

## **Statement of Intent – Maths**

*“Mathematics knows no races or geographic boundaries; for mathematics, the cultural world is one country.”* David Hilbert

At All Saints Academy we align our maths curriculum to our vision of *‘Living Well Together with Dignity, Faith and Hope.’* Within maths, we promote collaborative learning in the classroom in order for students to have the opportunities to build relationships with peers therefore demonstrating that we encourage them to show each other, and staff, that they are *‘Living Well Together.’* We strive to ensure that our students are mathematically literate in order have dignity in later life by applying the skills they have learnt to the wider world, but also to have the confidence to make mistakes and learn from them. We strive to develop their financial literacy across the 5 years to ensure students have dignity to live life confidently handling money matters once they leave school. As staff, we encourage students to have faith in their ability and their mastery of the key skills and content. It is our hope that all students leave us with the minimum of a GCSE grade 4 in order to give them the best opportunities in later life.

We make sure that any boundaries to learning are removed by using our pupil premium funding to fully equip students with the tools they require to complete all aspects of the maths curriculum. We do this by having scientific calculators, rulers, protractors and compasses in all maths classrooms. We recognise that all students learn at different rates and to make sure all students learn effectively we use differentiated online textbooks, which utilise the iPads that all students have access to. These textbooks are designed in conjunction with exam board so that we are confident that all content is covered in a way that builds self-mastery of the skills. Additionally, we use our student support workers to support small group work for students to allow them the time and space to develop their skills, without feeling rushed by the pace of the lesson for others in the class.

In order to engage our Year 7 cohort immediately we start students off by developing skills that were covered in KS2 so that students are aware that KS3 and KS4 curriculum is continually developing throughout their time at All Saints Academy. We have also designed the maths curriculum in such a way that retrieval tasks are used to refresh prior knowledge before developing further.

### **Year 7**

#### **Substantive knowledge**

Throughout Year 7 students will be expected to use and develop their substantive knowledge related to all topics within maths. Students will be expected to learn the following facts in relation to data and probability: how to group data, the different types of averages (which they will know from KS2), how to construct graphs including line graphs and composite bar charts, how to use language related to probability, and calculating probability and experimental probability. Within number, students will need to have a working knowledge of mathematical operations from KS2 to develop this further in order to find highest common factors and lowest common multiples, work with fractions and functions of fractions, and understand ratio and sharing quantities in a ratio. Students will have an understanding of shapes from KS2, but will develop this further by learning to identify angle facts in special triangles and in quadrilaterals, by constructing triangles, and by learning the skills of the four transformations. Algebra is introduced at KS2, however, this is only at the basic level of function machines. This will be developed in Year 7 to algebraic notation and expressions, developing this from their existing knowledge of function machines.

#### **Disciplinary knowledge**

Year 7 will be stretched in all areas of mathematics and this will be evident in the learning of new formulae and in the mathematical processing which they will be expected to do. We have high expectations for our Year 7 students and because of this have a challenging curriculum in order for them to make rapid progress in their mathematical thinking and mastery of the skills and content. Within the data topic, students will use their fluency in averages to develop their reasoning and problem-solving when comparing averages from a list and from a table, then further teaching our students how to analyse data from a variety of different graphs and tables.

Number looks at how students can use their current knowledge of mathematical operations, such as multiples and factors, and combine this with fractions skills in order to understand how to add and subtract fractions with different denominators. This will also lead to a better in depth understanding and interweaving of mathematical skills for students.

In algebra, once students understand the substantive concepts of notations and expressions, then they will be able to learn to manipulate these expressions through expanding brackets and substitution.

Shape looks to include many rules that students will need to learn and apply correctly, including having a link to algebra with substitution.

Within all of the above teaching, students are exposed to a wide range of vocabulary and develop their comprehension through the use of worded questions in a problem-solving and/or reasoning context. Students will also have a chance to develop their thinking skills through the use of projects, including a project on averages, one linked to money and salaries, one about understanding time and time zones and another looking at decorating and the mathematics involved in carpeting, painting and planning a room layout using scale.

## **Year 8**

**Substantive knowledge** Our Year 8 curriculum takes the new facts, which have been taught in Year 7, and continues to add to our students' mathematical understanding with a view to mastering these skills over time. We aim to ensure that maths becomes a second language where students are able to look at different mathematical problems and intuitively know what they can do to complete these calculations. The data topic builds on previous graphs to add further graphical knowledge in the form of stem and leaf diagrams and scatter graphs. Number focuses on developing highest common factor (HCF) and lowest common multiple (LCM) skills, combined with knowledge of prime numbers, to work on drawing prime factor trees and using these, and Venn diagrams, to find HCF and LCM. Students also develop their fraction skills from last year by working with mixed numbers and then starting to add percentages into their knowledge base. Shape relies upon the students having a clear understanding of properties of 2D shapes in order to further develop the angle rules from last year to look at angles on parallel lines, as well as developing their understanding of area and perimeter from KS2 to ensure they can use formulae to calculate these, further developing this to introduce calculating volume. Students will develop their working knowledge of algebra so they can learn that the opposite of expanding is to factorise an expression, and how to do this, as well as introducing the concept of algebraic notation in solving equations, something they will have done using function machines previously.

