# Mathematics assessment criteria: Year 1

## Criterion A: Knowing and understanding

**Maximum: 8**

At the end of year 1, students should be able to:

i.      select appropriate mathematics when solving problems in both familiar and unfamiliar situations

ii.     apply the selected mathematics successfully when solving problems

iii.    solve problems correctly in a variety of contexts.

| Achievement level | Level descriptor |
|---|---|
| 0 | The student **does not** reach a standard described by any of the descriptors below. |
| 1–2 | The student is able to: <br><br> i.   select appropriate mathematics when solving **simple problems** in **familiar situations** <br><br> ii.  apply the selected mathematics successfully when solving these problems <br><br> iii. generally solve these problems correctly in a variety of contexts. |
| 3–4 | The student is able to: <br><br> i.   select appropriate mathematics when solving **more complex problems** in **familiar situations** <br><br> ii.  apply the selected mathematics successfully when solving these problems <br><br> iii. generally solve these problems correctly in a variety of contexts. |
| 5–6 | The student is able to: <br><br> i.   select appropriate mathematics when solving **challenging problems** in **familiar situations** <br><br> ii.  apply the selected mathematics successfully when solving these problems <br><br> iii. generally solve these problems correctly in a variety of contexts. |
| 7–8 | The student is able to: <br><br> i.   select appropriate mathematics when solving **challenging problems** in both **familiar and unfamiliar situations** <br><br> ii.  apply the selected mathematics successfully when solving these problems <br><br> iii. generally solve these problems correctly in a variety of contexts. |

## Criterion B: Investigating patterns

**Maximum: 8**

At the end of year 1, students should be able to:

i.      apply mathematical problem-solving techniques to recognize patterns

ii.     describe patterns as relationships or general rules consistent with findings

iii.    verify whether the pattern works for other examples.

| Achievement level | Level descriptor |
|---|---|
| 0 | The student **does not** reach a standard described by any of the descriptors below. |
| 1–2 | The student is able to:<br><br>i.    **apply**, **with teacher support**, mathematical problem-solving techniques to recognize **simple patterns**<br><br>ii.    **state** predictions consistent with simple patterns. |
| 3–4 | The student is able to:<br><br>i.    **apply** mathematical problem-solving techniques to recognize **patterns**<br><br>ii.    **suggest** how these patterns work. |
| 5–6 | The student is able to:<br><br>i.    **apply** mathematical problem-solving techniques to recognize **patterns**<br><br>ii.    **suggest relationships** or general rules consistent with findings<br><br>iii.    verify whether patterns work for **another example**. |
| 7–8 | The student is able to:<br><br>i.    **select** and **apply** mathematical problem-solving techniques to recognize **correct patterns**<br><br>ii.    **describe patterns as relationships** or general rules consistent with **correct findings**<br><br>iii.    verify whether patterns work for **other examples**. |

**Note:** A task that does not allow students to select a problem-solving technique is too guided and should result in students earning a maximum achievement level of 6 (for years 1 and 2).

# Criterion C: Communicating

**Maximum: 8**

At the end of year 1, students should be able to:

i.    use appropriate mathematical language (notation, symbols and terminology) in both oral and written statements

ii.    use appropriate forms of mathematical representation to present information

iii.    communicate coherent mathematical lines of reasoning

iv.    organize information using a logical structure.

| Achievement level | Level descriptor |
|---|---|
| 0 | The student **does not** reach a standard described by any of the descriptors below. |
| 1–2 | The student is able to:<br><br>i.    use **limited** mathematical language<br><br>ii.    use **limited forms** of mathematical representation to present information<br><br>iii.    communicate through lines of reasoning that are **difficult to understand** |
| 3–4 | The student is able to:<br><br>i.    use **some appropriate** mathematical language<br><br>ii.    use **appropriate forms** of mathematical representation to present information **adequately**<br><br>iii.    communicate through lines of reasoning that are **able to be understood**, although these are **not always coherent** |

| Achievement level | Level descriptor |
|---|---|
| | iv.   **adequately organize** information using a logical structure. |
| 5–6 | The student is able to:<br><br>i.   **usually** use **appropriate** mathematical language<br><br>ii.   **usually** use **appropriate forms** of mathematical representation to present information **correctly**<br><br>iii.   communicate through lines of reasoning that are **usually coherent**<br><br>iv.   **present** work that is **usually organized** using a logical structure. |
| 7–8 | The student is able to:<br><br>i.   **consistently** use **appropriate** mathematical language<br><br>ii.   **consistently** use **appropriate forms** of mathematical representation to present information **correctly**<br><br>iii.   communicate **clearly** through **coherent** lines of reasoning<br><br>iv.   present work that is **consistently organized** using a logical structure. |

