

GRADE 12 MATHEMATICS AS REQUIREMENT FOR ADMISSION TO A FIRST DEGREE OR DIPLOMA AT HIGHER EDUCATION INSTITUTIONS

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INTRODUCTION

A variety of degree and diploma programmes at Higher Education Institutions requires some level of Grade 12 mathematics for admission purposes. These requirements are stated in terms of symbols that need to be obtained on either higher grade (HG) or standard grade (SG). The distinction between the two grades will fall away with the introduction of the new Further Education and Training Certificate (FETC) in secondary schools. The HG and SG mathematics will be replaced by a single subject, FETC Mathematics. In addition to this a totally new subject called “Mathematical Literacy” will be introduced.

Higher Education Institutions (HEIs) need to make decisions regarding admission criteria to these programmes in terms of the new FETC Mathematics and Mathematical Literacy. The matter is urgent because current grade 9 learners must make their subject choices for grades 10 to 12 towards the end of this year. These decisions must obviously be taken as part of an overall admissions policy in terms of the FETC, which will also include: (i) minimum threshold requirements to replace the current matriculation exemption – a SAUVCA/HESA task team has been working on this, (ii) minimum aggregate scores to be obtained on systems such as the Swedish point or Matric scores system and (iii) other subject requirements, eg Physical Science, Biology and English. While there is still some time to finalize these (the first FETC learners will at the earliest apply for admission for studies at HEI’s in 2009), the learners are confronted at the end of grade 9 with a compulsory choice between Mathematics and Mathematical Literacy. HEI’s must send a clear message to schools regarding the acceptability of Mathematical Literacy for admission to certain programmes or not. It is probably not necessary to prescribe the level at which Mathematics or Mathematical literacy need to be passed at this stage, but only which one of the 2 subjects will be used as pre-requisite for admission.

DIFFERENCE BETWEEN OLD AND NEW SYSTEMS

In the current system HG and SG Mathematics is the same subject, with the difference to be found in the level at which it is offered and assessed. It is possible for learners to attempt the subject at HG level, and if they are unsuccessful it can be converted to a pass on SG level. Similarly a fail on SG can be converted to a pass on lower grade (LG), although LG is not offered as such in schools. The implication of this conversion is that a student may fail a subject on a chosen level, but can still have the subject reflected as a pass on their senior certificate, although on a different level.

In the new system Mathematics and Mathematical Literacy are two different subjects, and not different levels of the same subject. The aim of Mathematics is to prepare the learner for the rigid demands of further studies in areas with a strong mathematics base. Mathematical Literacy on the other hand aims to provide the learner with the basic numerical skills that are needed in everyday life. Mathematical Literacy will prepare learners for the numerical demands of studies in areas not requiring a rigid mathematical base. A fail in Mathematics can not be converted to a pass in Mathematical Literacy because the nature of the two subjects is too different.

In the current senior certificate system learners can fail one of their 6 subjects, but still obtain a senior certificate with 5 subjects. In the new FETC learners must pass all 7 their subjects to obtain the FETC. The implication of this is that learners who choose FETC Mathematics and not Mathematical Literacy, and fail this subject will fail the FETC. Currently many learners are discouraged from doing mathematics HG for a fear of failure and in an attempt to increase the pass rates of schools. It can be expected that a similar attitude might cause teachers and parents to discourage learners from doing the FETC Mathematics.

It is very difficult at this stage to compare the level of difficulty of the “old” and “new” Mathematics, and predict what mark (scale from 0 to 6) on the FETC can be compared with either HG or SG symbols for the current mathematics. Although a comparison can be made of the content, as formulated in the national curriculum statements (NCS), a real comparison will only be possible once assessment standards or sample assessment papers, i.e. the level of work required from learners in the assessment, is known. An analysis of the content and topics however creates the impression that the FETC Mathematics is on a higher level than, or at least equal to, the current HG mathematics, i.e. totally out of reach of many of the current mathematics SG learners. This impression was contained in the submission of SAMS to the DOE when the curriculum statements were published in 2002.

The addition of new topics, specifically on statistics and probability, and the inclusion of more advanced applications in other areas, implies that many current mathematics teachers will struggle to present the FETC Mathematics effectively. This will compound the current huge problem regarding a lack of sufficient qualified mathematics teachers.

The latest policy document regarding the FETC released at the end of May 2005 for comments includes two new clauses that are of particular importance to Universities.

- ◆ For the transitional period, until a date determined by the Minister of Education, an achievement of 25% in Mathematical Literacy will be accepted as sub-minimum for obtaining the FETC. This, together with the current reworking of the Mathematical literacy to a lower mathematical level, further reduces the usability of the subject for the purpose of admission to studies at HEIs in areas where mathematics is required.
- ◆ Learners will be allowed to change subjects until the end of Grade 10, if they can prove that they meet the outcomes of the new chosen subject. No changes will be allowed at a later stage. The practical implications of this for mathematics is that learners should be able to change from Mathematics to Mathematical Literacy at this stage should they not cope with the level of work in Mathematics. This will hopefully encourage more learners to at least start with Mathematics in Grade 10. A change in the other direction, i.e. from Mathematical literacy to mathematics will be highly unlikely.

