

Mathematics SL

Additional Notes and Guidance on the exploration

Criteria and Notes

Additional notes have been written to provide further guidance to moderators on applying the criteria. These notes will provide useful advice to teachers, so are included in this document.

Further advice and information on the exploration is available on the Online Curriculum Centre (OCC), will be included in the subject report, and in the updated Teacher Support Material (TSM). This will include exemplar student work both unmarked and marked.

One area which teachers need to be more familiar with is the use of citations. Information and guidance on all aspects of academic honesty is available on the OCC, but it is essential that students acknowledge sources, and cite these at the point where they occur in the work. It is not sufficient to note sources in the bibliography.

Feedback from moderators indicated that many teachers are not providing comments and annotations on the work. Teachers should provide as much information as possible, including reasons why certain levels are awarded, and background information. Marking information should be included on the work itself, as well as on the form 5/EXCS.

Teachers are also responsible for checking that mathematics used is correct, and to indicate this, or note where it is incorrect.

Criterion A: Communication

This criterion assesses the organization and coherence of the exploration. A well-organized exploration contains an introduction, has a rationale (which includes explaining why this topic was chosen), describes the aim of the exploration and has a conclusion. A coherent exploration is logically developed and easy to follow.

Graphs, tables and diagrams should accompany the work in the appropriate place and not be attached as appendices to the document.

Achievement level	Descriptor
0	The exploration does not reach the standard described by the descriptors below.
1	The exploration has some coherence.
2	The exploration has some coherence and shows some organization.
3	The exploration is coherent and well organized.
4	The exploration is coherent, well organized, concise and complete.

Additional notes

A complete exploration will have all steps clearly explained, and will meet its aim.

Key ideas and concepts should be clearly explained. **Mathematical** definitions and terminology should be considered under criterion B.

The use of technology is not required (although encouraged where appropriate). Therefore the use of analytic approaches rather than technological ones does not necessarily mean lack of conciseness, and should not be penalised. This does not mean that repetitive calculations are condoned.

An exploration which shows some organisation but does not have some coherence can achieve level 1.

The aim, introduction, rationale and conclusion do not have to be formally identified by the student and may be in the main body of the exploration.

Organisation refers to the overall structure or framework, including the introduction, body, conclusion etc.

Coherence refers to how well different parts of the exploration link to each other. It can also refer to the overall flow, including between different parts, or from text to mathematical presentation etc.

Criterion B: Mathematical presentation

This criterion assesses to what extent the student is able to:

- use appropriate mathematical language (notation, symbols, terminology)
- define key terms, where required
- use multiple forms of mathematical representation such as formulae, diagrams, tables, charts, graphs and models, where appropriate.
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Students are expected to use mathematical language when communicating mathematical ideas, reasoning and findings.

Students are encouraged to choose and use appropriate ICT tools such as graphic display calculators, screenshots, graphing, spreadsheets, databases, drawing and word processing software, as appropriate, to enhance mathematical communication.

Achievement level	Descriptor
0	The exploration does not reach the standard described by the descriptors below.
1	There is some appropriate mathematical presentation.
2	The mathematical presentation is mostly appropriate.
3	The mathematical presentation is appropriate throughout.

Additional notes

Mathematical presentation is not the same as communication. However, when there appears to be an overlap, care has to be taken **not** to penalise a student for the same shortcoming in criteria A and B.

There are multiple facets to criterion B, including using correct notation and terminology, and selecting the **appropriate** mathematical tool(s) and representation(s).

Level 3 can be achieved by using only one form of mathematical representation as long as this is appropriate.

Consistency in presentation is expected, but if there are inconsistencies which do not adversely affect the use of mathematics, they can be condoned.

Calculator and computer notation should not be penalized if it is software generated. It is expected that students use appropriate mathematical notation in their own work.

Criterion C: Personal engagement

This criterion assesses the extent to which the student engages with the exploration and makes it their own. Personal engagement may be recognized in different attributes and skills. These include thinking independently and/or creatively, addressing personal interest and presenting mathematical ideas in their own way.