# Criterion D: Applying mathematics in real-life contexts

**Maximum: 8**

At the end of year 1, students should be able to:

i.   identify relevant elements of authentic real-life situations

ii.   select appropriate mathematical strategies when solving authentic real-life situations

iii.   apply the selected mathematical strategies successfully to reach a solution

iv.   explain the degree of accuracy of a solution

v.   describe whether a solution makes sense in the context of the authentic real-life situation.

| Achievement level | Level descriptor |
|---|---|
| 0 | The student **does not** reach a standard described by any of the descriptors below. |
| 1–2 | The student is able to:<br><br>i.   identify **some** of the elements of the authentic real-life situation<br><br>ii.   apply mathematical strategies to **find a solution** to the authentic real-life situation, **with limited success**. |
| 3–4 | The student is able to:<br><br>i.   identify the **relevant** elements of the authentic real-life situation<br><br>ii.   apply mathematical strategies to **reach a solution** to the authentic real-life situation<br><br>iii.   **state**, **but not always correctly**, whether the solution makes sense in the context of the authentic real-life situation. |
| 5–6 | The student is able to:<br><br>i.   identify the **relevant** elements of the authentic real-life situation<br><br>ii.   select **adequate** mathematical strategies to model the authentic real-life situation<br><br>iii.   apply the selected mathematical strategies to **reach a valid solution** to the authentic real-life situation |

| Achievement level | Level descriptor |
|---|---|
| | iv. **describe** the degree of accuracy of the solution |
| | v. **state correctly** whether the solution makes sense in the context of the authentic real-life situation. |
| 7–8 | The student is able to: |
| | i. identify the **relevant** elements of the authentic real-life situation |
| | ii. select **adequate** mathematical strategies to model the authentic real-life situation |
| | iii. apply the selected mathematical strategies to **reach a correct solution** to the authentic real-life situation |
| | iv. **explain** the degree of accuracy of the solution |
| | v. **describe correctly** whether the solution makes sense in the context of the authentic real-life situation. |

# Mathematics assessment criteria: Year 3

## Criterion A: Knowing and understanding

**Maximum: 8**

At the end of year 3, students should be able to:

i.      select appropriate mathematics when solving problems in both familiar and unfamiliar situations

ii.     apply the selected mathematics successfully when solving problems

iii.    solve problems correctly in a variety of contexts.

| Achievement level | Level descriptor |
|---|---|
| 0 | The student **does not** reach a standard described by any of the descriptors below. |
| 1–2 | The student is able to: <br><br> i.  select appropriate mathematics when solving **simple problems** in **familiar situations** <br><br> ii.  apply the selected mathematics successfully when solving these problems <br><br> iii.  generally solve these problems correctly in a variety of contexts. |
| 3–4 | The student is able to: <br><br> i.  select appropriate mathematics when solving **more complex problems** in **familiar situations** <br><br> ii.  apply the selected mathematics successfully when solving these problems <br><br> iii.  generally solve these problems correctly in a variety of contexts. |
| 5–6 | The student is able to: <br><br> i.  select appropriate mathematics when solving **challenging problems** in **familiar situations** <br><br> ii.  apply the selected mathematics successfully when solving these problems <br><br> iii.  generally solve these problems correctly in a variety of contexts. |
| 7–8 | The student is able to: <br><br> i.  select appropriate mathematics when solving **challenging problems** in both **familiar and unfamiliar situations** <br><br> ii.  apply the selected mathematics successfully when solving these problems <br><br> iii.  generally solve these problems correctly in a variety of contexts. |

## Criterion B: Investigating patterns

**Maximum: 8**

At the end of year 3, students should be able to:

i.      select and apply mathematical problem-solving techniques to discover complex patterns

ii.     describe patterns as relationships and/or general rules consistent with findings

iii.    verify and justify relationships and/or general rules.

