

## MATHEMATICS

### Why is the study of Mathematics important?

Mathematics expands our minds. Maths lessons are full of discussion, questioning, proving and explaining. New students to Scalby School... you are going to love it!

The ability to use mathematics allows us to participate effectively in society and in the work place. Mathematics is a universal language – a language of national and international communication - and therefore all students need to develop the ability and confidence to apply mathematical skills competently.

The study of mathematics encourages us all to think deeply and helps us to solve problems more effectively – a great life skill that all colleges, universities and employers will appreciate. In mathematics lessons at Scalby School students will explore number, algebra, shape and space and statistics. Lessons will provide a wide range of opportunities for discovering rules and understanding procedures, through the use of concrete materials such as counters, through pictorial representations to demonstrate mathematical concepts and to apply these to solve problems, both abstract and from real-life. Students will learn to see mathematics as one coherent picture rather than seemingly unconnected, unrelated topics. Students will be able to build on the knowledge and skills gained in Key Stage 2 so that, for example, their fluency and confidence with number is further enhanced leading to algebraic generalisations and a mastery of the subject.

### What skills will the study of Mathematics teach you?

At Scalby School students work towards becoming mathematically literate citizens. They develop the ability to make evidenced based decisions in the 21<sup>st</sup> Century. They develop the knowledge and cultural capital needed to succeed in life, leaving school with mathematical skills for future learning and future employment.

The Mathematics Curriculum is rigorous and ambitious for every student. It is carefully planned to maximise the progress from the first day of year 7 to the last day of year 11. Scalby School has been in the top quintile of schools for Progress for the 3 years prior to Covid 19 disruption. Our first set of examination results after Covid looks likely to again place us in the top quintile for Progress. We are actively working to improve the outcomes in Mathematics for students in other schools which have recently joined our Trust. The Mathematics Curriculum seeks to raise the aspirations of our students and includes links with careers and financial capability. It provides our students with the knowledge they need to for future success in education and helps students to develop core transferable skills required for success in later life.

### What will students know and understand from the study of Mathematics?

Studying mathematics teaches students:

- Not to be afraid of “being lost” and having to struggle to find a way through a problem
- To use calculation to solve basic problems
- To be resilient and persevere with tasks and challenges
- To have rapid and sound memorisation of mathematical material.
- To be able to concentrate on mathematics for longer periods without fatigue.

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- To be able to offer and use multiple representations of the same mathematical object.
- An instinct to approach a problem in a variety of ways: even if a problem has been solved, is there an alternative way to reach the solution?
- To make connections.
- To develop the skills to link two or more procedures to construct a solution to a multi-step problem.
- To recognise what it means to “know for certain”.
- To understand proof
- To be efficient, striving to find the most economical ways to solve problems, to look for clarity and simplicity in a solution.
- To use rapid abbreviation, compression or a curtailment of reasoning in problem solving e.g. algebra.

### How does the study of Mathematics support students’ expertise in other subjects?

Mathematics features in many other subjects such as geography, PE, science, engineering or indeed any subject that analyses data, looks at trends, takes measurements and uses formulae. Computer Science is a subject that uses an algorithmic approach that many topics in mathematics also use. The ability to follow a process accurately and apply logic is applicable to many other subjects too. The first lessons at the start of Year 7 are designed to ensure students can substitute into basic scientific formulae, read and interpret graphs and charts, draw accurately using basic scale drawing, and calculate the mean and range. These lessons ensure early success in other subjects and were designed for Scalby students after consultation with other subject leaders. Transferable skills enable young people to face the demands of further and higher education, as well as the demands of the workplace, and are important in the teaching and learning of mathematics. These skills include:

### Cognitive skills

- Non-routine problem solving – expert thinking, metacognition, creativity.
- Systems thinking – decision making and reasoning.
- Critical thinking – analysing, synthesising and reasoning.
- ICT literacy

### Interpersonal skills

- Communication – active listening, oral communication, written communication, assertive communication and non-verbal communication.
- Relationship-building skills – teamwork, trust, intercultural sensitivity, self-presentation, social influence, conflict resolution and negotiation.
- Collaborative problem solving – shared understanding, taking action, team organisation.

