

STEP III, 2007, Q14

- 14 (i) My favourite dartboard is a disc of unit radius and centre O . I never miss the board, and the probability of my hitting any given area of the dartboard is proportional to the area. Each throw is independent of any other throw. I throw a dart n times (where $n > 1$). Find the expected area of the smallest circle, with centre O , that encloses all the n holes made by my dart.
- Find also the expected area of the smallest circle, with centre O , that encloses all the $(n - 1)$ holes nearest to O .
- (ii) My other dartboard is a square of side 2 units, with centre Q . I never miss the board, and the probability of my hitting any given area of the dartboard is proportional to the area. Each throw is independent of any other throw. I throw a dart n times (where $n > 1$). Find the expected area of the smallest square, with centre Q , that encloses all the n holes made by my dart.
- (iii) Determine, without detailed calculations, whether the expected area of the smallest circle, with centre Q , on my square dartboard that encloses all the n holes made by my darts is larger or smaller than that for my circular dartboard.



NextStepMaths.com

To view mark schemes, fully worked solutions and examiner's comments, and for more details about tutoring and other services offered, go to [NextStepMaths.com](https://www.NextStepMaths.com)



NextStepMaths.com

To view mark schemes, fully worked solutions and examiner's comments, and for more details about tutoring and other services offered, go to [NextStepMaths.com](https://www.NextStepMaths.com)