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

School name	Worthington-Kilbourne		School code	007119
Name of the DP subject	Mathematics			

Level *(indicate with X)*	Higher [ ]	Standard completed in two years [X]	Standard completed in one year * [ ]

Name of the teacher who completed this outline	John Kovick	**Date of IB training**	6/25/11 to 6/28/11
Date when outline was completed	8/16/11 (revised September 2018)	**Name of workshop** *(indicate name of subject and workshop category)*	Lake Tahoe, Math SL

* 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) *State the topics/units in the order you are planning to teach them.*	Contents	Allocated time	Assessment instruments to be used	Resources *List the main resources to be used, including information technology if applicable.*
		One class is **50** minutes. In one week there are **5** classes.		
Topic 1	Algebra. Topics to include : - Arithmetic and geometric sequences, Arithmetic and geometric series, end behaviour of series, infinite series - rational exponents, properties of logs and exponents, base changes - binomial theorem, Pascal triangle, combinations, permutations, binomial probabilities, binomial distributions	This material is all review from the previous year. I will spend 25 classes including six days of review and assessments.	**Quiz** **Will also be expected to apply on other tests through out the year**	IB textbooks from Fabio Cirrito and Haese. In addition, all topics have multiple questions taken from past IB exams. *Personally made material.* Graphing Calculator Digital Camera and projector White board

	Topic 2	Functions and equations. Topics to include: Graph of parent functions, scale changes and translations of functions, composition of functions, inverse functions, symmetries of graph, and identifying horizontal and vertical asymptotes. Finding the zeros of a function by graphing, factoring, and quadratic function. Application problems involving functions. Describing the domain and range of functions along with domain restrictions. Identifying the axis of symmetry, reflecting graphs, using the discriminant to tell the number of real solutions of a function. Plotting and comparing graphs, analysing and comparing functions, deduct if solutions are inconsistent or extraneous.	This material is all review from the previous year. I will spend 25 classes including three days of review and assessments.	Quiz and test	IB textbooks from Fabio Cirrito and Haese. In addition, all topics have multiple questions taken from past IB exams Personally made material. Graphing Calculator Digital Camera and projector *White board*

| | Topic 3 | Circular functions and trigonometry. Topics to include:

unit circle, magnitudes of rotations , measurements of arcs, the six trig functions, periodicity theorem, translation of trigonometric functions, scale changes of trigonometric functions, graph standardization theorem, real life application of trigonometry.

Law of Sine, Law of Cosine, Inverse trig functions, general solutions to trigonometric equations, parametric equations for circles and ellipses, double and half angle theorems.

Pythagorean Theorem, Supplemental Theorem, Opposite Theorem, and area of a triangle | This material is all review from the previous year. I will spend 30 classes including four days of review and assessments. | Quiz and test | IB textbooks from Fabio Cirrito and Haese. In addition, all topics have multiple questions taken from past IB exams

Personally made material.

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| Year 1 | Topic 4 | Vectors:

Topics to include:

Vectors in a plane, adding and subtracting vectors, parallel vectors and equations of lines, the dot product and angle between two vectors, three-dimensional coordinates, vectors in 3-space, multiplication by a scalar, magnitude of a vector, distinguishing between coincident and parallel lines, finding points of intersections | This material is all review from the previous year. I will spend 30 classes including four days of review and assessments. | Quiz and test | IB textbooks from Fabio Cirrito and Haese. In addition, all topics have multiple questions taken from past IB exams

Personally made material.

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	Topic 5	Stats and probability Topics to include: Sample vs. population, random samples, independent and independent events, mutual exclusive events, Venn diagrams, frequency distributions, box-plots, histograms, outliers, variance and standard deviation, five number summary, range, measures of central tendencies, probabilities and odds, sample space, expected mean, discrete random variables and their probability distributions, binomial distributions, mean of binomial distributions, normal distribution, standardization of normal variables,	The majority of this material is all review from the previous year. 40 classes including 5 days of review and assessments. .		IB textbooks from Fabio Cirrito and Haese. In addition, all topics have multiple questions taken from past IB exams Personally made material. . Graphing Calculator Digital Camera and projector *White board*

				Quizzes(4) and tests(3)	
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 textbooks from Fabio Cirrito and Haese. In addition, all topics have multiple questions taken from past IB exams
	IB Focused Material	I would like to spend at least 10 days going over IB type exam questions spread throughout the year	20 classes		Personally made material.
	Topic 6	Calculus. Topics to include: Derivatives of Trigono-metric exponential and logarithmic functions. 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,	90 classes including reviews and assessments. b		Graphing Calculator Digital Camera and projector *White board* YouTube. – Nancy – Math BFF
	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.	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. 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.		

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 beginning of second quarter (around Nov 1). I will show the students at least one sample. The students will start working on the AI between Thanksgiving and Christmas year 2. I would like to give feedback every two weeks.

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)
How different civilizations approached mathematics	A study of how and why different civilizations calculated their value of PI. I chose this topic because it always fascinated me how different civilizations approached a universal problem so differently. The resources I will use include PC World magazine, Gap-System.org web site, and University of Arkansas website.

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)

Calculas 6.3 Applications	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. 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. Right now his yield would be $57.60 per acre, but if he waits two weeks it will be $58.80. Should he wait? How large is the farm? Are there weather risks? Are there pestilence risks? Etc.

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: www.gap-system.org and web based article on www.UNLV.edu

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 a 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 Standard Level by Fabio Cirrito, Ti graphing calculators, , Excel software, MathGV graphing 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.