

Express Riddler

25 September 2020

Riddle:

The U.S. Open concluded last weekend, with physics major Bryson DeChambeau emerging victorious. Seeing his favorite golfer win his first major got Dan thinking about the precision needed to be a professional at the sport.

A typical hole is about 400 yards long, while the cup measures a mere 4.25 inches in diameter. Suppose that, with every swing, you hit the ball X percent closer to the center of the hole. For example, if X were 75 percent, then with every swing the ball would be four times closer to the hole than it was previously.

For a 400-yard hole, assuming there are no hazards (water, sand or otherwise) in the way, what is the minimum value of X so that you'll shoot par, meaning you'll hit the ball into the cup in exactly four strokes?

Solution:

This is a pretty simple problem with exponents. Besides the explicit assumptions in the puzzle, I am also assuming that the golf ball is point-like (or, alternately, is perfectly spherical, and touches the perfectly flat ground at a single point). If the starting and ending distances from the center of the hole are d_{tee} and d_{edge} , the desired number of strokes is n , and the X value is used as a fraction (instead of a percent), then X is the solution to the equation

$$(1 - X)^n = \frac{d_{edge}}{d_{tee}}$$

In this case, $n = 4$, $d_{edge} = 2.125$ in, $d_{tee} = 400$ yd, giving a ratio $d_{edge}/d_{tee} \approx 0.0001476$. Solving for X gives the (approximate) solution of 0.8898, or **88.98%**