectors

- Understand and use vector notation
- Multiply vectors by scalars
- Add and subtract vectors
- Interpret vector movement and journeys in shapes
- Understand and use parallel vectors

Notes/Links/Interleaving

- Revisit angle facts and geometric reasoning from KS3 when solving problems involving polygons and parallel lines
- Choose when to use mental, written or calculator methods
- Connect statistical diagrams to prior work on probability and data interpretation
- Reinforce coordinate skills and transformations when introducing vectors
- Students will use a variety of graphs and diagrams to present scientific data

Extend steps

Angles

- Prove geometric facts

Graphs and diagrams

- Compare distributions using box plots

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Year 10 Higher Summer Half Term 2

Block 4 – Weeks 7 and 8

Factors, powers and surds

- Understand and use prime factorisation, HCF and LCM
- Understand and use powers and roots
- Understand and use fractional and negative powers
- Four operations with surds
- Simplify and expand brackets with surds
- Rationalise denominators
- Solve problems with surds

Block 5 – Weeks 9 and 10

Pythagoras and trigonometry

- Use Pythagoras' theorem to find unknown lengths in 2-D and 3-D shapes
- Use trigonometric ratios to find unknown lengths and angles
- Use exact trigonometric values
- Apply trigonometry to 3-D shapes
- Use the sine and cosine rules
- Calculate the area of a non-right-angled triangle

Block 6 – Weeks 11 and 12

Simultaneous equations

- Solve simultaneous equations graphically
- Solve simultaneous equations algebraically
- Interpret solutions in context
- Solve problems with simultaneous equations

Notes/Links/Interleaving

- Build on learning from KS3 properties of number
- Reinforce algebraic manipulation and index laws alongside the factors, powers and surds block
- Connect trigonometry to earlier ratio and geometry work
- Use both graphical and algebraic approaches for simultaneous equations
- Encourage students to choose efficient solution methods
- Reinforce directed number calculations

Extend steps

Factors and powers

- Rationalise the denominator with more complex denominators

Simultaneous equations

- Solve simultaneous equations (one linear, one non-linear) using graphs
- Solve simultaneous equations (one linear, one non-linear) by equating expressions
- Solve simultaneous equations (one linear, one non-linear) using substitution

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Year 11 Foundation Autumn Half Term 1

Block 1 – Weeks 1 and 2

Ratio and proportion

- Solve problems with ratio
- Solve problems with direct and inverse proportion
- Solve best buy problems
- Use conversion graphs
- Represent proportional relationships graphically
- Convert currencies

Block 2 – Weeks 3 and 4

Area and volume

- Use isometric paper
- Draw and interpret plans and elevations
- Calculate the volume cylinders, spheres, cones and pyramids

Block 3 – Weeks 5 and 6

Similarity and congruence

- Identify similar and congruent triangles
- Use similarity to find unknown lengths and angles
- Solve problems with similar shapes
- Use congruence conditions

Notes/Links/Interleaving

- Revisit ratio and scale factor reasoning in geometric contexts
- Reinforce multiplicative thinking through ratio and proportion
- Choose when to use mental, written or calculator methods
- Reinforce rounding and metric unit conversions
- Connect similarity to transformations and proportional reasoning
- Use diagrams and models to support spatial reasoning
- Encourage justification when solving geometric problems
- Students identify that two quantities are directly proportional by plotting a graph from experimental data in science

Extend steps

Ratio and proportion

- Direct proportion equations, Direct and inverse proportion graphs

Area and volume

- Surface area of a cylinder, Surface area of a pyramid, Surface area of a cone
- Convert metric units of area, Convert metric units of volume

Similarity and congruence

- Prove a pair of triangles are similar, Prove a pair of triangles are congruent

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Year 11 Foundation Autumn Half Term 2

Block 4 – Weeks 7 and 8

Sequences and proof

- Explore linear and non-linear sequences
- Generate and describe sequences
- Find the nth terms of a linear sequence

Block 5 – Week 9

Standard form

- Convert between ordinary and standard form
- Compare and order numbers in standard form

Block 6 – Weeks 10 and 11

Work with circles

- Calculate the circumference and area of a circle
- Calculate the area and perimeter of fractional parts of a circle
- Solve problems with compound shapes involving circles

Block 7 – Week 12

Set notation and Venn diagrams

- Draw and interpret Venn diagrams
- Use set notation
- Calculate probabilities from Venn diagrams

Notes/Links/Interleaving

- Reinforce algebraic thinking through sequences and proof
- Encourage students to explain patterns and generalisations
- Link standard form to index laws and calculator fluency
- Reinforce exact values and rounding appropriately
- Reinforce FDP equivalence and fraction arithmetic when working with probability
- In science, students will use standard form to represent large quantities such as distances in the solar system, small quantities such as the size of an atom and calculations such as wave speeds

Extend steps

Sequences and proof

- Represent numbers algebraically
- Arguments and counterexamples

Standard form

- Multiply and divide numbers in standard form
- Add and subtract numbers in standard form

Work with circles

- Area of a sector
- Arc length and perimeter

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Year 11 Foundation Spring Half Term 1

Block 1 – Weeks 1 and 2

Functions and graphs

- Use and interpret function machines
- Plot and interpret quadratic, cubic and reciprocal graphs
- Interpret roots and turning points
- Solve equations graphically
- Recognise and sketch graphs

Block 2 – Weeks 3 and 4

Equations and formulae

- Solve equations and inequalities
- Form and solve equations
- Solve simultaneous equations
- Solve problems with equations

Block 3 – Weeks 5 and 6

Rates

- Convert units of time
- Calculate speed, distance and time
- Draw and interpret distance–time graphs
- Work with density, mass and volume
- Work with pressure, force and area

Notes/Links/Interleaving

- Revisit graph interpretation when exploring linear and non-linear functions and graphs
- Encourage links between graphical and algebraic methods
- Reinforce directed number fluency
- Link equations and formulae to earlier algebraic manipulation skills
- Use real-life contexts to deepen understanding of compound measures
- Allow students to use a calculator where appropriate
- Students will draw and interpret kinematic graphs in science

Extend steps

Equations and formulae

- Form and solve equations with unknowns on both sides
- Form and solve inequalities
- Form and solve more complex equations and inequalities

Rates

- Convert compound units

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Year 11 Foundation Spring Half Term 2

Block 4 – Weeks 7 and 8

Angles, bearings and trigonometry

- Use angle facts in parallel lines and shapes
- Solve problems with angles
- Understand and use bearings
- Solve problems with bearings
- Work with scale drawings using bearings
- Solve problems using Pythagoras' theorem and trigonometry

Block 5 – Weeks 9 and 10

Constructions and loci

- Use rulers, protractors and compasses accurately
- Accurately draw triangles
- Construct perpendicular and angle bisectors
- Interpret and construct loci
- Solve problems with loci

Block 6 – Weeks 11 and 12

Transformations

- Reflect, rotate, translate and enlarge shapes
- Work with line symmetry and rotational symmetry
- Describe transformations using mathematical notation
- Combine transformations

Notes/Links/Interleaving

- Build on angles, Pythagoras' theorem and trigonometry from KS3 and Year 10
- Link constructions and loci to earlier coordinate and shape work
- Encourage precision with notation and construction techniques
- Revisit coordinates, scale factors and similarity in transformation work
- Use diagrams and dynamic geometry software to support transformational understanding

Extend steps

Angles, bearings and trigonometry

- Solve problems with angles and algebra
- Calculate bearings using angle rules
- Solve problems with bearings using Pythagoras and trigonometry

Constructions and loci

- Accurately draw polygons

Transformations

- Find the result of a series of transformations

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Year 11 Higher Autumn Half Term 1

Block 1 – Weeks 1 and 2

Ratio and proportion

- Solve problems with ratio, direct and inverse proportion
- Solve best buy problems
- Represent proportional relationships graphically
- Convert currencies
- Use equations of proportional relationships
- Interpret proportional graphs

Block 2 – Week 3

Area and volume

- Draw and interpret plans and elevations
- Calculate the volume and surface area of spheres and cones
- Calculate the volume of a pyramid
- Convert metric units of area and volume

Block 3 – Weeks 4 and 5

Similarity and congruence

- Identify similar and congruent triangles
- Use similarity to find unknown lengths and angles
- Use congruence conditions
- Use area and volume scale factors
- Apply geometric proof

Block 4 – Weeks 6 and 7

Sequences and proof

- Generate and describe sequences
- Find the nth term of a linear sequence
- Use algebraic arguments and proof
- Use examples and counterexamples

Notes/Links/Interleaving

- Revisit ratio and scale factor reasoning in geometry and measures
- Reinforce multiplicative thinking through ratio and proportion
- Choose when to use mental, written or calculator methods
- Reinforce rounding and metric unit conversions
- Connect similarity to transformations and proportional reasoning
- Encourage algebraic justification when proving results
- Use diagrams and representations to support geometric reasoning
- Students identify that two quantities are directly proportional by plotting a graph from experimental data in science

Extend steps

Ratio and proportion

- Complex direct proportion equations
- Inverse proportion equations

Area and volume

- Volume and surface area of a frustum

Sequences and proof

- Describe and continue sequences involving surds
- nth term of a quadratic sequence

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Year 11 Higher Autumn Half Term 2

Block 5 – Week 8

Standard form

- Convert between ordinary and standard form
- Compare and order numbers in standard form
- Four operations with standard form
- Solve problems with standard form

Block 6 – Weeks 9 and 10

Circle theorems

- Use circle theorems to find unknown angles
- Apply angle facts in circles
- Solve problems involving tangents and chords
- Use geometric reasoning and proof

Block 7 – Week 11

Set notation and Venn diagrams

- Draw and interpret Venn diagrams
- Use set notation
- Calculate probabilities from Venn diagrams

Block 8 – Week 12

Vectors

- Add and subtract vectors
- Multiply vectors by scalars
- Simplify vector journeys

Notes/Links/Interleaving

- Link standard form to index laws and calculator fluency
- Connect circle theorems to earlier angle facts and geometric reasoning
- Reinforce rounding appropriately
- Reinforce FDP equivalence and fraction arithmetic when working with probability
- In science, students will use standard form to represent large quantities such as distances in the solar system, small quantities such as the size of an atom and calculations such as wave speeds

Extend steps

Circle theorems

- Circle theorem (alternate segment theorem)

Set notation and Venn diagrams

- Conditional probability (Venn diagrams and two-way tables)

Vectors

- Ratios with vectors
- Collinear points using vectors
- Geometric arguments and proofs using vectors

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Year 11 Higher Spring Half Term 1

Block 1 – Weeks 1 and 2

Functions and graphs

- Understand and use function notation
- Work with composite and inverse functions
- Plot and interpret quadratic, cubic, reciprocal and exponential graphs
- Roots, intercepts and turning points
- Recognise and sketch graphs

Block 2 – Weeks 3, 4 and 5

Equations and formulae

- Solve equations and inequalities
- Form and solve equations and inequalities
- Solve simultaneous equations
- Solve problems with equations
- Understand and use iteration to solve equations

Block 3 – Week 6

Rates

- Calculate speed, distance and time
- Draw and interpret distance–time graphs
- Interpret velocity-time graphs
- Work with density, mass and volume
- Work with pressure, force and area
- Convert compound units

Notes/Links/Interleaving

- Revisit graph interpretation when exploring linear and non-linear functions and graphs
- Encourage links between graphical and algebraic methods
- Reinforce directed number fluency
- Link equations and formulae to earlier algebraic manipulation skills
- Use real-life contexts to deepen understanding of compound measures
- Allow students to use a calculator where appropriate
- Students will draw and interpret kinematic graphs in science

Extend steps

Functions and graphs

- Trigonometric graphs, Translation of the graph of a function, Reflection of the graph of a function, More complex transformations of the graph of a function

Equations and formulae

- Form and solve more complex equations and inequalities, Quadratic inequalities, Solve simultaneous equations (one linear, one non-linear), Solve a pair of simultaneous equations involving algebraic constants for a third unknown

Rates

- Velocity-time graphs

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Year 11 Higher Spring Half Term 2

Block 4 – Weeks 7 and 8

Angles, bearings and trigonometry

- Use angle facts in parallel lines and shapes
- Understand and use bearings
- Solve problems with bearings
- Work with scale drawings using bearings
- Solve problems using Pythagoras' theorem, trigonometry and bearings

Block 5 – Weeks 9 and 10

Constructions and loci

- Use rulers, protractors and compasses accurately
- Accurately draw triangles and polygons
- Construct perpendicular and angle bisectors
- Interpret and construct loci
- Solve problems with loci

Block 6 – Weeks 11 and 12

Transformations

- Reflect, rotate, translate and enlarge shapes
- Describe transformations using mathematical notation
- Combine transformations

Notes/Links/Interleaving

- Build on angles, Pythagoras' theorem and trigonometry from KS3 and Year 10
- Link constructions and loci to earlier coordinate and shape work
- Encourage precision with notation and construction techniques
- Revisit coordinates, scale factors and similarity in transformation work
- Use diagrams and dynamic geometry software to support transformational understanding

Extend steps

Angles, bearings and trigonometry

- Solve problems with bearings using the sine and cosine rules

Transformations

- Invariant points

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Medium term plans and small steps

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Year 7 Autumn Term Block 1 Sequences

Sequences

Students develop fluency and reasoning skills through recognising, describing and continuing numerical and pictorial sequences. Learning focuses on identifying patterns, comparing linear and non-linear sequences, and using mathematical vocabulary to describe relationships between terms. Students explore arithmetic, geometric and other non-linear sequences, including finding missing terms and identifying common differences. Formal exploration of nth terms is introduced in Year 8 Summer Block 5. Concrete and pictorial representations are recommended throughout to support reasoning, discussion and pattern spotting before moving towards more abstract representations.

National curriculum links

- Generate terms of a sequence from either a term-to-term or a position-to-term rule
- Recognise arithmetic sequences
- Recognise geometric sequences and appreciate other sequences that arise

Small steps

Step 1	Describe and continue sequences
Step 2	Find the next term(s)
Step 3	Linear and non-linear sequences
Step 4	Continue linear sequences
Step 5	Continue non-linear sequences
Step 6	Term-to-term rules
Step 7	Find missing terms (E)

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Year 7 Autumn Term Block 2 Algebraic notation and substitution

Algebraic notation and substitution

Students are introduced to algebraic notation through function machines, substitution and inverse operations. Emphasis is placed on understanding variables, expressions and correct notation, alongside developing fluency in interpreting and forming algebraic expressions. Students move from numerical to algebraic representations, working with one-step and two-step function machines to develop understanding of how algebra can represent general mathematical relationships.

National curriculum links

- Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative
- Recognise and use relationships between operations including inverse operations
- Use a calculator and other technologies to calculate results accurately and then interpret them appropriately
- Use and interpret algebraic notation, including: ab in place of $a \times b$; $3y$ in place of $y + y + y$ and $3 \times y$; a^2 in place of $a \times a$; a^3 in place of $a \times a \times a$; a^2b in place of $a \times a \times b$; $\frac{a}{b}$ in place of $a \div b$ coefficients written as fractions rather than decimals; brackets
- Substitute numerical values into formulae and expressions, including scientific formulae

Small steps

Step 1	1-step function machines (number)
Step 2	1-step function machines (algebra)
Step 3	Find a function (one step)
Step 4	Substitution (one step)
Step 5	2-step function machines (number)
Step 6	2-step function machines (algebra)
Step 7	Find a function (two step)
Step 8	Substitution (two step)

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Year 7 Autumn Term Block 3 Expressions and equations

Expressions and equations

Students develop understanding of equality and equivalence before progressing to simplifying expressions and solving equations. Teaching focuses on interpreting the equals sign correctly, identifying like and unlike terms, and simplifying expressions by collecting like terms while maintaining equivalence. Students then apply inverse operations to solve one-step and two-step equations using a range of concrete, pictorial and abstract representations to support conceptual understanding.

National curriculum links

- Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors
- Use and interpret algebraic notation, including: ab in place of $a \times b$; $3y$ in place of $y + y + y$ and $3 \times y$; a^2 in place of $a \times a$; a^3 in place of $a \times a \times a$; a^2b in place of $a \times a \times b$; $\frac{a}{b}$ in place of $a \div b$ coefficients written as fractions rather than decimals; brackets
- Recognise and use relationships between operations including inverse operations
- Simplify and manipulate algebraic expressions to maintain equivalence by: collecting like terms; multiplying a single term over a bracket; taking out common factors; expanding products of two or more binomials

Small steps

Step 1	Equality and equivalence
Step 2	Related facts
Step 3	Like and unlike terms
Step 4	Collect like terms
Step 5	Solve 1-step equations (+/−)
Step 6	Solve 1-step equations (×/÷)
Step 7	Solve 2-step equations

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Year 7 Autumn Term Block 4 Place value, ordering and rounding

Place value, ordering and rounding

Students develop fluency and confidence with place value through reading, writing, comparing and ordering integers and decimal numbers. Teaching focuses on understanding the value of digits within a number, using place value charts and number lines to support reasoning about magnitude, intervals and position. Students apply this understanding when comparing and ordering numbers, interpreting decimal place value and rounding to different degrees of accuracy, including powers of 10, integers and decimal places. Work on positioning numbers accurately on number lines also lays important foundations for later learning with scales, coordinates and graph axes. Extend steps introduce powers of 10 and standard form, helping students make connections between place value and the representation of very large and very small numbers. Concrete, pictorial and contextual representations are used throughout to develop conceptual understanding, mathematical language and accuracy.

National curriculum links

- Understand and use place value for decimals, measures and integers of any size
- Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols $=, \neq, <, >, \leq, \geq$
- Round numbers and measures to an appropriate degree of accuracy [for example, to a number of decimal places or significant figures]
- Use integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5 and distinguish between exact representations of roots and their decimal approximations
- Interpret and compare numbers in standard form $A \times 10^n$ $1 \leq A < 10$, where n is a positive or negative integer or zero

Small steps

Step 1	Write integers in numerals and words
Step 2	Intervals on a number line
Step 3	Compare and order integers
Step 4	Place value for decimals
Step 5	Decimals on a number line
Step 6	Compare and order decimals
Step 7	Round to powers of 10
Step 8	Round to the nearest integer
Step 9	Round to decimal places
Step 10	Powers of 10 (E)
Step 11	Numbers greater than 1 in standard form (E)
Step 12	Negative powers of 10 (E)
Step 13	Numbers between 0 and 1 in standard form (E)

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Year 7 Autumn Term Block 5 Four operations

Four operations

Students develop fluency and confidence with the four operations through a progression from integer calculations to working with decimals and more complex operations. Teaching focuses on developing conceptual understanding alongside formal written methods, using place value charts, counters, bar models and mathematical discussion to support reasoning and accuracy. Students build understanding of place value through multiplying and dividing by powers of 10, before applying this knowledge to decimal calculations and problem solving. Emphasis is placed on selecting efficient calculation strategies, estimating and checking answers using inverse operations, and understanding the structure of calculations through the order of operations. Extend steps deepen understanding of multiplication and division with decimals, helping students make connections between place value, equivalence and proportional reasoning.

National curriculum links

- Understand and use place value for decimals, measures and integers of any size
- Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative
- Work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and $\frac{7}{2}$ or 0.375 and $\frac{3}{8}$)
- Interpret fractions and percentages as operators

Small steps

Step 1	Add and subtract integers
Step 2	Add and subtract decimals
Step 3	Multiply and divide by 10, 100 and 1000
Step 4	Multiply by 0.1 and 0.01 (E)
Step 5	Multiply integers
Step 6	Divide integers
Step 7	Multiply decimals
Step 8	Divide decimals by integers
Step 9	Divide by a decimal (E)
Step 10	Order of operations

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Year 7 Autumn Term Block 6 Averages and range

Averages and range

Students develop understanding of averages and range through calculating, interpreting and comparing different measures from a range of data sets. Teaching focuses on understanding the purpose of averages and recognising the similarities and differences between the mean, median, mode and range. Concrete resources and real-life contexts support understanding, helping students make connections between numerical calculations and the data they represent. Students calculate the mean, median, mode and range, identify these measures from data presented in a variety of forms, and solve problems involving missing values.

National curriculum links

- Describe, interpret and compare observed distributions of a single variable through: appropriate graphical representation involving discrete, continuous and grouped data; and appropriate measures of central tendency (mean, mode, median) and spread (range, consideration of outliers)

Small steps

Step 1	Mode
Step 2	Mean
Step 3	Median
Step 4	Range
Step 5	Solve problems with averages and range

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Year 7 Autumn Term Block 7 Rounding and estimation

Rounding and estimation

Students develop understanding of rounding and estimation through rounding numbers to significant figures and using approximation to estimate answers to calculations and problems. This block builds on earlier work with place value and the four operations, as students apply their understanding of digit value, ordering and calculation strategies when rounding and estimating. Teaching focuses on identifying significant figures accurately, understanding when estimates are overestimates or underestimates, and recognising when estimation is useful for checking whether answers are reasonable. Number lines, mathematical discussion and contextual problems are used throughout to support conceptual understanding and develop fluency with approximation and accuracy. The block culminates in solving estimation problems in a variety of contexts, encouraging students to reflect on the suitability and reasonableness of their estimates. The extend step introduces error interval notation and upper and lower bounds, building on students' understanding of rounding and inequalities.

National curriculum links

- Round numbers and measures to an appropriate degree of accuracy [for example, to a number of decimal places or significant figures]
- Use approximation through rounding to estimate answers and calculate possible resulting errors expressed using inequality notation $a < x \leq b$

Small steps

Step 1	Round to 1 significant figure
Step 2	Round to 2 or more significant figures
Step 3	Estimate answers to calculations
Step 4	Solve problems with estimation
Step 5	Understand and use error interval notation (E)

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Year 7 Spring Term Block 1 Graphing data

Graphing data

Students develop understanding of how data can be represented and interpreted through a range of graphs and charts. This block builds on earlier work with place value and averages, as students apply their understanding of scales, intervals and accurate plotting when constructing and interpreting graphs. Teaching focuses on drawing and interpreting graphical representations, including pictograms, bar charts, scatter graphs and time series graphs. Mathematical discussion and contextual data are used throughout to support reasoning and develop fluency with statistical vocabulary and graphical conventions, including accurate labelling, scales and keys. Students interpret and compare data, describe correlations and draw lines of best fit to identify patterns and make estimates. The block culminates in exploring linear and non-linear relationships, helping students recognise how graphs can represent different types of relationships between variables.

National curriculum links

- Construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data
- Work with coordinates in all four quadrants
- Describe simple mathematical relationships between two variables (bivariate data) in observational and experimental contexts and illustrate using scatter graphs
- Interpret mathematical relationships both algebraically and graphically

Small steps

Step 1	Pictograms
Step 2	Bar charts
Step 3	Dual bar charts
Step 4	Composite bar charts
Step 5	Coordinates in the first quadrant
Step 6	Scatter graphs
Step 7	Correlation
Step 8	Lines of best fit
Step 9	Time series graphs
Step 10	Non-linear relationships

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Year 7 Spring Term Block 2 Fractions, decimals and percentages

Fractions, decimals and percentages

Students develop an understanding of fractions, decimals and percentages through representations, number lines and equivalence. This block builds on earlier work with place value and fractions, as students connect different forms and move fluently between them. Teaching focuses on understanding relationships between representations, comparing and ordering values, and interpreting fractions as both numbers and division. Visual models, number lines and mathematical discussion are used throughout to support conceptual understanding and develop fluency with conversion and equivalence. The extend step explores fractions, decimals and percentages greater than 1, building on students' understanding of equivalence and conversion.

National curriculum links

- Define percentage as "number of parts per hundred", interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express one quantity as a percentage of another, compare two quantities using percentages, and work with percentages greater than 100%
- Work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and $\frac{7}{2}$ or 0.375 and $\frac{3}{8}$)
- Understand and use place value for decimals, measures and integers of any size
- Interpret fractions and percentages as operators
- Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols $=, \neq, <, >, \leq, \geq$
- Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction

Small steps

Step 1	Represent tenths and hundredths
Step 2	Number lines with fractions and decimals
Step 3	Tenths, hundredths, fifths and quarters
Step 4	Eighths and thousandths
Step 5	Understand percentages
Step 6	Convert simple fractions, decimals and percentages
Step 7	Fractions as diagrams
Step 8	Fractions on a number line
Step 9	Equivalent fractions
Step 10	Compare and order fractions
Step 11	Fractions as division
Step 12	Convert fractions, decimals and percentages
Step 13	Fractions, decimals and percentages greater than 1 (E)

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Year 7 Spring Term Block 3 Directed number

Directed number

Students develop understanding of directed numbers through representations, calculations and problem solving with positive and negative values. This block builds on earlier work with number lines, ordering, four operations and the order of operations, as students compare, order and calculate with directed numbers in a range of contexts. Teaching focuses on developing conceptual understanding through number lines, zero pairs and double-sided counters, helping students make sense of calculations that cross zero and the relationships between positive and negative numbers. Students explore addition, subtraction, multiplication and division with directed numbers, before applying the order of operations and calculator methods to more complex calculations.

National curriculum links

- Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols $=, \neq, <, >, \leq, \geq$
- Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative
- Use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals

Small steps

Step 1	Directed number and number lines
Step 2	Compare and order directed numbers
Step 3	Calculations that cross zero
Step 4	Directed number and zero pairs
Step 5	Add directed numbers
Step 6	Subtract directed numbers
Step 7	Multiply and divide directed numbers
Step 8	Order of operations with directed numbers
Step 9	Use a calculator with directed numbers

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Year 7 Spring Term Block 4 Fractions and percentages of amounts

Fractions and percentages of amounts

Students develop an understanding of fractions and percentages as operators through calculating fractions and percentages of amounts and solving problems in context. This block builds on earlier work with fractions, equivalence and the four operations, as students find parts and wholes using proportional reasoning. Teaching focuses on using bar models and representations to support conceptual understanding, helping students connect fractions, percentages and their equivalent forms. Students explore non-calculator and calculator methods, percentage increase and decrease, and finding the whole from a given fraction or percentage. The extend steps introduce percentages and fractions greater than 1, building on students' understanding of equivalence, scaling and proportional relationships.

National curriculum links

- Interpret fractions and percentages as operators
- Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative
- Define percentage as "number of parts per hundred", interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express one quantity as a percentage of another, compare two quantities using percentages, and work with percentages greater than 100%
- Solve problems involving percentage change, including: percentage increase, decrease and original value problems and simple interest in financial mathematics
- Use a calculator and other technologies to calculate results accurately and then interpret them appropriately

Small steps

Step 1	Fraction of an amount
Step 2	Use a fraction to find the whole
Step 3	Percentage of an amount (non-calculator)
Step 4	Percentage of an amount (calculator)
Step 5	Percentage increase and decrease
Step 6	Use a percentage to find the whole (E)
Step 7	Solve problems with fractions and percentages greater than 1 (E)

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Year 7 Spring Term Block 5 Perimeter and area

Perimeter and area

Students develop an understanding of perimeter and area through calculating and solving problems with a range of 2-D shapes. This block builds on earlier work with the four operations and rounding, as students apply calculation strategies when working with measures and geometric problems. Teaching focuses on unit conversion, deriving and using formulae for rectangles, parallelograms, triangles and trapezia. Diagrams, grids and mathematical discussion support students in identifying perpendicular height, unknown lengths and efficient strategies when solving problems. Students apply their understanding to compound shapes and contextual problems involving perimeter and area. The extend step introduces forming algebraic expressions for perimeter and area, building on students' understanding of algebraic notation and simplifying expressions.

National curriculum links

- Change freely between related standard units [for example, time, length, area, volume/capacity, mass]
- Derive and apply formulae to calculate and solve problems involving: perimeter and area of triangles, parallelograms, trapezia, volume of cuboids (including cubes) and other prisms (including cylinders)
- Calculate and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes
- Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs
- Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors

Small steps

Step 1	Convert metric units of length
Step 2	Perimeter of a polygon
Step 3	Perimeter of a compound shape
Step 4	Area of rectangles and parallelograms
Step 5	Area of a triangle
Step 6	Area of a trapezium
Step 7	Solve problems with perimeter and area
Step 8	Form expressions with perimeter and area (E)

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Year 7 Summer Term Block 1 Speed, distance and time

Speed, distance and time

Students develop an understanding of speed, distance and time through unit conversion, calculation and interpreting journeys in context. This block builds on earlier work with the four operations and graphs, as students apply calculation strategies when working with compound measures. Teaching focuses on converting between units of time, interpreting tables and timetables, and understanding the relationships between speed, distance and time through representations such as bar models, number lines and distance–time graphs. Students solve problems involving average speed, distance and time in a range of contexts, while developing fluency with compound units and graphical interpretation. The extend step introduces calculating speed from distance–time graphs, building on students' understanding of graphs and rates of change.

National curriculum links

- Use standard units of mass, length, time, money and other measures, including with decimal quantities
- Change freely between related standard units [for example, time, length, area, volume/capacity, mass]
- Construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data
- Use compound units such as speed, unit pricing and density to solve problems
- Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs
- Interpret mathematical relationships both algebraically and graphically

Small steps

Step 1	Convert between milliseconds, seconds, minutes and hours
Step 2	Convert between hours, days and years
Step 3	Solve problems with tables and timetables
Step 4	Solve problems with time and the calendar
Step 5	Calculate speed
Step 6	Calculate time and distance
Step 7	Solve problems with speed, distance and time
Step 8	Interpret distance-time graphs
Step 9	Draw distance-time graphs
Step 10	Calculate speed from a distance-time graph (E)

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Year 7 Summer Term Block 2 Properties of number

Properties of number

Students develop an understanding of the properties of numbers through exploring multiples, factors and prime numbers, building on their fluency with multiplication and division. Teaching focuses on identifying factors and multiples, recognising prime numbers, and expressing numbers as a product of prime factors using representations such as arrays and prime factor trees. They apply their understanding to finding the highest common factor and lowest common multiple of two or more numbers. Students explore square, cube and triangular numbers, alongside square and cube roots, developing an understanding of numerical patterns and relationships. The extend steps introduce higher powers and roots, using Venn diagrams to find HCF and LCM, and simplifying calculations using factors, building on students' understanding of inverse operations, multiplication and number structure.

National curriculum links

- Use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation property
- Simplify and manipulate algebraic expressions to maintain equivalence by: collecting like terms; multiplying a single term over a bracket; taking out common factors; expanding products of two or more binomials
- Use integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5 and distinguish between exact representations of roots and their decimal approximations

Small steps

Step 1	Multiples
Step 2	Factors
Step 3	Prime numbers
Step 4	Write a number as a product of prime factors
Step 5	Square, cube and triangular numbers
Step 6	Square roots and cube roots
Step 7	Explore higher powers and roots (E)
Step 8	Highest common factor (HCF)
Step 9	Lowest common multiple (LCM)
Step 10	HCF and LCM from a Venn diagram (E)
Step 11	Use factors to simplify calculations (E)

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Year 7 Summer Term Block 3 Add and subtract fractions

Add and subtract fractions

Students develop an understanding of simplifying, converting and calculating with fractions. This block builds on earlier work with factors, multiples and equivalence, as students simplify fractions and find common denominators. Teaching focuses on converting between mixed numbers and improper fractions and adding and subtracting fractions with the same and different denominators. The extend steps introduce decimals, algebraic fractions and equations with fractions.

