Course Outline

Course Title: International Baccalaureate (IB) Pre Diploma Program Mathematics (PreDP) **MYP Level 5**
Instructor: Mr. Alei Room 201 **Contact**: balei@desertacademy.org
Web Page: www.aleimath.blogspot.com (505) 424-9613 (home); (505) 699-1248 (cell)

Course Description: This course prepares the student for the IB High Level mathematics course to be taken in the junior and senior years. As such, it caters to students with a strong background in mathematics who are competent in a range of analytical and technical skills.

Course Aims: The aims of all IB diploma program mathematics courses are to enable students to:

- Appreciate the multicultural and historical perspectives of the study of mathematics and in particular to explore
  - differences in notation
  - the lives of mathematicians set in a historical and/or social context
  - the cultural context of mathematical discoveries
  - the ways in which specific mathematical discoveries were made and the techniques used to make them
  - how the attitudes of different societies towards specific areas of mathematics are demonstrated
  - the universality of mathematics as a means of communication
- Enjoy the courses and develop an appreciation of the elegance, power and usefulness of the mathematics
- Develop logical, critical and creative thinking
- Develop an understanding of the principles and nature of the subject
- Employ and refine their powers of abstraction and generalization
- Develop patience and persistence in problem solving
- Appreciate the consequences arising from technological developments
- Transfer skills to alternative situations and to future developments
- Communicate clearly and confidently in a variety of contexts.

Course Objectives: Students are expected to know and use mathematical concepts and principles. In particular, students must be able to:

- Read, interpret and solve a given problem using appropriate mathematical terms
- Organize and present information and data in tabular, graphical and/or diagrammatic forms
- Know and use appropriate notation and terminology
- Formulate a mathematical argument and communicate it clearly
- Select and use appropriate mathematical strategies and techniques
- Demonstrate an understanding of both the significance and the reasonableness of results
- Recognize patterns and structures in a variety of situations, and make generalizations
- Recognize and demonstrate an understanding of the practical applications of mathematics
- Use appropriate technological devices as mathematical tools
- Demonstrate an understanding of and the appropriate use of mathematical modeling.

Texts & Resources: We will use three primary sources for our texts. Other materials will be used as needed.

Exeter: A problem based curriculum published by the Phillips Exeter Academy (PEA) and available at http://aleimath.blogspot.com/2011/07/resources.html. There will be a printed classroom set of these materials available, however students may be asked to download and print their own copies.

Haese & Harris: (*Mathematics SL, Second Edition*). The text will be provided and an electronic copy with tutorial support is available.

Dunham, William: (*Journey Through Genius*). The text will be provided.

Methodology: In the PreDP course, we will begin working on the topics included in the IB High Level Math syllabus, solidifying our conceptual and procedural foundations, while taking time to explore extensions into areas of student interest not included in IB. We will be working on all the ideas more or less simultaneously, increasing the level of sophistication and understanding as we go. The emphasis on various topics will be adapted based on the existing knowledge and background of the class. Detailed content from each area of study is given in the syllabus published by IB which is available at http://www.aleigonzalez.org/Desert/math.hl.08.pdf. Students should download this and keep it for reference over the course of their study. A summary of the HL areas of study with the approximate time allocated to each area is shown.

	Topic	Hrs	Weeks
Topic 1	Algebra	20	5
Topic 2	Functions and equations	26	6.5
Topic 3	Circular functions and trigonometry	22	5.5
Topic 4	Matrices	12	3
Topic 5	Vectors	22	5.5
Topic 6	Statistics and probability	40	10
Topic 7	Calculus	48	12
Option	Series & Differential Equations	40	10
	Portfolio (IA)	10	2.5
	Total	**240**	**60**

Methods of Assessment: Students will be assessed using both summative and formative assessments. Tests, quizzes, projects and regular oral and written problem presentations will be assessed.

IB Internal Assessment (IA): All students, whether or not they are candidates for an IB certificate, will be expected to complete practice IB portfolio tasks (IAs) in preparation for their work in HL. Expect to do two such tasks over the year, one being a mathematical investigation and the other exploring mathematical modeling as described in the IB syllabus. Time will be set aside in class to work on these projects though additional time outside of class will be required.

Mandatory Assignments: Students are required to complete the semester and final exams and may miss no more than two unit tests in order to receive credit for the course. They must also complete any IA assignments.

Late work policy: It is expected that assignments will be completed, turned in on time, and represent the student's own work. Timely completion of assignments is essential to ensuring strong class participation and optimal learning outcomes. Late assignments will be subject to the following policy: Non-mandatory course assignments must be turned no later than the end of the Unit with which they are associated. Absent extenuating circumstances, these late assignments may be marked down one to two letter grades. Mandatory assignments must be turned in within the Semester that they were assigned. Failure to turn in a mandatory course assignment within this time period results in the issuing of an incomplete and no credit for the course. Students have six weeks to convert an incomplete to a grade. Absent extenuating circumstances, these late assignments may be marked down by one to two letter grades.

