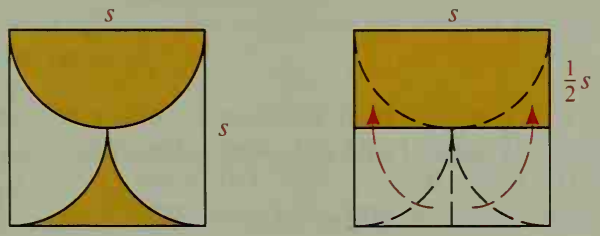
An unfamiliar figure can sometimes be divided into pieces that can be rearranged to form a familiar figure whose area is easier to calculate. This method is called *dissection*.

Example Find the area of the "goblet" that is constructed in a square by drawing one semicircle and two quarter circles, as shown in the diagram at the left below.

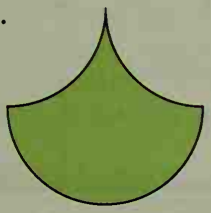


Solution Divide the bottom of the goblet into halves and rotate them upward as shown in the diagram at the right above. Thus the shaded area is $\frac{1}{2}s^2$.

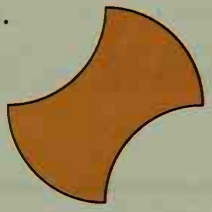
Exercises

Each figure below is drawn with arcs of radius 4. Use rotations to find the area of each.

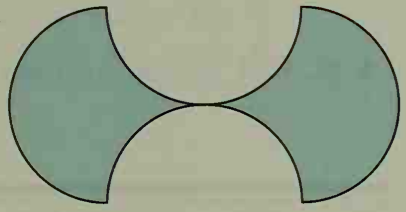
1.



2.



3.



4. The figure shows a series of squares inscribed within each other. Transformation T, which maps region I to region II is achieved by performing a rotation followed by a dilation.

a. Give the number of degrees in the rotation and the scale factor of the dilation.

b. What is the image of region I by the transformation T^2 (T performed twice)? by the transformation T^3?

c. Give the areas of regions I, II, III, IV and V.