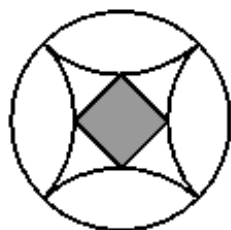17. The diagram shows a pattern found on a floor tile in the cathedral in Spoleto, Umbria. A circle of radius 1 surrounds four quarter circles, also of radius 1, which enclose a square. The pattern has four axes of symmetry. What is the side length of the square?

A $\dfrac{1}{\sqrt{2}}$ B $2 - \sqrt{2}$ C $\dfrac{1}{\sqrt{3}}$ D $\dfrac{1}{2}$ E $\sqrt{2} - 1$

17. **B** In the diagram, B is the centre of the quarter-circle arc AC; D is the point where the central square touches arc AC; F is the point where the central square touches arc CE; O is the centre of the circle.

As both the circle and arc AC have radius 1, $OABC$ is a square of side 1. By Pythagoras' Theorem: $OB^2 = 1^2 + 1^2$. So $OB = \sqrt{2}$. Therefore $OD = OB - DB = \sqrt{2} - 1$. By a similar argument, $OF = \sqrt{2} - 1$. Now $DF^2 = OD^2 + OF^2 = 2 \times OD^2$ since $OD = OF$. So the side of the square is $\sqrt{2} \times OD = \sqrt{2}(\sqrt{2} - 1) = 2 - \sqrt{2}$.