National curriculum links

- Use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation property
- Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative
- Work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and $\frac{7}{2}$ or 0.375 and $\frac{3}{8}$)
- Use and interpret algebraic notation, including: ab in place of $a \times b$; $3y$ in place of $y + y + y$ and $3 \times y$; a^2 in place of $a \times a$; a^3 in place of $a \times a \times a$; a^2b in place of $a \times a \times b$; $\frac{a}{b}$ in place of $a \div b$ coefficients written as fractions rather than decimals; brackets
- Substitute numerical values into formulae and expressions, including scientific formulae
- Use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement)

Small steps

Step 1	Simplify fractions
Step 2	Convert between mixed numbers and improper fractions
Step 3	Add and subtract fractions with the same denominator
Step 4	Add and subtract with fractions and integers
Step 5	Add and subtract fractions where denominators share a simple common multiple
Step 6	Add and subtract fractions with any denominator
Step 7	Add and subtract improper fractions and mixed numbers
Step 8	Use equivalence to add and subtract decimals and fractions (E)
Step 9	Add and subtract simple algebraic fractions (E)
Step 10	Substitution and solving equations with fractions (E)

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Year 7 Summer Term Block 4 Angles and polygons

Angles and polygons

Students develop an understanding of angles and polygons through measuring, calculating and applying angle facts in geometric contexts. Students use known facts to derive further facts, calculate unknown angles and classify polygons. Teaching focuses on angles around a point, angles on a straight line, vertically opposite angles, and angles in triangles and quadrilaterals. The extend steps introduce angles in parallel lines, interior angles in polygons and simple geometric proofs, building on students' understanding of angle relationships and reasoning.

National curriculum links

- Draw and measure line segments and angles in geometric figures, including interpreting scale drawings
- Describe, sketch and draw using conventional terms and notations: points, lines, parallel lines, perpendicular lines, right angles, regular polygons, and other polygons that are reflectively and rotationally symmetric
- Apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles
- Derive and use the sum of angles in a triangle and use it to deduce the angle sum in any polygon, and to derive properties of regular polygons
- Derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures [for example, equal lengths and angles] using appropriate language and technologies
- Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides, including Pythagoras' theorem, and use known results to obtain simple proofs

Small steps

Step 1	Draw and measure line segments and angles
Step 2	Understand and use geometric notation
Step 3	Angles around a point
Step 4	Angles on a straight line
Step 5	Vertically opposite angles
Step 6	Recognise and name polygons
Step 7	Angles in a triangle
Step 8	Angles in a quadrilateral
Step 9	Solve problems with angles
Step 10	Parallel and perpendicular lines
Step 11	Investigate angles in parallel lines (E)
Step 12	Angles in any polygon (E)
Step 13	Simple proofs (E)

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Year 8 Autumn Term Block 1 Ratio

Ratio

Students develop an understanding of ratio through representing multiplicative relationships and solving problems in context. This block builds on students' understanding of fractions, proportional reasoning and multiplicative relationships from Year 7, as students use ratio notation, simplify ratios and divide quantities into given ratios. Teaching focuses on using bar models and representations to support conceptual understanding, helping students connect ratios, fractions and proportional relationships. Students solve ratio problems where the whole, a part or the difference is given, and compare ratios and fractions to deepen understanding of parts and wholes. The extend step introduces expressing ratios in the form 1 : n and n : 1, building on students' understanding of proportional relationships.

National curriculum links

- Use ratio notation, including reduction to simplest form
- Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction
- Divide a given quantity into two parts in a given part : part or part : whole ratio; express the division of a quantity into two parts as a ratio

Small steps

Step 1	Understand ratio
Step 2	Ratio problems (whole given)
Step 3	Ratio problems (part given)
Step 4	Ratio problems (difference given)
Step 5	Simplify ratios
Step 6	Express ratios in the form 1 : n and n : 1 (E)
Step 7	Compare ratios and fractions
Step 8	Solve problems with ratio

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Year 8 Autumn Term Block 2 Proportion and scale

Proportion and scale

Students develop an understanding of proportion and scale through multiplicative relationships, graphs and measures. Students apply proportional reasoning to conversion graphs, currencies, similar shapes, metric conversions and scale diagrams. The block develops fluency with scale factors, direct proportion and interpreting maps.

National curriculum links

- Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction
- Solve problems involving direct and inverse proportion, including graphical and algebraic representations
- Use scale factors, scale diagrams and maps
- Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs
- Interpret mathematical relationships both algebraically and graphically
- Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides, including Pythagoras' Theorem, and use known results to obtain simple proofs
- Understand and use place value for decimals, measures and integers of any size
- Use standard units of mass, length, time, money and other measures, including with decimal quantities
- Change freely between related standard units [for example time, length, area, volume/capacity, mass]

Small steps

Step 1	Direct proportion
Step 2	Conversion graphs
Step 3	Convert between currencies
Step 4	Direct proportion graphs
Step 5	Similar shapes
Step 6	Convert metric units
Step 7	Scale diagrams
Step 8	Interpret maps using scale and ratios

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Year 8 Autumn Term Block 3 Algebraic manipulation

Algebraic manipulation

Students develop an understanding of algebraic manipulation through forming, simplifying, expanding and factorising expressions. This block builds on students' Year 7 understanding of algebraic notation, substitution and solving equations, as students develop fluency with manipulating expressions and equivalence. Teaching focuses on forming expressions, distinguishing between expressions, equations, formulae and identities and simplifying expressions using directed number. Students apply their understanding when substituting into expressions, expanding and factorising single brackets, and simplifying expressions. Representations such as algebra tiles and area models support understanding and help students make connections between expanding and factorising. The extend steps introduce expanding double brackets and factorising quadratic expressions.

National curriculum links

- Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors
- Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs
- Interpret mathematical relationships both algebraically and graphically
- Understand and use standard mathematical formulae; rearrange formulae to change the subject
- Simplify and manipulate algebraic expressions to maintain equivalence by: collecting like terms, multiplying a single term over a bracket, taking out common factors, expanding products of two or more binomials
- Substitute numerical values into formulae and expressions, including scientific formulae

Small steps

Step 1	Form algebraic expressions
Step 2	Identify and use formulae, expressions, identities and equations
Step 3	Simplify expressions
Step 4	Use directed number with algebra
Step 5	Substitution with directed number
Step 6	Expand a single bracket
Step 7	Factorise into a single bracket
Step 8	Expand single brackets and simplify
Step 9	Expand double brackets (E)
Step 10	Factorise quadratic expressions (E)

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Year 8 Autumn Term Block 4 Coordinates and graphs

Coordinates and graphs

Students develop understanding of coordinates and graphs through plotting, interpreting and connecting algebraic and graphical representations. This block builds on students' Year 7 understanding of coordinates, substitution and equations, as students generate tables of values, plot straight line graphs and explore lines of the form $y = mx$ and $y = mx + c$. Teaching focuses on recognising relationships between equations, coordinates and graphs, including gradient, intercepts and direct proportion. The extend steps introduce midpoint problems, solving problems with graphs and plotting quadratic graphs.

National curriculum links

- Work with coordinates in all four quadrants
- Recognise, sketch and produce graphs of linear and quadratic functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane
- Substitute numerical values into formulae and expressions, including scientific formulae
- Reduce a given linear equation in two variables to the standard form $y = mx + c$; calculate and interpret gradients and intercepts of graphs of such linear equations numerically, graphically and algebraically
- Solve problems involving direct and inverse proportion, including graphical and algebraic representations
- Interpret mathematical relationships both algebraically and graphically
- Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs

Small steps

Step 1	Coordinates in all four quadrants
Step 2	Lines parallel to the axes
Step 3	Table of values
Step 4	Recognise and use the line $y = x$
Step 5	Lines of the form $y = mx$
Step 6	Link $y = mx$ to direct proportion (E)
Step 7	Introduce gradient ($y = mx$)
Step 8	Lines with a negative gradient
Step 9	Lines of the form $y = x + c$
Step 10	Lines of the form $y = mx + c$
Step 11	Find the midpoint of a line segment (E)
Step 12	Solve problems with coordinates and graphs (E)
Step 13	Quadratic graphs (E)

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Year 8 Autumn Term Block 5 Multiply and divide fractions

Multiply and divide fractions

Students develop an understanding of multiplying and dividing fractions through representations, reasoning and efficient calculation strategies. This block builds on students' Year 7 understanding of adding and subtracting fractions, equivalence and simplifying fractions, as students extend their understanding to multiplying and dividing fractions, integers and mixed numbers. Teaching focuses on using bar models, number lines and area models to support conceptual understanding, helping students connect multiplication and division with fractions in meaningful ways. Students explore multiplying fractions by integers and fractions, dividing integers and fractions by unit and non-unit fractions, and understanding reciprocals as multiplicative inverses. Emphasis is placed on understanding the structure of calculations, recognising when answers will be greater or less than the starting value, and developing fluency with converting between mixed numbers and improper fractions. The extend step introduces multiplying and dividing algebraic fractions, building on students' understanding of algebraic notation and fraction operations.

National curriculum links

- Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative
- Interpret fractions and percentages as operators

Small steps

Step 1	Multiply a fraction by an integer
Step 2	Multiply fractions
Step 3	Understand reciprocals
Step 4	Divide an integer by a fraction
Step 5	Divide a fraction by an integer
Step 6	Divide a fraction by a unit fraction
Step 7	Divide fractions
Step 8	Multiply and divide mixed numbers
Step 9	Multiply and divide algebraic fractions (E)

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Year 8 Autumn Term Block 6 Symmetry and reflection

Symmetry and reflection

Students develop an understanding of symmetry and reflection through identifying symmetrical properties and performing reflections. This block builds on students' Year 7 understanding of shape properties, coordinates and equations of lines, as students explore line symmetry, rotational symmetry and reflections in horizontal, vertical and diagonal lines. Teaching focuses on using tracing paper and coordinate grids to support conceptual understanding and help students connect symmetry with transformations. Students reflect shapes in lines such as $x = a$, $y = a$, $y = x$ and $y = -x$. The extend steps introduce reflecting shapes given the equation of a line and describing reflections using mathematical language and equations of lines.

National curriculum links

- Describe, sketch and draw using conventional terms and notations: points, lines, parallel lines, perpendicular lines, right angles, regular polygons, and other polygons that are reflectively and rotationally symmetric
- Identify properties of, and describe the results of, translations, rotations and reflections applied to given figures

Small steps

Step 1	Line symmetry
Step 2	Rotational symmetry
Step 3	Reflect a shape in a horizontal or vertical line
Step 4	Reflect a shape in a diagonal line
Step 5	Reflect a shape given the equation of a line (E)
Step 6	Describe a reflection (E)

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Year 8 Spring Term Block 1 Area, volume and density

Area, volume and density

Students develop an understanding of area, volume and density through calculating, measuring and applying compound measures. This block builds on students' Year 7 understanding of area, metric units and properties of shapes, as students calculate the area of compound shapes, volumes of cubes and cuboids, and explore the relationships between mass, volume and density. Teaching focuses on understanding density as mass per unit volume, using and rearranging the density formula, and selecting appropriate units for mass, volume and density calculations. Students solve problems involving density, mass and volume while developing fluency with compound measures and metric conversions.

National curriculum links

- Derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures [for example, equal lengths and angles] using appropriate language and technologies
- Use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, pyramids, cones and spheres to solve problems in 3-D
- Derive and apply formulae to calculate and solve problems involving: perimeter and area of triangles, parallelograms, trapezia, volume of cuboids (including cubes) and other prisms (including cylinders)
- Calculate and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes
- Change freely between related standard units [for example time, length, area, volume/capacity, mass]
- Use compound units such as speed, unit pricing and density to solve problems

Small steps

Step 1	Name 2-D and 3-D shapes
Step 2	Area of a 2-D shape
Step 3	Area of a compound shape
Step 4	Recognise prisms
Step 5	Volume of cubes and cuboids
Step 6	Convert metric units of mass and capacity
Step 7	Understand the units of density, mass and volume
Step 8	Solve problems with density, mass and volume

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Year 8 Spring Term Block 2 Equations and inequalities

Equations and inequalities

Students develop an understanding of equations and inequalities through forming, solving and interpreting algebraic relationships. This block builds on students' Year 7 understanding of algebraic notation, substitution and solving simple equations, as students solve equations with brackets, fractions and unknowns on both sides. Teaching focuses on using inverse operations, maintaining equality and interpreting inequalities as a range of possible solutions. Students represent inequalities on number lines, form and solve equations and inequalities in different contexts and develop fluency with algebraic reasoning and mathematical notation. The extend step introduces solving inequalities with unknowns on both sides.

National curriculum links

- Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors
- Recognise and use relationships between operations including inverse operations
- Use and interpret algebraic notation, including: ab in place of $a \times b$; $3y$ in place of $y + y + y$ and $3 \times y$; a^2 in place of $a \times a$; a^3 in place of $a \times a \times a$; a^2b in place of $a \times a \times b$; $\frac{a}{b}$ in place of $a \div b$ coefficients written as fractions rather than decimals; brackets
- Use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement)
- Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols $=, \neq, <, >, \leq, \geq$

Small steps

Step 1	Solve simple 1- and 2-step equations
Step 2	Solve more complex equations
Step 3	Solve fractional equations
Step 4	Form and solve equations
Step 5	Solve equations with unknowns on both sides
Step 6	Understand and use inequalities
Step 7	Inequalities on a number line
Step 8	Solve simple inequalities
Step 9	Form and solve inequalities
Step 10	Solve inequalities with unknowns on both sides (E)

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Year 8 Spring Term Block 3 Percentages

Percentages

Students develop an understanding of percentages through calculating percentages of amounts, converting between percentages and decimals, and solving percentage problems in a range of contexts. This block builds on prior learning of fractions, decimals and percentages from Year 7. Teaching focuses on making connections between percentages, decimals and multipliers, and selecting efficient methods to solve problems. Students calculate percentages of amounts, express one number as a fraction or percentage of another, calculate percentage change, use multipliers for percentage increases and decreases, and find original values. They also solve increasingly complex percentage problems and justify their choice of method.

National curriculum links

- Define percentage as “number of parts per hundred”, interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express one quantity as a percentage of another, compare two quantities using percentages, and work with percentages greater than 100%
- Interpret fractions and percentages as operators
- Solve problems involving percentage change, including: percentage increase, decrease and original value problems and simple interest in financial mathematics
- Express one quantity as a fraction of another, where the fraction is less than 1 and greater than 1
- Use a calculator and other technologies to calculate results accurately and then interpret them appropriately

Small steps

Step 1	Percentage of an amount
Step 2	Convert between percentages and decimals
Step 3	Use multipliers to calculate percentages
Step 4	Convert between percentages and decimals greater than 1
Step 5	Percentage increase using a multiplier
Step 6	Percentage decrease using a multiplier
Step 7	Percentage increase and decrease using a multiplier
Step 8	Express one number as a fraction or a percentage of another (non-calculator)
Step 9	Express one number as a fraction or a percentage of another (calculator)
Step 10	Percentage change
Step 11	Find the original value given a percentage
Step 12	Choose appropriate methods to solve percentage problems

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Year 8 Spring Term Block 4 Indices

Indices

Students develop an understanding of indices through simplifying, multiplying and dividing expressions involving powers. This block builds on students' Year 7 understanding of algebraic notation, powers and simplifying expressions, as students collect like terms with indices and explore the laws of indices. Teaching focuses on recognising repeated multiplication, understanding the role of the base and index, and applying the addition and subtraction laws for indices when multiplying and dividing terms with the same base. Students develop fluency with simplifying algebraic expressions involving indices and reasoning about equivalent forms. The extend steps introduce powers of powers, negative indices and fractional indices.

National curriculum links

- Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors
- Use and interpret algebraic notation, including: ab in place of $a \times b$; $3y$ in place of $y + y + y$ and $3 \times y$; a^2 in place of $a \times a$; a^3 in place of $a \times a \times a$; a^2b in place of $a \times a \times b$; $\frac{a}{b}$ in place of $a \div b$ coefficients written as fractions rather than decimals; brackets
- Simplify and manipulate algebraic expressions to maintain equivalence by: collecting like terms; multiplying a single term over a bracket; taking out common factors; expanding products of two or more binomials

Small steps

Step 1	Add and subtract expressions with indices
Step 2	Multiply and divide expressions with indices
Step 3	Addition law for indices
Step 4	Subtraction law for indices
Step 5	Addition and subtraction laws for indices
Step 6	Powers of powers (E)
Step 7	Negative indices (E)
Step 8	Fractional indices (E)

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Year 8 Spring Term Block 5 Standard form

Standard form

Students develop an understanding of standard form through exploring positive and negative powers of 10 and representing very large and very small numbers efficiently. This block builds on students' Year 7 understanding of place value, powers and index notation, as students write numbers greater than 1 and between 0 and 1 in standard form. Teaching focuses on the relationship between ordinary numbers and powers of 10, interpreting positive and negative indices, and recognising the structure of numbers written in standard form. Students develop fluency with converting between ordinary numbers and standard form, interpreting numbers in context and using calculators to work with numbers in standard form.

National curriculum links

- Understand and use place value for decimals, measures and integers of any size
- Interpret and compare numbers in standard form $A \times 10^n$ $1 \leq A < 10$, where n is a positive or negative integer or zero
- Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative
- Use a calculator and other technologies to calculate results accurately and then interpret them appropriately

Small steps

Step 1	Positive and negative powers of 10
Step 2	Numbers greater than 1 in standard form
Step 3	Numbers between 0 and 1 in standard form
Step 4	Standard form on a calculator

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Year 8 Spring Term Block 6 Interpret and represent data

Interpret and represent data

Students develop an understanding of interpreting and representing data through calculating averages, analysing distributions and organising data in tables and grouped frequency tables. This block builds on students' Year 7 understanding of averages, as students work with discrete, continuous, qualitative and quantitative data. Teaching focuses on calculating and interpreting the mean, median, mode and range, identifying outliers and choosing the most appropriate average for a data set. Students compare distributions using averages and range, represent grouped data in frequency tables and interpret continuous data using class intervals and inequalities. The extend step introduces estimating the mean and identifying the modal class from grouped frequency tables.

National curriculum links

- Describe, interpret and compare observed distributions of a single variable through: appropriate graphical representation involving discrete, continuous and grouped data; and appropriate measures of central tendency (mean, mode, median) and spread (range, consideration of outliers)
- Construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data

Small steps

Step 1	Types of data
Step 2	Averages and range
Step 3	Outliers and errors
Step 4	Choose the most appropriate average
Step 5	Compare distributions using averages and the range
Step 6	Averages from an ungrouped frequency table
Step 7	Represent and interpret grouped discrete data
Step 8	Represent and interpret continuous data grouped into equal classes
Step 9	Mean and mode from a grouped frequency table (E)

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Year 8 Summer Term Block 1 Angles in parallel lines and polygons

Angles in parallel lines and polygons

Students develop an understanding of angles in parallel lines and polygons through reasoning and proof. This block builds on students' Year 7 understanding of basic angle facts, notation and properties of shapes, as students explore alternate, corresponding and co-interior angles formed by parallel lines and transversals. Teaching focuses on identifying angle relationships, using correct mathematical language and justifying reasoning using known angle facts. Students solve complex problems involving parallel lines, special quadrilaterals and polygons, while developing fluency with interior and exterior angle sums. The extend step introduces proving simple geometric facts using formal reasoning and angle relationships.

National curriculum links

- Use the standard conventions for labelling the sides and angles of triangle ABC, and know and use the criteria for congruence of triangles
- Apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles
- Understand and use the relationship between parallel lines and alternate and corresponding angles
- Describe, sketch and draw using conventional terms and notations: points, lines, parallel lines, perpendicular lines, right angles, regular polygons, and other polygons that are reflectively and rotationally symmetric
- Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides, including Pythagoras' theorem, and use known results to obtain simple proofs
- Derive and use the sum of angles in a triangle and use it to deduce the angle sum in any polygon, and to derive properties of regular polygons

Small steps

Step 1	Basic angles rules and notation
Step 2	Angles in parallel lines
Step 3	Alternate and corresponding angles
Step 4	Alternate, corresponding and co-interior angles
Step 5	Solve problems with angles in parallel lines
Step 6	Properties of special quadrilaterals and their diagonals
Step 7	Find unknown lengths and angles in special quadrilaterals
Step 8	Exterior angles of a polygon
Step 9	Interior angles of a polygon
Step 10	Interior angles of a regular polygon
Step 11	Prove simple geometric facts (E)

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Year 8 Summer Term Block 2 Tables and probability

Tables and probability

Students develop an understanding of probability and statistical representation through exploring likelihood, organising outcomes and interpreting data. This block builds on students' Year 7 understanding of data handling, fractions, decimals and percentages, as students calculate probabilities, use probability notation and represent outcomes using sample spaces, two-way tables and frequency trees. Teaching focuses on interpreting probabilities on the 0–1 scale, understanding equally likely outcomes, and recognising that probabilities sum to 1. Students explore theoretical and experimental probability through experiments, comparing results and considering the reliability of outcomes from different sample sizes. Emphasis is placed on using systematic methods to organise information, interpret data accurately and select the correct totals when calculating probabilities from tables and diagrams.

National curriculum links

- Record, describe and analyse the frequency of outcomes of simple probability experiments involving randomness, fairness, equally and unequally likely outcomes, using appropriate language and the 0–1 probability scale
- Understand that the probabilities of all possible outcomes sum to 1
- Generate theoretical sample spaces for single and combined events with equally likely, mutually exclusive outcomes and use these to calculate theoretical probabilities
- Construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data

Small steps

Step 1	Probability vocabulary
Step 2	The probability scale
Step 3	Probability of a single event
Step 4	Use the property that probabilities sum to 1
Step 5	Probability experiments
Step 6	Sample spaces for 1 or more events
Step 7	Probabilities from sample space diagrams
Step 8	Two-way tables
Step 9	Probabilities from two-way tables
Step 10	Frequency trees
Step 11	Probabilities from frequency trees

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Year 8 Summer Term Block 3 Circles

Circles

Students develop an understanding of circles through exploring circle vocabulary, calculating circumference and area, and solving problems involving sectors and compound shapes. This block builds on students' Year 7 understanding of perimeter, area, ratio and geometric properties, as students investigate the relationship between diameter, circumference and π. Teaching focuses on understanding and applying the formulae for circumference and area, recognising the relationships between radius and diameter, and solving problems involving parts of circles and compound shapes. Students develop fluency with calculating arc lengths, sector areas, perimeters and areas involving circles, while reasoning about the effect of changing dimensions on circumference and area.

National curriculum links

- Derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures [for example, equal lengths and angles] using appropriate language and technologies
- Calculate and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes
- Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction
- Derive and apply formulae to calculate and solve problems involving: perimeter and area of triangles, parallelograms, trapezia, volume of cuboids (including cubes) and other prisms (including cylinders)

Small steps

Step 1	Circle vocabulary
Step 2	Pi as a ratio
Step 3	Circumference of a circle
Step 4	Perimeter of parts of a circle
Step 5	Area of a circle
Step 6	Area of parts of a circle
Step 7	Area and circumference of a circle
Step 8	Perimeter of a compound shape with circles
Step 9	Perimeter and area of compound shapes with circles

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Year 8 Summer Term Block 4 Charts and graphs

Charts and graphs

Students develop an understanding of graphs and charts through constructing, interpreting and comparing a range of statistical representations. This block builds on students' Year 7 understanding of pictograms, bar charts, pie charts and averages, as students extend their understanding to composite and dual bar charts, vertical line charts, line graphs and comparing distributions. Teaching focuses on selecting the most appropriate graph or chart for different types of data, interpreting scales, frequencies and proportions accurately, and understanding the strengths and limitations of different statistical representations. Students develop fluency with drawing and interpreting pie charts, line graphs and vertical line charts, while reasoning about trends, distributions and comparisons within data. Emphasis is placed on interpreting data critically, identifying misleading graphs and charts, and justifying conclusions using evidence from statistical representations.

National curriculum links

- Construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data
- Interpret mathematical relationships both algebraically and graphically
- Describe, interpret and compare observed distributions of a single variable through: appropriate graphical representation involving discrete, continuous and grouped data; and appropriate measures of central tendency (mean, mode, median) and spread (range, consideration of outliers)

Small steps

Step 1	Pictograms and bar charts
Step 2	Vertical line charts
Step 3	Draw pie charts
Step 4	Interpret pie charts
Step 5	Line graphs
Step 6	Choose the most appropriate graph or chart
Step 7	Compare distributions using graphs
Step 8	Misleading graphs and charts

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Year 8 Summer Term Block 5 Sequences

Sequences

Students develop an understanding of sequences through generating, describing and generalising numerical and algebraic patterns. This block builds on students' Year 7 understanding of patterns, substitution and algebraic notation, as students generate sequences from term-to-term and position-to-term rules and find the nth term of linear sequences. Teaching focuses on recognising common differences, connecting algebraic rules with sequence patterns and understanding how coefficients and constants affect the structure of a sequence. Students develop fluency with generating sequences from algebraic rules, describing patterns mathematically and using substitution to generate terms from nth term expressions. The extend step introduces generating sequences from more complex algebraic rules involving brackets, indices and fractions.

National curriculum links

- Generate terms of a sequence from either a term-to-term or a position-to-term rule
- Recognise arithmetic sequences and find the nth term

Small steps

Step 1	Generate and describe a sequence given a rule in words
Step 2	Generate a sequence given a simple algebraic rule
Step 3	nth term of a linear sequence
Step 4	Generate a sequence given a complex algebraic rule (E)

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Year 9 Autumn Term Block 1 Properties of number

Properties of number

Students develop an understanding of properties of number through exploring types of numbers such as factors, multiples and prime numbers. This block builds on students' Year 7 understanding by revisiting factors, multiples, prime numbers and writing numbers as a product of prime factors, before extending to index notation and finding HCF and LCM using Venn diagrams. Teaching focuses on identifying relationships between numbers, representing numbers efficiently and applying factors and multiples in different contexts. Students develop understanding of integers, rational numbers, irrational numbers and real numbers, while reasoning about the relationships between different types of numbers. The extend steps introduce using prime factors to investigate square and cube numbers, alongside an introduction to surds.

National curriculum links

- Use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation property
- Enumerate sets and unions/intersections of sets systematically, using tables, grids and Venn diagrams
- Appreciate the infinite nature of the sets of integers, real and rational numbers

Small steps

Step 1	Factors, multiples and primes
Step 2	Write a number as a product of prime factors
Step 3	Use prime factors (E)
Step 4	Highest common factor (HCF) and lowest common multiple (LCM)
Step 5	Venn diagrams
Step 6	Use a Venn diagram to calculate HCF and LCM
Step 7	Integers, real numbers and rational numbers
Step 8	Introduction to surds (E)

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Year 9 Autumn Term Block 2 Percentages

Percentages

Students develop an understanding of percentages through calculating percentage change, solving problems involving percentages and exploring financial mathematics. This block builds on students' Year 8 understanding of percentages, multipliers and proportional reasoning, as students extend their understanding to repeated percentage change, simple interest and compound interest. Teaching focuses on using multipliers efficiently, interpreting percentage change in context and reasoning about the relationships between percentages, fractions and decimals. Students develop fluency with percentage increase and decrease, finding original values, expressing change as a percentage and solving problems using calculator and non-calculator methods. Emphasis is placed on understanding repeated percentage change and applying percentages in financial contexts involving interest, loans and investments.

National curriculum links

- Define percentage as "number of parts per hundred", interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express one quantity as a percentage of another, compare two quantities using percentages and work with percentages greater than 100%
- Interpret fractions and percentages as operators
- Solve problems involving percentage change, including: percentage increase, decrease and original value problems and simple interest in financial mathematics

Small steps

Step 1	Percentage increase and decrease
Step 2	Express a change as a percentage
Step 3	Find the original value after a percentage change
Step 4	Solve problems with percentages (non-calculator)
Step 5	Solve problems with percentages (calculator)
Step 6	Repeated percentage change
Step 7	Understand interest
Step 8	Simple interest
Step 9	Compound interest

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Year 9 Autumn Term Block 3 Area and volume

Area and volume

Students develop an understanding of area and volume through exploring 2-D and 3-D shapes, applying formulae and solving geometric problems. This block builds on students' Year 7 and Year 8 understanding of perimeter, area and volume, as students extend their understanding to circles, prisms and cylinders. Teaching focuses on deriving and applying formulae, identifying correct dimensions and selecting appropriate units for area, surface area and volume. Students develop fluency with nets, circles, surface area and volume calculations involving prisms and cylinders. The extend steps introduce surface area of triangular prisms and cylinders, volume of cones, pyramids and spheres, and converting metric units of area and volume.

National curriculum links

- Use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, pyramids, cones and spheres to solve problems in 3-D
- Derive and apply formulae to calculate and solve problems involving: perimeter and area of triangles, parallelograms, trapezia, volume of cuboids (including cubes) and other prisms (including cylinders)
- Derive and illustrate properties of triangles, quadrilaterals, circles and other plane figures [for example, equal lengths and angles] using appropriate language and technologies
- Calculate and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes
- Change freely between related standard units [for example time, length, area, volume/capacity, mass]
- Use standard units of mass, length, time, money and other measures, including with decimal quantities

Small steps

Step 1	Nets
Step 2	Area of a 2-D shape
Step 3	Area and circumference of a circle
Step 4	Surface area of cubes and cuboids
Step 5	Surface area of a triangular prism (E)
Step 6	Surface area of a cylinder (E)
Step 7	Volume of a prism
Step 8	Volume of a cylinder
Step 9	Volume of cones, pyramids and spheres (E)
Step 10	Convert metric units of area and volume (E)

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Year 9 Autumn Term Block 4 Equations, inequalities and formulae

Equations, inequalities and formulae

Students develop an understanding of equations, inequalities and formulae through solving, rearranging and applying algebraic relationships. This block builds on students' Year 7 and Year 8 understanding of algebraic notation, substitution and solving equations, as students extend their understanding to equations and inequalities with brackets, unknowns on both sides and changing the subject of formulae. Teaching focuses on using inverse operations, interpreting algebraic relationships and applying algebraic methods accurately. Students develop fluency with solving equations and inequalities, substituting into formulae and rearranging formulae. The extend steps introduce inequalities with negative numbers and changing the subject of more complex formulae.

National curriculum links

- Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols $=, \neq, <, >, \leq, \geq$
- Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors
- Use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement)
- Simplify and manipulate algebraic expressions to maintain equivalence by: collecting like terms, multiplying a single term over a bracket, taking out common factors, expanding products of two or more binomials
- Recognise and use relationships between operations including inverse operations
- Understand and use standard mathematical formulae; rearrange formulae to change the subject

Small steps

Step 1	Solve equations and inequalities
Step 2	Solve equations and inequalities with brackets
Step 3	Inequalities with negative numbers (E)
Step 4	Solve equations and inequalities with unknowns on both sides
Step 5	Solve problems with equations and inequalities
Step 6	Substitute into formulae and equations
Step 7	Change the subject of a formula (one-step)
Step 8	Change the subject of a formula (two-step)
Step 9	Change the subject of a complex formula (E)

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Year 9 Autumn Term Block 5 Fractions

Fractions

Students develop an understanding of fractions through calculating, reasoning and solving problems involving fraction operations. This block builds on students' Year 7 and Year 8 understanding of equivalent fractions, mixed numbers and the four operations, as students extend their understanding to adding, subtracting, multiplying and dividing fractions in more complex contexts. Teaching focuses on selecting efficient methods, interpreting fractions as operators and applying fraction methods accurately. Students develop fluency with calculations involving proper fractions, improper fractions and mixed numbers, alongside finding fractions of amounts and solving problems involving increasing and decreasing by fractions.

National curriculum links

- Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative
- Interpret fractions and percentages as operators

Small steps

Step 1	Add and subtract fractions
Step 2	Multiply and divide fractions
Step 3	Fraction of an amount

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Year 9 Autumn Term Block 6 Rates

Rates

Students develop an understanding of rates through exploring compound measures, interpreting graphs and solving problems involving speed, flow and rates of change. This block builds on students' Year 7 understanding of speed, distance and time, as students extend their understanding to distance–time graphs, flow problems and compound units. Teaching focuses on interpreting rates in context, understanding relationships between measures and applying compound units accurately. Students develop fluency with speed, distance and time calculations, interpreting and drawing distance–time graphs, and reasoning about rates of change using graphs and units. The extend step introduces converting compound units such as metres per second and kilometres per hour.