Achievement level	Descriptor
0	The exploration does not reach the standard described by the descriptors below.
1	There is evidence of limited or superficial personal engagement.
2	There is evidence of some personal engagement.
3	There is evidence of significant personal engagement.
4	There is abundant evidence of outstanding personal engagement.

Additional notes

There must be evidence of personal engagement seen in the exploration. It is not sufficient that a teacher comments that a student was highly engaged.

There are many ways of demonstrating personal engagement, not just those mentioned in the guide and TSM.

A common “investigation/textbook problem” is unlikely to achieve the higher levels on criterion C unless there is clear evidence that the student has considered the problem from their own viewpoint or other contexts. This could be demonstrated by the students considering **and** applying new mathematics.

“Abundant evidence” refers to what is reasonable for a DP student (rather than an experienced teacher) to demonstrate in an exploration.

Criterion D: Reflection

This criterion assesses how the student reviews, analyses and evaluates the exploration. Although reflection may be seen in the conclusion to the exploration, it may also be found throughout the exploration.

Achievement level	Descriptor
0	The exploration does not reach the standard described by the descriptors below.
1	There is evidence of limited or superficial reflection.
2	There is evidence of meaningful reflection.
3	There is substantial evidence of critical reflection.

Additional notes

Simply describing results represents limited or superficial reflection. Further consideration is required to achieve the higher levels.

Some ways of showing meaningful reflection are: linking to the aims, commenting on what they have learnt, considering some limitations or comparing different mathematical approaches.

Some ways of showing critical reflection are: considering what next, discussing implications of results, discussing strengths and weaknesses of approaches, and considering different perspectives.

Substantial evidence is likely to mean that reflection is present throughout the exploration. Potentially it may be seen only at the end; however this will need to be of a high quality in order to achieve a level 3.

Criterion E : Use of mathematics

This criterion assesses to what extent students use mathematics in the exploration.

Students are expected to produce work that is commensurate with the level of the course. The mathematics explored should either be part of the syllabus, or at a similar level or beyond. It should not be completely based on mathematics listed in the prior learning. If the level of mathematics is not commensurate with the level of the course, a maximum of two marks can be awarded for this criterion.

A piece of mathematics can be regarded as correct even if there are occasional minor errors as long as they do not detract from the flow of the mathematics or lead to an unreasonable outcome.

Achievement level	Descriptor
0	The exploration does not reach the standard described by the descriptors below.
1	Some relevant mathematics is used.
2	Some relevant mathematics is used. Limited understanding is demonstrated.
3	Relevant mathematics commensurate with the level of the course is used. Limited understanding is demonstrated.
4	Relevant mathematics commensurate with the level of the course is used. The mathematics explored is partially correct. Some knowledge and understanding are demonstrated.
5	Relevant mathematics commensurate with the level of the course is used. The mathematics explored is mostly correct. Good knowledge and understanding are demonstrated.
6	Relevant mathematics commensurate with the level of the course is used. The mathematics explored is correct. Thorough knowledge and understanding are demonstrated.

Additional notes

A key word in the descriptors is “demonstrated”. Obtaining a correct answer is not sufficient to demonstrate understanding. Students must **demonstrate** their understanding (even limited understanding) in order to achieve level 2 or higher.

The mathematics used need only be what is required to support the development of the exploration. This could be a few small topics or even a single topic from the syllabus. It is better to do a few things well, rather than a lot of things not so well. If the mathematics used is relevant to the topic being explored, commensurate with the course, and understood by the student, then it can achieve a high level in this criterion.

If only a very minimal amount of mathematics commensurate with the course is used, but this mathematics is central to the development of the exploration, the exploration may achieve level 3 or more.

Regression using technology is commensurate with the level of the course, but understanding must be demonstrated in order for the candidate to achieve higher than level 1.

For knowledge and understanding to be thorough it must be demonstrated **throughout** the work.

While topics specifically listed in the “Prior Learning” are not considered commensurate with the course, other topics not listed in the syllabus may be commensurate.