**IB Diploma Course Outline**

**Course Title: IB Math Applications & Interpretation**

**School Year: 2022-2024**

**School: Pueblo East High School**

**Instructor: Chad Arguello**

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1. **Course description:** This course recognizes the increasing role that mathematics and technology play in a diverse range of fields in a data-rich world. As such, it emphasizes the meaning of mathematics in context by focusing on topics that are often used as applications or in mathematical modelling. To give this understanding a firm base, this course also includes topics that are traditionally part of pre-university mathematics courses, such as calculus and statistics. The course makes extensive use of technology to allow students to explore and construct mathematical models. Mathematics: applications and interpretation will develop mathematical thinking, often in the context of a practical problem and using technology to justify conjectures. (Mathematics: applications and interpretation guide, Feb. 2019) **The expectation of the school is that all students enrolled in IB courses will take those IB exams.**
2. **Aims of the Course:**

The aims of all DP mathematics courses are to enable students to:

* develop a curiosity and enjoyment of mathematics, and appreciate its elegance and power
* develop an understanding of the concepts, principles and nature of mathematics
* communicate mathematics clearly, concisely and confidently in a variety of contexts
* develop logical and creative thinking, and patience and persistence in problem solving to instill confidence in using mathematics
* employ and refine their powers of abstraction and generalization
* take action to apply and transfer skills to alternative situations, to other areas of knowledge and to future developments in their local and global communities
* appreciate how developments in technology and mathematics influence each other
* appreciate the moral, social and ethical questions arising from the work of mathematicians and the applications of mathematics
* appreciate the universality of mathematics and its multicultural, international and historical perspectives
* appreciate the contribution of mathematics to other disciplines, and as a particular “area of knowledge” in the TOK course
* develop the ability to reflect critically upon their own work and the work of others
* independently and collaboratively extend their understanding of mathematics.

1. **Objectives of the Course:**

Problem solving is central to learning mathematics and involves the acquisition of mathematical skills and concepts in a wide range of situations, including non-routine, open-ended and real-world problems. Having followed a DP mathematics course, students will be expected to demonstrate the following:

* Knowledge and understanding: Recall, select and use their knowledge of mathematical facts, concepts and techniques in a variety of familiar and unfamiliar contexts.
* Problem solving: Recall, select and use their knowledge of mathematical skills, results and models in both abstract and real-world contexts to solve problems.
* Communication and interpretation: Transform common realistic contexts into mathematics; comment on the context; sketch or draw mathematical diagrams, graphs or constructions both on paper and using technology; record methods, solutions and conclusions using standardized notation; use appropriate notation and terminology.
* Technology: Use technology accurately, appropriately and efficiently both to explore new ideas and to solve problems.
* Reasoning: Construct mathematical arguments through the use of precise statements, logical deduction and inference and by the manipulation of mathematical expressions.
* Inquiry approaches: Investigate unfamiliar situations, both abstract and from the real world, involving organizing and analyzing information, making conjectures, drawing conclusions, and testing their validity.

1. **Inclusion of Internationalism and the Learner Profile Attributes:**

The aim of all IB programmes is to develop internationally minded people who, recognizing their common humanity and shared guardianship of the planet, help to create a better and more peaceful world. Students in this course will be encouraged to develop the attributes of the IB Learner Profile through various activities including collaboration, inquiry-based lessons and reflection. IB Learners strive to be inquirers, knowledgeable, thinkers, communicators, principled, open-minded, caring, risk-takers, balanced, and reflective.

1. **Connections to Theory of Knowledge:**

IB diploma students may be enrolled in a Theory of Knowledge course in which they learn about the four ways in which knowing occurs. Students in this course will spend time exploring how mathematics connects to the Theory of Knowledge.

1. **IB Math Studies/Applications & Interpretation Standard Level: Two-Year Sequence**

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| --- | --- |
| **Syllabus Component** | **Hours of Instruction** |
| **Number and Algebra** | 16 |
| **Functions** | 31 |
| **Geometry and Trigonometry** | 18 |
| **Statistics and Probability** | 36 |
| **Calculus** | 19 |
| **Mathematical Exploration, including “toolkit” activities** | 30 |
| **Total Teaching** | 150 |

**VII. Unit Sequence for this Course**

**Year One**

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| **Unit or Topic of Study** | **Duration** |
| **Unit 1:** Measuring space: accuracy and 2D geometry | Approximately 4 Weeks |
| **Unit 2:** Representing space: non-right angled trigonometry and volumes | Approximately 2 Weeks |
| **Unit 3:** Representing and describing data: descriptive statistics | Approximately 4 Weeks |
| **Unit 4:** Dividing up space: coordinate geometry, lines, Voronoi diagrams | Approximately 3 Weeks |
| **Unit 5:** Modelling constant rates of change: linear functions | Approximately 3 Weeks |
| **Unit 6:** Modelling relationships: linear correlation of bivariate data | Approximately 2 Weeks |

