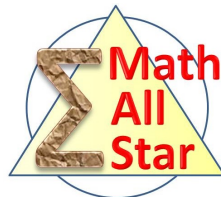

Number Theory

Modular Arithmetic



Math for Gifted Students

<http://www.mathallstar.org>

Number Theory

Modular Arithmetic



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

Sample

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, \dots

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?