National curriculum links

- Use compound units such as speed, unit pricing and density to solve problems
- Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs
- Interpret mathematical relationships both algebraically and graphically
- Find approximate solutions to contextual problems from given graphs of a variety of functions, including piece-wise linear, exponential and reciprocal graphs
- Use standard units of mass, length, time, money and other measures, including with decimal quantities
- Solve problems involving direct and inverse proportion, including graphical and algebraic representations
- Change freely between related standard units [for example time, length, area, volume/capacity, mass]

Small steps

Step 1	Speed, distance and time
Step 2	Distance-time graphs
Step 3	Flow problems and their graphs
Step 4	Rates of change and their units
Step 5	Convert compound units (E)

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Year 9 Autumn Term Block 7 Standard form

Standard form

Students develop an understanding of standard form through representing, comparing and calculating with large and very small numbers. This block builds on students' Year 8 understanding of powers of 10 and standard form, as students extend their understanding to comparing, ordering and calculating with numbers written in standard form. Teaching focuses on interpreting powers of 10, recognising correct standard form and applying index laws accurately in calculations. Students develop fluency with converting between ordinary numbers and standard form, comparing and ordering numbers, and performing calculations involving multiplication, division, addition and subtraction in standard form.

National curriculum links

- Interpret and compare numbers in standard form $A \times 10^n$ $1 \leq A < 10$, where n is a positive or negative integer or zero
- Understand and use place value for decimals, measures and integers of any size
- Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative
- Use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals

Small steps

Step 1	Numbers in standard form
Step 2	Compare and order numbers in standard form
Step 3	Multiply and divide numbers in standard form
Step 4	Add and subtract numbers in standard form

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Year 9 Spring Term Block 1 Maths and money

Maths and money

Students develop an understanding of financial mathematics through exploring banking, budgeting, borrowing, saving and spending in real-life contexts. This block builds on students' earlier understanding of percentages and decimals, as students apply mathematical skills to financial decision-making in everyday situations. Teaching focuses on interpreting financial information, understanding financial vocabulary and using percentages accurately in practical contexts. Students develop fluency with calculations involving earnings, personal income tax, National Insurance, VAT, interest, exchange rates, budgeting and loans, while comparing financial options and reasoning about value for money. Students also explore bank accounts, mortgages, investments, insurance and different ways to pay, save and borrow money while developing awareness of both the benefits and risks involved in financial decisions.

National curriculum links

- Use standard units of mass, length, time, money and other measures, including with decimal quantities
- Use a calculator and other technologies to calculate results accurately and then interpret them appropriately
- Solve problems involving percentage change, including: percentage increase, decrease and original value problems and simple interest in financial mathematics
- Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative

Small steps

Step 1	Understand a bank account
Step 2	Value added tax
Step 3	Ways to pay
Step 4	Ways to save
Step 5	Jobs and pay
Step 6	Investments
Step 7	Borrowing (buying a house)
Step 8	Running a house or a business
Step 9	Budgeting
Step 10	Borrowing (loans)
Step 11	Spending overseas
Step 12	Insurance

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Year 9 Spring Term Block 2 Straight line graphs

Straight line graphs

Students develop an understanding of straight line graphs by exploring gradients, intercepts and equations of lines. This block builds on students' Year 8 understanding of coordinates, tables of values, lines parallel to the axes and lines of the form $y = mx$ and $y = mx + c$, as students extend their understanding to interpreting gradients and intercepts and finding equations of lines from graphs. Teaching focuses on connecting equations and graphical representations, while developing understanding of how gradients and intercepts affect the position and steepness of a line. Students develop fluency with lines parallel to the axes, the lines $y = x$ and $y = -x$, drawing and interpreting straight line graphs. The extend steps introduce rearranging equations into the form $y = mx + c$ and graphing inequalities.

National curriculum links

- Recognise, sketch and produce graphs of linear and quadratic functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane
- Interpret mathematical relationships both algebraically and graphically
- Work with coordinates in all four quadrants
- Reduce a given linear equation in two variables to the standard form $y = mx + c$; calculate and interpret gradients and intercepts of graphs of such linear equations numerically, graphically and algebraically
- Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs
- Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors

Small steps

Step 1	Lines parallel to the axes, $y = x$ and $y = -x$
Step 2	Explore gradients
Step 3	Explore intercepts
Step 4	$y = mx + c$
Step 5	Rearrange equations to the form $y = mx + c$ (E)
Step 6	Find the equation of a line from a graph
Step 7	Interpret gradients and intercepts of real-life graphs
Step 8	Graph inequalities (E)

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Year 9 Spring Term Block 3 Ratio and proportion

Ratio and proportion

Students develop an understanding of ratio and proportion through solving problems, interpreting graphs and exploring proportional relationships. This block builds on students' Year 8 understanding of direct proportion, graphs and ratio, as they extend their understanding to inverse proportion and conversion graphs. Teaching focuses on recognising proportional relationships and applying multiplicative reasoning accurately. The extend steps introduce inverse proportion graphs and ratio problems involving algebra.

National curriculum links

- Solve problems involving direct and inverse proportion, including graphical and algebraic representations
- Use scale factors, scale diagrams and maps
- Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction
- Interpret mathematical relationships both algebraically and graphically
- Use ratio notation, including reduction to simplest form
- Divide a given quantity into two parts in a given part : part or part : whole ratio; express the division of a quantity into two parts as a ratio
- Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors
- Simplify and manipulate algebraic expressions to maintain equivalence by: collecting like terms; multiplying a single term over a bracket; taking out common factors; expanding products of two or more binomials

Small steps

Step 1	Direct proportion
Step 2	Direct proportion and conversion graphs
Step 3	Inverse proportion
Step 4	Inverse proportion graphs (E)
Step 5	Ratio problems (whole or a part given)
Step 6	Solve problems with ratio and algebra (E)

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Year 9 Spring Term Block 4 Constructions and congruence

Constructions and congruence

Students develop an understanding of constructions and congruence through accurately drawing shapes, using geometrical constructions and identifying congruent figures. This block builds on students' Year 7 understanding of angle facts, polygons and geometric notation, as students extend their understanding to constructing triangles, angle and perpendicular bisectors, and congruent triangles. Teaching focuses on using rulers, protractors and compasses accurately, interpreting geometric information and applying conditions for congruence.

National curriculum links

- Draw and measure line segments and angles in geometric figures, including interpreting scale drawings
- Use the standard conventions for labelling the sides and angles of triangle ABC, and know and use the criteria for congruence of triangles
- Describe, sketch and draw using conventional terms and notations: points, lines, parallel lines, perpendicular lines, right angles, regular symmetric polygons, and other polygons that are reflectively and rotationally symmetric
- Identify and construct congruent triangles, and construct similar shapes by enlargement, with and without coordinate grids
- Derive and use the standard ruler and compass constructions (perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle); recognise and use the perpendicular distance from a point to a line as the shortest distance to the line
- Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides, including Pythagoras' theorem, and use known results to obtain simple proofs

Small steps

Step 1	Draw and measure angles
Step 2	Accurately draw triangles using ASA and SAS
Step 3	Accurately draw triangles using SSS
Step 4	Construct an angle bisector
Step 5	Construct a perpendicular bisector
Step 6	Construct a perpendicular from or to a point
Step 7	Accurately draw more complex polygons
Step 8	Identify congruent figures
Step 9	Congruent triangles

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Year 9 Spring Term Block 5 Similarity

Similarity

Students develop an understanding of similarity through recognising enlargements, using scale factors and solving problems involving similar shapes. This block builds on students' Year 8 understanding of ratio and proportion, and their understanding of congruence from the previous block, as students extend their understanding to similarity, corresponding lengths and angles, and scale factors in similar shapes. Teaching focuses on identifying corresponding sides and angles, applying scale factors accurately and reasoning about proportional relationships. Students develop fluency with enlargements, calculating unknown lengths and angles in similar shapes, and solving problems involving similar triangles. The extend steps introduce ratio in right-angled triangles.

National curriculum links

- Use scale factors, scale diagrams and maps
- Identify and construct congruent triangles, and construct similar shapes by enlargement, with and without coordinate grids
- Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides, including Pythagoras' theorem, and use known results to obtain simple proofs
- Use Pythagoras' theorem and trigonometric ratios in similar triangles to solve problems involving right-angled triangles

Small steps

Step 1	Recognise enlargement and similarity
Step 2	Work out unknown lengths and angles in similar shapes
Step 3	Solve problems with similar triangles (E)
Step 4	Ratio in right-angled triangles (E)

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Year 9 Spring Term Block 6 Algebraic manipulation

Algebraic manipulation

Students develop understanding of algebraic manipulation through expanding, factorising and simplifying algebraic expressions. This block builds on students' Year 8 understanding of simplifying expressions, substitution and single brackets, as students extend their understanding to double brackets, identities and quadratic expressions. Teaching focuses on recognising equivalent expressions, applying algebraic methods accurately and using algebra tiles, area models and multiplication grids to support conceptual understanding. Students develop fluency with expanding and factorising single and double brackets, using identities and factorising quadratic expressions. The extend steps introduce solving quadratic equations and expanding triple brackets.

National curriculum links

- Simplify and manipulate algebraic expressions to maintain equivalence by: collecting like terms; multiplying a single term over a bracket; taking out common factors; expanding products of two or more binomials

Small steps

Step 1	Expand single brackets and simplify
Step 2	Factorise into a single bracket
Step 3	Expand double brackets
Step 4	Expand more complex double brackets
Step 5	Use identities
Step 6	Factorise quadratic expressions
Step 7	Solve quadratic equations (E)
Step 8	Expand triple brackets (E)

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Year 9 Summer Term Block 1 Pythagoras' theorem

Pythagoras' theorem

Students develop an understanding of Pythagoras' theorem through exploring right-angled triangles, square numbers and square roots. This block builds on students' Year 7 understanding of squares and square roots, as students extend their understanding to identifying the hypotenuse and determining whether a triangle is right-angled before applying Pythagoras' theorem to calculate unknown lengths. Teaching focuses on identifying right-angled triangles, interpreting the relationship $a^2+b^2 = c^2$ and using visual representations to support conceptual understanding. Students develop fluency with finding unknown sides in right-angled triangles and applying Pythagoras' theorem on coordinate axes. The extend steps introduce proofs of Pythagoras' theorem and applying the theorem in 3-D shapes.

National curriculum links

- Use integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5 and distinguish between exact representations of roots and their decimal approximations
- Use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement)
- Derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures [for example, equal lengths and angles] using appropriate language and technologies
- Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides, including Pythagoras' theorem, and use known results to obtain simple proofs
- Use Pythagoras' theorem and trigonometric ratios in similar triangles to solve problems involving right-angled triangles

Small steps

Step 1	Solve equations with squares and square roots
Step 2	Identify the hypotenuse
Step 3	Determine whether a triangle is right-angled
Step 4	Pythagoras' theorem (find the hypotenuse)
Step 5	Pythagoras' theorem (find any side)
Step 6	Use Pythagoras' theorem on coordinate axes
Step 7	Proofs of Pythagoras' theorem (E)
Step 8	Pythagoras' theorem in 3-D shapes (E)

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Year 9 Summer Term Block 2 Non-linear graphs

Non-linear graphs

Students develop an understanding of non-linear graphs by exploring quadratic, reciprocal, exponential and cubic graphs. This block builds on students' earlier understanding of coordinates, tables of values and straight line graphs, as students extend their understanding of substituting into quadratic expressions, drawing and interpreting quadratic graphs, and recognising features of non-linear relationships. Teaching focuses on connecting equations, tables of values and graphical representations, while developing understanding of symmetry, intercepts and turning points. Students develop fluency with plotting quadratic graphs, interpreting values from graphs and exploring reciprocal and exponential graphs. The extend steps introduce cubic graphs and interpreting roots, intercepts and turning points.

National curriculum links

- Substitute numerical values into formulae and expressions, including scientific formulae
- Work with coordinates in all four quadrants
- Recognise, sketch and produce graphs of linear and quadratic functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane
- Use linear and quadratic graphs to estimate values of y for given values of x and vice versa and to find approximate solutions of simultaneous linear equations
- Interpret mathematical relationships both algebraically and graphically
- Find approximate solutions to contextual problems from given graphs of a variety of functions, including piece-wise linear, exponential and reciprocal graphs
- Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs

Small steps

Step 1	Substitute into quadratic expressions
Step 2	Draw quadratic graphs
Step 3	Draw more complex quadratic graphs
Step 4	Interpret quadratic graphs
Step 5	Reciprocal and exponential graphs
Step 6	Draw cubic graphs (E)
Step 7	Interpret cubic graphs (E)
Step 8	Interpret roots, intercepts and turning points (E)

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Year 9 Summer Term Block 3 Sets and probability

Sets and probability

Students develop an understanding of sets and probability through exploring set notation, Venn diagrams and probability experiments. This block builds on students' earlier understanding of Venn diagrams and probability from Year 8, as students extend their understanding to intersections, unions, complements and probabilities involving sets. Teaching focuses on interpreting and representing information using set notation, diagrams and probability language, while developing understanding of mutually exclusive and independent events. Students develop fluency with calculating probabilities from diagrams, relative frequency and expected outcomes. The extend step introduces the complement of a set.

National curriculum links

- Enumerate sets and unions/intersections of sets systematically, using tables, grids and Venn diagrams
- Record, describe and analyse the frequency of outcomes of simple probability experiments involving randomness, fairness, equally and unequally likely outcomes, using appropriate language and the 0–1 probability scale
- Understand that the probabilities of all possible outcomes sum to 1
- Generate theoretical sample spaces for single and combined events with equally likely, mutually exclusive outcomes and use these to calculate theoretical probabilities

Small steps

Step 1	Identify and represent sets
Step 2	Intersection of sets
Step 3	Union of sets
Step 4	Complement of a set (E)
Step 5	Probability of a single event
Step 6	Use diagrams to work out probabilities
Step 7	Relative frequency
Step 8	Expected outcomes
Step 9	Independent events
Step 10	Probabilities from Venn diagrams

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Year 9 Summer Term Block 4 Transformations

Transformations

Students develop an understanding of transformations through exploring enlargements, rotations, translations and reflections. This block builds on students' Year 8 understanding of reflections and earlier understanding of coordinates and symmetry, as students extend their understanding to enlargements using scale factors and centres of enlargement, rotations about a point and translations using column vectors. Teaching focuses on using tracing paper to complete transformations, coordinate grids and precise mathematical language to support conceptual understanding. Students develop fluency with performing and describing transformations. The extend steps introduce enlargements with negative scale factors and combinations of transformations.

National curriculum links

- Identify and construct congruent triangles, and construct similar shapes by enlargement, with and without coordinate grids
- Identify properties of, and describe the results of, translations, rotations and reflections applied to given figures
- Describe, sketch and draw using conventional terms and notations: points, lines, parallel lines, perpendicular lines, right angles, regular polygons, and other polygons that are reflectively and rotationally symmetric

Small steps

Step 1	Enlargement (positive scale factor)
Step 2	Enlargement from a point (positive scale factor)
Step 3	Enlargement (fractional scale factor)
Step 4	Enlargement (negative scale factor) (E)
Step 5	Describe an enlargement
Step 6	Rotation about a point
Step 7	Describe a rotation
Step 8	Translation
Step 9	Describe a translation
Step 10	Reflection
Step 11	Find the result of a series of transformations (E)

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Year 9 Summer Term Block 5 Simultaneous equations (optional block)

Simultaneous equations

This is an optional block, with the content revisited in Year 10. Students develop an understanding of simultaneous equations through exploring graphical and algebraic methods for finding solutions. This block builds on students' earlier understanding of substitution, solving equations and straight line graphs, as students extend their understanding to solving simultaneous equations using graphs, elimination and substitution methods. Teaching focuses on using concrete representations, bar models and counters to support conceptual understanding, while developing fluency with manipulating equivalent equations and eliminating unknowns. Students develop fluency with solving simultaneous equations where one or both equations require adjustment. The extend steps introduce solving simultaneous equations by substitution and adjusting both equations before elimination.

National curriculum links

- Substitute numerical values into formulae and expressions, including scientific formulae
- Use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement)
- Recognise, sketch and produce graphs of linear and quadratic functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane
- Use linear and quadratic graphs to estimate values of y for given values of x and vice versa and to find approximate solutions of simultaneous linear equations
- Simplify and manipulate algebraic expressions to maintain equivalence by: collecting like terms, multiplying a single term over a bracket, taking out common factors, expanding products of two or more binomials

Small steps

Step 1	Use one value to find another
Step 2	Introduction to simultaneous equations
Step 3	Solve simultaneous equations using graphs
Step 4	Solve simultaneous equations (no adjustments)
Step 5	Manipulating equations
Step 6	Solve simultaneous equations (adjust one)
Step 7	Solve simultaneous equations (adjust both) (E)
Step 8	Solve simultaneous equations by substitution (E)

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Year 9 Summer Term Block 6 Trigonometry (optional block)

Trigonometry

This is an optional block, with the content revisited in Year 10. Students develop an understanding of trigonometry through exploring relationships between angles and side lengths in right-angled triangles. This block builds on students' earlier understanding of Pythagoras' theorem, ratio and similarity, as students extend their understanding to identifying the hypotenuse, opposite and adjacent sides, and using sine, cosine and tangent ratios to calculate unknown lengths and angles. Teaching focuses on selecting appropriate methods, accurately identifying sides in relation to an angle and applying trigonometric ratios in different contexts and orientations. Students develop fluency with solving problems involving right-angled triangles using trigonometry and Pythagoras' theorem. The extend steps introduce exact trigonometric values and trigonometry in 3-D shapes.

National curriculum links

- Use Pythagoras' theorem and trigonometric ratios in similar triangles to solve problems involving right-angled triangles

Small steps

Step 1	Identify hypotenuse, opposite and adjacent sides
Step 2	Use the tangent ratio to find unknown side lengths
Step 3	Use sine and cosine ratios to find unknown side lengths
Step 4	Use sine, cosine and tangent ratios to find unknown angles
Step 5	Choose appropriate methods to solve problems with right-angled triangles
Step 6	Key angles in right-angled triangles (E)
Step 7	Trigonometry in 3-D shapes (E)

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Year 10 Foundation Autumn Term Block 1 Algebraic manipulation

Algebraic manipulation

Students develop an understanding of algebraic manipulation through substitution, simplifying expressions, applying the laws of indices, expanding brackets and factorising. This block builds on students' Year 7 understanding of collecting like terms and work in Years 8 and 9 on substitution, simplifying expressions, expanding single brackets and factorising. Teaching focuses on recognising equivalent expressions, applying algebraic notation accurately and making connections between different forms of algebraic representation. Algebra tiles, multiplication grids and area models are used to support conceptual understanding, helping students move from concrete and pictorial representations to increasingly abstract methods. Students develop fluency with substitution, simplifying expressions, applying the laws of indices, expanding brackets and factorising, and begin to apply these skills within geometrical contexts and formulae.

National curriculum links

- Substitute numerical values into formulae and expressions, including scientific formulae (KS3)
- Simplify and manipulate algebraic expressions to maintain equivalence by: collecting like terms, multiplying a single term over a bracket, taking out common factors, expanding products of two or more binomials (KS3)
- Simplify and manipulate algebraic expressions (including those involving surds) by: simplifying expressions involving sums, products and powers, including the laws of indices

Small steps

Step 1	Substitution
Step 2	Collect like terms
Step 3	Simplify expressions
Step 4	Addition and subtraction laws for indices
Step 5	Powers of powers
Step 6	Expand a single bracket
Step 7	Factorise into a single bracket

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Year 10 Foundation Autumn Term Block 2 Equations, inequalities and formulae

Equations, inequalities and formulae

Students develop an understanding of equations, inequalities and formulae through solving equations, interpreting inequalities and rearranging formulae. This block builds on students' work in Years 8 and 9 on understanding of inverse operations, equations and formulae. Teaching focuses on connecting solving equations with changing the subject of a formula, using bar models, function machines and number lines to support understanding. Students solve equations, represent inequalities and rearrange formulae. The extend step introduces complex formulae involving fractions, brackets, squares and square roots.

National curriculum links

- Recognise and use relationships between operations including inverse operations (KS3)
- Simplify and manipulate algebraic expressions to maintain equivalence by: multiplying a single term over a bracket (KS3)
- Use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement) (KS3)
- Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols $=, \neq, <, >, \leq, \geq$ (KS3)
- Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors (KS3)
- Understand and use standard mathematical formulae; rearrange formulae to change the subject (KS3)
- Solve linear inequalities in one variable; represent the solution set on a number line

Small steps

Step 1	Solve equations
Step 2	Solve fractional equations
Step 3	Solve equations with unknowns on both sides
Step 4	Understand inequalities
Step 5	Solve inequalities
Step 6	Change the subject of a simple formula
Step 7	Change the subject of a known formula
Step 8	Change the subject of a complex formula (E)

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Year 10 Foundation Autumn Term Block 3 Quadratic expressions and equations

Quadratic expressions and equations

Students develop an understanding of quadratic expressions and equations through expanding double brackets, factorising quadratic expressions and solving quadratic equations. This block builds on students' Year 9 understanding of expanding and factorising expressions, solving equations and drawing quadratic graphs. Teaching focuses on making connections between expanding, factorising and solving, helping students recognise these as linked algebraic processes. Algebra tiles, area models, multiplication grids and graphical representations are used to support conceptual understanding and strengthen links between concrete, pictorial and abstract methods. Students develop confidence with expanding and factorising quadratic expressions, solving quadratic equations and plotting quadratic graphs. The extend step introduces factorising and applying the difference of two squares.

National curriculum links

- Simplify and manipulate algebraic expressions (including those involving surds) by: factorising quadratic expressions of the form $x^2 + bx + c$, including the difference of two squares
- Solve quadratic equations algebraically by factorising; find approximate solutions using a graph
- Recognise, sketch and produce graphs of linear and quadratic functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane (KS3)
- Recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$

Small steps

Step 1	Expand double brackets
Step 2	Factorise quadratic expressions (positive only)
Step 3	Factorise quadratic expressions
Step 4	Difference of two squares (E)
Step 5	Solve quadratic equations equal to 0
Step 6	Solve quadratic equations by factorisation
Step 7	Quadratic graphs of the form $y = x^2 + a$

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Year 10 Foundation Autumn Term Block 4 Percentages

Percentages

Students develop an understanding of percentages by calculating percentages of amounts, percentage increases and decreases, percentage change, and finding original values. This block builds on students' work in Years 8 and 9 on understanding of percentages, fractions, decimals and multipliers, as they apply these skills in increasingly complex contexts. Teaching focuses on selecting efficient methods, comparing calculator and non-calculator approaches, and using bar models to support understanding of percentage change and original value problems. Students develop fluency with percentage calculations, interpreting percentage change and solving problems involving simple and compound interest. The extend steps introduce repeated percentage change and compound interest.

National curriculum links

- Define percentage as 'number of parts per hundred', interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express one quantity as a percentage of another, compare two quantities using percentages, and work with percentages greater than 100% (KS3)
- Interpret fractions and percentages as operators (KS3)
- Solve problems involving percentage change, including: percentage increase, decrease and original value problems and simple interest in financial mathematics (KS3)
- Express one quantity as a fraction of another, where the fraction is less than 1 and greater than 1 (KS3)
- Set up, solve and interpret the answers in growth and decay problems, including compound interest

Small steps

Step 1	Percentage of an amount
Step 2	Percentage increase and decrease
Step 3	Repeated percentage change (E)
Step 4	Express one number as a fraction or percentage of another
Step 5	Express a change as a percentage
Step 6	Find the original value after a percentage change
Step 7	Simple interest
Step 8	Compound interest (E)
Step 9	Choose appropriate methods to solve percentage problems

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Year 10 Foundation Autumn Term Block 5 Ratio and scale

Ratio and scale

Students develop an understanding of ratio and scale by simplifying ratios, sharing in a ratio and interpreting scale drawings. This block builds on students' Year 8 understanding of ratio notation, sharing quantities and scale diagrams, as they extend their understanding to solving more complex ratio problems, linking ratios and fractions, and working with scales involving unit conversions. Teaching focuses on identifying multiplicative relationships, recognising equivalent ratios and selecting efficient strategies for solving problems. Comparison and single bar models, ratio tables and counters are used to support understanding before moving to more abstract methods. Students solve problems involving ratio, fractions and scale in a range of contexts. The extend steps introduce combining ratios and solving ratio problems algebraically.

National curriculum links

- Use ratio notation, including reduction to simplest form (KS3)
- Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction (KS3)
- Divide a given quantity into two parts in a given part : part or part : whole ratio; express the division of a quantity into two parts as a ratio (KS3)
- Identify and work with fractions in ratio problems
- Interpret mathematical relationships both algebraically and graphically (KS3)
- Change freely between related standard units [for example time, length, area, volume/capacity, mass] (KS3)
- Use scale factors, scale diagrams and maps (KS3)

Small steps

Step 1	Equivalent ratios
Step 2	Share in a ratio (whole given)
Step 3	Share in a ratio (part or difference given)
Step 4	Link ratios and fractions
Step 5	Combine a set of ratios (E)
Step 6	Share in a ratio (algebraically) (E)
Step 7	Ratios and scales

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Year 10 Foundation Autumn Term Block 6 Work with fractions

Work with fractions

Students develop an understanding of fractions by finding fractions of amounts, working with equivalent fractions and mixed numbers, and applying the four operations to fractions. This block builds on students' Year 7 understanding of fractions as parts of a whole and work in Years 8 and 9 on equivalent fractions, mixed numbers and fraction calculations. Teaching focuses on making connections between fractions as numbers, operators and proportions, while encouraging students to select efficient methods and recognise when different representations describe the same value. Bar models, partitioned shapes and other pictorial representations are used to support understanding before moving to increasingly abstract methods. Students apply fraction methods in a range of contexts, including measures, money and problem solving, while developing confidence with addition, subtraction, multiplication and division involving proper fractions, improper fractions and mixed numbers.

National curriculum links

- Interpret fractions and percentages as operators (KS3)
- Use the four operations, including formal written methods, applied and to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative (KS3)

Small steps

Step 1	Fraction of an amount
Step 2	Increase or decrease an amount by a fraction
Step 3	Use a fraction to find the whole
Step 4	Equivalent fractions and mixed numbers
Step 5	Add and subtract fractions
Step 6	Multiply fractions
Step 7	Divide fractions
Step 8	Solve problems with fractions

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Year 10 Foundation Spring Term Block 1 Non-calculator methods

Non-calculator methods

Students develop confidence with non-calculator methods for the four operations, place value and directed number. This block builds on students' Year 7 understanding of number and calculation, revisiting key arithmetic skills in more complex contexts. Teaching focuses on efficient strategies and connections between related calculations, using place value charts, counters, number lines and bar models to support understanding. Students apply these skills to solve multi-step problems.

National curriculum links

- Understand and use place value for decimals, measures and integers of any size (KS3)
- Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols $=, \neq, <, >, \leq, \geq$ (KS3)
- Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative (KS3)
- Recognise and use relationships between operations including inverse operations (KS3)
- Use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals (KS3)
- Define percentage as "number of parts per hundred", interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express 1 quantity as a percentage of another, compare 2 quantities using percentages, and work with percentages greater than 100% (KS3)
- Interpret fractions and percentages as operators (KS3)

Small steps

Step 1	Place value for integers and decimals
Step 2	Compare and order numbers
Step 3	Add and subtract integers and decimals
Step 4	Multiply and divide integers and decimals
Step 5	Four operations with directed number
Step 6	Order of operations
Step 7	Related calculations
Step 8	Solve multi-step problems

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Year 10 Foundation Spring Term Block 2 Straight line graphs

Straight line graphs

Students develop an understanding of straight line graphs through drawing and interpreting linear graphs, exploring gradients and using the form $y = mx + c$. This block builds on students' work in Years 8 and 9 on understanding of coordinates, graphing and linear relationships. Teaching focuses on connecting equations, tables of values and graphs, the use of dynamic graphing software is suggested to support understanding of gradients and y-intercepts. Students solve equations graphically, find midpoints, and determine equations of lines from graphs, points and gradients. The extend steps introduce finding the equation of a line from two points and interpreting real-life straight line graphs.

National curriculum links

- Plot and interpret graphs (including reciprocal graphs) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration
- Use linear and quadratic graphs to estimate values of y for given values of x and vice versa and to find approximate solutions of simultaneous linear equations (KS3)
- Reduce a given linear equation in two variables to the standard form $y = mx + c$; calculate and interpret gradients and intercepts of graphs of such linear equations numerically, graphically and algebraically (KS3)
- Use the form $y = mx + c$ to identify parallel lines; find the equation of the line through two given points, or through one point with a given gradient
- Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs (KS3)
- Work with coordinates in all four quadrants (KS3)

Small steps

Step 1	Draw straight line graphs
Step 2	Find solutions to equations using straight line graphs
Step 3	Explore gradients
Step 4	$y = mx + c$
Step 5	Find the equation of a line from a graph (E)
Step 6	Find the midpoint of a line segment
Step 7	Equation of a straight line graph given one point and a gradient
Step 8	Equation of a straight line graph given two points (E)
Step 9	Real-life straight line graphs (E)

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Year 10 Foundation Spring Term Block 3 Probability

Probability

Students develop an understanding of probability through calculating probabilities, listing outcomes and using representations such as sample spaces, two-way tables and frequency trees. This block builds on students' understanding from Years 8 and 9 of probability and systematic listing strategies. The extend step introduces tree diagrams for dependent events.

National curriculum links

- Record, describe and analyse the frequency of outcomes of simple probability experiments involving randomness, fairness, equally and unequally likely outcomes, using appropriate language and the 0–1 probability scale (KS3)
- Apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to one
- Apply systematic listing strategies
- Use a probability model to predict the outcomes of future experiments; understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size
- Generate theoretical sample spaces for single and combined events with equally likely, mutually exclusive outcomes and use these to calculate theoretical probabilities (KS3)
- Construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data (KS3)
- Calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions

Small steps

Step 1	Probability of a single event
Step 2	Use the property that probabilities sum to 1
Step 3	List outcomes
Step 4	Relative frequency
Step 5	Sample spaces for 1 or more events
Step 6	Two-way tables
Step 7	Frequency trees
Step 8	Independent events
Step 9	Tree diagrams for independent events
Step 10	Tree diagrams for dependent events (E)

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Year 10 Foundation Spring Term Block 4 Rounding and estimation

Rounding and estimation

Students develop an understanding of rounding and estimation through rounding to decimal places and significant figures, estimating calculations and using calculators appropriately. This block builds on students' Year 7 understanding of place value, rounding and estimation. Teaching focuses on selecting appropriate degrees of accuracy, interpreting calculator outputs and using number lines to support conceptual understanding of rounding. Students estimate answers, identify overestimates and underestimates, and use rounding to assess whether calculations are reasonable. The extend step introduces error intervals and truncation.

National curriculum links

- Understand and use place value for decimals, measures and integers of any size (KS3)
- Round numbers and measures to an appropriate degree of accuracy [for example, to a number of decimal places or significant figures] (KS3)
- Use approximation through rounding to estimate answers and calculate possible resulting errors expressed using inequality notation $a < x \leq b$ (KS3)
- Use a calculator and other technologies to calculate results accurately and then interpret them appropriately (KS3)
- Calculate with roots, and with integer indices
- Apply and interpret limits of accuracy when rounding or truncating {including upper and lower bounds}

Small steps

Step 1	Round to decimal places
Step 2	Round to significant figures
Step 3	Estimate answers to calculations
Step 4	Use of a calculator
Step 5	Error intervals (including truncation) (E)

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Year 10 Foundation Spring Term Block 5 Perimeter, area and volume

Perimeter, area and volume

Students develop an understanding of perimeter, area and volume through applying formulae for 2-D and 3-D shapes. This block builds on students' learning from Years 8 and 9 of shape properties, perimeter, area, circles, volume and nets. Teaching focuses on selecting appropriate formulae, while physical models, nets and diagrams can support understanding and visualisation. Students calculate the perimeter and area of a range of shapes, including compound shapes and circles, and solve problems involving the volume and surface area of prisms, including examples that require Pythagoras' theorem to determine missing lengths.