## **Disciplinary knowledge**

Much like Year 7, we focus on fluency, reasoning and problem-solving in all areas of mathematics in order to continually develop these skills. This will again be different in each area of mathematics, however, the key principle which students will continue to focus on is the idea that all maths is interwoven and that content and skills from one area in algebra, for example, can help with solving an angles problem in shape.

Within data, we use the skills of drawing graphs and representing data to also look at how graphs can produce misleading data, focussing on reasoning and drawing conclusions whilst being able to critique. In addition, students begin to look at real life graphs and their cross-curricular uses in science.

Number skills are developed from last year to start to link with other topics, for example, decimals and ratio are interwoven skills, therefore knowing how to access these and link the substantive knowledge to build the disciplinary knowledge is something we will support students to develop. Shape introduces 3D shapes and angle rules so this will be reinforced with understanding why angles rules are those rules or why volume is linked with length and depth in a cuboid ensuring students are not just learning a process, but are gaining a deeper understanding. Algebra is used heavily this year in terms of a focus on graphs. This unit gives students the opportunity to see how number, data and algebra have a key link and, again, are interwoven skills.

Within all of the above knowledge, students will also look at maths in real-life context through independent and group projects. In particular, for Year 8, students have a long-term project over 3 or 4 lessons that looks at building a theme park, developing further their skills in scale drawing, budgeting, money calculations and creativity in advertising and marketing. Additionally, students will continue developing their financial literacy through the use of the Money Matters project developed with MoneySavingExpert, Martin Lewis, to help students understand money and budgeting once they leave school.

## **Year 9**

### **Substantive knowledge**

At the start of Year 9, we expect our students to now have a working knowledge of maths and how topics interweave and work together, therefore, this year we are able to really extend and challenge their thinking in terms of content and knowledge. Within the data topic, students will be combining their previous knowledge from Year 7 and Year 8 in order to be able to calculate with averages from a table as well as extending their knowledge of Stem and Leaf diagrams into back-to-back Stem and Leaf diagrams.

Probability is revisited this year with further development from experimental probability in Year 7 to now understanding the difference between experimental and theoretical probability and how to calculate outcomes using both of these. Additionally, students will look at other ways of representing probability problems such as Sample Space Diagrams and Venn Diagrams, which they saw in Year 8 in their number topic. Topics within number continue to develop their knowledge of number notation, especially in terms of indices, leading to confidence in interweaving place value and indices to learn standard form. Students will also challenge their percentage knowledge by understanding reverse percentages as well as looking at simple and compound interest. Within shape, students challenge the transformation skills developed in Year 7 to be able to enlarge shapes by fractional and negative scale factors. Students will also develop their construction skills and link this with loci, with a final stretch at the end of the year with Pythagoras' Theorem and trigonometry. Algebra, this year, builds on manipulation of expressions introduced in Years 7 and 8, to be able to expand quadratics and also re-arrange expressions as well as solving more difficult equations involving variables on both sides of the equation.

### **Disciplinary knowledge**

Year 9 consolidates students' knowledge from Years 7 and 8 as well as introducing students to higher-level content, which will use their fluency in maths, but also deepen their reasoning and problem-solving skills. In the data topic, students will use their reasoning skills to draw conclusions from graphs and the averages information gained from graphs. Number skills will interweave with algebra skills as we challenge Year 9 with quadratic sequences, inequalities and direct and inverse proportion. With

in shape, we combine the skills and content with skills in number and algebra to show that when the skills of roots and rearranging equations are applied then we can confidently learn topics such as Pythagoras' Theorem and trigonometry. Within algebra, we continue to solve equations, developing the concept of the inverse to extend this further. Additionally, students develop their graph skills further through inverse and direct proportion graphs, and the cross-curricular link of these in science.

In addition to the above, students will continue to work on projects to support their learning and understanding. There are more projects to develop financial literacy, looking particularly at bills and how these are calculated, as well as interest rates for both saving and borrowing money and the impact this can have. Additionally, when students are stretched in Pythagoras' Theorem, they will independently investigate the theorem to gain a deeper understanding of why the theorem is, rather than just learning how to use and re-arrange a formula.

## **Year 10**

### **Substantive knowledge**

Students are expected to have a working knowledge of all skills, techniques and formulae from both the KS2 and KS3 syllabus. Students will then need to know when to apply these skills within a GCSE exam paper. This is the first year where students will be split into higher and foundation tiers. Foundation students will start with number in Year 10, with the aim to ensure there is an opportunity to use retrieval to ensure fluency, but also to plug any gaps in learning. Students will then revisit fractions and percentages with a view to extend their previous KS3 learning to further reasoning and problem-solving skills, especially as Paper 3, the problem-solving paper, has been a weaker area for our cohort.

