

## Diploma Programme subject outline—Group 5: mathematics and computer science

<b>School name</b>	Worthington-Kilbourne	<b>School code</b>	007119
<b>Name of the DP subject</b>	Mathematics		
<b>Level</b> <i>(indicate with X)</i>	Higher <input type="checkbox"/>	Standard completed in two years <input type="checkbox"/>	Standard completed in one year * <input checked="" type="checkbox"/> X
<b>Name of the teacher who completed this outline</b>	John Kovick	<b>Date of IB training</b>	March 2018
<b>Date when outline was completed</b>	September 2018	<b>Name of workshop</b> <i>(indicate name of subject and workshop category)</i>	Online

\* All Diploma Programme courses are designed as two-year learning experiences. However, up to two standard level subjects, excluding languages ab initio and pilot subjects, can be completed in one year, according to conditions established in the *Handbook of procedures for the Diploma Programme*.

### 1. Course outline

- Use the following table to organize the topics to be taught in the course. If you need to include topics that cover other requirements you have to teach (for example, national syllabus), make sure that you do so in an integrated way, but also differentiate them using italics. Add as many rows as you need.
- This document should not be a day-by-day accounting of each unit. It is an outline showing how you will distribute the topics and the time to ensure that students are prepared to comply with the requirements of the subject.
- This outline should show how you will develop the teaching of the subject. It should reflect the individual nature of the course in your classroom and should not just be a “copy and paste” from the subject guide.
- If you will teach both higher and standard level, make sure that this is clearly identified in your outline.

Topic/unit (as identified in the IB subject guide) <i>State the topics/units in the order you are planning to teach them.</i>	Contents	Allocated time	Assessment instruments to be used	Resources <i>List the main resources to be used, including information technology if applicable.</i>
		One class is <input type="text" value="75"/> minutes. In one week there are <input type="text" value="5"/> classes.		
Topic 1 Number and Algebra	Covers chapter 1-4 1: Number Properties 2: Measurement 3:Laws of Algebra 4: Equations and Formulas	This work was completed for summer work. Two weeks reviewing material (10 class periods)	<b>Test</b> <b>Will also be expected to apply on other tests through out the year</b>	Textbook:Mathematics for the International Student and multiple questions taken from past IB exams.  Graphing Calculator Digital Camera and projector <i>White board</i>