National curriculum links

- Derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures [for example, equal lengths and angles] using appropriate language and technologies (KS3)
- Use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, pyramids, cones and spheres to solve problems in 3-D (KS3)
- Derive and apply formulae to calculate and solve problems involving: perimeter and area of triangles, parallelograms, trapezia, volume of cuboids (including cubes) and other prisms (including cylinders) (KS3)
- Calculate and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes (KS3)
- Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment
- Calculate surface areas and volumes of spheres, pyramids, cones and composite solids

Small steps

Step 1	Name 2-D and 3-D shapes
Step 2	Perimeter of a 2-D shape
Step 3	Area of a 2-D shape
Step 4	Area of a compound shape
Step 5	Recognise and label parts of a circle
Step 6	Circumference of a circle
Step 7	Area of a circle
Step 8	Volume of a prism
Step 9	Nets
Step 10	Surface area of a prism

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Year 10 Foundation Spring Term Block 6 Interpret and represent data

Interpret and represent data

Students develop an understanding of statistical measures and data representation through calculating averages, interpreting frequency tables, sampling and analysing scatter graphs. This block builds on students' Year 7 and 8 understanding of data handling and statistics, extending students' ability to interpret and compare data sets. Teaching focuses on selecting appropriate statistical measures, understanding the strengths and limitations of different data representations, and interpreting data in context. Students calculate averages from grouped and ungrouped data, compare distributions using averages and range, explore sampling methods, and interpret correlation in scatter graphs. The extend steps introduce interpolation and extrapolation and comparing distributions.

National curriculum links

- Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: appropriate graphical representation involving discrete, continuous and grouped data, appropriate measures of central tendency (including modal class) and spread
- Construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data (KS3)
- Infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling, Apply statistics to describe a population
- Use and interpret scatter graphs of bivariate data; recognise correlation and know that it does not indicate causation; draw estimated lines of best fit; make predictions; interpolate and extrapolate apparent trends whilst knowing the dangers of so doing

Small steps

Step 1	Averages and range
Step 2	Averages from an ungrouped frequency table
Step 3	Mean from a grouped frequency table
Step 4	Averages from a grouped frequency table
Step 5	Use data to compare distributions (E)
Step 6	Types of data
Step 7	Sampling
Step 8	Scatter graphs
Step 9	Interpolation and extrapolation (E)

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Year 10 Foundation Spring Term Block 7 Non-linear graphs

Non-linear graphs

Students develop an understanding of non-linear graphs through plotting and interpreting quadratic and cubic graphs. This block builds on students' Year 9 understanding of coordinates, tables of values, substitution and graphing, as they extend these ideas to non-linear relationships. Teaching focuses on connecting equations, tables of values and graphical representations, while dynamic graphing software can support understanding of graph shape, intercepts and turning points. Students interpret key features of quadratic and cubic graphs, estimate values from graphs and develop confidence with substituting positive and negative values into expressions. The extend steps introduce interpreting roots and intercepts of quadratic graphs and finding approximate solutions to equations using graphs.

National curriculum links

- Interpret mathematical relationships both algebraically and graphically (KS3)
- Recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$
- Identify and interpret roots, intercepts and turning points of quadratic functions graphically; deduce roots algebraically
- Use linear and quadratic graphs to estimate values of y for given values of x and vice versa and to find approximate solutions of simultaneous linear equations (KS3)
- Solve quadratic equations algebraically by factorising; find approximate solutions using a graph

Small steps

Step 1	Quadratic graphs
Step 2	Intercepts and roots of quadratic graphs (E)
Step 3	Cubic graphs
Step 4	Approximate solutions to equations using graphs (E)

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Year 10 Foundation Summer Term Block 1 Angles

Angles

Students develop an understanding of angle facts through exploring angles in triangles, quadrilaterals, polygons and parallel lines. This block builds on students' Year 7 and 8 learning of basic angle rules, angle properties of shapes and angles in parallel lines. Teaching focuses on selecting and applying appropriate angle facts, justifying solutions and making connections between different geometric relationships. Diagrams and accurately drawn shapes can support visualisation and reasoning. Students solve increasingly complex problems involving interior and exterior angles, regular polygons, and angles formed by parallel lines and transversals. The extend steps introduce solving multi-step polygon problems and proving geometric facts using clear mathematical reasoning.

National curriculum links

- Use the standard conventions for labelling the sides and angles of triangle ABC, and know and use the criteria for congruence of triangles (KS3)
- Apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles (KS3)
- Derive and use the sum of angles in a triangle and use it to deduce the angle sum in any polygon, and to derive properties of regular polygons (KS3)
- Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides, including Pythagoras' Theorem, and use known results to obtain simple proofs (KS3)
- Understand and use the relationship between parallel lines and alternate and corresponding angles (KS3)

Small steps

Step 1	Angles around a point, on a straight line and vertically opposite
Step 2	Angles in a triangle
Step 3	Angles in a quadrilateral
Step 4	Exterior angles of a polygon
Step 5	Interior angles of a polygon
Step 6	Solve problems with angles in polygons (E)
Step 7	Alternate and corresponding angles
Step 8	Alternate, corresponding and co-interior angles
Step 9	Prove geometric facts (E)

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Year 10 Foundation Summer Term Block 2 Graphs and diagrams

Graphs and diagrams

Students develop an understanding of statistical graphs and diagrams through constructing and interpreting pictograms, bar charts, pie charts, time series graphs, frequency polygons and stem-and-leaf diagrams. This block builds on students' Year 7 and 8 understanding of data representation and statistical measures, extending their ability to select, construct and interpret appropriate representations for different types of data. Teaching focuses on making connections between tables, charts and graphs, interpreting data in context, and recognising the strengths and limitations of different representations. Real-life data sets, frequency tables and graphical representations support students in comparing distributions, identifying trends and communicating statistical information effectively. Students also calculate averages and range from diagrams and use graphs to draw conclusions and make comparisons.

National curriculum links

- Construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data (KS3)
- Interpret and construct tables and line graphs for time series data
- Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: appropriate graphical representation involving discrete, continuous and grouped data

Small steps

Step 1	Pictograms
Step 2	Vertical line and bar charts
Step 3	Dual and composite bar charts
Step 4	Draw pie charts
Step 5	Interpret pie charts
Step 6	Time series graphs
Step 7	Frequency polygons
Step 8	Stem-and-leaf diagrams

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Year 10 Foundation Summer Term Block 3 Vectors

Vectors

Students develop an understanding of vectors through representing vectors, using vector notation, multiplying vectors by scalars, and performing vector addition and subtraction. This block builds on students' Year 9 understanding of translations, extending their knowledge from describing movement on a grid to working with vectors as mathematical objects with both magnitude and direction. Teaching focuses on making connections between diagrams, column vectors and vector notation, with grid representations supporting understanding of vector operations. Students explore scalar multiples and parallel vectors, including within simple geometric shapes such as parallelograms, developing confidence in interpreting and manipulating vectors in both geometric and abstract contexts. The extend step introduces solving problems involving coordinates, vectors and algebra.

National curriculum links

- Describe translations as 2D vectors
- Apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representations of vectors

Small steps

Step 1	Understand and represent vectors
Step 2	Vector notation
Step 3	Vectors multiplied by a scalar
Step 4	Add vectors
Step 5	Add and subtract vectors
Step 6	Solve problems with vectors (E)

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Year 10 Foundation Summer Term Block 4 Factors, powers and surds

Factors, powers and surds

Students develop an understanding of factors, multiples, prime factorisation, powers, roots and surds. This block builds on students' Key Stage 3 learning of number structure. Teaching focuses on identifying relationships between factors and multiples, using prime factorisation to determine the HCF and LCM, and understanding the connections between powers and roots. Factor trees, Venn diagrams and number lines can support understanding. Students classify rational and irrational numbers, including surds, and simplify expressions involving powers and roots. The extend steps introduce negative indices, simplifying surds, and expanding brackets involving surds.

National curriculum links

- Use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation property (KS3)
- Use integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5 and distinguish between exact representations of roots and their decimal approximations (KS3)
- Calculate with roots, and with integer indices
- Appreciate the infinite nature of the sets of integers, real and rational numbers (KS3)
- Simplify and manipulate algebraic expressions (including those involving surds) by: factorising quadratic expressions of the form $x^2 + bx + c$, including the difference of two squares; simplifying expressions involving sums, products and powers, including the laws of indices

Small steps

Step 1	Factors, multiples and primes
Step 2	Prime factorisation
Step 3	HCF and LCM
Step 4	Square and cube numbers
Step 5	Powers and roots
Step 6	Negative indices (E)
Step 7	Rational and irrational numbers, including surds
Step 8	Simplify expressions with surds (E)
Step 9	Expand brackets with surds (E)

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Year 10 Foundation Summer Term Block 5 Pythagoras and trigonometry

Pythagoras and trigonometry

Students develop an understanding of Pythagoras' theorem and trigonometry through solving problems involving right-angled triangles. This block builds on students' Year 9 learning of Pythagoras' theorem, similarity and ratio, extending these ideas to trigonometric ratios and their applications. Some students may also have encountered introductory trigonometry in the optional Year 9 block. Teaching focuses on identifying and interpreting the hypotenuse, opposite and adjacent sides, and making connections between side lengths, angles and ratios. Similar triangles, diagrams and geometric representations support understanding of why trigonometric ratios remain constant for a given angle. Students use Pythagoras' theorem to find unknown lengths and apply sine, cosine and tangent ratios to calculate missing sides and angles. The extend step introduces exact trigonometric values.

National curriculum links

- Apply Pythagoras' Theorem and trigonometric ratios to find angles and lengths in right-angled triangles in two dimensional figures
- Use Pythagoras' Theorem and trigonometric ratios in similar triangles to solve problems involving right-angled triangles (KS3)
- Compare lengths, areas and volumes using ratio notation and/or scale factors; make links to similarity (including trigonometric ratios)
- Know the exact values of sin θ and cos θ for θ = 0°, 30°, 45°, 60° and 90°; know the exact values for tan θ for θ = 0°, 30°, 45°, 60°

Small steps

Step 1	Pythagoras' theorem (find the hypotenuse)
Step 2	Pythagoras' theorem (find any side)
Step 3	Identify hypotenuse, opposite and adjacent sides
Step 4	Ratios in right-angled triangles
Step 5	Use the tangent ratio to find an unknown side length
Step 6	Use the sine and cosine ratio to find an unknown side length
Step 7	Use trigonometric ratios to find an unknown side length
Step 8	Use trigonometric ratios to find an unknown angle
Step 9	Exact trigonometric values (E)

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Year 10 Foundation Summer Term Block 6 Simultaneous equations

Simultaneous equations

Students develop an understanding of simultaneous equations through graphical and algebraic methods for finding solutions to pairs of linear equations. This block builds on students' Key Stage 3 learning of substitution, solving linear equations, straight line graphs and equivalence. Some students may also have completed the optional simultaneous equations block in Year 9. Teaching focuses on understanding what a solution represents, making connections between graphical and algebraic methods, and selecting efficient strategies for solving equations. Bar models, cubes, counters and graphs can support understanding before students move to more abstract algebraic approaches. Students solve simultaneous equations using graphs and elimination methods, including cases where one or both equations need to be manipulated. The extend step introduces solving simultaneous equations using substitution.

National curriculum links

- Substitute numerical values into formulae and expressions, including scientific formulae (KS3)
- Use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement) (KS3)
- Solve two simultaneous equations in two variables (linear/linear) algebraically; find approximate solutions using a graph

Small steps

Step 1	Use one value to find another
Step 2	Introduction to simultaneous equations
Step 3	Solve simultaneous equations using graphs
Step 4	Solve simultaneous equations (no adjustments)
Step 5	Manipulating equations
Step 6	Solve simultaneous equations (adjust one)
Step 7	Solve simultaneous equations (adjust both)
Step 8	Solve simultaneous equations by substitution (E)

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Year 10 Higher Autumn Term Block 1 Algebraic manipulation

Algebraic manipulation

Students develop an understanding of algebraic manipulation through simplifying expressions, applying the laws of indices, expanding brackets and factorising expressions. This block builds on students' Key Stage 3 learning of algebraic notation, collecting like terms, indices, expanding brackets and factorisation, extending these ideas to more complex algebraic expressions involving powers and multiple variables. Teaching focuses on maintaining equivalence, recognising structure within expressions, and making connections between expanding and factorising as inverse processes. Algebra tiles, area models, multiplication grids and visual representations can support understanding before students move to more abstract methods.
Students simplify expressions involving all four operations, apply the laws of indices, expand and simplify single brackets, and factorise expressions by identifying the highest common factor. Students also begin working with expressions involving higher powers, preparing them for future work with algebraic fractions, quadratics and algebraic arguments.

National curriculum links

- Simplify and manipulate algebraic expressions (including those involving surds {and algebraic fractions}) by: simplifying expressions involving sums, products and powers, including the laws of indices
- Simplify and manipulate algebraic expressions to maintain equivalence by: collecting like terms, multiplying a single term over a bracket, taking out common factors, expanding products of two or more binomials (KS3)

Small steps

Step 1	Simplify expressions
Step 2	Laws of indices
Step 3	Expand a single bracket
Step 4	Factorise into a single bracket

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Year 10 Higher Autumn Term Block 2 Equations, inequalities and formulae

Equations, inequalities and formulae

Students develop an understanding of equations, inequalities and formulae through solving, interpreting and rearranging algebraic relationships. This block builds on students' Key Stage 3 learning of equations, substitution, inverse operations and algebraic notation, extending these ideas to more complex equations, inequalities and formulae. Teaching focuses on maintaining equivalence, applying inverse operations accurately and understanding the relationships between different algebraic representations. Bar models and number lines can support understanding before students move to more abstract methods. Students solve linear equations, including fractional equations and equations with unknowns on both sides, and use this understanding to support solving and interpreting inequalities. Solving equations is also used to support students' understanding of changing the subject of formulae, helping them recognise the similarities between the two processes. The extend steps introduce set notation and changing the subject where the subject appears more than once.

National curriculum links

- Recognise and use relationships between operations including inverse operations (KS3)
- Use and interpret algebraic notation, including: 3y in place of $y + y + y$ and $3 \times y$, brackets and $\frac{a}{b}$ in place of $a \div b$ (KS3)
- Simplify and manipulate algebraic expressions to maintain equivalence by: multiplying a single term over a bracket (KS3)

(NC links are continued on the next page)

Small steps

Step 1	Solve equations
Step 2	Solve fractional equations
Step 3	Solve equations with unknowns on both sides
Step 4	Understand inequalities
Step 5	Solve inequalities
Step 6	Represent solutions to inequalities using set notation (E)
Step 7	Change the subject of a simple formula
Step 8	Change the subject of a known formula
Step 9	Change the subject of a complex formula
Step 10	Change the subject where the subject appears more than once (E)

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Year 10 Higher Autumn Term Block 2 Equations, inequalities and formulae

National curriculum links

- Use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement) (KS3)
- Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols $=, \neq, <, >, \leq, \geq$ (KS3)
- Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors (KS3)
- Appreciate the infinite nature of the sets of integers, real and rational numbers (KS3)
- Understand and use standard mathematical formulae; rearrange formulae to change the subject (KS3)
- Solve linear inequalities in one {or two} variable{s}, {and quadratic inequalities in one variable}; represent the solution set on a number line, {using set notation and on a graph}

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Year 10 Higher Autumn Term Block 3 Quadratic expressions and equations

Quadratic expressions and equations

Students develop an understanding of quadratic expressions and equations by expanding, factorising and solving quadratics. This block builds on students' Key Stage 3 learning of expanding, factorising and solving equations. Algebra tiles, area models and multiplication grids can support understanding. Students expand and factorise quadratic expressions, including the difference of two squares, and solve quadratic equations by factorisation, completing the square and using the quadratic formula. The extend steps introduce more complex factorisation.

National curriculum links

- Simplify and manipulate algebraic expressions to maintain equivalence by: collecting like terms, multiplying a single term over a bracket, taking out common factors, expanding products of two or more binomials (KS3)
- Simplify and manipulate algebraic expressions (including those involving surds {and algebraic fractions}) by: factorising quadratic expressions of the form $x^2 + bx + c$, including the difference of two squares; {factorising quadratic expressions of the form $ax^2 + bx + c$}, simplifying expressions involving sums, products and powers, including the laws of indices
- Solve quadratic equations {including those that require rearrangement} algebraically by factorising, {by completing the square and by using the quadratic formula}; find approximate solutions using a graph

Small steps

Step 1	Expand double brackets
Step 2	Expand triple brackets
Step 3	Factorise quadratic expressions
Step 4	Factorise more complex quadratic expressions (E)
Step 5	Difference of two squares
Step 6	Solve quadratic equations equal to 0
Step 7	Solve quadratic equations by factorisation
Step 8	Solve more complex quadratic equations by factorisation (E)
Step 9	Complete the square
Step 10	Complete the square with more complex quadratic expressions (E)
Step 11	Solve quadratic equations by completing the square (E)
Step 12	Solve quadratic equations using the quadratic formula

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Year 10 Higher Autumn Term Block 4 Percentages

Percentages

Students develop an understanding of percentages through calculating, comparing and interpreting percentage change in a range of contexts. This block builds on students' Key Stage 3 learning of percentages, fractions and decimals, extending these ideas to repeated percentage change, original value problems and financial mathematics. Multipliers, bar models and contextual problems can support understanding and help students select efficient methods. Students calculate percentage increases and decreases, express one quantity as a percentage of another, determine percentage change, find original values, and explore simple and compound interest. Throughout the block, students compare methods and select appropriate strategies to solve percentage problems efficiently.

National curriculum links

- Define percentage as 'number of parts per hundred', interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express one quantity as a percentage of another, compare two quantities using percentages, and work with percentages greater than 100% (KS3)
- Interpret fractions and percentages as operators (KS3)
- Solve problems involving percentage change, including: percentage increase, decrease and original value problems and simple interest in financial mathematics (KS3)
- Express one quantity as a fraction of another, where the fraction is less than 1 and greater than 1 (KS3)
- Set up, solve and interpret the answers in growth and decay problems, including compound interest {and work with general iterative processes}

Small steps

Step 1	Percentage of an amount
Step 2	Percentage increase and decrease
Step 3	Repeated percentage change
Step 4	Express one number as a fraction or percentage of another
Step 5	Express a change as a percentage
Step 6	Find the original value after a percentage change
Step 7	Simple interest
Step 8	Compound interest
Step 9	Choose appropriate methods to solve percentage problems

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Year 10 Higher Autumn Term Block 5 Ratio and scale

Ratio and scale

Students develop an understanding of ratio by simplifying, comparing and applying proportional relationships in a range of contexts. This block builds on students' Key Stage 3 learning of ratio, fractions and proportion, extending these ideas to algebraic ratio problems and scale diagrams. Teaching focuses on recognising multiplicative relationships, using equivalent ratios and making connections between ratios and fractions. Bar models, counters, ratio tables and scale diagrams can support understanding. Students simplify ratios, share quantities in a ratio, combine ratios, solve ratio problems involving algebra, and interpret scales using appropriate unit conversions.

National curriculum links

- Use ratio notation, including reduction to simplest form (KS3)
- Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction (KS3)
- Divide a given quantity into two parts in a given part : part or part : whole ratio; express the division of a quantity into two parts as a ratio (KS3)
- Identify and work with fractions in ratio problems
- Interpret mathematical relationships both algebraically and graphically (KS3)
- Simplify and manipulate algebraic expressions to maintain equivalence by: collecting like terms, multiplying a single term over a bracket, taking out common factors, expanding products of two or more binomials (KS3)
- Change freely between related standard units [for example time, length, area, volume/capacity, mass] (KS3)
- Use scale factors, scale diagrams and maps (KS3)

Small steps

Step 1	Equivalent ratios
Step 2	Share in a ratio (whole, part or difference given)
Step 3	Link ratios and fractions
Step 4	Combine a set of ratios
Step 5	Share in a ratio (algebraically)
Step 6	Solve problems with ratio and algebra
Step 7	Ratios and scales

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Year 10 Higher Autumn Term Block 6 Work with fractions

Work with fractions

Students develop an understanding of fractions through applying the four operations to numerical and algebraic fractions. This block builds on students' Key Stage 3 learning of fractions and algebraic manipulation, extending these ideas to algebraic fractions and their application in equations. Teaching focuses on making connections between numerical and algebraic methods, using equivalence, and recognising common factors to simplify calculations efficiently. Students add, subtract, multiply and divide fractions, solve problems involving fractions, and apply these methods to algebraic fractions, including simplifying expressions through factorisation. The extend steps introduce more complex algebraic fractions and solving equations involving algebraic fractions.

National curriculum links

- Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative (KS3)
- Interpret fractions and percentages as operators (KS3)
- Simplify and manipulate algebraic expressions (including those involving surds {and algebraic fractions}) by: factorising quadratic expressions of the form $x^2 + bx + c$, including the difference of two squares; {factorising quadratic expressions of the form $ax^2 + bx + c$}, simplifying expressions involving sums, products and powers, including the laws of indices
- Use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement) (KS3)

Small steps

Step 1	Add and subtract fractions
Step 2	Multiply and divide fractions
Step 3	Solve problems with fractions
Step 4	Add and subtract algebraic fractions
Step 5	Multiply algebraic fractions
Step 6	Divide algebraic fractions
Step 7	Simplify algebraic fractions by factorising
Step 8	Add and subtract more complex algebraic fractions (E)
Step 9	Multiply and divide more complex algebraic fractions (E)
Step 10	Solve equations with algebraic fractions (E)

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Year 10 Higher Spring Term Block 1 Non-calculator methods

Non-calculator methods

Students develop an understanding of non-calculator methods through applying arithmetic, reasoning and problem-solving skills efficiently and accurately. This block builds on students' Key Stage 3 learning of calculation strategies, fractions and decimals. Students apply the order of operations, use related calculations and solve multi-step problems. They also develop understanding of recurring decimals by converting recurring decimals with single repeating digits into fractions and making connections between fractions, decimals and algebraic methods. The extend step introduces converting more complex recurring decimals to fractions.

National curriculum links

- Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative (KS3)
- Use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals (KS3)
- Recognise and use relationships between operations including inverse operations (KS3)
- Define percentage as "number of parts per hundred", interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express 1 quantity as a percentage of another, compare 2 quantities using percentages, and work with percentages greater than 100% (KS3)
- Interpret fractions and percentages as operators (KS3)
- Understand and use place value for decimals, measures and integers of any size (KS3)
- {Change recurring decimals into their corresponding fractions and vice versa}

Small steps

Step 1	Order of operations
Step 2	Related calculations
Step 3	Solve multi-step problems
Step 4	Convert recurring decimals to fractions
Step 5	Convert more complex recurring decimals to fractions (E)

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Year 10 Higher Spring Term Block 2 Straight line graphs

Straight line graphs

Students develop an understanding of straight line graphs through plotting, interpreting and forming equations of lines. This block builds on students' Key Stage 3 learning of coordinates and linear relationships. Students interpret gradients and y-intercepts, find equations from graphs and coordinates, and represent inequalities graphically. The extend steps introduce multiple inequalities and perpendicular lines.

National curriculum links

- Use linear and quadratic graphs to estimate values of y for given values of x and vice versa and to find approximate solutions of simultaneous linear equations (KS3)
- Plot and interpret graphs (including reciprocal graphs) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration
- Reduce a given linear equation in two variables to the standard form $y = mx + c$; calculate and interpret gradients and intercepts of graphs of such linear equations numerically, graphically and algebraically (KS3)
- Use the form $y = mx + c$ to identify parallel {and perpendicular} lines; find the equation of the line through two given points, or through one point with a given gradient
- Solve linear inequalities in one {or two} variable{s}, {and quadratic inequalities in one variable}; represent the solution set on a number line, {using set notation and on a graph}
- Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs (KS3)
- Work with coordinates in all four quadrants (KS3)

Small steps

Step 1	Draw straight line graphs
Step 2	$y = mx + c$
Step 3	Find the equation of a line from a graph
Step 4	Represent solutions to single inequalities on a graph
Step 5	Represent solutions to multiple inequalities on a graph (E)
Step 6	Find the midpoint of a line segment
Step 7	Equation of a straight line graph given one point and a gradient
Step 8	Equation of a straight line graph given two points
Step 9	Equations of perpendicular lines (E)
Step 10	Real-life straight line graphs

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Year 10 Higher Spring Term Block 3 Probability

Probability

Students develop an understanding of probability through calculating, interpreting and comparing probabilities in a range of contexts. This block builds on students' Key Stage 3 learning of probability, extending these ideas to relative frequency, sample spaces, two-way tables, frequency trees and tree diagrams. Teaching focuses on using practical experiments, counters, dice and visual representations to develop understanding, while encouraging students to work systematically when listing and counting outcomes, including applying the product rule. Students calculate probabilities for single and combined events, use the property that probabilities sum to 1, compare theoretical and experimental probability, and explore how increasing the number of trials affects relative frequency. They also use sample spaces, two-way tables, frequency trees and tree diagrams to organise information and solve problems involving independent and dependent events.

National curriculum links

- Record, describe and analyse the frequency of outcomes of simple probability experiments involving randomness, fairness, equally and unequally likely outcomes, using appropriate language and the 0–1 probability scale (KS3)
- Apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to one
- Apply systematic listing strategies, {including use of the product rule for counting}

(NC links are continued on the next page)

Small steps

Step 1	Probability of a single event
Step 2	Use the property that probabilities sum to 1
Step 3	List and count outcomes
Step 4	Relative frequency
Step 5	Sample spaces for 1 or more events
Step 6	Two-way tables and frequency trees
Step 7	Independent events
Step 8	Tree diagrams for independent events
Step 9	Tree diagrams for dependent events

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Year 10 Higher Spring Term Block 3 Probability

National curriculum links

- Use a probability model to predict the outcomes of future experiments; understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size
- Generate theoretical sample spaces for single and combined events with equally likely, mutually exclusive outcomes and use these to calculate theoretical probabilities (KS3)
- Construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data (KS3)
- {Calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams}
- Calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions

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Year 10 Higher Spring Term Block 4 Rounding and estimation

Rounding and estimation

Students develop an understanding of rounding and estimation through approximating values, interpreting accuracy and calculating limits of possible values. This block builds on students' Key Stage 3 learning of place value, rounding and estimation, extending these ideas to error intervals, truncation, and upper and lower bounds. Teaching focuses on using number lines, inequalities, calculator technology and contextual problems to support understanding of accuracy and reasonableness. Students round numbers to decimal places and significant figures, estimate answers to calculations, identify overestimates and underestimates, and use calculators to perform calculations and round answers appropriately. They also write and interpret error intervals, including those involving truncation, and use upper and lower bounds to determine the limits of calculations involving measures and quantities.

National curriculum links

- Understand and use place value for decimals, measures and integers of any size (KS3)
- Round numbers and measures to an appropriate degree of accuracy [for example, to a number of decimal places or significant figures] (KS3)
- Use approximation through rounding to estimate answers and calculate possible resulting errors expressed using inequality notation $a < x \leq b$ (KS3)
- Use a calculator and other technologies to calculate results accurately and then interpret them appropriately. (KS3)
- Calculate with roots, and with integer (and fractional) indices
- Apply and interpret limits of accuracy when rounding or truncating {including upper and lower bounds}

Small steps

Step 1	Round to decimal places and significant figures
Step 2	Estimate answers to calculations
Step 3	Use of a calculator
Step 4	Error intervals (including truncation)
Step 5	Upper and lower bounds

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Year 10 Higher Spring Term Block 5 Perimeter, area and volume

Perimeter, area and volume

Students develop an understanding of perimeter, area and volume through applying formulae to 2-D and 3-D shapes. This block builds on students' Key Stage 3 learning of shape properties, perimeter, area, circles, volume and nets. Teaching focuses on selecting appropriate formulae, making connections between 2-D and 3-D geometry, and using nets, diagrams and physical models to support visualisation. Students calculate the perimeter and area of a range of shapes, including circles, sectors and compound shapes, and solve problems involving the volume and surface area of prisms and cylinders. Some problems require students to determine missing lengths using geometric reasoning, including Pythagoras' theorem.

National curriculum links

- Derive and apply formulae to calculate and solve problems involving: perimeter and area of triangles, parallelograms, trapezia, volume of cuboids (including cubes) and other prisms (including cylinders) (KS3)
- Calculate and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes (KS3)
- Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment
- Calculate arc lengths, angles and areas of sectors of circles
- Use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, pyramids, cones and spheres to solve problems in 3-D (KS3)
- Calculate surface areas and volumes of spheres, pyramids, cones and composite solids

Small steps

Step 1	Perimeter of a 2-D shape
Step 2	Area of a 2-D shape
Step 3	Area and circumference of a circle
Step 4	Arc length and perimeter
Step 5	Area of a sector
Step 6	Volume of a prism
Step 7	Volume of a cylinder
Step 8	Nets
Step 9	Surface area of a prism
Step 10	Surface area of a cylinder

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Year 10 Higher Spring Term Block 6 Interpret and represent data

Interpret and represent data

Students develop an understanding of statistical measures and data collection through analysing and interpreting data. This block builds on students' Key Stage 3 learning of averages, range, frequency tables and scatter graphs, extending these ideas to grouped data, sampling and capture–recapture. Teaching focuses on selecting appropriate statistical measures, comparing distributions and understanding the strengths and limitations of different methods of collecting and representing data. Students calculate and interpret averages and range from ungrouped and grouped data, compare distributions, classify data types, use sampling methods, estimate populations using capture–recapture, and interpret scatter graphs using correlation, lines of best fit, interpolation and extrapolation.

National curriculum links

- Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: appropriate graphical representation involving discrete, continuous and grouped data, {including box plots} appropriate measures of central tendency (including modal class) and spread including quartiles and inter-quartile range}
- Construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data (KS3)
- Infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling, Apply statistics to describe a population
- Use and interpret scatter graphs of bivariate data; recognise correlation and know that it does not indicate causation; draw estimated lines of best fit; make predictions; interpolate and when extrapolate apparent trends

Small steps

Step 1	Averages and range
Step 2	Averages from an ungrouped frequency table
Step 3	Mean from a grouped frequency table
Step 4	Averages from a grouped frequency table
Step 5	Use data to compare distributions
Step 6	Types of data
Step 7	Sampling
Step 8	Capture and recapture
Step 9	Scatter graphs
Step 10	Interpolation and extrapolation

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Year 10 Higher Spring Term Block 7 Non-linear graphs

Non-linear graphs

Students develop an understanding of non-linear graphs through plotting and interpreting quadratic and cubic graphs and graphs of circles. This block builds on students' Key Stage 3 learning of graphing and algebra, extending these ideas to roots, intercepts, turning points and graphical methods for solving equations. Teaching focuses on making connections between equations and graphical features, with tables of values, geometric representations and dynamic graphing software supporting understanding and visualisation. Students plot and interpret quadratic and cubic graphs, identify roots, intercepts and turning points, find approximate solutions to equations using graphs, and estimate the gradient of a curve using tangents. They also develop understanding of the equation of a circle and the links between coordinates, radii and tangents.

