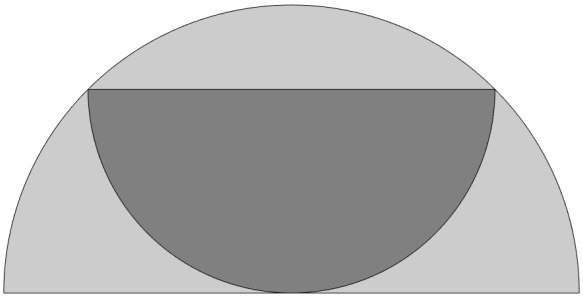
Riddler Express

15 November 2019

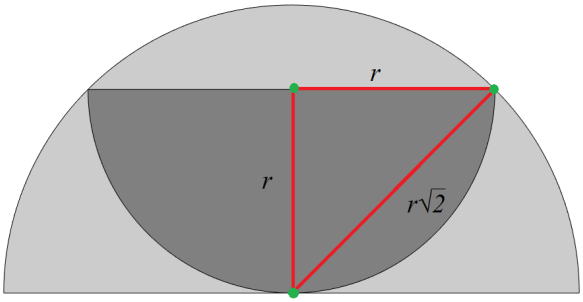
Riddle:



The picture above shows two semicircles. The lighter region (inside the larger semicircle but outside the smaller one) has an area of 7. What's the area of the darker region?

Solution:

For this riddle, I am making two seemingly obvious assumptions that make the problem very easy. First, the small semicircle is tangent at all three points, and second, that the flat edges of the two semicircles are parallel (and exactly horizontal, to wit). To solve this, I have drawn some lines in the image which make the math clear.



The small semicircle has radius r. The horizontal and vertical lines are radii, and form a right triangle with hypotenuse $r\sqrt{2}$. The hypotenuse is also the radius of the larger semicircle, because the centers of the semicircles are vertically aligned. Therefore, the ratio of the radii is $\sqrt{2}$, and the ratio of the total areas of the semicircles (not just the shaded areas) is 2. So the total area of the large semicircle is 14, and the remaining lightly shaded area is $14 - 7 = \boxed{\mathbf{7}}$.