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10th International Mathematics and Science Olympiad (IMSO) for Primary School 2013

Instructions:

- * Write down your name and country on the answer sheet.
- * Write your answer on the answer sheet.
- * You have 120 minutes to work on this test.
- * Use pen or pencil to write your answer.



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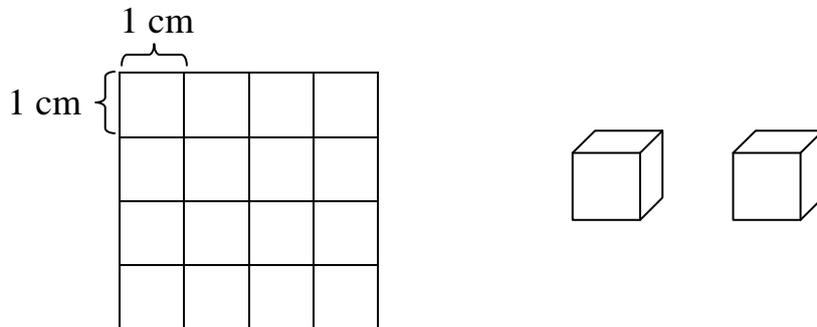
Alfonso, Cavite, Philippines

25 – 29 Nov 2013

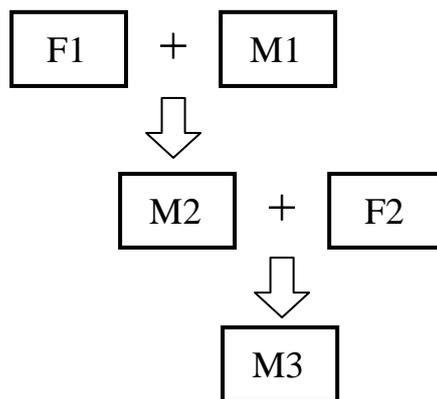
Country: _____ Name: _____ No.: _____ Score: _____

EXPLORATION PROBLEMS

1. From a $4\text{ cm} \times 4\text{ cm}$ piece of paper shown below, cut out two pieces that do not overlap. Each of them may be folded into a hollow $1\text{ cm} \times 1\text{ cm} \times 1\text{ cm}$ cube.



2. Explain how 12 rods, each 13 units long, should be cut to obtain 13 pieces of length 3 units, 13 pieces of length 4 units and 13 pieces of length 5 units.
3. A family tree is a diagram that shows relationships among family members.



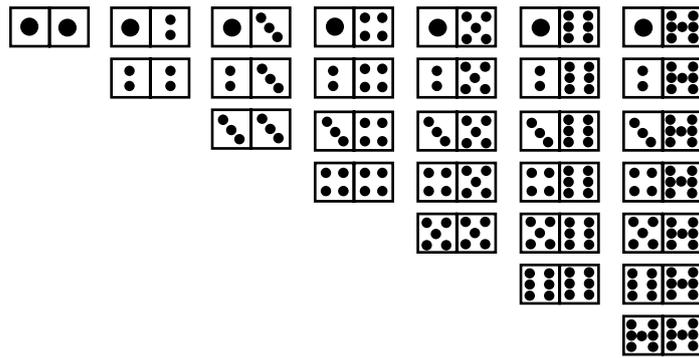
In the diagram above with two females (F1 and F2) and three males (M1, M2, and M3), we can see there are at least one grandfather and one father in law (M1), one grandmother and one mother in law (F1), two fathers (M1 and M2), two mothers (F1 and F2), two sons (M2, M3), one daughter in law (F2), and one grandson (M3).

Make a family tree with the least number of family members that contains at least :

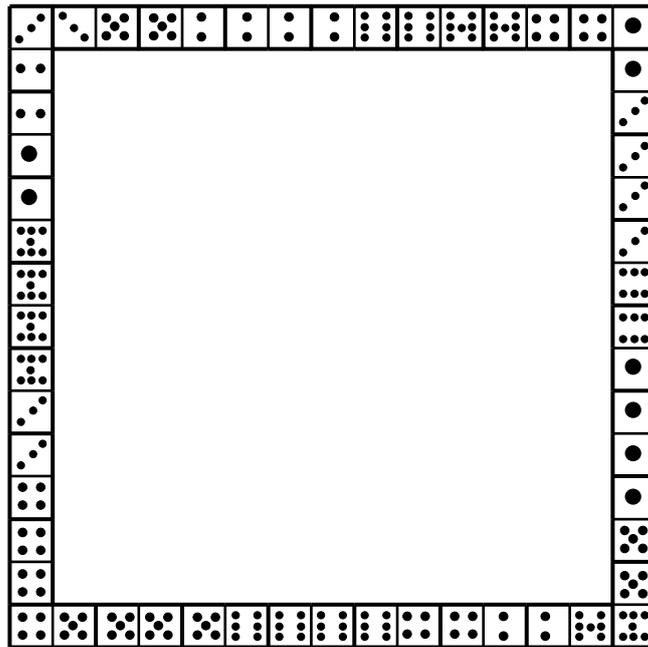
- | | | |
|-----------------------|-------------------|------------------------|
| ● one grandfather | ● one grandmother | ● one father in law |
| ● one mother in law | ● two fathers | ● two mothers |
| ● two sons | ● two daughters | ● three grand children |
| ● one daughter in law | ● two sisters | ● one brother |

4. Insert some plus and minus sign between the digits 123456789 or in front the first digit to make the sum 100. However, you can not change the order of the digits. For example: $-1+2-3+4+5+6+78+9=100$. Find 7 more solutions.