National curriculum links

- Interpret mathematical relationships both algebraically and graphically (KS3)
- Recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$ {the exponential function $y = k^x$ for positive values of k, and the trigonometric functions (with arguments in degrees), and $y = \tan x$ for angles of any size}
- Identify and interpret roots, intercepts and turning points of quadratic functions graphically; deduce roots algebraically {and turning points by completing the square}

(NC links are continued on the next page)

Small steps

Step 1	Quadratic graphs
Step 2	Intercepts and roots of quadratic graphs
Step 3	Turning points
Step 4	Cubic graphs
Step 5	Approximate solutions to equations using graphs
Step 6	Estimate the gradient of a curve at a given point
Step 7	Estimate the area under a curve (E)
Step 8	Equation of a circle
Step 9	Equation of a tangent to a circle (E)

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Year 10 Higher Spring Term Block 7 Non-linear graphs

National curriculum links

- Use linear and quadratic graphs to estimate values of y for given values of x and vice versa and to find approximate solutions of simultaneous linear equations (KS3)
- Solve two simultaneous equations in two variables (linear/linear {or linear/quadratic}) algebraically; find approximate solutions using a graph
- {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 numerical, algebraic and graphical contexts}
- {Calculate or estimate gradients of graphs and areas under graphs (including quadratic and other non-linear graphs), and interpret results in cases such as distance–time graphs, velocity–time graphs and graphs in financial contexts}
- {Recognise and use the equation of a circle with centre at the origin; find the equation of a tangent to a circle at a given point}

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Year 10 Higher Summer Term Block 1 Angles

Angles

Students develop an understanding of angles through applying and connecting basic angle facts. This block builds on students' Key Stage 3 learning of angles in shapes, polygons and parallel lines. Teaching focuses on selecting appropriate angle facts, justifying reasoning and using clear mathematical notation. Students solve problems involving angles around a point, on a straight line, in triangles and quadrilaterals, and use interior and exterior angle properties of polygons. They also apply alternate, corresponding and co-interior angles, and form and solve equations involving angles and algebra. The extend step introduces proving geometric facts using clear mathematical reasoning.

National curriculum links

- Use the standard conventions for labelling the sides and angles of triangle ABC, and know and use the criteria for congruence of triangles (KS3)
- Apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles (KS3)
- Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides, including Pythagoras' Theorem, and use known results to obtain simple proofs (KS3)
- Derive and use the sum of angles in a triangle and use it to deduce the angle sum in any polygon and to derive properties of regular polygons (KS3)
- Understand and use the relationship between parallel lines and alternate and corresponding angles (KS3)
- Translate simple situations or procedures into algebraic expressions or formulae; derive an equation (or two simultaneous equations), solve the equation(s) and interpret the solution

Small steps

Step 1	Angles around a point, on a straight line and vertically opposite
Step 2	Angles in triangles and quadrilaterals
Step 3	Exterior angles of a polygon
Step 4	Interior angles of a polygon
Step 5	Solve problems with angles in polygons
Step 6	Alternate, corresponding and co-interior angles
Step 7	Solve problems with angles and algebra
Step 8	Prove geometric facts (E)

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Year 10 Higher Summer Term Block 2 Graphs and diagrams

Graphs and diagrams

Students develop an understanding of statistical graphs and diagrams through constructing, interpreting and comparing a range of representations. This block builds on students' Key Stage 3 learning of data handling and graphical representation, extending these ideas to histograms, cumulative frequency diagrams and box plots. Teaching focuses on selecting appropriate representations and interpreting distributions. Students draw and interpret pie charts, time series graphs, frequency polygons, stem-and-leaf diagrams, histograms, cumulative frequency diagrams and box plots, using these to analyse data and estimate measures such as the median, quartiles and interquartile range. The extend step introduces comparing distributions using box plots.

National curriculum links

- Construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data (KS3)
- Interpret and construct tables and line graphs for time series data
- Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: appropriate graphical representation involving discrete, continuous and grouped data, {including box plots}
- {construct and interpret diagrams for grouped discrete data and continuous data, i.e. histograms with equal and unequal class intervals and cumulative frequency graphs, and know their appropriate use}
- Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: appropriate measures of central tendency (including modal class) and spread {including quartiles and inter-quartile range}

Small steps

Step 1	Pie charts
Step 2	Time series graphs
Step 3	Frequency polygons
Step 4	Stem-and-leaf diagrams
Step 5	Draw histograms
Step 6	Interpret histograms
Step 7	Draw cumulative frequency diagrams
Step 8	Interpret cumulative frequency diagrams
Step 9	Box plots
Step 10	Compare distributions using box plots (E)

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Year 10 Higher Summer Term Block 3 Vectors

Vectors

Students develop an understanding of vectors through representing, combining and analysing vectors in a range of geometric contexts. This block builds on students' Year 9 learning of translations, extending these ideas to column vectors, vector notation, scalar multiplication, vector arithmetic and vector journeys. Teaching focuses on making connections between diagrammatic and algebraic representations, with grids, geometric diagrams and simple shapes such as parallelograms supporting understanding. Students represent vectors using column notation, multiply vectors by scalars, add and subtract vectors, and describe and simplify vector journeys. They apply vector reasoning in quadrilaterals, recognise equivalent vector routes and identify parallel vectors by considering scalar multiples and direction.

National curriculum links

- Describe translations as 2D vectors
- Apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representations of vectors; {use vectors to construct geometric arguments and proofs}

Small steps

Step 1	Understand and represent vectors
Step 2	Vector notation
Step 3	Vectors multiplied by a scalar
Step 4	Add vectors
Step 5	Add and subtract vectors
Step 6	Vector journeys in shapes
Step 7	Vectors in quadrilaterals
Step 8	Parallel vectors

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Year 10 Higher Summer Term Block 4 Factors, powers and surds

Factors, powers and surds

Students develop an understanding of surds through simplifying and manipulating exact values. This block builds on students' prior learning of powers, roots and introductory surds. Students simplify, perform calculations, expand brackets, rationalise denominators and solve problems using exact values. The extend step introduces rationalising more complex denominators using conjugate pairs.

National curriculum links

- Use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation property (KS3)
- Use integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5 and distinguish between exact representations of roots and their decimal approximations (KS3)
- Calculate with roots, and with integer {and fractional} indices
- Simplify and manipulate algebraic expressions (including those involving surds) {and algebraic fractions} by: factorising quadratic expressions of the form $x^2 + bx + c$, including the difference of two squares; {factorising quadratic expressions of the form $ax^2 + bx + c$}; simplifying expressions involving sums, products and powers, including the laws of indices
- Calculate exactly with fractions, {surds} and multiples of π; {simplify surd expressions involving squares [for example $\sqrt{12} = \sqrt{4 \times 3} = \sqrt{4} \times \sqrt{3} = 2\sqrt{3}$] and rationalise denominators}

Small steps

Step 1	Prime factorisation, HCF and LCM
Step 2	Powers, roots and negative indices
Step 3	Fractional indices
Step 4	Four operations with surds
Step 5	Simplify surds
Step 6	Expand single brackets with surds
Step 7	Rationalise the denominator
Step 8	Expand double brackets with surds
Step 9	Rationalise the denominator with more complex denominators (E)
Step 10	Solve problems with surds

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Year 10 Higher Summer Term Block 5 Pythagoras and trigonometry

Pythagoras and trigonometry

Students develop an understanding of Pythagoras' theorem and trigonometry through solving problems involving lengths, angles and area. This block builds on students' Year 9 learning of Pythagoras' theorem. Some students may also have studied finding unknown angles and exact trigonometric values in the optional Year 9 trigonometry block. Teaching focuses on selecting appropriate methods, making connections between geometric and algebraic representations, and using diagrams and dynamic software to support understanding. Students apply Pythagoras' theorem and trigonometric ratios to find unknown lengths and angles in right-angled triangles, use exact trigonometric values, calculate the area of non-right-angled triangles, and solve problems using the sine and cosine rules to find unknown lengths and angles. They also develop fluency in choosing efficient methods and interpreting relationships between sides and angles in a range of geometric contexts.

National curriculum links

- Apply Pythagoras' Theorem and trigonometric ratios to find angles and lengths in right-angled triangles {and, where possible, general triangles} in two {and three} dimensional figures
- Know the exact values of sin θ and cos θ for θ = 0°, 30°, 45°, 60° and 90°; know the exact values for tan θ for $\theta = 0°, 30°, 45°, 60°$
- {Know and apply Area $= \frac{1}{2}ab\ sin\ C$ to calculate the area, sides or angles of any triangle}
- {Know and apply the sine rule, $\frac{a}{sinA} = \frac{b}{sinB} = \frac{c}{sinC}$ and cosine rule, $a^2 = b^2 + c^2 - 2bc\ cos\ A$, to find unknown lengths and angles}

Small steps

Step 1	Pythagoras' theorem (find any side)
Step 2	Use trigonometric ratios to find an unknown side length
Step 3	Use trigonometric ratios to find an unknown angle
Step 4	Exact trigonometric values
Step 5	Trigonometry in 3-D shapes
Step 6	Area of a non-right-angled triangle
Step 7	Use the sine rule to find an unknown side length
Step 8	Use the sine rule to find an unknown angle
Step 9	Use the cosine rule to find an unknown side length
Step 10	Use the cosine rule to find an unknown angle

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Year 10 Higher Summer Term Block 6 Simultaneous equations

Simultaneous equations

Students develop an understanding of simultaneous equations through graphical and algebraic methods for finding solutions to pairs of equations. Some students may have previously studied solving simultaneous equations by substitution in the optional Year 9 block. Teaching focuses on making connections between graphical and algebraic representations, using bar models, graphs and algebraic reasoning to support understanding. Students solve simultaneous equations using elimination, substitution and graphical methods, form and solve simultaneous equations from contextual problems, and interpret solutions as points of intersection. The extend steps introduce simultaneous equations involving one linear and one non-linear equation, solved using graphical methods, equating expressions and substitution.

National curriculum links

- Solve two simultaneous equations in two variables (linear/linear {or linear/quadratic}) algebraically; find approximate solutions using a graph

Small steps

Step 1	Solve simultaneous equations using graphs
Step 2	Solve simultaneous equations (no adjustments)
Step 3	Solve simultaneous equations (adjust one)
Step 4	Solve simultaneous equations (adjust both)
Step 5	Solve simultaneous equations by substitution
Step 6	Solve problems with simultaneous equations
Step 7	Solve simultaneous equations (one linear, one non-linear) using graphs (E)
Step 8	Solve simultaneous equations (one linear, one non-linear) by equating expressions (E)
Step 9	Solve simultaneous equations (one linear, one non-linear) using substitution (E)

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Year 11 Foundation Autumn Term Block 1 Ratio and proportion

Ratio and proportion

Students develop an understanding of ratio and proportion through solving problems involving sharing, scaling and multiplicative relationships. Teaching focuses on identifying proportional relationships and making connections between different representations. Bar models, double number lines and graphs support understanding. Students solve ratio problems, use direct and inverse proportion, compare value for money, and interpret conversion graphs and exchange rates. The extend steps introduce direct proportion equations and proportion graphs.

National curriculum links

- Use ratio notation, including reduction to simplest form (KS3)
- Divide a given quantity into two parts in a given part : part or part : whole ratio; express the division of a quantity into two parts as a ratio (KS3)
- Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction (KS3)
- Identify and work with fractions in ratio problems
- Solve problems involving direct and inverse proportion, including graphical and algebraic representations (KS3)
- Use scale factors, scale diagrams and maps (KS3)
- Interpret mathematical relationships both algebraically and graphically (KS3)
- Understand that X is inversely proportional to Y is equivalent to X is proportional to inverse proportion $\frac{1}{Y}$; interpret equations that describe direct and inverse proportion
- Interpret the gradient of a straight line graph as a rate of change; recognise and interpret graphs that illustrate direct and inverse proportion

Small steps

Step 1	Solve problems with ratio
Step 2	Direct proportion
Step 3	Best buy problems
Step 4	Conversion graphs
Step 5	Exchange rates
Step 6	Inverse proportion
Step 7	Direct proportion equations (E)
Step 8	Direct and inverse proportion graphs (E)

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Year 11 Foundation Autumn Term Block 2 Area and volume

Area and volume

Students develop an understanding of area, surface area and volume through visualising, representing and calculating properties of 3-D shapes. This block builds on prior learning of area, volume and circle geometry, extending students' understanding to spheres, cones and pyramids. Teaching focuses on making connections between 2-D and 3-D representations, using isometric drawings, plans, elevations, nets and diagrams to support understanding. Students draw and interpret isometric representations, plans and elevations, calculate the volume of cylinders, spheres, cones and pyramids, and find the surface area of spheres. They apply formulae involving π and solve problems in a range of contexts involving volume and surface area. The extend steps introduce surface area of cylinders, pyramids and cones, together with converting metric units of area and volume.

National curriculum links

- Use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, pyramids, cones and spheres to solve problems in 3-D (KS3)
- Construct and interpret plans and elevations of 3D shapes
- Derive and apply formulae to calculate and solve problems, involving: perimeter and area of triangles, parallelograms, trapezia, volume of cuboids (including cubes) and other prisms (including cylinders) (KS3)
- Calculate surface areas and volumes of spheres, pyramids, cones and composite solids
- Change freely between related standard units [for example time, length, area, volume/capacity, mass] (KS3)
- Use standard units of mass, length, time, money and other measures, including with decimal quantities (KS3)

Small steps

Step 1	Isometric drawings
Step 2	Plans and elevations
Step 3	Volume of a cylinder
Step 4	Volume of a sphere
Step 5	Volume of cones and pyramids
Step 6	Surface area of a sphere
Step 7	Surface area of a cylinder (E)
Step 8	Surface area of a pyramid (E)
Step 9	Surface area of a cone (E)
Step 10	Convert metric units of area (E)
Step 11	Convert metric units of volume (E)

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Year 11 Foundation Autumn Term Block 3 Similarity and congruence

Similarity and congruence

Students develop an understanding of similarity and congruence through identifying relationships between shapes and applying geometric reasoning to solve problems. Teaching focuses on identifying corresponding sides and angles, making connections between proportional reasoning and geometry, and using diagrams to support understanding. Students identify similar shapes and triangles, calculate unknown lengths and angles, solve problems involving similarity, and distinguish between similarity and congruence. They also explore the conditions for congruent triangles and use them to justify congruence. The extend steps introduce proving pairs of triangles are similar and congruent.

National curriculum links

- Use scale factors, scale diagrams and maps (KS3)
- Apply the concepts of congruence and similarity, including the relationships between lengths, in similar figures
- Understand and use the relationship between parallel lines and alternate and corresponding angles (KS3)
- Compare lengths, areas and volumes using ratio notation and/or scale factors; make links to similarity (including trigonometric ratios)
- Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides, including Pythagoras' Theorem, and use known results to obtain simple proofs (KS3)
- Use the standard conventions for labelling the sides and angles of triangle ABC, and know and use the criteria for congruence of triangles (KS3)
- Identify and construct congruent triangles, and construct similar shapes by enlargement, with and without coordinate grids (KS3)

Small steps

Step 1	Identify similar shapes
Step 2	Find unknown lengths and angles in similar shapes
Step 3	Identify similar triangles
Step 4	Solve problems with similar shapes
Step 5	Prove a pair of triangles are similar (E)
Step 6	Similarity and congruence
Step 7	Congruent triangles
Step 8	Prove a pair of triangles are congruent (E)

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Year 11 Foundation Autumn Term Block 4 Sequences and proof

Sequences and proof

Students develop an understanding of sequences and proof through recognising patterns, generating terms and using algebra to describe relationships. This block builds on prior learning of sequences and substitution, extending students' understanding of arithmetic, geometric and Fibonacci sequences. Teaching focuses on identifying patterns, making connections between numerical and algebraic representations, and using algebraic reasoning to justify conclusions. Students describe and continue sequences, generate sequences from algebraic rules, find the nth term of linear sequences, and use algebra to represent numbers and relationships. The extend steps introduce algebraic arguments, counterexamples and simple proof.

National curriculum links

- Recognise and use sequences of triangular, square and cube numbers, simple arithmetic progressions, Fibonacci type sequences, quadratic sequences, and simple geometric progressions (r^n where n is an integer, and r is a positive rational number)
- Deduce expressions to calculate the nth term of linear sequences
- Know the difference between an equation and an identity; argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments

Small steps

Step 1	Describe and continue arithmetic and geometric sequences
Step 2	Explore other sequences
Step 3	Generate a sequence given an algebraic rule
Step 4	nth term of a linear sequence
Step 5	Represent numbers algebraically (E)
Step 6	Arguments and counterexamples (E)

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Year 11 Foundation Autumn Term Block 5 Standard form

Standard form

Students develop an understanding of standard form through representing, comparing and calculating with very large and very small numbers. This block builds on prior learning of place value, powers of ten and indices. Teaching focuses on making connections between ordinary numbers and standard form, using place value reasoning to support understanding. Students convert numbers to and from standard form, compare and order numbers written in standard form, and adjust numbers into correct standard form after calculations. The extend steps introduce multiplying, dividing, adding and subtracting numbers in standard form.

National curriculum links

- Interpret and compare numbers in standard form $A \times 10^n$ $1 \leq A < 10$, where n is a positive or negative integer or zero (KS3)
- Calculate with numbers in standard form $A \times 10^n$, where $1 \leq A < 10$ and n is an integer

Small steps

Step 1	Numbers greater than 1 in standard form
Step 2	Numbers between 0 and 1 in standard form
Step 3	Adjust a number to standard form
Step 4	Multiply and divide numbers in standard form (E)
Step 5	Add and subtract numbers in standard form (E)

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Year 11 Foundation Autumn Term Block 6 Work with circles

Work with circles

Students develop an understanding of circles through calculating and applying measures of area, circumference, arc length and perimeter. This block builds on prior learning of circle properties, area and circumference, extending understanding to sectors and compound shapes. Teaching focuses on selecting appropriate formulae, making connections between fractions of circles and corresponding lengths and areas, and working with exact values in terms of π. Students calculate the area and circumference of circles, find areas and perimeters of fractional parts of circles, and solve problems involving compound shapes made from circles and other shapes. They apply their understanding in a range of contexts, choosing efficient methods and interpreting geometric information from diagrams. The extend steps introduce finding the area of a sector and calculating arc lengths and sector perimeters using angle proportions.

National curriculum links

- Calculate and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes (KS3)
- Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment
- Calculate arc lengths, angles and areas of sectors of circles

Small steps

Step 1	Area and circumference of a circle
Step 2	Fractional parts of a circle (area)
Step 3	Area of a sector (E)
Step 4	Fractional parts of a circle (perimeter)
Step 5	Arc length and perimeter (E)
Step 6	Area and perimeter of compound shapes with circles
Step 7	Solve problems with circles

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Year 11 Foundation Autumn Term Block 7 Set notation and Venn diagrams

Set notation and Venn diagrams

Students develop an understanding of sets and probability through interpreting Venn diagrams and using set notation to represent relationships between groups of data. This block builds on prior learning of Venn diagrams and probability, developing students' understanding of intersections, unions, complements and the universal set. Teaching focuses on interpreting and representing information visually, making connections between diagrams, set notation and probability. Students create and interpret Venn diagrams, identify and describe sets using set notation, and calculate probabilities from Venn diagrams. They use mathematical language and notation to describe relationships between sets and solve problems involving overlapping groups of data.

National curriculum links

- Enumerate sets and unions/intersections of sets systematically, using tables, grids and Venn diagrams (KS3)
- Calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions

Small steps

Step 1	Venn diagrams
Step 2	Set notation
Step 3	Probabilities from Venn diagrams

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Year 11 Foundation Spring Term Block 1 Functions and graphs

Functions and graphs

Students develop an understanding of functions and graphs through exploring relationships between inputs and outputs, representing functions algebraically, and interpreting graphical representations. This block builds on prior learning of function machines, substitution and coordinate graphs. Teaching focuses on making connections between numerical, algebraic and graphical representations, using tables of values and graphing techniques to support understanding. Students use function machines, write expressions and formulae from functions, and plot and interpret quadratic, cubic and reciprocal graphs. They identify key features such as roots, intercepts, turning points and asymptotes, and use graphs to estimate solutions to equations. Students also recognise and sketch different graph types, making connections between equations and their graphical representations.

National curriculum links

- Recognise and use relationships between operations including inverse operations (KS3)
- Where appropriate, interpret simple expressions as functions with inputs and outputs
- Solve quadratic equations algebraically by factorising, find approximate solutions using a graph
- Identify and interpret roots, intercepts and turning points of quadratic functions graphically; deduce roots algebraically
- Recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$

Small steps

Step 1	Function machines
Step 2	Write an expression or formula from a function machine
Step 3	Quadratic graphs
Step 4	Cubic graphs
Step 5	Reciprocal graphs
Step 6	Recognise and sketch graphs

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Year 11 Foundation Spring Term Block 2 Equations and formulae

Equations and formulae

Students develop an understanding of equations, inequalities and formulae through forming and solving algebraic relationships. Teaching focuses on representing situations algebraically, selecting efficient methods and interpreting solutions in context. Students solve equations, inequalities and simultaneous equations, and form and solve equations from geometric and worded problems. The extend steps introduce equations and inequalities with unknowns on both sides and more complex algebraic forms.

National curriculum links

- Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors (KS3)
- Recognise and use relationships between operations including inverse operations (KS3)
- Simplify and manipulate algebraic expressions to maintain equivalence by multiplying a single term over a bracket (KS3)
- Use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement) (KS3)
- Translate simple situations or procedures into algebraic expressions or formulae; derive an equation (or two simultaneous equations), solve the equation(s) and interpret the solution
- Solve linear inequalities in one variable; represent the solution set on a number line
- Solve two simultaneous equations in two variables (linear/linear) algebraically; find approximate solutions using a graph

Small steps

Step 1	Solve equations
Step 2	Form and solve equations
Step 3	Form and solve equations with unknowns on both sides (E)
Step 4	Solve inequalities
Step 5	Form and solve inequalities (E)
Step 6	Form and solve more complex equations and inequalities (E)
Step 7	Solve simultaneous equations
Step 8	Solve problems with simultaneous equations

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Year 11 Foundation Spring Term Block 3 Rates

Rates

Students develop an understanding of rates through solving problems involving time, speed, distance, density and pressure. This block builds on prior learning of compound measures and unit conversion. Teaching focuses on interpreting rates in context, selecting appropriate calculations and making connections between numerical, graphical and algebraic representations. Students convert between hours and minutes, solve speed, distance and time problems, and interpret and draw distance–time graphs. They also calculate density and pressure and solve problems involving compound measures. The extend step introduces converting compound units such as m/s and km/h.

National curriculum links

- Use standard units of mass, length, time, money and other measures, including with decimal quantities (KS3)
- Change freely between related standard units [for example time, length, area, volume/capacity, mass] (KS3)
- Use compound units such as speed, unit pricing and density to solve problems (KS3)
- Plot and interpret graphs (including reciprocal graphs) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration
- Convert between related compound units (speed, rates of pay, prices, density, pressure) in numerical and algebraic contexts

Small steps

Step 1	Convert between hours and minutes
Step 2	Speed, distance and time
Step 3	Interpret distance-time graphs
Step 4	Draw distance-time graphs
Step 5	Density and pressure
Step 6	Convert compound units (E)

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Year 11 Foundation Spring Term Block 4 Angles, bearings and trigonometry

Angles, bearings and trigonometry

Students develop an understanding of angles, bearings and trigonometry through applying geometric reasoning to solve problems involving direction, shape and right-angled triangles. Teaching focuses on selecting appropriate methods, making connections between diagrams and calculations, and using accurate mathematical notation. Students solve problems involving angles in lines, shapes and parallel lines, interpret and use bearings, and construct and interpret scale drawings. They also apply Pythagoras' theorem and trigonometric ratios to find unknown lengths and angles. The extend steps introduce solving angle problems using algebra and solving bearings problems using Pythagoras' theorem and trigonometry.

National curriculum links

- Apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles (KS3)
- Derive and use the sum of angles in a triangle and use it to deduce the angle sum in any polygon, and to derive properties of regular polygons (KS3)
- Understand and use the relationship between parallel lines and alternate and corresponding angles (KS3)
- Interpret mathematical relationships both algebraically and geometrically (KS3)
- Interpret and use bearings
- Draw and measure line segments and angles in geometric figures, including interpreting scale drawings (KS3)
- Apply Pythagoras' theorem and trigonometric ratios to find angles and lengths in right-angled triangles in two dimensional figures

Small steps

Step 1	Angles in lines and shapes
Step 2	Solve problems with angles in parallel lines
Step 3	Solve problems with angles and algebra (E)
Step 4	Compass points and related angles
Step 5	Understand and represent bearings
Step 6	Measure and read bearings
Step 7	Scale drawings using bearings
Step 8	Calculate bearings using angles rules (E)
Step 9	Choose appropriate methods to solve problems with right-angled triangles
Step 10	Solve problems with bearings using Pythagoras and trigonometry (E)

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Year 11 Foundation Spring Term Block 5 Constructions and loci

Constructions and loci

Students develop an understanding of constructions and loci through using geometrical equipment accurately and applying construction techniques to solve problems. This block builds on prior learning of angle facts, properties of shapes and geometric reasoning. Teaching focuses on accurate use of rulers, protractors and compasses, and on making connections between constructions and loci. Students accurately draw triangles, construct angle and perpendicular bisectors, and construct perpendiculars from and to a point. They investigate loci involving distance from points and lines, identify points equidistant from two points or two lines, and solve problems involving loci. The extend step introduces accurately drawing polygons.

National curriculum links

- Draw and measure line segments and angles in geometric figures, including interpreting scale drawings (KS3)
- Describe, sketch and draw using conventional terms and notations: points, lines, parallel lines, perpendicular lines, right angles, regular polygons, and other polygons that are reflectively and rotationally symmetric (KS3)
- Use the standard conventions for labelling the sides and angles of triangle ABC, and know and use the criteria for congruence of triangles (KS3)
- Identify and construct congruent triangles, and construct similar shapes by enlargement, with and without coordinate grids (KS3)
- Derive and use the standard ruler and compass constructions (perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle); recognise and use the perpendicular distance from a point to a line as the shortest distance to the line (KS3)

Small steps

Step 1	Use geometrical equipment
Step 2	Accurately draw triangles
Step 3	Accurately draw polygons (E)
Step 4	Construct an angle bisector
Step 5	Construct a perpendicular bisector
Step 6	Construct a perpendicular from or to a point
Step 7	Locus of distance from a point or a straight line
Step 8	Locus equidistant from two points
Step 9	Locus equidistant from two lines
Step 10	Solve problems with loci

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Year 11 Foundation Spring Term Block 6 Transformations

Transformations

Students develop an understanding of transformations through exploring how shapes can be moved, reflected, rotated and enlarged. This block builds on prior learning of symmetry and transformations. Teaching focuses on identifying the properties of different transformations, making connections between graphical and geometric representations, and using accurate mathematical language to describe transformations. Students enlarge shapes using positive and fractional scale factors, identify line and rotational symmetry, and perform and describe reflections, rotations and translations. They also describe transformations fully and determine the result of transformations in a range of contexts. The extend step introduces finding the result of a series of transformations.

National curriculum links

- Identify and construct congruent triangles, and construct similar shapes by enlargement, with and without coordinate grids (KS3)
- Interpret and use fractional scale factors for enlargements
- Describe, sketch and draw using conventional terms and notations: points, lines, parallel lines, perpendicular lines, right angles, regular polygons, and other polygons that are reflectively and rotationally symmetric (KS3)
- Identify properties of, and describe the results of, translations, rotations and reflections applied to given figures (KS3)
- Describe translations as 2D vectors

Small steps

Step 1	Enlargement (positive integer scale factor)
Step 2	Enlargement (fractional scale factor)
Step 3	Line symmetry and rotational symmetry
Step 4	Reflection
Step 5	Rotation
Step 6	Translation
Step 7	Describe a transformation
Step 8	Find the result of a series of transformations (E)

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Year 11 Higher Autumn Term Block 1 Ratio and proportion

Ratio and proportion

Students develop an understanding of ratio and proportion through solving problems involving sharing, value for money and proportional relationships. Teaching focuses on identifying multiplicative relationships and making connections between numerical, graphical and algebraic representations. Students solve ratio problems, compare value for money, interpret conversion graphs and exchange rates, and use direct and inverse proportion equations and graphs. The extend steps introduce proportion equations involving powers and roots.

National curriculum links

- Use ratio notation, including reduction to simplest form (KS3)
- Divide a given quantity into two parts in a given part : part or part : whole ratio; express the division of a quantity into two parts as a ratio (KS3)
- Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction (KS3)
- Identify and work with fractions in ratio problems
- Solve problems involving direct and inverse proportion, including graphical and algebraic representations (KS3)
- Use scale factors, scale diagrams and maps (KS3)
- Interpret mathematical relationships both algebraically and graphically (KS3)
- Understand that X is inversely proportional to Y is equivalent to X is proportional to inverse proportion $\frac{1}{Y}$; {construct and} interpret equations that describe direct and inverse proportion
- Interpret the gradient of a straight line graph as a rate of change; recognise and interpret graphs that illustrate direct and inverse proportion

Small steps

Step 1	Solve problems with ratio
Step 2	Best buy problems
Step 3	Conversion graphs
Step 4	Exchange rates
Step 5	Direct proportion equations
Step 6	Complex direct proportion equations (E)
Step 7	Inverse proportion
Step 8	Inverse proportion equations (E)
Step 9	Direct and inverse proportion graphs

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Year 11 Higher Autumn Term Block 2 Area and volume

Area and volume

Students develop an understanding of area and volume through visualising, representing and calculating properties of 3-D shapes. This block builds on prior learning of area, volume and 3-D representations, extending students' understanding to spheres, cones and pyramids. Teaching focuses on making connections between 2-D and 3-D representations, using plans and elevations to support visualisation and geometric reasoning. Students draw and interpret plans and elevations, calculate the volume of spheres, cones and pyramids, and find the surface area of spheres and cones. They solve problems involving compound solids, work with exact values involving π, and convert metric units of area and volume. The extend step introduces calculating the volume and surface area of frustums using similarity and geometric reasoning.

National curriculum links

- Construct and interpret plans and elevations of 3D shapes
- Calculate surface areas and volumes of spheres, pyramids, cones and composite solids
- Change freely between related standard units [for example time, length, area, volume/capacity, mass] (KS3)
- Use standard units of mass, length, time, money and other measures, including with decimal quantities (KS3)

Small steps

Step 1	Plans and elevations
Step 2	Volume of a sphere
Step 3	Volume of cones and pyramids
Step 4	Surface area of spheres and cones
Step 5	Volume and surface area of a frustum (E)
Step 6	Convert metric units of area and volume

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Year 11 Higher Autumn Term Block 3 Similarity and congruence

Similarity and congruence

Students develop an understanding of similarity and congruence through applying geometric reasoning to solve problems. Teaching focuses on identifying corresponding sides and angles and using precise mathematical language. Students calculate unknown lengths and angles in similar shapes, solve problems involving similar triangles, explore area and volume scale factors, and apply the conditions for congruent triangles.

