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Mathematics Exploration Problems

9th International Mathematics and Science Olympiad (IMSO) for Primary School 2012

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.

“Smart, Skilled, and Creative In a Joyful Competition for Excellence”

City Montessori Inter College,
RDSO Campus, Manak Nagar, Lucknow, India
27 Oct. – 2 Nov 2012
EXPLORATION PROBLEMS

1. Fill in the positive integers 1 to 30 into the following boxes to form 15 fractions, with each number used exactly once, such that as many of these fractions as possible have integer values.

2. A palindrome number is a positive integer that can be read the same way in either direction. For instance, 909, 3553 and 12421 are palindrome numbers. Find all 5-digit palindrome numbers divisible by 44.

3. The plane is divided into a number of non-overlapping polygons by \( n \) lines. What is the largest number of triangles among these polygons?
   (a) When \( n=5 \)? (1 point)
   (b) When \( n=6 \)? (2 point)
   (c) When \( n=7 \)? (3 point)

4. Select as many of the integers from 1 to 21 as possible, so that no two disjoint pairs of them have the same difference. For example \( \{1, 3, 5, 13\} \) is such a collection; although \( 3-1=5-3 \), the two pairs are not disjoint. On the other hand, \( \{1, 2, 4, 7, 10\} \) is not since \( 4-1=10-7 \). What is the maximum number of integers that can be select?

5. Find a three-digit number such that the ratio of this three-digit number to the sum of its digit has the least value.

6. Place the numbers 1 to 42 in the squares of the 6 × 7 table so that any two consecutive numbers are in squares which share a common side. The numbers 11, 20 and 30 are already placed as shown in the diagram below.

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EXPLORATION PROBLEMS

NAME ___________________ COUNTRY ____________________

Answer Sheet

1. 

2. 

3. 

(a) 

(b) 

(c) 

4. The maximum number of integers that can be selected is ______________.

5. The answer is ______________.

6.

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