Bergen County Mathematics League

Good Luck To You

Good Luck To All

Contest #6 (Calculators Allowed) **2015-2016**

Part I *Time Limit:* 12 *minutes* Answers must be exact or have 4 (or more) significant digits, correctly rounded.

6-1. In a certain 2016-term sequence of nonzero integers, the product of any three consecutive terms equals the middle term. What are all possible values of the first term?

6-2. If the lengths of two sides of a triangle are 16 and 20, how many different integers can be the length of the third side?

Part II *Time Limit:* 12 *minutes*

6-3. If i represents the imaginary unit, what value of n satisfies $(1 - i)^n = 256$?

6-4. From a point interior to an equilateral triangle T, perpendiculars drawn to the sides of T have lengths of 1, 4, and 7. How long is each side of T?

Part III *Time Limit:* 12 *minutes*

6-5. What are all values of x, $0 \le x < 2\pi$, that satisfy

$$\log_2 2 + \log_2 \sin x + \log_2 \cos x = -1?$$

6-6. When organizing a parade, Professor Brainiac noticed that if the participants tried to arrange themselves into a square, there would be 15 people left over. He determined that the participants could arrange themselves into a rectangle whose width and length differed by 7, with no one left over. How many participants are in the parade?

Answers

6-1. 1, -1
6-2. 31
6-3. 16
6-4. $24/\sqrt{3}$ or $8\sqrt{3}$
6-5. $\pi/12$, $5\pi/12$
6-6. 744