National curriculum links

- Use scale factors, scale diagrams and maps (KS3)
- Understand and use the relationship between parallel lines and alternate and corresponding angles (KS3)
- Apply the concepts of congruence and similarity, including the relationships between lengths, {areas and volumes} in similar figures
- Compare lengths, areas and volumes using ratio notation and/or scale factors; make links to similarity (including trigonometric ratios)
- Use the standard conventions for labelling the sides and angles of triangle ABC, and know and use the criteria for congruence of triangles (KS3)
- Identify and construct congruent triangles, and construct similar shapes by enlargement, with and without coordinate grids (KS3)
- Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides, including Pythagoras' Theorem, and use known results to obtain simple proofs (KS3)

Small steps

Step 1	Find unknown lengths and angles in similar shapes
Step 2	Identify similar triangles
Step 3	Solve problems with similar shapes
Step 4	Prove a pair of triangles are similar
Step 5	Areas of similar shapes
Step 6	Volumes of similar shapes
Step 7	Solve problems with area and volume in similar shapes
Step 8	Congruence
Step 9	Prove a pair of triangles are congruent

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Year 11 Higher Autumn Term Block 4 Sequences and proof

Sequences and proof

Students develop an understanding of sequences and proof through recognising patterns, generating terms and using algebra to justify conclusions. This block builds on prior learning of sequences, substitution and algebraic manipulation. Teaching focuses on identifying patterns, making connections between numerical and algebraic representations, and using algebraic reasoning to support mathematical arguments. Students describe and continue arithmetic, geometric and Fibonacci sequences, generate sequences from algebraic rules, and find the nth term of linear sequences. They represent numbers algebraically and use algebra to construct and justify proofs. The extend steps introduce sequences involving surds and finding the nth term of quadratic sequences.

National curriculum links

- Recognise and use sequences of triangular, square and cube numbers, simple arithmetic progressions, Fibonacci type sequences, quadratic sequences, and simple geometric progressions (r^n where n is an integer, and r is a positive rational number{or a surd}) {and other sequences}
- Deduce expressions to calculate the nth term of linear {and quadratic} sequences
- Know the difference between an equation and an identity; argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments {and proofs}

Small steps

Step 1	Describe and continue sequences
Step 2	Explore sequences with algebraic terms
Step 3	Describe and continue sequences involving surds (E)
Step 4	Generate a sequence given an algebraic rule
Step 5	nth term of a linear sequence
Step 6	nth term of a quadratic sequence (E)
Step 7	Represent numbers algebraically
Step 8	Algebraic arguments and proof

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Year 11 Higher Autumn Term Block 5 Standard form

Standard form

Students develop an understanding of standard form through representing, comparing and calculating with very large and very small numbers. This block revisits prior learning of powers of ten and standard form, extending students' fluency in calculations and problem solving. Teaching focuses on making connections between ordinary numbers and standard form, applying index laws, and selecting efficient calculation methods. Students convert numbers to and from standard form, compare and order numbers, perform the four operations with numbers in standard form, and solve problems in a range of mathematical and real-world contexts. They also interpret calculator outputs and round answers appropriately.

National curriculum links

- Interpret and compare numbers in standard form $A \times 10^n$ $1 \leq A < 10$, where n is a positive or negative integer or zero (KS3)
- Calculate with numbers in standard form $A \times 10^n$, where $1 \leq A < 10$ and n is an integer

Small steps

Step 1	Numbers in standard form
Step 2	Four operations with numbers in standard form
Step 3	Solve problems with standard form

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Year 11 Higher Autumn Term Block 6 Circle theorems

Circle theorems

Students develop an understanding of circle theorems through exploring and applying relationships between angles, chords, radii and tangents in circles. This block builds on prior learning of angle facts, properties of circles and geometric reasoning. Teaching focuses on identifying when different circle theorems apply, making connections between diagrams and geometric properties, and justifying solutions using precise mathematical language. Students use and apply circle theorems involving angles at the centre and circumference, angles in a semicircle, angles in the same segment, cyclic quadrilaterals, chords, radii and tangents. They solve increasingly complex problems by combining multiple circle theorems with other angle facts, geometric reasoning and begin to justify and prove results.

National curriculum links

- Derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures [for example, equal lengths and angles] using appropriate language and technologies (KS3)
- Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment
- {Apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results}

Small steps

Step 1	Angles in circles
Step 2	Circle theorem (angles at the centre and circumference)
Step 3	Circle theorem (angles in a semicircle)
Step 4	Circle theorem (angles in the same segment)
Step 5	Circle theorem (angles in a cyclic quadrilateral)
Step 6	Circle theorem (perpendicular from the centre to a chord)
Step 7	Circle theorem (angle between radius and tangent)
Step 8	Circle theorem (two tangents from a point)
Step 9	Circle theorem (alternate segment theorem) (E)
Step 10	Solve problems with circle theorems

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Year 11 Higher Autumn Term Block 7 Set notation and Venn diagrams

Set notation and Venn diagrams

Students develop an understanding of sets and Venn diagrams through representing information using set notation and interpreting relationships between sets. This block revisits prior learning of sets, Venn diagrams and probability, extending students' use of set notation and problem-solving skills. Teaching focuses on making connections between diagrams, notation and probability, and interpreting intersections, unions and complements. Students represent and describe sets, interpret and complete Venn diagrams, and solve problems involving probabilities and set notation. They use Venn diagrams to organise information, calculate probabilities and justify their reasoning. The extend step introduces conditional probability using Venn diagrams and two-way tables.

National curriculum links

- Enumerate sets and unions/intersections of sets systematically, using tables, grids and Venn diagrams (KS3)
- Calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions
- {Calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams}

Small steps

Step 1	Set notation
Step 2	Venn diagrams
Step 3	Solve problems with Venn diagrams
Step 4	Conditional probability (Venn diagrams and two-way tables) (E)

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Year 11 Higher Autumn Term Block 8 Vectors

Vectors

Students develop an understanding of vectors through solving problems, representing vector relationships and using vectors to justify geometric results. This block revisits prior learning of vector notation, scalar multiplication and vector journeys, extending students' reasoning through ratio problems and geometric proofs. Teaching focuses on interpreting and manipulating vectors, identifying parallel vectors, and constructing clear mathematical arguments. Students add, subtract and multiply vectors by scalars, solve problems involving vectors in geometric diagrams, and use vectors to show points are collinear. The extend steps introduce ratios with vectors, collinearity proofs and geometric arguments using vectors.

National curriculum links

- Apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representations of vectors; {use vectors to construct geometric arguments and proofs}

Small steps

Step 1	Solve problems with vectors
Step 2	Ratios with vectors (E)
Step 3	Collinear points using vectors (E)
Step 4	Geometric arguments and proofs using vectors (E)

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Year 11 Higher Spring Term Block 1 Functions and graphs

Functions and graphs

Students develop an understanding of functions and graphs through representing relationships algebraically and graphically. This block introduces function notation, composite and inverse functions, and extends students' understanding of a range of graph types. Teaching focuses on making connections between equations, tables of values and graphs, and interpreting key features such as roots, turning points and asymptotes. Students sketch and interpret quadratic, cubic, reciprocal and exponential graphs, recognise and compare graph shapes, and solve problems involving functions. They also investigate translations and reflections of graphs and their effects on equations. The extend steps introduce trigonometric graphs and more complex transformations of functions.

National curriculum links

- Where appropriate, interpret simple expressions as functions with inputs and outputs; {interpret the reverse process as the 'inverse function'; interpret the succession of two functions as a 'composite function'}
- Recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$ {the exponential function $y = k^x$ for positive values of k, and the trigonometric functions (with arguments in degrees) $y = \sin x$, $y = \cos x$ and $y = \tan x$ for angles of any size}
- Plot and interpret graphs (including reciprocal graphs {and exponential graphs}) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration
- {Sketch translations and reflections of the graph of a given function}

Small steps

Step 1	Function notation
Step 2	Composite functions
Step 3	Inverse functions
Step 4	Quadratic and cubic graphs
Step 5	Reciprocal graphs
Step 6	Exponential graphs
Step 7	Trigonometric graphs (E)
Step 8	Recognise and sketch graphs
Step 9	Translation of the graph of a function (E)
Step 10	Reflection of the graph of a function (E)
Step 11	More complex transformations of the graph of a function (E)

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Year 11 Higher Spring Term Block 2 Equations and formulae

Equations and formulae

Students develop an understanding of equations and formulae through forming, solving and interpreting algebraic relationships. Teaching focuses on selecting efficient methods, making connections between algebraic and graphical representations, and interpreting solutions in context. Students form and solve equations and inequalities, solve quadratic equations using a range of methods, use iteration to estimate solutions, and solve simultaneous equations. The extend steps introduce more complex equations and inequalities, quadratic inequalities, simultaneous equations involving linear and non-linear relationships, and solutions involving algebraic constants.

National curriculum links

- Translate simple situations or procedures into algebraic expressions or formulae; derive an equation (or two simultaneous equations), solve the equation(s) and interpret the solution
- Solve linear inequalities in one {or two} variable{s}, {and quadratic inequalities in one variable}; represent the solution set on a number line, {using set notation and on a graph}
- Solve quadratic equations {including those that require rearrangement} algebraically by factorising, {by completing the square and by using the quadratic formula}; find approximate solutions using a graph
- Set up, solve and interpret the answers in growth and decay problems, including compound interest {and work with general iterative processes}
- {Find approximate solutions to equations numerically using iteration}
- Solve two simultaneous equations in two variables (linear/linear {or linear/quadratic}) algebraically; find approximate solutions using a graph

Small steps

Step 1	Form and solve equations
Step 2	Form and solve inequalities
Step 3	Form and solve equations and inequalities with unknowns on both sides
Step 4	Form and solve more complex equations and inequalities (E)
Step 5	Quadratic equations
Step 6	Quadratic inequalities (E)
Step 7	Understand iterative processes
Step 8	Solve equations by iteration
Step 9	Solve simultaneous equations
Step 10	Solve simultaneous equations (one linear, one non-linear) (E)
Step 11	Solve a pair of simultaneous equations involving algebraic constants for a third unknown (E)

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Year 11 Higher Spring Term Block 3 Rates

Rates

Students develop an understanding of rates through solving problems involving speed, distance, time, density and pressure. This block revisits prior learning of compound measures and unit conversion, extending students' understanding through graphical representations and more complex calculations. Teaching focuses on interpreting rates in context, making connections between numerical, graphical and algebraic representations, and selecting appropriate methods. Students solve speed, distance and time problems, interpret distance–time and velocity–time graphs, calculate density and pressure, and convert compound units.

National curriculum links

- Use compound units such as speed, unit pricing and density to solve problems (KS3)
- Plot and interpret graphs (including reciprocal graphs {and exponential graphs}) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration
- {calculate or estimate gradients of graphs and areas under graphs (including quadratic and other non–linear graphs), and interpret results in cases such as distance–time graphs, velocity–time graphs and graphs in financial contexts}
- Convert between related compound units (speed, rates of pay, prices, density, pressure) in numerical and algebraic contexts

Small steps

Step 1	Speed, distance and time
Step 2	Distance-time graphs
Step 3	Velocity-time graphs (E)
Step 4	Density and pressure
Step 5	Convert compound units

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Year 11 Higher Spring Term Block 4 Angles, bearings and trigonometry

Angles, bearings and trigonometry

Students develop an understanding of angles, bearings and trigonometry through solving problems involving direction, shape and triangles. This block revisits prior learning of angle facts, bearings, Pythagoras' theorem and trigonometric ratios. Teaching focuses on selecting appropriate methods, making connections between geometric and algebraic representations, and using precise mathematical language to justify solutions. Students interpret and calculate bearings, use scale drawings, apply angle rules, and solve problems involving right-angled triangles using Pythagoras' theorem and trigonometry. They also use the sine and cosine rules to find unknown lengths and angles. The extend step introduces solving bearings problems using the sine and cosine rules.

National curriculum links

- Interpret and use bearings
- Draw and measure line segments and angles in geometric figures, including interpreting scale drawings (KS3)
- Apply Pythagoras' theorem and trigonometric ratios to find angles and lengths in right-angled triangles {and, where possible, general triangles} in two {and three} dimensional figures
- {Know and apply the sine rule, $\frac{a}{sinA} = \frac{b}{sinB} = \frac{c}{sinC}$ and cosine rule, $a^2 = b^2 + c^2 - 2bc\ cos\ A$, to find unknown lengths and angles}

Small steps

Step 1	Understand and represent bearings
Step 2	Measure and read bearings
Step 3	Scale drawings using bearings
Step 4	Calculate bearings using angles rules
Step 5	Choose appropriate methods to solve problems with right-angled triangles
Step 6	Solve problems with bearings using Pythagoras and trigonometry
Step 7	Sine and cosine rules
Step 8	Solve problems with bearings using the sine and cosine rules (E)

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Year 11 Higher Spring Term Block 5 Constructions and loci

Constructions and loci

Students develop an understanding of constructions and loci through using geometrical equipment accurately and applying construction techniques to solve problems. This block revisits prior learning of angle facts, properties of shapes and geometric reasoning. Teaching focuses on accurate use of rulers, protractors and compasses, making connections between constructions and loci, and using precise mathematical language to justify solutions. Students accurately draw triangles and polygons, construct angle and perpendicular bisectors, construct perpendiculars from and to a point, and identify loci involving distance from points and lines. They also solve problems involving points equidistant from two points or two lines and apply a range of constructions to solve loci problems.

National curriculum links

- Identify and construct congruent triangles, and construct similar shapes by enlargement, with and without coordinate grids (KS3)
- Describe, sketch and draw using conventional terms and notations: points, lines, parallel lines, perpendicular lines, right angles, regular polygons, and other polygons that are reflectively and rotationally symmetric (KS3)
- Draw and measure line segments and angles in geometric figures, including interpreting scale drawings (KS3)
- Derive and use the standard ruler and compass constructions (perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle); recognise and use the perpendicular distance from a point to a line as the shortest distance to the line (KS3)

Small steps

Step 1	Accurately draw triangles
Step 2	Accurately draw polygons
Step 3	Construct an angle bisector and a perpendicular bisector
Step 4	Construct a perpendicular from or to a point
Step 5	Locus of distance from a point or a straight line
Step 6	Locus equidistant from two points
Step 7	Locus equidistant from two lines
Step 8	Solve problems with loci

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Year 11 Higher Spring Term Block 6 Transformations

Transformations

Students develop an understanding of transformations through exploring and describing the effects of enlargements, reflections, rotations and translations. This block revisits prior learning of transformations and similarity, extending students' understanding to fractional and negative scale factor enlargements. Teaching focuses on identifying the properties of each transformation and using precise mathematical language to describe transformations. Students perform and describe enlargements, reflections, rotations and translations, identify centres and scale factors, and determine single transformations equivalent to a series of transformations. The extend step introduces invariant points and lines in transformations.

National curriculum links

- Identify and construct congruent triangles, and construct similar shapes by enlargement, with and without coordinate grids (KS3)
- Interpret and use fractional {and negative} scale factors for enlargements
- Identify properties of, and describe the results of, translations, rotations and reflections applied to given figures (KS3)
- {Describe the changes and invariance achieved by combinations of rotations, reflections and translations}
- Describe translations as 2D vectors

Small steps

Step 1	Enlargement (positive scale factor)
Step 2	Enlargement (fractional scale factor)
Step 3	Enlargement (negative scale factor)
Step 4	Reflection
Step 5	Rotation
Step 6	Translation
Step 7	Describe a transformation
Step 8	Find the result of a series of transformations
Step 9	Invariant points (E)

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Topic progression
Foundation

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Number: Place value and rounding (Foundation)

Year 7

Autumn Block 4 & 7
- Understand & use place value
- Compare & order numbers
- Round to powers of 10, integers, decimal places & significant figures
- Standard form (E)
- Error intervals (E)

Spring Block 3
- Compare & order directed numbers

Year 8

Spring Block 5
- Positive & negative powers of 10
- Convert between ordinary numbers & standard form

Year 9

Autumn Block 7

Revisit & extend Y8 content:
- Convert between ordinary numbers & standard form
- Compare & order numbers in standard form

Year 10 Foundation

Spring Block 1 & 4

Revise & extend KS3 content:
- Place value
- Comparing & ordering
- Rounding
- Error intervals (E)

Year 11 Foundation

Autumn Block 5

Revise & extend KS3 content:
- Convert between ordinary numbers & standard form
- Adjust a number to standard form

Summer Blocks
- Revision

KS3 National Curriculum

- Understand and use place value for decimals, measures and integers of any size
- Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols $=, \neq, <, >, \leq, \geq$
- Round numbers and measures to an appropriate degree of accuracy [for example, to a number of decimal places or significant figures]
- Use approximation through rounding to estimate answers and calculate possible resulting errors expressed using inequality notation $a < x \leq b$
- Interpret and compare numbers in standard form $A \times 10^n$ $1 \leq A < 10$, where n is a positive or negative integer or zero

KS4 National Curriculum

- Calculate with numbers in standard form $A \times 10^n$, where $1 \leq A < 10$ and n is an integer
- Apply and interpret limits of accuracy when rounding or truncating

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Number: Properties of number (Foundation)

Year 7

Summer Block 2

- Factors, multiples & primes
- Prime factorisation
- Square, cubes, triangular numbers & roots
- HCF & LCM
- Higher powers & roots (E)
- HCF & LCM from a Venn diagram (E)
- Use factors to simplify calculations (E)

Year 8

Spring Block 4

- Powers of powers (E)
- Negative & fractional indices (E)

Year 9

Autumn Block 1

Revisit & extend Y7 content:

- Factors, multiples & primes
- Prime factorisation
- HCF & LCM
- HCF & LCM from a Venn diagram
- Integers, real numbers and irrational numbers
- Use prime factors (E)

Year 10 Foundation

Summer Block 4

Revise & extend KS3 content:

- Factors, multiples & primes,
- Prime factorisation
- HCF & LCM
- Square & cube numbers
- Powers & roots
- Rational & irrational numbers
- Negative indices (E)

Year 11 Foundation

Autumn Block 7

Revise & extend KS3 content including multiples and factors when working with Venn diagrams.

Summer Blocks

- Revision

KS3 National Curriculum

- Use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation property
- Use integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5 and distinguish between exact representations of roots and their decimal approximations
- Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors
- Appreciate the infinite nature of the sets of integers, real and rational numbers
- Use and interpret algebraic notation, including: ab in place of $a \times b$; $3y$ in place of $y + y + y$ and $3 \times y$; a^2 in place of $a \times a$; a^3 in place of $a \times a \times a$; a^2b in place of $a \times a \times b$; $\frac{a}{b}$ in place of $a \div b$ coefficients written as fractions rather than decimals; brackets

KS4 National Curriculum

- Calculate with roots, and with integer indices
- Simplify and manipulate algebraic expressions (including those involving surds) by: simplifying expressions involving sums, products and powers, including the laws of indices

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Number: Calculations (Foundation)

Year 7

Autumn Block 5 & 7
- Use the four operations with integers & decimals
- Multiply & divide by powers of 10
- Order of operations
- Estimate answers to calculations

Spring Block 3
- Use the four operations with directed numbers
- Use a calculator

Year 8

Spring Block 5

Revisit & extend Y7 content:
- Standard form on a calculator

Year 9

Autumn Block 1
- Introduce surds (E)

Autumn Block 7

Revisit & extend Y8 content:
- Multiply & divide numbers in standard form
- Add & subtract numbers in standard form

Year 10 Foundation

Spring Block 1 & 4

Revise & extend KS3 content:
- Use the four operations with integers, decimals & directed numbers
- Order of operations
- Related calculations
- Solve multi-step problems
- Estimate answers
- Use a calculator

Summer Block 4
- Manipulate surds (E)

Year 11 Foundation

Autumn Block 5

Revise & extend KS3 content:
- Multiply & divide numbers in standard form (E)
- Add & subtract numbers in standard form (E)

Summer Blocks
- Revision

KS3 National Curriculum

- Understand and use place value for decimals, measures and integers of any size
- Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative
- Work interchangeably with terminating decimals and their corresponding fractions
- Interpret fractions and percentages as operators
- Use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals
- Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols $=, \neq, <, >, \leq, \geq$
- Interpret and compare numbers in standard form $A \times 10^n$ $1 \leq A < 10$, where n is a positive or negative integer or zero
- Use a calculator and other technologies to calculate results accurately and then interpret them appropriately
- Appreciate the infinite nature of the sets of integers, real and rational numbers

KS4 National Curriculum

- Calculate with roots, and with integer indices
- Simplify and manipulate algebraic expressions (including those involving surds) by: simplifying expressions involving sums, products and powers, including the laws of indices
- Calculate with numbers in standard form $A \times 10^n$, where $1 \leq A < 10$ and n is an integer

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Number: Understand fractions & fraction calculations (Foundation)

Year 7

Spring Block 2 & 4
- Represent fractions
- Interchange between fractions, decimals & percentages
- Equivalent fractions
- Compare & order fractions
- Find fractions of an amount

Summer Block 3
- Simplify fractions
- Add & subtract with fractions & mixed numbers

Year 8

Autumn Block 5
- Multiply with fractions & mixed numbers
- Understand reciprocals
- Divide with fractions & mixed numbers

Spring Block 3
- Express one number as a fraction of another

Year 9

Autumn Block 5

Revisit & extend Y7 & Y8 content:
- Add & subtract fractions & mixed numbers
- Multiply & divide fractions & mixed numbers
- Find fractions of an amount

Year 10 Foundation

Autumn Block 4 & 6

Revise & extend KS3 content:
- Express one number as a fraction of another
- Find fractions of an amount
- Increase or decrease an amount by a fraction
- Use the four operations with fractions & mixed numbers
- Solve problems with fractions & mixed numbers

Year 11 Foundation

Autumn Block 1

Revise & extend KS3 content including fractions when working with ratio & proportion.

Summer Blocks
- Revision

KS3 National Curriculum

- Work interchangeably with terminating decimals and their corresponding fractions
- Interpret fractions and percentages as operators
- Understand and use place value for decimals, measures and integers of any size
- Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols $=, \neq, <, >, \leq, \geq$
- Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction
- Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative
- Use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation property
- Express one quantity as a fraction of another, where the fraction is less than 1 and greater than 1

KS4 National Curriculum

- Identify and work with fractions in ratio problems

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Number: Percentages (Foundation)

Year 7

Spring Block 2 & 4
- Understand percentages
- Interchange between fractions, decimals & percentages
- FDP greater than 1 (E)
- Percentage of an amount (calculator & non-calculator)
- Percentage increase & decrease
- Find the original value (E)

Year 8

Spring Block 3

Revisit & extend Y7 content:
- Percentage of an amount, increase & decrease
- Use multipliers
- Express one number as a percentage of another
- Percentage change
- Find the original value given a percentage
- Solve problems

Year 9

Autumn Block 2

Revisit & extend Y8 content:
- Percentage increase & decrease
- Find the original value after a percentage change
- Solve problems
- Repeated percentage change
- Simple & compound interest

Spring Block 1
- Financial maths

Year 10 Foundation

Autumn Block 4

Revise & extend KS3 content:
- Calculate with percentages
- Repeated percentage change (E)
- Express one number as a percentage of another
- Percentage change
- Find the original value
- Simple interest
- Compound interest (E)
- Solve problems

Year 11 Foundation

Summer Blocks
- Revision

KS3 National Curriculum

- Define percentage as “number of parts per hundred”, interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express one quantity as a percentage of another, compare two quantities using percentages, and work with percentages greater than 100%
- Interpret fractions and percentages as operators
- Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols $=, \neq, <, >, \leq, \geq$
- Solve problems involving percentage change, including: percentage increase, decrease and original value problems and simple interest in financial mathematics
- Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative
- Use a calculator and other technologies to calculate results accurately and then interpret them appropriately

KS4 National Curriculum

- Set up, solve and interpret the answers in growth and decay problems, including compound interest

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Algebra: Understand notation and substitute (Foundation)

Year 7

Autumn Block 2 & 3
- 1-step function machines
- 2-step function machines
- Substitution
- Related facts

Spring Block 5
- Form expression with perimeter and area (E)

Summer Block 3
- Substitution and solving equations with fractions (E)

Year 8

Autumn Block 3

Revisit & extend Y7 content:
- Form algebraic expressions
- Substitution with directed number

Year 9

Autumn Block 4

Revisit & extend Y7/Y8 content:
- Substitute into formulae and equations

Summer Block 2
- Substitute into quadratic equations

Year 10 Foundation

Autumn Block 1

Revise & extend KS3 content:
- Substitution

Summer Block 6
- Solve simultaneous equations by substitution (E)

Year 11 Foundation

Spring Block 1

Revise & extend KS3 & Y10 content:
- Function machines
- Substitution

Summer Blocks
- Revision

KS3 National Curriculum

- Use and interpret algebraic notation, including: ab in place of $a \times b$; $3y$ in place of $y + y + y$ and $3 \times y$; a^2 in place of $a \times a$; a^3 in place of $a \times a \times a$; a^2b in place of $a \times a \times b$; $\frac{a}{b}$ in place of $a \div b$ coefficients written as fractions rather than decimals; brackets
- Recognise and use relationships between operations including inverse operations
- Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors
- Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs
- Substitute numerical values into formulae and expressions, including scientific formulae
- Use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement)
- Understand and use standard mathematical formulae; rearrange formulae to change the subject

KS4 National Curriculum

- Solve two simultaneous equations in two variables (linear/linear) algebraically; find approximate solutions using a graph
- Where appropriate, interpret simple expressions as functions with inputs and outputs

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Algebra: Equivalence and proof (Foundation)

Year 7

Autumn Block 3
- Equality & equivalence
- Related facts
- Collect like terms

Summer Block 3
- Add & subtract simple algebraic fractions (E)

Year 8

Autumn Block 3 & 5
Revisit & extend Y7 content:
- Formulae, expressions, identities & equations
- Simplify expressions
- Expand & factorise
- Expand double brackets (E)
- Factorise quadratics (E)
- Multiply & divide algebraic fractions (E)

Spring Block 4
- Work with indices

Year 9

Spring Block 6
Revisit & extend Y8 content:
- Expand single brackets & simplify
- Factorise into a single bracket
- Expand double brackets
- Use identities
- Factorise quadratic expressions
- Expand triple brackets (E)

Year 10 Foundation

Autumn Block 1 & 3
Revise & extend KS3 content:
- Collect like terms
- Simplify expressions
- Work with indices
- Powers of powers
- Expand & factorise
- Expand double brackets
- Factorise quadratic expressions
- Difference of two squares (E)

Year 11 Foundation

Autumn Block 4
Revise & extend KS3 & Y10 content:
- Represent numbers algebraically (E)
- Arguments & counterexamples (E)

Spring Block 2
- Solve equations

Summer Blocks
- Revision

KS3 National Curriculum

- Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors
- Use and interpret algebraic notation, including: ab in place of $a \times b$; $3y$ in place of $y + y + y$ and $3 \times y$; a^2 in place of $a \times a$; a^3 in place of $a \times a \times a$; a^2b in place of $a \times a \times b$; $\frac{a}{b}$ in place of $a \div b$ coefficients written as fractions rather than decimals; brackets
- Simplify and manipulate algebraic expressions to maintain equivalence by: collecting like terms; multiplying a single term over a brackets; taking out common factors; expanding products of two or more binomials
- Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative
- Understand and use standard mathematical formulae; rearrange formulae to change the subject

KS4 National Curriculum

- Simplify and manipulate algebraic expressions (including those involving surds) by: factorising quadratic expressions of the form $x^2 + bx + c$, including the difference of two squares; simplifying expressions involving sums, products and powers, including the laws of indices
- Solve quadratic equations algebraically by factorising; find approximate solutions using a graph
- Know the difference between an equation and an identity; argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments

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Algebra: Equations, inequalities and formulae (Foundation)

Year 7

Autumn Block 3
- Solve 1-step equations
- Solve 2-step equations

Year 8

Spring Block 2
Revisit & extend Y7 content:
- Solve 1-step & 2-step equations
- Solve more complex equations
- Understand inequalities
- Solve inequalities
- Form & solve equations & inequalities

Year 9

Autumn Block 4
Revisit & extend Y8 content:
- Solve equations & inequalities
- Change the subject of a formula

Spring Block 6
- Solve quadratic equations (E)

Summer Block 5
- Solve simultaneous equations

Year 10 Foundation

Autumn Block 2 & 3
Revise & extend KS3 content:
- Solve equations & inequalities, changing the subject of a formula
- Solve quadratic equations by factorisation

Summer Block 6
- Solve simultaneous equations

Year 11 Foundation

Spring Block 2
Revise & extend KS3 & Y10 content:
- Form and solve equations
- Solve inequalities
- Form and solve & inequalities (E)
- Solve problems with simultaneous equations

Summer Blocks
- Revision

KS3 National Curriculum

- Recognise and use relationships between operations including inverse operations
- Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors, Use and interpret algebraic notation
- Simplify and manipulate algebraic expressions to maintain equivalence by: collecting like terms, multiplying a single term over a bracket, taking out common factors, expanding products of two or more binomials
- Substitute numerical values into formulae and expressions, including scientific formulae
- Use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement)
- Understand and use standard mathematical formulae; rearrange formulae

KS4 National Curriculum

- Solve linear inequalities in one variable; represent the solution set on a number line
- Simplify and manipulate algebraic expressions (including those involving surds) by: factorising quadratic expressions of the form $x^2 + bx + c$, including the difference of two squares; simplifying expressions involving sums, products and powers, including the laws of indices
- Solve quadratic equations algebraically by factorising; find approximate solutions using a graph
- Solve two simultaneous equations in two variables (linear/linear) algebraically; find approximate solutions using a graph
- Translate simple situations or procedures into algebraic expressions or formulae; derive an equation (or two simultaneous equations), solve the equation(s) and interpret the solution

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White Rose MATHS

Algebra: Linear graphs (Foundation)

Year 7

Autumn Block 1
- Linear & non-linear sequences

Spring Block 1
- Coordinates in the first quadrant

Year 8

Autumn Block 4
- Coordinates in 4 quadrants
- Lines parallel to the axes
- Table of values
- Lines of the $y = mx$, $y = x + c$, $y = mx + c$
- Explore gradients
- Link $y = mx$ to direct proportion (E)
- Find the midpoint of a line segment (E)
- Solve problems (E)

Year 9

Spring Block 2

Revisit & extend Y8 content:
- Lines parallel to the axes, $y = x$ and $y = -x$
- Gradients & intercepts
- $y = mx + c$
- Rearrange equations to the form $y = mx + c$
- Find the equation of a line from a graph
- Real-life graphs
- Graph inequalities (E)

Year 10 Foundation

Spring Block 2

Revise & extend KS3 content:
- Draw straight line graphs
- Find solutions using graphs
- Explore gradients
- Find the equation of a line
  Find the midpoint of a line segment
- Real-life graphs (E)

Summer Block 6
- Solve simultaneous equations using graphs

Year 11 Foundation

Spring Block 1 & 6

Revise & extend KS3/Y10 content including lines parallel to the axes, $y = x$ and $y = -x$, when working with functions & graphs and transformations.

