

**MASSACHUSETTS MATHEMATICS LEAGUE**  
**CONTEST 3 - DECEMBER 2007**  
**ROUND 2 ARITHMETIC/ ELEMENTARY NUMBER THEORY**

**ANSWERS**

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

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

C) \_\_\_\_\_

- A) A magic integer is defined to be a positive integer that is both a perfect square and a perfect cube. Determine the sum of all magic integers less than 100,000.

- B) Given the following pattern:
- |  |  |   |  |   |  |    |  |    |  |
|--|--|---|--|---|--|----|--|----|--|
|  |  | 1 |  | 4 |  | 4  |  | 1  |  |
|  |  | 1 |  | 5 |  | 8  |  | 5  |  |
|  |  | 1 |  | 6 |  | 13 |  | 13 |  |

The sum of the entries in row 1 is 10.

Each row has one more entry than the previous row.

Each row begins and ends with 1 and the in-between entries are the sum of the entries immediately to the right and left in the previous row.

What is the sum of the entries in the 16<sup>th</sup> row?

- C) Determine a simplified factored expression, in terms of the positive integer  $x$ , for the number of even factors of the following expression:

$$(12^{x+1}) \cdot (18^{x-1}) \cdot (75^3)$$