

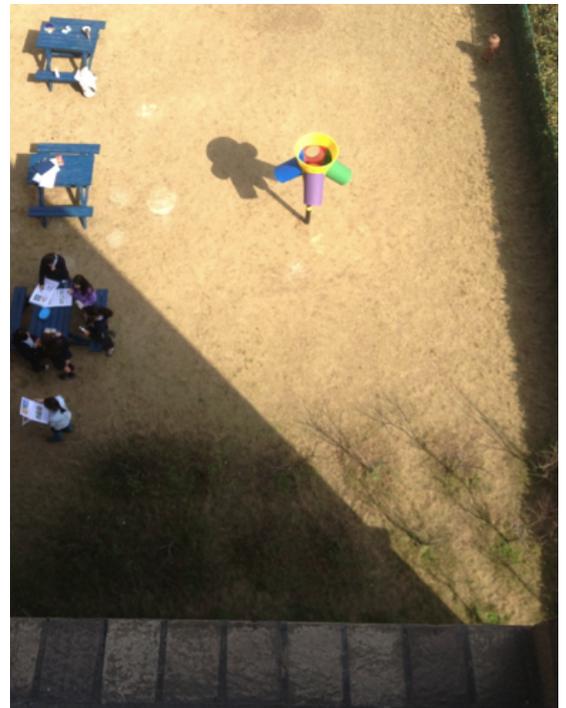
Learning Standard Tasks – Projectile Motion

1. A baseball coach asks for an easy way to measure the speed of a pitcher's throw without having to buy a radar gun. You mention that you might be able to use what you know about projectile motion to be able to make an estimate of the speed.
 - Devise a method of making this measurement. The method should be simple enough that the coach should be able to find the speed with minimal effort and measurements.
 - Create a spreadsheet that includes fields for all relevant information about the pitcher. The coach should be able to input information about his pitcher at the top of the spreadsheet, and at the bottom clearly see what the model predicts about the speed of the ball.
 - Include a description of whether the model overestimates or underestimates the actual speed of the ball. Be clear in explaining your reasoning.



2. Find the minimum speed necessary for a person standing on the ground to throw a ball over the bridge outside the classroom. Collect any data you need and clearly indicate this data in your solution. You can use Geogebra or a spreadsheet, but you must include a complete description of your assumptions and all relevant data in your answer to the question.

3. The lower school playground has a basketball toy (shown at right) outside the window.
 - Find a possible launch speed and angle that would result in the ball landing in the toy.
 - Is it possible to take a basketball, place it on a ramp in Mr. Weinberg's room, and roll it so that it lands in the toy? If not, use a model to explain why not. If it is possible, find the angle of the ramp, the length of the ramp, and any other information you would need to show that it is possible.



4. A student hands you the experimental data for a projectile contained in 'Problem 4 Data.xlsx' on s-share and says he is unable to model it properly using either a spreadsheet or Geogebra.
 - Use the data to figure out the initial conditions of the projectile.
 - Create an explanation either for what the student is doing wrong, or why the data cannot be matched using the numerical models.

5. A video at <http://www.youtube.com/watch?v=5lyY0DoH75o> (also on s-share) shows a kick from a goalkeeper at one end of a soccer field that ends up scoring on the opposite side of the field. Use information from the video and your knowledge of the projectile motion model from class to find out as much information as possible about the speed, velocity, and height of the ball after the kick. Tracker is not an ideal tool to use here because the camera moves during the video.

Your task is to use the above scenarios to demonstrate your proficiency at the following standards for this unit by the end of class on **Tuesday, March 12.**

Standard 6.1	I can <u>adjust</u> a computer model to match a given projectile motion problem or set of data. I can identify when a given computer model does not adequately describe a set of data. I can use spreadsheet capabilities to solve equations for unknown variables.
Standard 6.2	I can <u>create</u> a spreadsheet or Geogebra model to use for solving projectile motion problems in the absence of air resistance.
Standard 6.3	I can use graphs or tables of position vs time and velocity vs. time for projectiles to identify characteristics of the movement of a projectile. This includes horizontal distance, maximum height, time of maximum height, and information about the angle or magnitude of velocity.
Standard 6.4	I can use algebraic methods to find characteristics of the movement of a projectile and solve projectile motion problems.

- You are not required to do all of the problems, but you must do Questions 4 and 5.
- The responsibility is yours to clearly demonstrate your proficiency on these standards. If it is clear that you require assistance in solving these (from me or other students), you will receive no higher than a 2 on the relevant standards.
- Your solutions to the questions should be documented as a blog post. If you do work by hand, you may scan this work and upload it to your blog, but it should not just be a post containing a single scanned image. You should write and annotate your solution completely.
- You must explicitly include an algebraic component to your solutions in order to show proficiency in Standard 6.4. This may be a confirmation of the calculations made by the computer model – you are not required to do an entire problem just by hand to earn proficiency for this standard.

Proficiency 0 - 1	Proficiency Level 2	Proficiency Level 3	Proficiency Level 4	Proficiency Level 5
Basic knowledge of vocabulary and concepts	Able to complete problems with assistance from teacher/other students	Able to complete routine problems independently	Able to figure out new problems independently	Can connect multiple standards together, solve open ended questions, clearly communicate reasoning and process