IB Mathematics Applications and Interpretations HL

Summer Assignment: IA TOPIC AND OUTLINE

As an HL student there is a lot of mathematics yet to learn in this course and it may not be beneficial to write your IA over the summer before being exposed to more complex mathematical topics. Therefore, your summer assignment is to narrow your focus by **choosing a topic and creating an outline**.

Please read the rubric and guidance on the following pages as well as additional materials and resources posted in a Google Classroom for you to use over the summer. The code to join is det7qia

Summer Contact Information: Mrs. Bolden can be reached at aebolden@fcps.edu. I check email almost every day. **Please feel free** to contact me with any questions. I welcome student emails and am more than willing to help you. I am serious – I LOVE when students email me!!!

Beyond picking a topic, I am asking you to create an outline.

Pick a topic that is of interest to you. Have you always wondered about the way certain things are related mathematically? Are you interested in medicine, finance, sports, ecology? Think outside the box! To do well on the IA, you do not need to do overly complex math, simply do good strong appropriate math well. No two students can do the exact same topic or math so if you know what you want to do, let Mrs. Bolden know ASAP!

The outline should include the following:

- What information you plan to gather or use for your exploration. Include sources. If you can gather the relevant data/information over the summer, you will thank yourself later!

- What mathematics you intend to use (or think you will need to use) for your exploration. Through the Google Classroom you can see a list of content that we will be covering throughout the year including the content you previously covered. Pay attention to which content is considered HL as that should be the content you focus on using in your IA to achieve at the higher levels. You do not need to do the math yet, just tell me what topics you might use (i.e. differential calculus or regression models).

- A description of your personal engagement with the topic. Personal engagement is more than just saying you are doing a sports related topic because you play that sport. How is this topic relevant to your life? Why is this topic important to you?

While it is best for you to pick a topic and stick with it, you will have the ability to change as we continue the IA writing process.
Grading: 20 point Assignment

5 points: Submit a suitable topic

5 points: Outline includes appropriate and sufficient information and/or sources.

5 points: Outline includes appropriate and sufficient intended mathematics.

5 points: Outline contains a description of your personal engagement with the topic.

IB Guidelines (Rubric)

Taken from the IB Teacher Support Material

Purpose of the Internal Assessment (Exploration)

The exploration is intended to provide students with opportunities to increase their understanding of mathematical concepts and processes, and to develop a wider appreciation of mathematics. It enables students to demonstrate the application of their skills and knowledge and to pursue their personal interests without the time limitations and other constraints that are associated with written examinations. It is intended that, by doing the exploration, students benefit from the mathematical activities undertaken and find them both stimulation and rewarding.

The specific purposes of the exploration are to:

• Develop students' personal insight into the nature of mathematics and to develop their ability to ask their own questions about mathematics • Provide opportunities for students to complete a piece of mathematical work over an extended period of time • Enable students to experience the satisfaction of applying mathematical processes independently
• Provide students with the opportunity to experience for themselves the beauty, power and usefulness of mathematics • Encourage students, where appropriate, to discover, use and appreciate the power of technology as a mathematical tool • Enable students to develop the qualities of patience and persistence, and to reflect on the significance of their work • Provide opportunities for students to show, with confidence, how they have developed mathematically.

Criterion A – Presentation

Achievement Level	Descriptor
0	The exploration does not reach the standard described by the descriptors below.

1	The exploration has some coherence or 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 and complete.

Specifics regarding the Communication criterion:

- *Express your ideas clearly*
- *Identify a clear aim for the exploration*
- *Focusing on the aim and avoiding irrelevance. Don't put information into your paper just to put it in.*
- *Structure your ideas in a logical manner. Make sure it is easy to follow. If the reader has to pause to figure out what you are saying OR look back a few pages to 'get the idea', you have a fault in your communication.*
- *Include graphs, tables, and diagrams at appropriate places. DO NOT tack them on the end in an Appendix.*
- *Cite references where appropriate.*

To achieve marks above a 2, the exploration must contain an introduction, a logically organized and well-written explanation, and a conclusion. More words does not mean better! Avoid being repetitive.

