Teacher(s)	Franco	Subject group and discipline	Mathematics - Algebra		
Unit title	Quadratic Functions	MYP year	4	Unit duration (hrs)	15 hours

Inquiry: Establishing the purpose of the unit

Key concept	Related concept(s)	Global context & (exploration)
Relationships	**Change/Models**	**GC – Personal and Cultural Expression** **Exploration: Artistry**

Statement of inquiry Process
Conceptual Understanding Models demonstrate changes in relationships. (This goes better with the summative task as it is written and it is in the present tense. SOI's should be in the present tense as we teach and learn in the present.)
Statement of Inquiry Models demonstrate changes in artistic relationships.

Inquiry questions
Factual Question — What is change? **Conceptual Question—** Why do we use models? **Debatable Question—** Are models necessary to understand relationships?

Objectives and their strands	Summative assessment	
C i. use appropriate mathematical language (notation, symbols and terminology) in both oral and written explanations ii. use appropriate forms of mathematical representation to present information iii. move between different forms of mathematical representation iv. communicate complete, coherent and concise mathematical lines of reasoning v. organize information using a logical structure. D iv. explain the degree of accuracy of a solution	Outline of summative assessment task(s) using the GRASPS model including assessment criteria (not the strands) in the final "S" of GRASPS: G – Your goal is to show your understandihng of how models demonstrate changes in artistic relationships. R- You are an artist. A - Your audience… is a group of millionaires and art collectors who are requesting art that represents accurate mathematics found in the world around us. S – The situation you find yourself in is that the collectors need an art interpreter that will be able to show them the mathematical accuracy of these relationships represented by the models (your work). P - You will create/design/write/produce etc. in order to create a piece of culturally relevant art. Please remember to use what you know about quadratic functions in order to create a model that accurately communicates relationships. It will be important to describe what your work means to you.	Relationship between summative assessment task(s) and statement of inquiry. (The description of the relationship here should describe in detail how the concepts will be unpacked through the teaching and learning in order to allow students to show their own understanding of the statement of inquiry.) During this summative assessment students will understand how they can use models to demonstrate changes in artistic relationships by using mathematics. Students will perform transformations on the vertex form of quadratic function to model a realworld artifact. The transformations/changes done will be to the a, h, and k of the vertex form of a quadratic function, $(f(x) = a(x-h)^2 + k)$. Students will draw a coordate plane on a picture of their artefact. They will then identify the vertex and 2 other points on the curve of the figure that represents the parabola. Using the Nspire handheld, students will plot the points found on their artefact. Students will then graph the quadratic parent function on the same plane. Using transformations students will change the a, h, and k until the parabola matches the points plotted. During this process the students are noticing how the transformations/changes are affecting the relationship that is modelling the artefact. Through the transformations of the quadratic model, students will see how the mathematical relationship that describes their piece of art changes.

	S- Your work will be assessed with MYP Criteria C & D	

Approaches to learning (ATL)
Example: In order for students to [strand:] use appropriate mathematical language (symbols, terminology) in both oral and written statements students must [skill:] comprehend and use language with accuracy, clarity, and discernment (ATL Category: Thinking, Skill Cluster: Critical Thinking) In order for students to use appropriate mathematical language (notation, symbols and terminology) in both oral and written explanations and use appropriate forms of mathematical representation to present information students must understand and use mathematical notation. (Category: Communication Cluster: Communication). In order for students to move between different forms of mathematical representation students and organize information using a logical structure.must combine knowledge, understanding and skills to create a product or solution. (Category: Thinking Cluster: Transfer) In order for students to communicate complete, coherent and concise mathematical lines of reasoning students must paraphrase accurately and concisely. (Category: Communication   Cluster: Communication) In order for students to explain the degree of accuracy of a solution students must organize and depict logically. (Category: Thinking Cluster: Transfer)