**Year Two**

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| **Unit or Topic of Study** | **Duration** |
| **Unit 1:** Quantifying uncertainty: probability, binomial and normal distributions | Approximately 4 Weeks |
| **Unit 2:** Testing for validity: Spearman’s hypothesis testing and Chi-squared test for independence | Approximately 2 Weeks |
| **Unit 3:** Modelling relationships with functions: power functions | Approximately 3 Weeks |
| **Unit 4:** Modelling rates of change: exponential and logarithmic functions | Approximately 3 Weeks |
| **Unit 5:** Modelling periodic phenomena: trigonometric functions | Approximately 2 Weeks |
| **Unit 6:** Analyzing rates of change: differential calculus | Approximately 2 Weeks |
| **Unit 7:** Approximating irregular spaces: integrations | Approximately 2 Weeks |

**VIII. Proposed Process and Expected Assessment**:

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| **Assessment**   1. Summative assessment: These are assessments set at the end of the grading period to determine a student’s performance in that reporting period. This may include major unit tests, major projects, etc. Questions from unit tests will be pulled from question banks issued by the IB to mirror the external assessment as much as possible. This will account for 60% of the weighted report card grade. 2. Formative assessments: These are a variety of tests and assignments set by the school as part of the teaching and learning process. This may include quizzes, mini projects, or parts of project work. This will account for 40% of the weighted report card grade. 3. Final assessment: These are the assessments determined by the IB for this course (taken from the Subject Guide). It includes both External Assessments and Internal Assessments.   Grading Scale  90%-100% A  80%-89% B  70%-79% C  60%-69% D  below 60% F  \**To receive Honors credit (weighted grade), students must complete all course requirements, including internal and external assessments and IB exams. Failure to do so will result in the loss of Honors credit and the student will earn their grade at standard credit.*  **The final IB assessment is weighted as follows:**  **External Assessments**  Examinations given at the end of year two and determined by the IB:  Paper 1 and Paper 2  80 marks each  **Internal Assessments**  Mathematical Exploration  20 marks  Students will choose a topic of interest in which they will gather data and/or measurements, perform mathematical procedures to evaluate the data or measurements, make inferences, draw conclusions about the project, and comment on the validity of the project. Students will be given some time to work on the project in class, however, it is expected that the students will also put forth a commitment to the project outside of class. The project will be broken up into smaller components so as to provide students with a structure to manage the heavy workload that is inherent to the Diploma Program. The project will be scored by the teacher using scoring criterion provided by the IB, and it will then be submitted to IB for moderation. The assessment criteria are as follows:  Criterion A: Presentation  Criterion B: Mathematical communication  Criterion C: Personal engagement  Criterion D: Reflection  Criterion E: Use of Mathematics  **Weighting**  The externally assessed component, paper 1 and paper 2 (80 marks each) accounts for 80% of the weighted score, and the internally assessed component, the mathematical exploration (20 marks) accounts for 20% of the weighted grade. Grade boundaries are then applied, to determine the band (from 1 to 7) to which the student’s performance in Math Studies falls. Students receiving a score between 4 and 7 are considered to be passing and are awarded college credit by many universities. |

**IX. Course Textbooks/Resources/Requirements**

Mathematics: Application and Interpretation, Standard Level (2019) Wathall et al.

It is strongly recommend that students have a TI-84 graphing calculator. We will use these often, and students will need to use these when completing homework. They will also use these calculators on the IB examination. It is crucial for them to be comfortable and familiar with the calculator. While a classroom set is available, calculators cannot be checked out to students for use at home as students only attend class every other day.

**X. Other Course Outline Components:**

**Attendance and Tardies**:

Attendance is required. There is a direct correlation between high student achievement and good attendance.

**Absences:**

Please refer to the East High School Handbook http://east.pueblocityschools.us/ for school policy regarding absences from school. Extended absences will be reviewed on an individual basis. In the case of an excused absence on a test day, students must take the missing test the day of return to school. Make-up work will only be allowed for excused absences. Students are responsible for any content missed due to absences. An excused absence does not mean students are not required to make up assignments and assessments.

**Tardies:**

Please refer to the East High School Handbook http://east.pueblocityschools.us/ for school policy regarding tardiness to school and class.

**Behavior:**

Respect is expected at all times for the instructor, substitute instructor, all students and their ideas. Please refer to the Pueblo City Schools Student Conduct Code for student guidelines. The standard dress code will be enforced in my classroom, so students should come to class dressed appropriately.

**CELL PHONES** will not be permitted for use during class time. According to research, “heavier smartphone use has been linked to lower-quality sleep and lower GPAs” and “more than 75 percent of students reported texting while in class, and in-class texting was linked to an average drop of half a letter grade or more.” Therefore, students will not be allowed to be on cellphones during class time unless specifically instructed by the teacher for a learning activity. In an effort to enforce this policy, students will be required to place their phones in a caddy at the front of the classroom each day. Parents needing to reach their students in the event of an emergency during class may do so by calling the main office at 549-7222. Thank you for your support of this effort and your cooperation in not texting or phoning your student during class time.

**Academic Honesty:**

Any kind of cheating will not be tolerated on homework, quizzes, projects, or exams. Cheating will result in a zero for all parties involved and possible removal from the class.

Please see the Academic Honesty Policy for additional information.