

**TP A.26**

**The amount of English required for "gearing" outside English**

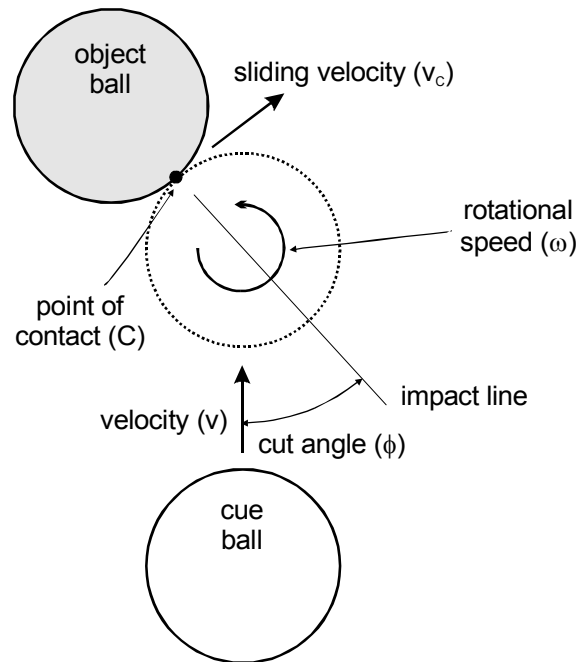
supporting:

“The Illustrated Principles of Pool and Billiards”

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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:

$$v_C = v \cdot \sin(\phi) - \omega \cdot R = 0$$

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

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

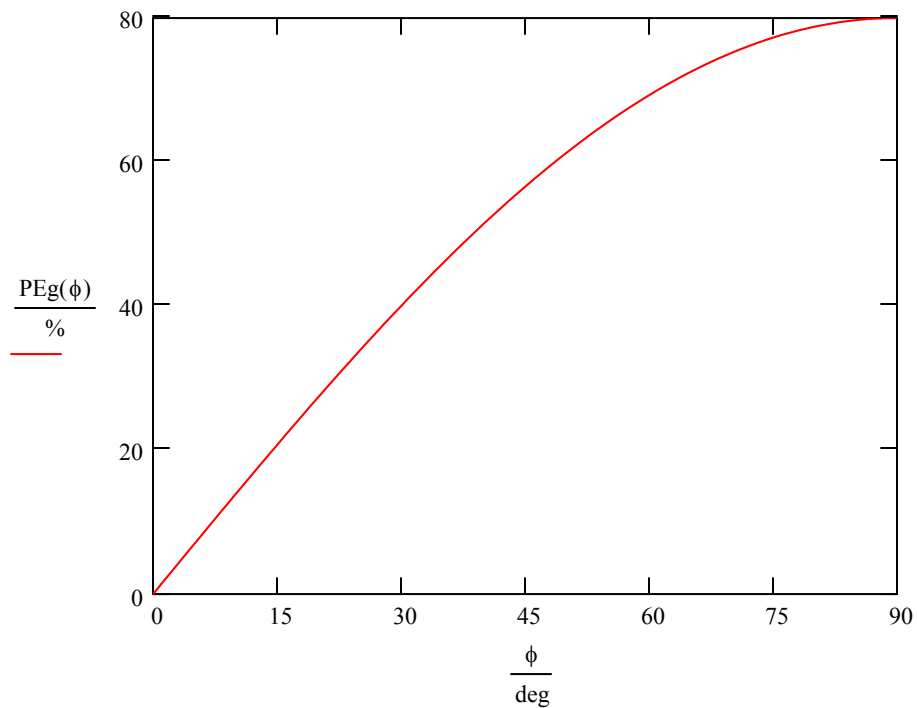
From TP A.25, the percent English required to achieve this SRF is:

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

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

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

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



For a half-ball hit:

$$\phi := 30 \cdot \text{deg} \quad \text{PEg}(\phi) = 40\%$$

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.