	<p>Topic 2 Descriptive Statistics</p>	<p>Chapter 6 Measure of Central Tendencies Discrete Data Standard Deviation Range IQR and Outliers Box Plots Cumulative Frequency Graphs</p>	<p>This topic will be completed in 12 classes including assessments</p>	<p>Quiz and test</p>	<p>Textbook: Mathematics for the International Student and multiple questions taken from past IB exams.</p> <p>Material taken from the Internet. Climate change data from the IB Biology class.</p> <p>Personally made material.</p> <p>Graphing Calculator</p> <p>Digital Camera and projector</p> <p><i>White board</i></p>
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	<p>Topic 3 Logic, Sets and Probability</p>	<p>Chapter 7 and 8 Sets Compliments of Sets Venn Diagrams Propositions Compound Propositions Truth Tables Implication and Equivalence Converse, Inverse, and Contrapositive Valid arguments</p>	<p>Chapter 7 12 class periods including assessments and Chapter 8 12 class periods including assessments</p>	<p>Quizzes(2) and tests(2)</p>	<p>Mathematics for the International Student and multiple questions taken from past IB exams.  Material Taken from our Pre-Calculus textbook.  Material taken from Internet and personally made material.  Graphing Calculator Digital Camera and projector <i>White board</i></p>
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Year 1	Topic 4 Statistical Applications	Chapter 10 and 11 Normal Distribution Probabilities using a calculator Quantiles or K values  Correlation Measuring Calculations Line of Best Fit (by eye) Linear Regression Chi square test of independence	Chapter 10 12 class periods including assessments and Chapter 11 12 class periods including assessments	Quizzes(2) and tests(2)	Mathematics for the International Student and multiple questions taken from past IB exams.  Will also supplement chapter 10 with Math SL material Graphing Calculator Digital Camera and projector <i>White board</i>
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	<p>Topic 5 Geometry and Trigonometry</p>	<p>Chapter 13, 14 &amp; 15</p> <p>Midpoints</p> <p>Gradient</p> <p>Parallel and Perpendicular lines</p> <p>Applications of Gradient</p> <p>Vertical and Horizontal Lines</p> <p>Equations of Lines</p> <p>Graphing Lines</p> <p>Perpendicular Bisectors</p> <p>Perimeters</p> <p>Area and Surface Area</p> <p>Volume and Capacity</p> <p>Density</p> <p>Trig Ratios</p> <p>Using Trig in Geometric figures</p> <p>Using Trig in Application Problems</p> <p>3D Problem Solving</p> <p>Cosine and Sine Rules</p>	<p>Chapter 13 10 classes including assessments</p> <p>Chapter 14 12 classes including assessments</p> <p>Chapter 15 15 classes including assessments</p>	<p>Quizzes(5) and tests(3)</p>	<p>Mathematics for the International Student and multiple questions taken from past IB exams.</p> <p>Material Taken from our Pre-Calculus textbook.</p> <p>Material taken from Internet and personally made material.</p> <p>Graphing Calculator</p> <p>Digital Camera and projector</p> <p><i>White board</i></p>
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	<p>Topic 6 Mathematical Models</p>	<p>Chapter 16, 17 &amp; 19 Relations and Functions Function Notations Domain and Range Linear Models Quadratic Functions Graphs from Tables Axes Intercepts Graph <math>y = ax^2</math> Axes of Symmetry Vertices Quadratic Models Combined Functions</p>	<p>Chapter 16 5 classes including assessments Chapter 17 9 classes including assessments Chapter 19 9 classes including assessments</p>	<p>tests(2)</p>	<p>Mathematics for the International Student and multiple questions taken from past IB exams.</p> <p>Graphing Calculator Digital Camera and projector <i>White board</i></p>
	<p>Topic 7 Introduction to Differential Calculus</p>	<p>Chapter 20 and 21 Rates of Change Instantaneous Rates of Change Derivative Function Rules of Differentiation Normal of Curve Increasing and Decreasing Functions Stationary Points Rates of Change Optimization</p> <p>Increasing and decreasing functions</p>	<p>Chapter 20 12 classes Chapter 21 15 Classes including assessments</p>	<p>Quizzes(2) &amp; Tests(2)</p>	<p>Mathematics for the International Student and multiple questions taken from past IB exams.</p> <p>YouTube. – Nancy – Math BFF Graphing Calculator Digital Camera and projector <i>White board</i></p>

Year 2	Lab work	Allow research time in class and time for individual student meetings to assist and check their progress	10 classes	Quizzes(4) and tests(3)	
	IB Focused Material	I would like to spend at least 10 days going over IB type exam questions spread throughout the year	20 classes		
	Topic 6	<p>Calculus.</p> <p>Topics to include:</p> <p>Derivatives of trigonometric exponential and logarithmic functions.</p> <p>The chain rule, product and quotient rules, optimizations, applications, anti-derivatives, second derivatives, maximizing and minimizing points, area and definite integrals, areas, volumes with integrals, modelling linear motion, points of inflexion with zero and non-zero gradients,</p>	90 classes including reviews and assessments.		
	Exam Review	I will allow 40 classes to do both group and individual exam review. The exam reviews will be both broken down by size and point values. I will also give several mock exams during this time.	<p>I will spend 50 classes. Please note that I plan on giving IB style questions throughout the year like I did with the AP exam.</p> <p>If the course is structured properly, and I provide the right material throughout the course, no more than a week should be needed to review for the external assessment.</p>		

**2. IB internal assessment requirement to be completed during the course**

Briefly explain how and when you will work on it. Include the date when you will first introduce the internal assessment requirement to your students, the different stages and when the internal assessment requirement will be due.

