

Catapult Project: Application of Quadratic Functions

Project Overview: Catapults were used in the past as weapons. In modern day, there are many applications for catapults such as the launching of aircrafts off the aircraft carriers. For this project, students will build a catapult that shoots baseballs as far as it can by applying projectile motion, quadratic functions, and trigonometry.

Essential question: How do we build a catapult that shoots baseballs to meet the minimum requirement (established by individual class) by applying projectile motion and quadratic functions?

Learning Objectives:

1. Use two-dimensional equations of projectile motion to calculate initial velocity, time in the air, horizontal distance and maximum height
2. Use trigonometry to resolve two-dimensional vectors into its vertical and horizontal components
3. Graph quadratic equation and find x-intercepts, y-intercepts and vertex
4. Apply factoring, quadratic formula and graphing calculator to find x-intercepts of a quadratic graph

Deliverables:

- Research & Inquiry: historical background information & modern day applications (collaboration with Mr. Marshall) essay
- Real-world Connection: Design Proposal (collaboration with Mr. Sevilla)
- Authenticity & Rigor: Projectile motion calculations of 3 different launches
- Authenticity & Rigor: Projectile motion graphs of 3 different launches
- Authenticity & Rigor: Projectile motion equations of 3 different launches

Timeline: 6 weeks (tentative)

Week 1: Project launch & polynomial functions as product of linear factors

Week 2: Roots (zeros) of quadratic functions

Week 3: Roots (zeros) of quadratic functions & projectile motion (quadratics and trigonometry)

Week 4: Projectile motion & build catapult

Week 5: Test catapult & make predictions using projectile motion & trigonometry

Week 6: Catapult launch & complete calculations, graphs, and equations.

Final product: A catapult that shoots baseballs the farthest possible distance using projectile motion, quadratic functions, & trigonometry.

DETAILED TIMELINE

Dates	Activities	Notes
1/12-1/16/2015	<ul style="list-style-type: none">• Launch project• Polynomial functions & linear factors	Design Process done in Mr. Sevilla's class!
1/20-1/23/2015	<ul style="list-style-type: none">• Research & inquiry: historical background information & modern day applications (Humanities)• Roots (zeros) of quadratic functions	Vee is out of town for a conference on 1/22 & 1/23.
1/26-1/30/2015	<ul style="list-style-type: none">• Roots (zeros) of quadratic functions• Projectile motion	Bring in materials for catapults!
2/2-2/6/2015	<ul style="list-style-type: none">• Projectile motion• Start to build catapult	
2/9-2/12/2015	<ul style="list-style-type: none">• Test catapult• Make predictions	
2/17-2/20/2015	<ul style="list-style-type: none">• Launch catapult• Complete project portfolio	Project portfolio is due on 2/20/15