ABGS MIDDLE SCHOOL Unit Planner

ALGEBRA 1

UNIT 5 – Transformations of Functions

Teacher(s)	N. Davis T. Moran D. Topping	**Subject Group and Discipline**	Advanced 8 Algebra 1		
Unit Title	Unit 5 Transformation and Comparison of Functions	**MYP Year**	4	**Unit Duration**	**4 – 5 WEEKS**

INQUIRY? Establishing the purpose of the unit

Key Concept	Related Concept(s)	Global Context
Change	Models, Patterns, Form	Relationships

Statement of Inquiry
Conceptual Understanding: Transformed representations of functional models create a change in the form of the original functional model. **Statement of Inquiry**: Using representations to model the changes in the relationship of patterns in real-life situations.
Inquiry Questions
Factual: Which transformations can be applied to change the form and model of lines and curves? **Conceptual**: What effect does performing a transformation on a function have on the relationship between the patterns in the original function? **Debatable**: If the graph of a function has been transformed from its original function, then how has the function changed?

MYP OBJECTIVES	
NYS Next Generation Standards	**IB Objectives**
NY-8.G.1: Verify experimentally the properties of rotations, reflections and translations. **Notes**: **A translation displaces every point in the plane by the same distance (in the same direction) and can be described using a vector.** **A rotation requires knowing the center/point of rotation and the measure/direction of the angle of rotation.** **A line reflection requires a line and the knowledge of perpendicular bisectors.** **NY-8.G.3**: Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates. **Note**: **Lines of reflection are limited to both axes and lines of the form $y = k$, where k is a constant. Rotations are limited to 90 and 180 degrees about the origin. Unless otherwise specified, rotations are assumed to be counterclockwise.** ***NOTE: NY-8 GIVEN FOR INFORMATION ONLY.*** **AI-F.BF.1**: Write a function that describes a relationship between two quantities.* (Shared standard with Algebra II) **Notes**: • Algebra I tasks are limited to linear, quadratic **and exponential functions of the form $f(x) = a(b)^x$ where $a > 0$ and $b > 0$ $(b \neq 1)$.** • **Work with geometric sequences may involve an exponential equation/formula of the form $a_n = ar^{n-1}$, where a is the first term and r is the common ratio.** • **Sequences will be written explicitly and only in subscript notation.**	**Objective A**: Knowing and Understanding i: Students select appropriate mathematics when solving simple problems in familiar and unfamiliar situations. ii: Students apply the selected mathematics successfully when solving problems. iii: Students solve problems in a variety of contexts. **Objective B**: Investigating Patterns i: Students select and apply mathematical problem-solving techniques to discover complex patterns. ii: Students describe patterns as relationships and/or general rules consistent with findings. iii: Students verify and justify relationships and/or general rules. **Objective C**: Communicating i: Students use appropriate mathematical language (notation, symbols and terminology) in both oral and written explanations. ii: Students use appropriate forms of mathematical representation to present information.

AI-F.BF.3a: Using $f(x)+k, kf(x)$, and $f(x+k)$: i) identify the effect on the graph when replacing $f(x)$ by $f(x+k), kf(x),$ and $f(x+k)$ for specific values of k (both positive and negative); ii) find the value of k given the graphs; iii) **write the new function using the value of k**; and iv) use technology to experiment with cases and explore the effects on the graph. (Shared standard with Algebra II) **Note**: **Tasks are limited to linear, quadratic, square root, and absolute value functions; and exponential functions of the form $f(x) = a(b)^x$ where $a > 0$ and $b > 0$ $(b \neq 1)$.** **AI-F.LE.1**: Distinguish between situations that can be modeled with linear functions and exponential functions. **AI-F.LE.1a**: Justify that a function is linear because it grows by equal differences over equal intervals and that a function is exponential because it grows by equal factors over equal factors. **AI-F.LE.1b**: Recognize situations in which one quantity changes at a constant rate per unit interval relative to another **and therefore, can be modeled linearly**. e.g., **A flower grows two inches per day.** **AI-F.LE.1c**: Recognize situations in which one quantity grows or decays by a constant rate per unit interval relative to another **and therefore, can be modeled exponentially**. **e.g., A flower doubles in size each day.** **AI-F.LE.2**: Construct a linear or exponential function symbolically given: i) a graph; ii) a description of the relationship; iii) two input-out pairs (including reading these from a table). (Shared standard with Algebra II)	iii: Students move between different forms of mathematical representation. v: Students organize information using a logical structure. **Objective D**: Applying Mathematics in Real-Life Contexts i: Students identify relevant elements of authentic real-life situations. ii: Students select appropriate mathematical strategies when solving authentic real-life situations. iii: Students apply the selected mathematical strategies to reach a solution. iv: Students explain the degree of accuracy of a solution. v: Students explain whether a solution makes sense in the context of the authentic real-life solution.

