

Geometry: Area by dissection

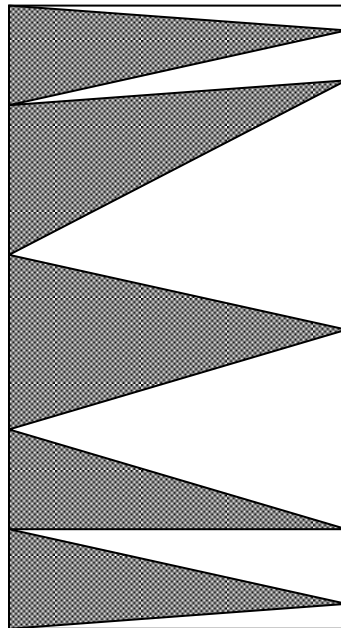
(Triangles ,Pythagoras, Circle).

Name: _____

(Most of the material and ideas herein are taken from: "Area by dissection", by Ioana Mihalia and Ellen Barger, in *Mathematics teacher*, vol 102(5), Dec 2008).

Question 0

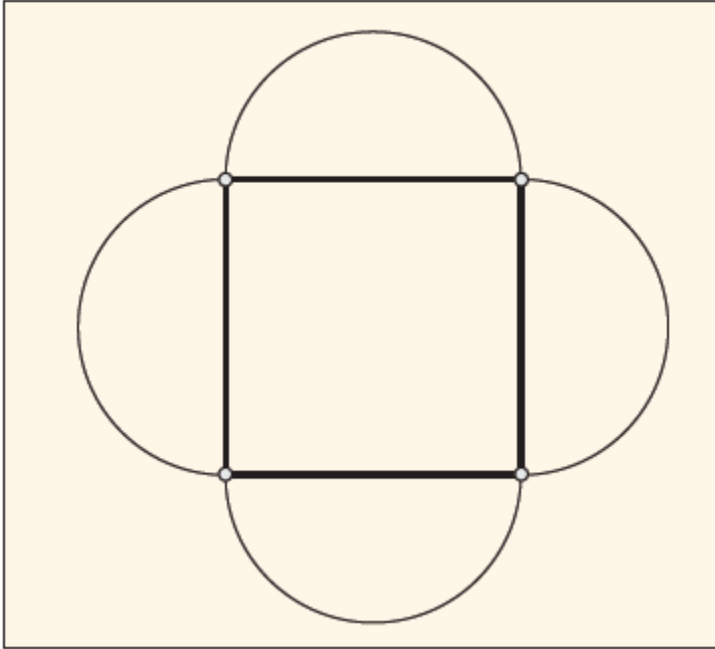
What is the area of the shaded part in the following picture?



Answer: _____

Question 1 - Tablecloth

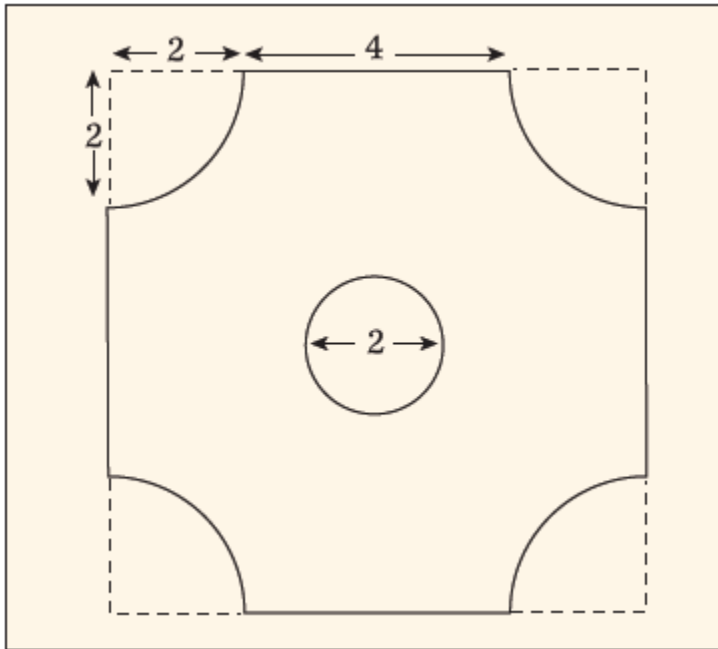
A tablecloth for a square table has the shape shown in the following figure. The four semicircles are meant to hang over the sides of the table. If the side of the table is 100cm, what is the area of the tablecloth?



Answer: (you can leave the final result as a function of π .)

