

Let Maths take you Further...

IMPORTANT DATES

Conferences for Centre Managers

- Spring 2008 Conference, March 10th and 11th.
- FMN Day at the MEI Conference, July 4th. (full conference is July 3rd to July 5th)

Dates for termly returns

- Winter Term: Friday 18th January 2008.
- Spring Term: Friday 18th April 2008.

GREAT NEWS

- The heats of the UKMT/ FMN Senior Mathematics Team Challenge have been a resounding success. The Final will take place at the Clothworkers' Hall London, on 7th February. Prizes will be presented by Professor Marcus du Sautoy.

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Building On Our Success

The number of students being tutored through the FM Network continues to increase and, as a result of our support and encouragement, more schools and colleges can and do now teach Further Mathematics themselves. Recent analysis of DCSF data has shown the strength of the FM Network's impact on the state sector. In 2005/6 (the most recent data currently available) almost 80% of the increase in Further Mathematics student numbers was from the state sector and the number of state schools/colleges offering Further Mathematics rose by 16%.

This term has seen the start of two major developments, both of which we will build upon in the future. These are online tuition and the United Kingdom Mathematics Trust/FM Network Senior Team Mathematics Challenge. Detailed reports are included in this newsletter.

Online tuition will enable us to give tuition to any student, even when it is not possible to organise frequent face-to-face classes. It will also enable us to provide flexible and economical professional development for teachers and has the potential to allow us to give universal expert tuition to students studying for STEP and AEA examinations.

The Senior Team Mathematics Challenge gives sixth formers a chance to take part in a team mathematics quiz. The pilot competition has been a huge success and we hope it will establish itself as a prestigious national event that all schools and colleges will wish to take part in.

Charlie Stripp, Programme Leader

Attracting the best students of mathematics into engineering

Mathematics in Education and Industry and the Institution of Engineering and Technology have just published the report of a conference they held last May. The conference looked at ways the FM Network could help university engineering departments and employers. There was also discussion of how the Network could benefit from these organisations, and some of these are beginning to take effect – for example one employer has offered the Network the use of some of its conference facilities. The conference report may be found at:

www.mei.org.uk/files/pdf/MEI_IET_Report.pdf

Richard Browne, Programme Leader (Industry)

More Resources for Registered Schools and Colleges

Schools and colleges that register with the Further Mathematics Network receive a single username to access the online resources for AS/A2 applied mathematics and further pure mathematics units. We have recently added more resources for all specifications.

Units currently supported:

	FP1	FP2	FP3	DE	M1	M2	M3	M4	S1	S2	S3	D1	D2	NM
AQA	✓	✓	✓	N/A	✓				✓			✓		N/A
Edx	✓	✓	✓	N/A	✓	✓			✓			✓		N/A
MEI	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
OCR	✓	✓	✓	N/A	✓	✓			✓			✓		N/A

The resources are continually updated and resources for units that are not currently supported will be added in due course.

Tom Button, Online Learning and IT Coordinator

FM Network Remote Tuition Team

After piloting tuition through Elluminate during Spring and Summer 2007, the FM Network Remote Tuition Team has been teaching Further Mathematics to around 20 students this term. We are delighted with how this has gone. The students are taking to Elluminate like ducks to water! Feedback tells us that they are very happy with the learning experience it provides:

“At first I thought it would be difficult to understand work learning it off a screen, but it actually helps to focus your concentration.”

“The Elluminate system has allowed me to study for a course that I would not otherwise have been able to. The system is great, the microphones, white board and application sharing mean the students can experience classroom style interaction with teachers and students that may be hundreds of miles away.”

We have also been able to use Elluminate to provide an extensive programme of online revision sessions for many different modules and specifications for the January exams. At the time of writing these are about to begin. We'll be doing this again for the Summer exams; please look out for announcements about this.

We believe that using Elluminate to provide Further Mathematics tuition is a very good solution in situations where face-to-face tuition is very difficult or impossible to arrange. It is an excellent way to extend the reach and level of support provided by the Network and we hope that many FM Network Centres will make use of it. The necessary equipment (graphics tablets and headsets) is very cheap and easily obtained. FM Network Centres can access their own online Elluminate classroom by following a single hyperlink.

Students love working with Elluminate; it's easy to forget just how much today's sixth formers are used to communicating through the internet. Within Elluminate this happens via audio, text and handwritten mathematics.