| Achievement level | Level descriptor |
|---|---|
| 0 | The student **does not** reach a standard described by any of the descriptors below. |
| 1–2 | The student is able to:<br><br>i. **apply**, **with teacher support**, mathematical problem-solving techniques to discover **simple patterns**<br><br>ii. **state predictions** consistent with patterns. |
| 3–4 | The student is able to:<br><br>i. **apply** mathematical problem-solving techniques to discover **simple patterns**<br><br>ii. **suggest relationships** and/or general rules consistent with **findings**. |
| 5–6 | The student is able to:<br><br>i. **select** and **apply** mathematical problem-solving techniques to discover **complex patterns**<br><br>ii. **describe patterns** as relationships and/or general rules consistent with **findings**<br><br>iii. **verify** these relationships and/or general rules. |
| 7–8 | The student is able to:<br><br>i. **select** and **apply** mathematical problem-solving techniques to discover **complex patterns**<br><br>ii. **describe patterns** as relationships and/or general rules consistent with **correct findings**<br><br>iii. **verify** and **justify** these relationships and/or general rules. |

**Note:** A task that does not allow students to select a problem-solving technique is too guided and should result in students earning a maximum achievement level of 4 (year 3 and higher). However, teachers should give enough direction to ensure that all students can begin the investigation.

For year 3 and higher, a student who describes a general rule consistent with incorrect findings will be able to achieve a maximum achievement level of 6, provided that the rule is of an equivalent level of complexity.

# Criterion C: Communicating

**Maximum: 8**

At the end of year 3, students should be able to:

i. use appropriate mathematical language (notation, symbols and terminology) in both oral and written explanations

ii. use appropriate forms of mathematical representation to present information

iii. move between different forms of mathematical representation

iv. communicate complete and coherent mathematical lines of reasoning

v. organize information using a logical structure.

| Achievement level | Level descriptor |
|---|---|
| 0 | The student **does not** reach a standard described by any of the descriptors below. |
| 1–2 | The student is able to:<br><br>i. use **limited** mathematical language<br><br>ii. use **limited forms** of mathematical representation to present information |

| Achievement level | Level descriptor |
|---|---|
| | iii.    communicate through lines of reasoning that are **difficult to interpret**. |
| 3–4 | The student is able to:<br><br>i.    use **some appropriate** mathematical language<br><br>ii.    use **appropriate forms** of mathematical representation to present information **adequately**<br><br>iii.    communicate through lines of reasoning that are **able to be understood**, although these are **not always clear**<br><br>iv.    **adequately organize** information using a logical structure. |
| 5–6 | The student is able to:<br><br>i.    **usually** use **appropriate** mathematical language<br><br>ii.    **usually** use **appropriate forms** of mathematical representation to present information **correctly**<br><br>iii.    move between different forms of mathematical representation **with some success**<br><br>iv.    communicate through lines of reasoning that are clear although **not always coherent or complete**<br><br>v.    present work that is **usually organized** using a logical structure. |
| 7–8 | The student is able to:<br><br>i.    **consistently** use **appropriate** mathematical language<br><br>ii.    use **appropriate forms** of mathematical representation to **consistently** present information **correctly**<br><br>iii.    move **effectively** between different forms of mathematical representation<br><br>iv.    communicate through lines of reasoning that are **complete and coherent**<br><br>v.    present work that is **consistently organized** using a logical structure. |

# Criterion D: Applying mathematics in real-life contexts

**Maximum: 8**

At the end of year 3, students should be able to:

i.    identify relevant elements of authentic real-life situations

ii.    select appropriate mathematical strategies when solving authentic real-life situations

iii.    apply the selected mathematical strategies successfully to reach a solution

iv.    explain the degree of accuracy of a solution

v.    explain whether a solution makes sense in the context of the authentic real-life situation.

| Achievement level | Level descriptor |
|---|---|
| 0 | The student **does not** reach a standard described by any of the descriptors below. |
| 1–2 | The student is able to:<br><br>i.    identify **some** of the elements of the authentic real-life situation<br><br>ii.    apply mathematical strategies to **find a solution** to the authentic real-life situation, **with limited success**. |
| 3–4 | The student is able to: |

| Achievement level | Level descriptor |
|---|---|
| | i.     identify the **relevant** elements of the authentic real-life situation |
| | ii.    select, **with some success**, **adequate** mathematical strategies to model the authentic real-life situation |
| | iii.   apply mathematical strategies to **reach a solution** to the authentic real-life situation |
| | iv.    **describe** whether the solution makes sense in the context of the authentic real-life situation. |
| 5–6 | The student is able to: |
| | i.     identify the **relevant** elements of the authentic real-life situation |
| | ii.    select **adequate** mathematical strategies to model the authentic real-life situation |
| | iii.   apply the selected mathematical strategies to **reach a valid solution** to the authentic real-life situation |
| | iv.    **describe** the degree of accuracy of the solution |
| | v.     **discuss** whether the solution makes sense in the context of the authentic real-life situation. |
| 7–8 | The student is able to: |
| | i.     identify the **relevant** elements of the authentic real-life situation |
| | ii.    select **appropriate** mathematical strategies to model the authentic real-life situation |
| | iii.   apply the selected mathematical strategies to **reach a correct solution** |
| | iv.    **explain** the degree of accuracy of the solution |
| | v.     **explain** whether the solution makes sense in the context of the authentic real-life situation. |

