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**To:** Reference group on teacher qualifications  
The Office of School Education, DEET Victoria

**Subject:** Review of the subject area guidelines that link teacher qualifications to areas of teaching

The review of qualifications for teaching in specific disciplines is timely. The Australian Mathematical Society (AustMS) welcomes the opportunity to provide advice on mathematics for teachers.

Definitions and clarifications:

A **major** used to be defined as a first year load of 0.25 of a year's load, the second 0.33 of a year's load, and the third 0.50 of a year's load.

A **minor** used to be defined as the first and second year loads as above,  $0.25 + 0.33$ .

*Many existing teachers reaching retirement age would have these qualifications.*

More recent definitions have seen 0.25 of a first year and 0.25 of a second year defined as a **minor** and an additional 0.25 of a third year constituting a **major**.

*There appears to be a trend towards new mathematics teachers having less discipline background than the ones they are replacing.*

**Early years, middle years and final years of schooling** will be defined as P-4, 5-9 and 10-12

Introductory remarks:

The supply of suitably qualified mathematics teachers is dependent on the number of graduates with sufficient mathematics background from education and mathematics. The number of mathematics graduates has been falling and starting salaries for graduate mathematicians are rising. Few new graduates are being attracted to teaching. This makes it even more important to define what content and methods studies teachers of mathematics should have for each stage of schooling as planning should commence as to the retraining needs of existing teachers.

The AustMS is aware of considerable debate in some overseas countries as to what constitutes appropriate mathematics education for teachers. This debate has still to happen in Australia although a serious attempt was made by the Speedy review of 1989 and much of what was said then was re-iterated by Ramsay in his report on teacher education to the NSW Government in 2000.

The AustMS is also aware of a couple of small, idiosyncratic studies being cited that claim that the amount of mathematics studied by teachers is not particularly important to student outcomes. This is refuted by major studies, especially in the USA.

It is clear that teachers must know and understand the mathematics they are teaching. However, they also need to have good teaching skills and be able to relate mathematics to other areas of the curriculum and to the world outside the classroom. Teachers of all disciplines should be well educated, not narrowly educated.

There are particular responsibilities for teachers of mathematics to students in their final years of schooling. From year 10 students should be able to expect appropriate advice from knowledgeable teachers about the mathematical demands of particular careers and interesting examples of uses of contemporary mathematics.

This implies that they must have on-going contact with the discipline of mathematics. However the AustMS believes that the professional development of all teachers of mathematics should include content studies on a regular basis and views with interest developments in California to pay particular attention to professional development programs and embedded content.

Mathematics teachers at all levels should be able to connect mathematics to real applications and careers and to show appreciation of the power and beauty of mathematics.

The following recommendations are based on consultation with a number of teachers as well as teacher educators and members of the AustMS Education Standing Committee.

#### Recommendations:

##### *Content standards*

The AustMS believes that the absolute minimum requirement for years 10-12 be 0.75 of a year's study—the newer definition of a major. These should be sequential courses taken over three years. This has been widely supported by the teachers consulted. The one caveat cited was that some engineers or physics majors may obtain sufficient additional study in mathematical applications during their course to have a lesser amount of specified mathematics.

The Society is convinced that 0.75 is not sufficient, especially for the more advanced year 12 courses and where schools teach university subjects. It accepts this only because it is unlikely that teachers will be found for remote and other hard to staff schools if there is a higher requirement. Teachers with this minimum standard must be given the opportunity, and required over time, to take further studies in mathematics.

For the middle years there is an urgent need to define appropriate mathematical knowledge and courses for these teachers. In the interim the requirement should be the newer definition of a minor. Again this should be seen as an absolute minimum. Teachers with at least 0.25 but less than 0.50 could be given provisional registration as a middle years mathematics teachers provided they had a mathematics method and undertook further studies in mathematics over time.

Ma's and other work on mathematics for early years teachers challenges notions that this is easy mathematics and 0.5 of a year's content study over a 4 year qualification in addition to pedagogical studies should be set as minimum.

Two semesters of pedagogical studies and a minimum of 20 days supervised teaching practice in mathematics should apply at all levels.

##### *Course validation*

To ensure the integrity, coherence and quality of the mathematical content for prospective teachers, courses should normally be taught within mathematics departments in close collaboration with mathematics educators and teachers.

##### *Professional Development*

With the proposed accreditation of teachers through the Institute of Teachers, on-going

development in the discipline. The Society will pursue this further as the Institute is developed.

### Concluding comment

In modern Australia two subjects remain the access subjects in terms of participation in society and to careers—English and Mathematics. They must be taught by appropriately qualified teachers. The Society would see as a matter of urgency that the Government put in place a strategy to ensure that all students were taught mathematics by teachers who at least met the minimum standards outlined above. This will require a considerable investment in study leave and course delivery which could be jointly shared by Federal and State ministries.

The Society is particularly concerned by the retraining scheme for overcoming the mathematics teacher shortage in NSW. Not only does it appear to have insufficient mathematics content for the background of the teachers involved but mathematics is best learnt over time. Further, little thought or time appears to have been given to the structure and content of the courses.

By adopting appropriate qualifications standards in Victoria, it would be hoped that something much more appropriate could be adopted for retraining teachers which is something that needs to happen as soon as possible to address those already teaching out of field.

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