BULGARIA INTERNATIONAL MATHEMATICS COMPETITION

BIMC 2018

BURGAS • 01.07 - 06.07 • 2018

Elementary Mathematics International Contest

Team Contest

Time limit: 70 minutes

Information:

- You are allowed 70 minutes for this paper, consisting of 10 questions printed on separate sheets. For questions 1, 3, 5, 7 and 9, only numerical answers are required. For questions 2, 4, 6, 8 and 10, full solutions are required.
- Each question is worth 40 points. For odd-numbered questions, no partial credits are given. There are no penalties for incorrect answers, but you must not give more than the number of answers being asked for. For questions asking for several answers, full credit will only be given if all correct answers are found. For even-numbered questions, partial credits may be awarded.
- Diagrams shown may not be drawn to scale.

Instructions:

- Write down your team's name in the space provided on every question sheet.
- Enter your answers in the space provided after individual questions on the question paper.
- During the first 10 minutes, the four team members examine the first 8 questions together, and then altogether discuss them. Then they distribute the questions among themselves, with each team member is allotted at least 1 question.
- During the next 35 minutes, the four team members write down the solutions of their allotted problems on the respective question sheets, with no further communication /discussion among themselves.
- During the last 25 minutes, the four team members work together to write down the solutions of the last 2 questions on the respective questions sheets.
- You may not use instruments such as protractors, calculators and electronic devices.
- At the end of the contest, you must hand in the envelope containing all question sheets and all scratch papers.

English Version

Team: _____ ***Score:*** _____

For Juries Use Only

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

Elementary Mathematics International Contest

TEAM CONTEST

3rd July, 2018, Burgas, Bulgaria

Team：_____ Score：_____

1. There are four contestants and 25 questions in a television quiz show. Each question is attempted by only one contestant, and several points, from 0 to 150, are awarded according to how it is answered. The results for the 25 questions are shown in the table below, without indicating which contestants receive the points.

80	0	40	0	35
50	40	90	60	25
100	30	10	100	0
50	75	150	15	30
30	0	35	0	10

The first contestant gets twice as many points as the third while the second gets three times as many points as the third. The fourth contestant attempts only one question. How many points does he get on that question?

Answer: _____ points

Elementary Mathematics International Contest

TEAM CONTEST

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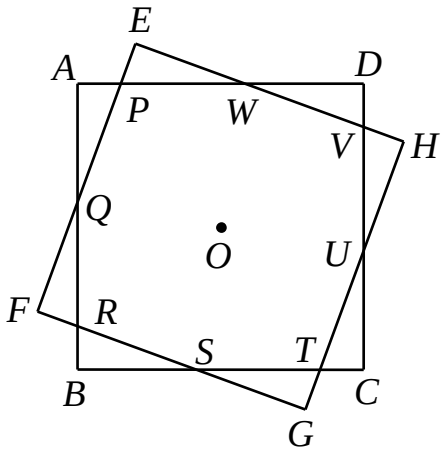
Team：_____ Score：_____

2. In the diagram, *ABCD* and *EFGH* are both unit squares, with a common centre at *O*. If the length of *PW* is equal to $\frac{45}{101}$ units, find the area, in square units, of the octagon *PQRSTUVW*.



Answer: _____ square units

Elementary Mathematics International Contest

TEAM CONTEST

3rd July, 2018, Burgas, Bulgaria

Team：_____ Score：_____

3. Four positive integers are arranged to form a 2×2 table. The product of the two numbers in each row and in each column is computed. These four products are added to the sum of the four numbers in the table, and the result is 2018. What is the sum of the four numbers in the table?

Answer: _____

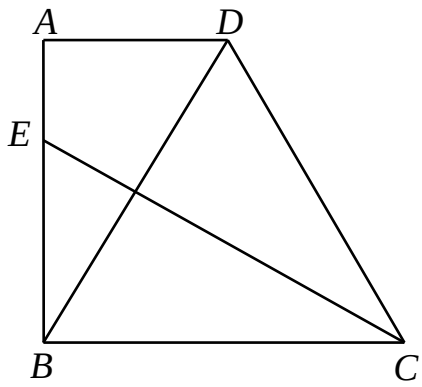
Elementary Mathematics International Contest

TEAM CONTEST

3rd July, 2018, Burgas, Bulgaria

Team：_____ Score：_____

4. In quadrilateral $ABCD$, $\angle ABC = \angle BAD = 90°$. Point E is on AB such that $BE \times (BC - AD) = AE \times BC$. If $BC - AD = 1\text{cm}$ and $\angle ADB = 2\angle BCE$, find the length of BD in cm.