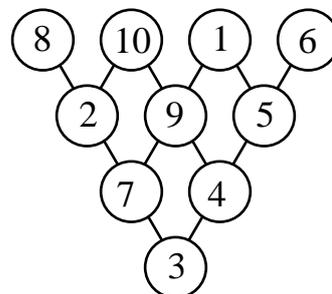
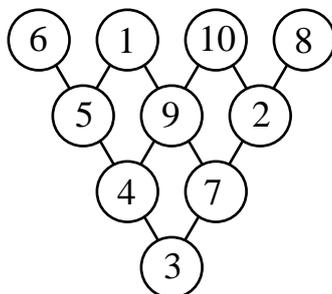
5. A set of dominoes consists of the following 28 pieces:



The basic rule in playing dominoes is that, when two dominoes share a common edge, the numbers of dots inside the two squares which share that edge must be the same. The figure shows an example of a hollow square formed from all 28 domino pieces in accordance with basic rule. The total number of dots along the lower side is 74, the total along right side is 47 points and the total along each of the other two sides is 59. The difference between the largest and the smallest totals is $74 - 47 = 27$. Rearrange the domino pieces so that the difference between the largest and the smallest totals is as small as possible.



6. Arrange the positive integers 1 ~ 10 in the triangular array so that apart from the top row of four numbers, each number in a subsequent row is the absolute difference of the two numbers immediately above it. Below are two solutions which are mirror images of each other. We require that the number in the top left corner to be less than the number in the top right corner, so that the second solution does not count. Find 3 other solutions.

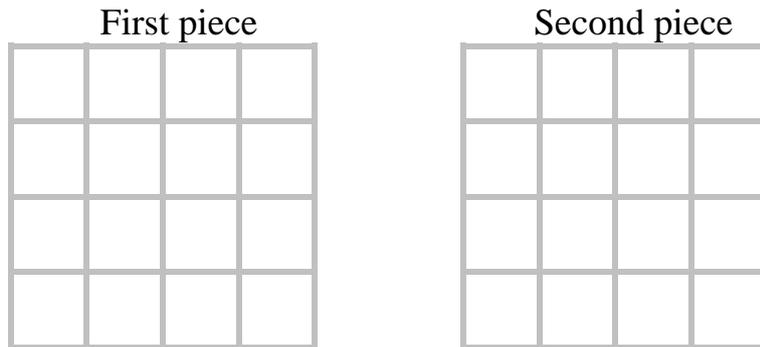


EXPLORATION PROBLEMS

NAME _____ COUNTRY _____

Answer Sheet

1.



2.

Cut the 1st rod into _____
Cut the 2nd rod into _____
Cut the 3rd rod into _____
Cut the 4th rod into _____
Cut the 5th rod into _____
Cut the 6th rod into _____

Cut the 7th rod into _____
Cut the 8th rod into _____
Cut the 9th rod into _____
Cut the 10th rod into _____
Cut the 11th rod into _____
Cut the 12th rod into _____

3.

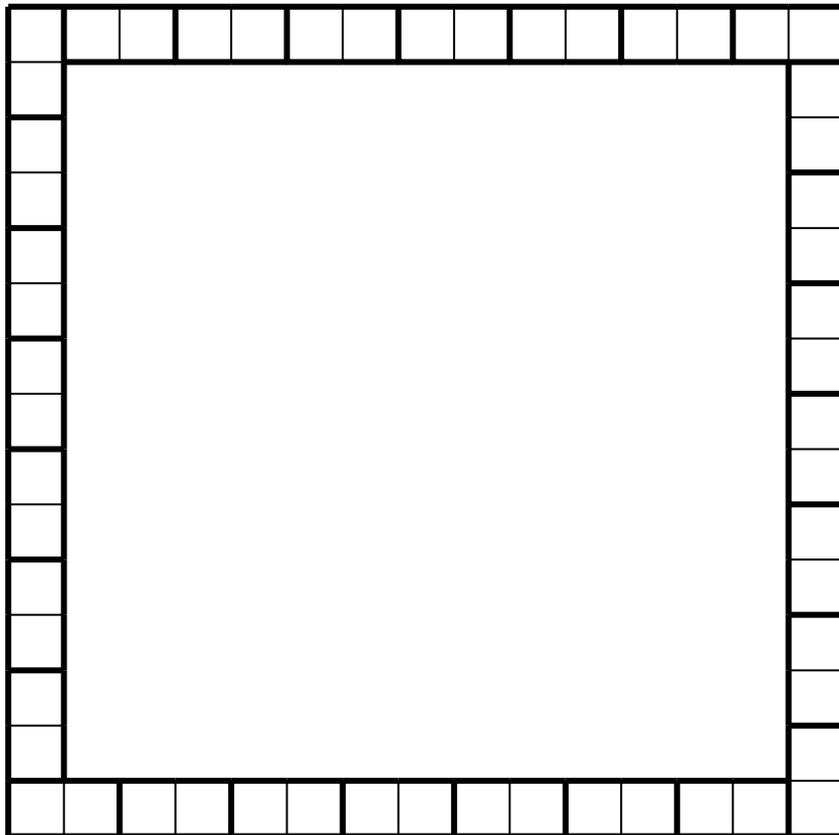
EXPLORATION PROBLEMS

NAME _____ COUNTRY _____

Answer Sheet

4. (1) $-1+2-3+4+5+6+7+8+9=100$ (5) _____
(2) _____ (6) _____
(3) _____ (7) _____
(4) _____ (8) _____

5.



6.