Question 2 - Swiss Cheese

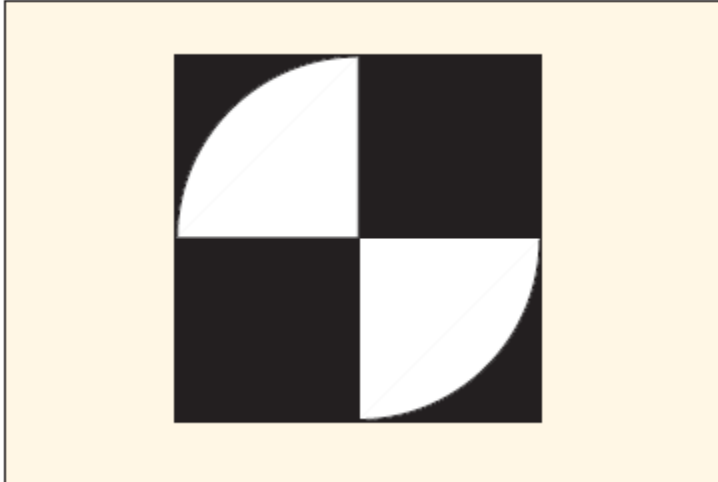
A slice of baby Swiss cheese looks like the image shown below. You are beginning to think that your parents have paid too much for all these cheese holes. They could have purchased mozzarella cheese instead – the slices would have been the same size and would have no missing sections. What percentage of the area of the slice of mozzarella is the area of the slice of Swiss cheese?



Answer: (you can leave the final result as a function of π .)

Question 3 - Darts

A dart is thrown in such a way that it is constrained to land within the boundaries of a 6foot x 6foot square, as in the figure below. The unshaded regions are each a quarter of an inscribed circle. What is the probability that the dart lands in one of the shaded regions?



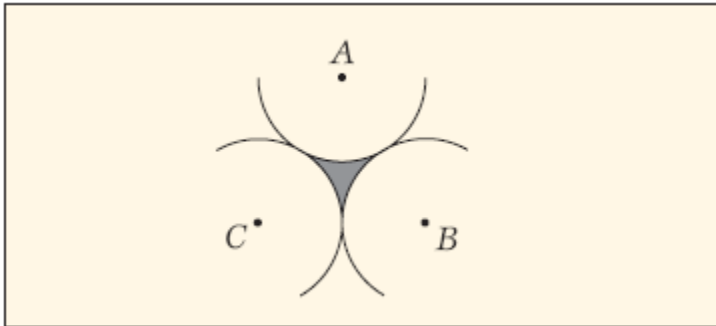
Answer: (you can leave the final result as a function of π .)

Question 4 - Mutually Tangent Arcs

Three mutually tangent arcs with radius 1 unit are drawn with A,B, and C as centers (see figure). Find the shaded area.

Possible answers:

- (a) $\sqrt{3} - \frac{\pi}{2}$
- (b) $\sqrt{3} - \frac{\pi}{3}$
- (c) $2\sqrt{3} - \frac{\pi}{2}$
- (d) $2\sqrt{3} - \frac{\pi}{3}$
- (e) None of the above.

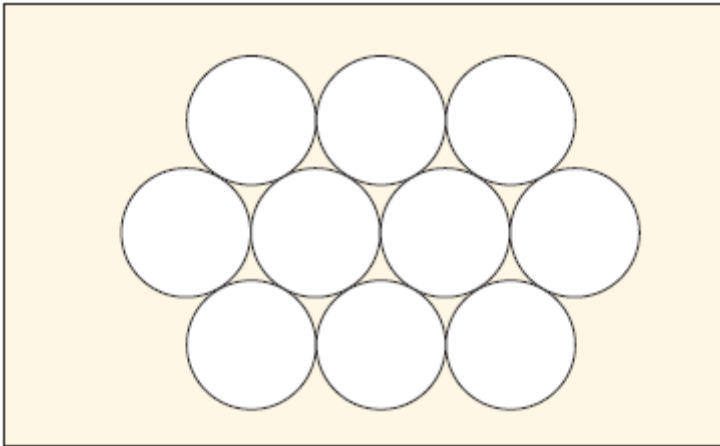


Answer:

Question 5 - Pennies on table

Pennies are arranged in a regular pattern all over a large table (the infinite plane) such that each penny touches six other pennies and the straight lines joining the centers of the pennies divide the plane into equilateral triangles (see figure). What percentage of the plane (rounded to the nearest integer) is covered by the pennies?