As well as using audio alongside straightforward whiteboard work and slide presentations, through Elluminate you can also:

- share Excel spreadsheets – brilliant for Numerical Methods and Statistics
- share Autograph graph plotting software – useful throughout Further Mathematics
- work with a TI-84 Plus emulator to show students how to use a graphical calculator
- use the multiple choice tests from the online resources to have live polls
- show students webpages (including the online resources)

There are already lots of resources available for use in Elluminate that have been created by the Remote Tuition Team. Tutors can also record their Elluminate sessions so that students can use/watch them again at a later date.

Please see www.fmnetwork.org.uk/online.php for further details.

In January 2008, details of STEP and AEA support provided by the Remote Tuition Team will appear there. Support on using Elluminate, including one-to-one training sessions, can be organised by contacting me.

Richard Lissaman, Deputy Programme Leader

Online, Live and Interactive Professional Development in Maths

Professional development and support for teachers using Elluminate is an exciting project that will enable teachers to improve their subject knowledge and prepare themselves to teach new topics. The courses will focus on subject knowledge, with different courses addressing different strands/units of the AS/A level Mathematics specifications. We believe that this type of PD can solve many of the problems facing teachers who want to improve their subject knowledge. The courses will not involve teachers taking time off school, so more should be able to participate, and the costs are lower than traditional one-day courses plus supply cover. Small groups of teachers will meet online for hour-long sessions with an expert tutor over a period of several weeks, so teachers will be working with others with similar needs. Teachers will be able to study and communicate between sessions and receive ongoing support.

Pilot sessions for Remote Professional Development are now well underway. We are grateful to the FMN Centre Managers who have taken part and given feedback on the sessions. The first course, covering Further Pure Mathematics 1 starts in the New Year and will be followed by Decision 1 and Mechanics 1 courses in the summer. Further information about the project and the courses is available at: www.fmnetwork.org.uk/cpd.php

Sue de Pomerai, Assistant Programme Leader

**Support for
the most able
A level Maths/
Further Maths
students:
Tuition
for STEP
and AEA
through the
FM Network**

During the spring term the FM Network will be running a pilot programme offering support for the Cambridge Sixth Term Entry Paper (STEP) and the Advanced Extension Award (AEA) via online tutorials. Some FM Network Centres will also be offering face-to-face classes.

The online tuition will take the form of 10 weekly one hour long online sessions, where groups of up to 5 students will meet with an expert tutor on-line, in a virtual classroom.

There will be a number of weekly timeslots available (e.g. Mondays at 5pm, Tuesdays at 6pm,...). Details of these and how to book places will appear in January 2008 at: www.fmnetwork.org.uk/online.php. In the meantime, if anyone has any queries about these tutorials, please contact Richard Lissaman (See back page for all contact details).

The fee for the 10 pilot sessions will be £100. We hope and expect that schools and colleges will consider this to be an appropriate use of their Gifted and Talented funding.

Preparing for STEP/AEA Mathematics exams allows the most mathematically able sixth form students to develop their mathematical problem solving skills to a very high level. STEP papers are aimed at the top 2% of the A level Mathematics cohort, AEA papers are aimed at the top 10%. These students should all be studying for A levels in both Mathematics and Further Mathematics.

STEP/AEA Mathematics exams have a different emphasis to A level Mathematics and Further Mathematics. The A level exams are relatively short (90 minutes for each paper) and students are expected to demonstrate a fluent knowledge of the techniques they have learnt by applying them to fairly standard problems. STEP/AEA exams are longer (3 hours) and students are expected to tackle at most 6 or 7 questions, meaning that they have time to think hard about solving difficult problems. To get the maximum benefit from STEP/AEA Mathematics, students need regular expert input over a number of weeks. At the moment many talented students are not fortunate enough to have access to appropriate support.

The long-term aim is that, through the support of the FM Network, appropriate tuition in STEP/AEA Mathematics will be available for an affordable amount to all students who could benefit from it. We hope that the FM Network will be able to solve this equal opportunities issue and give all students a fairer chance to benefit from the experience of STEP/AEA Mathematics.

Charlie Stripp, Programme Leader

**Student
Area on FM
Network Site**

We have added a student area to the FM Network website:
www.fmnetwork.org.uk/student_area/

The student area contains a guide for students studying Further Mathematics, recreational maths activities, examples of maths used in the real-world, podcasts and much more. The student area is not just for students – many teachers will find material of interest there too!