| Symbol | Meaning |
|--------|---------|
| ⊂ | Is a proper subset of |
| ⊆ | Is a subset of |
| $A'$ | The complement of the set $A$ |

# Mathematics subject-specific grade descriptors

Subject-specific grade descriptors serve as an important reference in the assessment process. Through careful analysis of subject-group criteria and the general grade descriptors, they have been written to capture and describe in a single descriptor the performance of students at each grade for each MYP subject group.

For on-screen examination subjects, teachers are required to submit predicted grades. When considering predicted grades, teachers should consider their own assessment of students during MYP year 4 and the first part of MYP year 5 and, allowing for subsequent academic development, are asked to predict the outcome of eAssessment for their students with reference to the subject-specific grade descriptors. This prediction helps the IB to check the alignment between teachers' expectations and the IB's assessment outcome and, as such, forms an essential strategy for ensuring reliable results.

Subject-specific grade descriptors are also the main reference used to select grade boundaries for each discipline in each assessment session. During this process, the grade award team compares student performance against descriptors of achievement at grades 2 and 3; 3 and 4; and 6 and 7 (other boundaries are set at equal intervals between these key transitions). The grade award process is able to compensate for variations in challenge between examinations and in standards applied to marking (both between subjects and for a particular subject across sessions) by setting boundaries for each discipline and examination session, with reference to real student work.

Subject-specific grade descriptors tie eAssessment to criterion-related assessment and to MYP assessment criteria and level descriptors, which put the programme's criterion-related assessment philosophy into practice.

| Grade | Descriptor |
|-------|-----------|
| 1 | Produces work of a very limited quality. Conveys many significant misunderstandings or lacks understanding of most concepts and contexts. Very rarely demonstrates evidence of mathematical thinking. Very inflexible, rarely shows evidence of knowledge or skills. |
| 2 | Produces mathematical work of limited quality. Communicates limited understanding of some concepts and contexts. Demonstrates limited evidence of mathematical thinking. Limited evidence of transfer of mathematical knowledge and application of skills. |
| 3 | Produces mathematical work of an acceptable quality. Communicates basic understanding of many concepts and contexts with occasional evidence of appropriate application of mathematical techniques and terminology, with occasional significant misunderstandings or gaps. Begins to demonstrate some analytical thinking when problem-solving and investigating. Begins to transfer mathematical knowledge and apply skills, requiring support even in familiar classroom situations. |
| 4 | Produces good-quality mathematical work. Communicates basic understanding of most concepts and contexts with evidence of appropriate application of mathematical techniques and terminology, with few misunderstandings and minor gaps. Often demonstrates analytical thinking when problem-solving and investigating. Transfers some mathematical knowledge and applies skills in familiar classroom situations, but requires support in unfamiliar situations. |
| 5 | Produces generally high-quality mathematical work. Communicates good understanding of concepts and contexts demonstrating proficient application of |

| Grade | Descriptor |
|---|---|
|  | mathematical techniques and terminology. Demonstrates analytical thinking and logical processes, sometimes with sophistication, when problem-solving and investigating. Usually transfers mathematical knowledge and applies skills, with some independence, in familiar classroom and real-world situations. |
| 6 | Produces high-quality, occasionally insightful mathematical work. Communicates extensive understanding of concepts and contexts demonstrating proficient application of mathematical techniques and terminology. Demonstrates analytical thinking and logical processes, frequently with sophistication when problem-solving and investigating. Transfers mathematical knowledge and applies skills, often with independence, in a variety of familiar and unfamiliar classroom and real-world situations. |
| 7 | Produces high-quality work that frequently uses mathematics insightfully. Communicates comprehensive, nuanced understanding of concepts and contexts demonstrating proficient application of mathematical techniques and terminology. Consistently demonstrates sophisticated analytical thinking and logical processes when problem-solving and investigating. Frequently transfers mathematical knowledge and applies skills, with independence and expertise, in a variety of complex classroom and real-world situations. |