Richard Lander School

Statement of Intent

Every subject maximises the potential of each student, enabling them to become successful learners, confident learners and responsible citizens. We will ensure that all students are well prepared for life and work and are keen to make a positive difference to the world they live in.

Mathematics

Intent
We believe that our students deserve a vibrant, ambitious and engaging mathematics curriculum; rich in skills, concepts and knowledge that challenge and support all learners to fulfil their potential and be the best they can be. The maths curriculum aims to stimulate the curiosity of students by setting increasingly complex problems, helping them to become confident in solving all manner of mathematical problems systematically, logically and in differing contexts. In doing so, students will develop independence and be able to apply their thinking skills across the wider curriculum.

Skills
Maths is more than arithmetic, algebra or memorising formulae; it's about being inquisitive, problem solving, deducing truth, working logically, creating theories, exploring puzzles, questioning, forming hypotheses and conjectures, structuring arguments, discussing methods and exploring alternative ways of working. Developing these skills in maths enables our students to apply them to all their other subjects. In addition, practising and honing these techniques throughout their time at RLS will help our students grow in confidence, self-esteem and maturity. Acquiring these skills in maths helps to produce well-rounded young adults who are capable of making an active contribution to the world around them.

Purpose of Study
Mathematics is a creative and highly interconnected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.

Aims
The national curriculum for mathematics aims to ensure that all students:

- become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that students develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately
- reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions

Rationale

A single mathematical phenomenon interlinks with many others.
Consider the rectangle. The concept of perimeter and area spring immediately to mind, then there are units of length and area, converting between these units and the relationship between square units and linear units. The metric system, the imperial system and their origins. Or perhaps instead of taking that route, you could simply cut the rectangle in half through its diagonal and explore the world of mathematics associated with triangles. All of this can be connected back to the rectangle. We want our students to be able to see these sort of links and will explore these throughout the 5 years at Richard Lander School.

However, in order for our students to become fluent, reason mathematically and solve problems, we believe that mathematics needs to be loosely broken into topic areas that are cyclically revisited over the course of the 5 years. During the 5 years, students will access increasingly complex material and concepts, become fluent in its associated skills and procedures and learn how to solve related problems that connect maths to real life problems and other maths topics.

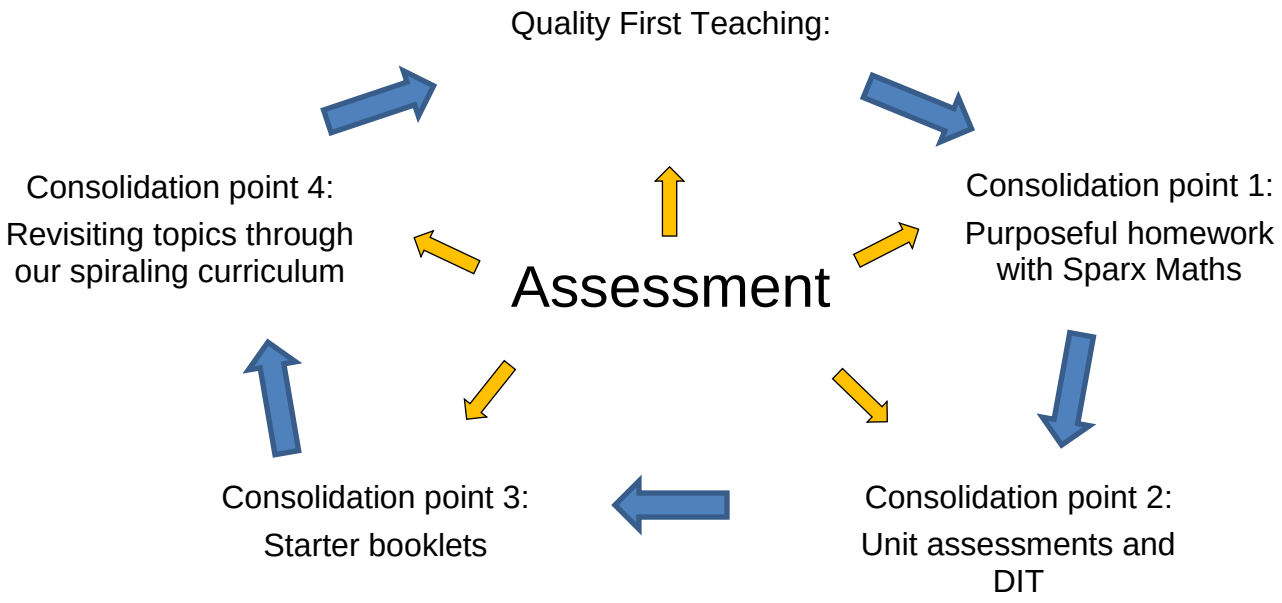
Through thoughtful pedagogy and careful planning towards individuals' needs, students will experience those Eureka moments in maths lessons upon learning new skills. Unfortunately, the sieve-like nature of the human brain means that what is understood in one lesson may not be remembered later on. Through planning engaging lessons, carefully sequenced topics, planning realistic and useful homework tasks, summative assessments and using formative assessment techniques, we believe we have systems in place that will maximise all students' chances of success in Maths at Richard Lander School.

<u>The key principals of the maths department</u>

Quality first teaching & subsequent consolidation points

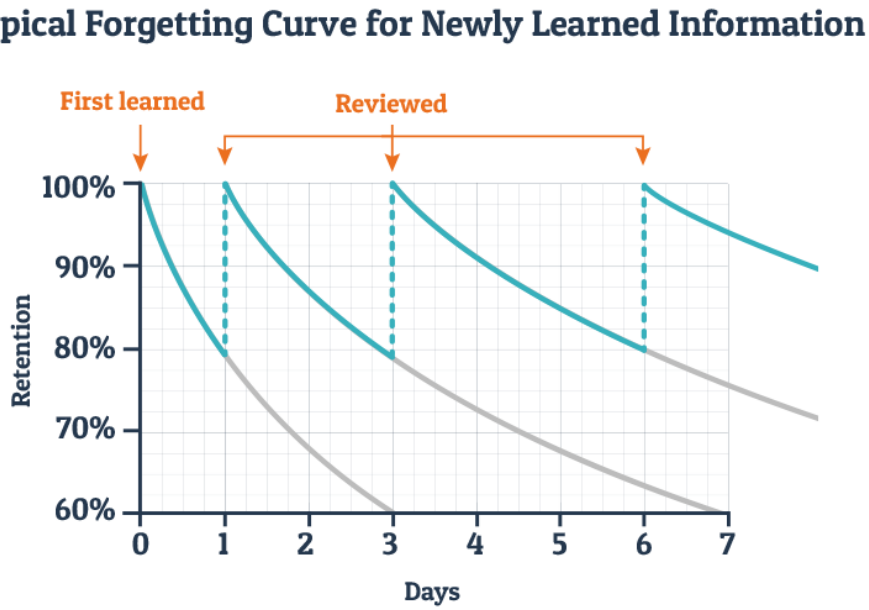
In an ideal world, when a student learns something for the first time and can apply this in a variety of contexts, they can also recall this days, weeks, months and even years later. However, this for the vast majority of students is not the case.

With this in mind, we have several consolidation points in place to try to ensure that when something is forgotten there are subsequent opportunities to trigger that memory and 'make it stick'.



The research behind our key principals

The ability to remember work hugely increases students' confidence in maths and is therefore an important focus for our continuing development as a department.
The Ebbinghaus forgetting curve is at the centre of our strategy for helping students to recall what they successfully understood as a result of a well-planned and well-delivered lesson.



