MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 3 - DECEMBER 2008
ROUND 2 ARITHMETIC/NUMBER THEORY

ANSWERS

A) _____

B) (____ , ____ , ____ , ____)

C) _____$_3$

A) Let $N = 158400$.
A denotes the largest odd factor of *N*.
B, whose only odd factor is 1, is the largest possible even factor of *N*.
Compute the product *AB*.

B) Given: $24^3 \cdot 120^2 \cdot 441 = 28^A \cdot 15^B \cdot 12^C \cdot 2^D$
Find the ordered quadruple (*A*, *B*, *C*, *D*).

C) Consider numbers written in "base 3", but rather than using the digits 0, 1 and 2, use the digits are *A*, *B* and *C*, where $A = 1$, $B = -1$ and $C = 0$.
For example, $21_{10} = ABAC_3$, since $ABAC_3 = 27(1) + 9(-1) + 3(1) + 1(0) = 27 - 9 + 3 + 0 = 21$.

How would you represent the base ten integer 211 in base 3 in terms of *A*, *B* and *C*?