Algebra in Year 10 also works on mastery of the skills learned through Year 7 to Year 9, but challenges students to further interweave these skills with other mathematical skills as they started to do in Year 9. The data lessons will focus on extending the knowledge they already have in Stem and Leaf Diagrams and Scatter Graphs and add further knowledge in Pie Charts and Time Series graphs before moving onto extension tasks in averages such as estimating the mean and looking at sampling in research. In shape, students will look at retrieving their angle skills and applying these to more complicated geometrical problems that interweave with various other mathematical skills. Students will also learn to convert metric measurements in area and volume as an extension to their previous learning as well as learning how to describe and combine the transformations they learned in KS3.

Higher students will also start with number in Year 10, but will focus on reinforcing the higher skills that were visited in Year 9 such as negative indices and calculating with standard form. They will then develop their fraction and percentage skills to interweave these with their ratio skills.

Algebra at the higher tier assumes mastery at a higher level in terms of covering more content in a shorter space of time allowing students to extend to solving simultaneous equations and solving quadratics through to completing the square by the end of Year 10. The data lessons will focus on introducing some new content such as Time Series as well as developing disciplinary knowledge in interpreting data.

In shape, students will master and deepen their understanding of Pythagoras' Theorem and trigonometry visited in Year 9 as well as moving their area and volume knowledge on to new shapes

such as sectors, spheres and pyramids. Higher students will also revisit and extend probability skills through learning tree diagrams.

### **Disciplinary knowledge**

Both foundation and higher students will prepare for their GCSE exams by developing their reasoning and problem-solving skills throughout Year 10 and Year 11. Foundation students in particular will use Year 10 to develop their problem-solving and reasoning in number, algebra and shape by ensuring that they master the skills through fluency and retrieval, leading to them being able to work with a variety of problems that uses the cross-over of this skill set. Higher students will focus their problem-solving in data and, through looking at data, being able to identify appropriate statistical graphs and diagrams to use to represent and interpret data. This will also allow students to revisit their work on misleading data.

In addition to the above, students will continue to develop their financial literacy through work on understanding salary in terms of taxes and national insurance.

### **Year 11**

#### **Substantive knowledge**

In Year 11, our focus is on improving students from the bottom up so where they have developed skills through KS3 and mastered these in Year 10, they will further extend these skills in Year 11 to aim for the top grades in their particular tier of entry. We also ensure students are not capped at any point and allow fluid movement between foundation and higher tiers when assessments indicate appropriate.

Foundation students in Year 11 develop their ratio skills and revisit these from Year 8, then building on them they look at proportion linking this to graphs, showing again the interweaving of skills across maths. They will also look at an entire topic based on multiplicative reasoning, demonstrating the variety of skills that are founded in basics of number and multiplication, before moving on to secure their knowledge in indices and standard form.

Their algebra lessons will now extend to where higher students were in Year 10 in order to allow students to solve quadratics, solve simultaneous equations as well as draw quadratic graphs. Shape is a big focus for Year 11 foundation students who will develop their area and volume skills by looking at circles, pyramids and cones, but also will secure their learning in Year 9 in terms of Pythagoras' Theorem and trigonometry. Students will also develop their understanding of enlargement in order to understand similarity, linking this through to congruency.

Higher students will start with interwoven skills in multiplicative reasoning before extending their number skills in proportion and direct proportion, leading to exponential functions and function graphs. Data lessons will ensure students develop the higher skill set through learning cumulative frequency, box plots and histograms. Their algebra lessons will develop the previously mastered skills to now look at algebraic fractions and surds, especially linking surds to early algebra skills such as expanding brackets. Similarly to foundation students, shape is a big focus as they further develop their skills in similar shapes and congruency as well as advancing trigonometry beyond right-angled triangles and learning circle theorems.

#### **Disciplinary knowledge**

Throughout Year 11, teachers and students will focus on ensuring all gaps in learning are addressed and also that with each development of a skill, there is an opportunity for retrieval and mastery to ensure students are confident when they walk into their exam in the summer. Students on foundation tier will ensure their reasoning skills are secure in Year 11 as this is often a weakness for

our cohort at this level. Students will have multiple opportunities to investigate the kinds of questions that require reasoning in terms of both drawing conclusions and reasoning links between different areas of maths. At a higher level, students will need to develop their problem-solving skills from being able to identify the elements of a problem to being able to problem-solve which mathematical skill and/or formula is appropriate such as when to use the sine or cosine rule. In addition to the above, students will have opportunities for tutoring and interventions to support the development of these skills as well as support any gaps in learning. Additionally, students will continue their financial literacy development by investigating and understanding mortgages.