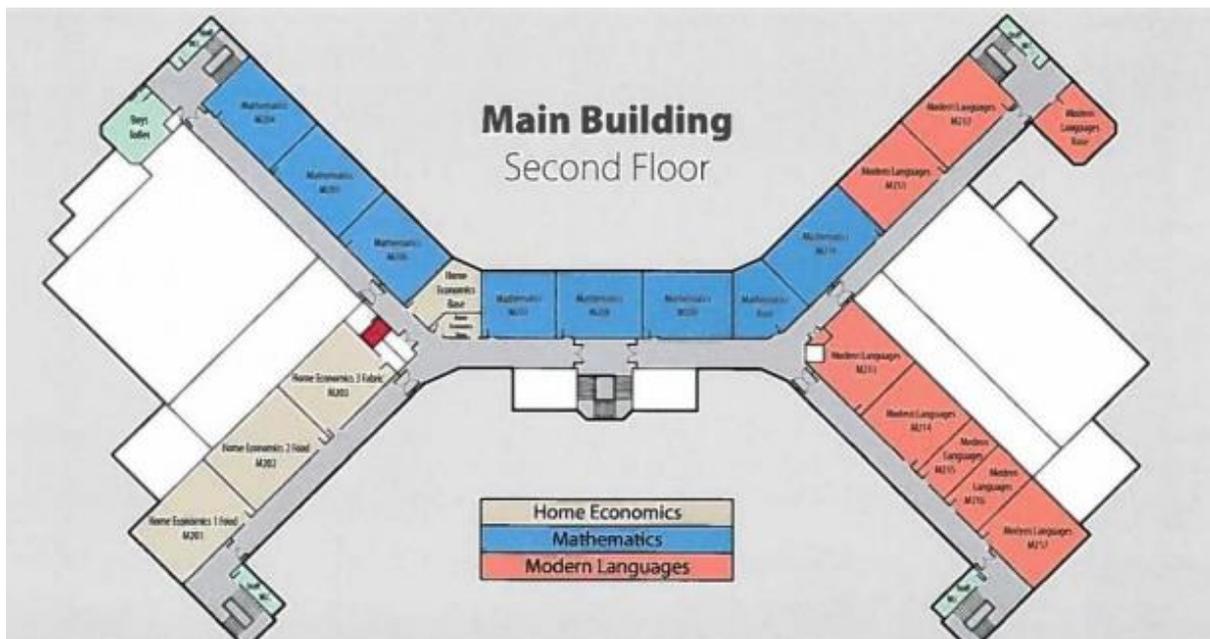


# Hillhead High School



## Department of Mathematics



## Departmental Handbook for Parents and Carers

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## **Introduction**

Mathematics is at the intersection of tradition and innovation and our philosophy of learning and teaching reflects this. As well as developing content knowledge, young people grow as mathematicians throughout their time at Hillhead. This involves regular engagement with problems, creating their own and reflecting on the process – individually and collaboratively. The subject is vital in fostering a love of learning as well as developing more general learning capacities such as curiosity, creativity, and resilience. There is a reason that mathematical thinkers are highly sought after by employers and universities! Being numerate is also becoming increasingly important in being a well-informed citizen.

A mastery approach is fully embedded in the department. Mastery is a fundamentally inclusive model that implicitly promotes a growth mind-set in a meaningful way. Time is removed as a barrier to learning and teachers are encouraged to develop their range of metaphors to get it right for young people. Depth is prioritised over tokenistic coverage to ensure that young people gain a true understanding of ideas and can connect these ideas across the curriculum. Staff are continually gaining a deeper understanding into mastery with CPD, professional discussions and extensive reading forming the basis for this.

At Hillhead High School, staff development is a priority. As a result of this, there is outstanding expertise across the department. More importantly, a collegiate approach is evident, and teachers regularly help each other's classes by hosting many supported study sessions throughout each week. New schedules can be found in the math

## **Curriculum**

Although our curriculum has been carefully developed over many years, it remains a work in progress. A major part of the work done so far has been developing and implementing a mastery model. We have created and refined a formative-assessment model where homework and quizzes are essential tools for learners and teachers to improve.

Time has been removed as a barrier to learning and have opened pathways to Higher Mathematics that were not previously available to young people. This inclusive model ensures that a deep understanding of mathematical concepts is developed, and confidence is built. Ideas are then connected, complex problems are solved, and learners can think about mathematics in increasingly creative ways.

