Problem 19

Equianqular hexagon $ABCDEF$ has side lengths $AB = CD = EF = 1$ and $BC = DE = FA = r$. The area of $\triangle ACE$ is 70% of the area of the hexagon. What is the sum of all possible values of r ?

(A) $\frac{4\sqrt{3}}{3}$

(B) $\frac{10}{3}$

© 4 (D) $\frac{17}{4}$

(E) 6

106

Problem 16

A square of side length 1 and a circle of radius $\frac{\sqrt{3}}{3}$ share the same center. What is the area inside the circle, but outside the square?

(A) $\frac{\pi}{3} - 1$

(B) $\frac{2\pi}{9} - \frac{\sqrt{3}}{3}$

© $\frac{\pi}{18}$

(D) $\frac{1}{4}$

(E) $\frac{2\pi}{9}$

Problem 19

A circle with center O has area 156π. Triangle ABC is equilateral, $\overrightarrow{BC}$ is a chord on the circle, $OA = 4\sqrt{3}$, and point O is outside $\triangle ABC$. What is the side length of $\triangle ABC$?

(A) $2\sqrt{3}$

(B) 6

© $4\sqrt{3}$

(D) 12

(E) 18

Problem 20

Two circles lie outside regular hexagon $ABCDEF$. The first is tangent to $\overrightarrow{AB}$, and the second is tangent to $\overrightarrow{DE}$. Both are tangent to lines BC and FA. What is the ratio of the area of the second circle to that of the first circle?

(A) 18

(B) 27

© 36

(D) 81

(E) 108

11a

Problem 18

Circles A, B, and C each have radius 1 . Circles A and B share one point of tangency. Circle C has a point of tangency with the midpoint of $\overrightarrow{AB}$. What is the area inside Circle C but outside circle $\vec{A}$ and circle B ?

(A) $3 - \frac{\pi}{2}$

(B) $\frac{\pi}{2}$

© 2

(D) $\frac{3\pi}{4}$

(E) $1 + \frac{\pi}{2}$

11b