

Assessment criteria

Each exploration should be assessed against the following five criteria.

Criterion A	Presentation
Criterion B	Mathematical communication
Criterion C	Personal engagement
Criterion D	Reflection
Criterion E	Use of mathematics

The descriptions of the achievement levels for each of these five assessment criteria follow and it is important to note that each achievement level represents the **minimum** requirement for that level to be awarded. The final mark for each exploration is obtained by adding together the achievement levels awarded for each criterion A-E. It should be noted that the descriptors for criterion E are different for SL and HL.

The maximum possible mark is 20.

Applying the assessment criteria

The method of assessment used is criterion referenced, not norm referenced. That is, the method of assessing each exploration judges students by their performance in relation to identified assessment criteria and not in relation to the work of other students.

Each exploration submitted for mathematics SL or mathematics HL is assessed against the five criteria A to E. For each assessment criterion, different levels of achievement are described that concentrate on positive achievement. The description of each achievement level represents the minimum requirement for that level to be achieved.

The aim is to find, for each criterion, the level descriptor that conveys most adequately the achievement level attained by the student.

Teachers should read the description of each achievement level, starting with level 0, until one is reached that describes a level of achievement that has **not** been reached. The level of achievement gained by the student is therefore the preceding one, and it is this that should be recorded.

For example, when considering successive achievement levels for a particular criterion, if the description for level 3 does not apply, then level 2 should be recorded.

For each criterion, whole numbers only may be recorded; fractions and decimals are not acceptable.

The highest achievement levels do not imply faultless performance, and teachers should not hesitate to use the extremes, including 0, if they are appropriate descriptions of the work being assessed.

A student who attains a high level of achievement in relation to one criterion will not necessarily attain high levels of achievement in relation to the other criteria. Similarly, a student who attains a low level of achievement for one criterion will not necessarily attain low achievement levels for the other criteria. Teachers should not assume that the overall assessment of the students will produce any particular distribution of marks.

It is expected that the assessment criteria will be available to students at all times. Descriptors of the achievement levels for each assessment criterion are given in the tables in the following section. Within the

tables, for each achievement level, there is a link to an exploration within this TSM that achieved that level for that particular criterion.

Students should be made aware that they will not receive a grade for mathematics if they have not submitted an exploration.

Achievement levels

Criterion A: Presentation

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 or some organization.
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.

Criterion B: Mathematical communication

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

- use appropriate mathematical language (notation, symbols, terminology)
- define key terms and variables, where required
- use multiple forms of mathematical representation such as formulae, diagrams, tables, charts, graphs and models, where appropriate
- used a deductive method and set out proofs logically where appropriate.

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	The exploration contains some relevant mathematical communication, which is partially appropriate.
2	The exploration contains some relevant appropriate mathematical communication.
3	The mathematical communication is relevant, appropriate and is mostly consistent.
4	The mathematical communication is relevant, appropriate and consistent throughout.

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 some personal engagement.
2	There is evidence of significant personal engagement.
3	There is evidence of outstanding personal engagement.

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 reflection.
2	There is evidence of meaningful reflection.
3	There is substantial evidence of critical reflection.

Criterion E: Use of mathematics

The achievement levels and descriptors for criterion E are different for SL and HL.

SL only

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.

Achievement level	Descriptor
6	Relevant mathematics commensurate with the level of the course is used. The mathematics explored is correct. Thorough knowledge and understanding are demonstrated.

HL only

This criterion assesses to what extent and how well students use mathematics in their 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.

The 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. Sophistication in mathematics may include understanding and use of challenging mathematical concepts, looking at a problem from different perspectives and seeing underlying structures to link different areas of mathematics. Rigour involves clarity of logic and language when making mathematical arguments and calculations. Precise mathematics is error-free and uses an appropriate level of accuracy at all times.

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