This is enhanced by the two-year model in the Senior Phase which allowed students to focus on fifth year qualifications from earlier – progress is not slowed by having a break for examinations in S4. Learning mathematics is a continuous journey – ideas developed at Third Level are essential to develop ideas at Higher and beyond.

We have no fixed setting policy in the department – we will do what is best for the young people in each unique year-group.

## Third Level

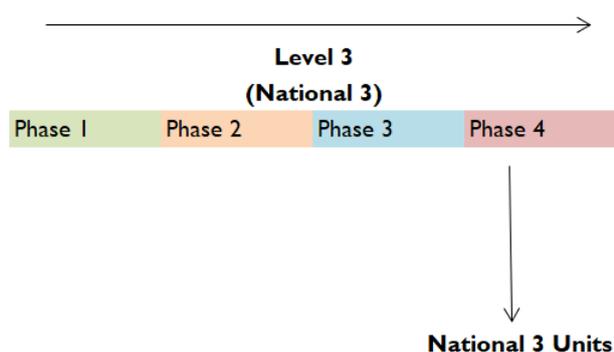
All students who join Hillhead in S1 begin the curriculum at Whole Numbers and work through each phase, taking the time that is needed. Although many of these topics will not be completely new to young people, these are studied in depth and often go into more detail than third level requires. This is especially the case when we know concepts will be essential to master for enjoyment and success at later stages of the curriculum.

As can be seen from the table below, there is a big focus on Number throughout third level. Time is invested in this area as all other areas of mathematics build upon it.

Should any student join the school after the beginning of S1, they will be assessed using information from their previous school as well as some in-house testing to ensure they begin the journey at the best starting point for them.

	<b>Number</b>	<b>Algebra</b>	<b>Geometry &amp; Measure</b>
Level 3 Phase 1	Whole Numbers Integers 1		Co-ordinates Angles
Phase 2	Factors and Primes Decimals Integers 2	Expressions 1	Length
Phase 3	Fractions Ratio	Equations 1	Area
Phase 4	Percentages The Link	Equations 2	Volume 1

Having mastered content at third level, young people are more than equipped to pass qualifications at National 3. For some classes, National 3 assessments may be completed at this point before fourth level is embarked on.



## Fourth Level

Although algebra is introduced during third level, it is developed in much more detail in fourth level.

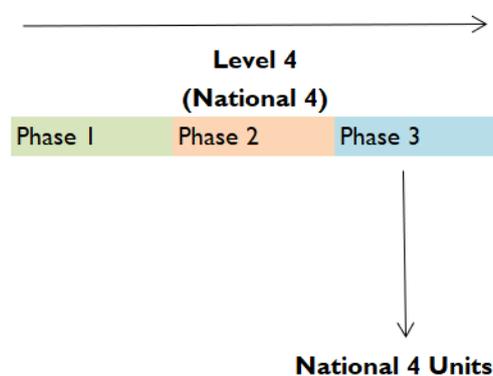
Pythagoras' Theorem and Trigonometry as essential concepts for future experience of mathematics. These ideas occur very naturally and are the key to solving many geometric problems.

Becoming data literate is essential to becoming an informed citizen and some methods of analysing data are explored in depth at this stage.

As is the case with third level, students will often go into more depth with concepts than fourth level Experiences and Outcomes outline. Again, this is to best meet the needs of learners in the long-term. Sustainable understanding and mastering of key ideas is always the priority over short-term box-ticking.

	Number	Algebra	Geometry & Measure	Data
Level 4 Phase 1	Fr, dec, %	Expressions 2 Equations 3 Inequalities	Circle Pythagoras' Theorem	
Phase 2	Scientific Notation	Straight Line 1	Trigonometry	Data Analysis Time and Money
Phase 3	Significant Figures	Simultaneous Equations Factorisation	Volume and Surface Area	

National 4 is a natural jumping off point for students who complete fourth level in S5. Many other students will complete their National 4 assessments at this stage even if they intend to continue to fifth level (and National 5) or beyond. This is to ensure that students can fully focus on future qualifications safe in the knowledge that National 4 has been achieved.