Grading Policy: Your grade will be based on problem presentations, quizzes, and tests as follows:

- Problem presentations – 40% (includes HW spot checks for completion, and hand-in HW problems)
- Classwork – 10% (assessed through performance and participation in classroom activities)
- Quizzes – 20%
- Tests – 30% (Practice IB Internal Assessments will count the same as a single test. Semester and Final Exams will carry twice the weight of a regular test. Most tests and quizzes will look a lot like IB exams, using similar questions and marking schemes.)

Process: We will use a variety of learning approaches in this course, primarily through student led discussions, drawing on homework problems from Either Haese & Harris or the PEA curriculum (see below). On most block days, students will be expected to arrive to class and immediately select a problem from the previous homework assignment, go a whiteboard, and write up a clear explanation of the problem. About 5-10 minutes into the class, we will sit down and students will explain their problem, one at a time, as other students discuss and clarify questions or issues that arise. Students may be asked to present more than one problem. **Every student should be prepared to present at least one problem per class period**. On occasion, announced in advance or not, you will be asked to hand in problems for grading. On other occasions, students will be asked to prepare presentations explaining some idea or the results of work which they have done. There will be a strong emphasis on communicating mathematical ideas clearly both orally and in writing. Most tests, quizzes, and in class project work will be done on Fridays

Homework Policy: Because math is best learned through regular practice, expect to have nightly homework. Unless otherwise indicated, homework is due at the beginning of the following class period. In most cases, you will be presenting one or more homework problems during class. The remaining problems will be spot checked for completion and collected on a random basis for explicit grading. Be prepared to hand in any homework assignment.

Absences and Tardies: Please refer to the school's absentee and tardy policies in the 2011-12 Parent Student Handbook. Note that as students arrive to class, they will select the problem(s) they wish to present on a first come, first served basis so it is to your advantage to arrive to class on time. If you are absent, you are responsible for making up the missed material on your own time. In general missed HW is due one day following your return from an absence. It is your responsibility to schedule a time to make up missed tests or quizzes.

Required Materials: Students are expected to bring the following materials to class **every day**.

- Text book (if class sets are not available)
- Math notebook. I **strongly** suggest a graph paper notebook, available at Staples for about $3.
- 3 Ring binder to help organize handouts and submitted work that has been returned to you.
- Graphing calculator (TI-84Plus or TI-89 recommended)
- At least two pencils with good erasers.
- There is generally a class set of rulers, protractors, compasses, etc, but having your own is nice.

A Note about the Exeter Materials: This note is taken from the preface to the Exeter Math 2 book. There are also introductions by PEA students in the texts which I encourage all students to read.

To the Student

Contents: Members of the PEA Mathematics Department have written the material in this book. As you work through it, you will discover that algebra, geometry, and trigonometry have been integrated into a mathematical whole. There is no Chapter 5, nor is there a section on tangents to circles. The curriculum is problem-centered, rather than topic-centered. Techniques and theorems will become apparent as you work through the problems, and you will need to keep appropriate notes for your records — there are no boxes containing important theorems. There is no index as such, but the reference section that starts on page 201 should help you recall the meanings of key words that are defined in the problems (where they usually appear italicized)

Comments on problem-solving: You should approach each problem as an exploration. Reading each question carefully is essential, especially since definitions, highlighted in italics, are routinely inserted into the problem texts. It is important to make accurate diagrams whenever appropriate. Useful strategies to keep in mind are: create an easier problem, guess and check, work backwards, and recall a similar problem. It is important that you work on each problem when assigned, since the questions you may have about a problem will likely motivate class discussion the next day. Problem-solving requires persistence as much as it requires ingenuity. When you get stuck, or solve a problem incorrectly, back up and start over. Keep in mind that you're probably not the only one who is stuck, and that may even include your teacher. If you have taken the time to think about a problem, you should bring to class a written record of your efforts, not just a blank space in your notebook. The methods that you use to solve a problem, the corrections that you make in your approach, the means by which you test the validity of your solutions, and your ability to communicate ideas are just as important as getting the correct answer.

About technology: Many of the problems in this book require the use of technology (graphing calculators or computer software) in order to solve them. Moreover, you are encouraged to use technology to explore, and to formulate and test conjectures. Keep the following guidelines in mind: write before you calculate, so that you will have a clear record of what you have done; store intermediate answers in your calculator for later use in your solution; pay attention to the degree of accuracy requested; refer to your calculator's manual when needed; and be prepared to explain your method to your classmates. Also, if you are asked to "graph y =(2x - 3)/(x + 1)", for instance, the expectation is that, although you might use your calculator to generate a picture of the curve, you should sketch that picture in your notebook or on the board, with correctly scaled axes.

Phillips Exeter Academy

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Student Name (please print) Parent Name (please print)

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Student Signature Parent Signature Date