MUHS Course Criteria/ Syllabus Course Title& Name:
International Baccalaureate: Middle Years Program: 4S

Credit: 1.0

Department: Mathematics

Teacher: Derek Bartlett (dbartlett@acsdvt.org) Phone Number: 382-1135

Prerequisites: 8th Grade Pre-Algebra/Algebra

Course Description:
This course is the first in an integrated sequence of four to work through both, the Common Core Standards for high school mathematics and to prepare students for International Baccalaureate Standard Level requirements. This course is rigorous and is designed to improve students’ problem-solving abilities, and to develop conceptual meaning behind mathematics. Students will engage in both guided and open-ended mathematical explorations to help them make connections

Statements of Inquiry:
1. Discovering Relationships can lead to understanding how patterns evolve in the natural world
2. Representations of models reveal relationships
3. Modeling relationships helps us understand the world around us
4. Points of equivalence in a system of relationships can help us understand how to better use resources
5. Systems of representations have their limitations
6. Simplification requires an understanding of logical application of rules within a system
7. How quantities are represented allows us to use logic to make better decisions and predictions

Texts and/or materials:
Mathematics Vision Project (www.mathematicsvisionproject.org) and International Baccalaureate resources
All materials as well as tutorials can be found on my web-page (www.acsdvt.org/muhs)
EXPECTATIONS

Climate:
We are working together to learn as much math as possible. Everyone in class is expected to work in a friendly and open way so that our classroom is a comfortable and safe place to learn. I will treat each of you with the utmost kindness and respect. I expect kindness and respect to be reciprocated between students, classroom visitors, and teacher at all times.

“Out of trust and respect, grows confidence!”

All electronic devices must be turned off and put away in your backpack!

Notebook:
I expect you to have a notebook (3-ring binder), specifically designated for math. The organization of your math notebook will be succinct with the calendar for each unit of study. Your notebook will need a minimum of 20 dividers.

Homework:
Homework will be assigned daily. It should be attempted/completed for the following day. You should come prepared with specific questions regarding any problems that gave you difficulty. I will collect and provide feedback for homework assignments. Scores on homework assignments are on a scale of 0 – 10 and will be entered into Powerschool. To receive full credit you should complete all problems accurately. Make sure you show your work!

Attendance:
When you are absent from class, you are responsible for bringing in the excused absence slip. If you know in advance that you will be absent, you are responsible for getting the assignment ahead of time. If possible, you should try the next assignment and arrange for any help needed upon your return to school. You can access most materials needed at my web page as well as the daily objectives and daily agenda. This form of medium should keep you current with what is taking place in the classroom.
Assessments:
Expect one or two quizzes (formative assessments) per unit and a test (summative assessment), or project (summative assessment) at the end of each unit. Assessments count for 80% of quarter grade, (summative assessments 100% and formative assessments 50%). Classwork/homework will count for the remaining 20%.

*Students may retake formative assessments (quizzes) to improve their content knowledge given that:

1) All homework is completed

2) All corrections are made on previous quiz

*A unit test will replace a lower quiz score in the same unit!

Academic Honesty:
I expect you to take responsibility for your own work. Cheating is a serious offense. This includes copying homework, problem solving activities, tests and/or quizzes. Please reference page 32 of the MUHS Student Handbook for more details.

Extra Help:
If at any time during the school year, you need extra help, PLEASE ASK! I am available before school (7:30-8:00 am) by appointment or after school (3:30-4:00 pm) by appointment. I am also available during Flex Time to provide additional support. Regular tutoring is also available through the Learning Lab (Room H-103).

Grading Policy:
Quarter Grade:
80% Assessments
20% Classwork/Homework
100% Total

Yearly Grade:
Quarter 1: 25%
Quarter 2: 25%
Quarter 3: 25%
Quarter 4: 25%
100%
MUHS Course Alignment to CCSS & Common Tasks
Units of study with corresponding Common Tasks & Standards (Common Core, GEs, Power Standards and/or National Standards)

UNIT 1: SEQUENCES (LPR: Caring, Thinkers, Reflective)

N.Q.2 Define appropriate quantities for the purpose of descriptive modeling.

