

Curriculum III Maths

Ambition

- Subject sentence – What is the quest of your discipline?

"The Mathematics department ensured that every student could become skilled educated citizens who use logic and problem-solving skills to explore, analyse and understand the world around them."

- How does your subject address social disadvantage by equipping students with powerful knowledge?

Every student comes into Trinity with an idea of where they want to get to, what they want to achieve. We encourage them to aim high and to aspire to climb the mountain. Some believe there are barriers to those careers just like some believe they can not be successful at maths. Maths is a skill, not a talent and we teach those skills to each of our students, so they have to opportunity to achieve their goal through hard work. Our curriculum is based on our most vulnerable students which is then scaled up to meet everyone's needs. We spend time planning our intervention so that it is highly tailored to each individual fairly so vulnerabilities are not a hinderance for those striving high. The powerful knowledge they learn can and will open those doors by equipping them with highly desirable skills sought after by many employers and giving them the ability to be a successful independent individual. No matter where they want to go, the skills they learn in Maths will help them develop fluency in their thinking and logic in their approach. Every student has the ability of being successful in Maths if the opportunities are presented and the hard work is put in.

- What skills and cultural capital do students acquire in your subject?

Skills that are acquired are those need to be independent adults who can live on their own. We teach them the skills to identify how much they earn, what their tax is, how much they will spend on food shopping. We teach how to identify good interest rate for loans and savings accounts. All the percentage work, fractional work, and the problem-solving skills they will need to know how to live sensible and within their means.

- How do you make Careers education explicit in your curriculum?

At the beginning of every lesson there is a purpose. This purpose states a reason why we learn this topic which includes career possibilities for the subject. Teachers should read through the LI and then discuss the purpose as a class so the students can see the link clearly between the careers and content. There are also career spotlights every half cycle which provides information on interesting careers you can do within the specific topic. This ensures that the students are not only exposed to a variety of careers but also how they link to Maths. Going forward we will focus on the qualifications available and what careers you might need a maths qualification for; As/A-level maths, Level 3 Core Maths, Apprenticeships. A large issue is that students do not tend to think that Maths leads to anywhere other than teaching maths. We think it is important to raise awareness of careers such as Economics, Business studies, Psychology which are all examples of careers that maths plays a big part of that may not be obvious.

- How does your curriculum support Civic Responsibility for the local community?

Civic responsibility involves trying to solve issues that arise in the community and to do this a proposal has to be submitted. We teach them how to approach a problem and think logically about what steps to take which will solve that issue. Within maths we teach students how to give facts that support their arguments and back up what they are stating. Through statistics and averages we teach them how to analyse data so they can really understand what information they can use effectively. The skills we teach in maths will help those in the community analyse the problem and put together a cohesive logically proposal that might help fix it.

- How does your curriculum approach issues surround race?

Race is not an issue that has typically come up for the subject of maths as we teach a lot of hard facts about the material. However, to address this we are currently introducing a purpose slide for each lesson which goes into the history of the subject and the important figures behind the concept being covered. We are actively trying to include people from varying different backgrounds and origins to make sure a fair representation is being given of the important figures. We are also using career spotlights to help tackle this issue giving examples of varied careers and people within those jobs from different walks of life. Another step we are taking is to add in the History of Maths to the purpose slides in each lesson. This is to allow students to see that the history of maths is global and to see the different influences from different cultures.

- What additional experiences (including expeditions) do your students access in your subject?

We are currently and in previous years have done TTRS in school and towards the end of the year we have taken a couple of students to the final of the TTRS competition. This is an event that explores puzzles and logic games to challenge the student's way of thinking. We also do the UKMT maths challenge each year for year 7-10. This is an excellent way of introduces problems that requires a different way of approaching the question to gain speed and accuracy. This can bring something different to inspire students to pursue maths in school. There are numerous days throughout the year such as Pi day and Number day where we introduce the students to key important ideas in maths. We would however, like to organise a maths centred trip to do with engineering or architecture to really immerse students in the practical applications of the higher-level maths topics.

- Where does your curriculum link with the PDS curriculum?