Answer: _____ cm

Elementary Mathematics International Contest

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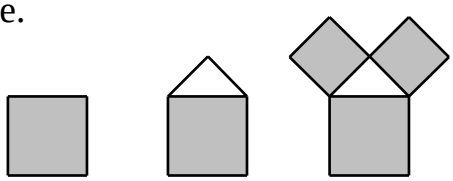
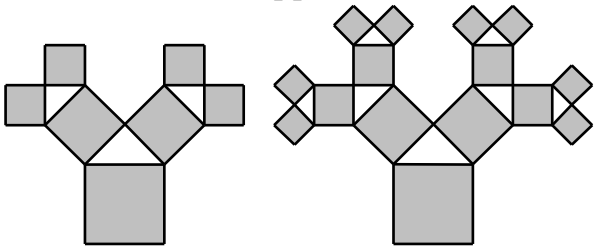
3rd July, 2018, Burgas, Bulgaria

Team : _____ Score : _____

5. A magic crystal is in the shape of a shaded square. On the first day, it grows a white head in the shape of an isosceles right triangle whose hypotenuse is a side of the square, and two shaded ears in the shape of squares each with a leg of the white triangle as a side.



The diagram above shows what it looks like after the first day. On the second day, each ear grows a head and two ears like in the first day. The diagram below shows what it looks like after the second and third day. Note that the new head always grows on the side of the ear opposite to the head of the day before.



The crystal explodes whenever two of its ears touch. After how many days will this happen?

Answer: _____ days

Elementary Mathematics International Contest

TEAM CONTEST

3rd July, 2018, Burgas, Bulgaria

Team：_____ Score：_____

6. Four different three-digit numbers have the same hundreds digit. Their sum is divisible by three of them. Find the remainder when the sum is divided by the fourth number.

Answer: _____

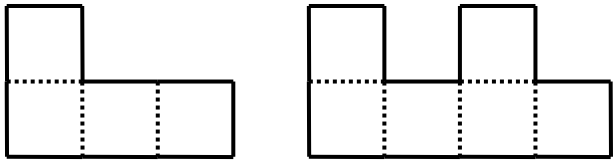
Elementary Mathematics International Contest

TEAM CONTEST

3rd July, 2018, Burgas, Bulgaria

Team：_____ Score：_____

7. Use each of the two pieces below exactly once to form a shape which can be divided into two parts by a line such that the two parts are mirror images of each other across the line. The pieces may be rotated and/or reflected multiple times, but they may not overlap. Find two solutions.



Answer: _____

Elementary Mathematics International Contest

TEAM CONTEST

3rd July, 2018, Burgas, Bulgaria

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8. At noon, Donny and Ronny started from Burgas towards Varna while Lonny started from Varna towards Burgas. The three boys are riding their bicycles at different constant speeds. At 13:00, Ronny was midway between Donny and Lonny, and at 13:20, Lonny was midway between Donny and Ronny. At what time will Donny be midway between Ronny and Lonny?

Answer: _____ :

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9. A town has 25 building blocks in a 5×5 arrangement. Each block has a height from 1 to 5. There is a block of each height in every row and every column. Twenty observers are standing outside looking in. Each observer records the number of blocks he can see, which are blocks not hidden behind a taller block. Determine the height of each block.

	4	3	2	2	1	
4						1
3						3
4						2
2						2
1						2
	1	2	4	2	2	

	4	3	2	2	1	
4						1
3						3
4						2
2						2
1						2
	1	2	4	2	2	

Answer: _____

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TEAM CONTEST

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10. The greatest common divisor of four positive integers, not necessarily distinct, is equal to 1. Their least common multiple is equal to their sum. Find the number of possible values of the sum of these four numbers.

Answer: _____