Tom Button, Online Learning and IT Coordinator

**Great News
from St
George's
Medical
School**

Following representations from the FM Network, St George's Medical School has agreed to accept AS Further Mathematics to count towards its undergraduate admissions offer of AAB in three A levels, plus an A in a distinct AS level. Up to now both AS and A level Further Mathematics have been excluded from St George's offers.

The text below is quoted from their admissions tutor:

"Our admissions policy requires three A levels and an additional distinct AS level we have agreed that a candidate offering A level Mathematics in addition to AS level Further Mathematics would be considered. However, a candidate offering two A levels in Mathematics and Further Mathematics in addition to either Chemistry or Biology would not be covering a broad enough range of subjects.... Of course, very able mathematicians who wish to offer four A levels would be considered but we could not consider both Mathematics subjects as a contribution to the overall AAB grades required at A level."

Last year we achieved a similar result with Imperial College Medical School. Many medical schools do accept Further Mathematics qualifications and we will continue to encourage those that do not to change their policy. Please let us know of any specific examples where students have been affected by medical schools' admissions policies relating to Further Mathematics.

Charlie Stripp, Programme Leader

Report on UKMT/FMN Senior Team Mathematics Challenge

At the time of writing, just three of the nineteen regional heats of the UKMT/FM Network Senior Team Mathematics Challenge are yet to take place. Once all the heats have finished over 300 schools and 1200 students will have taken part in this pilot competition.

I've been to two of the heats and both were thrilling occasions. The students competing were completely immersed in the mathematics, which generated a real feeling of tension. Many of the Centre Managers who have organised heats have been sending me comments and passing on feedback from students who took part. Almost all of this feedback has been extremely positive and we hope the competition will go on to become an annual event.



The pilot has shown us several ways in which we might make any future competition even better. It has also shown us that there is huge demand from schools and colleges to take part. To satisfy demand we hope to have many more heats next year.

As those of you who have been at heats will know, the teachers accompanying their teams have a big part to play at the event, so I'd like to thank them for their support.

Our collaboration with UKMT has been a fantastically positive experience. As those organising heats will confirm, the job of running the heats has been made relatively straightforward thanks to UKMT's amazing support. I'd like to thank everyone at UKMT for all their hard work and particularly Mary Wimbury (Director, UK Mathematics Trust).

Richard Lissaman, Deputy Programme Leader

Questions and Answers from the Pilot Event

We would like all schools and colleges to feel confident about taking part in the competition. Some schools and colleges are very familiar with taking part in such events; others have no experience of mathematics competitions and do not know what to expect, which may discourage them from entering. To help address this, we have made this year's questions and answers available on the FM Network website, along with details of how the events operate and the rules for each round. Please see: www.fmnetwork.org.uk/stmchallenge.php

These questions are useful for mathematics enrichment. Students who are keen on mathematics will really enjoy working on them and they are excellent for helping students to develop their mathematical problem-solving skills. One way to use them is as optional 'enrichment homework' for enthusiastic students. Students also gain a lot from working together in pairs or small groups to solve these types of problems.

Charlie Stripp, Programme Leader

Wiltshire Heat of UKMT/FMN Senior Team Mathematics Challenge

The Wiltshire Heat of the Senior Team Maths Challenge took place on the 20th November 2007 at Hardenhuish School, Chippenham. Twenty-two teams of four keen mathematicians, each accompanied by a teacher, had entered, including one from Hardenhuish School, one from nearby Sheldon, and several from outside the county who had been unable to find space in their nearest heat.

Schools started to arrive from 1.00 pm, and began to tackle the starter questions. These, the questions from the group round of last year's Junior Team Maths Challenge, also run by UKMT, did not count towards the Challenge itself, but a separate prize had been arranged. By the scheduled start time of 2.00 pm all the schools had arrived and the Challenge was ready to begin.

Schools began with the group round, in which they were given ten questions, each worth six marks, with 45 minutes to answer them all. The questions were tough, but good teamwork skills meant that some excellent scores were recorded, including three perfect 60s.

The next round, the crossnumber, was to prove much tougher. The teams were split into two and given a crossnumber to solve - for the uninitiated, a crossnumber is like a crossword puzzle but with numbers instead of words. One pair was given the across clues, and the other the down clues, and the pairs were only allowed to communicate through the teacher. The clues were all mathematical puzzles, which at first glance appeared simple; however, many of them were related to other clues, making it difficult to know where to start – some teams decided that the best tactic was to forfeit some points by guessing in order to be given a couple of correct answers if they were wrong (see the crossnumber rules). In this way they were able to make a start on what was a fiendishly difficult puzzle. As a result, no-one was surprised to find that no score of more than 50 of the 75 marks available was recorded - the teams deserve to be congratulated on a good display of teamwork and mathematical ability.

