PROJECTILE MOTION

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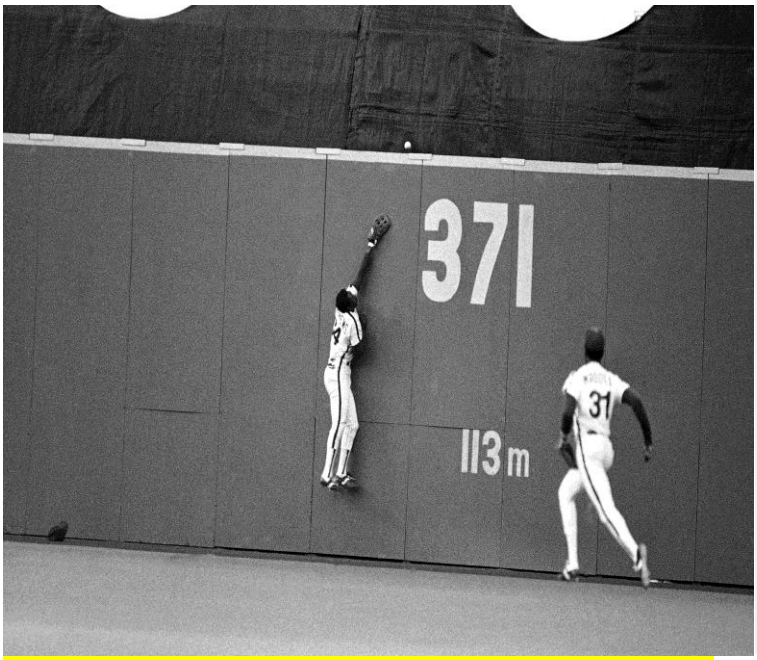
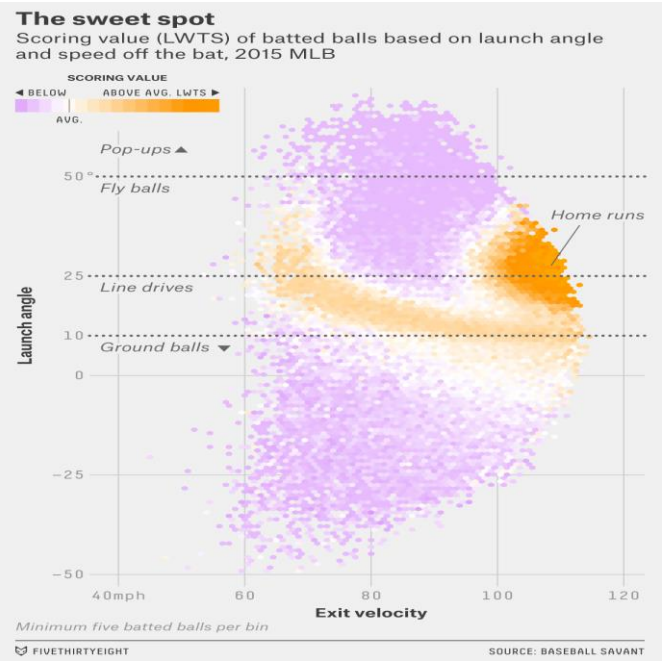
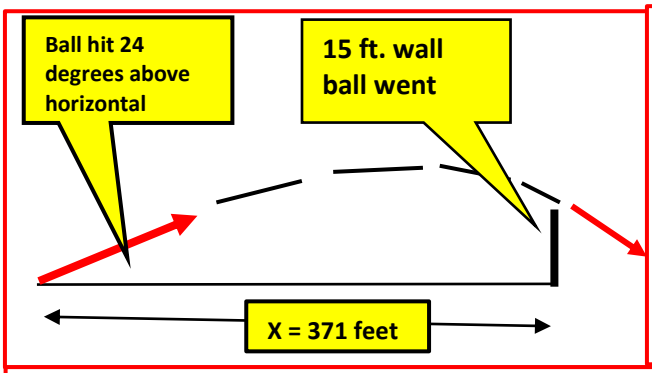
A Baseball Writer Looks Back on 20 World Series





The Phillies' Gary Matthews leaping in vain for the first of two home runs by the Orioles' Eddie Murray in a decisive Game 5 victory in 1983.

The first time I went to a World Series game, in 1983, I woke up in a state of panic. I was 8 years old. Whenever I wore my lucky Phillies hat to Veterans Stadium in Philadelphia, the home team won. I could not find it anywhere. But we had to get going. This was an afternoon start in the brilliant October sunshine, the last World Series day game ever played in a National League park. I found out later that my younger brother had hid my hat, and I assumed this was why the Baltimore Orioles had won the game. I'd be back the next night, anyway. All these years later, I keep coming back to the World Series — one more as a fan, in 1993, and the rest as a writer.



QUESTIONS: **(a) Using data in graphic at left and picture in upper left…. find the speed ball was hit and time of flight? (b) Find speed(in ft./s. & mph)of ball as it goes over the 15 ft. wall 371 ft. from home plate? (c) Why is your computed speed ball was hit at less than reality hit ball speeds (100 – 110 mph) in graphic in upper right? (d) Extra Credit(not essential) Use energy concepts to find ball speed going over wall? For (d) let friction = 0**

HINTS: **Break solution into horizontal and vertical parts. No acceleration horizontally. This is due to considering friction = 0.**

HINTS(CONTINUED): **g vertical = -32 ft./s.^{2} , X = $V_{HORIZONTAL}$ t , Y = $V_{ORIG.\ VERTICAL}$ t + ½ g t^2 , Work = ΔK + ΔU, Drag force on objects(could be a baseball) = ½ C_D ρ V^2 A , where C_D = coefficient of drag = 0.3 , ρ = air density, V = speed of object(baseball), A = surface area of baseball, 88 ft./s. = 60 mph , V = V_o + a t , K = ½ m V^2 , U = m g h ,**

ANSWERS: **(a) $V_{INITIAL}$ = 132.55 ft./s. or 90.4 mph , t = ~ 3.064 seconds , (b) $V_{OVER\ WALL}$ = 128.88 ft./s., (c) In our solution we considered air friction = 0. Thus, a smaller hit speed would be needed with no air friction. Air friction does slow balls down by drag force listed above in hints. Thus, baseballs must be hit at faster speeds than competed speeds where friction is considered zero. (d) Using energy conservation concepts $V_{OVER\ WALL}$ = 128.88 ft./s.**