### Intrapersonal skills

- Adaptability – ability and willingness to cope with the uncertain, handling work stress, adapting to different personalities, communication styles and cultures.
- Self-management and self-development – ability to work autonomously, be self-motivating and self-monitoring, willing and able to acquire new information and new skills.

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### How can students become an expert in Mathematics?

It is simple: expertise in Mathematics comes from doing mathematics.

Where to start? So much mathematics is underpinned and unlocked by a knowledge of multiplication tables that we can honestly say that a rapid recall of time tables is fundamental for early success.

### What opportunities are there to experience Mathematics beyond the classroom?

Outside of Mathematics lessons there are a range of initiatives that can help students deepen their experience of mathematics such as the UKMT Maths Challenge led by Leeds University. We regularly use online learning resources such as Corbett Maths, which is free and requires no log in, White Rose Maths Parents and Pupils home learning resources, and Mathswatch which Scalby School subscribes to and requires a login and password. Mathswatch is a virtual learning environment (VLE) with instructional videos, examples and practice questions with video solutions. It also has self-marking questions on all GCSE maths topics. We also have our own bespoke Maths Online Learning Program that is ideal for learners to keep up with the class even if they are out of school or out of a lesson. It has an online lesson linked to each and every classroom based lesson. We run architecture workshops where students work together to produce mathematical structures. We have links with local employers such as Keepmoat Construction and Sirius Minerals who send representatives to work with groups of young people and arrange visits to local construction sites. We have excellent links to the Mathematics Departments at Scarborough Sixth Form College and Scarborough University Technical College.

### How will you develop your character through your Spiritual, Moral, Social & Cultural experiences in English?

**Spiritual** - Students develop the ability to measure the world around them. Mathematics is used to model and understand the universe, developing a sense of wonder at reality around us. Students reflect on their strengths/areas of improvement e.g. performance, working independently, working with a partner, working in groups, feedback, supporting others etc.

**Moral** - The ideas of averages and typicality encourage students to question how we respond to people and situations that differ from the norm. Students investigate the validity of statements and consider how they might prove or disprove them. Students reflect on how much we value finding truth. Finance issues encourage students to reflect on how we use our money and the values that underlie this.

**Social** – Students become receptive to other people's feelings and viewpoints, giving and receiving constructive criticism. Respecting contributions from others by listening in silence before responding. Working together in collaboration on Mathematical tasks often gives better outcomes than working alone.

**Cultural** – Students develop the ability to co-operate with others and show support and tolerance of others with differing abilities and viewpoints. Students have an opportunity to celebrate the differences between cultures and to understand the contributions made by historically significant mathematicians from a huge variety of cultures and communities.

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### Key Assessment Objectives

AO1: Use and apply standard techniques

Students should be able to: • accurately recall facts, terminology and definitions • use and interpret notation correctly • accurately carry out routine procedures or set tasks requiring multi-step solutions

AO2: Reason, interpret and communicate mathematically

Students should be able to: • make deductions, inferences and draw conclusions from mathematical information • construct chains of reasoning to achieve a given result • interpret and communicate information accurately • present arguments and proofs • assess the validity of an argument and critically evaluate a given way of presenting information

AO3: Solve problems within mathematics and in other contexts

Students should be able to: • translate problems in mathematical or non-mathematical contexts into a process or a series of mathematical processes • make and use connections between different parts of mathematics • interpret results in the context of the given problem • evaluate methods used and results obtained • evaluate solutions to identify how they may have been affected by assumptions made

GCSE specifications in mathematics should enable students to develop fluent knowledge, skills and understanding of mathematical methods and concepts. They acquire, select and apply mathematical techniques to solve problems. Students should be able to reason mathematically, make deductions and inferences and draw conclusions. They will comprehend, interpret and communicate mathematical information in a

variety of forms appropriate to the information and context.

### How will students be assessed in Mathematics?

We operate a thorough testing process. Students complete a short test every unit of work to assess progress. At KS3 (Years 7, 8 and 9) the tests consist of a short 30 minute test paper, typically every two weeks. Each test paper is RAGged and the Question Level Analysis is stored in our records database so we have a full diagnosis of strengths and weaknesses of each individual student. After doing test corrections and intervention there is an opportunity to improve during the Improvement Check Homework that takes place during the week after the test results are issued. The QLA from the test informs planning: any remaining misconceptions are drip fed into subsequent lessons in interleaving retrieval starters and cumulative starters

Students are entered for Pearson Edexcel GCSE Mathematics at the end of year 11. Traditionally our two top sets and two second sets are entered for Higher Tier. Our two third sets and the fourth set are entered for Foundation Tier. From experience we anticipate that learners towards the bottom of our B half set 2 find access to Higher Tier challenging and so in Year 11 we create an extra small set which enables them to focus on grade 5/6/7 without the need to study the most challenging topics at grade 9.