By the time of the final round, the mini-relay, the hall was buzzing with anticipation. In this round, the team members were each given a puzzle to solve on their own. However, each team member required the solution from the previous team member i.e. only the first student could solve their problem without information from a team mate. This meant that this round involved some tactical thinking about where to put your best mathematicians. There were three sets of questions, worth 20 marks each for 4 correct answers, and the teams had ten minutes for each set. Once again, the teams showed that they were up to the challenge, with some very good scores, including one perfect 60.

While the scores were counted, the organisers provided a delicious tea, which was seized upon eagerly by the teams, hungry from their endeavours.



It was then time for the presentation. Firstly the organisers thanked the schools for attending. The team members from South Wiltshire Grammar School were then presented with their prizes for winning the starter round, having achieved a perfect score. Attention then turned to the main competition, and certificates were given to the winning team, Eton College. They will be representing the heat at the final in London on February 7th 2008, and we wish them the best of luck. Commendations should also go to the runners-up, Thomas Hardy School and Sheldon School, who also received certificates.

Finally, Benn, Andrea and Sarah from the Wiltshire FM Network Centre should be congratulated for organising an excellent competition.



This article was written by the FM Network Year in Industry (YINI) students James Hewlett and Michelle Bourne, who attended and assisted with the Wiltshire Heat of the UKMT/FMN Senior Team Mathematics Challenge.

(Information about the excellent YINI scheme can be obtained from: www.yini.org.uk)

News and events from the FM Network Centres

GLOUCESTER FMNC

The Last Piece of the FM Network Jigsaw is Added

Monday 19th November saw an exciting event for all those involved in the FM Network – the official opening of the Gloucestershire FM Network Centre, which completes the national FM Network. In September 2007, Penny Calder took up the post of Centre Manager, taking over from Dick Russell, the Centre Manager for neighbouring Somerset, who had been covering the position since January. Thanks to Dick's hard work establishing contacts in Gloucestershire, Penny has been able to get off to a great start with, among other things, a regional heat of the Senior Team Mathematics Challenge and a C1 revision day.



The fund holder for the Centre is Chosen Hill School, a specialist technology college in the village of Churchdown. By a strange co-incidence, this is the school that was attended by Andrew Ramsay, Chief Executive of the Engineering Council and Chair of the FM Network Advisory Panel. Andrew was delighted to accept an invitation from the school to perform the official opening of the Centre.

After a tour of his old school, Andrew gave an interesting and entertaining talk to year 11 and year 12 students entitled "Mathematics - the language of the 21st century". Andrew then unveiled the FM Network fund holder plaque and spent some time talking with students.

Penny Calder, Gloucestershire FMNC Manager and Sue de Pomerai, Assistant Programme Leader

MANCHESTER FMNC

Current Activities

We are delighted that students from four more schools are studying Further Mathematics with us this year. This means that Further Mathematics is very widely available to students studying in Manchester and the surrounding areas. We are now tutoring students in 14 schools. Over the last few years our student numbers have been relatively stable. This year we are tutoring between 50 and 60 students. As new schools come onboard, others have been able to start teaching Further Mathematics in-house. A great success for us is that some schools we have worked with are now able to teach Further Mathematics themselves. Recently, two schools that have had students tutored through the Manchester FMN Centre have been able to take Further Mathematics completely back in-house; two others are offering part of the course in-house, but still collaborating with the Manchester FMN Centre. One Head of Department said:

"Thanks to the Further Maths Network, we have finally managed to get Further Maths back onto the timetable at our school... Without their help and support this would not have been possible; the students have valued both the tuition and study/revision sessions available to them."

In addition to direct tuition, we are offering a wide range of events in collaboration with Manchester University's Schools and Colleges Liaison group. Coming up are MEI study and revision days for S1, S2, D1, NM as well as Core Maths revision days for all syllabuses for the January Exams; we expect numbers to exceed the 200 students that attended last year. We also have a full programme of teachers' professional development courses, including two-day courses for C1/C2 and C3/C4. Tom Button (Online Learning and IT Coordinator) will be presenting a course on 'Stretching the brighter year 11 pupil' and Sue de Pomerai (FMN Assistant Programme Leader) will be taking us 'From D1 to D2'. During the Autumn term we have already run two Mathematics taster days for year 11 pupils and more are to be organised for the coming year. The plans are now starting for the big 'Making Mathematics at Manchester' residential event next summer.

