BULGARIA INTERNATIONAL MATHEMATICS COMPETITION

BIMC 2018

BURGAS • 01.07 - 06.07 • 2018

Elementary Mathematics International Contest

Individual Contest

Time limit: 90 minutes

Information:

- You are allowed 90 minutes for this paper, consisting of 15 questions to which only numerical answers are required.
- Each question is worth 10 points. 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.
- Diagrams shown may not be drawn to scale.

Instructions:

- Write down your name, your contestant number and your team's name on the answer sheet.
- Enter your answers in the space provided on the answer sheet.
- You must use either a pencil or a ball-point pen which is either black or blue.
- 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 the question paper, your answer sheet and all scratch papers.

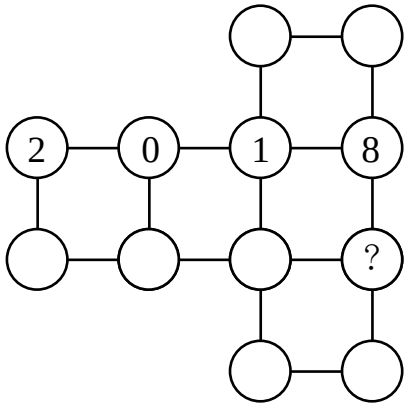
English Version

Team: _____ ***Name:*** _____ ***No.:*** _____

1. Mark went to a movie which started at 19：00. He went to the toilet after watching one-third of the movie. When he came back, the rest of the movie was seven times as long as the time he was in the toilet. At 21：12, the time from his return from the toilet was six times the rest of the movie. At what time did the movie end?

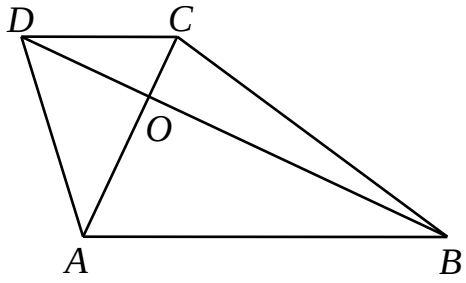
2. Peter, Anna and Andria bought three identical cars at the same price. Peter initially paid €1300, Anna €1000 and Andria €600. Every month after that, Peter paid €180, Anna €240 and Andria €280 until the price of each car have been exactly paid by the respective person. What is the lowest possible price, in Euros, of the car?

3. The eight empty circles in the diagram below are to be filled in, using each of the integers 3, 4, 5, 6, 7, 9, 10 and 11 exactly once, to make the sums of the four numbers at the corners of each square the same. Find the number inside the circle marked with a "?".



4. Using the same two digits, Andrei and Natalie write down different six-digit numbers. For each of these numbers, the three digits in odd places are the same and the three digits in even places are also the same. If 5 times Andrei's number is equal to 6 times Natalie's number, what is Andrei's number?

5. In quadrilateral $ABCD$, AB is parallel to CD, and the diagonals AC and BD are perpendicular and intersect at point O. If $AO = p$ cm, $CO = q$ cm, $BO = r$ cm, $DO = s$ cm, $AB = 7$ cm and $CD = 3$ cm, what is the value of $pq + rs$?

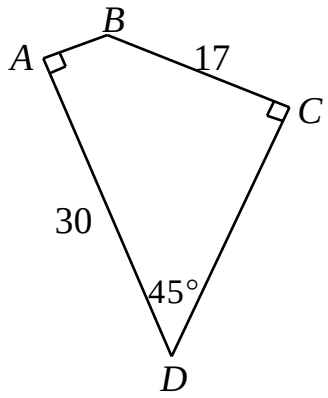


6. The sum of three 3-digit numbers is 2418. All nine digits of those numbers are different, and two of those numbers are multiples of nine. What is the smallest possible value of the third number?

