Sixth Form Preparation for Success
Welcome to Core Maths
AQA Level 3 Mathematical Studies 1350

Introduction

This course is aimed at students who have achieved a Grade 5 or above in GCSE Mathematics and are not studying AS / A level Mathematics. It is particularly useful for students who are studying Biology, Sports Studies, Psychology, Economics, Business Studies, Geography, Sociology or Health and Social Care.

The course is assessed by two written examinations, each 1½ hours duration. Paper 1 covers data collection (including different methods of sampling), data processing and representation, together with financial calculations such as student loans, income tax and national insurance. Paper 2 covers statistical techniques such as: correlation and regression, confidence intervals for a population mean and the Normal distribution.

Year 11 into Year 12 Core Maths Specific Bridging Work

To be completed May – September

Remember that prizes will be awarded for 'exceptional' work that demonstrates effort above expected ! It would be a good idea to write all work that you do on lined file paper, keep it all in a file and bring it to school for your first lesson in September.

- **Places of interest –** Given the circumstances at the moment, you may not be able to physically visit the places suggested below so try the websites – many have virtual tours and mini lectures - and email their customer services with any questions; people love to hear from young people who show an interest in their line of work!

- You could visit the Diamond, which is the University of Sheffield's brand new, state-of-the-art engineering facility. You have to visit https://www.sheffield.ac.uk/diamond/visits and fill in the online form, after which someone will get back to you within three days to arrange your own bespoke visit – brilliant! A must for anyone who might consider a career in engineering. If you've got friends who are also doing A-level maths, perhaps you could go together.

- Look out for other places where you can see maths applied in a science/technology/engineering context: how about Magna in Rotherham or the National Space Centre in Leicester?
- Looking further afield you could visit Bletchley Park (near Milton Keynes): see for yourself how some of the country's best mathematicians made a decisive contribution in World War II by cracking the German Enigma code, which was previously considered unbreakable.

b) Wider reading

Priority: Research the following topics using a variety of sources aspects of financial calculations such as VAT, income tax, national insurance and student loans. Make sure you are familiar with the various rates of VAT, income tax allowances and the various rates of income tax and their thresholds, national insurance rates and thresholds and how student loans are repaid depending upon your salary when you start work. The website www.gov.uk will give you a useful starting point.

Other suggestions…

- I would highly recommend a book called '1089 and All That: A Journey Into Mathematics' by David Acheson. It's short, easy to read and introduces a number of fundamental A level concepts in a really engaging way. Available for £6.73 on Amazon.
- The Numberphile videos are excellent (http://www.numberphile.com/): tricky mathematical concepts explained in a really engaging and accessible way.
- Marcus du Sautoy's 'A Brief History of Mathematics' on Radio 4 was excellent, informative and engaging. You can access all ten episodes on BBC iPlayer radio or as a podcast. If you're interested in mathematicians of the past, there's also an excellent archive here (http://www-history.mcs.st-and.ac.uk/)
- Choose an article from the Guardian's data blog (https://www.theguardian.com/data) which looks interesting to you. How does the use of statistics help the reader make sense of the real-world issues being discussed? If you're interested in analysing the use of statistics (for good or ill!) try the 'More or Less' podcast by the BBC's Tim Harford.
- http://www.mathscareers.org.uk/ is an excellent website about maths careers with plenty of detailed information about the value of maths in all sorts of different jobs.
- The Royal Institution has an excellent YouTube channel (https://www.youtube.com/user/TheRoyalInstitution - scroll down to the maths playlist, under 'Browse talks by subject) – interesting lectures about all sorts of topics (and a useful insight into university-style learning too).
- https://freakonomics.com/archive/ The co-creation by an economist and a journalist. Freakonomics is an engaging and interesting book about a real mixture of topics and answers questions such as: What do teachers and sumo wrestlers have in common? Did TV cause a rise in crime? Can eating kangaroos save the planet? If you think statistics is boring, this book may convince you otherwise.
- How is Maths our real sixth sense? In this engaging talk, high school math teacher and YouTube star Eddie Woo shares his passion for mathematics, calling it an extra sense that we can all access. https://www.ted.com/talks/eddie_woo_how_math_is_our_real_sixth_sense?language=en

….and for the film buffs, here are 13 maths movies based on true events that will make you think about maths and mathematicians in a different way. Visit the link for a summary of each and see as many as you can:

https://medium.com/@Alikayaspor/13-must-see-mathematics-movies-inspired-by-true-events-1beda86255cd

The Man Who Knew Infinity, Pi, A Beautiful Mind, Stand and Deliver, X + Y, Good Will Hunting, The Imitation Game, Codebreaker, A Brief History of Time, N is a Number: A portrait of Paul Erdos, Travelling Salesman, Fermat's Room, The Oxford Murders.

c) Compulsory task (to be submitted in early September)

- HegartyMaths and mymaths lessons and quizzes will be set for you to complete before the start of your course. They will focus on the prerequisite skills and knowledge needed. By completing this work you will be at a major advantage and will find the transition to this course significantly smoother.