A.SSE.1 Interpret expressions that represent a quantity in terms of its context.
   a. Interpret parts of an expression, such as terms, factors, and coefficients.
   b. Interpret complicated expressions by viewing one or more of their parts as a single entity.

F-BF: Build a function that models a relationship between two quantities.
   1: Write a function that describes a relationship between two quantities.*
      a. Determine an explicit expression, a recursive process, or steps for calculation from a context.

F-LE: Linear, Quadratic, and Exponential Models* (Secondary I focus on linear and exponential only) Construct and compare linear, quadratic and exponential models and solve problems.
   1. Distinguish between situations that can be modeled with linear functions and with exponential functions.
      a. Prove that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals.
      b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
   2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). Interpret expression for functions in terms of the situation they model.
      3. Interpret the parameters in a linear or exponential function in terms of a context.

F-BF: Build a function that models a relationship between two quantities.
   1: Write a function that describes a relationship between two quantities.*
      a. Determine an explicit expression, a recursive process, or steps for calculation from a context.
2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). Interpret expression for functions in terms of the situation they model.

**F.BF.1** Write a function that describes a relationship between two quantities.*

a. Determine an explicit expression, a recursive process, or steps for calculation from a context.

**F.LE.1** Distinguish between situations that can be modeled with linear functions and with exponential functions.

a. Prove that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals.

b. Recognize situations in which one quantity grows or decays by a constant percent rate per unit interval relative to another.

**F.LE.2** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

**F.IF.5** Interpret the parameters in a linear or exponential function in terms of a context.

**A.REI.3** Solve linear equations and inequalities in one variable including equations with coefficients represented by letters.

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**UNIT 2: LINEAR AND EXPONENTIAL FUNCTIONS** (Knowledgeable, Communicators, Courageous)

**F.IF.3:** Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.

**F.BF.1:** Write a function that describes a relationship between two quantities.

a. Determine an explicit expression, a recursive process, or steps from a calculation from a context.

**F.LE.1:** Distinguish between situations that can be modeled with linear functions and with exponential functions.

**F.LE.2:** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

F-BF.2 Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.

F-LE.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.

F-LE.5 Interpret the parameters in a linear or exponential function in terms of a context.

F-IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

a. Graph linear and quadratic functions and show intercepts, maxima, and minima.

b. Graph exponential and logarithmic functions, showing intercepts and end behavior

F-IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.

A-SSE.1 Interpret expressions that represent a quantity in terms of its context. a) Interpret parts of an expression, such as terms, factors, and coefficients.

A-SSE.6 Use the structure of an expression to identify ways to rewrite it.

A-CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

F-LE.2 Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

F-LE.5 Interpret the parameters in a linear or exponential function in terms of a context.

UNIT 3: LINEAR EQUATIONS AND INEQUALITIES (Open-Mindedness, Principled, Balanced)

N.Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas.

A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
A.REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

A.REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution.

a. Construct a viable argument to justify a solution method.

b. Solve equations and inequalities in one variable.

UNIT 4: SYSTEMS OF LINEAR EQUATIONS AND INEQUALITIES (Thinkers, Inquirers, Reflective)

A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.

A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

A.REI.12 Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality)

A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

A.REI.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

A.REI.5 Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

UNIT 5: COORDINATE GEOMETRY (Communicators, Caring, Knowledgeable)

G.CO.4 Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.

G.CO.5 Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure. Specify a sequence of transformations that will carry a given figure onto another.

G.CO.1 Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc

G.GPE.5 Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems.