Action: Teaching and learning through inquiry

Content	Learning process		
	Learning experiences and teaching strategies	**Formative Assessment**	**Differentiation**
A.6(B) write equations of quadratic functions given the vertex and another point on the graph, write the equation in vertex form ($f(x) = a(x - h)^2 + k$), and rewrite the equation from vertex form to standard form ($f(x) = ax^2 + bx + c$) A.6(C) write quadratic functions when given real solutions and graphs of their related equations. A.7(A) graph quadratic functions on the coordinate plane and use the graph to identify key attributes, if possible, including *x*-intercept, *y*-intercept, zeros, maximum value, minimum values, vertex, and the equation of the axis of symmetry (C) determine the effects on the graph of	Students will be introduced to quadratic function by investigating real life situations, a rocket launch, a kicked soccer ball, shooting a basketball, and dropping an object from a great height. Students will determine why the shape is non-linear, and will name the shape a parbola. Students will identify the key features of the quadratic function in standard form, $f(x) = ax^2 + bx + c$. Students will identify key features of a quadric function's graph, from an equation and in context of a situation. They will practice identifying the x-intercepts, maximum, minimum, vertex, y-intercepts, and line of symmetry. Students will investigate how the shape of a parabola changes when the a and c of the standard form of a quadratic function is changed in specific ways. Students will investigate tranformations to the quadratic parent function when done in function notation. F(x) will be replaced with af(x), f(bx), f(x-c), f(x)+d. Students will be introduced to the vertex form of a quadratic function, $f(x) = a(x - h)^2 + k$. They will compare and contrast the standard form to the	Students will be given daily exit tickes over the content taught. Warm ups daily will be given and tracked using the Nspire Navigator system. A quiz half way throught the unit will be given. A unit test will be given covering quadratics.	Students will be working with peers, and study groups. Tutoring. Use of problems that are in the interest of the student, soccer, football. Alternative methods of answering questions. Alternative use of technology. Assistance from Co-teacher. Use of color, diagrams, and graphic organinzers in interactive journal.

the parent function *f(x)* = x^2 when *f(x)* is replaced by *af(x), f(x) + d, f(x - c), f(bx)* for specific values of *a*, *b*, *c,* and *d*. A.8(B) write, using technology, quadratic functions that provide a reasonable fit to data to estimate solutions and make predictions for real-world problems.	vertex form of a quadratic function, by finding all the key features of the graph in vertex form. Students will practice transforming the vertex form of a quadratic functions given pictures of quadratics found in nature and in architecture. The pictures will be embedded in the graphing documents on the Nspire handheld. Students will try to change the a, h, and k of the parent function in vertex form to align with the curve of the picture. Students will describe how the changes affected the parabola. Students will write an equation in vertex form, given a point and a vertex. Students will be required to substitute in values for x, y, h, and k, and solve for the "a" value.		

Resources		
TI Nspire TI Nsprie Navigator system Education.ti.com Teacher made materials		

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

Prior to teaching the unit	During teaching	After teaching the unit
•Students must have an understanding of how to use the TI-Nspire. • Attendance. Students must be present to receive the content and tools needed to complete the project. •Time manegemnt. Keep due dates and reminders posted. •Students must be comfortable in using the vocabulary in identifying key features of a quadratic function. •Have reviews/ Warm ups ready for absent students. •Supplies/Tools. Students will need cameras/technology to take pictures or find pictures of parabolas in the real world. Students will also need access to technology to print or email their pictures.	•Students are absent often. •Warm-ups and the interactive journal help studetns to catch up quickly when they come to class. •Students found the vocabulary easy to use. They still have a problem with “parabola”, but they are comfortable with the key features. •Students were able to use the technology quite easily. They were able to help their peers, including the ones absent often. •Students were given daily reminders weeks inadvance to turn in or email a picture for their project. •I printed back up picture ready to use incase students did not turn in their picture. •Materials needed to make their presentions were readily available.	•Due to student absences I had to be readily available for tutoring. Daily reminders were given for students to come to tutoring to finish their projects. •Only 33% of students turned in a picture. Next year I will take students out for a parabola scavenger hunt around campus. •Students made great connections between the vertex form and the graph of a quadratic function. •I provided an extension for students done with their summative assessment quickly. Students used a point and the vertex, and solved for “a” in the vertex form. Students then compared and contrasted the two methods of finding the model for their artefact.