THE EFFECT OF THE CHANGES ON HIGHER EDUCATION

The factors discussed in the previous section create the fear that parents and teachers will be very hesitant to advise learners to choose the FETC Mathematics and not the Mathematical Literacy, especially in township and rural schools that traditionally have not offered HG Mathematics through a lack of qualified teachers. If only FETC Mathematics and not Mathematical Literacy is accepted for programmes in faculties of Science, Engineering, Health Sciences, Medicine, and Business and Economic Sciences, this can potentially drastically reduce the number of learners who meet the

admission criteria for studies in these faculties. In such a case institutions will need to creatively put plans in place to produce their own school leavers who will meet the required mathematical levels.

Since the first publication of the FET NCS for Mathematics and Mathematical Literacy various bodies have lobbied the DOE for the re-introduction of an intermediate level mathematics in the FETC. This included strong representations from SAUVCA as well as from the South African Mathematical Society (SAMS). A ministerial task team was appointed to report to the minister on this and other related issues. The final report from the task team was submitted to the Minister of Education at the end of March 2005. Although the Minister has not officially reacted on the recommendations contained in the report the latest policy document from the DOE, where the implementation in 2006 has been confirmed, suggest that she has accepted at least most of the report's recommendations. The most important recommendations from the report are:

- ◆ The NCS for Mathematical Literacy should be reworked in such a way that: (i) the focus is moved away from content to the context in which the mathematical literacy skills are to be applied and (ii) it contains more details.
- ◆ No provision is made for an intermediate level mathematics.
- ◆ To address the fears that both learners and teachers might have around a too high level of mathematics in the FETC Mathematics NCS, the task team proposed a “middle ground” position. A process is proposed whereby the full FETC Mathematics is phased in over a period and that the full curriculum is not offered immediately, and that only a core curriculum is offered for at least a 3 year period. This should be revised when the provision of qualified teachers has reached the stage where sufficient numbers are equipped to present the full FETC curriculum. A proposed timeline indicates 2014 as a target date for the full implementation of the NCS.
- ◆ The components of the proposed core curriculum are:
 - Topics in Learning outcomes 1 (Numbers and number relations) and 2 (Functions and Algebra) in the NCS that are currently included in SG mathematics
 - Linear programming and Absolute values that are currently only offered in HG mathematics
 - Topics in learning outcome 3 (Space, Shape and measurement) in the NCS that are currently included in SG mathematics, but with the specific exclusion of Euclidean Geometry riders
- ◆ The level and depth at which these topics will be treated is not clear at this stage. Clarity should be forthcoming when the assessment standards and sample examination papers are released by the DOE in September this year
- ◆ Schools should have the choice to offer the remaining topics in the current NCS, i.e. Euclidean geometry riders from Learning outcome 3 and everything in Learning outcome 4 (Data handling and probability), as an elective to learners. It is not yet clear if and how the elective topics will be assessed.
- ◆ Further electives such as Vector and matrix algebra, Financial mathematics, Modelling, Number theory, Integral and further differential calculus, Transformation geometry can be introduced with time
- ◆ HEIs should be requested to base their admission decisions only on the performance of a learner in the core, and not on the electives. The idea of the task team behind this request is that institutions can still, in particular in the case of high level programmes with a restriction in student intake numbers, use results in the electives as further guideline for selecting students.

The implications of the proposals of the task team for HEIs are:

- ◆ Mathematical Literacy can not be used for admission to any study programme requiring mathematics
- ◆ Where the original NCS for mathematics created the impression of a very high level of mathematics, the proposed core might imply that learners do not have all the skills and competencies with which the current HG mathematics equip them. Unfortunately clarity on this will only be obtained when the assessment standards and sample examination papers are released in September.

SAMS RECOMMENDATIONS

In view of the background provided above SAMS recommends the following regarding the use of the FETC Mathematics and Mathematical Literacy as admission requirements for studies at HEI's:

1. That no comments can be made at this stage regarding a possible mapping between symbols obtained in the current HG and SG Mathematics and levels of attainment on the FETC Mathematics and Mathematical Literacy. As soon as the final assessment guidelines, sample assessments and the outcome of the benchmarking project of SAUVCA/HESA are available these will be studied by SAMS and a recommendation will be made at that stage.
2. That, for the moment, secondary schools are advised that for admission to all degrees that currently requires Mathematics HG or SG, the Mathematical Literacy of the FETC will not be acceptable, and that the FETC Mathematics will be required. The exact symbols that learners need to obtain will be made known at a later stage.
3. That Mathematical Literacy will be accepted for admission to all other degrees and diplomas that currently requires no mathematics at all. Once again recommendations on the level of achievement (symbol) which learners need to attain will be made at a later stage.
4. That, despite the recommendation in 3 it should be recommended to schools, parents, teachers and learners that as many as possible learners should enroll for Mathematics in Grade 10, because it will allow learners to keep their study options open for a longer period of time. They will be able to change to Mathematical literacy until the end of grade 10 should they not cope with mathematics.

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