Note: Tasks are limited to constructing linear and exponential functions in simple context (not multi-step). **AL-F.LE.3**: Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, graphically or (more generally) as a polynomial function. **AI-F.LE.5**: Interpret the parameters in a linear or exponential function in terms of a context. (Shared standard with Algebra II) **Note**: Tasks have a real-world context. **Exponential functions are limited to those with domains in the integers and are of the form $f(x) = a(b)^x$ where $a > 0$ and $b > 0$ $(b \neq 1)$.**	

Summative Assessment	Relationship Between Summative Assessment Task and Statement of Inquiry
Goal: Using representations to model the changes in the relationship of patterns in real-life situations. **Role**: Brandon Architecture, Inc. **Audience**: Builders, Homeowners **Situation**: You own a firm that specializes in roof designs. A customer came into your office requesting a special roof for their home. You showed the customer a design where the roof was in the shape of the letter V. The equation was $y = 2\|x + 2\| - 6$. You did not want the V to open up, width of the roof was too short, and the height of the roof was too low. You decided to write your own equation, $y = -2\|x + 7\| + 8$. **Product**: Roof Expansions 1. Name the function by the given equation. 2. Write the transformations that changed the original equation of the company to the one you described. 3. Did the changes meet your specifications of your equation.	Using representations to model the changes in the relationship of patterns in real-life situations.

Approaches to Learning (ATL)
Thinking: Use prioritization and order of precedence in problem-solving. Communication: Organize and interpret data using both analogue and digital tools.]

ACTION: Teaching and learning through inquiry

Content	Learning Process
Name the parent functions of the linear, quadratic, exponential, absolute-value, square root, and cubic functions. Define transformation. Define vertical and horizontal translations. Define reflection. Define compression and stretch of a function. Describe how a transformation, using the letter k in an equation, changes the equation of the parent function. Identify the change that occurs in each graph after a specific transformation. Sketch the change that occurs in each graph after a specific transformation. Identify the equation of a graph after transformation of the parent function. Differentiate between linear, quadratic, and exponential functions based on equations, graphs, and tables of values. Explain how the constant rate of change between intervals denotes a linear or exponential function.	**Learning Experiences and Teaching Strategies** Direct Instruction Group Activities Independent Practice **Formative Assessment** Quizzes Tests Homework Classwork

VOCABULARY	Differentiation
Parent Function Vertical Translation Horizontal Translation Reflection Stretch (Vertical Dilation) Compression (Horizontal Dilation) Parameter Linear Function Quadratic Function Decay Growth Exponential Function Decay Growth Square Root Function Absolute Value Function Cubic Function Original Function (Pre-image) Interval Rate of Change (Constant & Average)	TI 84 & TI 30 Graphing Calculator Student's IEP's Real life situations Student Options With Additional Teacher

Resources		
Teacher Created Worksheets Math Textbook Brain-Pop Teachers Pay Teachers	Computer Based Worksheets & Activities Delta Math www.jmap.org Kahn Academy	Algebra Teachers' Activity Book IXL Problem-Attic Kendrick Krause (YouTube)

REFLECTION: Considering the planning, process and impact of the inquiry

Prior to Teaching the Unit	During Teaching	After Teaching the Unit
Why do we think that the unit or the selection of topics will be interesting? What do students already know, and what can they do? What have students encountered in this discipline before? What does my experience tell me about what to expect in this unit? What attributes of the learning profile does this unit offer students opportunities to develop? What potential interdisciplinary connections can we identify? What do we know about my students' preferences and patterns of interaction? Are there any possible opportunities for meaningful service learning? What in the unit might be inspiring for community or personal projects? Could we develop authentic opportunities for service learning? How can we use my students' multilingualism as a resource for learning?	Why do we think that the unit or the selection of topics will be interesting? What do students already know, and what can they do? What have students encountered in this discipline before? What does my experience tell me about what to expect in this unit? What attributes of the learning profile does this unit offer students opportunities to develop? What potential interdisciplinary connections can we identify? What do we know about my students' preferences and patterns of interaction? Are there any possible opportunities for meaningful service learning? What in the unit might be inspiring for community or personal projects? Could we develop authentic opportunities for service learning? How can we use my students' multilingualism as a resource for learning?	What were the learning outcomes of this unit? How well did the summative assessment task serve to distinguish levels of achievement? Was the task sufficiently complex to allow students to reach the highest levels? What evidence of learning can we identify? What artefacts of learning should we document? Which teaching strategies were effective? Why? What was surprising? What student-initiated action did we notice? What will we do differently next time? How will we build on our experience to plan the next unit? How effectively did we differentiate learning in this unit? What can students carry forward from this unit to the unit? to the next year/ level of study? Which subject groups could we work with next time? What did we learn from standardizing the assessment?