

Cal Poly Department of Mathematics

Puzzle of the Week

Jan 31 - Feb 6, 2013

Beth stands at point P in the Euclidean plane and then takes three unit-length steps, each in a randomly chosen direction. What is the probability she ends up within a unit distance of P ?

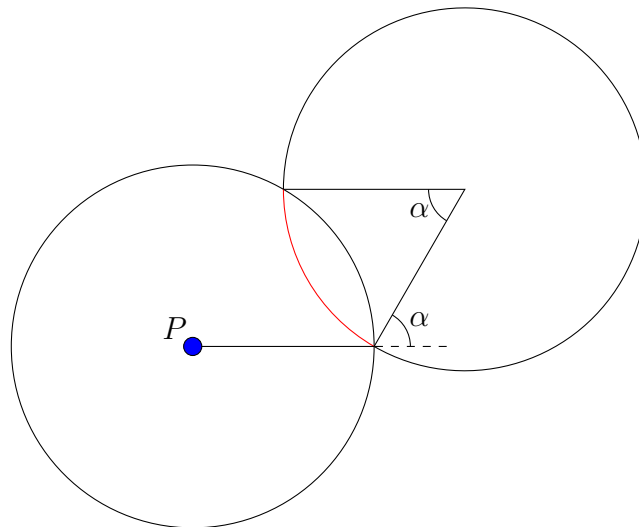
Solutions should be submitted to Morgan Sherman:

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Office: bldg 25 room 310*

before next Thursday. Those with correct and complete solutions will have their names listed on the puzzle's web site (see below) as well as in next week's email announcement. Anybody is welcome to make a submission.

<http://www.calpoly.edu/~sherman1/puzzleoftheweek>

Solution: Beth lands within a unit distance of P with probability $\frac{1}{4}$.



From symmetry considerations we can assume Beth's first step is directly to the right, and her next step makes an angle α with $0 \leq \alpha \leq \pi$ [see picture]. Now her third step will land her on a circle of which $\frac{\alpha}{2\pi}$ lies within the original unit circle about P . So now one computes the probability as being $p = \frac{1}{\pi} \int_0^{\pi} \frac{\alpha}{2\pi} d\alpha = \frac{1}{4}$.