# Mathematics

| Unit/Timeframe: Algebra IB - Exponents and Exponential Functions / 5 weeks | Grade Level: 9, 10, 11, 12 |
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| **Content Standards** | **2017 MA Literacy Framework** |
| N.RN.A.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.<br>N.RN.A.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.<br>N.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.<br>A.SSE.A.1.B Interpret complicated expressions by viewing one or more of their parts as a single entity.<br>A.SSE.B.3.C Use the properties of exponents to transform expressions for exponential functions.<br>A.CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.<br>F.IF.A.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.<br>F.IF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive or negative, relative maximums and minimums, symmetries, end behavior, and periodicity.<br>F.IF.B.5 Relate the domain of a function to ist graph and where applicable, to the quantitative relationship it describes.<br>F.IF.B.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.<br>F.IF.C.9 Compare properties of two functions each represented in a different way ( algebraically, graphically, numerically in tables, or by verbal descriptions).<br>F.BF.A.1.A Determine an explicit expression, a recursive process, or steps for calculation from a context.<br>F.BF.A.2 Write arithmetic and geometric sequences both recursively and with an explicit formula them to model situations, and translate between two forms.<br>F.BF.B.3 Identify the effect on the graph of replacing f(x) by f(x) + k, kf(x), f(kx), and | Speaking and Listening Standard:<br>Comprehension and Collaboration<br>2. Reason abstractly and quantitatively<br>3. Construct viable arguments and respond to the reasoning of others.<br>Writing Standard:<br>Text, type and purposes<br>1C. Use words, phrases and clauses with precision. |

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| f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Include linear, quadratic, exponential, and absolute value functions. Utilize technology to experiment with cases and illustrate an explanation of the effects on the graph.<br>F.LE.A.1 Distinguish between situations that can be modeled with linear functions and with exponential functions<br>F.LE.A.1.A Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.<br>F.LE.A.1.C Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.<br>F.LE.A.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<br>F.LE.B.5 Interpret the parameters in a linear or exponential function in terms of a context | |

| Essential Questions | Skills/Knowledge |
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| How do you use exponential functions to model situations and solve problems? | Extend the properties of exponents to rational exponents.<br>Interpret the structure of expressions.<br>Write expressions in equivalent forms to solve problems.<br>Create equations that describe numbers or relationships.<br>Understand the concept of a function and use function notation.<br>Interpret functions that arise in applications in terms of the context.<br>Analyze functions using different representations.<br>Build a function that models a relationship between two quantities.<br>Build new functions from existing functions.<br>Construct and compare linear, quadratic, and exponential models and solve problems.<br>Interpret expressions for functions in terms of the situation they model. |

| Common Resources | Common Assessments |
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| Algebra 1 text and available resources | Chapter Test Exponents and exponential functions |

| Vocabulary |
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| Tier II: integer exponent, power of a power property, product of powers property, Quotient of powers property, rational exponent, asymptote, constant ratio, exponential function exponential function, compound interest, decay factor, exponential growth, |

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| growth factor arithmetic sequence, explicit formula, recursive formula, geometric sequence, constant exponential function, translation<br>Tier III: |
| **Additional Notes** |
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