## Fifth Level

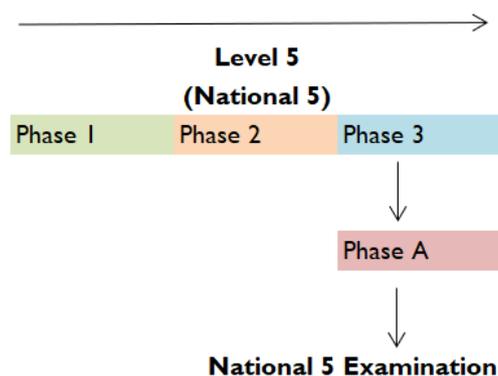
At fifth level, mathematics becomes more abstract again with a further focus on algebra. However, it is not quite as simple as placing the topics into the headings. For example, indices are arguably number and algebra. Students should be beginning to see how the various branches of mathematics are connected.

Although fifth level is pitched at National 5 level, all ideas encountered in phases 1 to 3 are essential for Higher and, as is the case with prior levels, depth is prioritised over simply checking off learning intentions.

Phase A rounds off the final topics required for National 5 examinations. Students who are continuing to work at sixth level (Higher) are not required to work through Phase A.

	Number	Algebra	Geometry & Measure	Data
Level 5 Phase 1	Surd	Completing the Square Quadratics 1 Changing the Subject		
Phase 2		Indices Quadratics 2 Function Notation	Trigonometric Graphs	
Phase 3		Trigonometric Equations Algebraic Fractions	Vectors 1 Volume 2	
Phase A			Arcs & Sectors Similarity Angles in Circles Sine and Cosine Rules	Measures of Spread

Following the completion of Phase 3 there are two pathways for students. Some young people will complete Phase A with a view to sitting the National 5 examination at the end of S5. Others will move onto Phase 1 of Level 6 with the plan of sitting Higher at the end of S6. This depends on the needs of the student.



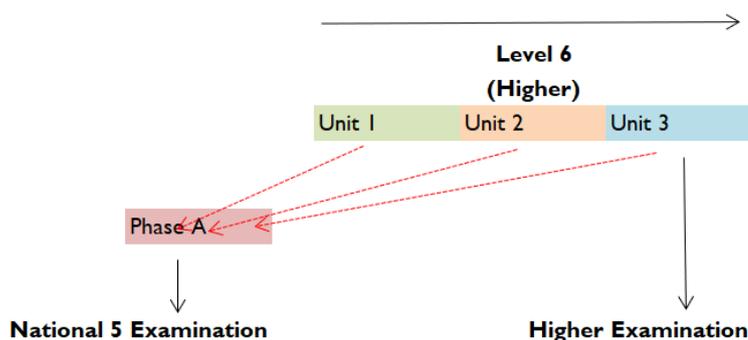
## Sixth Level

Sixth level is essentially the Higher Mathematics course. However, because of the time invested at earlier levels (and the two-year model), students at Hillhead should not find the jump from fifth to sixth level quite as daunting as in other contexts.

Students experience their first taste of Calculus at this stage. Calculus is the mathematics of change and is a huge part of many mathematics, engineering, and science courses at university. As well as being underpinned by many ideas from third level to fifth, there is a rich and exciting history of calculus to learn about too.

	Number	Algebra	Geometry & Measure	Calculus
Level 6 Phase 1	Logs and Exponentials A	Straight Line 2 Functions Recurrence	Trigonometry A	Differentiation I
Phase 2		Polynomials Quadratics 3 Circle	Trigonometry B	Integration I
Phase 3	Logs and Exponentials B		Vectors 2 Trigonometry C	Further Calculus I

It is essential that students are presented for the correct qualification in S5. There is a rigorous monitoring and tracking structure so that students can sit the National 5 examination rather than Higher if that suits them best. This involves students completing Phase A before sitting this examination. However, the vast majority of students who begin Level 6 will sit the Higher exam at the end of S5.



## **Assessment**

Assessment is used to ensure that students have the most positive experience of our subject as possible. As mentioned, we thoroughly believe in a mastery approach to learning and efficient assessment is an important part of that. The various types of assessment are designed to be part of the experience and should not feel cumbersome. Students are regularly receiving feedback in a number of ways following or during this process.

### **Formative Assessment (Daily)**

You will see a range of formative assessment techniques in our department. From the use of mini whiteboards to exit passes, teachers are well trained in several techniques and use these creatively to ensure that learners are ready to move on. This is the most important type of assessment and teachers in our department are experts at reacting to the information gleaned from students in-the-moment and work hard to make creative pedagogical decisions that are best to facilitate learning.

