

## Mathematics assessment criteria

Please note that the assessment criteria in this guide are for first use in final assessment in the 2008 academic year (southern hemisphere) and the 2008–2009 academic year (northern hemisphere). For final assessment before this time, please use the assessment criteria as published in the previous MYP *Mathematics guide* (August 2000).

The following assessment criteria have been established by the IBO for mathematics in the MYP. The final assessment required for IBO-validated grades and certification at the end of the MYP must be based on these assessment criteria.

Criterion A	Knowledge and understanding	Maximum 8
Criterion B	Investigating patterns	Maximum 8
Criterion C	Communication in mathematics	Maximum 6
Criterion D	Reflection in mathematics	Maximum 6

- For each assessment criterion, a number of band descriptors are defined. These describe a range of achievement levels with the lowest represented as 0.
- The criteria are not equally weighted.
- The descriptors concentrate on positive achievement, although failure to achieve may be included in the description for the lower levels.

Detailed descriptions of the assessment criteria and band descriptors follow.

## Criterion A: knowledge and understanding

### Maximum 8

Knowledge and understanding are fundamental to studying mathematics and form the base from which to explore concepts and develop skills. This criterion expects students to use their knowledge and to demonstrate their understanding of the concepts and skills of the prescribed framework in order to make deductions and solve problems in different situations, including those in real-life contexts.

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

- know and demonstrate understanding of the concepts from the five branches of mathematics (number, algebra, geometry and trigonometry, statistics and probability, and discrete mathematics)
- use appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations, including those in real-life contexts
- select and apply general rules correctly to solve problems, including those in real-life contexts.

**Assessment tasks** for this criterion are likely to be class tests, examinations, real-life problems and investigations that may have a variety of solutions.

Achievement level	Descriptor
0	The student does not reach a standard described by any of the descriptors given below.
1–2	The student <b>attempts</b> to make deductions when solving <b>simple</b> problems in <b>familiar</b> contexts.
3–4	The student <b>sometimes</b> makes <b>appropriate</b> deductions when solving <b>simple and more-complex</b> problems in <b>familiar</b> contexts.
5–6	The student <b>generally</b> makes <b>appropriate</b> deductions when solving <b>challenging</b> problems in a <b>variety</b> of <b>familiar</b> contexts.
7–8	The student <b>consistently</b> makes <b>appropriate</b> deductions when solving <b>challenging</b> problems in a <b>variety</b> of contexts including <b>unfamiliar</b> situations.

### Notes

1. Context: the situation and the parameters given to a problem.
2. Unfamiliar situation: challenging questions or instructions set in a new context in which students are required to apply knowledge and/or skills they have been taught.
3. Deduction: reasoning from the general to the particular/specific.

## Criterion B: investigating patterns

### Maximum 8

Students are expected to investigate a problem by applying mathematical problem-solving techniques, to find patterns, and to describe these mathematically as relationships or general rules and justify or prove them.

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

- select and apply appropriate inquiry and mathematical problem-solving techniques
- recognize patterns
- describe patterns as relationships or general rules
- draw conclusions consistent with findings
- justify or prove mathematical relationships and general rules.

**Assessment tasks** for this criterion should be mathematical investigations of some complexity, as appropriate to the level of MYP mathematics. Tasks should allow students to choose their own mathematical techniques to investigate problems, and to reason from the specific to the general. Assessment tasks could have a variety of solutions and may be set in real-life contexts. Teachers should clearly state whether the student has to provide a justification or proof.

Teachers should include a good balance between tasks done under test conditions and tasks done at home in order to ensure the development of independent mathematical thinking.

