



IB Math Exploration

You will be answering these questions and turning them in to me:

- Here's my general topic:
- Here's what I want to do with that topic:
- Here's the math I want to incorporate:

Key Dates:

- Exploration Introduction Monday, Dec. 8th
- In the Computer Lab to Explore Ideas Wednesday, Dec. 10th
- Answers to 3 questions from above DUE Wednesday, Dec. 17th (5 points)
- Go through sample papers and grading Monday, Jan. 5th
- In the LMC to Research Topic ?
- Outline of Exploration DUE Wednesday, Jan. 14th (10 points)
- Rough Draft of Exploration DUE Friday, Jan. 30th (25 points)
- Mr. Peterson meets with students about first draft Week of Feb. 9th
- Completed Exploration DUE Friday, Feb. 27th (100 points)
 - \circ You will be submitting this to Turnitin.com and giving me a paper copy.

Grading:

- Each part must be turned in at the start of class that day.
- If a part is turned in late (including to turnitin.com), there is a 10% reduction of the grade for that assignment for each day it is not turned in.

FAQ:

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* states 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.

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.

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 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 A because it lacked a clear aim or conclusion, for example.

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.

Sample Papers, Grading Criteria, etc. can be found on the link on my webpage.

Titles for the Online Sample Explorations:

Example 1 – "Breaking the Code" – Looking at encoding and decoding information. (15 out of 20)

Example 2 – "Proving Euler's Totient Theorem" – Looking at a theorem Euler discovered. (16 out of 20)

Example 3 – "Minesweeper" – Looking at the computer game of Minesweeper. (5 out of 20)

Example 4 – "Modelling musical chords using sine waves" (9 out of 20)

Example 5 – "Newton-Raphson method" – Looking at using calculus to approximate roots of functions. (11 out of 20)

Example 6 – "The Polar Area Diagrams of Florence Nightingale" – Looking at the geometry involved in her diagrams. (20 out of 20)

Example 7 – "Modelling Rainfall" – Looking at the calculus involved in rainfall. (16 out of 20)

Example 8 - "Spirals in Nature" - Looking at spirals in terms of polar coordinates. (16 out of 20)

Example 9 – "The Legend" – Looking at the Tower of Hanoi and the patterns in it. (14 out of 20)

Stimuli

Students sometimes find it difficult to know where to start with a task as open-ended as this. While it is hoped that students will appreciate the richness of opportunities for mathematical exploration, it may sometimes be useful to provide a stimulus as a means of helping them to get started on their explorations.

Possible stimuli that could be given to the students include:

sport	archaeology	computers	algorithms
cell phones	music	sine	musical harmony
motion	е	electricity	water
space	orbits	food	volcanoes
diet	Euler	games	symmetry
architecture	codes	the internet	communication
tiling	population	agriculture	viruses
health	dance	play	pi (π)
geography	biology	business	economics
physics	chemistry	information technology in a global society	psychology

A possible mind map for the stimulus "water"

During introductory discussions about the exploration, the use of brainstorming sessions can be useful to generate ideas. In particular, the use of a mind map has been shown to be useful in helping students to generate thoughts on this. The mind map below illustrates how, starting with the stimulus "water", some possible foci for a mathematical exploration could be generated.



Links:

Sample Ideas: http://ibmathsresources.com/maths-ia-maths-exploration-topics/

Sample Papers, etc.:

http://xmltwo.ibo.org/publications/DP/Group5/d_5_matsl_tsm_1205_1/html/content/exist/rest/app/tsm.xql@doc=d_ 5_matsl_tsm_1205_1_e&part=1&chapter=1.html

Syllabus Content:

http://xmltwo.ibo.org/publications/DP/Group5/d_5_matsl_gui_1203_1/html/67.207.142.65/exist/rest/app/gui.xql@do c=d_5_matsl_gui_1203_1_e&part=2&chapter=4.html

Grading Criteria:

http://xmltwo.ibo.org/publications/DP/Group5/d_5_matsl_tsm_1205_1/html/content/exist/rest/app/tsm.xql@doc=d_ 5_matsl_tsm_1205_1_e&part=1&chapter=8.html