- By means of two <u>fully</u> worked examples, explain and illustrate the difference between simple interest and compound interest. You should quote any relevant formulas and explain the meanings of the variables in your formulas.

- By means of two <u>fully</u> worked examples, explain and illustrate the difference between APR and AER. You should quote any relevant formulas and explain the meanings of the variables in your formulas.

d) Stretch!

- UKMT Questions – individual and group https://www.ukmt.org.uk/competitions
- N rich – problem solving tasks https://nrich.maths.org/secondary
- Dr Frost https://www.drfrostmaths.com/resourceexplorer.php
- During your course you will be shown how to calculate Pearson's Product Moment Correlation Coefficient (PMCC), by using both a very complicated formula and by using the built – in statistical functions of a calculator. You will then be shown how to interpret the value of PMCC in context. This video explains the basic principles really well https://www.youtube.com/watch?v=ugd4k3dC_8Y

- Another measure of correlation is Spearman's rank correlation coefficient. Research this second measure and produce a PowerPoint presentation explaining how to calculate the value of it. Your audience will be fellow students in the Sixth Form. The following sources may be useful: http://www.statstutor.ac.uk/resources/uploaded/spearmans.pdf

Part II - Year 12 Head Start! for completion June – September

Specification of the course

Studying Core Maths helps students develop their quantitative and problem-solving skills. This is valuable preparation for the quantitative skills they will need for many degree courses, particularly subjects such as psychology, geography, business-related courses, sports and social sciences, and natural science courses that do not require AS/A Mathematics.

Please find below a link to the specification of the course, in addition I have summarised the topic headings. Note at McAuley we have opted to teach and assess you on Paper 2A so topics 3.8 – 3.13 can be ignored.

https://filestore.aqa.org.uk/resources/mathematics/specifications/AQA-1350-SP-2014.PDF

Paper 1: What's assessed & exam details

- Analysis of data
- Maths for personal finance
- Estimation
- 90 minute exam, 60 marks, scientific/ graphical calculator allowed

Paper 2A: What's assessed & exam details

- Critical analysis of given data and models
- The normal distribution
- Probabilities and estimation
- Correlation and regression
- 90 minute exam, 60 marks, scientific/ graphical calculator allowed

Your overall mark for the course will come Paper 1 + Paper 2. An equal weighting of 50% comes from each paper.

Headstart to the course

The resources below are designed to help you to make the transition from GCSE to AS Core Mathmatics. Many students say that they find the initial transition from GCSE challenging. These resources focus on key skills that will be used across the whole spectrum of AS Core Mathematics.

There are six sets of resources and each set should provide about 3 hours of work. If you really get engaged by the enrichment activities, you may want to spend longer than this. Each set includes either written worked solutions, video solutions or links to websites.

We hope you find these resources useful, that they add depth to your understanding, and that they help you make a smooth and successful transition to AS Core Mathematics.

https://amsp.org.uk/resource/gcse-alevel-transition-resources

The Mr Hayes Challenge

For those of you who do not know Mr Hayes, he is a teacher at McAuley who specialises and teaches only Key Stage 5 Mathematics groups. He is our Core Maths Leader. Please complete a challenge he has sent you below:

Task 1

The marks of 15 students in a Geography test were as follows:

23, 58, 71, 32, 44, 63, 80, 27, 41, 72, 97, 56, 31, 63, 58

- Showing full working out, determine the range, median and mean mark.
- Research how to find the mid – range of a set of data and determine this measure for the data above.
- Research how to find the lower quartile (Q_1) and upper quartile (Q_3) for a set of discrete data such as that above. Determine these two measures for the data above and hence find the interquartile range.

Task 2 (Extension)

The same 15 students also took a History test but were joined by a student who was absent for the Geography test. The marks of the 16 students in the History test were as follows:

45, 19, 37, 47, 51, 36, 31, 59, 26, 61, 92, 35, 39, 28, 47, 29

- Showing full working out, determine the range, median, mean, mid – range and interquartile range for the History test marks.
- The mark of 92 in the History test is much larger than any of the other fifteen marks. It could be regarded as an <u>outlier</u>. Research how to test for outliers for a set of discrete data. Check to see if this value of 92 is indeed an outlier. You must justify your answer.

We very much look forward to working with you in Core Maths next year!