Achievement level	Descriptor
0	The student does not reach a standard described by any of the descriptors given below.
1–2	The student <b>applies, with some guidance</b> , mathematical problem-solving techniques to recognize <b>simple</b> patterns.
3–4	The student <b>selects and applies</b> mathematical problem-solving techniques to recognize patterns, and <b>suggests</b> relationships or general rules.
5–6	The student <b>selects and applies</b> mathematical problem-solving techniques to recognize patterns, <b>describes</b> them as relationships or general rules, and <b>draws conclusions</b> consistent with findings.
7–8	The student <b>selects and applies</b> mathematical problem-solving techniques to recognize patterns, <b>describes</b> them as relationships or general rules, <b>draws conclusions</b> consistent with findings, and <b>provides justifications or proofs</b> .

### Notes

1. Pattern: the underlining order, regularity or predictability between the elements of a mathematical system. To identify pattern is to begin to understand how mathematics applies to the world in which we live. The repetitive features of patterns can be identified and described as relationships or generalized rules.
2. Justification: a clear and logical mathematical explanation of **why** the rule works.
3. Proof: a mathematical demonstration of the truth of a given proposition.

## Criterion C: communication in mathematics

### Maximum 6

Students are expected to use mathematical language when communicating mathematical ideas, reasoning and findings—both orally and in writing.

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

- use appropriate mathematical language (notation, symbols, terminology) in both oral and written explanations
- use different forms of mathematical representation (formulae, diagrams, tables, charts, graphs and models)
- move between different forms of representation.

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 communication.

**Assessment tasks** for this criterion are likely to be real-life problems, tests, examinations and investigations. Tests and examinations that are to be assessed against criterion C must be designed to allow students to show complete lines of reasoning using mathematical language.

Achievement level	Descriptor
0	The student does not reach a standard described by any of the descriptors given below.
1–2	The student shows <b>basic</b> use of mathematical language <b>and/or</b> forms of mathematical representation. The lines of reasoning are <b>difficult to follow</b> .
3–4	The student shows <b>sufficient</b> use of mathematical language <b>and</b> forms of mathematical representation. The lines of reasoning are <b>clear</b> though not always <b>logical</b> or <b>complete</b> .  The student moves between different forms of representation <b>with some success</b> .
5–6	The student shows <b>good</b> use of mathematical language <b>and</b> forms of mathematical representation. The lines of reasoning are <b>concise, logical</b> and <b>complete</b> .  The student moves <b>effectively</b> between different forms of representation.

### Notes

1. Mathematical language: the use of notation, symbols, terminology and verbal explanations.
2. Forms of mathematical representation: refers to formulae, diagrams, tables, charts, graphs and models, used to represent mathematical information.

## Criterion D: reflection in mathematics

### Maximum 6

Reflection allows students to reflect upon their methods and findings.

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

- explain whether his or her results make sense in the context of the problem
- explain the importance of his or her findings in connection to real life
- justify the degree of accuracy of his or her results where appropriate
- suggest improvements to the method when necessary.

**Assessment tasks** are most likely to be investigations and real-life problems. Generally these types of tasks will provide students with opportunities to use mathematical concepts and skills to solve problems in real-life contexts.

Achievement level	Descriptor
0	The student does not reach a standard described by any of the descriptors given below.
1–2	The student <b>attempts</b> to explain whether his or her results make sense in the context of the problem. The student <b>attempts to describe</b> the importance of his or her findings in connection to real life.
3–4	The student <b>correctly but briefly explains</b> whether his or her results make sense in the context of the problem and <b>describes</b> the importance of his or her findings in connection to real life. The student <b>attempts</b> to justify the degree of accuracy of his or her results where appropriate.
5–6	The student <b>critically explains</b> whether his or her results make sense in the context of the problem and provides a <b>detailed explanation</b> of the importance of his or her findings in connection to real life. The student <b>justifies</b> the degree of accuracy of his or her results where appropriate. The student <b>suggests improvements</b> to the method when necessary.

### Notes

1. Describe: present an account without providing reasons or explanations.
2. Explain: give a detailed account including reasons, causes or justifications. Explanations should answer the questions “why” and “how”.