G.GPE.4 Use coordinates to prove simple geometric theorems algebraically.
G.GPE.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles using the distance formula

**UNIT 6: EXPONENTIAL EXPRESSIONS** (Balanced, Courageous, Open-Minded)

A.SSE.1a: Interpret parts of an expression, such as terms, factors and coefficients

A.SSE.1b: Interpret complicated expressions by viewing one or more of their parts as a single entity

A.SSE.2: Use the structure of an expression to identify ways to rewrite it

F.FIF.8b: Use the properties of exponents to interpret expressions for exponential functions

N.RN.1: Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents

N.RN.2: Rewrite expressions involving radicals and rational exponents using the properties of exponent

**UNIT 7: DATA ANALYSIS** (Inquirers, Thinkers, Communicators)

S.ID.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).

S.ID.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

S.ID.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

S.ID.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

S.ID.8 Compute (using technology) and interpret the correlation coefficient of a linear fit.

S.ID.9 Distinguish between correlation and causation.

S.ID.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

S.ID.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

b. Fit a linear function for a scatter plot that suggests a linear association.
c. Informally assess the fit of a function by plotting and analyzing residuals.

S.ID.6b: Informally assess the fit of a function by plotting and analyzing residuals.

Common Task: Unit Summative Assessment

**International Baccalaureate: Criterion (Objectives)**

**Criterion A: Knowing and Understanding**

Students select and apply mathematics to solve problems in both familiar and unfamiliar situations in a variety of contexts, demonstrating knowledge and understanding of the framework’s branches (number, algebra, geometry and trigonometry, statistics and probability).

**Criterion B: Investigating Patterns**

Students work through investigations to become risk-takers, inquirers and critical thinkers

**Criterion C: Communicating**

Students use appropriate mathematical language and different forms of representation when communicating mathematical ideas, reasoning and findings, both orally and in writing.

**Criterion D: Applying Mathematics in Real-Life Contexts**

Students transfer theoretical mathematical knowledge into real-world situations and apply appropriate problem-solving strategies, draw valid conclusions and reflect upon their results.
International Baccalaureate: Learner Profile

Students strive to be:

• **Inquirers**
  Students develop their natural curiosity. You acquire the skills necessary to conduct inquiry and research and show independence in learning. You actively enjoy learning and this love of learning will be sustained throughout their lives.

• **Knowledgeable**
  Students explore concepts, ideas and issues that have local and global significance. In so doing, you acquire in-depth knowledge and develop understanding across a broad and balanced range of disciplines.

• **Thinkers**
  Students exercise initiative in applying thinking skills critically and creatively to recognize and approach complex problems, and make reasoned, ethical decisions.

• **Communicators**
  Students understand and express ideas and information confidently and creatively in more than one language and in a variety of modes of communication. You work effectively and willingly in collaboration with others.

• **Principled**
  Students act with integrity and honesty, with a strong sense of fairness, justice and respect for the dignity of the individual, groups and communities. You take responsibility for their own actions and the consequences that accompany them.

• **Open-minded**
  Students understand and appreciate their own cultures and personal histories, and are open to the perspectives, values and traditions of other individuals and communities. You are accustomed to seeking and evaluating a range of points of view, and are willing to grow from the experience.

• **Caring**
  Students show empathy, compassion and respect towards the needs and feelings of others. You have a personal commitment to service, and act to make a positive difference to the lives of others and to the environment.

• **Risk-takers**
  Students approach unfamiliar situations and uncertainty with courage and forethought, and have the independence of spirit to explore new roles, ideas and strategies. You are brave and articulate in defending their beliefs.
• **Balanced**

Students understand the importance of intellectual, physical and emotional balance to achieve personal well-being for themselves and others.

• **Reflective**

Students give thoughtful consideration to their own learning and experience. You are able to assess and understand their strengths and limitations in order to support their learning and personal development.

**International Baccalaureate: Approaches to Learning (ATL)**

1. Communication
   - Communication
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2. Social
   - Collaboration

3. Self-Management
   - Organization
   - Affective
   - Reflection

4. Research
   - Information Literacy
   - Media Literacy

5. Thinking
   - Critical Thinking
   - Creativity and Innovation
   - Transfer