MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 4 – JANUARY 2007
ROUND 2 ALG 1: FACTORING AND/OR EQUATIONS INVOLVING FACTORING

ANSWERS

A) _____

B) _____

C) _____

A) 1741 is a prime number.
It does not factor as the product of two integers (except the trivial (1·1741).
Find the ordered pair of consecutive positive integers (a, b), where $a > b$, for which the product ab is closest to 1741.

B) Mersenne Numbers are numbers of the form $2^n - 1$, for integers $n > 2$. If n is even, this formula always generates numbers that are composite. If n is odd, this is not necessarily the case. Find the sum of all prime factors of the smallest composite Mersenne number generated by an odd value of n.
Note: 1 is neither prime nor composite.

C) Determine all values of x for which $\left(6\left(\frac{x-3}{x-7}\right)-4\right)^2-5\left(2-3\left(\frac{x-3}{x-7}\right)\right)=21$