### **Homework (Nightly)**

There is a bank of nightly homework exercises on the system for staff to choose from and adapt. The idea is that lessons are a place for learners to explore mathematics whereas homework is for more routine exercises to aid memory. Homework marking procedures are at individual teacher discretion although peer marking, whole class marking, and self-marking are all recommended and evident. It is clear to young people that homework is designed to help with retaining knowledge as are quizzes and other assessments. The department also runs a huge amount of supported study (before and after school) in the department to provide young people with a quiet place to do homework and seek help with problems.

### **Quizzes (Fortnightly)**

Fortnightly quizzes are usually based on the last two weeks of homework. Marks for these are put on the system with this data being used to inform next stages of teaching and learning. It is clear to everyone that these assessments are for learning and we are working together on how we use the information gleaned from quizzes to improve learning.

### **Tests (Phasely)**

End-of-phase summative assessments take place when students are ready for it. Revision packs are provided at least two weeks in advance to allow young people the opportunity to prepare thoroughly. As the aim of our curriculum for students to master mathematical ideas, it is important that mastery of ideas is demonstrated in these assessments. It is for this reason that we usually insist of a pass-mark of 80%. Concepts in future phases all build on previous phases so, to stand a chance of success, we invest time in each phase rather than moving on because time tells us to. Furthermore, resits are available so students can remediate. Again, materials and support are available for this.

## **Resources**

Microsoft Teams is the main online platform that is used by the department for students to seek resources whilst at home. This includes materials such as Departmental Booklets (see below) and support from their teacher and their peers. A few digital 'textbooks' have been created to bridge the gap between learning with a teacher and learning individually. We will see how effective they are before these become more widespread.

Topic Overviews are designed to guide the teacher pedagogically and didactically. You will find all learning intentions here and the teacher has the freedom to decide which resource is best to meet the needs of their class and their personal pedagogy. Although not designed for this use, these can be sent to parents upon request to obtain a clear idea of the details of a topic.

Departmental Booklets are designed to provide practice of key mathematical actions (e.g. finding percentages, solving equations). These are not necessarily to be worked through in order – the teacher may pick specific pages and/or questions – and are useful for revision. Furthermore, they are not designed to be given out with no input from the teacher.

Problem Books are designed to put learning from previous years into action. The purpose of learning to do various mathematical actions is so that they are available when needed. These problems require these actions to be carried out spontaneously (i.e. without the help of a teacher). Although this is useful for and reflect of what happens in examinations, this is not the only benefit – a joy of problem solving will likely be developed as young people gain success in solving problems.

It is rare that we find a textbook that we feel meets the needs of our students. However, there are times where a textbook does the job and teachers are free to use them if they find one that is the best option.

## Mathematics across the Curriculum

Maths is a subject that you will study from Primary School to your senior years at Hillhead High School. Some students brave it and venture into maths at degree level or beyond. Many of your classes and clubs in school involve counting, estimating, measuring, weighing, using statistics, and analysing data.

For example:

- In Social Subjects you could be asked to analyse charts and graphs.
- In Science you could be asked to make up a formula for an experiment you are working on.
- In Computing you may have to use complex equations and algorithms when designing and writing computer programmes.
- In Science you could be asked to find the number of molecules produced in a chemical reaction using equations and formulas.
- In Art you might have to create new colours by correctly mixing the correct ratio of different pigments.
- In Photography Club you would use maths to calculate things like shutter speed, lighting, and angles.
- Pupils studying drama, music, dance can benefit from basic mathematical knowledge due to the way maths informs rhythm and the basic beats of dances.

As maths teachers we often get asked the question “Where would we use maths in real life?” Well the answer is we use maths all the time!

Many people are at a disadvantage in their daily life due to their poor knowledge of maths. Here are examples which show that maths is essential in our lives and is everywhere.