Like it or not, our students' success at secondary level Maths will come down to their performance in 3 high stakes GCSE exams at the end of their 5 years at Richard Lander School. With a huge amount of content to remember, it is therefore crucial that students are helped to remember what they have learned.
The Ebbinghaus forgetting curve shows how strategically placed reviews of learning (Our consolidation points) can help strengthen students recall.

Assessment

Assessment at all levels informs how we shape and adapt both our curriculum and individual lesson plans and is evident in the following key principals:

- Quality first teaching
- CP1 – Purposeful homework with Sparx Maths
- CP2 – Unit assessments and DIT
- CP3 – Starter booklets
- CP4 – Revisiting and building on topics – A spiralling curriculum model

In the paragraphs below you will read how assessment plays a keep part in all aspects of our curriculum.

Quality first teaching

This is our biggest priority and will continue to be an area we focus on and develop indefinitely.

A classroom teacher must prioritise the most impactful elements of their role. Matched only by creating positive working relationships with our classes, planning is critical to the success of a lesson. Whilst we subscribe to several excellent resources, the most important resources we have are our maths teachers.

Creating time to plan:
No teacher here is isolated. Whilst a lot of collaboration occurs through the friendships within the department and the time we spend together during PPA and non-contact periods, we also ensure that directed time is spent planning collaboratively with teachers of similar sets sharing resources and co-planning.

A culture of sharing good practice:
As with planning time, sharing good practice is second nature within the department but again, during department meetings we will often discuss the pedagogy associated with an upcoming topic. For example, how should we go about teaching solving equations with the unknown on both sides? How do we go about teaching standard form to a mid-ability set compared to a high ability set?

Carefully teaching students new skills and using formative assessment information to inform planning are important elements of all classes' weekly routines. Teachers build in to every lesson strategies for identifying the learning that is taking place. These strategies include, questioning targeted to individual students, multiple choice, mini whiteboards, conversations with students. Another crucial element to teachers' planning is ensuring that we build in problems that show links between the topic being studied and other areas of both the maths curriculum and the outside world. For example: Teaching proportion can be easily linked to ratio problems and equations of straight line graphs but you could also look at the global dimension and look at proportions of ethnicity in the world and the distribution of global wealth. Maths can be a tool to explore equality and inequality.

Consolidation point 1: Purposeful homework with Sparx Maths

Sparx maths fits in perfectly with our departmental pedagogy.
Students are set a weekly homework that focuses on the topics being covered that very week. The Sparx algorithm adjusts the difficulty level of the questions asks to the individual meaning that questions are neither too easy or too difficult. In addition to the content being covered in lessons, students have a consolidation exercise to complete from work they have done previously. There is also a times-table element to the homework ensuring that students keep an eye on the fundamentals. This system is used for years 7 to 10.
With year 11 however, following the two PPEs in the Autumn and Spring terms plus the end of year 10 exam (their first experience of a GCSE paper), teachers create a homework plan containing topics that their classes fell short on and ensure that these topics are planned into subsequent homework assignments along with work currently being taught.
On the day that homework is due, instead of completing their usual starter activity (see consolidation point 3) teachers make students complete a range of questions that relate to their homework. These 'Insights' questions address the questions the students struggled with in their homework.
Students are awarded merits for completing homework to 100% and additional merits completing extra optional tasks. With a prize draw at the end of every half-term for each year group it can get pretty competitive!

Consolidation point 2: Unit assessments and DIT

Students in all year groups are assessed at the end of each unit, of which there are 10 per year at KS3 and roughly the same in KS4. In years 7-9, students termly progress reports are based on their average performance on the unit assessments covered up to that point. In years 7-9, students also have an end of year test, assessing them on all work covered that year. This, along with their performance in the unit tests will determine how well they have progressed. We will use the same assessments year after year, making it possible to compare year groups. All unit tests are taken from the Pearson Maths progress programme with extra tests created from a pearson bank of questions to ensure our least able can achieve success. The bespoke nature of these assessments also ensures a healthy balance of skills-based, reasoning and problem solving questions.

