Bergen County Mathematics League

Good Luck To You

Good Luck To All

Contest #5 (No Calculators) **2012-2013**

Part I *Time Limit: 12 minutes* On contest #6, ***any S.A.T. calculator will be allowed.***

5-1. Three vertices of a rectangle have respective coordinates (0,3), (9,0), and (0,-27). What are the coordinates of the fourth vertex?

5-2. What is the (simplest form) value of x for which $3^{2x+2} + 1 = 6(3^x)$?

Part II *Time Limit: 12 minutes*

5-3. Three mutually externally tangent circles, centered at A, B, and C, have radii of lengths 2, 2, and 3 respectively. The area of $\triangle ABC$ is $\sqrt{k}$. What is the value of the integer k?

5-4. What are all rational numbers x which satisfy $(\log_2 x)^2 - \log_2(x^2) = 8$?

Part III *Time Limit: 12 minutes*

5-5. In radians, if $0 \le x \le 2\pi$, what are all values of x for which $\cos^4 x + \sin^4 x = 1$?

5-6. Add $\frac{1}{1\times 2\times 3} + \frac{1}{2\times 3\times 4} + \frac{1}{3\times 4\times 5} + \ldots + \frac{1}{n(n+1)(n+2)} + \ldots + \frac{1}{8\times 9\times 10}$.
[Write the sum as a rational number in lowest terms.]

***Notice*: A question next meet will repeat the theme of question 5-4.**

Answers

5-1. (−9,−24)

5-2. −1

5-3. 84

5-4. 16, 1/4

5-5. 0, $\pi/2$, π, $3\pi/2$, 2π [All 5 required]

5-6. 11/45