Quadratics PBL
"Angry Birds"

Well Defined Outcome

Students will be able to use quadratics to create and solve a problem situation based upon the" angry birds" game.

Objectives

A2.6(C) - determine a quadratic function from its roots (real and complex) or a graph.

A2.8(A) - analyze situations involving quadratic functions and formulate quadratic equations or inequalities to solve problems;

A2.7(B) - use the parent function to investigate, describe, and predict the effects of changes in a, h, and k on the graphs of y = a(x - h)2 + k form of a function in applied and purely mathematical situations.

Materials Required

Nspire calculator
Angry bird rubric
Graph paper
Ipad with angry birds game downloaded

Engagement – Day 1
Students will observe/play "Angry birds" game and reflect upon pathways that the birds follow.
Students will learn about parts of equation of quadratic in vertex form … $y = a(x-h)^2 + k$.
Students will graph quadratics in vertex form or standard form and identify vertex, axis of symmetry, symmetrical points, and maximum or minimum.

Exploration – Day 1
Students will continue to graph quadratics and explore how "a" affects the graph.
Students will begin to create their own "angry birds" scene including launching device and housing structure.

Focusing question
What are some other projectiles/objects that follow similar pathways? What do you notice about the pathways? Do they have a maximum or a minimum as their vertex point? Why do you think these objects follow these particular pathway shapes? (What scientific force is acting upon the projectiles to cause the parabolic shape with negative "a" value?)

Explanation – Day 2
We can determine the equations of our parabolic pathways using two points and the vertex form of a quadratic: $y = a(x-h)^2 + k$

Using our starting point and vertex point (both of our choosing), we can solve for "a" by substituting the x and y values of the starting point for x and y in the formula and substituting the values of the vertex point for h and k respectively and then calculating for a. We then substitute back into the formula for a, h, and k and we have our quadratic equation for the parabolic pathway that our bird needs to follow.

Extension – Day 2, 3

Students will continue working on their "angry birds" motif, making sure to include a launching device which will serve as the starting point needed for each equation calculation. Students will choose a vertex/maximum point that they want each "bird" to fly through on its parabolic path to the desired target. Students will then calculate the equation of the parabola and then proceed to determine the point of impact for each "bird".

Evaluation – 3

Students will "judge" each other's angry birds equation calculations by checking to see if the equations contain all three required points: starting or launching point, vertex, and point of impact.
The only point that should be the same each time is the launch point.