### How can the study of Mathematics support students beyond school?

We offer the study of GCSE and Level 2 Further Mathematics. We strongly encourage our students to continue to study in this fantastic subject if they



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have demonstrated a passion for it, a flair and an ability. However, whether they choose to study Mathematics into A Level/Core Maths/Further Mathematics or not at Scarborough Sixth Form College, the UTC or elsewhere, they will have gained a lot from its study over the 5 years from years 7-11. Many students go on to follow vocational courses with mathematical content at Scarborough TEC. We know that the depth of understanding we encourage and support students to achieve will make them not only numerate, but also logical and analytical thinkers, resilient and ready to solve problems. Mathematics is offered at prestigious universities either as a single honours or a joint honours subject studied alongside other disciplines e.g. Statistics, Computer Science, Science, Philosophy, Engineering. A high level of qualification in mathematics is a pre-requisite for honours degrees in many engineering and physics related subjects. It is also cited that an A Level in maths demonstrates the very high level of analytical thinking that many universities are looking for in their applicants. The very fact students study mathematics helps with future applications, whether they be for colleges, universities, apprenticeships or employment. A strong GCSE in maths opens doors for future career opportunities— employers look favourably on mathematical knowledge when young people are looking for jobs or placements Post 16 and in colleges.

The study of mathematics provides entry into innumerable careers including many of our local industries:

- Mineral Extraction Engineering
- Sea Captain
- Marine Engineering
- Medicine
- Nursing
- RNLI
- Computing
- Web Design Programming
- Hydraulics and Hydrological Engineering
- Structural Engineering
- Sea Defence Engineering
- Mechanical Engineering
- Civil Engineering
- Building
- Quantity Surveying
- Estate Management
- Plumbing
- Carpentry
- Hairdressing
- Beautician
- Motor Vehicle
- Hotel and Catering Management
- Veterinary Medicine
- Actuary
- Chartered accountant
- Banking
- Data analyst
- Primary School Teacher
- Secondary school teacher
- College Lecturer
- Software engineer
- Statistician
- Financial manager
- Financial trader
- Insurance underwriter
- GCHQ Analyst





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### The Six Principles of Nurture

Language is a vital form of education

In mathematics we follow the whole school focus on vocabulary. We use Keywords boards in each classroom where we display a maximum of 3 keywords each lesson. We encourage correct spelling and our book marking stampers include a checkbox to indicate that we have checked the spellings of keywords are correct in the exercise books.

We use Frayer Models where appropriate, etymology where appropriate, and we encourage the use of formal mathematical language and the correct use of mathematical vocabulary during oral questioning.

The classroom offers a safe base

In the mathematics department we have a high expectations with regards to behaviour and engagement in lessons. We follow the Scalby School behaviour for learning system (outlined on page 8 of the student planner), we use a Matrix timetable for students who are causing concern and we use the SLT active patrol if necessary. All the teachers of mathematics are highly competent in the use of the systems.

Children's learning is understood developmentally

Students are set according to ability and regular assessment allows changes to groups in consultation with the student and the parent/carer. Each class in the Mathematics

Department has an SEN Provision Map which links to the SEN Register and My Profiles.

The importance of nurture for the development of wellbeing

Classroom teaching is supportive and mistakes are used as teaching points. We value incorrect responses as an opportunity to explore misconceptions. Anxiety in mathematics is minimised and students are tolerant of the responses of others.

All behaviour is communication

The school systems are applied fairly and consistently. Good behaviour is an expectation and the calm and productive climate for learning is essential for the best outcomes for all.

The importance of transition in children's lives

We use data from primary partners and our own Progress in Mathematics Test on entry in year 7. We allocate staff to groups according to the needs of the group and the expertise of the teacher, whilst also considering professional development opportunities and career development.

Any setting changes are handled sensitively and the need of the student takes priority.