**Frequently asked questions**

**What is the difference between a mathematical exploration and an extended essay in mathematics?**

The criteria are completely different. It is intended that the exploration is to be a much less extensive piece of work than a mathematics extended essay. The intention is for students to “explore” an idea rather than have to do the formal research demanded in an extended essay.

**How long should it be?**

It is difficult to be prescriptive about mathematical writing. However, the *Mathematics SL guide* and the *Mathematics HL guide* state that 6–12 pages should be appropriate. A common failing of mathematical writing is excessive repetition, and this should be avoided, as such explorations will be penalized for lack of conciseness. However, it is recognized that some explorations will require the use of several diagrams, which may extend them beyond the page limit.

**How long should it take?**

It is difficult to give a single answer. However, the guideline of 10 hours class time with approximately the same amount of time outside class should suffice for students to develop their ideas and complete the exploration.

**Does the exploration need a title?**

It is good practice to have a title for all pieces of work. If the exploration is based on a stimulus, it is recommended that the title not just be the stimulus. Rather, the title should give a better indication of where the stimulus has taken the student. For example, rather than have the title “water”, the title could be “Water—predicting storm surges”.

**Can students in the same school/class use the same title for the exploration?**

Yes, but the explorations must be different, based on the avenues followed by each student. As noted above, the title should give an idea of what the exploration is about. Group work is not allowed.

**Can students in the same school/class use the same stimulus?**

Yes, this is permissible. However, the stimuli are intended to be broad themes around which a variety of foci could develop. It is therefore expected that, even if students use the same stimuli, the resulting explorations will be very different.

**Can SL and HL students use the same stimulus?**

Yes, there is no reason to restrict any stimulus to a particular level, although the assessment of criterion E will be different.

**Do teachers have to use stimuli?**

No, but it may sometimes be useful to provide a stimulus as a means of helping students to get started on their exploration.

**Can teachers choose their own stimuli?**

If a teacher decides to use stimuli, they are free to choose their own or to choose one from the TSM list. Indeed, the suggested stimuli are intended merely to illustrate the wide-ranging potential for exploring mathematics.

**How many explorations should be done by a student during the course?**

The exploration is a significant piece of work and, as such, the advice would be that there is no necessity to undertake more than one during the course. However, in line with the “Approaches to the teaching and learning of mathematics SL/HL” section of the two guides, students should be given many opportunities to use modelling and investigative techniques to develop the sorts of skills necessary to perform well in the exploration.

**If a student does more than one exploration, how will the teacher choose which one to submit?**

This will be a matter for the school to decide. As long as one exploration is submitted that is the student’s own work, how this is chosen is not prescribed by the IB.

**Should the scope and sequence of the SL/HL course be influenced by the exploration?**

Ideally, it should not be. It is intended that the exploration should be a natural opportunity to develop ideas that students have become familiar with as a part of the course. However, if it is felt that particular skills are likely to be needed in order for students to undertake the exploration successfully, then a teacher or school may wish to consider this when deciding on the teaching sequence.

**How much help can a teacher give the student in finding a topic/focus for their exploration?**

The role of the teacher here is to provide advice to the student on choosing the topic, and there is no set limit to the amount of help a teacher can give in this respect. However, if the student has little or no input into the decision about which focus to choose, then it is unlikely that he or she will be able to explore the ideas successfully in order to generate a good exploration.

**How much help can the teacher give to the student with the mathematical content of the exploration?**

If a student needs help with the revision of a particular topic because they are having some problems using this in their exploration, then it is permissible (indeed, this is good practice) for the teacher to give this help. However, this must be done in such a way that is not directly connected with the exploration.

**When is a good time in the course to introduce the exploration?**

It is a good idea to mention it as early as possible, so that students are aware of the requirements, and to make reference to it during the early part of the course. Certain topics may lend themselves more easily to exploration work, and teachers should try to make suggestions about this when appropriate. Ideally, the work on the exploration should start before the end of the first year.

**What should the target audience be for a student when writing the exploration?**

The exploration should be accessible to fellow students.

**Can the students use mathematics other than that they have done in class?**

Yes, but this must be clearly explained and referenced, and teacher comments should clarify this.

**Can students use mathematics that is outside the syllabus?**

Yes, as long as the mathematics used is relevant. However, this is not necessary to obtain full marks.

**What happened to investigation and modelling in the curriculum?**

The section in the guides on “Approaches to the teaching and learning of mathematics SL/HL” shows that investigation and modelling are still regarded as essential skills in mathematics SL and mathematics HL. Use of such pedagogical techniques are good practice in reinforcing students’ understanding, and this will be assessed in examination questions. However, it is likely that some good explorations will also involve the use of investigation and/or modelling.