- Shopping: Maths surrounds you the minute you step through the doors of a shop (The automatic doors and security scanner you pass through are composed of electronic systems that could have never been designed by maths). You use your mental maths skills as you shop to roughly work out how much your shopping will be. If there is a sale on you may use percentages and fractions to work out how much you will save. When you pay for your shopping you should use your subtraction skills to make sure you get the correct change back (the products that you buy all have a barcode and are scanned by a laser, this couldn't be possible without maths!)
- Cooking: For cooking you may be following a recipe for 3 people, but you need it for 4 people therefore you have to adjust your quantities using your proportion skills. You should also know how to convert weights and how to use fractions (the recipe may say mix  $\frac{2}{3}$  of 600g flour)
- Buying a House: When buying a house, you must look at all your money calculations wisely. You will need to look at interest rates and work out the best deal to help you pay your mortgage. Once you buy your house you will then need to use a range of different skills when doing up your home. For example, you will need to measure for carpets and flooring. Once you are settled in your house you will need to make a monthly budget for food, petrol, holidays, etc.

- Fitness classes: in aerobics you need to keep count to stay in sync with the sequence of movements.
- Sport: In sport you use lots of maths, to calculate a distance, speed, or time. To calculate the angle of a shot or how far you need to throw a ball. You would use probability skills too when making decisions in-the-moment.
- Organise yourself day to day: To count days and months, evaluate the time needed to perform a task.
- Getting from A to B: To estimate the distance and time involved in getting to a destination.
- Planning a trip: This involves budgeting for the trip and using maths operations throughout the trip such as dividing food bills, working out exchange rates etc.
- Sewing: Maths is applied when using symmetry, to calculate angles and to make the correct cuts to create an accurate pattern.
- In scuba diving: To stay safe by evaluating the depth, the amount of air remaining, the time between dives.
- To solve puzzles and other mental maths games.

We hope this shows you how important Maths is and we really hope you enjoy studying Maths at Hillhead High School.

## **Staff Profiles**

### **Mr Carson (Principal Teacher of Mathematics)**

I joined Hillhead as PT in May of 2019 (although I was a student-teacher in the school many years before this!). Before this, I taught at St. Mungo's Academy and St. Paul's High School.

My undergraduate degree is in Chemical Engineering. This is very useful as it gives me a first-hand idea of the uses of mathematics outside of the subject. For example, designing a reactor involved planning the geometry of the tank (volume, surface area), flowrates (calculus) as well as the financial implications of this area of the chemical plant. In the end, I enjoyed the maths more than the chemistry which led me to maths teaching.

My favourite thing about maths is that you don't need anything for it. A pencil and paper are useful, but I often like to just think about mathematical ideas. Often, I can be stuck on a problem for a while and it is later, when I least expect it, that the solution comes to me. I love moments like that. I especially love seeing this happen in my classroom.



### **Miss Copland (Teacher of Mathematics and Principal Teacher of Raising Attainment, S5)**



I have been a member of Hillhead's Maths Department since August 2016.

My undergraduate degree is in Mathematics & Statistics. I originally wanted to be a primary teacher but after 4 years studying Maths at university I thought it would be a crying shame to learn all that I had learned just for a graduate certificate and then forget it all. I chose teaching to keep that joy from maths alive for myself and bring it to life for pupils, who so often complain of hating the subject.

What I know and understand about Maths would be useless if I couldn't teach it, if I couldn't make others see what I see and I wouldn't enjoy it half as much if I didn't have the opportunity to see the maths as others see it, how the pupils see it. Maths is a never-ending conversation of questions and answers.

### **Mr Scanlan (Teacher of Mathematics)**

I joined the maths department at Hillhead High School at the beginning of 2017 and I have loved every minute of working with the young people of Hillhead.

I have a degree in mathematics which I choose to study further after school as my high school teachers encouraged and inspired me to delve deeper into the subject. My career has been shaped by the influence that my maths teachers had on me and that's what I remind myself of every day when I am teaching; my actions will have a lasting effect on my pupils and therefore I have a great responsibility to ensure my actions are the right ones, which in turn I hope will inspire my pupils to enjoy maths as much as I do.



### **Miss Lennox (Probationer Teacher of Mathematics)**

I joined the department in January 2020 during my second PGDE placement and have been lucky enough to also be able to complete my probationary year here at Hillhead High School.

Prior to completing my PGDE at Strathclyde University I worked for Moray House School of Education, at the University of Edinburgh, and then taught English in Spain for 4 years. These experiences helped solidify the knowledge that I wanted to pursue teaching as a career.

My undergraduate degree is in Chemistry, but I've always enjoyed Maths since school due to its logical nature. My favourite part of teaching is watching pupils progress whilst enjoying the learning process.