- (a) **50%**
- (b) **67%**
- (c) **80%**
- (d) **85%**
- (e) **91%**

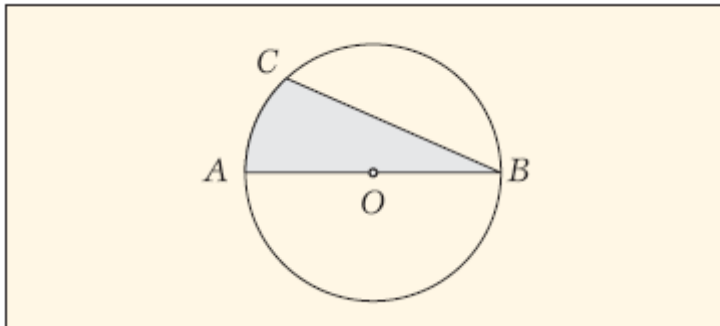


Answer:

Question 6 - Circle sections

The circle with center O has diameter AB , with length 4 and angle ABC of measure 30 degrees (see figure). Find the area of the shaded region.

- (a) $\frac{\pi}{3}$
- (b) $\sqrt{3} + \frac{\pi}{3}$
- (c) $\sqrt{3} + \frac{2\pi}{3}$
- (d) $2\sqrt{3} + \frac{\pi}{3}$
- (e) None of the above.

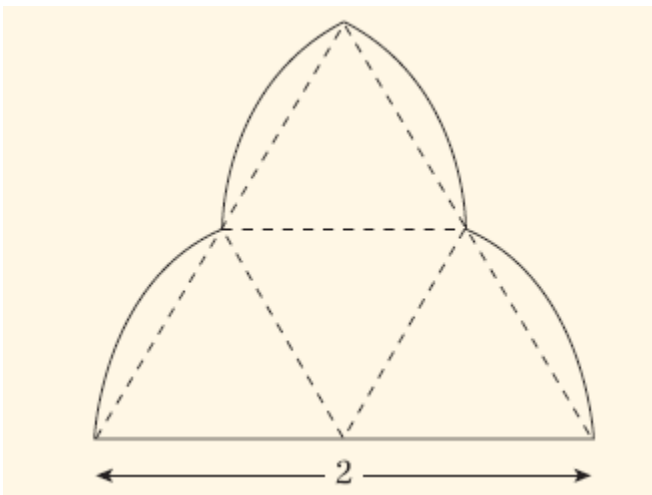


Answer:

Question 7 - Trefoil

A *trefoil* (see figure) is formed by constructing circular arcs about the sides of the congruent equilateral triangles; each arc is centered on a vertex of a triangle. What is the area of a trefoil whose horizontal base has length 2?

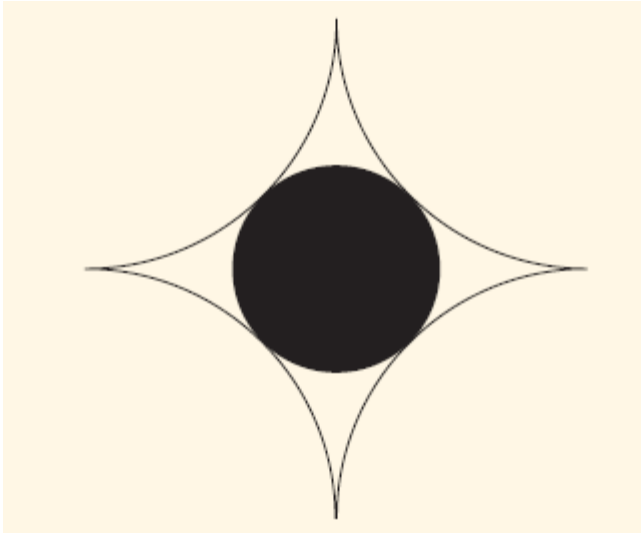
- (a) $\frac{\sqrt{3}}{2} + \frac{\pi}{3}$
- (b) $\frac{2\pi}{3}$
- (c) $\frac{\sqrt{3}}{4} + \frac{2\pi}{3}$
- (d) $\frac{\sqrt{3}}{3} + \frac{2\pi}{3}$
- (e) None of the above.



Answer:

Question 8 - Fifth Tangent Circle

Four equal circles are tangent to one another as shown in the figure below. The radius of each of the four large circles is equal to 2. Find the area of the small shaded circle tangent to all four of the larger circles.



Answer:

=== =End=====