Last, but certainly not least, we were pleased to welcome Charlie Stripp (FMN Programme Leader) to speak at a Teachers' evening on 29th November. This event enabled us to update teachers on both local and national developments in mathematics education and it also provided a medium whereby they enjoyed a relaxing and informative evening in the company of teachers from different schools and colleges in the region.

Abigail Bown, Manchester FMNC Manager

Recreational Mathematics

As reported in this newsletter, the regional heats of the UKMT/FMN Senior Team Mathematics Challenge have been taking place. Having good questions is vital for the success of any mathematics competition. It therefore seems appropriate to include here some of the excellent questions written by UKMT.

UKMT is also involved in coordinating several mathematics challenges for individuals each year, at junior, intermediate and senior level. These have a common format of 25 multiple choice questions, with the first 15 being more accessible than the latter 10, which give more food for thought! For further information see:

www.mathcomp.leeds.ac.uk/Home.htm

Below are recent problems from the individual Senior Mathematics Challenge (which is primarily for 16-19 year olds) that were set as question 25, reputedly the most difficult question of the paper,

Acknowledgment: These questions are copyright UKMT. We are grateful for UKMT's permission to reproduce them here.

2003: Q25

How many pairs of positive integers (x, y) are solutions of the equation: $\frac{1}{x} + \frac{2}{y} = \frac{3}{19}$

- A: 0 B: 1 C: 2 D: 3 E: more than 3

2004: Q25

Positive integers x and y satisfy the equation: $\sqrt{x + \frac{1}{2}\sqrt{y}} - \sqrt{x - \frac{1}{2}\sqrt{y}} = 1$

Which of the following is a possible value of y ?

- A: 5 B: 6 C: 7 D: 8 E: 9

2005: Q25

Which of the following is equal to $\frac{1}{\sqrt{2005 + \sqrt{2005^2 - 1}}}$?

- A: $\sqrt{1003} - \sqrt{1002}$ B: $\sqrt{1005} - \sqrt{1004}$ C: $\sqrt{1007} - \sqrt{1005}$
 D: $\sqrt{2005} - \sqrt{2003}$ E: $\sqrt{2007} - \sqrt{2005}$

2006: Q25

X is a positive integer in which each digit is 1; that is, X is of the form 11111...

Given that every digit of the integer $pX^2 + qX + r$ (where p , q and r are fixed integer coefficients and $p > 0$) is also 1, irrespective of the number of digits X , which of the following is a possible value of q ?

- A: -2 B: -1 C: 0 D: 1 E: 2

2007: Q25

The line with equation $y = x$ is an axis of symmetry of the curve with equation:

$$y = \frac{px + q}{rx + s}$$

where p , q , r , s are all non-zero. Which of the following is necessarily true?

- A: $p + q = 0$ B: $r + s = 0$ C: $p + r = 0$ D: $p + s = 0$ E: $q + r = 0$

UKMT Senior Maths Challenge – Question 25!

Recreational Mathematics

In the last issue we included three questions from the ten that were posed to delegates at the 2007 MEI conference.

Questions:

1. 2007 can be written as the sum of consecutive positive integers in several ways. Of these which involves the most integers?
2. In (a variant of) the game **fizz-buzz**, the positive integers are called out in order starting from 1 but replacing any number which is a multiple of 3 with 'fizz' and replacing any number which is a multiple of 5 with 'buzz'. So the game begins: 1, 2, **fizz**, 4, **buzz**, **fizz**, 7, 8, **fizz**, **buzz**, 11, **fizz**, 13, 14, **fizzbuzz**, 16, ... What is the 2007th number to be said aloud?
3. The integers from 1 to N are written down in alphabetical order in English. Two thousand and seven is in position 2007. Give all possible values of N.

Answers:

1. 18 integers (103+...+120) 2. 3763 3. 2011, 2012 or 2013

The other questions posed, along with comprehensive solutions can be found at:

www.fmnetwork.org.uk/challenge.php

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for the latest from the Network don't forget to visit the website every week

www.fmnetwork.org.uk

Let Maths take you Further...