Curriculum Overview - Maths

Principles and Purpose of the Maths Curriculum

The purpose of the maths curriculum is to provide a secure understanding of mathematical concepts, from basic principles of mathematics to complex topics that combine several areas of study into a single question. The curriculum promotes retention of knowledge and a depth of learning rather than an accelerated curriculum, resulting in pupils who are confident in taking their studies further into sixth form, university and beyond.

In all year groups, there is an intentional focus on numeracy which will support pupils not only in their study of maths but will also enable them to access mathematical questions in other subjects.

The following principles have informed the planning of the United Learning curriculum across all subjects:

- **Entitlement:** All pupils have the right to learn what is in the United Learning curriculum, and schools have a duty to ensure that all pupils are taught the whole of it.
- **Coherence:** Taking the National Curriculum as its starting point, our curriculum is carefully sequenced so that powerful knowledge builds term by term and year by year. We make meaningful connections within subjects and between subjects.
- **Mastery:** We ensure that foundational knowledge, skills and concepts are secure before moving on. Pupils revisit prior learning and apply their understanding in new contexts.
- **Adaptability:** The core content – the 'what' – of the curriculum is stable, but schools will bring it to life in their local context, and teachers will adapt lessons – the 'how' – to meet the needs of their own classes.
- **Representation:** All pupils see themselves in our curriculum, and our curriculum takes all pupils beyond their immediate experience.
- **Education with character:** Our curriculum - which includes the taught subject timetable as well as spiritual, moral, social and cultural development, our co-curricular provision and the ethos and 'hidden curriculum' of the school – is intended to spark curiosity and to nourish both the head and the heart.

Here we explore these principles in the context of the maths curriculum:

- **Entitlement:** All pupils in maths are exposed to extensive number, algebra, geometry, proportion, and statistics content and are not taught on separate pathways until Key Stage 4. This ensures that all pupils can access all areas of maths and have time to develop their skills before limiting their entitlement to Higher maths.
- **Coherence:** Our curriculum has been carefully sequenced to ensure that knowledge is revisited without having a spiral curriculum, and to ensure that classic misconceptions between topic areas are avoided.
- **Mastery:** Mathematical concepts are taught in-depth and continually revisited through careful interleaving of content into future teaching topics. The focus on retention of knowledge is at the core of the maths curriculum; the mastery approach supports this.
- **Adaptability:** Teachers are provided with a fully resourced curriculum that will meet the expectations of the maths curriculum in Key Stage 3 and Key Stage 4. Teachers are expected to adapt these resources and have autonomy in the way they are delivered in the classroom.
- **Representation:** Maths is universal, providing all pupils with an elegant and logical way of viewing the world. Where our resources include names and places, these have been selected to be inclusive. We believe that a secure understanding of maths is an essential starting point for all young people.
- **Education with character:** Mathematics is a common language in which all pupils can solve, analyse, and problem solve. Our curriculum supports pupils to build logical reasoning, critical thinking and is mentally rigorous.

Roadmap of the Maths Curriculum

The roadmap diagram on the following page sets out the route that we expect pupils to take through our Key Stage 3 curriculum. The roadmap shows the sequence of units covered in Year 7 to Year 9, broken down into a half-term structure to support planning and assessment points. All units are compulsory components of Key Stage 3 teaching and results in a core base of knowledge to begin Key Stage 4. The curriculum has been carefully designed to continuously interleave content, enabling pupils to revisit prior knowledge without having a spiral curriculum. The curriculum focuses on teaching in a sequence that provides building blocks for pupils to access future topics.

