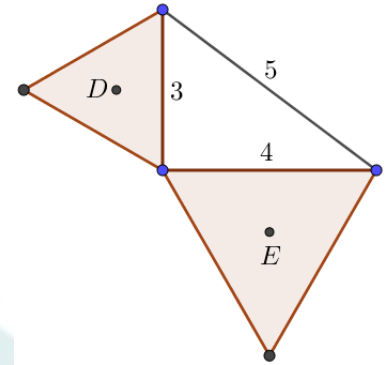


1. The shaded figures are equilateral triangles, and their circumcenters are D and E respectively. Let point F (not pictured) be the circumcenter of the $(3,4,5)$ -triangle.

Find the area of triangle DEF .

- (a) $2 + \frac{25\sqrt{3}}{24}$ (b) $4\sqrt{2} + 25\sqrt{3}$
 (c) $\frac{25}{24} + 2\sqrt{3}$ (d) $\frac{25}{2} + 24\sqrt{3}$
 (e) $\frac{25+\sqrt{3}}{24}$



2. A polynomial $P(x)$ with integer coefficients returns the value 4, 3, 2, 1, 0 when x is 1, 2, 3, 4, 5 respectively. What is the smallest possible value of $P(6)$, given that it is positive?

- (a) 118 (b) 119 (c) 120 (d) 121 (e) 123

3. How many ordered pairs (a, b) are there, with a and b positive integers greater than 1, such that a divides $b + 1$ and b divides $a + 2$?

- (a) 0 (b) 1 (c) 2 (d) 3 (e) 5

4. In a certain mathematics competition, only students from grade 7 to 9 are allowed to join. All participants are to be divided into 20 groups of equal number of members. The committee notices that regardless of how the participants are divided, every group necessarily contains at least 3 students who are from the same grade. Which of the following shows the least number of participants in the competition?

- (a) 30 (b) 60 (c) 100 (d) 140 (e) 150