Problem 16

Three circles with radius 2 are mutually tangent. What is the total area of the circles and the region bounded by them, as shown in the figure?

(A) $10\pi + 4\sqrt{3}$

(B) $13\pi - \sqrt{3}$

© $12\pi + \sqrt{3}$

(D) $10\pi + 9$

(E) 13π

Problem 17

Ilesse cuts a circular paper disk of radius 12 along two radii to form two sectors, the smaller having a central angle of 120 degrees. He makes two circular cones, using each sector to form the lateral surface of a cone. What is the ratio of the volume of the smaller cone to that of the layer?

(A) $\frac{1}{8}$

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

© $\frac{\sqrt{10}}{10}$

(D) $\frac{\sqrt{5}}{6}$

(E) $\frac{\sqrt{5}}{5}$

Problem 18

Suppose that one of every 500 people in a certain population has a particular disease, which displays no symptoms. A blood test is available for screening for this disease. For a person who has this disease, the test always turns out positive. For the two patients, the patient is able to identify the most common cause of the disease. The most common cause of the disease is that of the time the test will turn out negative, but 2% of the time the test will turn out positive and will incorrectly indicate that the person has the disease, let p be the probability that a person who is chosen at random free this population and gets a positive test result actually has the disease. Which of the following is closest to p ?

(A) $\frac{1}{98}$

(B) $\frac{1}{9}$

© $\frac{1}{11}$

(D) $\frac{49}{99}$

(E) $\frac{98}{99}$

Problem 19

In rectangle $ABCD$, $AB = 6$. $AD = 30$, and G is the midpoint of $\overline{AD}$. Segment AB is extended 2 units beyond B to point E, and F is the intersection of ED and BC. What is the area of $BFDQ$?

(A) $\frac{133}{2}$

(B) 67

© $\frac{135}{2}$

(D) 68

(E) $\frac{137}{2}$

Problem 21

Four distinct points are arranged on a plane so that the segments connecting them have lengths a, a, a, a. 2a, and b. What is the ratio of $\hat{b}$ to $\hat{a}$?

(A) $\sqrt{3}$

(B) 2

© $\sqrt{5}$

(D) 3

(E) π

13a

Problem 16

A triangle with vertices $(6, 5)$, $(8, -3)$, and $(9, 1)$ is reflected about the line $x = 8$ to create a second triangle. What is the area of the union of the two triangles?

(A) 9

(B) $\frac{28}{3}$

© 10

(D) $\frac{31}{3}$

(E) $\frac{32}{3}$