Summer Blocks
- Revision

KS3 National Curriculum

- Substitute numerical values into formulae and expressions, including scientific formulae
- Recognise, sketch and produce graphs of linear and quadratic functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane
- Interpret mathematical relationships both algebraically and graphically
- Work with coordinates in all four quadrants
- Reduce a given linear equation in two variables to the standard form $y = mx + c$; calculate and interpret gradients and intercepts of graphs of such linear equations numerically, graphically and algebraically
- Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs
- Solve problems involving direct and inverse proportion, including graphical and algebraic representations

KS4 National Curriculum

- Use the form $y = mx + c$ to identify parallel lines; find the equation of the line through two given points, or through one point with a given gradient
- Plot and interpret graphs (including reciprocal graphs) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration
- Recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$

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White Rose MATHS

Algebra: Non-linear graphs (Foundation)

Year 7

Autumn Block 1
- Linear & non-linear sequences

Spring Block 1
- Coordinates in the first quadrant

Year 8

Autumn Block 4
- Quadratic graphs (E)

Year 9

Summer Block 2
- Draw quadratic graphs
- Interpret quadratic graphs
- Reciprocal & exponential graphs
- Cubic graphs (E)
- Interpret roots, intercepts & turning points (E)

Year 10 Foundation

Autumn Block 3

Revise & extend KS3 content:
- Quadratic graphs of the form $y = x^2 + a$

Spring Block 7
- Quadratic graphs
- Intercepts & roots (E)
- Cubic graphs
- Approximate solutions (E)

Year 11 Foundation

Spring Block 1

Revise & extend KS3/Y10 content:
- Quadratic graphs
- Cubic graphs
- Reciprocal graphs
- Recognise & sketch graphs

Summer Blocks
- Revision

KS3 National Curriculum

- Substitute numerical values into formulae and expressions, including scientific formulae
- Work with coordinates in all four quadrants
- Interpret mathematical relationships both algebraically and graphically
- Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs
- Recognise, sketch and produce graphs of linear and quadratic functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane
- Use linear and quadratic graphs to estimate values of y for given values of x and vice versa and to find approximate solutions of simultaneous linear equations
- Find approximate solutions to contextual problems from given graphs of a variety of functions, including piece-wise linear, exponential and reciprocal graphs

KS4 National Curriculum

- Solve quadratic equations algebraically by factorising; find approximate solutions using a graph
- Identify and interpret roots, intercepts and turning points of quadratic functions graphically; deduce roots algebraically
- Recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$
- Plot and interpret graphs (including reciprocal graphs) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration

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White Rose MATHS

Algebra: Sequences (Foundation)

Year 7

Autumn Block 1
- Describe & continue sequences
- Find the next terms
- Linear & non-linear sequences
- Term-to-term rules
- Find missing terms (E)

Year 8

Summer Block 5
Revisit & extend Y7 content:
- Generate & describe sequences given a rule in words
- Generate & describe sequences given an algebraic rule
- nth term of a linear sequence

Year 9

Spring Block 2
Revisit & extend Y7/Y8 content including sequences in a table & graphically when working with straight line graphs.

Year 10 Foundation

Spring Block 2
Revise & extend KS3 content including sequences in a table & graphically when working with straight line graphs.

Year 11 Foundation

Autumn Block 4
Revise & extend KS3 content:
- Describe & continue arithmetic and geometric sequences
- Explore other sequences
- nth term of a linear sequence

Summer Blocks
- Revision

KS3 National Curriculum

- Generate terms of a sequence from either a term-to-term or a position-to-term rule
- Recognise arithmetic sequences
- Recognise geometric sequences and appreciate other sequences that arise
- Interpret mathematical relationships both algebraically and graphically
- Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs

KS4 National Curriculum

- Recognise and use sequences of triangular, square and cube numbers, simple arithmetic progressions, Fibonacci type sequences, quadratic sequences, and simple geometric progressions (r^n where n is an integer, and r is a positive rational number)
- Deduce expressions to calculate the nth term of linear sequences
- Know the difference between an equation and an identity; argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments

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White Rose MATHS

Ratio, proportion & rates of change : Multiplicative relationships (Foundation)

Year 7

Spring Block 5
- Convert metric units

Year 8

Autumn Block 2
- Direct proportion
- Conversion graphs
- Exchange rates
- Direct proportion graphs
- Similar shapes
- Convert metric units
- Scale diagrams
- Interpret maps using scale & ratio

Year 9

Spring Block 1, 3 & 5

Revisit & extend Y8 content:
- Best buys (budgeting)
- Direct & inverse proportion
- Inverse proportion graphs (E)
- Similar shapes
- Solve problems with similar triangles (E)
- Convert metric units of area & volume (E)
- Ratio in right-angled triangles (E)

Year 10 Foundation

Autumn Block 5

Revise & extend KS3 content:
- Ratio & scales

Summer Block 5
- Ratio in right-angled triangles

Year 11 Foundation

Autumn Block 1, 2 & 3

Revise & extend KS3 content:
- Direct & inverse proportion
- Proportion equations (E)
- Inverse proportion graphs (E)
- Convert metric units of area & volume (E)
- Similar shapes
- Prove a pair of triangles are similar (E)

Spring Block 4
- Scale drawings & bearings

KS3 National Curriculum

- Change freely between related standard units [for example, time, length, area, volume/capacity, mass
- Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction
- Solve problems involving direct and inverse proportion, including graphical and algebraic representations
- Use scale factors, scale diagrams and maps
- Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs
- Interpret mathematical relationships both algebraically and graphically
- Use standard units of mass, length, time, money and other measures, including with decimal quantities
- Use ratio notation, including reduction to simplest form
- Identify and construct congruent triangles, and construct similar shapes by enlargement, with and without coordinate grids
- Use a calculator and other technologies to calculate results accurately and then interpret them appropriately

KS4 National Curriculum

- Understand that X is inversely proportional to Y is equivalent to X is proportional to inverse proportion $\frac{1}{Y}$; interpret equations that describe direct and inverse proportion
- Interpret the gradient of a straight line graph as a rate of change; recognise and interpret graphs that illustrate direct and inverse proportion
- Apply the concepts of congruence and similarity, including the relationships between lengths, in similar figures
- Compare lengths, areas and volumes using ratio notation and/or scale factors; make links to similarity (including trigonometric ratios)

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White Rose MATHS

Ratio, proportion & rates of change : Ratio & rates (Foundation)

Year 7

Summer Block 1
- Convert between units of time
- Calculate speed, distance & time
- Solve problems with speed, distance & time
- Interpret & draw distance-time graphs
- Find speed from a distance-time graph

Year 8

Autumn Block 1
- Understand & use ratio notation
- Divide in a ratio
- Work out parts & wholes
- Use the form 1 : n
- Compare ratio & fractions

Spring Block 1
- Density, mass & volume
- Mass & capacity

Summer Block 3
- Pi as a ratio

Year 9

Autumn Block 6

Revisit & extend Y7/Y8 content:
- Speed, distance & time
- Distance-time graphs
- Flow problems & graphs
- Rates of change
- Convert compound units (E)

Spring Block 3
- Ratio problems
- Ratio with algebra (E)

Year 10 Foundation

Autumn Block 5

Revise & extend KS3 content:
- Equivalent ratios
- Divide in a ratio
- Ratio & fractions
- Combine ratios (E)
- Divide in a ratio algebraically (E)

Year 11 Foundation

Autumn Block 1

Revise & extend KS3/Y10 content:
- Solve problems with ratio

Spring Block 3
- Convert between units of time
- Speed, distance & time
- Distance-time graphs
- Density & pressure
- Convert compound units (E)

KS3 National Curriculum

- Use standard units of mass, length, time, money and other measures, including with decimal quantities; Change freely between related standard units [for example, time, length, area, volume/capacity, mass]
- Use compound units such as speed, unit pricing and density to solve problems
- Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs; Interpret mathematical relationships both algebraically and graphically
- Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction; Divide a given quantity into two parts in a given part : part or part : whole ratio; express the division of a quantity into two parts as a ratio
- Use compound units such as speed, unit pricing and density to solve problems
- Find approximate solutions to contextual problems from given graphs of a variety of functions, including piece-wise linear, exponential and reciprocal graphs
- Solve problems involving direct and inverse proportion, graphical and algebraic representations

KS4 National Curriculum

- Identify and work with fractions in ratio problems
- Understand that X is inversely proportional to Y is equivalent to X is proportional to inverse proportion $\frac{1}{Y}$; interpret equations that describe direct and inverse proportion
- Interpret the gradient of a straight line graph as a rate of change; recognise and interpret graphs that illustrate direct and inverse proportion
- Plot and interpret graphs (including reciprocal graphs) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration
- Convert between related compound units (speed, rates of pay, prices, density, pressure) in numerical and algebraic contexts

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White Rose MATHS

Geometry & measures: Perimeter, area & volume (Foundation)

Year 7

Spring Block 5

- Perimeter of a polygon & compound shapes
- Area of rectangles, parallelograms, triangles & trapezia
- Solve problems with perimeter and area
- Form expression with perimeter and area (E)

Year 8

Spring Block 1

Revisit & extend Y7 content:

- Area of 2-D shapes
- Area of a compound shape
- Volume of cubes & cuboids

Summer Block 3

- Circumference & area of a circle
- Perimeter & area of parts of circles
- Perimeter & area of compound shapes

Year 9

Autumn Block 3

Revisit & extend Y7/Y8 content:

- Area of 2-D shapes
- Circumference & area
- Surface area of cubes & cuboids
- Surface area of triangular prisms & cylinders (E)
- Volume of prisms & cylinders
- Volume of cones, pyramids and spheres (E)

Year 10 Foundation

Spring Block 5

Revise & extend KS3 content:

- Perimeter & area of 2-D shapes
- Area of compound shapes
- Circumference & area
- Volume of prisms
- Surface area of prisms

Year 11 Foundation

Autumn Block 2 & 6

Revise & extend Y10/KS3 content:

- Volume of cylinders, spheres, cones & pyramids
- Surface area of a sphere
- Surface area of cylinders, pyramids & cones (E)
- Circumference & area
- Area of a sector (E)
- Arc length (E)
- Solve problems with circles

KS3 National Curriculum

- Change freely between related standard units [for example, time, length, area, volume/capacity, mass]
- Use standard units of mass, length, time, money and other measures, including with decimal quantities
- Derive and apply formulae to calculate and solve problems involving: perimeter and area of triangles, parallelograms, trapezia, volume of cuboids (including cubes) and other prisms (including cylinders)
- Calculate and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes
- Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs
- Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors

KS4 National Curriculum

- Calculate surface areas and volumes of spheres, pyramids, cones and composite solids
- Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment
- Calculate arc lengths, angles and areas of sectors of circles

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White Rose MATHS

Geometry & measures: Construct & transform geometric figures (Foundation)

Year 7

Summer Block 4
- Draw & measure line segments & angles
- Understand & use geometric notation
- Parallel & perpendicular lines

Year 8

Autumn Block 6
- Line symmetry
- Rotational symmetry
- Reflect a shape in a line
- Reflect a shape given the equation of a line (E)
- Describe a reflection (E)

Summer Block 1
- Angle rules & notation

Year 9

Spring Block 4

Revisit & extend Y7 content:
- Accurately draw triangles & polygons
- Construct angle & perpendicular bisectors

Summer Block 4
- Enlargement
- Negative scale factors (E)
- Rotation, translations & reflections
- Describe transformations

Year 10 Foundation

Summer Block 1

Revise constructions when working with angles.

Year 11 Foundation

Autumn Block 2

Revise & extend KS3 content:
- Plans & elevations

Spring Block 5 & 6
- Accurately draw triangles
- Accurately draw polygons (E)
- Construct angle & perpendicular bisectors
- Loci
- Transformations

Summer Blocks
- Revision

KS3 National Curriculum

- Draw and measure line segments and angles in geometric figures, including interpreting scale drawings
- Use the standard conventions for labelling the sides and angles of triangle ABC, and know and use the criteria for congruence of triangles
- Derive and use the standard ruler and compass constructions (perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle); recognise and use the perpendicular distance from a point to a line as the shortest distance to the line
- Identify and construct congruent triangles, and construct similar shapes by enlargement, with and without coordinate grids
- Identify properties of, and describe the results of, translations, rotations and reflections applied to given figures
- Describe, sketch and draw using conventional terms and notations: points, lines, parallel lines, perpendicular lines, right angles, regular polygons, and other polygons that are reflectively and rotationally symmetric

KS4 National Curriculum

- Construct and interpret plans and elevations of 3D shapes
- Interpret and use fractional scale factors for enlargements
- Describe translations as 2D vectors

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White Rose MATHS

Geometry & measures: Shape properties (Foundation)

Year 7

Summer Block 4
- Recognise & name polygons

Year 8

Spring Block 1
Revisit & extend Y7 content:
- Name 2-D & 3-D shapes
- Recognise prisms

Summer Block 1 & 3
- Properties of quadrilaterals & their diagonals
- Circle vocabulary

Year 9

Autumn Block 3
Revisit & extend Y7/Y8 content:
- Nets

Summer Block 4
Revisit shape names and properties in the context of enlargement.

Year 10 Foundation

Spring Block 5
Revise & extend KS3 content:
- Name 2-D & 3-D shapes
- Recognise & label parts of a circle
- Nets

Summer Block 1 & 5
Revise shape names and properties in the context of angles & Pythagoras' theorem & trigonometry.

Year 11 Foundation

Autumn Block 2
Revise & extend Y10/KS3 content:
- Isometric drawings

Autumn Block 1
Revise & extend KS3 content including shape properties when working with angles, bearings & trigonometry.

Summer Blocks
- Revision

KS3 National Curriculum

- Describe, sketch and draw using conventional terms and notations: points, lines, parallel lines, perpendicular lines, right angles, regular polygons, and other polygons that are reflectively and rotationally symmetric
- Derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures [for example, equal lengths and angles] using appropriate language and technologies
- Use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, pyramids, cones and spheres to solve problems in 3-D

KS4 National Curriculum

- Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment

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White Rose MATHS

Geometry & measures: Angles (Foundation)

Year 7

Summer Block 4

- Angles around a point, straight line & vertically opposite
- Angles in a triangle
- Angles in a quadrilateral
- Solve problems with angles
- Investigate angles in parallel lines (E)
- Angles in any polygon (E)

Year 8

Summer Block 1

Revisit & extend Y7 content:

- Angle rules & notation
- Angles in parallel lines
- Find unknown lengths & angles in special quadrilaterals
- Exterior & interior angles of a polygon

Year 9

Spring Block 4

Revisit & extend Y7/Y8 content:

- Draw & measure angles
- Accurately draw polygons

Year 10 Foundation

Summer Block 1

Revise & extend KS3 content:

- Angles around a point, straight line & vertically opposite
- Angles in a triangle & quadrilateral
- Exterior & interior angles of a polygon
- Solve problems with angles in polygons (E)
- Angles in parallel lines

Year 11 Foundation

Spring Block 4

Revise & extend Y10/KS3 content:

- Angles in lines & shapes
- Solve problems with angles in parallel lines
- Angles & algebra (E)
- Bearings
- Scale drawings & bearings
- Use geometrical equipment

Summer Blocks

- Revision

KS3 National Curriculum

- Apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles
- Derive and use the sum of angles in a triangle and use it to deduce the angle sum in any polygon, and to derive properties of regular polygons
- Derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures [for example, equal lengths and angles] using appropriate language and technologies
- Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides, including Pythagoras' theorem, and use known results to obtain simple proofs
- Use the standard conventions for labelling the sides and angles of triangle ABC, and know and use the criteria for congruence of triangles
- Understand and use the relationship between parallel lines and alternate and corresponding angles
- Draw and measure line segments and angles in geometric figures, including interpreting scale drawings

KS4 National Curriculum

- Interpret and use bearings

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White Rose MATHS

Geometry & measures: Pythagoras and trigonometry (Foundation)

Year 7

Year 8

Year 9

Spring Block 5
- Ratio in right-angled triangles (E)

Summer Block 1 & 6
- Identify the hypotenuse
- Determine whether a triangle is right-angled
- Pythagoras' theorem
- Use trigonometric ratios
- Pythagoras & trigonometry in 3-D shapes (E)

Year 10 Foundation

Summer Block 5

Revise & extend KS3 content:
- Pythagoras' theorem
- Ratios in right-angled triangles
- Use trigonometric ratios
- Exact trigonometric values (E)

Year 11 Foundation

Spring Block 4

Revise & extend Y10 content:
- Solve problems with right-angled triangles
- Solve problems with bearings using Pythagoras & trigonometry (E)

Summer Blocks
- Revision

KS3 National Curriculum

- Use Pythagoras' Theorem and trigonometric ratios in similar triangles to solve problems involving right-angled triangles
- Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides, including Pythagoras' theorem, and use known results to obtain simple proofs
- Use integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5 and distinguish between exact representations of roots and their decimal approximations
- Use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement)

KS4 National Curriculum

- Apply Pythagoras' theorem and trigonometric ratios to find angles and lengths in right-angled triangles in two dimensional figures
- Know the exact values of sin θ and cos θ for θ = 0°, 30°, 45°, 60° and 90°; know the exact values for tan θ for $\theta = 0°, 30°, 45°, 60°$
- Interpret and use bearings

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Geometry & measures: Geometric proof (Foundation)

Year 7

Summer Block 4
- Simple angle proofs (E)

Year 8

Summer Block 1
Revisit & extend Y7 content:
- Prove simple geometric facts (E)

Year 9

Spring Block 4
- Identify congruent figures
- Congruent triangles

Summer Block 1
- Determine whether a triangle is right-angled
- Proof of Pythagoras' theorem (E)

Year 10 Foundation

Summer Block 1 & 3
Revise & extend KS3 content:
- Prove geometric facts (E)
- Understand & represent vectors
- Add & subtract vectors
- Solve problems with vectors (E)

Year 11 Foundation

Autumn Block 3
Revise & extend Y10/KS3 content:
- Similarity & congruence
- Congruent triangles
- Prove a pair of triangles are congruent (E)

Summer Blocks
- Revision

KS3 National Curriculum

- Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides, including Pythagoras' theorem, and use known results to obtain simple proofs
- Use the standard conventions for labelling the sides and angles of triangle ABC, and know and use the criteria for congruence of triangles
- Identify and construct congruent triangles, and construct similar shapes by enlargement, with and without coordinate grids
- Use Pythagoras' theorem and trigonometric ratios in similar triangles to solve problems involving right-angled triangles
- Interpret mathematical relationships both algebraically and geometrically

KS4 National Curriculum

- Describe translations as 2D vectors
- Apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representations of vectors
- Apply the concepts of congruence and similarity, including the relationships between lengths, in similar figures
- Compare lengths, areas and volumes using ratio notation and/or scale factors; make links to similarity (including trigonometric ratios)

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White Rose MATHS

Probability (Foundation)

Year 7

Year 8

Summer Block 2

- Probability vocabulary
- Probability scale
- Probability of a single event
- Use the property that probabilities sum to 1
- Probability experiments
- Probabilities from sample spaces, two-way tables & frequency trees

Year 9

Summer Block 3

Revisit & extend Y8 content:

- Identify & represent sets
- Intersection & union of sets
- Complement of a set (E)
- Probability of a single event
- Probabilities from diagrams
- Relative frequency
- Expected outcomes
- Independent events
- Probabilities from Venn diagrams

Year 10 Foundation

Spring Block 3

Revise & extend KS3 content:

- Probability of a single event
- Use the property that probabilities sum to 1
- List outcomes
- Relative frequency
- Probabilities from diagrams
- Tree diagrams for independent events
- Tree diagrams for dependent events (E)

Year 11 Foundation

Autumn Block 7

Revise & extend Y10/KS3 content:

- Venn diagrams
- Set notation
- Probabilities from Venn diagrams

Summer Blocks

- Revision

KS3 National Curriculum

- Record, describe and analyse the frequency of outcomes of simple probability experiments involving randomness, fairness, equally and unequally likely outcomes, using appropriate language and the 0–1 probability scale
- Understand that the probabilities of all possible outcomes sum to 1
- Generate theoretical sample spaces for single and combined events with equally likely, mutually exclusive outcomes and use these to calculate theoretical probabilities
- Construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data
- Enumerate sets and unions/intersections of sets systematically, using tables, grids and Venn diagrams

KS4 National Curriculum

- Apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to one
- Apply systematic listing strategies
- Use a probability model to predict the outcomes of future experiments; understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size
- Calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions

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White Rose MATHS

Statistics: Represent & interpret data (Foundation)

Year 7

Spring Block 1
- Pictograms
- Bar charts
- Dual bar charts
- Composite bar charts
- Time series graphs
- Non-linear relationships

Year 8

Spring Block 6
Revisit & extend Y7 content:
- Types of data
- Grouped & continuous data

Summer Block 2 & 4
- Two-way tables
- Frequency trees
- Pictograms & bar charts
- Vertical line charts
- Pie charts
- Line graphs
- Misleading graphs

Year 9

Summer Block 3
Revisit representing & interpreting data in tables when working with sets and probability.

Year 10 Foundation

Spring Block 6
Revise & extend KS3 content:
- Types of data
- Sampling

Summer Block 2
- Pictograms, bar charts and line charts
- Pie charts
- Time series graphs
- Frequency polygons
- Stem-and-leaf diagrams

Year 11 Foundation

Autumn Block 7
Revise & extend KS3 content including diagrams when working with sets and Venn diagrams.

Summer Blocks
- Revision

KS3 National Curriculum

- Construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data
- Work with coordinates in all four quadrants
- Interpret mathematical relationships both algebraically and graphically
- Describe, interpret and compare observed distributions of a single variable through: appropriate graphical representation involving discrete, continuous and grouped data; and appropriate measures of central tendency (mean, mode, median) and spread (range, consideration of outliers)

KS4 National Curriculum

- Infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling
- Apply statistics to describe a population
- Interpret and construct tables and line graphs for time series data
- Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: appropriate graphical representation involving discrete, continuous and grouped data

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Statistics: Statistical measures (Foundation)

Year 7

Autumn Block 6

- Mode
- Mean
- Median
- Range
- Solve problems with averages & range

Year 8

Spring Block 6

Revisit & extend Y7 content:

- Averages & range
- Outliers & errors
- Choose the most appropriate average
- Compare distributions using average & range
- Averages from an ungrouped frequency table
- Mean & mode from a grouped frequency table (E)

Year 9

Year 10 Foundation

Spring Block 6

Revise & extend KS3 content:

- Averages & range
- Averages from an ungrouped frequency table
- Mean from a grouped frequency table
- Averages from a grouped frequency table
- Use data to compare distributions (E)

Year 11 Foundation

Summer Blocks

- Revision

KS3 National Curriculum

- Describe, interpret and compare observed distributions of a single variable through: appropriate graphical representation involving discrete, continuous and grouped data; and appropriate measures of central tendency (mean, mode, median) and spread (range, consideration of outliers)
- Construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data

KS4 National Curriculum

- Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: appropriate graphical representation involving discrete, continuous and grouped data, appropriate measures of central tendency (including modal class) and spread

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White Rose MATHS

Statistics: Bivariate data (Foundation)

Year 7

Spring Block 1
- Scatter graphs
- Correlation
- Lines of best fit

Year 8

Spring Block 6
Revisit representing scatter graphs when exploring outliers.

Year 9

Year 10 Foundation

Spring Block 6
Revise & extend Y7 content:
- Scatter graphs
- Interpolation & extrapolation (E)

Year 11 Foundation

Summer Blocks
- Revision

KS3 National Curriculum

- Work with coordinates in all four quadrants
- Describe simple mathematical relationships between two variables (bivariate data) in observational and experimental contexts and illustrate using scatter graphs

KS4 National Curriculum

- Use and interpret scatter graphs of bivariate data; recognise correlation and know that it does not indicate causation; draw estimated lines of best fit; make predictions; interpolate and extrapolate apparent trends whilst knowing the dangers of so doing

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Topic progression
Higher

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Number: Place value and rounding (Higher)

Year 7

Autumn Block 4 & 7
- Understand & use place value
- Compare & order numbers
- Round to powers of 10, integers, decimal places & significant figures
- Standard form (E)
- Error intervals (E)

Spring Block 3
- Compare & order directed numbers

Year 8

Spring Block 5
- Positive & negative powers of 10
- Convert between ordinary numbers & standard form

Year 9

Autumn Block 7

Revisit & extend Y8 content:
- Convert between ordinary numbers & standard form
- Compare & order numbers in standard form

Year 10 Higher

Spring Block 1 & 4

Revise & extend KS3 content:
- Place value
- Rounding
- Error intervals
- Upper and lower bounds

Year 11 Higher

Autumn Block 5

Revise & extend KS3 content:
- Convert between ordinary numbers & standard form

Summer Blocks
- Revision

KS3 National Curriculum

- Understand and use place value for decimals, measures and integers of any size
- Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols $=, \neq, <, >, \leq, \geq$
- Round numbers and measures to an appropriate degree of accuracy [for example, to a number of decimal places or significant figures]
- Use approximation through rounding to estimate answers and calculate possible resulting errors expressed using inequality notation $a < x \leq b$
- Interpret and compare numbers in standard form $A \times 10^n$ $1 \leq A < 10$, where n is a positive or negative integer or zero

KS4 National Curriculum

- Calculate with numbers in standard form $A \times 10^n$, where $1 \leq A < 10$ and n is an integer
- Apply and interpret limits of accuracy when rounding or truncating {including upper and lower bounds}

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White Rose MATHS

Number: Properties of number (Higher)

Year 7

Summer Block 2

- Factors, multiples & primes
- Prime factorisation
- Square, cubes, triangular numbers & roots
- HCF & LCM
- Higher powers & roots (E)
- HCF & LCM from a Venn diagram (E)
- Use factors to simplify calculations (E)

Year 8

Spring Block 4

- Powers of powers (E)
- Negative & fractional indices (E)

Year 9

Autumn Block 1

Revisit & extend Y7 content:

- Factors, multiples & primes
- Prime factorisation
- HCF & LCM
- HCF & LCM from a Venn diagram
- Integers, real numbers and irrational numbers
- Use prime factors (E)

Year 10 Higher

Summer Block 4

Revise & extend KS3 content:

- Factors, multiples & primes,
- Prime factorisation
- HCF & LCM
- Powers & roots
- Rational & irrational numbers
- Negative indices
- Fractional indices

Year 11 Higher

Autumn Block 7

Revise & extend KS3 content including multiples and factors when working with Venn diagrams.

Summer Blocks

- Revision

KS3 National Curriculum

- Use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation property
- Use integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5 and distinguish between exact representations of roots and their decimal approximations
- Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors
- Appreciate the infinite nature of the sets of integers, real and rational numbers
- Use and interpret algebraic notation, including: ab in place of $a \times b$; $3y$ in place of $y + y + y$ and $3 \times y$; a^2 in place of $a \times a$; a^3 in place of $a \times a \times a$; a^2b in place of $a \times a \times b$; $\frac{a}{b}$ in place of $a \div b$ coefficients written as fractions rather than decimals; brackets

KS4 National Curriculum

- Calculate with roots, and with integer {and fractional} indices
- {Estimate powers and roots of any given positive number}
- Simplify and manipulate algebraic expressions (including those involving surds) {and algebraic fractions} by: simplifying expressions involving sums, products and powers, including the laws of indices

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Number: Calculations (Higher)

Year 7

Autumn Block 5 & 7
- Use the four operations with integers & decimals
- Multiply & divide by powers of 10
- Order of operations
- Estimate answers to calculations

Spring Block 3
- Use the four operations with directed numbers
- Use a calculator

Year 8

Spring Block 5

Revisit & extend Y7 content:
- Standard form on a calculator

Year 9

Autumn Block 1
- Introduce surds (E)

Autumn Block 7

Revisit & extend Y8 content:
- Multiply & divide numbers in standard form
- Add & subtract numbers in standard form

Year 10 Higher

Spring Block 1 & 4

Revise & extend KS3 content:
- Use the four operations
- Order of operations
- Related calculations
- Solve multi-step problems
- Estimate answers
- Use a calculator

Summer Block 4
- Manipulate & calculate with surds

Year 11 Higher

Autumn Block 5

Revise & extend KS3 content:
- Use the four operations with numbers in standard form
- Solve problems with standard from

Summer Blocks
- Revision

KS3 National Curriculum

- Understand and use place value for decimals, measures and integers of any size
- Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative
- Work interchangeably with terminating decimals and their corresponding fractions
- Interpret fractions and percentages as operators
- Use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals
- Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols $=, \neq, <, >, \leq, \geq$
- Interpret and compare numbers in standard form $A \times 10^n$ $1 \leq A < 10$, where n is a positive or negative integer or zero
- Use a calculator and other technologies to calculate results accurately and then interpret them appropriately
- Appreciate the infinite nature of the sets of integers, real and rational numbers

KS4 National Curriculum

- Calculate with roots, and with integer {and fractional} indices
- Simplify and manipulate algebraic expressions (including those involving surds) {and algebraic fractions} by: simplifying expressions involving sums, products and powers, including the laws of indices
- Calculate with numbers in standard form $A \times 10^n$, where $1 \leq A < 10$ and n is an integer
- Calculate exactly with fractions, {surds} and multiples of π; {simplify surd expressions involving squares [for example $\sqrt{12} = \sqrt{4 \times 3} = \sqrt{4} \times \sqrt{3} = 2\sqrt{3}$] and rationalise denominators}

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White Rose MATHS

Number: Understand fractions & fraction calculations (Higher)

Year 7

Spring Block 2 & 4
- Represent fractions
- Interchange between fractions, decimals & percentages
- Equivalent fractions
- Compare & order fractions
- Find fractions of an amount

Summer Block 3
- Simplify fractions
- Add & subtract with fractions & mixed numbers

Year 8

Autumn Block 5
- Multiply with fractions & mixed numbers
- Understand reciprocals
- Divide with fractions & mixed numbers

Spring Block 3
- Express one number as a fraction of another

Year 9

Autumn Block 7

Revisit & extend Y7 & Y8 content:
- Add & subtract fractions & mixed numbers
- Multiply & divide fractions & mixed numbers
- Find fractions of an amount

Year 10 Higher

Autumn Block 4 & 6

Revise & extend KS3 content:
- Express one number as a fraction of another
- Use the four operations with fractions & mixed numbers
- Solve problems with fractions & mixed numbers

Spring Block 1
- Convert recurring decimals to fractions

Year 11 Higher

Autumn Block 1

Revise & extend KS3 content including fractions when working with ratio & proportion.