### **Miss Jackson (Teacher of Mathematics and Nurture)**



I studied Mathematics at Strathclyde University, I taught at Castlehead High School and Ardrossan Academy before joining the team at Hillhead. I really love working at Hillhead as there is a great community spirit within the school and I have worked with many wonderful pupils and teachers over the past few years.

The Maths department has a great buzz about it. We are constantly discussing maths problems and coming up with new ones for you to solve. Maths is such an interesting subject and we want to share this with you.

Outside of school I love to travel and play sport so feel free to come and have a chat about your holidays and give me some new ideas of places to visit! I take a running club within the school so if you are a keen runner, I hope to see you there.

### **Mr Barcella (Teacher of Mathematics)**

I completed my undergraduate degree in Mathematics through the Open University with a focus on applied maths. I did not immediately venture in to teaching and in fact spent over 10yrs in business before deciding to pursue this career. My own life experiences have further proven to me how fortunate I was in having received a great maths education.

I joined Hillhead High as a student teacher and have been here ever since. I genuinely relish the challenges of “doing” maths but perhaps even more so, nurturing others as they embark on their own mathematical journey. As a teacher I aim to inspire young people and ensure that they develop the skills required to forge whatever path they choose in life.



### **Mrs McCarthy (Teacher of Mathematics)**



I have worked in Hillhead High teaching Mathematics since 2008. I was Principal Teacher of the department from then until 2014.

I now teach Mathematics 3 days per week (Wed - Fri) Before arriving in Hillhead I also worked in Lourdes Secondary school from 2000.

Teaching is the only career I ever wanted, and I have been very lucky to be doing this for over 20 years and still love it.

I went to Strathclyde University and studied Maths and Sociology before going to teacher training at Jordanhill.

As well as teaching Mathematics I enjoy running with staff and pupils in our running group.

My favourite part of my job is getting to work with so many different people of different ages and backgrounds.

I am very lucky to work in a department where each one of us wants to make a difference for the young people we work with. Long may it continue.

### **Mr Pender (Teacher of Mathematics)**

I am an honours graduate from the University of Strathclyde where I studied Pure Mathematics. After university, I pursued a career in the financial services sector becoming professionally qualified and enjoying employments in Edinburgh, London and Glasgow. After 15 years in Finance, I decided to change direction and moved into education where I hoped to share both my professional experience and enthusiasm for Maths. I have now been teaching in Glasgow for nearly 15 years and it has been a very rewarding experience and a privilege to work with so many vibrant young people.



**Miss Higgins (Teacher of Mathematics and Principal Teacher of Pastoral Care)**



My undergraduate degree is in Mathematics. I then completed my PGDE in Secondary Education and began my career in teaching.

My first teaching job was in Barrhead High. I then worked for four years at Bellahouston Academy, which I loved. It was there that I experienced the amazing work and relationships integral to the Pastoral Care role within a school. I started at Hillhead High in August 2015 as a Principal Teacher of Pastoral Care. I am very fortunate that the schools I have worked in have allowed me to continue teaching Maths whilst carrying out my Pastoral Care duties. I would never like to be in the position where I had to choose teaching Maths or doing Pastoral Care, as I love both! Hillhead High is a fantastic school and I am so grateful to be part of such a great team and work with such amazing young people.

**Mr Neil (Link Deputy Head Teacher for Mathematics)**

It is great being the link DHT for Maths. All the staff in the department are so enthusiastic about their subject area and are there to help every pupil develop and improve their mathematical skills. Every pupil who steps into the Maths Department has the capability to improve and the teachers will always work hard to positively encourage you to reach your potential in the subject. I know you will enjoy your experience in Maths. Always work hard and be certain that Mr Carson and his team will be there to support you throughout.



## **Contact Details**

There are several ways to get in touch with us.

If you are having an issue with homework or revision, the quickest way to get in touch with your teacher is through Teams. Post on the wall and a teacher or a classmate will be able to help.

Some teachers prefer to interact by email and will give you their email address if this is their preferred option. Staff emails can also be found by searching on Glow.

The department Twitter is [@HHS\\_Mathematics](#) and can be used to keep informed of events within the department.

For any other issues at all, please contact Mr Carson by email [gw11carsonthomas3@glow.sc.uk](mailto:gw11carsonthomas3@glow.sc.uk).