Criterion B – 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.

The "mathematical communication" criterion assesses to what extent the student has:

- *Use appropriate mathematical language (**notation, symbols and terminology**). Calculator and computer notation is acceptable only if it is software generated (meaning you are typing it what was returned to you by software OR what you had to code to generate your findings)* • ***Define key terms** where required. For example, you would define a word like "tensor", but not a word like "circumference."* • *Use multiple forms of mathematical representation **such as** tables, graphs, formulas, diagrams, charts, and models where it is appropriate.* • *Express your results to an appropriate degree of accuracy (3 sig figs). When writing an approximation, use '≈' and not '='.* • *Use a **deductive method** and set out proofs logically where appropriate*

*Examples of **level 1** can include graphs not being labelled, consistent use of computer notation with no other forms of correct mathematical communication.*

***Level 4** can be achieved by using only one form of mathematical representation as long as this is appropriate to the topic being explored. For **level 4**, any **minor** errors that do not impair clear communication should not be penalized.*

Criterion C – Personal Engagement

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 abundant evidence of outstanding personal engagement.

The "personal engagement" criterion assesses the extent to which the student engages with the topic by exploring the mathematics and making it their own. It is not a measure of effort.

Personal engagement may be recognized in different ways. These include thinking independently or creatively, presenting mathematical ideas in their own way, exploring the topic from different perspectives, making and testing predictions.

***Significant** means: The student demonstrates authentic personal engagement in the exploration on a few occasions and it is evident that these drive the exploration forward and help the reader to better understand the writer's intentions.*

***Outstanding** means: The student demonstrates authentic personal engagement in the exploration in numerous instances and they are of a high quality. It is evident that these drive the exploration forward in a creative way. It leaves the impression that the student has developed, through their approach, a complete understanding of the context of the exploration topic and the reader better understands the writer's intentions.*

Criterion D – Reflection

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.

The "reflection" 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.

Limited Reflection *= merely describing the results.*

Meaningful Reflection*: examples include linking the aims of the exploration, commenting on what they have learned, or considering some limitation or comparing different mathematical approaches.*

Critical Reflection: *crucial, deciding or deeply insightful. Will often develop the exploration by addressing the mathematical results and their impact on the student's understanding of the topic. Examples: considering what next, discussing the implications of the results, discussing strengths and weaknesses of approaches, and considering different perspectives.*

Substantial Reflection: *critical reflection is present throughout the exploration.*

Criterion E – Use of Mathematics

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 is 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.

Relevant *refers to mathematics that supports the development of the exploration towards the completion of its aim. Overly complicated mathematics where simple mathematics would suffice is not relevant.*
Commensurate with the level of the course*: means it should not be completely based on mathematics of their prior learning. The mathematics explored should be in the syllabus or beyond. The mathematics explored should either be part of the syllabus, at a similar level or slightly beyond. However, mathematics of a level slightly beyond is* ***not*** *required to achieve the highest levels.*

Demonstrated*: "to make clear by reasoning or evidence, illustrating with examples or practical application." Obtaining the correct answer is not sufficient to demonstrate understanding (even some understanding) in order to achieve level 2 or higher.* ***Understanding*** *must be demonstrated for a student to achieve higher than a level 1. Substituting numbers into a formula does not necessarily demonstrate understanding.*

Sophistication: *mathematics used should be commensurate with the HL syllabus, or if contained in the SL syllabus, the mathematics has been used in a complex way that is beyond what could reasonably be expected of an SL student.*

The mathematics only need to be what is required to support the development of the exploration. This could be a few small elements of mathematics or even a single topic (or sub-topic) from the syllabus. It is better to a few things well than a lot of things not so well. If the mathematics used is relevant to the topic being explored, commensurate with the level of the course and understood by the student, then it can achieve a high level in this criterion.