

The Two Quarters Problem

Solution

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The moving quarter rotates through 720 degrees: two full turns.

Let a quarter's radius be r . The center of the moving quarter travels around a circle of radius $2r$, because its center stays one diameter from the fixed quarter's center.

That journey has length

$$2\pi(2r) = 4\pi r.$$

For a rolling circle, one full turn carries its center a distance equal to its circumference, $2\pi r$, along its path. The center travels two such circumferences here, so the quarter makes two full turns.

Another way to see the extra turn is to track the line joining the two centers. Relative to this rotating line, the moving quarter makes one turn as its edge rolls around the fixed quarter. But the line itself turns once around the table. Relative to the fixed table, the two turns add.

This is why “the two quarters have equal circumferences, so the answer is one turn” misses a turn. It counts the rotation relative to the changing line of centers, not relative to the table.

The statement assumes the edges roll without slipping, like meshing gears. Sliding the quarter around without rolling it would be a different motion.

History and sources: [companion history PDF](#).