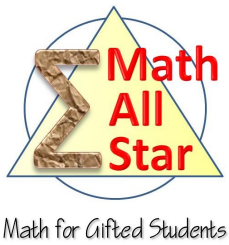
Number Theory

Modular Arithmetic



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Instructions

- *Write down and submit intermediate steps along with your final answer.*
- *If the final result is too complex to compute, give the expression. e.g.* C_{100}^{50} *is acceptable.*
- *Problems are not necessarily ordered based on their difficulty levels.*
- *Always ask yourself what makes this problem a good one to practise?*
- *Complete the My Record section below before submission.*

My Comments and Notes

Modular Arithmetic

Practice 1

Find the remainder when $3^{2015} + 4^{2015}$ is divided by 5.

Practice 2

How many terms in the following sequences are square numbers?

$$4, 44, 444, 4444, 44444, \cdots$$

Practice 3

Let positive integers a, b, and c are relatively prime. If they satisfy the relationship $a^2 + b^2 = c^2$, show that a and b must be opposite parity.

Practice 4

The number 2^{29} is a nine-digit number whose digits are all distinct. Without computing the actual value of 2^{29}, can you find out which digit among 0 to 9 does not appear?