

CENTRIPETAL FORCE & PROJECTILES

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Golf Pro Aims to Revolutionize an Industry With One-Size-Fits-All Irons



Bryson DeChambeau competing in the first round of the Farmers Insurance Open on Thursday at Torrey Pines in San Diego. He is a leading voice for single-length irons, which eliminate the need for stance and swing adjustments.

WINTER GARDEN, Fla. — Bryson DeChambeau raked one ball after another in front of him, making them soar a little higher in the air each time. Then he made them scream at a lower trajectory. Before there was time to rub an eye and make sure the shot was real, DeChambeau hit another one. Same club. Same shot. The ball went into the sun and dropped again. Same place. Toss a beach blanket at his target, and all the balls would land atop it. “Do you want them to go straighter?” DeChambeau asked his audience with a wry chuckle. On Tuesday, while Tiger Woods and a majority of the field at the PGA Tour’s Farmers Insurance Open [were preparing](#) in San Diego, DeChambeau was thousands of miles away spreading the gospel of Cobra’s **new single-length**

irons, all the **shaft lengths are 37½ inches** — to hundreds of golf pros on a driving range at Orange County National Golf Club. **The logic behind single-length iron sets is simple: It promotes a more consistent swing and eliminates the need to make stance, ball position and swing-plane adjustments as the club gets longer or shorter.**

Conventional golf clubs are built in half-inch-length increments with varying club-head angles throughout the set. Bryson DeChambeau demonstrating Cobra’s new single-length irons, in which all the shafts are 37½ inches. To DeChambeau, 23, this amounted to **13 swings he needed to master. The physics student in him wondered if there was a better way. In 2011, DeChambeau began experimenting with swinging on a single plane.**

DeChambeau’s first swing with an 8-iron flew a perfect 160 yards.

When DeChambeau won on the Web.com Tour in October, it was the first time a player had won a PGA Tour-sponsored tournament using a set of irons all the same length.

INTRODUCTION: The goal here is to first find the initial velocity of golf ball from projectile concepts. Since golf balls mass is 0.046 kg. and club heads more at 0.28 kg., we will assume (with elastic collisions at impact) the velocity of club head to be about the same as hit golf ball.

QUESTIONS: (a) Using data on eight iron shot in lower left graphic ... find velocity of golf ball and time of flight? (b) *Assuming 0.28 kg. club head speed is about the same as hit golf ball, find tension force in golf club shaft at time ball is hit?* Use centripetal force concepts to find tension force (T).

HINTS: ((Projectile concepts: $V_{HORIZONTAL} = \text{constant}$, $V_{VERTICAL} =$ like any free fall objrct, $t_{HORIZONTAL} = t_{VERTICAL}$, best practice to solve projectile solutions is to break into horizontal and vertical parts.)) Centripetal force solutions best practices: First make a free body diagram of forces on object making the turn, set up working equation using..... $F_{NET} = m v^2/R$, 2.205 lb./kg.

$R = 37.5$ inch

$T = ?$

mg

HINTS: (continued):
12 inches = 1 ft.,

ANSWERS:(a) $v = 126.6$ ft/s.
 $t = 4.74$ s., (b) $T = \sim 99.55$ lb.
 $T =$ tension in shaft as golfer Swings and hits golf ball.

FURTHER HINTS:(part b)
After making a free body diagram (as at left) set up a working equation as :
 $T - mg = mv^2/R$