GREATER BOSTON MATH OLYMPIAD 2006 GRADE 7

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. On a grid paper, there is a rectangle which sides are on the grid. If there are A intersections inside the rectangle and B intersections on its boundary, what's the area of the rectangle?

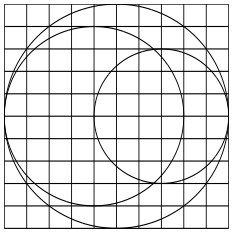
Problem 2. A row of 10 digits is written according to the following rule: the first three digits are chosen arbitrarily, and then each next digit is the last digit of the sum of the previous three. For example, starting with 1-2-3 yields 1-2-3-6-1-0-7-8-5-0. Which three digits should go first so that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

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

?	**?**	**?**					**7**	**8**	**1**

Problem 3. To pay his income tax, a pirate has to give 10 piles of golden coins, arranged in such a way that no two piles have same number of coins, and no two piles combined have same number of coins as a third pile. What is the minimal number of coins the pirate has to pay?

Problem 4. Three discs are placed within a square as shown on the right. Let x be the area of intersection of two smaller discs. Let y be the area of the part of the larger disc which is not covered by either of the smaller discs. What is the ratio of x and y?



Problem 5. In Math-annapolis, chicken nuggets can be ordered in boxes of 6,11, 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. What is the last digit of $3^{2007} - 2^{2005}$?