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MATHEMATICS

YEAR	TERM	KPI		PRIOR KNOWLEDGE
7	1	7.01	Place Value and Number Sense	KS2 Y6 PoS
		7.02	Addition and Subtraction	KS2 Y6 PoS
		7.03	Perimeter	KS2 Y6 PoS, 7.02
		7.04	Rounding and Estimation (in Real Life Situations)	Whole Numbers: KS2 Y6 PoS
			Mid-Year Assessment	
	2	7.05	Multiplication and Division	KS2 Y6 PoS
		7.06	Factors and Multiples	KS2 Y6 PoS
		7.07	Area of Rectangles, Triangles and Parallelograms	KS2 Y6 PoS (not Compound Shapes, 7.05
	3	7.08	Fractions as Part of a Whole	KS2 Y6 PoS
		7.09	Fractions - Addition and Subtraction	KS2 Y6 PoS
		7.10	Fractions - Compare and Order	KS2 Y6 PoS
		7.11	Fraction of an Amount	7.05
	4	7.12	Order of Operations	BIDMAS with 4 Operations: KS2 Y6 PoS
		7.13	Basic Rules of Algebra	KS2 Y6 PoS, 7.03, 7.09
		7.14	Expand and Factorise	KS2 Y6 PoS (Neg. Numbers), 7.02, 7.05, 7.13
		7.15	Substitution	KS2 Y6 PoS (Neg. Numbers), 7.05, 7.13
	5	7.16	Angles	KS2 Y6 PoS, 7.02
		7.17	Polygons	KS2 Y6 PoS
		7.18	Symmetry and Reflection	KS2 Y5 PoS
		7.19	Coordinates	KS2 Y6 PoS
			End of Year Assessment	
	6	7.20	Mean	KS2 Y6 PoS, 7.02, 7.05
		7.21	Two Way Tables and Venn Diagrams	7.02
8	1	8.01	Indices	7.01
		8.02	Primes	7.06
		8.03	Rounding	7.04
		8.04	Fractions	7.08, 7.09
		8.05	Negative Number Review	7.14
	2	8.06	Linear Equations	7.13
		8.07	Linear Equations in Context	7.03, 7.07, 7.13, 8.06
		8.08	Coordinates and Basic Graphs	7.19
			Mid-Year Assessment	
	3	8.09	Units of Measurement	7.05
		8.10	Angles in Parallel Lines	7.16
		8.11	Interior and Exterior Angles	7.05, 7.16, 7.17
		8.12	Circumference	7.03, 8.09
	4	8.13	Proportional Reasoning	7.05
		8.14	Fractions, Decimals and Percentages	7.08, 7.10, 8.04
		8.15	Ratio	KS2 Y6 PoS, 7.05, 8.13
	5	8.16	Area of Circles and Trapezia	7.07, 8.09
		8.17	Presenting and Interpreting Data	7.16
		8.18	Averages	7.20
			End of Year Assessment	
	6	8.19	3-D Visualisation	KS2 Y6 PoS
		8.20	Volume	KS2 Y6 PoS, 7.05
9	1	9.01	Place Value and Number Properties	7.10, 8.05
		9.02	Decimals	7.02, 7.05, 7.12
		9.03	Rounding and Estimation	8.03
		9.04	Indices, Powers and Roots	8.01, 8.05
		9.05	Factors, Multiples and Primes	8.02
		9.06	Ratio	8.15
	2	9.07	Fractions, Decimals and Percentages	7.10, 8.04, 9.01
		9.08	Fractions	8.04
		9.09	Percentages	8.14
		9.10	Proportion	7.15, 8.06, 8.09, 8.13
			Mid-Year Assessment	
	3	9.11	Notation	7.13
		9.12	Simplifying and Index Laws	8.06, 9.04, 9.08
		9.13	Expanding and Factorising	8.06
		9.14	Expressions and Substitution	7.15, 8.01
	4	9.15	Linear Equations	7.15, 8.06, 8.07, 9.08
		9.16	Linear Inequalities	9.01, 9.15
		9.17	Perimeter and Area	7.03, 7.07, 7.16, 8.09, 8.10, 8.12, 9.15
		9.18	Pythagoras	7.19, 8.01, 8.03, 9.14
	5	9.19	Properties of Shapes	7.17, 7.18, 7.19
		9.20	Angle Facts	7.16, 8.10, 8.11
		9.21	Parallel Lines	8.10
		9.22	Circles	8.12, 8.16
		9.23	Volume	8.20, 8.21
			End of Year Assessment	
	6	9.24	Surface Area	8.20
		9.25	Sequences	9.14
		9.26	Basic Vectors	7.02, 8.05
		9.27	Plans and Elevations	8.20