The PDS curriculum is centred on giving the students knowledge outside of academia to help them becoming functioning and contributing members of society. The skills in maths come up in these discussions when introducing the students to the idea of living independently. In this scenario they may need to be able to evaluate their finances, work out interest on loans and be able to decide what they can afford to buy. They also need to be aware of things not in the curriculum like mortgages and rent which will affect their everyday and relies heavily on them being able to apply percentages to different amounts of money. Something else that may be covered in PDS is how to cook meals for themselves and understanding how to weigh ingredients or adapt a recipe to more than it is designed for. When they may have family round calculating how many drinks or how much food will use those keys maths skills so we look to involve real life examples when we can. In PDS it is often a space for debate when something like politics and within this often come reports and statistics that try to back up their argument. Maths explores the logic behind these arguments and allows students to analyse the data themselves as well as evaluate whether the data is viable. This allows them to have a clearer and well-rounded understanding of what may be happening in the world.

- How do you support personal development through House and Stretch?

We encourage the idea of unity and individuality within maths to help support our student's personal development. We work closely with the House team to ensure that Maths is something the students are exposed to outside of lesson. We run numerous maths day with themed quizzes and ideas which also include house competitions. We also encourage the students to evaluate their approach to something which are skills they will use when researching and putting together their stretch presentation. The maths skills we teach helps the students to evaluate what is a good source of information and if the key facts are valid or misinterpreted.

Rationale

- How is your curriculum designed?

The curriculum is designed to support the students we receive from primary to "climb their mountain" and be successful independent individuals. This to us is a sufficient and working knowledge of Maths which they will see in their everyday lives and careers. The students in year 7 come to us with varying ability and topics they have covered in primary so our curriculum covers all the foundation skills to make sure every student can access the material later in school. To achieve this mathematical fluency and understanding the curriculum is designed to be intelligently sequenced so the students build on the foundation block of knowledge which is then developed upon year on year. In year 7 we cover the basic skills needed to access this content. In year we then build on this knowledge adding in more difficulty and content, so they have a good understanding of most of the key ideas. In year 9 we introduce and cover the context these questions may be asked in for example, proportion and building, decorating and Pythagoras. We continue to build on that previous knowledge constantly revisiting it to allow the students to make links to knowledge they may already know. In key stage 4 the content is designed on developing the problem-solving skills. We start to focus on introducing questions where they must figure out how to answer the question and therefore apply knowledge to a broader spectrum of topics. This is to help us create logical thinkers who can solve problems by applying previously learnt knowledge.

- What content do you cover and how is this delivered over time?

Maths can be split into 4 major topics which are Algebra, Geometry, Number and Probability and statistics. Each major topic can be split into lots of smaller topics with varying degrees of difficulty. Each topic is taught in every year throughout KS3 and KS4. Year 7 start with the building blocks of each of these such as adding fractions, collecting like terms, angle facts, Averages etc. In Year 8 we build on this knowledge by introducing angles in polygons, multiplying single brackets and from grouped data. In Year 9 we start adding in context to each of these topics so that the students must start to use their knowledge and applying it to scenarios as well as more complex content such as quadratic sequences. In year 10 we develop this further by adding in more complex problems which may include factorising quadratics and circle theorems. In year 11 we focus on revising and retrieving previous knowledge to build the concepts stored in their long-term memory.

- Which content do not you cover (that others might)? Why?

Statistics is a separate course that was taken a few years ago but is now no longer offered. This is partly due to lack of specialism and staffing. The basic idea of Statistics is covered at GCSE regardless so the students can still gain the necessary skills needed to understand data.

- How many lessons do students have per week, for each year group?

Groups 3,4 and 5 have 5 lessons a week in KS3. Groups 1 and 2 have 4 lessons a week in KS3. In KS4 all groups have 5 lessons a week.

- Which exam board to you use? Why?

We use Edexcel for the GCSE's exam. There are a few reasons that we chose this exam board. Overall, it is the most popular exam board nationally and within the trust. This has two main benefits; because it is more popular there are a lot of resources which are more tailored toward Edexcel. Also, because it is used more often it makes collaboration between schools easier especially within the trust, this makes sharing resources and revision simpler. We also tend to find that they have greater variability of questions which does not include multiple choice questions as we think these do not tend to evaluate the right skills. Lastly Edexcel questions seem to have better accessibility as they try to give clearer signals about how to show answers; they put lines when they want words and space when they want working out.