7. Given that $\overline{BIMC}+\overline{BI}+\overline{MC}+B+I+M+C-1=2018$, where *B*, *I*, *M* and *C* are distinct digits, what is the largest possible value of the 4-digit number $\overline{BIMC}$?

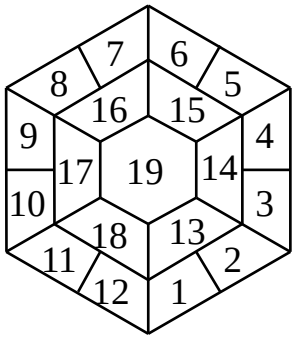
8. Using each of four distinct non-zero digits once, we can construct 24 different four-digit numbers. The second smallest of the numbers is a multiple of 5. The second largest is even but not divisible by 4. The positive difference between the fifth smallest number and the fifth largest number lies between 3000 and 4000. What is the maximum value of the largest of the 24 numbers?

9. In quadrilateral *ABCD*, $AD=30\,\text{cm}$, $BC=17\,\text{cm}$, $\angle ADC=45°$ and $\angle BAD=\angle BCD=90°$. What is the area, in cm^2, of *ABCD*?

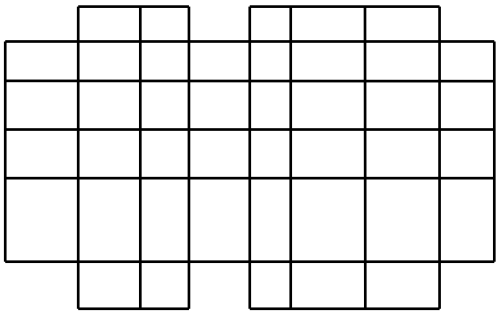


10. The sum of the ages of the three boys in a family is 25 and the product of the three ages is 360. This is also true about the ages of the three girls in the same family. The middle boy is older than the middle girl. How much older is the middle boy than the middle girl?

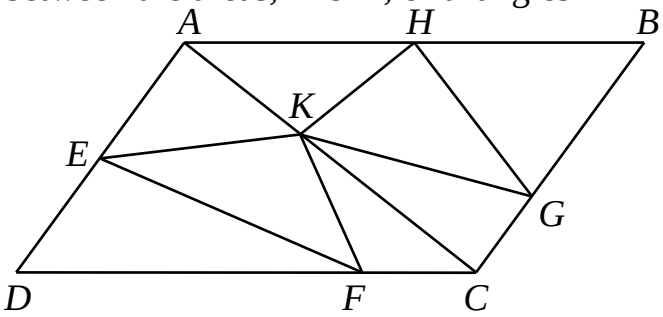
11. The diagram below shows a hexagonal room. Its floor is covered with 19 numbered rugs of four different colors. Two rugs with a common segment along their borders must have different colors. Only two colors are used in the middle layer, and at most one rug in the outer layer has the same color as the central rug. Two coloring patterns are different if the color of at least one rug has changed. How many different coloring patterns are there?



12. How many rectangles are there in the figure below?



13. In parallelogram *ABCD*, *E* is the midpoint of *AD*, *H* is the midpoint of *AB*. *G*, *F* and *K* are points on *BC*, *CD* and *CA* respectively such that $BG = 2GC$, $DF = 3FC$ and $2CK = 3KA$. The area of parallelogram *ABCD* is 240 cm^2. What is the difference between the areas, in cm^2, of triangles *EFK* and *HKG*?



14. The unit squares of a 8×8 table are to be filled in with the integers from 1 to 64, using each exactly once. You can choose where to put the number 1. Then the number 2 must be in an adjacent square in the same row or the same column as the square containing the number 1, the number 3 must be adjacent to the number 2, and so on. What is the maximum number of prime numbers you can get in the same row?

15. How many rectangular regions (including square regions) of the table below have the property that the sum of the numbers in them is divisible by 49?

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35
36	37	38	39	40	41	42
43	44	45	46	47	48	49