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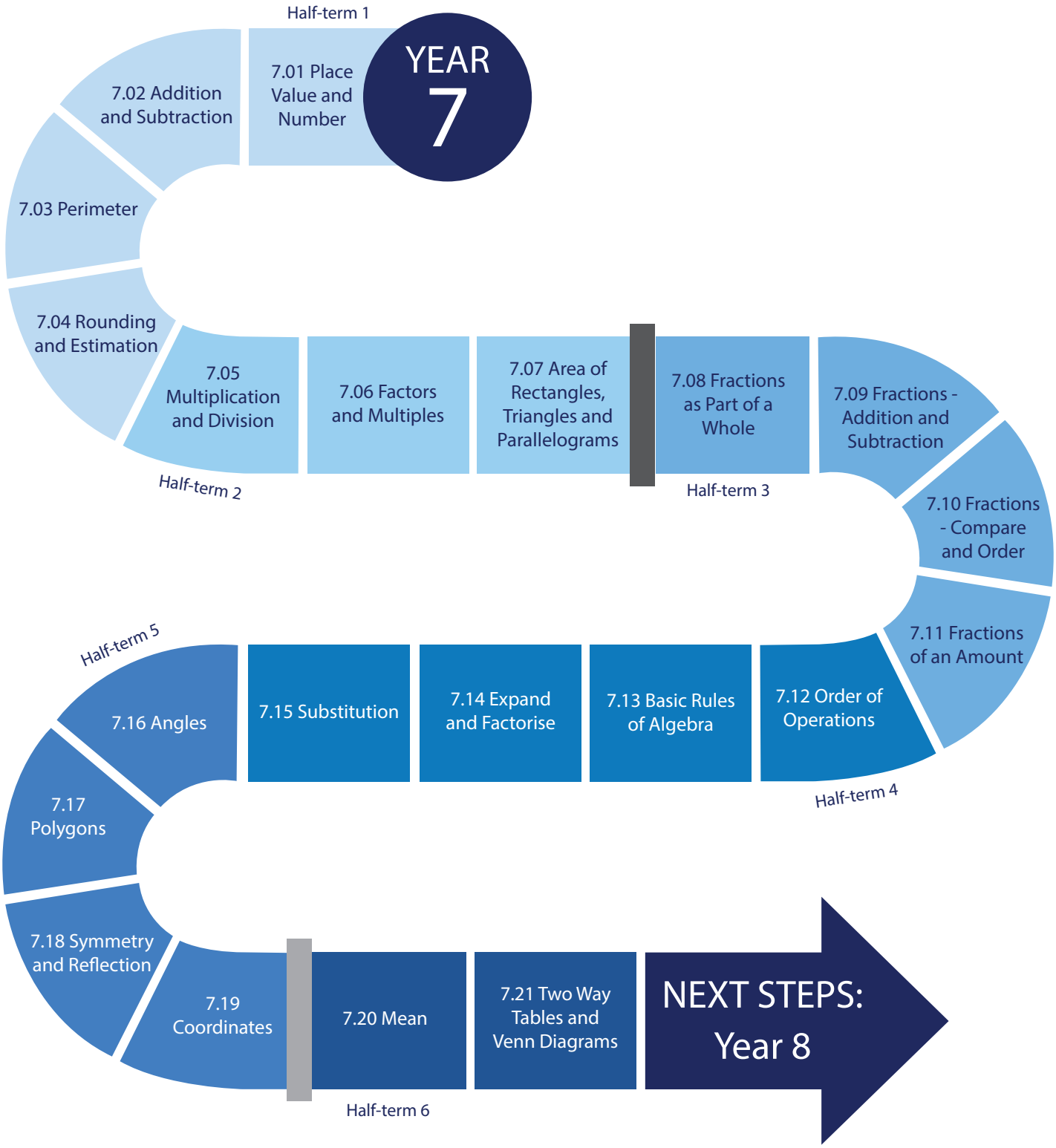
MATHEMATICS
Year 7

KEY:

