

**MASSACHUSETTS MATHEMATICS LEAGUE  
CONTEST 1 - OCTOBER 2011  
ROUND 7 TEAM QUESTIONS**

**ANSWERS**

A) \_\_\_\_\_ D) \_\_\_\_\_

B) \_\_\_\_\_ E) \_\_\_\_\_

C) \$\_\_\_\_\_. \_\_\_\_\_ F) \_\_\_\_\_

**\*\*\*\*\* NO CALCULATORS ON THIS ROUND \*\*\*\*\***

A) Given: A box (i.e. a rectangular solid) with faces having areas of 180 square units, 240 square units and 144 square units. Compute the length of a diagonal of the box.

B) Given:  $\triangle ABC$ , with a right angle at  $A$  such that

$$AB = 1, BC = \sqrt{10}$$

Let  $M$  be the point on  $\overline{BC}$  such that  $\frac{AM}{AC} = \frac{1}{3}$  and  $MC < AC$ . Compute  $MC$ .

C) On February 3, 1991, the postcard rate was increased to 19¢ and a first-class letter (1 oz. or less) to 29¢. A postal clerk sold 40 stamps (19¢ and 29¢ only) for \$9.20. The current rates for postcards and first-class mail are 28¢ and 44¢ respectively. Using current rates, how much (in dollars and cents) would it cost to mail the same number of postcards and first-class letters?

D) Let  $N = \frac{10x}{x+10}$  for integer values of  $x$ .

Compute the sum of all possible positive integer values of  $N$ .

E) The inequality  $|2x + 1| < x - c$ , where  $c$  is an integer, is satisfied by exactly 17 integer values of  $x$ . Determine the largest possible value of  $c$ .

F) What value is printed by the following “program”?

$T = 0$

$m = 1$

Repeat

$$p = 4m + 1$$

$$q = 4m + 3$$

If both  $p$  and  $q$  are prime, increase the value of  $T$  by  $(p + q)$ .

Increase the value of  $m$  by 1.

Until  $q > 100$

Print  $T$