In year 10, we use a similar system to KS3. Students are assessed at the end of every unit with sets 1 to 3 taking a higher tier test on that specific topic and sets 4-6 taking a foundation test. These unit tests have a similar feel to exam papers in that they start with questions that are accessible to all and work their way up to questions that our most able can access. AO1, AO2 and AO3 questions are all included This ensures that students are only assessed on work they have covered instead of introducing them to the exam papers with unfamiliar topics too soon. Only at the end of year 10 do students experience two GCSE papers for the first time. These papers will also indicate the questions that students have not yet fully covered. Our most able students will give these questions a try but some will choose to leave them until they have been thoroughly taught the content in year 11.
We use a ranking system to predict students' GCSE performance in all of the unit assessments taken up to that point but actual grades for students' work only starter with the first GCSE papers taken at the end of year 10.

In year 11, Our termly assessments take the form of past exam papers, with students being able to see their understanding grow over the year whilst honing their exam technique and familiarising themselves with the exam format which we believe will remove some of the anxiety associated with the pressure of exams.

Following each assessment, teachers identify collective and individual areas of strength and weakness and plan an initial DIT (Directed Improvement Time) lesson whereby students improve on the questions they did not successfully answer in the assessment. Whilst this goes some of the way to 'closing the loop' these common areas of misconception will be revisited in subsequent lessons, covered in the following half term's starter booklets and homework assignments and will be revisited due to the spiralling nature of our curriculum where topics are recapped and covered at greater depth in subsequent years.

Consolidation point 3: Starter booklets

The idea here is to take key elements of the previous half-terms' units and have students complete 5 questions every lesson on this, in silence during the first 10 minutes of all but one lesson per week. The other lesson is used to review homework. (See consolidation point 1)
Repeatedly drilling students with key skills can have the effect of making these skills long term and accessible. An added bonus to the starter booklets is that all students know exactly what happens at the start of a lesson meaning that upon arrival to lessons, they get straight on with meaningful work without being asked!

Consolidation point 4: Revisiting and building on topics - A spiralling curriculum model

Algebra, Number, Geometry & Measures, Ratio & Proportion, Statistics and Probability are revisited numerous times throughout the 5-year curriculum at Richard Lander school. Each time a specific topic is learnt, the prerequisite skills are recapped before more complex areas of the topic are explored.
As a cohesive department team, we are always talking about our subject. Conversations flow over lunch, at break and of course in more formal settings such as meetings and inset sessions. The need for this cannot be overstated and with this in mind, we wanted to make sure that for each individual year group, each class learns about the same topic at the same time. Our more-able students will learn this topic at a greater depth whilst students in need of support will become more fluent with the basic concepts.
Not only does this principle facilitate the sharing of resources and ideas between teachers, it also creates corridor conversations between students of different classes.

Pearson's KS3 and GCSE programmes of study ties in very nicely with our principles. The Key Stage 2 curriculum is revisited but not re-taught. There is continuity between techniques used at Key Stage 2 such as bar models. Topics are revisited periodically during the three KS3 years and then again in the two GCSE years. The sequencing of topics in both the KS3 and GCSE programmes, carefully considers prerequisite skills. For example, Pythagoras' theorem is covered in the Spring term of year 9. The prerequisite skills to this topic include solving equations and

working with indices, both of which are covered and revisited in year 7 and 8. At KS3, the Maths progress programme is in keeping with our principle of teaching the same unit to all students in a year group at the same time and in KS4 we have achieved the same goal albeit with a slight alteration to the order of the topics.

The KS3 and 4 textbook resources, whilst mainly used as a guide, provide an excellent variety of questions testing students' ability to answer questions requiring them to recall knowledge, reason mathematically and solve problems in a variety of contexts.

We constantly review our curriculum every year based on input from all of our team and the feedback they give throughout the year during informal discussions and more formal department meetings.