Concepts

- How is your subject curriculum designed and delivered in a way that allows pupils to transfer key knowledge to long-term memory?



Maths is a hierarchical subject where learning on concept heavily relies on being confident with a prerequisite concept. With this in mind our curriculum is designed in a way to continually return to previous knowledge and logically build on that year on year. If you imagine constructing a strong building you first start with the foundations of each rooms, making them strong and firm so that the building will stand for a long time. In Year 7 we start with the foundations of each skill across the four main areas: Number, Algebra, Geometry and Ratio and Statistics. We cover the very basic skills they need to start accessing these questions when faced with a test and also fill in those gaps from primary school. Then as with a building, you build the bare outside structure of each room. In year 8 and year 9 we covered each topic building the knowledge and frames so they will be able to understand the harder concepts. While these are covered, we revisit the previous main concepts in Do Nows and Homeworks. This means that the students are constantly revisiting previous work, each time with a longer gap helping to solidify that knowledge in the long-term memory as they work hard to retrieve the information they have previously learnt. In Year 10 we start to add the parts and design that make the building look finished. We fill in any gaps, we add the harder style questions which challenge their contextual knowledge and tries to encourage their critical thinking. Finally, in Year 11 we revisit the topics, testing and re-testing, filling any gaps that may have appeared so that they have a well rounded, excellent quality education that will see them through years of their life and help them achieve the "top of their mountain."

- How do you intelligently sequence your curriculum so that new knowledge and skills build on what has been taught before?

The curriculum is based on the building blocks format. We start with foundation blocks in year 7 which is then revisited every year adding in slightly harder extensions each time. Example - Triangles (Y7; properties/angles/types, Y8; constructions/Angles in polygons, Y9; Angles in Regular, Pythagoras, Y10; Trigonometry, (3d), Angles with Algebra, Circle Theorems, and geometry with proof. When we plan these lessons, we always have a review now to revisit the pre-requisite skills which then also allows the students to see the progression of a topic. We then introduce the new knowledge giving one new idea at a time to reduce cognitive load. We focus on the process and practicing that until they are confident before moving on therefore encouraging confidence and the motivation to work hard. We also link topics as we meet them adding another layer onto the skills they have learned. We sequence by starting with ideas that pop up everywhere, for example fractions. Then once the skills have been embedded, we might teach area, a new concept. Once that key skill has been learnt we may bring these two ideas together building on the previous knowledge and preparing them for application of multiple topics together.

- How do you use spaced practice / retrieval practice?

We cover a Learning Intention of new content each week. At the end of the following week allowing for a gap, the class will be given a mini test which will ask the students to retrieve that information. We then mark and do DIRT work on those mini tests, revisiting the learning and embedding the key ideas. At the end of the week after that they do a second mini test like the first to reveal how much they have retained. At the end of the half cycle, we then do a midi test which combines questions from all the mini tests asking the students to not only retrieve the knowledge but also judge where to use it. This further embeds the knowledge and leads to high retention as they must work harder to bring it into their working memory. In the year they do 2 full cycle assessment which will test everything they have learnt including topics being used together. This develops a pattern of testing and re-testing with an increasing gap each time; 1 week, 6 weeks, 13 weeks and 2 cycles which therefore supports the conversion from working memory to long term memory. Also, Retrieval practice in Morning Meeting and Do Nows in lesson are 5-10 questions based on the previous cycles work making sure that the students do not lose any knowledge that was taught a long time ago. Another way of using retrieval practice is brain dumps. Brain dumps are included in the weekly morning meetings and in the 100% homework the students complete this week. This is a mental exercise which helps the students commit knowledge to their long term memory.

- How does your subject use homework to support learning?

Hegarty is set every week based on previous weeks do now which is based on previous cycles learning. Teachers can also set topics which they feel the class needs more practice on. Hegarty also includes Memri which is set each week and is 5 questions on things they have already got right. This helps to provide high morale and keep up the skills which they already know as practice is needed to keep these in the long-term memory. The students also complete weekly 100% homework on maths where they do Look Cover Write Check on the key facts within the specific topic. The tests and retest their knowledge allowing the students to learn the key facts which will support their learning in lessons.

