Bergen County Mathematics League

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Contest #2 (Calculators Allowed) **2013-2014**

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

2-1. What is the only real number x which satisfies $|x| + |2013| = 1 + |x + 2013|$?

2-2. Express, as a fraction in lowest terms, the sum

$$\frac{1}{1\times 2} + \frac{1}{2\times 3} + \frac{1}{3\times 4} + \ldots + \frac{1}{(n)(n+1)} + \ldots + \frac{1}{98\times 99}.$$

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

2-3. Let brackets denote the greatest integer function, so $[x]$ is the largest integer $\leq x$. For example, $[\frac{1}{2}] = 0$ and $[-\frac{1}{2}] = -1$. What is the smallest integer $n > 0$ for which $[\frac{22}{7}n] \neq [\frac{22}{7}]n$?

2-4. What are all ordered pairs of integers (x,y) which satisfy $x^2 + 4x + y^2 = 9$?

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

2-5. There are infinitely many triples of unequal positive integers (a,b,c) in geometric progression in which every term is the square of an integer. What is the least possible value of $a+b+c$? [Note: We say that the positive integers a, b, c are in *geometric progression* if $\frac{c}{b} = \frac{b}{a}$.]

2-6. The sides of a triangle have lengths 7, 11, and 14. How long is the radius of the circle whose area is equal to the area of the triangle?

Reminder: **A question next meet will repeat the theme of question 2-3.**

Answers

2-1. $-\frac{1}{2}$

2-2. 98/99

2-3. 7

2-4. (1,2), (1,−2), (0,3), (0,−3), (−4,3), (−4,−3), (−5,2), (−5,−2)

2-5. 21

2-6. $\left(\frac{12\sqrt{10}}{\pi}\right)^{1/2}$ or $\left(\frac{1440}{\pi^2}\right)^{1/4}$