Challenge 201: Circle Conundrum

Point *A* has co-ordinates (1,1), and point *O* is the origin (0,0).

Points *P* and *Q* must be placed such that the acute angles *OPA* and *OQA* are both 45^{o}.

A circle *C* is drawn so that wherever *P* and *Q* are placed, these two points will always be either inside *C* or on its circumference.

What is the minimum possible diameter of *C*?