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| **Teacher(s)** | **Jason Summers** | **Subject group and discipline** | **Integrated Math I** |
| **Unit title** | **Exponential Growth & Decay** | **MYP year** | **3** | **Unit duration (hrs)** | **15** |

##### Inquiry: Establishing the purpose of the unit

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| **Key concept** | **Related concept(s)** | **Global context** |
| **Relationships** | **Representation** | **Identities and Relationships** |
| **Statement of inquiry** |
| Representing relationships can lead to finding solutions. |
| **Inquiry questions** |
| **Factual— What is the general exponential growth formula? What is the general exponential decay formula? What is an initial value? What do depreciation and appreciation mean? What does it mean if interest is compounded quarterly? What is a half-life? What is an asymptote? What is the recursive and explicit formula for a geometric sequence? What is a common ratio of a geometric sequence? What is average rate of change?****Conceptual— How do you know when you have finished solving an exponential equation? What does the answer to an exponential equation represent? How does the growth formula differ from the decay formula? How are exponential functions different from linear functions? How do you find the depreciation of a car? How do you find the compound interest accumulated by a savings account? How do you find the half-life of a radioactive element? How is graphing exponential functions similar to graphing linear functions? How do you find a certain term of a geometric sequence when given the common ratio and the initial value? How is average rate of change of an exponential graph similar and different to the rate of change of a linear equation?** **Debatable— Which type of word problem that we have studied so far is the easiest to solve with exponential equations? Why? (Compound Interest, Appreciation, Depreciation, Half-Life)****Which type of word problem that we have studied so far is the hardest to solve with exponential equations? Why? (Compound Interest, Appreciation, Depreciation, Half-Life)****Which type of sequences (Arithmetic or Geometric) do you find easiest to solve with equations? Why?****Which type of sequences (Arithmetic or Geometric) do you find most difficult to solve with equations? Why?****Which type of formulas (Explicit or Recursive) do you find the most useful in solving sequences? Why?****Which key feature of exponential functions do you find the most difficult to complete? Why? (Domain, Range, Increasing, Decreasing, x-intercept, y-intercept, Relative Maxima, Relative Minima, End Behavior, and Asymptotes** |
| **Objectives** | **Summative assessment** |
| B. Investigating Patternsi. select and apply mathematical problem-solving techniques to discover complex patternsii. describe patterns as general rules consistent with findingsiii. prove, or verify and justify, general rules | Outline of summative assessment task(s) including assessment criteria:Students will first be given a variety of exponential equations and inequalities to solve and graph. Students will also be asked to find the key features of a given exponential function. Students will be given a variety of real-life growth and decay word problems to solve using exponential equations (compound interest, depreciation, appreciation, and half-life word problems). The students will have to use appropriate formulas to solve for a variety of missing variables. They will have to set up an exponential equation to solve the real-life word problem, and finally the student must give the correct answer with accuracy and with appropriate units of measurement. The student will be asked to sketch various functions as well as write the equation of a function after translating it. The student will have to find the average rate of change for a given interval as well as graph and evaluate piecewise functions. The student will be given a variety of geometric sequences in which the student must find the explicit and recursive formulas for the patterns. The student must also extend the geometric pattern and find specific indicated terms of the sequence. The final piece of the summative assessment will test the students’ understanding of the unit by asking the student to justify their responses. The student must use writing to explain the answer. The student will also have to create their own exponential function with given key features (many different functions will be possible).  | Relationship between summative assessment task(s) and statement of inquiry:This task provides students with the opportunity to solve various math problems including real-life problems in both familiar and unfamiliar situations. Understanding algebraic relationships can lead to representing real-life situations with exponential equations and inequalities which can lead to finding solutions.  |
| **Approaches to learning (ATL)** |
| In order for students to select and apply mathematical problem-solving techniques to discover complex patterns, students must make inferences and draw conclusions. (ATL Category: Communication, ATL Cluster: Communication skills)In order for students to describe patterns as general rules consistent with findings, students must use and interpret a range of discipline-specific terms and symbols. (ATL Category: Communication, ATL Cluster: Communication skills)In order for students to prove, or verify and justify, general rules, students must organize and depict information logically. (ATL Category: Communication, ATL Cluster: Communication skills) |

##### Action: Teaching and learning through inquiry

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| **Content** | **Learning process** |
| **Standards:**Interpret functions that arise in applications in terms of context.Build a function that models a relationship between two quantities.Construct and compare linear, quadratic, and exponential models and solve problems.Solve equations and inequalities in one variable..**Text Objectives:**TLW solve growth and decay word problems.TLW sketch exponential functions using an x-y chart and label the asymptotes.TLW find explicit and recursive formulas of geometric sequences.TLW extend geometric sequences and find specific terms of the sequence.TLW find the average rate of change on an interval of an exponential function.TLW solve exponential equations and inequalities.TLW find the key features of an exponential function.TLW sketch a variety of functions and write an equation for a given translation.TLW graph and evaluate piecewise functions. | **Learning experiences and teaching strategies****Learning experiences:**- Relating lesson to prior knowledge- Modeling by teacher- Collaborating and communication with peers- Analyzing skill level through implementation- Guided practice with teacher- Taking math notes to aid in understanding- Completion of independent practice**Teaching strategies:**- Looking at student product, teacher observation to monitor student understanding.- Small group collaboration, modeling, using technology  |
| **Formative assessment**Classroom discussion and examples will provide useful information on students understanding and engagement.Daily problems, “exit tickets,” and “trivia questions for chocolate” will be used to provide snapshot information on student understanding and progress. |
| **Differentiation*** Differentiation will be applied as needed by small groups
* Different questioning techniques will be applied to individual students as needed
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| **Resources** |
| - Integrated Math I Textbook- Teacher-made worksheets- Small group work, modeling, large group discussion |

##### Reflection: Considering the planning, process and impact of the inquiry

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| **Prior to teaching the unit** | **During teaching** | **After teaching the unit** |
| I will need to create the new additional test questions that will require students to use writing and to explain their reasoning and answers as part of the summative assessment. I plan on doing this for each chapter assessment to provide similar questions as the constructive response questions on the new TNReady tests.  | I have decided to provide extra daily problems on the growth and decay word problems this year in order to provide extra practice before testing the students. I also plan on creating more teacher-made worksheets in order for the students to get additional homework practice. | After seeing the new TNReady tests, I plan on adjusting the types of word problems I teach next year. I may need to broaden the types of word problems taught or eliminate some types of word problems. More or less time might need to be provided. |