

TPA.26

The amount of English required for "gearing" outside English

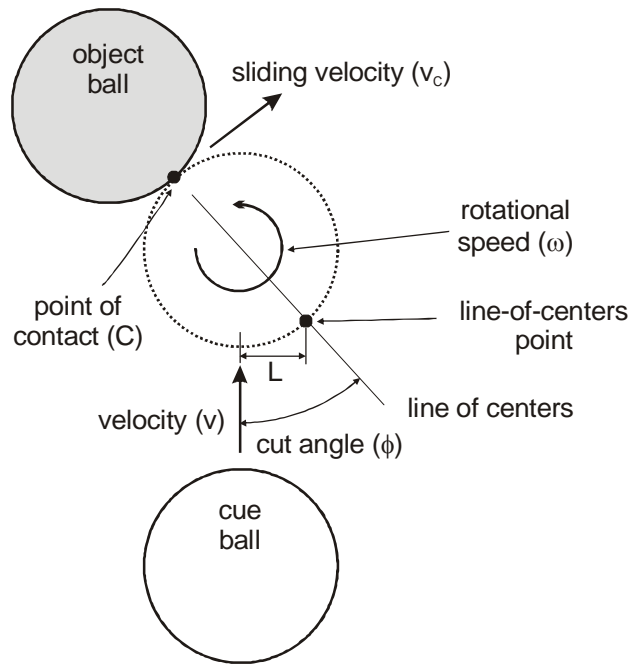
supporting:

“The Illustrated Principles of Pool and Billiards”

<http://billiards.colostate.edu>

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For "gearing" outside English, the sliding velocity of the point of contact between the cue ball and object ball must be 0, so:

$$v_C = v \cdot \sin(\phi) - \omega \cdot R = 0 \tag{1}$$

where R is the radius of the cue ball. So, using the definition of spin-rate factor (SRF) from TP A.12,

$$\text{SRF} = \frac{\omega}{\left(\frac{v}{R}\right)} = \sin(\phi) \tag{2}$$

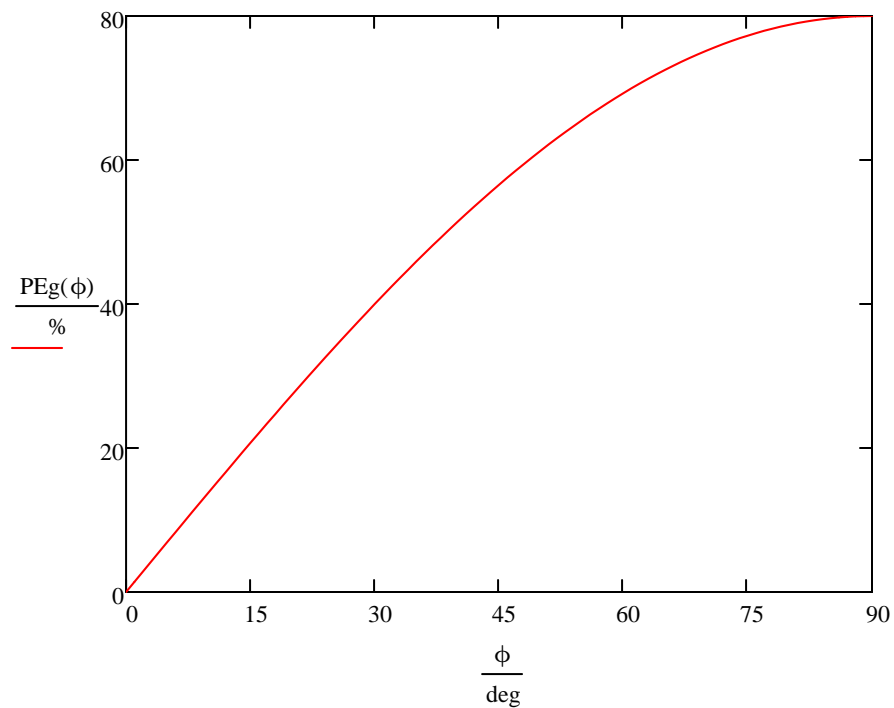
From TP A.25, the percent English required to achieve this SRF is:

$$PE = \frac{4}{5} \cdot \text{SRF} \cdot 100\% = \frac{4}{5} \cdot \sin(\phi) \cdot 100\% \quad (3)$$

The following plot summarizes how much English is required for "gearing" outside English for various cut angles:

$$\phi := 0\text{-deg}, 1\text{-deg}.. 90\text{-deg}$$

$$PEg(\phi) := \frac{4}{5} \cdot \sin(\phi) \cdot 100\%$$



For a half-ball hit:

$$\phi := 30\text{-deg} \quad PEG(\phi) = 40\text{-}\%$$

So, with a half-ball hit, anything less than 40% English will be less than "gearing" and will throw the OB to the right, and anything more than 40% English will result in excess outside English, causing throw to the left.

Here are the percentage-english amounts required for other standard ball-hit fractions:

from TP 1.23: $\phi(f) := \text{asin}(1 - f)$ $f(\phi) := 1 - \sin(\phi)$

$f := 0$ $f = 0\%$ $\phi(f) = 90\text{-deg}$ $\text{PEg}(\phi(f)) = 80\%$

$f := \frac{1}{4}$ $f = 25\%$ $\phi(f) = 48.59\text{-deg}$ $\text{PEg}(\phi(f)) = 60\%$

$f := \frac{1}{2}$ $f = 50\%$ $\phi(f) = 30\text{-deg}$ $\text{PEg}(\phi(f)) = 40\%$

$f := \frac{3}{4}$ $f = 75\%$ $\phi(f) = 14.478\text{-deg}$ $\text{PEg}(\phi(f)) = 20\%$

$f := 1$ $f = 100\%$ $\phi(f) = 0\text{-deg}$ $\text{PEg}(\phi(f)) = 0\%$

From the data and equations above, it is clear that **the percentage english required for gearing outside english (no throw) is 80% of 1 minus the ball-hit fraction:**

$$\text{PEg} = 0.8 \cdot (1 - f)$$

It is easy to visualize the amount of tip offset needed to create gearing outside English for any cut angle using the technique described and illustrated below.

From Equation 3 in TP A.12, and Equation 2 above, the tip offset (x) required for gearing outside English is:

$$x = \frac{2}{5} \cdot R \cdot \text{SPF} = \frac{2}{5} R \cdot \sin(\phi) = \frac{2}{5} \cdot R \cdot \left(\frac{L}{R}\right) = \frac{2}{5} \cdot L$$

where L is the distance between the line of aim and the line-of-centers point (see the diagram at the top of this document and the diagram below). Therefore, **the required tip offset is 40% (2/5) of the distance from the aiming line to the line-of-centers point on the front of the CB.** The following diagram illustrates how this technique is applied at the table:

