International Mathematics Competition,
25~29 July, 2010, Incheon, Korea,

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 problem is worth 40 points and the total is 400 points. Each question is printed on a separate sheet of paper. Complete solutions of problems 1, 3, 4, 5, 6, 8 and 9 are required. Partial credits may be given. In case the spaces provided in each problem are not enough, you may continue you work at the back page of the paper. Only answers are required for Problem number 2, 7 and 10.
- The four team members are allowed 10 minutes to discuss and distribute the first 8 problems among themselves. Each team member must solve at least one problem. Each will then have 35 minutes to write the solutions of the assigned problems 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

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1. Pat is building a number triangle so that the first row has only one number, and each subsequent row has two more numbers than the preceding one. Starting from 1, the odd numbers are used in order in the odd-numbered rows. Starting from 2, the even numbers are used in order in the even-numbered rows. Thus her triangle starts off as follows.

					1					
				2	4	6				
			3	5	7	9	11			
		8	10	12	14	16	18	20		
	13	15	17	19	21	23	25	27	29	
22	24	26	28	30	32	34	36	38	40	42
					⋮					

Determine the row number in which the number 2010 will appear in Pat's number triangle.

Answer: _____

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2. In a faulty calculator, only the keys 7, −, ×, ÷ and = work. If you press 7 after 7, you will get 77, and so on. As soon as an operation key is pressed, the preceding operation, if any, will be performed. When the = key is pressed, the final answer will appear. Find a sequence of key pressing which produces the final answer 34.

Answer: _____

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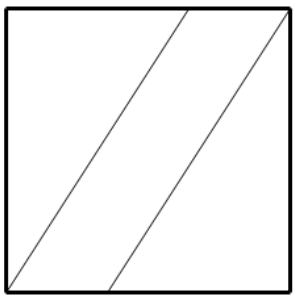
3. A square is divided into three parts of equal area by two parallel lines drawn from opposite vertices, as shown in the diagram below. Determine the area of the square, in cm^2, if the distance between the two parallel lines is 1 cm?



Answer: _____ cm^2

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4. John and Mary live in the same building which has ten apartments on each floor. The apartments are numbered consecutively, with 1 to 10 on the first floor, 11 to 20 on the second floor, 21 to 30 on the third floor, and so on. The number of Mary's apartment is equal to John's floor number, and the sum of their apartment numbers is 239. Determine the number of John's apartment.

Answer: _____

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5. Three couples went shopping in a mall. The following facts were known.
   (1) Each person spent a whole number of dollars.
   (2) The three wives spent $2408 among them.
   (3) Lady **A** spent $400 plus half of what Lady **B** spent.
   (4) Lady **C** spent $204 more than Lady **A** .
   (5) Mr. **X** spent four times as much as his wife.
   (6) Mr. **Y** spent $8 more than his wife.
   (7) Mr. **Z** spent one and a half times as much as his wife.
   (8) The three couples spent altogether $8040.

   Determine the three husband-wife pairs.

Answer: **Mr. X - Lady** _____

Mr. Y - Lady _____

Mr. Z - Lady _____

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6. A nine-digit number contains each of the digits 1, 2, 3, 4, 5, 6, 7, 8 and 9 exactly once, and every two adjacent digits of this nine-digit number form a two-digit number which is the product of two one-digit numbers. Determine this nine-digit number.

Answer: _____

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7. Sixteen students, labelled A to P, are writing a five-day examination. On each day, they write in four rooms, with four of them in a room. No two students are to be in the same room for more than one day. The published schedule, as shown in the diagram below, contains smudges, and unreadable entries are replaced by Xs. Replace each X by the correct letter.

Room	Day 1				Day 2				Day 3				Day 4				Day 5			
1	A	B	C	D	X	G	I	P	X	X	X	M	X	H	I	X	X	G	X	X
2	E	F	G	H	X	X	X	N	D	F	X	O	X	E	J	X	B	X	J	O
3	I	J	K	L	C	E	L	X	X	H	L	P	A	X	K	X	A	X	X	M
4	M	N	O	P	D	X	K	X	X	X	K	X	B	X	X	X	C	F	X	X

Answer:

Room	Day 1				Day 2				Day 3				Day 4				Day 5			
1	A	B	C	D		G	I	P				M		H	I			G		
2	E	F	G	H				N	D	F		O		E	J		B		J	O
3	I	J	K	L	C	E	L			H	L	P	A		K		A			M
4	M	N	O	P	D		K				K		B				C	F		

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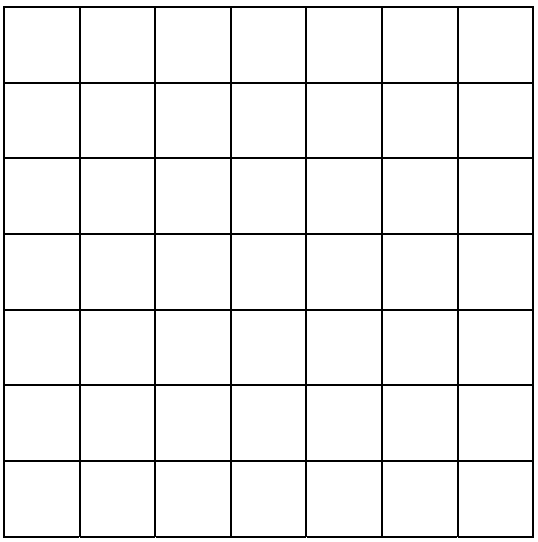
8. A 1×4 alien spaceship is going to land on a 7×7 airfield, occupying 4 of the 49 squares in a row or a column. Mines are placed in some of the squares, and if the alien space ship lands on a square with a mine, it will blow up. Determine the smallest number of mines required to guarantee that the alien spaceship will be blown up, wherever it lands on this airfield. Show where the mines should be placed.



Answer: _____

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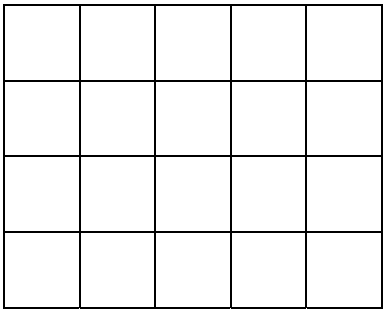
9. All but one of the numbers from 1 to 21 are to be filled into the squares of a 4×5 table, one number in each square, such that the sum of all the numbers in each row is equal to a number, and the sum of all the numbers in each column is equal to another number. Find all possible values of the number which is deleted, and find a way of filling in the table for each number that was deleted.



Answer: _____

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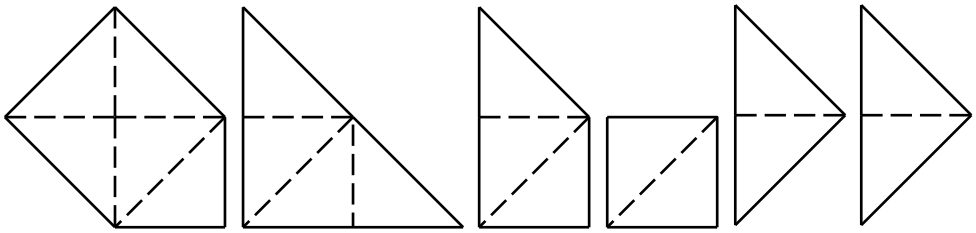
10. Each of the six pieces shown in the diagram below consists of two to five isosceles right triangles of the same size. A square is to be constructed, without overlap, using n of the six pieces. For each possible value of n, give a construction.



Answer: