Why study Mathematics?

Notes to accompany the powerpoint presentation

These slides form an approximately 30 minute presentation for parents/carers about the importance of studying mathematics post-GCSE. Please note that the presentation is for students starting A level Mathematics in September 2017.

These notes below provide additional information, advice and guidance for teachers, heads of mathematics departments, careers advisors and senior leaders to help support them in presenting the 'Why study Mathematics?' powerpoint.

Please add or remove slides to suit your talk/event. The presentation could also be used as a slideshow running on a loop during an opening evening event.

For more details about the work of the FMSP visit **www.furthermaths.org.uk**.

Slide numbers	*Notes*
1	FMSP logo **www.furthermaths.org.uk**
2	Information slide – to be deleted before using the powerpoint
3	Title slide
4	A key message to students should be that if they achieved a good pass at GCSE in Mathematics then they should not be asking "shall I take mathematics in the sixth form?", rather the question should be "which mathematics course shall I take?" The **Wolf Report** (2011) recommended that students who have not yet achieved grade A*-C in GCSE Mathematics by the age of 16 should continue to study it as part of their 16-19 education. This became part of the post-16 full time **funding arrangements** from August 2015. The main focus of this presentation will be information relating to AS and A level qualifications in Mathematics and Further Mathematics, however slides 5-7 have brief information about Core Maths and can be removed if it is not being offered.
5	Key questions that form the structure of the presentation. (Edit if you are not offering Core Maths)
6-7	A recommendation of the report **Towards Universal Participation in Post-16 Mathematics** (2013) was that all students in England should be enabled to study mathematics in upper secondary at an appropriate level. The report recommended the introduction of one new advanced mathematics pathway aimed at those who have achieved a grade C or above at GCSE but are not currently studying advanced mathematics. This has led to the development of six new qualifications, collectively known as Core Mathematics qualifications, which will be first examined in 2016. For more information see the list of **Core Maths Specifications.** The Core Maths Support Programme has some marketing materials and further

	information on its website **www.core-maths.org** A **video** and **report**, *Count Us In: Quantitative skills for a new generation,* by the British Academy provides a vision for a more numerate society.
8	This slide provides an overview for AS and A level Mathematics. At this stage, depending on the audience, it may be beneficial to explain what is meant by an AS qualification and how it relates to the A level qualification. Also, state that from 2017 AS Mathematics will be decoupled from A level mathematics. This means that marks from an AS qualification will no longer count towards the A level qualification. The rules for the number of subjects taken in the particular school/college could be outlined here, as could the school/college policy relating to whether or not AS levels will be entered at the end of the first year of the A level course of study.
9-10	These slides briefly explain the nature of the two types of application contained in AS / A level qualifications –Mechanics and Statistics. Note that decision mathematics is no longer an element of the AS/A level Mathematics qualification but it is an optional aspect of Further Mathematics courses, sometimes under the heading 'discrete mathematics'.
11-14	Slide 11 explains what Further Mathematics is and the differences from A level Mathematics. This slide could be adapted to indicate whether students will or will not take AS qualifications in Year 12. Slide 12 gives a very brief overview of the content of the Further Mathematics qualification. The list of possible options could be adapted to reflect those offered in the school/college. Slide 13 gives an insight into the new areas of pure mathematics that students would meet in Further Mathematics. Slide 14 is optional – it gives an insight into one topic that might be covered in a decision/discrete mathematics unit.
15	An overview of the reasons why students would benefit from studying A levels in Mathematics and Further Mathematics. Stress the skill development that comes from studying A level Mathematics – students would benefit from studying the course in conjunction with many other subjects for this reason. Mathematics can support Biology, Chemistry, Business Studies, Economics, Computing, Physics and Psychology in particular. Note that girls are more likely than boys to take A level Mathematics in conjunction with non-STEM subjects, so it is important to draw out links with non-STEM subjects as well as STEM subjects. (See slide 27 for more information about girls' participation in A level Mathematics and Further Mathematics).
16-18	These slides give an overview of the pattern of entry for A level Mathematics and Further Mathematics over time and how the 2016 entries for these qualifications compare to those in other subjects. Slide 16: More and more students each year are studying AS and A level Maths.

	Since 2003 UK entries in A level Mathematics have increased by 82% and AS level by 155%.
	Slide 17: The number of students taking AS and A level Further Maths has also increased dramatically. Since 2003 in the UK there has been an increase of 187% in A level Further Mathematics entries and 693% in AS Further Mathematics entries.
	Slide 18: In 2016 Mathematics was the most popular A level subject and Further Maths was the 16th most popular, with more entries than PE, Law, ICT or Languages.
19-26	This series of slides provide some introductory information about the importance of mathematics for a range of careers.
	Slide 19: As an introduction to mathematics in careers this slide lists some possible misconceptions about who might take Mathematics and Further Mathematics at A level. Take the opportunity here to stress that mathematics is a subject that is relevant to many careers and is not solely associated with physics/engineering type careers. Whilst it is important to dispel the myth that studying mathematics would only lead to a career as a mathematics teacher, it is important also to indicate the range of opportunities the teaching profession offers and that there is a shortage of well-qualified specialist mathematics teachers. Stress that parents and carers can play a key role in positively influencing girls' A level choices towards mathematics in particular.
	Slide 20: Mathematics and Further Mathematics are versatile qualifications, well-respected by employers and both are facilitating subjects for entry to higher education. Facilitating subjects are listed in the **Informed Choices** guide produced by the Russell group. Careers for men and women with good mathematics skills and qualifications are not only well paid, but they are also often interesting and rewarding. People who have studied mathematics are in the fortunate position of having an excellent choice of career, as illustrated in the wide range of career titles shown in the slide.
	Slide 21: The quote is taken from the **speech** by former Education Secretary Nicki Morgan at the launch of the **YourLife Campaign**. Your Life is a three-year campaign to helping young people in UK build the skills needed to succeed in the current competitive global economy. The campaign aims to inspire young people to study Maths and Physics as a gateway into wide-ranging careers - taking Maths and Science at school does not only lead to a career in a lab coat or hard hat, having mathematical skills will help students succeed in all sectors.
	Slide 22: The quote is taken from a speech by the former Education Secretary Elizabeth Truss, and states that A level Mathematics has been linked to an average increase of 10% in future earnings.
	Slides 23 – 26 outline a range of careers in STEM and non-STEM disciplines. Of course there are a huge number of careers in which mathematics is essential or beneficial – the **Mathscareers website** is a good starting point to provide guidance for students and their parents. They could also look at the FMSP's **careers pages** for more information.

27	A key national priority is to increase the proportion of girls studying A level Mathematics and Further Mathematics. **Data** about the participation rates of girls in these, and other science qualifications, has been published in recent years. This data is available at school, regional and national level. It shows that of all students taking at least one A level, boys are twice as likely to choose A level Mathematics and over 3.5 times more likely to choose A level Further Mathematics than girls. There are also regional variations with the lowest participation rates by girls occurring in the North East and Yorkshire and Humber regions.
	The FMSP is working to support an increase in the proportion of girls participating in A level Mathematics and Further Mathematics nationally. In conjunction with the UCL IOE we have published a **gender literature review** and the interim report of a series of **gender case studies**, both of which provide a series of recommendations for schools and colleges in how they can encourage girls to aspire to study advanced mathematics.
	Briefing documents summarising the research projects and other work of the FMSP in relation to gender can be found at **www.furthermaths.org.uk/encouraging-girls-maths**. Information for students can be obtained from **www.furthermaths.org.uk/girls-maths** - this page includes profiles of female A level students and of females who work in a diverse range of mathematics related careers.
28-36	This series of slides relates to university entry requirements and we suggest choosing a selection of these slides for your presentation. Students may not be yet thinking about university applications but their choice of A level subjects may limit the range of courses they can apply for in 2 years' time.
	Slides 28, 29 and 30 – provide an overview to the type of subjects for which A level Mathematics and Further Mathematics are useful preparation. Students should be made aware that even when AS or A level Mathematics is not a specific requirement of a course, many degree courses have a significant quantitative component. Studying mathematics in the sixth form helps develop these important quantitative skills and helps with the transition to learning new mathematical concepts at university. .
	The report **Popularity of A level subjects among UK university students** published in 2013 (relating to academic year 2010-11) shows that 30% of all accepted university applicants had A level Mathematics – this was the highest of all A level subjects (the second subject being A level Biology with 21.3% of all accepted applicants having this qualification). The same study showed 27% of students accepted to business and administrative degrees had A level Mathematics; 29% for social studies, 69% for medicine and dentistry; 43% for architecture, building and planning; and even 18% of students entering European languages degrees had studied A level Mathematics. 60% of the top ten subject combinations for students entering degree courses at Russell Group universities included A level Mathematics.
	The table in slide 29 shows data from the **Mathematical Transitions report**, published by the Higher Education Academy, 2014. In most subjects there has been a steady increase in the proportion of students entering university having taken A level Mathematics, which reflects the increased numbers taking A level

	Mathematics (see below). The proportions are likely to be higher for Russell Group and other leading universities. These data are for full A level Mathematics and the proportions are higher for AS level Mathematics. The key message being that even though A level Mathematics is not a specific requirement, students should be advised to consider taking Mathematics at least to AS level. The table in slide 30 shows similar data for A level Further Mathematics. For Mathematics, Physics and Engineering courses A level Mathematics is usually a requirement and AS/A level Further Mathematics is required or preferred by many leading universities. For further reading see the article **Transition to STEM Degrees – Further Maths A-level.** . Slides 31 – 35 show some exemplar entry requirements for a range of degree courses – these slides illustrate how universities might require or encourage students to take A levels in Mathematics and Further Mathematics. • Slide 31 shows a differentiated offer which emphasizes the way that FM is considered important in preparation for a mathematics degree. Taking AS FM or A level FM reduces the offer. • Slide 32 shows that Further Mathematics is often indicated as a preferential qualification for engineering in addition to required subjects. • On slide 33 the university have indicated the commonly chosen A level subjects for entry to the degree course. This shows that maths is essential for some Economics degrees and many students will also have studied Further Maths (25% in this case). • Slide 34 is a differentiated offer which shows the importance of maths (as well as chemistry and physics) as the optimal subject combination for entry to a Chemistry degree. • Slide 35 shows a differentiated offer for Biology if the student has taken Mathematics, Further Mathematics or two other subjects; there is also a differentiated offer for Psychology if students are studying A level Mathematics. Competition for places on some degree courses is high and students should consider taking A level Mathematics and Further Mathematics in order to distinguish their application, secure a place, and help them succeed once they start the course. Slide 36 provides a general summary of how to apply to university. Students and their parents might also be made aware of the website **www.bestcourseforme.com** which allows a search by subject area, university and guidance by chosen career.
37	This slide highlights information about how to stretch the most able mathematicians at A level in relation to the additional qualifications: • **AEA** - Advanced Extension Award (AEA), • **STEP** - Sixth Term Examination Papers (required for entry to Cambridge and some Universities) • **MAT** - Mathematics Admissions Test (required for entrance to Oxford University and Imperial). • **TMUA** – Test of Mathematics for University Admission (encouraged for

	applicants for Mathematics degrees by Durham Univerity). These qualifications are required for admission to some degree courses in mathematics and closely related subjects. The FMSP offers a range of support, for both **students** and **teachers**, in preparing for these examinations. This takes the form of enrichment and CPD events, problem solving materials and problem solving conferences. The FMSP offer an online **MAT preparation course**.
38	Links to other relevant websites which students and their parents might find interesting.
39	Information about the content of the FMSP website, which contains a wide range of information including: • exemplar materials which illustrate how mathematics is used in a range of degrees; • details of enrichment and CPD events • a page specifically to encourage girls to continue to participate in mathematics post-16.