

Big Things that Squeeze Round Corners

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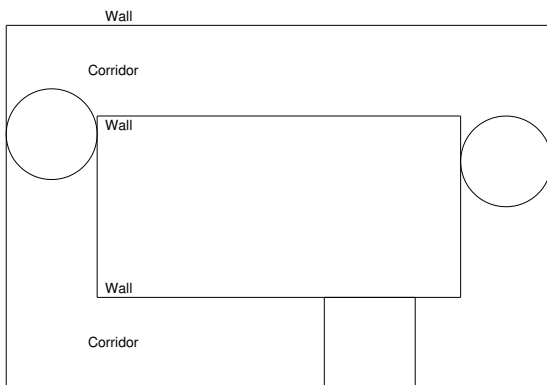
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No man is an island, entire of itself. But almost every man is a furniture-mover from time to time. And woman too of course.

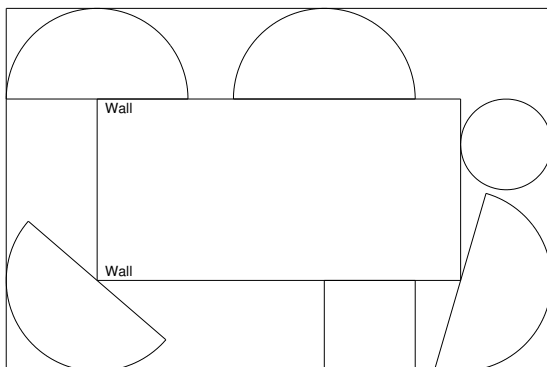
As furniture movers, we always ask ourselves: ‘will that bed/desk/wardrobe go up that staircase?’ After grunting and shoving for a few minutes, we wonder ‘hmm, would it go round the corner if I sawed that leg off?’ After sawing off all four legs and hacking away the banisters with an axe, we give up and decide to move into a different house.

In this article, I explore the question, ‘what is the largest piece of furniture that can be squeezed round a corner?’

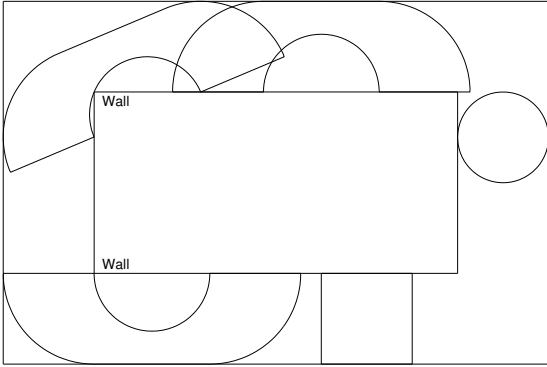
Even in a two-dimensional flatland, I don’t know a mathematical technique for tackling the problem. The task is to make a rigid object with the largest possible area that can be taken round a corner in a flatland corridor of width 1.



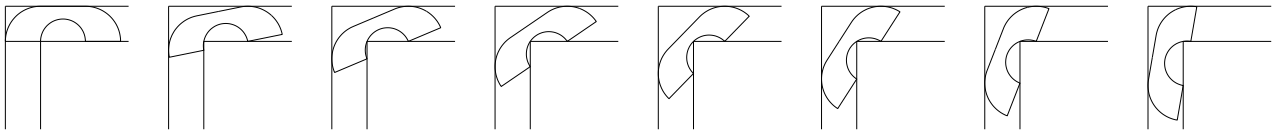
The figure shows a corridor of width 1, and two simple objects, a circle and a square of areas $\pi/4 \simeq 0.79$ and 1, respectively, both of which can slide along the corridor and go round the corners.



The third figure shows a semicircle of radius 1 and area $\pi/2 \simeq 1.57$.



The second figure shows a telephone-shaped object, whose area is $\pi/2 + 2/\pi \simeq 2.21$. It is built from two quarter-circles of radius 1 and a rectangle of size $1 \times (2/\pi)$, with a semi-circle chomped out of it. This is the largest object I have found that can go round the corner.



Is it the largest? Perhaps this field of furniture design is still an active research area.