Mid-Year Assessment

End of Year Assessment



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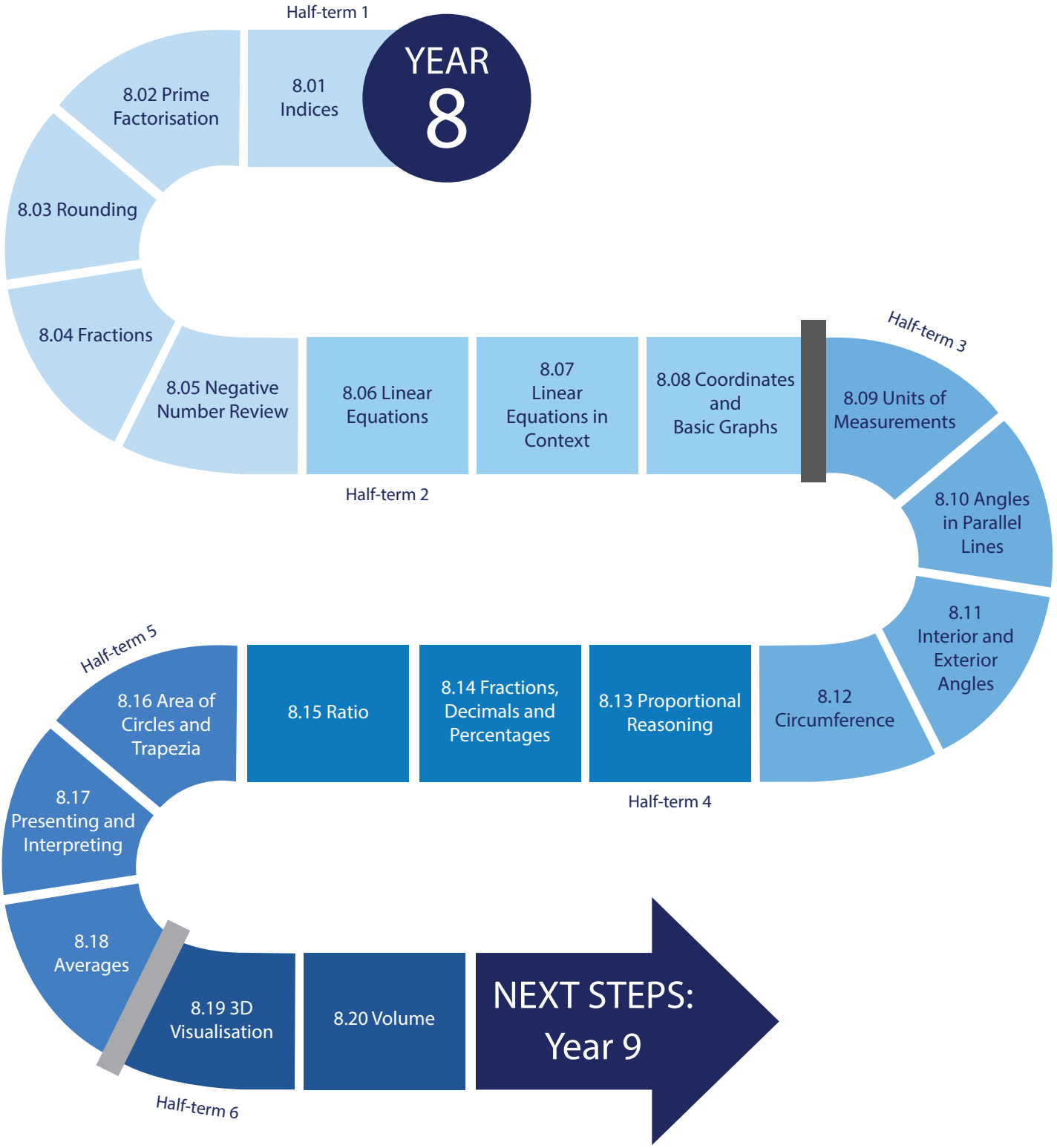
MATHEMATICS

Year 8

KEY:

