

VCE Mathematical Methods (CAS) computer-based delivery of Examination 2 trial 2010–2013

Expression of Interest

Introduction

The Victorian Curriculum and Assessment Authority (VCAA) is seeking expressions of interest from schools wishing to participate in a limited trial of computer-based delivery of Mathematical Methods (CAS) Examination 2. The purpose of the trial is to assess the use of Computer Algebra System (CAS) technology to deliver examination questions and capture student responses, building on earlier VCAA work on the use of Information and Communications Technology (ICT) in assessment.

Digital technologies such as CAS provide an opportunity to align enabling technology with delivery and response for related assessment. CAS software, or software employing CAS as an 'engine', can be used as a medium for delivery of test and examination assessment. The VCAA has decided that it is timely and appropriate to undertake a limited trial of CAS for delivery and recording of student responses in VCE Mathematics examinations, over a period of four years (2010–2013), culminating in computer-based delivery of Mathematical Methods (CAS) Examination 2 in 2013, the final year of the trial.

This document sets out the background to the trial, its structure and implementation details and technical requirements for schools interested in participating. The VCAA invites schools to submit expressions of interest no later than Friday 22 October 2010.

Background

CAS is a flexible and powerful mathematical technology widely used in industry, business, research and academia where mathematical analysis is required. CAS software and handheld devices have numerical, graphical, statistical, geometric and symbolic functionality and provide a medium for mathematical computations with sophisticated capabilities for interactive electronic documents including text and diagrams as well as computations. They can be used as presentation and publication tools and engines for web-based activities such as search engines.

Commencing in 2010, an approved CAS can be used as the enabling technology for *all* VCE Mathematics studies Units 1 to 4, following a period of transition in VCE Mathematics studies over the last five years. Between 2006 and 2009, studies in Mathematical Methods and Mathematical Methods (CAS) were offered, with transition to Mathematical Methods (CAS) only by 2010. Over the same period, the assumed enabling technology in Further Mathematics Units 3 and 4 and Specialist Mathematics Units 3 and 4 was an approved CAS or an approved graphics calculator.

Since 2006, with prior approval from the VCAA, schools and their students have been able to use CAS software as a computational tool in applicable examinations (that is, students provide written responses in examination booklets, but use CAS software on a computer as their computational tool rather than a CAS calculator). Prior approval from the VCAA is necessary to ensure that invigilation and security requirements for written examinations are met.

From 2010 (inclusive) an approved CAS calculator or software is the assumed enabling technology for Mathematical Methods (CAS) Units 1 to 4 and from 2010 (inclusive) for Specialist Mathematics Units 3 and 4. From 2010 (inclusive) either an approved CAS or an approved graphics calculator is the assumed enabling technology for Further Mathematics Units 3 and 4.

VCAA approved CAS include both hand-held devices and software: approved CAS calculators include the CASIO *Classpad*, Hewlett-Packard HP 50 and Texas-Instruments *NSpire*, and approved CAS software include *Maple* and *Mathematica*. Both *Maple* and *Mathematica* incorporate functionality specifically designed to support electronic design and delivery of test and examination assessment in an educational setting. CAS software licences provide a cost-effective means of supplying enabling technology to students in the school environment, and can be used to integrate pedagogical, curriculum and assessment practices.

Structure of the trial

It is planned that the trial will involve up to several hundred students across six volunteer schools, and will be structured through *two* staggered sequences of students working with CAS software in three one-year stages from Year 10 through to Year 12 as indicated in the following table. Each school participating in the trial would plan to implement *both* sequences.

Year	2010	2011	2012	2013
Sequence 1	Year 10 Semester 2	Year 11	Year 12	
	Expression of interest and selection of trial schools. Familiarisation with CAS.	Mathematical Methods (CAS) Units 1 and 2 trial of CAS delivered end of unit test/examination. VCAA develops trial test/examination in conjunction with trials schools.	Mathematical Methods (CAS) Units 3 and 4 trial of CAS delivered versions of previous examinations as practice papers. Students complete final paper in traditional script booklets using CAS software as computational tool only .	
Sequence 2		Year 10	Year 11	Year 12
		Familiarisation with CAS and trial of school-based CAS delivered tests.	Mathematical Methods (CAS) Units 1 and 2 trial of CAS delivered end of unit test/examination. VCAA develops trial test/examination in conjunction with trials schools.	Mathematical Methods (CAS) Units 3 and 4 trial of CAS delivered versions of previous examinations as practice papers. Students' complete final paper CAS delivered (computation and response).

