Bergen County Mathematics League

Good Luck To You — Good Luck To All

Contest #1 (No Calculators) — **2014-2015**

Part I *Time Limit: 12 minutes* On contests #2, #4, and #6, ***any S.A.T. calculator will be allowed.***

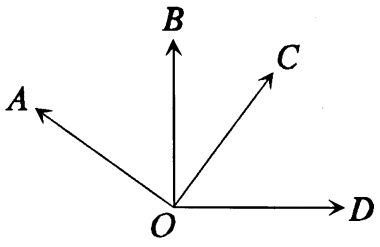
1-1. What are all values of x for which $10^2 + 11^2 + 12^2 = 13^2 + x^2$?

1-2. What is the value of $a + b + c + d + e$, given that

$$\begin{aligned} 2a + b + c + d + e &= 7, \\ a + 2b + c + d + e &= 4, \\ a + b + 2c + d + e &= 9, \\ a + b + c + 2d + e &= 2, \text{ and} \\ a + b + c + d + 2e &= 6? \end{aligned}$$

Part II *Time Limit: 12 minutes*

1-3. In the diagram at the right, which is not drawn to scale, $m\angle AOC = 90°$, $m\angle BOD = 90°$, and $m\angle AOD = 4(m\angle BOC)$. What is $m\angle BOC$?



1-4. The roots of $9x^3 - 36x^2 + 44x - 16 = 0$ are $\frac{2}{3}$, $\frac{4}{3}$, and 2. What are the three roots of $-16x^3 + 44x^2 - 36x + 9 = 0$?

Part III *Time Limit: 12 minutes*

1-5. If n is a positive integer, what is the largest integer which always divides every expression of the form $n^3 + 11n$?

1-6. Six numbers are chosen at random from set S, with replacement. If the median of all the numbers in S is not an element of S, what is the probability that this median lies between the largest and the smallest of the numbers that were chosen?

***Reminder*: A question next meet will repeat the theme of question 1-4.**

Answers

1-1. ± 14

1-2. $\frac{14}{3}$ or exact equivalent

1-3. 36 or 36°

1-4. $\frac{3}{2}$, $\frac{3}{4}$, $\frac{1}{2}$

1-5. 6

1-6. $\frac{31}{32}$