Mid-Year Assessment

End of Year Assessment



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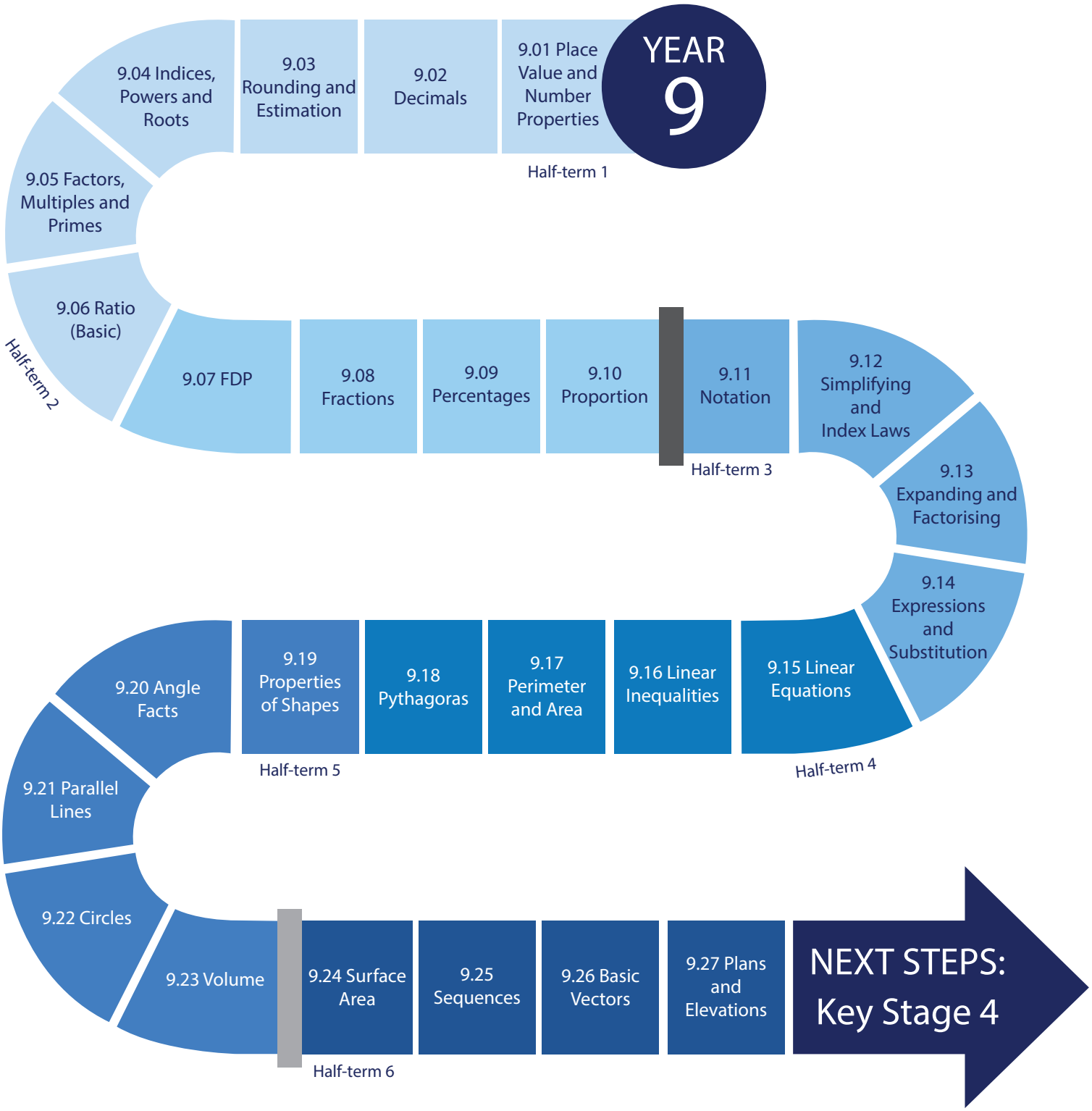
MATHEMATICS

Year 9

KEY:

Mid-Year Assessment

End of Year Assessment



'Why This, Why Now?'

In our planning, we have asked ourselves 'why this, why now?' Here we provide some examples of the curriculum choices we have made, and why the units have been placed in the order we have chosen:

- Perimeter and angles are taught following addition and subtraction so that pupils have the skill set needed to access the numeracy demands of these topics.
- Area and substitution are taught following multiplication and division so that pupils have the skill set needed to access the numeracy demands of these topics.
- Algebraic manipulation is taught in-depth in Year 7 to support solving equations in Year 8.
- Fraction and decimal manipulation are taught early in Year 7 and are then continually interleaved into future topics such as order of operations, linear equations, and circumference.
- Solving linear equations is taught in-depth in Year 8 and then it is continually interleaved into future topics such as angles in parallel lines.
- The Mean is taught in-depth in Year 7 before the introduction of the Median, Mode and Range in Year 8. This is to avoid misconceptions in the analysis of averages.
- Perimeter and area are taught separately with a suitable time gap to avoid misconceptions with these two mathematical areas.

