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Taiwan International
Mathematics Competition 2012
(TAIMC 2012)
World Conference on the Mathematically Gifted Students
---- the Role of Educators and Parents
Taipei, Taiwan, 23rd~28th July 2012

Elementary Mathematics International Contest

TEAM CONTEST

Time：60 minutes

Instructions:

- Do not turn to the first page until you are told to do so.
- Remember to write down your team name in the space indicated on every page.
- There are 10 problems in the Team Contest, arranged in increasing order of difficulty. Each question is printed on a separate sheet of paper. Each problem is worth 40 points and complete solutions of problem 2, 4, 6, 8 and 10 are required for full credits. Partial credits may be awarded. In case the spaces provided in each problem are not enough, you may continue your work at the back page of the paper. Only answers are required for problem number 1, 3, 5, 7 and 9.
- The four team members are allowed 10 minutes to discuss and distribute the first 8 problems among themselves. Each student must attempt at least one problem. Each will then have 35 minutes to write the solutions of their allotted problem independently with no further discussion or exchange of problems. The four team members are allowed 15 minutes to solve the last 2 problems together.
- No calculator or calculating device or electronic devices are allowed.
- Answer must be in pencil or in blue or black ball point pen.
- All papers shall be collected at the end of this test.

English Version

For Juries Use Only

No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**	Sign by Jury
Score												
Score												

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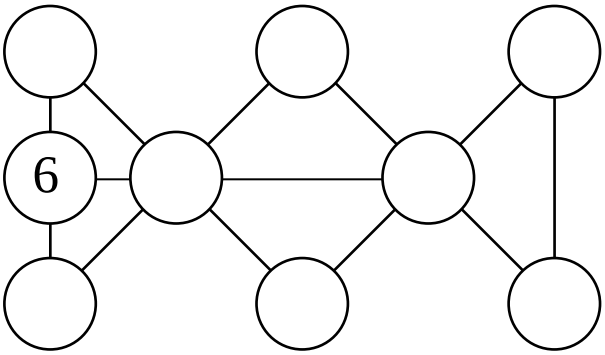
Elementary Mathematics International Contest

TEAM CONTEST

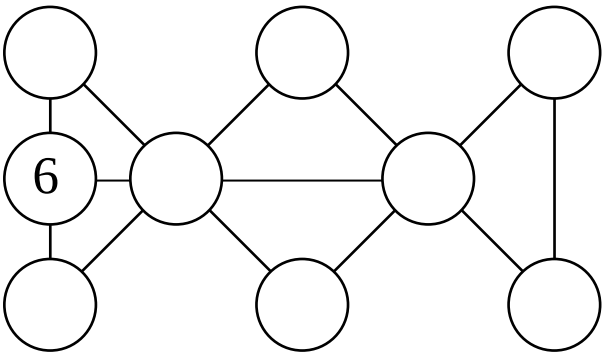
25th July 2012 Taipei, Taiwan

Team：_____ Score：_____

1. Each of the nine circles in the diagram below contains a different positive integer. These integers are consecutive and the sum of numbers in all the circles on each of the seven lines is 23. The number in the circle at the top right corner is less than the number in the circle at the bottom right corner. Eight of the numbers have been erased. Restore them.



Answer: _____



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2. A clay tablet consists of a table of numbers, part of which is shown in the diagram below on the left. The first column consists of consecutive numbers starting from 0. In the first row, each subsequent number is obtained from the preceding one by adding 1. In the second row, each subsequent number is obtained from the preceding one by adding 2. In the third row, each subsequent number is obtained from the preceding one by adding 3, and so on. The tablet falls down and breaks up into pieces, which are swept away except for the two shown in the diagram below on the right in magnified forms, each with a smudged square. What is the sum of the two numbers on these two squares?

0	1	2	3	4	5	
1	3	5	7	9	11	
2	5	8	11	14	17	
3	7	11	15	19	23	
4	9	14	19	24	29	
5	11	17	23	29	35	

?	2012	2023

2012
2683
?

Answer: _____

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3. In a row of numbers, each is either 2012 or 1. The first number is 2012. There is exactly one 1 between the first 2012 and the second 2012. There are exactly two 1s between the second 2012 and the third 2012. There are exactly three 1s between the third 2012 and the fourth 2012, and so on. What is the sum of the first 2012 numbers in the row?

Answer: _____

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4. In a test, one-third of the questions were answered incorrectly by Andrea and 7 questions were answered incorrectly by Barbara. One fifth of the questions were answered incorrectly by both of them. What was the maximum number of questions which were answered correctly by both of them?

Answer: _____

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5. Five different positive integers are multiplied two at a time, yielding ten products. The smallest product is 28, the largest product is 240 and 128 is also one of the products. What is the sum of these five numbers?