**What is the difference between criterion A (communication) and criterion B (mathematical** presentation)?

Communication is focusing on the overall organization and coherence of the exploration, whereas mathematical presentation focuses on the appropriateness of the mathematics. An exploration that is logically set out in terms of its overall structure could score well in criterion A despite using inappropriate mathematics. Conversely, an exploration that uses appropriate diagrams and technology to develop the ideas could score well in criterion B but poorly in criterion A because it lacked a clear aim or conclusion, for example.

**Can a student submit one of the old portfolios?**

The portfolio tasks were written for completely different criteria and are therefore unsuitable to be submitted as explorations.

**Does the exploration have to be word processed or handwritten?**

It can be in either form as long as it is clearly legible.

**What is personal engagement?**

The exploration is intended to be an opportunity for students to use mathematics to develop an area of interest to them rather than merely to solve a problem set by someone else. Criterion C (personal engagement) will be looking at how well the student is able to demonstrate that he or she has “made the exploration their own” and expressed ideas in an individual way.

**What is the difference between precise and correct?**

As outlined in criterion E (use of mathematics), “precise” mathematics requires absolute accuracy with appropriate use of notation. “Correct” mathematics may contain the occasional error as long as it does not seriously interfere with the flow of the work or give rise to conclusions or answers that are clearly wrong.

**What is a complete exploration?**

In a complete exploration, all steps are clearly explained without detracting from its conciseness.

**Is there any way to deal with students who do little or no work on the exploration?**

The obvious case to present to any student who is hesitant to make progress with the exploration work is to emphasize the possible impact on the final assessment, with the exploration making up 20% of their final mark. If a student is reluctant to do any work at all, then perhaps a meeting of student, parents or guardians, the teacher and the Diploma Programme coordinator is advisable. At such a meeting, it would be appropriate to review the consequences of not submitting an exploration. Students should be made aware that they will not receive a grade for mathematics SL or mathematics HL if they have not submitted an exploration.

It may also be helpful to develop a school or departmental policy for explorations, so that guidelines, due dates, expectations, consequences and so on are made clear to both students and parents early in the course.

**How can the teacher best monitor the work of students?**

Having a schedule of dates will help. It is also important that the teacher takes the time to review the work of students in class. Developing a checklist of tasks and allowing for brief comment might help to keep open communication channels between students and the teacher.

**Can you recommend a target date for completion of the exploration?**

This will, of course, vary from school to school depending upon several factors, not to mention other deadlines set within the Diploma Programme (for example, guided coursework, extended essays, laboratory reports). Teachers should also allow themselves plenty of time for the assessment process. The IB’s deadline for samples of student work for moderation is in April for a May examination session or in October for a November examination session. Therefore, it is not unreasonable for teachers to collect final explorations six to eight weeks prior to this deadline.

**Some teachers need further guidance on how to apply the exploration assessment criteria. Is guidance available?**

In addition to this teacher support material, teachers should attend a workshop for mathematics SL or mathematics HL as appropriate before it is time to assess the explorations of their students. The Diploma Programme coordinator has information about workshops, but details can also be found on the IB public website ([http://www.ibo.org](http://www.ibo.org/)).

If possible, teachers should also try to get help from within their own department or school in assessing the explorations of their students.

**How will teachers know if their assessment is satisfactory or appropriate?**

Following an examination session, each school is provided with feedback. This will normally provide comments on the contents of the explorations, interpretation of assessment criteria, and clerical and/or procedural matters.

**If a school has a large number of students (or several classes) doing the exploration, must only one teacher mark all the explorations?**

The exploration should be marked by the teacher who has taught the student. However, teachers should be aware that moderation is applied to a school rather than to individual teachers. It is, therefore, of the utmost importance that teachers collaborate and agree on their marking standards. Guidance is available in the *Handbook of procedures for the Diploma Programme*. It is essential that internal standardization between teachers takes place, including between mathematics SL and mathematics HL teachers.

**Where can teachers receive more advice on the exploration?**

Teachers should be aware that all questions on the exploration can be posted in the mathematics forums on the online curriculum centre (OCC), and advice will then be offered by experienced teachers and the online faculty member. The OCC also has many resources that have been posted by experienced teachers in the Resources section, and these may provide a useful starting point for new teachers. However, it is important to understand that all opinions expressed by users of the OCC are expressed strictly in their individual capacities, and not as representatives of the IB.