- How is reading and mathematical fluency prioritised in your subject?

We have key words in each lesson where we discuss meaning and understanding to help expose them to different types of words. We also ensure our students are answering in full sentences both verbally and in their writing. Questions often involve context and are heavily worded, so it is important that the students understand these questions. We add worded questions to each lesson we can and often have a full lesson devoted to worded/contextual questions.

Implementation

- Subject leadership – What are the roles and responsibilities for staff in your department?

The subject Head of Department would be responsible for monitoring the delivery of curriculum and making sure all staff are aligned in their teaching methods to reduce confusion in the possibility of cover. They would take the lead organising assessments for each year group, taking the lead on Year 11 in terms of priorities for teaching and taking accountability for their data. The HOD would also be responsible for collaborating across the trust to discuss and implement best practice. This responsibility is currently shared between EST, DKA and VHA. DKA and EST have taken the lead on Year 11 focussing on priorities for revision and organising mocks. ZMA and CTO take the lead on the other year groups organising the staff to ensure resources are made, teaching is consistent, and intervention is planned. CTO helps in ensuring teaching is consistent and that constant progress is being made toward best practice, she has also taken



on most of year 9/10 resources and SOW which include booklets and planning the scheme. KMA is Head of Year 7 and delivers successful curriculum lessons to KS4. ZMA and CHA both had responsibilities in making knowledge organisers, booklets and developing their ability to collaborate on Whole year group lectures. CHA also has the responsibility of designing and doing the preparation for Drill and TTRS. THA teaches Mat KS3 as well as History and significant SLT responsibilities. IHU also teaches some groups fours to bring more expertise in teaching and supporting SEN students.

- Subject knowledge – What are the staff specialisms? What has been the impact of staff training?

EST, DKA and AGR specialise in teaching GCSE and have taught Year 11 for many years so have the most experience at that level. VHA specialises in teaching foundation and supporting the students who may need that extra push to achieve their highest potential. KMA can teach and support those on the line between higher and foundation and can teach Geography as well. CTo can teach the full range of GCSE higher and foundation but specialises in Geometry and Proof in algebra. CHA has a maths degree and has excellent subject knowledge allowing support for the lower years to develop fluency. ZMA can teach KS3 confidently with a focus on developing mathematical rigour. IHU brings a knowledge of supporting SEN not previously seen within the department which allows the staff. There is ongoing department CPD to explore the best ways of content delivery however we also think it would be beneficial to involve different members of staff to deliver sessions on content. I also think it would be beneficial for staff to go on the occasional CPD course to ensure knowledge is kept up to date.

- Equitable delivery – How do you support disadvantaged students and students with SEND?

Our delivery and resources are planned with our disadvantaged, SEN students as the main learners. All students follow the same scheme and to level the playing field group 3 and 4 receive more lessons and therefore have more time to cover the content. Our booklets are designed to allow for clear scaffolding and giving access to material that students may not get elsewhere. All our group 4 lessons are double staffed to ensure smaller groups which provides greater room for the teacher to support individuals who may be struggling. We support students with additional physical needs through individual printed resources and using the visualiser to model answers. These resources make sure that a student can access the material no matter what challenges they may have. We also provided double staffing on each of our group 4 classes which is also, this year, a subject specialist. This ensure that those who need a little extra support have that help from a specialist who is knowledgeable of the content. We also support them ensuring each student has the opportunity to access these grades by entering them for foundation or higher depending on their attainment while at DTA.

- Planning the progression model – How does a certain topic (e.g., algebra / language analysis) progress across the key stage(s)?

Maths is a hierarchical subject where one concept usually heavily relies on having learnt a prerequisite concept which is why our curriculum is designed like a pyramid. The foundation blocks are taught in year 7, these are the skills that you need to answer any algebra questions. Once this knowledge is in the long-term memory, we can build on this knowledge to include solving and factorising etc. These are new skills which are needed to answer the KS4 questions and once this is embedded, we can develop further into the more complex problem-solving questions which combine topics such as geometry and algebra. The result is a lasting knowledge that will stand the test of time and will lead to a deeper understanding of how maths appears in the world and how it might be used in their careers. Below is an example of how the topics progress over each year.