Answer: _____

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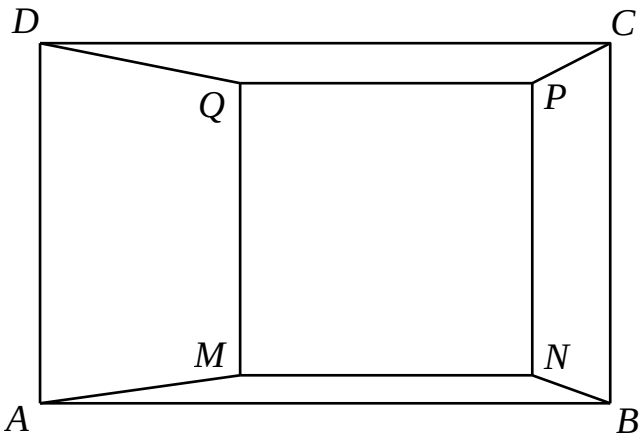
Elementary Mathematics International Contest

TEAM CONTEST

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6. The diagram below shows a square *MNPQ* inside a rectangle *ABCD* where $AB - BC = 7$ cm. The sides of the rectangle parallel to the sides of the square. If the total area of *ABNM* and *CDQP* is 123 cm^2 and the total area of *ADQM* and *BCPN* is 312 cm^2, what is the area of *MNPQ* in cm^2?



Answer: _____ cm^2

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7. Two companies have the same number of employees. The first company hires new employees so that its workforce is 11 times its original size. The second company lays off 11 employees. After the change, the number of employees in the first company is a multiple of the number of employees in the second company. What is the maximum number of employees in each company before the change?

Answer: _____

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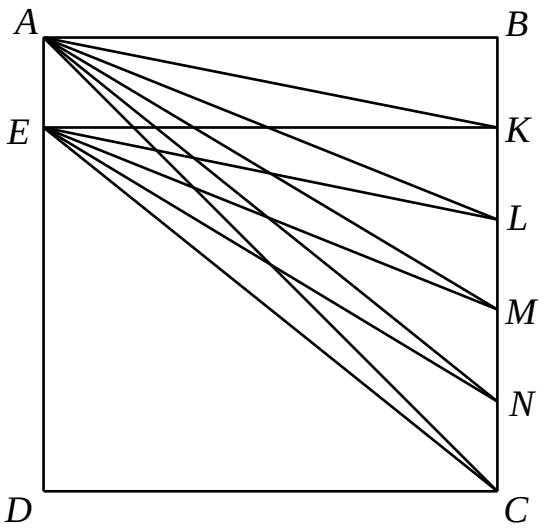
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8. *ABCD* is a square. *K*, *L*, *M* and *N* are points on *BC* such that *BK* = *KL* = *LM* = *MN* =*NC*. *E* is the point on *AD* such that *AE* = *BK*. In degrees, what is the measure of

$$\angle AKE + \angle ALE + \angle AME + \angle ANE + \angle ACE \text{ ?}$$



Answer: _____ °

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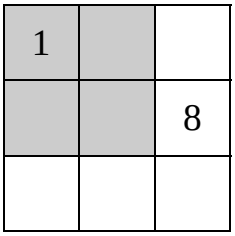
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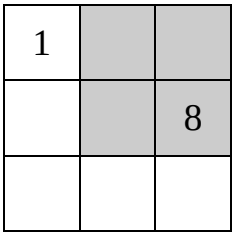
TEAM CONTEST

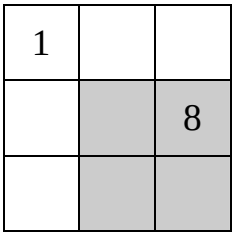
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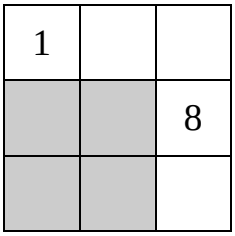
Team：_____ Score：_____

9. The numbers 1 and 8 have been put into two squares of a 3×3 table, as shown in the diagram below. The remaining seven squares are to be filled with the numbers 2, 3, 4, 5, 6, 7 and 9, using each exactly once, such that the sum of the numbers is the same in any of the four 2×2 subtables shaded in the diagram below. Find all possible solutions.

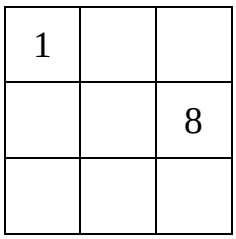


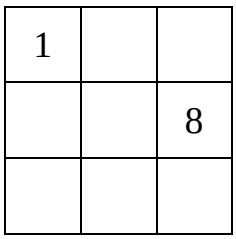


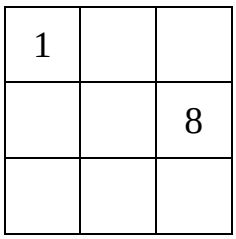


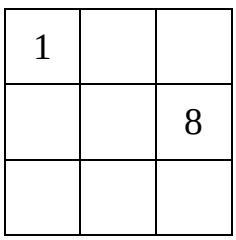


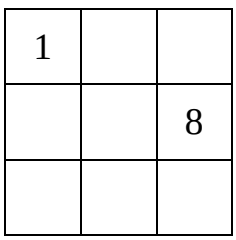
Answer:

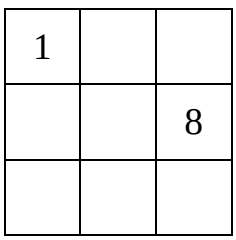












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10. At the beginning of each month, an adult red ant gives birth to three baby black ants. An adult black ant eats one baby black ant, gives birth to three baby red ants, and then dies (Also, it is known that there are always enough baby black ants to be eaten.) During the month, baby ants become adult ants, and the cycle continues. If there are 9000000 red ants and 1000000 black ants on Christmas day, what was the difference between the number of red ants and the number of black ants on Christmas day a year ago?

Answer: _____