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The Seventh International Young Mathematicians' Convention

IYMC-Mathematica 2016

2nd to 5th December 2016

Organised by: City Montessori School, Gomti Nagar Campus-I, Lucknow, India

International Young Mathematicians' Convention Junior Level

Team Contest

Time limit: 60 minutes

Information:

- You are allowed 60 minutes for this paper, consisting of 6 questions printed on separate sheets. For questions 1, 3 and 5, only numerical answers are required. For questions 2, 4 and 6, 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 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 on the spaces provided on every question sheet.
- Enter your answers in the spaces provided after individual questions on the question paper.
- During the first 10 minutes, the three team members examine the questions together, with discussion. Then they distribute the questions among themselves, with each team member allotted at least 1 question.
- During the next 50 minutes, the three team members write down the solutions to their allotted problems on the respective question sheets, with no further communication among themselves.
- 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.

Team: _____ **Score:** _____

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No.	1	2	3	4	5	6	Total
Score							
Score							



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TEAM CONTEST

Team : _____ Score : _____

1. A function $f(x, y)$ satisfies $f(x, y) + f(x, z) = f(x, y + z + 3)$ and $f(x, y) + f(z, y) = f(x + z + 4, y)$.
Find the value of $f(2016, 2017)$ if $f(1, 1) = 1$.

Answer: _____



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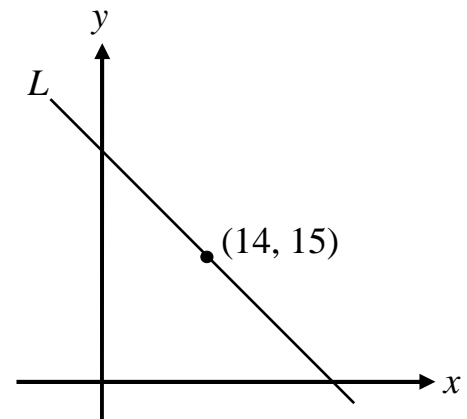
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TEAM CONTEST

Team : _____ Score : _____

2. In a rectangular coordinate plane, straight line L passes through the point $(14, 15)$, the x -coordinate in the intersection point of L and x -axis is a prime number, the y -coordinate in the intersection point of L and y -axis is a non-zero positive integer. How many possible straight line L will meet all the given conditions?



Answer: _____



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3. A, B, C, D and E participated in a marathon. At the start, A is leading, B is in the second place, C is in the middle, D is in the fourth place and E is last. During the marathon, A trades place with the other four runners a total of 11 times, while B does that 11 times, C does that 22 times and E does that 44 times. If A finished ahead of D, who is in the second place among these five runners at the finish?

Answer: _____



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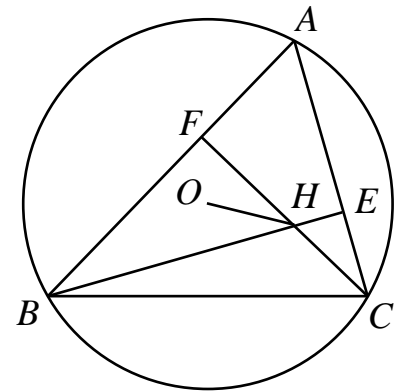
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TEAM CONTEST

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4. In the acute triangle ABC , $\angle A = 60^\circ$. Two altitudes, BE and CF , intersect at point H . Point O is the circumcentre of triangle ABC , as shown in the diagram below. Find the measure of $\angle FHO$, in degrees.



o

Answer: _____



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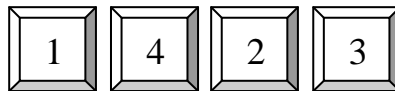
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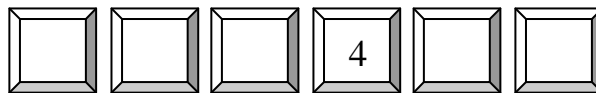
TEAM CONTEST

Team : _____ Score : _____

5. A code of the coffer is an arrangement of numbers satisfied that the differences between neighbours are all different. For example, the numbers



have differences 3, 2 and 1 — all different. Now the code is the numbers from 1 to 6 that are arranged with the condition, and with 4 in the fourth position from left to right,



Find the sum of the possible values of the rightmost position of the code.

Answer: _____



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TEAM CONTEST

Team : _____ Score : _____

6. A positive integer consists of distinct digits each of which is a divisor of the number. What is the largest number that fit the condition?

Answer: _____