The trial will incorporate:

- free unlimited *Maple* (from Ceanet) or *Mathematica* (from Wolfram Research) school site licence (including individual user licence for all participating students and their teachers and access to upgrades) for the duration of the trial. Schools will be randomly assigned to one of two groups of three schools – one group using *Maple*, the other using *Mathematica*
- technical training in the use of the CAS and its assessment functionality provided by the relevant technology company (Ceanet or Wolfram Research as applicable)
- a comprehensive professional development program provided by the VCAA
- access to a mentor who is familiar with the CAS software and its use in educational contexts (curriculum, pedagogy and assessment) who will work with the *Maple* and *Mathematica* school groups.

Schools wishing to be considered for participation in the trial must ensure that they will be able to meet the requirements outlined in Section 3 below.

Following successful conclusion of the trial those schools involved may have the option of continuing with computer-based delivery of Mathematical Methods (CAS) Examination 2 (or its equivalent), subject to VCAA approval.

VCAA requirements for use of CAS software in VCE Mathematics examinations

When the VCAA approved the introduction of CAS as a *computational tool* for students in VCE Mathematics Examination 2, a series of examination requirements for the use of CAS software were published in the November 2005 VCAA Bulletin No. 32. These requirements have been updated and revised for the purposes of the trial, as set out below.

Students at schools involved in the trial will be permitted to use computer-based CAS software, *Maple* or *Mathematica* and stored files on a single CD-ROM or DVD for Mathematical Methods (CAS) Examination 2 provided the school meets the following requirements from the beginning of 2011:

- all computers and monitors to be used are maintained in excellent working order
- every student has access to a computer which can operate independently of any other computer for the duration of the examination
- computers do not have any electronic, infra-red, blue-chip or other communication capability enabled
- computers are visually isolated from each other
- there are a suitable number of standby computers for use in case of failures (recommended 3–5 standby computers per 15–20 students)
- sufficient memory is available to run the approved CAS software, assessment software and security software under examination conditions for the cohort of students involved in the trial
- the approved CAS software, assessment software and security software has been successfully trialled prior to the examination, and are operational on each computer
- other folders, programs (including screensavers) or software have been removed or made unavailable for the duration of the examination
- a technical support person nominated and approved by the principal of the trial school sets up computers, as required by the VCAA, and monitors technical aspects of the conduct of the trial examination.

Schools selected to participate in the trial will receive further information and a nominated VCAA contact for inquiries about examination rules.

Teaching, technical and support requirements

In order to be considered for participation in the trial schools must:

- have a minimum of two mathematics teachers involved in teaching Mathematical Methods (CAS) for the duration of the trial (these need not be the same two teachers each year) and a trial coordinator, preferably the head of the mathematics faculty or subject coordinator, to implement the trial and be the school's contact
- meet 50% of the total costs for isolation and monitoring of computers used in VCE Mathematical Methods (CAS) Examination 2, for students of the school who are participating in the trial, as determined by the VCAA. The VCAA will contribute the other 50% of this cost.
- agree to have suitable ICT infrastructure and technical capacity in place to meet the requirements set out above in Section 3, from the beginning of 2011. Schools will be required to support implementation of CAS in classrooms, in trial testing and examinations at Year 11 (Units 1 and 2) from the beginning of 2011, for the conduct of Year 12 (Units 3 and 4) examinations in November 2012 (computation only) and November 2013 (computation, delivery and response).

Expressions of interest

The VCAA invites expressions of interest from Victorian schools wishing to participate in the trial. No previous experience with CAS software is necessary. Any queries in relation to the trial should be directed to the Curriculum Manager, Mathematics (see below for contact details).

Key Selection Criteria for the selection of schools to participate in the trial are:

- strong interest in and commitment to the trial for the duration of the trial
- demonstrated school leadership in mathematics teaching and learning and the use of technology
- demonstrated capacity of the school to provide relevant staffing, infrastructure and resources for implementation of the trial over the three year period
- demonstrated capability for implementation of ICT-based projects
- capacity for required infrastructure and technical support (set out in Section 3) to be in place by the beginning of 2011.

Expressions of interest using the *School Response to Expression of Interest Form* attached should be forwarded by 5.00 pm Friday 22 October 2010 to:

Dr David Leigh-Lancaster
Curriculum Manager Mathematics
Victorian Curriculum and Assessment Authority
41 St Andrews Place
East Melbourne 3002
Telephone: (03) 9651 4537
Email: leigh-lancaster.david.d@edumail.vic.gov.au

Following the expression of interest process, schools invited by the VCAA to participate in the trial will be required to enter a written agreement with the VCAA and to obtain the informed consent of participating students (and, where necessary, parents/guardians).