I will introduce the IA at the end of November and it will be due around (January 15)

**3. Links to TOK**

You are expected to explore links between the topics of your subject and TOK. As an example of how you would do this, choose one topic from your course outline that would allow your students to make links with TOK. Describe how you would plan the lesson.

Topic	Link with TOK (including description of lesson plan)
The validity of data and introduction of bias.	A study of how data can be bias and how to identify bias in real world data. I chose this topic because I have always been interested in how the media or companies can represent data to enhance (or misrepresent) their position. The resources I will use will be material that I find on the Internet. I have examples of graphs from other courses I have taught that show broken graphs and graph distortions.

**4. Approaches to learning**

Every IB course should contribute to the development of students' approaches to learning skills. As an example of how you would do this, choose one topic from your outline that would allow your students to specifically develop one or more of these skill categories (thinking, communication, social, self-management or research).

Topic	Contribution to the development of students' approaches to learning skills (including one or more skill category)
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Calculus 6.3 Applications	<p>When studying the application section of Calculus, I would like the students to be able to differentiate the difference between revenue and profit. Not just in “definition” but in practicality. For example, an artist who sells mugs at \$4.00 mug can sell 120 per week. For every \$0.30 the mug price, sales will increase by 20. So, doing the math, the students should be able to find the optimal price is \$2,88 with sales of 195 mugs. Now even though the revenue increases from \$480 to \$560, is it the best price? What about extra material? What about extra time? Etc.</p> <p>Similarly, a soybean farmer can harvests his crop today and the yield will average 120 bushels an acre and will sell for \$0.48 per bushel. He knows that if he waits, his yield will increase by about 10 bushels per week, but the price will decrease by \$0.03 per bushel per week.</p>
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**5. International mindedness**

Every IB course should contribute to the development of international mindedness in students. As an example of how you would do this, choose one topic from your outline that would allow your students to analyse it from different cultural perspectives. Briefly explain the reason for your choice and what resources you will use to achieve this goal.

Topic	Contribution to the development of international mindedness (including resources you will use)
History of PI	With so much of today’s news being dominated by diverse religious groups, I thought it would be a good idea to show the students how different religions influenced the development of mathematics. Resources will be web site: <a href="http://www.gap-system.org">www.gap-system.org</a> and web based article on <a href="http://www.UNLV.edu">www.UNLV.edu</a>

**6. Development of the IB learner profile**

Through the course it is also expected that students will develop the attributes of the IB learner profile. As an example of how you would do this, choose one topic from your course outline and explain how the contents and related skills would pursue the development of any attribute(s) of the IB learner profile that you will identify.

Topic	Contribution to the development of the attribute(s) of the IB learner profile
Topic 3	The students will have to think creatively and critically to solve a complex trigonometric problem such as tracking a satellite in orbit around the earth. The students might be asked to locate the satellite’s position from the equator given any amount of time after launch. They might also be asked to reverse their thinking, and give several possible time periods for a given location of the satellite from the equator.

## 7. Resources

Describe the resources that you and your student will have to support the subject. Indicate whether they are sufficient in terms of quality, quantity and variety. Briefly describe what plans are in place if changes are needed.

The students will have access to the following resources: Mathematics for the International Studies SL 3<sup>rd</sup> edition., Ti graphing calculators, , Excel software, , MS Word software, Equation editor, Internet with a variety of websites such as Khan Academy and YouTube. In addition to these, I will also have access to IB Question bank along with resources from other IB teachers. We have sufficient quantity of all of our resources, and I believe both the quality and variety will be sufficient for the class. If changes are necessary, I have the flexibility for change, and we have the financial resources to purchase necessary material.