MAΘ Competition Team Problem Set 14

Anders Christensen, Hannah Kim

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Problem 1. Given a number $\overline{a_3a_2a_1a_0}$ in base n, express this number in base 10.

Problem 2. Convert $(1011011)_2$ into base 10 and 435 into base 6.

Problem 3. The base-nine representation of the number N is $(27{,}006{,}000{,}052)_9$. What is the remainder when N is divided by 5?

Problem 4. Let n be a positive integer and d be a digit such that the value of the numeral $\overline{32d}$ in base n equals 263, and the value of the numeral $\overline{324}$ in base n equals the value of the numeral $\overline{11d1}$ in base six. What is n?

Problem 5. Let $P(x)$ be a polynomial with non-negative integer coefficients such that $P(1) = 4$ and $P(5) = 152$. What is $P(11)$?

Problem 6. There are digits a and b so that the 15-digit number $\overline{7a7ba7ab7ba7b77}$ is divisible by 99. Find $10a + b$.