GREATER BOSTON MATH OLYMPIAD 2006 GRADE 4

There are six problems, all weighted equally. Try to solve as many as you can, in any order you choose. Do not get discouraged if you cannot find a solution: many of these problems are difficult, though few require much calculation. Write your answers in the white paper forms. Explain why you think your answer is correct: merely guessing a correct answer will not receive full credit. Do not forget to sign on the top of the solution form (white paper). Good luck!

Problem 1. In this problem, same letters mean same digits, different letters mean different digits. We have a three-digit number ABB. The product of its digits is a two-digit number AC. The product of the digits of AC is C. What is that original number?

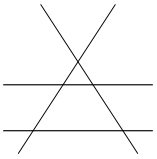
Problem 2. A row of 10 digits is written according to the following rule: the first three digits are chosen arbitrarily, and then each next digit is the last digit of the sum of the previous three. For example, starting with 1-2-3 yields 1-2-3-6-1-0-7-8-5-0. Which three digits should go first so that the *last* three are 1-2-3?

1	**2**	**3**	6	1	0	7	**8**	**5**	**0**

?	**?**	**?**					**1**	**2**	**3**

Problem 3. A book sells for 11 dollars. A customer wants to buy it but only has foreign currency. The exchange rate for the foreign currency is 11 round coins = 15 dollars, 11 square coins = 16 dollars. How many of each coinage should the customer pay?

Problem 4. Four lines can be used to draw 2 equilateral triangles on the plane, as shown on the right. What is the maximal number of equilateral triangles which can be drawn using 6 lines? (A triangle is equilateral when all of its angles equal 60°).



Problem 5. Chicken nuggets can be ordered in boxes of 6,9, and 20. What is the largest number such that you can not order any combination of the above to achieve exactly the number you want?

Problem 6. One wants to use tiles of form  and  to make a square without a unit size corner (no overlapping of the tiles and no holes are allowed). This can be done when the square is 4-by-4 units, as shown on the right. Among the squares of dimensions 5-by-5, 6-by-6, etc., up to 20-by-20, how many are those for which this can be done?