Year 7 - Algebra - Algebraic notation, basic sequences and collecting like terms

Year 8 - Collecting like terms, simplifying, expanding single brackets, sequences and solving

Year 9 - Quadratic sequences, expanding double brackets, factorising, plotting linear graphs

Year 10 - Plotting quadratic graphs, completing the square, quadratic formula, proof,

Year 11 - circle theorems, Revision

- Breadth and depth – How do your LTPs / SoW demonstrate extent of knowledge and skills coverage and depth?

All schemes of work and LTP's ensure that students develop mathematical fluency by linking in pre-requisite skills and showing how they develop into the content being taught. It ensures that the students cover a wide variety of topics which all interlink. These moments where they interlink helps the students develop the deeper understanding of just how influential maths can be in their lives and career. The scheme includes lots of career spotlights so the students learn where the concepts they are learning will appear in everyday life. When looking through the long-term plan it is clearly shown how each topic progresses through the years following the students own personal development as well. In KS4 there is a heavy focus on exam technique and tailoring our teaching to each specific group. The LTP's and SOW demonstrate this by having a more scaffolded approach planned for those more vulnerable children and having further extension work for the bright kids who may be working at a greater pace than others. This allows the students to have a broader knowledge of how the topic applies to any given career or life in general. The aim is to expose the students to enough information that they will be competent with the maths they face when living, everything up to a great life in a top job. The SOW details the context the topics can be used in and can give further ideas for development for those students who are curious. We also include new information in the whole year group to show where maths can help. An example would be whole year group lecture for year 7 where I taught them binary code, codebreaking and this year where Miss Harris went into coding for computers.

- Assessment – How do teachers assess across the unit / term / cycle / year / key stage?

Students are assessed in a few ways which are designed to ensure that they are retrieving information after different gaps of times. Each year is split into 3 cycles which are then split into half cycles which is one SOW. The SOL is then split into several learning intentions, one LI is taught a week in general. The LTP details which topic is taught in each half cycle and also which LI intention is taught each week. At the end of each week is a mini test out of 10 on the previous weeks learning which allows the teachers to assess retention. At the end of each half cycle is a midi test which assess' the whole half cycle. This then tests their previous knowledge again ensuring



it is harder to retrieve and therefore a good time for learning. The students will be given 2 cycle tests a year, either cycle 1 or cycle 2 and cycle 3. These will provide teachers with data that can be used to rank and analyse the progress of the students within the school and the trust. At the end of year 10 this becomes a GCSE paper so the students can be given a score and a grade to reflect their progress which will then be reviewed and used to decide their tier. This will also be reviewed in the year 11 mocks that take place in December and February. In year 11 the students are given weekly GCSE tests to analyse their progress and gaps to allow for targeted revision.

- Covid - Based on identified gaps in skills and knowledge, how have you adapted the curriculum due to the pandemic?

All year 7-11 LTPs and SOWs have been adapted to ensure that the full breadth of the curriculum has been covered due to lockdowns and online provisions. This content is interleaved strategically into our LTPs and SOWs to ensure that we are revisiting content. We have placed a greater emphasis on core number skills in year 7, 8 and 9 through the introduction of Arithmetic tests, these tests along with the DIRT activities ensure students regularly revisit foundational core number knowledge essential to access more challenging areas of the curriculum. We strategically use MM to revisit content with all students to ensure key knowledge affected through covid disruption is revisited.

- Covid - How have you integrated remote learning plans with your school curriculum?

Students who have long periods of absence have work centrally set work on the online platform Hegarty Maths. This complements the department designed booklets and content taught in lesson. When students are in isolation we ensure that remote learning plans using booklets are followed. The department is moving towards a greater usage of Teams to allow students who may be isolating to benefit from the teacher guidance via the use video conferencing tools. When work packs have been created which complement or extend a module taught in KS3 and KS4, these are sent in the post to absent students alongside the online platform.

Powerful knowledge: It is the substantive content, agreed by the subject specialist as being the best knowledge in the discipline that opens opportunities for the student. It will not be picked up by students from their everyday life.

Cultural Capital: It is the essential knowledge that pupils need to be educated citizens, introducing them to the best that has been thought and said and helping to engender an appreciation of human creativity and achievement.