Teaching the Maths Curriculum

The maths curriculum promotes a consistent approach to lesson delivery by linking lesson structure to the Rosenshine Principles of Instruction, in line with United Learning's centralised teaching and learning approach. We use these principles because cognitive research (e.g. Kirschner, Sweller and Clark, 2006) suggests that students need a large amount of subject knowledge in their long-term memory to become competent in any subject. In maths, pupils will be far better equipped to apply mathematical thinking to a problem if their working memory is not overloaded with basic calculations. Therefore, our curriculum always emphasises secure content knowledge before moving onto problem-solving tasks. This is a step away from discovery-based learning and acknowledges the gap between teachers as experts and pupils as novices, with the key point being that we can not expect pupils to show mathematical expertise until they have acquired fluency with numbers.

The development of long-term memory is supported by a curriculum that focuses on interleaving content, regular low stakes quizzing, daily starter grids that review prior learning, and formative assessments that feed into teacher planning to close gaps in knowledge. Consistent review of key content is integral to the structure and order of the curriculum itself. Teachers use Hegarty Maths, Seneca and Sparx to review this content as homework.

Our curriculum is designed to provide a challenge for all learners. Teachers are expected to adapt resources for the needs of their students. We use carefully constructed resources that exemplify accessible methods for students and teachers. We provide an opportunity for challenge by depth rather than accelerating through the curriculum. In Key Stage 4, exam questions focusing on the specification objectives AO1/2/3 are used, when appropriate, to assess understanding of core fluency and application of it in context.

So, when we walk into a maths lesson, what should we expect to see?

All teachers have the autonomy to combine or separate the United Learning resources to fit their pupils' needs. However, we do expect all lessons to follow a similar pattern. This pattern links directly to the Rosenshine Principles.

Rosenshine Principles

R1 - Begin with a short review of prior learning
R2 - Present new material in small amounts or steps
R3 - Ask many questions and check the responses of all students
R4 - Provide models
R5 - Guide student practice
R6 - Check for student understanding
R7 - Obtain a high success rate
R8 - Provide scaffolds for difficult tasks
R9 - Require and monitor independent practice
R10 - Engage students in weekly and monthly review

'Do now' activity: R1

- Mixed fluency skills based on pre-requisite knowledge presented in a structured starter grid
- Self-assessed answers should be pre-prepared to increase the pace and ease the transition to the next part of the lesson
- Poorly answered questions should appear in the next starter

Introduction of new skills: R2 – R5, R8

- Carefully chosen examples that are modelled in detail without whole class questioning
- Students complete a similar example to the modelled example
- Then ask targeted questions to check understanding

Check for understanding – AFL – R6, R3

- Check the understanding of examples – this could be in books, on MWB, with questioning and/or purposeful circulation
- Re-model questions that were not understood

Independent practice – R7

- Independent practice informed by AFL i.e. mini quiz, targeted questions
- Independent practice that relates directly to the modelled examples
- Enough time is given for students to complete questions with minimal copying out
- Problem-solving questions will follow when the fluency is secure

Review of independent practice – R9

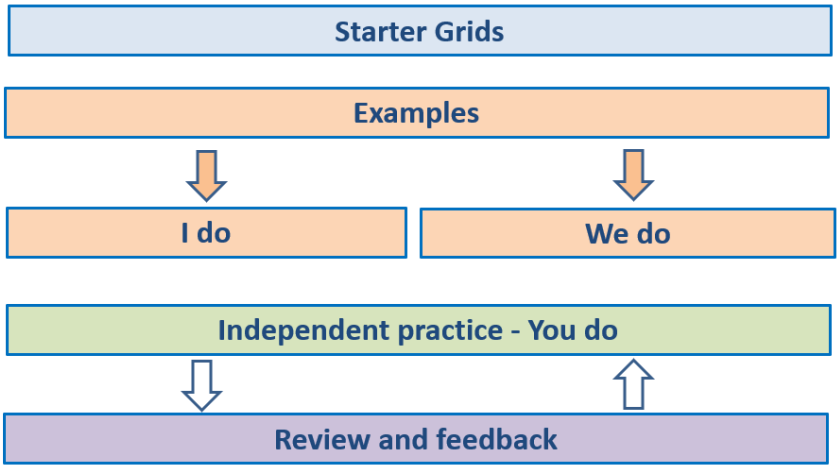
- Answers given to independent practice (prepare answers and minimise pupil input to increase the pace and maximise the clarity of answers)
- Students self-assess their work (coloured pen)

Regular review – R10

- Use starters and regular quizzing to review knowledge taught

The United Learning resources have been written to support Rosenshine principles in the classroom. The focus of these resources is the **I/we/you model:** Explanation/modelling >> guided practice >> independent practice.

