

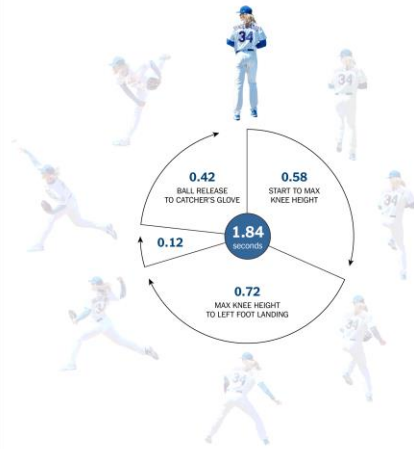
PROJECTILES & KINEMATICS

Units 9 & 4+5 , Dr. John P. Cise, Professor of Physics,

Austin Com. College, 1212 Rio Grande St., Austin Tx., 78701 , jpcise@austincc.edu & NYTimes April 16. 2017 by Begel Saget & Joe Ward. Dedicated to my first high school, Marist High School, Bayonne, NJ where I played baseball as a catcher in 1954.

Why Base Stealers Target Noah Syndergaard

Noah Syndergaard of the Mets uses his 6-foot-6 frame, a high leg kick and a deliberate windup to transform himself into one of baseball's most powerful pitchers. But it is exactly those attributes that make his delivery one of the slowest in the major leagues — a delivery that base stealers exploit. Here is the timing of one of his pitches during the season opener against the Atlanta Braves.



INTRODUCTION(A): Syndergaard pitches balls from release to catcher's glove in 0.42 seconds (see chart at left). Distance from pitchers mound to Homeplate is 60.5 ft. **QUESTIONS(A):** (a) Find speed he pitches balls in ft./s.? (b) Convert speed in ft./s. to mph? **HINTS:** 60 mph/88 ft./s., **ANS.:** (a) 144 ft./s., (b) 98.21 mph. **COMMENT:** He actually "does" throw ball ~100 mph

INTRODUCTION(B): Catcher Rivera normally takes 0.5 s. to wind up and throw ball to second base from home plate(wikidata). Thus, ball is in air from Homeplate release to second base in $(1.91 - 0.5) = 1.41$ s. (article data). Homeplate to second base is 127 ft. **QUESTIONS(B):** (a) Using projectile motion concepts (break solution into horizontal and vertical parts) find. Find angle and speed ball is thrown at by Rivera? (b) Convert speed found in ft./s. to mph?, (c) Are results plausible? **HINTS:** $\sin.\theta / \cos.\theta = \tan.\theta$, **ANSWERS(B):** (a) $\theta=14.1^\circ$, $v = 92.9$ ft./s.,(b) 63.3 mph

Last season, Syndergaard's delivery times ranked **248th out of 278** pitchers with at least 100 recorded times by Baseball Info Solutions. His average delivery time (from the start of his windup until the ball hit the catcher's glove) was 1.65 seconds, 0.25 of a second slower than the league average. He was clocked as slow as 2.04. These slow times resulted in Syndergaard's giving up the most stolen bases of any pitcher in baseball.

Why Base Stealers Have the Edge on Syndergaard

Good base stealers can get to second base in about 3.4 seconds; some get there even faster. Syndergaard's catcher, usually Rene Rivera, can catch the ball, transfer it to his throwing hand and get it to second base in an average of 1.91 seconds. (The league average for catchers is 1.98.) That leaves Syndergaard only 1.5 seconds to go through his wind-up and throw the pitch to Rivera. That's the problem: Syndergaard's delivery is rarely that fast.

With Syndergaard's average delivery time at 1.65 seconds, he and Rivera have to hope for a slow base stealer or one who gets a slow jump from first base.

