

## Higher level internal assessment

### Component grade boundaries

<b>Grade:</b>	1	2	3	4	5	6	7
<b>Mark range:</b>	0 - 2	3 - 5	6 - 8	9 - 11	12 - 14	15 - 16	17 - 20

### The range and suitability of the work submitted

The majority of explorations were generally commensurate with the Mathematics HL content but the quality was varied with some explorations in the top range; these consisted of work that had a very interesting creative approach on the use of Mathematics HL topics. Unfortunately a number of candidates submitted explorations that were a direct extraction from textbooks or online sources with some topics having a high level of complexity. In these cases it was evident that the candidate had not understood the mathematics used. In fact some explorations were so far removed from a teacher's/moderator's expected knowledge base that they were largely incomprehensible and very challenging to moderate. Students need to be reminded that the intended audience consists of peer students. Some explorations still lacked in-text citations; this requirement needs to be made clearly known to all teachers for transmission to students. Some teachers are still allowing students to submit explorations that are far too long. Although there is no strict penalty for explorations that exceed 12 pages, students need to be advised about choosing a focused topic that allows for an exploration to be written within the recommended page length. A number of well-worn topics continue to be submitted. These include the "SIR model", "Texas Hold'em Poker", "Fractals" and "The Golden Ratio". Although fewer in number, explorations were submitted that were extracted from mathematical videos. Although such videos act as a good stimulus at the beginning of the exploration process, students should not merely transcribe the video content and submit it as their own work exploration.

### Candidate performance against each criterion

#### Criterion A

In general this criterion was addressed well by most students, with work being coherent and organized to different extents. As mentioned above there is evidence to suggest that some students are not being well advised by teachers and submit work that is far too long, often in excess of 20 pages. A number of students included appendices to keep the length of the exploration within the 6 to 12 pages, however this rendered the exploration incoherent since the reader needed to refer to the appendix in order to understand the actual work. Some students continued to produce a table of contents and a word count. There is no need for either of these in the Exploration. Some problems with coherence were caused by students attempting to explain things that were beyond their own comprehension.

## Criterion B

Most students performed well against this criterion. A number of teachers condoned the misuse of calculator notation within student work resulting in an adjustment of the achievement level awarded by the teacher. In a few other cases the teacher allowed for the student to omit the definition of variables and parameters used in a modeling exploration.

## Criterion C

There is still a perception by teachers that this criterion is based on the student's commitment and enthusiasm for the topic. It is very important that teachers and students alike understand the scope of this criterion. Extracting work from a textbook, a website or a video clip does not allow the voice of the student to be heard in the exploration. Students are meant to take ownership of the work by solving some curiosity resulting from the stimulus used. Some explorations bore a clear stamp of originality with the student's enthusiasm coming through in the work submitted.

## Criterion D

In general students handled this more effectively in this session. This was seen when the student's reflection was ongoing showing cognitive reflection skills on their work. In most cases students seemed to understand what constitutes meaningful reflection but it continues to be challenging for most students to demonstrate critical reflection. Those students who achieved high levels against this criterion also scored highly against criterion C because as they made an effort to overcome their perceived shortcomings they managed to demonstrate personal engagement with their work.

For a few teachers and students this criterion still caused problems. When students include reflection only within the conclusion and just comment on the scope and limitations of the results obtained it often hinders the student from achieving higher levels. Teachers are advised to refer to the document "Additional notes and guidance on the Exploration" which can be found on the OCC.

## Criterion E

Once more the explorations submitted in this session included mathematics that was varied, ranging from very basic mathematics to extensions of the HL course that was well beyond the scope of the Exploration. Achieving a 6 still proved to be elusive on either count. Students who opted to explore more complex concepts were unable to demonstrate their understanding of the mathematics used and often transcribed information collected from researched sources; very often this was cobbled together with missing explanations showing that the student did not fully understand the concept and hence was unable to produce a written paper at a level accessible to a typical HL student. Some students who opted for modeling explorations failed to go beyond the mechanical work of either solving a differential or collecting data and technology based regression analysis.

## Recommendations for the teaching of future candidates

There was evidence to suggest that some teachers do not dedicate enough teaching time to the Exploration process. It is imperative that 10 hours of teaching time are used to guide the students and help them understand the requisites for this Internal Assessment and the Achievement Criteria. One way of achieving this would be to have students read and mark a couple of explorations that can be found on the Teacher Support Material. On the reverse side of the 5/EXCS form there is space to enter background information. The teacher and not the student should fill out this section. It should also include mathematical background knowledge of the class at the time the exploration was assigned and not information about the individual and their commitment to the topic. It is also mandatory that teachers show evidence of marking explorations with tick marks indicating where the mathematics used is correct and identifying errors. Annotations and comments should be written directly on the student's written response. The teacher assesses the work and the role of the moderator is to confirm the achievement levels awarded by the teacher and not to mark the work. Cryptic comments on student work, like "C+" or "D+" do not help the moderator when trying to verify the achievement level awarded. Teachers should avoid sending photocopies of student work. The original annotated work of the student (printed in colour when appropriate) should be sent for moderation.

## Higher level paper one

### Component grade boundaries

<b>Grade:</b>	1	2	3	4	5	6	7
<b>Mark range:</b>	0 - 17	18 - 34	35 - 46	47 - 59	60 - 73	74 - 86	87 - 120

## General comments

This proved to be an accessible paper with the majority of candidates able to score some marks on most of the questions. Candidates do need to be aware of the importance to read the questions carefully as they were often missing important details. These will be highlighted below in the comments on individual questions.

## The areas of the programme and examination which appeared difficult for the candidates

The following topics caused most difficulties for the candidates: Application of vectors in geometric problems, transformation of trigonometric functions, laws of logarithms, multiple solutions to trigonometric equations and solving equations which include absolute value functions.