

Focus of the Month

December 2017

STEP, MAT, TMUA and AEA: Supporting students with higher level problem solving



Our focus for this month is the support the FMSP provides for students preparing for examinations that require higher level problem solving skills. We will be looking at materials that can be found directly on the FMSP website; regular problem solving classes for students; student and teacher conferences; and teacher professional development in providing support for STEP, MAT, TMUA and AEA.

An overview of STEP, AEA and the MAT

The **Sixth Term Examination Paper (STEP)** is an examination that was developed to replace the old Cambridge scholarship and entrance examinations that were required for entry around 25 years ago. It is a well-established examination that is used in conditional offers for both the University of Cambridge and the University of Warwick. Some other universities encourage students to take STEP papers.

The STEP papers are designed to test candidates on questions that are similar in style to undergraduate mathematics. You can download the [STEP specification](#) from the [Admissions Testing Service](#) website.

The **Mathematics Admissions Test (MAT)** is a test for applicants to the University of Oxford's courses in Mathematics and Computer Science (and some of their joint degrees). Since 2013, Imperial College London has also used the MAT as part of their entry requirements. Warwick University and Durham University accept the MAT as part of their offer.

The MAT is set with the aim of being approachable by all A level Mathematics students, including those without Further Mathematics A Level (or equivalent). You can [read about the MAT](#) on the [Admissions Testing Service](#) website.

The **Test of Mathematics for University Admission (TMUA)** is designed to give students the opportunity to demonstrate that they have the essential mathematical thinking and reasoning skills needed for a demanding undergraduate Mathematics or Mathematics-related course.

Students applying to study Mathematics courses at Durham University, Lancaster University or the University of Warwick can take this test as part of their application. The test is not

compulsory, however a good performance on this test may result in a reduced offer. Students can also share their results with the London School of Economics and Political Science (LSE) if they are applying to study Mathematics and Economics or Mathematics with Economics. You can [read about the TMUA](#) on the [Admissions Testing Service](#) website.

The Advanced Extension Award (AEA) is a means of testing students against standards comparable with the most demanding to be found in other countries. Some universities use AEA as a means to differentiate between able students.

AEA papers are aimed at the top 10% of A level students and are designed to provide challenge and opportunities for students to demonstrate greater depth of understanding than that required at A level. You can read the [AEA specification](#) on the Pearson (Edexcel) website.

The final planned AEA examination is in June 2018. Pearson (Edexcel) have issued a survey to schools to assess the need for a new equivalent qualification.

Resources

We provide a number of [A level resources](#) designed to support teachers and students.

In preparing for STEP, AEA and the MAT, it is important for students to develop their problem solving skills. The [A level problem solving](#) pages provide

- Groupwork activities – These allow students to solve a problem as a team and promote mathematical discussion.
- Year 12 problem solving practice questions – These are an ideal primer for students thinking of applying for a university that asks for STEP, AEA and the MAT.
- Year 12 and 13 masterclass activities – These look at specific areas of mathematics that are important for success with STEP, AEA and the MAT.

Materials from the [Senior Team Mathematics Challenge](#) provide a wealth of enjoyable and challenging questions with which students can hone their problem solving skills.

These resources can be used to as enrichment or to develop problem solving skills in any A level mathematics classroom regardless of student aspiration.

Regular problem solving classes

The FMSP, in association with several universities, runs a number of regular problem solving classes across the country.

Year 12 problem solving classes focus on developing problem solving skills by using examples from a number of sources. For students who are interested there is support in preparing for the MAT which is used by Oxford University, Imperial College, London and Warwick University and the TMUA which is used by Durham University, Warwick University and Lancaster University as part of their selection procedures.

Year 13 problem solving classes focus primarily on the sort of problem solving required for success in the STEP examinations used by Cambridge University and Warwick University as part of their selection procedures.

Each set of classes consists of 10 – 15 two to three hour sessions usually based at a local university. The sessions are run by tutors with experience of preparing students for STEP, AEA and the MAT. Details of these classes can be found on the [STEP/AEA/MAT](#) pages.

Problem solving conferences

The FMSP runs several of these one-day events to give students a taste of problem solving and an idea about what is expected for the STEP, AEA and MAT examinations. Details of these classes can also be found on the [STEP/AEA/MAT](#) pages.

Problem Solving Matters

MEI, in conjunction with the FMSP, organises the *Problem Solving Matters* course for year 12 students from state-funded schools, academies and colleges who are interested in applying for places at Oxford University, Imperial College, Durham University and Warwick University to study Mathematics.

This course is designed to prepare students for the way they will have to think to achieve success in the MAT, TMUA and other problem-solving mathematics examinations by developing their mathematical thinking and problem solving skills.

The course consists of three face to face study days (at one of the University of Oxford, Imperial College London, Durham University and Warwick University), three summer assignments, and five online follow-up sessions.

The 2017 course is now closed. Applications for the 2018 course will be accepted from April. Details can be found on the [MAT and TMUA](#) page of the MEI website.

Online support for STEP, MAT, TMUA, AEA

MEI, in conjunction with the FMSP, provides online tutorials for students preparing for STEP, AEA and the MAT.

The [STEP and AEA](#) courses consist of 10 fortnightly tutorials running from February to June. Students are given access to a set of online resources to accompany the tutorials.

The [MAT and TMUA](#) course consists of seven one-hour online sessions that take place in September and October. The MAT and TMUA online sessions include discussion of key points and examples from past papers. Participants are given access to additional online resources for the MAT and TMUA including extra notes, exercise sheets and solutions.

Professional development

The FMSP provides professional development and resources to support teachers in preparing students for STEP, AEA and the MAT.

Supporting students with STEP and AEA Mathematics is a one day course focusing on the development of problem-solving skills at Key Stage 5 and strategies for preparing students for the STEP and AEA examinations.

Supporting students with STEP Mathematics is an in-depth two-day course focusing on the development of problem-solving skills, and the key ideas, concepts and strategies for preparing students for the STEP examinations.

To find details of courses like these running locally, please see our [teacher events pages](#), or contact your Area Coordinator.

Other useful sources of help with STEP, AEA and the MAT

[NRICH](#) provide a vast number of mathematical problems with which your students can develop their problem solving skills. They also have a specific [STEP prep](#) section on their website with [instructions on how to use their materials](#).

[Meikleriggs mathematics](#) has a number of resources to help students prepare for the STEP examinations including worked solutions to past papers.

Cambridge University runs a [STEP Support Programme](#). Students can register to access materials and a forum to help them prepare for the STEP examinations.

Stephen Siklos has produced two booklets to help students prepare for the STEP examinations:

[Advanced Problems in Core Mathematics](#) and [Advanced Problems in Mathematics](#). Both booklets provide worked examples with commentaries to explain the thinking required.

Jonny Griffiths' [Rich Starting Points for A level Core Mathematics](#) (or risps) provide some excellent investigations for A level students that get them thinking more deeply about the mathematics they use.

Materials from [Underground Mathematics](#) can be used to develop good problem solving skills at A level.

Universities that require or encourage STEP, AEA and the MAT

	STEP	MAT	TMUA
Required by	University of Cambridge University of Warwick*	University of Oxford Imperial College London	University of Warwick (as an alternative to STEP I)
Encouraged by	King's College London Loughborough University University College London University of Bath University of Bristol	Durham University Warwick University both as an alternative to the TMUA/STEP for students also applying to Oxford University or Imperial College	Durham University Lancaster University LSE

* Warwick University have several routes to an offer of a place. There is one offer that does not include any additional qualifications.