MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 3 - DECEMBER 2016
ROUND 2 ARITHMETIC/NUMBER THEORY

ANSWERS

A) (_____ , _____)

B) _____

C) _____

A) The value of $n!$ gets large very quickly, but the sum of the digits of $n!$ increases slowly. Let P = minimum value of n for which Q, the sum of the digits of $n!$, exceeds 10. Compute the ordered pair (P, Q).

Note: $n!$ (read n factorial) is defined as the product $n \cdot (n-1) \cdot (n-2) \cdot \ldots \cdot 2 \cdot 1$.

B) Find the remainder when 7^{355} is divided by 4.

C) A two-digit positive integer N leaves a remainder of 1 when divided by 5. If the digits are reversed, this new integer leaves a remainder of 3 when divided by 5. What is the remainder when the sum of all integers N satisfying these conditions is divided by 9?