The flow chart below summarises a typical structure that we should expect to see in maths lessons



In Year 11 and Sixth Form maths lessons we expect to see exam questions featuring in most lessons. Where exam questions are used there should be a clear reference to the number of marks available, how they are attained, and where it is likely to feature on an exam.

Homework

All pupils complete homework online on Hegarty Maths or Sparx. Both platforms support the Key Stage 3 and Key Stage 4 curriculum, and all United Learning resources signpost pupils to the relevant maths clips on these websites. For example, in summative assessment question level analysis sheets (QLAs), in KPI tests and the scheme of work to support independent work and teaching of prior knowledge.

On Sparx, teachers input the United Learning maths curriculum into the system at the start of the year breaking down what is being learnt on a week-by-week basis, directly linking our curriculum to the homework platform.

Assessing the Maths Curriculum

Formative Assessment in Maths

Formative assessment can identify what pupils can and cannot do and is a way to review prior knowledge. The following resources support formative assessment in maths:

- **Starter grids** – daily quiz at the beginning of every lesson covering prior knowledge.
- **Fluency tests** – that can be used as weekly/fortnightly recap quizzes.
- **KPI tests** – to identify class gaps in a recently taught unit. Whole class marking identifies themes in pupils' responses which can inform reteaching and starter grid content.

Summative Assessment in Maths

Summative assessments are provided for the end of each half term of teaching. Most schools use the mid-year assessment, and all schools are expected to sit the end of year assessment.

Summative assessments are followed by an in-class review of key gaps in learning. Each pupil is provided with colour coded, personalised, question-level analysis sheets directing them to independent learning tasks on Hegarty Maths or Sparx.

Recovery and Catch-up in Maths

Summative assessment will help to identify pupils who have fallen behind and need to catch up. QLAs post-assessment provides pupils with targeted support directing them to independent learning tasks on Hegarty Maths or Sparx.

Gaps identified through summative and formative assessments can be addressed in starter grids and designated catch-up lessons.

Progression in the Maths Curriculum

Primary to Secondary:

The Year 7 curriculum builds on and develops the Key Stage 2 curriculum. The curriculum ensures that topics are revisited in depth to support the transition from Year 6. For example, numeracy and geometry and revisited in the first term, covering basic and extended content. This ensures that pupils have an opportunity to quickly catch up if there are any gaps in their Key Stage 2 knowledge. A baseline assessment at the start of Year 7 helps to identify what students can and cannot do. The Year 7 curriculum is also mapped to prior learning in Key Stage 2 so that teachers know which material pupils have been exposed to.

Key Stage 3 to Key Stage 4:

The Key Stage 3 curriculum covers key mathematical building blocks in depth that will support a successful start to the Key Stage 4 GCSE curriculum. In the Key Stage 4 curriculum, there are many opportunities to revisit prior knowledge through formative assessment resources such as starter grids and fluency tests.

Key Stage 4 to Key Stage 5:

Students who wish to take maths A-Level should pay particular attention to the transition course that is provided, which will ensure that they have secure prior knowledge to access A-level content.

Key Stage 5 to University:

- Maths A-level unlocks opportunities to study a huge variety of courses related to maths, but it is also seen as a route to other career paths such as Medicine.
- The opportunities available to degree level maths graduates are vast.
- The UCAS subject page HERE is a helpful way of viewing the different degrees related to maths.

The Maths curriculum website

Our classroom resources are designed to put teachers in the driving seat. We provide centrally planned resources so that teachers can focus on preparing lessons for their classes and pupils. We have been clear about the purpose of each resource, and all of the resources we have produced support the principles shared in this document. Ultimately, once a teacher downloads and adapts a resource it becomes their lesson.

All resources can be found on the United Learning Curriculum Website.