Summer Blocks
- Revision

KS3 National Curriculum

- Work interchangeably with terminating decimals and their corresponding fractions
- Interpret fractions and percentages as operators
- Understand and use place value for decimals, measures and integers of any size
- Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols $=, \neq, <, >, \leq, \geq$
- Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction
- Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative
- Use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation property
- Express one quantity as a fraction of another, where the fraction is less than 1 and greater than 1

KS4 National Curriculum

- {Change recurring decimals into their corresponding fractions and vice versa}
- Identify and work with fractions in ratio problems

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White Rose MATHS

Number: Percentages (Higher)

Year 7

Spring Block 2 & 4
- Understand percentages
- Interchange between fractions, decimals & percentages
- FDP greater than 1 (E)
- Percentage of an amount (calculator & non-calculator)
- Percentage increase & decrease
- Find the original value (E)

Year 8

Spring Block 3

Revisit & extend Y7 content:
- Percentage of an amount, increase & decrease
- Use multipliers
- Express one number as a percentage of another
- Percentage change
- Find the original value given a percentage
- Solve problems

Year 9

Autumn Block 2

Revisit & extend Y8 content:
- Percentage increase & decrease
- Find the original value after a percentage change
- Solve problems
- Repeated percentage change
- Simple & compound interest

Spring Block 1
- Financial maths

Year 10 Higher

Autumn Block 4

Revise & extend KS3 content:
- Calculate with percentages
- Repeated percentage change
- Express one number as a percentage of another
- Percentage change
- Find the original value
- Simple interest
- Compound interest
- Solve problems

Year 11 Higher

Summer Blocks
- Revision

KS3 National Curriculum

- Define percentage as “number of parts per hundred”, interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express one quantity as a percentage of another, compare two quantities using percentages, and work with percentages greater than 100%
- Interpret fractions and percentages as operators
- Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols $=, \neq, <, >, \leq, \geq$
- Solve problems involving percentage change, including: percentage increase, decrease and original value problems and simple interest in financial mathematics
- Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative
- Use a calculator and other technologies to calculate results accurately and then interpret them appropriately

KS4 National Curriculum

- Set up, solve and interpret the answers in growth and decay problems, including compound interest {and work with general iterative processes}

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White Rose MATHS

Algebra: Understand notation and substitute (Higher)

Year 7

Autumn Block 2 & 3
- 1-step function machines
- 2-step function machines
- Substitution
- Related facts

Spring Block 5
- Form expression with perimeter and area (E)

Summer Block 3
- Substitution and solving equations with fractions (E)

Year 8

Autumn Block 3

Revisit & extend Y7 content:
- Form algebraic expressions
- Substitution with directed number

Year 9

Autumn Block 4

Revisit & extend Y7/Y8 content:
- Substitute intro formulae and equations

Summer Block 2
- Substitute into quadratic equations

Year 10 Higher

Summer Block 6

Revise & extend KS3 content:
- Solve simultaneous equations by substitution

Year 11 Higher

Spring Block 1

Revise & extend KS3 & Y10 content:
- Function notation
- Composite functions
- Inverse functions

Summer Blocks
- Revision

KS3 National Curriculum

- Use and interpret algebraic notation, including: ab in place of $a \times b$; $3y$ in place of $y + y + y$ and $3 \times y$; a^2 in place of $a \times a$; a^3 in place of $a \times a \times a$; a^2b in place of $a \times a \times b$; $\frac{a}{b}$ in place of $a \div b$ coefficients written as fractions rather than decimals; brackets
- Recognise and use relationships between operations including inverse operations
- Understand and use the concepts and vocabulary of expressions, equations, inequalities , terms and factors
- Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs
- Substitute numerical values into formulae and expressions, including scientific formulae
- Use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement)
- Understand and use standard mathematical formulae; rearrange formulae to change the subject

KS4 National Curriculum

- Solve two simultaneous equations in two variables (linear/linear {or linear/quadratic}) algebraically; find approximate solutions using a graph
- Where appropriate, interpret simple expressions as functions with inputs and outputs; {interpret the reverse process as the 'inverse function'; interpret the succession of two functions as a 'composite function'}

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Algebra: Equivalence and proof (Higher)

Year 7

Autumn Block 3
- Equality & equivalence
- Related facts
- Collect like terms

Summer Block 3
- Add & subtract simple algebraic fractions (E)

Year 8

Autumn Block 3 & 5
Revisit & extend Y7 content:
- Formulae, expressions, identities & equations
- Simplify expressions
- Expand & factorise
- Expand double brackets (E)
- Factorise quadratics (E)
- Multiply & divide algebraic fractions (E)

Spring Block 4
- Work with indices

Year 9

Spring Block 6
Revisit & extend Y8 content:
- Expand single brackets & simplify
- Factorise into a single bracket
- Expand double brackets
- Use identities
- Factorise quadratic expressions
- Expand triple brackets (E)

Year 10 Higher

Autumn Block 1 & 3
Revise & extend KS3 content:
- Simplify expressions
- Work with indices
- Expand & factorise
- Difference of two squares
- Complete the square

Autumn Block 6
- Four operations with algebraic fractions
- Simplify algebraic fractions

Year 11 Higher

Autumn Block 4
Revise & extend KS3 & Y10 content:
- Represent numbers algebraically
- Algebraic arguments & proof

Spring Block 2
- Solve equations

Summer Blocks
- Revision

KS3 National Curriculum

- Understand and use the concepts and vocabulary of expressions, equations, inequalities , terms and factors
- Use and interpret algebraic notation, including: ab in place of $a \times b$; $3y$ in place of $y + y + y$ and $3 \times y$; a^2 in place of $a \times a$; a^3 in place of $a \times a \times a$; a^2b in place of $a \times a \times b$; $\frac{a}{b}$ in place of $a \div b$ coefficients written as fractions rather than decimals; brackets
- Simplify and manipulate algebraic expressions to maintain equivalence by: collecting like terms; multiplying a single term over a brackets; taking out common factors; expanding products of two or more binomials
- Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative
- Understand and use standard mathematical formulae; rearrange formulae

KS4 National Curriculum

- Simplify and manipulate algebraic expressions (including those involving surds {and algebraic fractions}) by: factorising quadratic expressions of the form $x^2 + bx + c$, including the difference of two squares; {factorising quadratic expressions of the form $ax^2 + bx + c$}; simplifying expressions involving sums, products and powers, including the laws of indices
- Solve quadratic equations {including those that require rearrangement} algebraically by factorising, {by completing the square and by using the quadratic formula}; find approximate solutions using a graph
- Know the difference between an equation and an identity; argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments {and proofs}

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Algebra: Equations, inequalities and formulae (Higher)

Year 7

Autumn Block 3
- Solve 1-step equations
- Solve 2-step equations

Year 8

Spring Block 2
Revisit & extend Y7 content:
- Solve 1-step & 2-step equations
- Solve more complex equations
- Understand inequalities
- Solve inequalities
- Form & solve equations & inequalities

Year 9

Autumn Block 4
Revisit & extend Y8 content:
- Solve equations & inequalities
- Change the subject of a formula

Spring Block 6
- Solve quadratic equations (E)

Summer Block 5
- Solve simultaneous equations

Year 10 Higher

Autumn Block 2 & 3
Revise & extend KS3 content:
- Solve equations & inequalities, changing the subject of a formula
- Solve quadratic equations

Autumn Block 6
- Solve equations with algebraic fractions (E)

Summer Block 6
- Solve simultaneous equations

Year 11 Higher

Spring Block 2
Revise & extend KS3 & Y10 content:
- Form and solve equations & inequalities
- Solve quadratic equations
- Iteration
- Solve simultaneous equations

Summer Blocks
- Revision

KS3 National Curriculum

- Recognise and use relationships between operations including inverse operations
- Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors, Use and interpret algebraic notation
- Simplify and manipulate algebraic expressions to maintain equivalence by: collecting like terms, multiplying a single term over a bracket, taking out common factors, expanding products of two or more binomials
- Substitute numerical values into formulae and expressions, including scientific formulae
- Use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement)
- Understand and use standard mathematical formulae; rearrange formulae

KS4 National Curriculum

- Solve linear inequalities in one {or two} variable{s}, {and quadratic inequalities in one variable}; represent the solution set on a number line, {using set notation and on a graph}
- Simplify and manipulate algebraic expressions (including those involving surds {and algebraic fractions}) by: factorising quadratic expressions of the form $x^2 + bx + c$, including the difference of two squares; {factorising quadratic expressions of the form $ax^2 + bx + c$}, simplifying expressions involving sums, products and powers, including the laws of indices
- Solve quadratic equations {including those that require rearrangement} algebraically by factorising, {by completing the square and by using the quadratic formula}; find approximate solutions using a graph
- Solve two simultaneous equations in two variables (linear/linear {or linear/quadratic}) algebraically; find approximate solutions using a graph

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Algebra: Linear graphs (Higher)

Year 7

Autumn Block 1
- Linear & non-linear sequences

Spring Block 1
- Coordinates in the first quadrant

Year 8

Autumn Block 4
- Coordinates in 4 quadrants
- Lines parallel to the axes
- Table of values
- Lines of the $y = mx$, $y = x + c$, $y = mx + c$
- Explore gradients
- Link $y = mx$ to direct proportion (E)
- Find the midpoint of a line segment (E)
- Solve problems (E)

Year 9

Spring Block 2

Revisit & extend Y8 content:
- Lines parallel to the axes, $y = x$ and $y = -x$
- Gradients & intercepts
- $y = mx + c$
- Rearrange equations to the form $y = mc + c$
- Find the equation of a line from a graph
- Real-life graphs
- Graph inequalities (E)

Year 10 Higher

Spring Block 2

Revise & extend KS3 content:
- Draw straight line graphs
- Find the equation of a line
- Represent solutions to inequalities on a graph
- Midpoint of a line segment
- Perpendicular lines (E)
- Real-life graphs

Summer Block 6

Solve simultaneous equations using graphs

Year 11 Higher

Spring Block 1 & 6

Revise & extend KS3/Y10 content including lines parallel to the axes, $y = x$ and $y = -x$, when working with functions & graphs and transformations.

Summer Blocks
- Revision

KS3 National Curriculum

- Substitute numerical values into formulae and expressions, including scientific formulae
- Recognise, sketch and produce graphs of linear and quadratic functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane
- Interpret mathematical relationships both algebraically and graphically
- Work with coordinates in all four quadrants
- Reduce a given linear equation in two variables to the standard form $y = mx + c$; calculate and interpret gradients and intercepts of graphs of such linear equations numerically, graphically and algebraically
- Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs; Solve problems involving direct and inverse proportion, including graphical and algebraic representations

KS4 National Curriculum

- Use the form $y = mx + c$ to identify parallel {and perpendicular} lines; find the equation of the line through two given points, or through one point with a given gradient
- Plot and interpret graphs (including reciprocal graphs {and exponential graphs}) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration
- Recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$

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White Rose MATHS

Algebra: Non-linear graphs (Higher)

Year 7

Autumn Block 1
- Linear & non-linear sequences

Spring Block 1
- Coordinates in the first quadrant

Year 8

Autumn Block 4
- Quadratic graphs (E)

Year 9

Summer Block 2
- Draw quadratic graphs
- Interpret quadratic graphs
- Reciprocal & exponential graphs
- Cubic graphs (E)
- Interpret roots, intercepts & turning points (E)

Year 10 Higher

Spring Block 7

Revise & extend KS3 content:
- Quadratic & cubic graphs
- Roots & turning points
- Approximate solutions
- Gradient of a curve
- Area under a curve (E)
- Equation of a circle/tangent

Summer Block 6

Solve simultaneous equations using graphs

Year 11 Higher

Spring Block 1

Revise & extend KS3/Y10 content:
- Quadratic graphs
- Cubic graphs
- Reciprocal graphs
- Exponential graphs
- Recognise & sketch graphs
- Trigonometric graphs (E)
- Transformations of graphs (E)

KS3 National Curriculum

See foundation KS3 National Curriculum links (page 204)

KS4 National Curriculum

- Solve quadratic equations algebraically by factorising; find approximate solutions using a graph
- {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 numerical, algebraic and graphical contexts}
- {Calculate or estimate gradients of graphs and areas under graphs (including quadratic and other non-linear graphs), and interpret results in cases such as distance–time graphs, velocity–time graphs and graphs in financial contexts}
- {Recognise and use the equation of a circle with centre at the origin; find the equation of a tangent to a circle at a given point}
- Identify and interpret roots, intercepts and turning points of quadratic functions graphically; deduce roots algebraically {and turning points by completing the square}
- Recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$ {the exponential function $y = k^x$ for positive values of k, and the trigonometric functions (with arguments in degrees) $y = sin\, x$, $y = cos\, x$ and $y = tan\, x$ for angles of any size}
- Plot and interpret graphs (including reciprocal graphs {and exponential graphs}) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration
- {Sketch translations and reflections of the graph of a given function}

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White Rose MATHS

Algebra: Sequences (Higher)

Year 7

Autumn Block 1

- Describe & continue sequences
- Find the next terms
- Linear & non-linear sequences
- Term-to-term rules
- Find missing terms (E)

Year 8

Summer Block 5

Revisit & extend Y7 content:

- Generate & describe sequences given a rule in words
- Generate & describe sequences given an algebraic rule
- nth term of a linear sequence

Year 9

Spring Block 2

Revisit & extend Y7/Y8 content including sequences in a table & graphically when working with straight line graphs.

Year 10 Higher

Spring Block 2

Revise & extend KS3 content including sequences in a table & graphically when working with straight line graphs.

Year 11 Higher

Autumn Block 4

Revise & extend KS3 content:

- Describe, continue & generate sequences
- Explore sequences with algebraic terms
- Describe & continue sequences with surds (E)
- nth term of a linear sequence
- nth term of a quadratic sequence (E)

KS3 National Curriculum

- Generate terms of a sequence from either a term-to-term or a position-to-term rule
- Recognise arithmetic sequences
- Recognise geometric sequences and appreciate other sequences that arise
- Interpret mathematical relationships both algebraically and graphically
- Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs

KS4 National Curriculum

- Recognise and use sequences of triangular, square and cube numbers, simple arithmetic progressions, Fibonacci type sequences, quadratic sequences, and simple geometric progressions (r^n where n is an integer, and r is a positive rational number{or a surd}) {and other sequences}
- Deduce expressions to calculate the nth term of linear {and quadratic} sequences
- Know the difference between an equation and an identity; argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments {and proofs}

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White Rose MATHS

Ratio, proportion & rates of change : Multiplicative relationships (Higher)

Year 7

Spring Block 5
- Convert metric units

Year 8

Autumn Block 2
- Direct proportion
- Conversion graphs
- Exchange rates
- Direct proportion graphs
- Similar shapes
- Convert metric units
- Scale diagrams
- Interpret maps using scale & ratio

Year 9

Spring Block 1, 3 & 5

Revisit & extend Y8 content:
- Best buys (budgeting)
- Direct & inverse proportion
- Inverse proportion graphs (E)
- Similar shapes
- Solve problems with similar triangles (E)
- Convert metric units of area & volume (E)
- Ratio in right-angled triangles (E)

Year 10 Higher

Autumn Block 5

Revise & extend KS3 content:
- Ratio & scales

Year 11 Higher

Autumn Block 1, 2 & 3

Revise & extend KS3 content:
- Direct proportion equations
- Inverse proportion & graphs
- Convert metric units of area & volume
- Similar shapes
- Prove triangles are similar
- Area & volume in similar shapes

Spring Block 4
- Scale drawings & bearings

KS3 National Curriculum

- Change freely between related standard units [for example, time, length, area, volume/capacity, mass
- Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction
- Solve problems involving direct and inverse proportion, including graphical and algebraic representations
- Use scale factors, scale diagrams and maps
- Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs
- Interpret mathematical relationships both algebraically and graphically
- Use standard units of mass, length, time, money and other measures, including with decimal quantities
- Use ratio notation, including reduction to simplest form
- Identify and construct congruent triangles, and construct similar shapes by enlargement, with and without coordinate grids
- Use a calculator and other technologies to calculate results accurately and then interpret them appropriately

KS4 National Curriculum

- Understand that X is inversely proportional to Y is equivalent to X is proportional to inverse proportion $\frac{1}{Y}$; {construct and} interpret equations that describe direct and inverse proportion
- Interpret the gradient of a straight line graph as a rate of change; recognise and interpret graphs that illustrate direct and inverse proportion
- Apply the concepts of congruence and similarity, including the relationships between lengths, in similar figures
- Compare lengths, areas and volumes using ratio notation and/or scale factors; make links to similarity (including trigonometric ratios)

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White Rose MATHS

Ratio, proportion & rates of change : Ratio & rates (Higher)

Year 7

Summer Block 1
- Convert between units of time
- Calculate speed, distance & time
- Solve problems with speed, distance & time
- Interpret & draw distance-time graphs
- Find speed from a distance-time graph

Year 8

Autumn Block 1
- Understand & use ratio notation
- Divide in a ratio
- Work out parts & wholes
- Use the form 1 : n
- Compare ratio & fractions

Spring Block 1
- Density, mass & volume
- Mass & capacity

Summer Block 3
- Pi as a ratio

Year 9

Autumn Block 6

Revisit & extend Y7/Y8 content:
- Speed, distance & time
- Distance-time graphs
- Flow problems & graphs
- Rates of change
- Convert compound units (E)

Spring Block 3
- Ratio problems
- Ratio with algebra (E)

Year 10 Higher

Autumn Block 5

Revise & extend KS3 content:
- Equivalent ratios
- Divide in a ratio
- Ratio & fractions
- Combine ratios
- Divide in a ratio algebraically

Year 11 Higher

Autumn Block 1

Revise & extend KS3/Y10 content:
- Solve problems with ratio

Spring Block 3
- Speed, distance & time
- Distance-time graphs
- Velocity-time graphs (E)
- Density & pressure
- Convert compound units

Summer Blocks
- Revision

KS3 National Curriculum

See foundation KS3 National Curriculum links (page 207)

KS4 National Curriculum

- Identify and work with fractions in ratio problems
- Understand that X is inversely proportional to Y is equivalent to X is proportional to inverse proportion $\frac{1}{Y}$; {construct and} interpret equations that describe direct and inverse proportion
- Interpret the gradient of a straight line graph as a rate of change; recognise and interpret graphs that illustrate direct and inverse proportion
- Plot and interpret graphs (including reciprocal graphs) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration
- Convert between related compound units (speed, rates of pay, prices, density, pressure) in numerical and algebraic contexts
- {calculate or estimate gradients of graphs and areas under graphs (including quadratic and other non–linear graphs), and interpret results in cases such as distance–time graphs, velocity–time graphs and graphs in financial contexts}

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White Rose MATHS

Geometry & measures: Perimeter, area & volume (Higher)

Year 7

Spring Block 5

- Perimeter of a polygon & compound shapes
- Area of rectangles, parallelograms, triangles & trapezia
- Solve problems with perimeter and area
- Form expression with perimeter and area (E)

Year 8

Spring Block 1

Revisit & extend Y7 content:

- Area of 2-D shapes
- Area of a compound shape
- Volume of cubes & cuboids

Summer Block 3

- Circumference & area of a circle
- Perimeter & area of parts of circles
- Perimeter & area of compound shapes

Year 9

Autumn Block 3

Revisit & extend Y7/Y8 content:

- Area of 2-D shapes
- Circumference & area
- Surface area of cubes & cuboids
- Surface area of triangular prisms & cylinders (E)
- Volume of prisms & cylinders
- Volume of cones, pyramids and spheres (E)

Year 10 Higher

Spring Block 5

Revise & extend KS3 content:

- Perimeter & area of 2-D shapes
- Area of compound shapes
- Circumference & area
- Area of a sector
- Arc length
- Volume of prisms & cylinders
- Surface area of prisms & cylinders

Year 11 Higher

Autumn Block 2

Revise & extend Y10/KS3 content:

- Volume of spheres, cones & pyramids
- Surface area of spheres & cones
- Volume & surface area of a frustum (E)

Summer Blocks

- Revision

KS3 National Curriculum

- Change freely between related standard units [for example, time, length, area, volume/capacity, mass]
- Use standard units of mass, length, time, money and other measures, including with decimal quantities
- Derive and apply formulae to calculate and solve problems involving: perimeter and area of triangles, parallelograms, trapezia, volume of cuboids (including cubes) and other prisms (including cylinders)
- Calculate and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes
- Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs
- Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors

KS4 National Curriculum

- Calculate surface areas and volumes of spheres, pyramids, cones and composite solids
- Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment
- Calculate arc lengths, angles and areas of sectors of circles

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Geometry & measures: Construct & transform geometric figures (Higher)

Year 7

Summer Block 4
- Draw & measure line segments & angles
- Understand & use geometric notation
- Parallel & perpendicular lines

Year 8

Autumn Block 6
- Line symmetry
- Rotational symmetry
- Reflect a shape in a line
- Reflect a shape given the equation of a line (E)
- Describe a reflection (E)

Summer Block 1
- Angle rules & notation

Year 9

Spring Block 4

Revisit & extend Y7 content:
- Accurately draw triangles & polygons
- Construct angle & perpendicular bisectors

Summer Block 4
- Enlargement
- Negative scale factors (E)
- Rotation, translations & reflections
- Describe transformations

Year 10 Higher

Summer Block 1

Revise constructions when working with angles.

Year 11 Higher

Autumn Block 2

Revise & extend KS3 content:
- Plans & elevations

Spring Block 5 & 6
- Accurately draw polygons
- Construct angle & perpendicular bisectors
- Loci
- Transformations
- Invariant points (E)

Summer Blocks
- Revision

KS3 National Curriculum

- Draw and measure line segments and angles in geometric figures, including interpreting scale drawings
- Use the standard conventions for labelling the sides and angles of triangle ABC, and know and use the criteria for congruence of triangles
- Derive and use the standard ruler and compass constructions (perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle); recognise and use the perpendicular distance from a point to a line as the shortest distance to the line
- Identify and construct congruent triangles, and construct similar shapes by enlargement, with and without coordinate grids
- Identify properties of, and describe the results of, translations, rotations and reflections applied to given figures
- Describe, sketch and draw using conventional terms and notations: points, lines, parallel lines, perpendicular lines, right angles, regular polygons, and other polygons that are reflectively and rotationally symmetric

KS4 National Curriculum

- Construct and interpret plans and elevations of 3D shapes
- Interpret and use fractional {and negative} scale factors for enlargements
- Describe translations as 2D vectors
- {describe the changes and invariance achieved by combinations of rotations, reflections and translations}

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White Rose MATHS

Geometry & measures: Shape properties (Higher)

Year 7

Summer Block 4
- Recognise & name polygons

Year 8

Spring Block 1
Revisit & extend Y7 content:
- Name 2-D & 3-D shapes
- Recognise prisms

Summer Block 1 & 3
- Properties of quadrilaterals & their diagonals
- Circle vocabulary

Year 9

Autumn Block 3
Revisit & extend Y7/Y8 content:
- Nets

Summer Block 4
Revisit shape names and properties in the context of enlargement.

Year 10 Higher

Spring Block 5
Revise & extend KS3 content:
- Nets

Summer Block 1 & 5
Revise shape names and properties in the context of angles & Pythagoras' theorem & trigonometry.

Year 11 Higher

Autumn Block 1
Revise & extend KS3 content including shape properties when working with angles, bearings & trigonometry.

Summer Blocks
- Revision

KS3 National Curriculum

- Describe, sketch and draw using conventional terms and notations: points, lines, parallel lines, perpendicular lines, right angles, regular polygons, and other polygons that are reflectively and rotationally symmetric
- Derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures [for example, equal lengths and angles] using appropriate language and technologies
- Use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, pyramids, cones and spheres to solve problems in 3-D

KS4 National Curriculum

- Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment

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Geometry & measures: Angles (Higher)

Year 7

Summer Block 4

- Angles around a point, straight line & vertically opposite
- Angles in a triangle
- Angles in a quadrilateral
- Solve problems with angles
- Investigate angles in parallel lines (E)
- Angles in any polygon (E)

Year 8

Summer Block 1

Revisit & extend Y7 content:

- Angle rules & notation
- Angles in parallel lines
- Find unknown lengths & angles in special quadrilaterals
- Exterior & interior angles of a polygon

Year 9

Spring Block 4

Revisit & extend Y7/Y8 content:

- Draw & measure angles
- Accurately draw polygons

Year 10 Higher

Summer Block 1

Revise & extend KS3 content:

- Angles around a point, straight line & vertically opposite
- Angles in a triangle & quadrilateral
- Exterior & interior angles of a polygon
- Angles in parallel lines
- Solve problems with angles
- Angles & algebra

Year 11 Higher

Spring Block 4

Revise & extend Y10/KS3 content:

- Bearings
- Scale drawings & bearings

Summer Blocks

- Revision

KS3 National Curriculum

- Apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles
- Derive and use the sum of angles in a triangle and use it to deduce the angle sum in any polygon, and to derive properties of regular polygons
- Derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures [for example, equal lengths and angles] using appropriate language and technologies
- Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides, including Pythagoras' theorem, and use known results to obtain simple proofs
- Use the standard conventions for labelling the sides and angles of triangle ABC, and know and use the criteria for congruence of triangles
- Understand and use the relationship between parallel lines and alternate and corresponding angles
- Draw and measure line segments and angles in geometric figures, including interpreting scale drawings

KS4 National Curriculum

- Interpret and use bearings

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Geometry & measures: Pythagoras and trigonometry (Higher)

Year 7

Year 8

Year 9

Spring Block 5
- Ratio in right-angled triangles (E)

Summer Block 1 & 6
- Identify the hypotenuse
- Determine whether a triangle is right-angled
- Pythagoras' theorem
- Use trigonometric ratios
- Pythagoras & trigonometry in 3-D shapes (E)

Year 10 Higher

Summer Block 5

Revise & extend KS3 content:
- Pythagoras' theorem
- Use trigonometric ratios
- Exact trigonometric values
- Trigonometry in 3-D shapes
- Area of a non-right-angled triangle
- Use and apply the sine rule
- Use and apply the cosine rule

Year 11 Higher

Spring Block 1

Revise & extend Y10 content:
- Trigonometric graphs (E)

Spring Block 4
- Solve problems with bearings using Pythagoras & trigonometry
- Sine & cosine rules
- Solve problems with bearings using sine & cosine (E)

KS3 National Curriculum

- Use Pythagoras' Theorem and trigonometric ratios in similar triangles to solve problems involving right-angled triangles
- Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides, including Pythagoras' theorem, and use known results to obtain simple proofs
- Use integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5 and distinguish between exact representations of roots and their decimal approximations
- Use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement)

KS4 National Curriculum

- Apply Pythagoras' theorem and trigonometric ratios to find angles and lengths in right-angled s {and, where possible, general triangles} in two {and three} dimensional figures
- Know the exact values of sin θ and cos θ for θ = 0°, 30°, 45°, 60° and 90°; know the exact values for tan θ for $\theta = 0°, 30°, 45°, 60°$
- {Know and apply the sine rule, $\frac{a}{sinA} = \frac{b}{sinB} = \frac{c}{sinC}$ and cosine rule, $a^2 = b^2 + c^2 - 2bc\ cos\ A$, to find unknown lengths and angles}
- {Know and apply Area $= \frac{1}{2}ab\ sin\ C$ to calculate the area, sides or angles of any triangle}
- Interpret and use bearings

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Geometry & measures: Geometric proof (Higher)

Year 7

Summer Block 4
- Simple angle proofs (E)

Year 8

Summer Block 1
Revisit & extend Y7 content:
- Prove simple geometric facts (E)

Year 9

Spring Block 4
- Identify congruent figures
- Congruent triangles

Summer Block 1
- Determine whether a triangle is right-angled
- Proof of Pythagoras' theorem (E)

Year 10 Higher

Summer Block 1 & 3
Revise & extend KS3 content:
- Prove geometric facts (E)
- Understand & represent vectors
- Add & subtract vectors
- Vector journeys in shapes
- Vectors in quadrilaterals
- Parallel vectors

Year 11 Higher

Autumn Block 3, 6 & 8
Revise & extend Y10 content:
- Prove a pair of triangles are congruent
- Circle theorems
- Solve problems with vectors
- Ratios with vectors (E)
- Collinear points using vectors (E)
- Geometric arguments & proofs using vectors (E)

KS3 National Curriculum

- See foundation KS3 National Curriculum links (page 213)

KS4 National Curriculum

- Describe translations as 2D vectors
- Apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representations of vectors; {use vectors to construct geometric arguments and proofs}
- Apply the concepts of congruence and similarity, including the relationships between lengths, {areas and volumes} in similar figures
- Compare lengths, areas and volumes using ratio notation and/or scale factors; make links to similarity (including trigonometric ratios)
- Derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures [for example, equal lengths and angles] using appropriate language and technologies (KS3)
- Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment
- {apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results}

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White Rose MATHS

Probability (Higher)

Year 7

Year 8

Summer Block 2

- Probability vocabulary
- Probability scale
- Probability of a single event
- Use the property that probabilities sum to 1
- Probability experiments
- Probabilities from samples spaces, two-way tables & frequency trees

Year 9

Summer Block 3

Revisit & extend Y8 content:

- Identify & represent sets
- Intersection & union of sets
- Complement of a set (E)
- Probability of a single event
- Probabilities from diagrams
- Relative frequency
- Expected outcomes
- Independent events
- Probabilities from Venn diagrams

Year 10 Higher

Spring Block 3

Revise & extend KS3 content:

- Probability of a single event
- Use the property that probabilities sum to 1
- List & count outcomes
- Relative frequency
- Probabilities from diagrams
- Tree diagrams for independent events
- Tree diagrams for dependent events

Year 11 Higher

Autumn Block 7

Revise & extend Y10/KS3 content:

- Venn diagrams
- Set notation
- Solve problems with Venn diagrams
- Conditional probability (E)

Summer Blocks

- Revision

KS3 National Curriculum

- Record, describe and analyse the frequency of outcomes of simple probability experiments involving randomness, fairness, equally and unequally likely outcomes, using appropriate language and the 0–1 probability scale
- Understand that the probabilities of all possible outcomes sum to 1
- Generate theoretical sample spaces for single and combined events with equally likely, mutually exclusive outcomes and use these to calculate theoretical probabilities
- Construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data
- Enumerate sets and unions/intersections of sets systematically, using tables, grids and Venn diagrams

KS4 National Curriculum

- Apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to one
- Apply systematic listing strategies {including use of the product rule for counting}
- Use a probability model to predict the outcomes of future experiments; understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size
- Calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions
- {calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams}

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White Rose MATHS

Statistics: Represent & interpret data (Higher)

Year 7

Spring Block 1
- Pictograms
- Bar charts
- Dual bar charts
- Composite bar charts
- Time series graphs
- Non-linear relationships

Year 8

Spring Block 6
Revisit & extend Y7 content:
- Types of data
- Grouped & continuous data

Summer Block 2 & 4
- Two-way tables
- Frequency trees
- Pictograms & bar charts
- Vertical line charts
- Pie charts
- Line graphs
- Misleading graphs

Year 9

Summer Block 3
Revisit representing & interpreting data in tables when working with sets and probability.

Year 10 Higher

Spring Block 6
Revise & extend KS3 content:
- Types of data & sampling
- Capture & recapture

Summer Block 2
- Pie charts & time series
- Frequency polygons
- Stem-and-leaf diagrams
- Histograms
- Cumulative frequency diagrams
- Box plots

Year 11 Higher

Autumn Block 7
Revise & extend KS3 content including diagrams when working with sets and Venn diagrams.

Summer Blocks
- Revision

KS3 National Curriculum

- Construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data
- Work with coordinates in all four quadrants
- Interpret mathematical relationships both algebraically and graphically
- Describe, interpret and compare observed distributions of a single variable through: appropriate graphical representation involving discrete, continuous and grouped data; and appropriate measures of central tendency (mean, mode, median) and spread (range, consideration of outliers)

KS4 National Curriculum

- Infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling
- Apply statistics to describe a population
- Interpret and construct tables and line graphs for time series data
- Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: appropriate graphical representation involving discrete, continuous and grouped data, {including box plots}, appropriate measures of central tendency (including modal class) and spread {including quartiles and inter-quartile range}
- {construct and interpret diagrams for grouped discrete data and continuous data, i.e. histograms with equal and unequal class intervals and cumulative frequency graphs, and know their appropriate use}

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Statistics: Statistical measures (Higher)

Year 7

Autumn Block 6

- Mode
- Mean
- Median
- Range
- Solve problems with averages & range

Year 8

Spring Block 6

Revisit & extend Y7 content:

- Averages & range
- Outliers & errors
- Choose the most appropriate average
- Compare distributions using average & range
- Averages from an ungrouped frequency table
- Mean & mode from a grouped frequency table (E)

Year 9

Year 10 Higher

Spring Block 6

Revise & extend KS3 content:

- Averages & range
- Averages from an ungrouped frequency table
- Mean from a grouped frequency table
- Averages from a grouped frequency table
- Use data to compare distributions

Year 11 Higher

Summer Blocks

- Revision

KS3 National Curriculum

- Describe, interpret and compare observed distributions of a single variable through: appropriate graphical representation involving discrete, continuous and grouped data; and appropriate measures of central tendency (mean, mode, median) and spread (range, consideration of outliers)
- Construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data

KS4 National Curriculum

- Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: appropriate graphical representation involving discrete, continuous and grouped data, {including box plots} appropriate measures of central tendency (including modal class) and spread including quartiles and inter-quartile range}

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Statistics: Bivariate data (Higher)

Year 7

Spring Block 1
- Scatter graphs
- Correlation
- Lines of best fit

Year 8

Spring Block 6
Revisit representing scatter graphs when exploring outliers.

Year 9

Year 10 Higher

Spring Block 6
Revise & extend Y7 content:
- Scatter graphs
- Interpolation & extrapolation

Year 11 Higher

Summer Blocks
- Revision

KS3 National Curriculum

- Work with coordinates in all four quadrants
- Describe simple mathematical relationships between two variables (bivariate data) in observational and experimental contexts and illustrate using scatter graphs

KS4 National Curriculum

- Use and interpret scatter graphs of bivariate data; recognise correlation and know that it does not indicate causation; draw estimated lines of best fit; make predictions; interpolate and extrapolate apparent trends whilst knowing the dangers of so doing

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