MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 1 - OCTOBER 2008
ROUND 6 ALG 1: EVALUATIONS

ANSWERS

A)   JAN FEB MAR APR MAY JUN

JUL AUG SEP OCT NOV DEC

B) _____

C) _____

A) The first Thursday in 2025 is on New Year's Day, 1/1. Specify in what month the first
Thursday falls later than the 5th for the first time. Circle the correct month above.
The numbers of days in each month for a non-leap year are:

31, 28, 31, 30, 31, 30, 31, 31, 30, 31, 30 and 31.

B) The proper factors of 20 are 1, 2, 4, 5 and 10.
Since the sum of these factors is greater than 20, the integer 20 is called an _abundant_ number.
Determine the largest abundant number N <u>strictly</u> between 20 and 30, that is $20 < N < 30$.

The following is a formal definition of an abundant number:

An positive integer N is <u>abundant</u> if and only if the sum of its proper factors is <u>greater than</u> N itself.

C) Consider the following binary operation: $a \blacklozenge b = (a + 1)(2 - b)$
Let S be a set of 7 ordered pairs, specifically $S = \{(x, x^2) | \ -3 \le x \le 3\}$.
For <u>how many</u> ordered pairs in S – call them (a, b) – does $a \blacklozenge b = b \blacklozenge a$?