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The Eighth International Young Mathematicians' Convention

# IYMC-Mathematica 2018

2nd to 5th December 2018

*Organised by: City Montessori School, Gomti Nagar Campus-1, 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 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 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 6 questions together, and altogether discuss them. Then they distribute the questions among themselves, with each team member is allotted at least 1 question.
- During the next 50 minutes, the three team members write down the solutions of their allotted problems on the respective question sheets, with no further communication / discussion 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 scrap papers.

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

## For Juries Use Only

| No. | 1 | 2 | 3 | 4 | 5 | 6 | Total |
|---|---|---|---|---|---|---|---|
| Score | | | | | | | |
| Score | | | | | | | |

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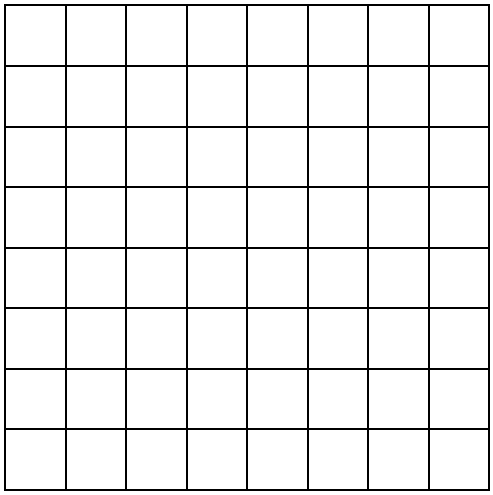
## TEAM CONTEST

Team：_____ Score：_____

1. A number is placed on each unit square of a checkerboard such that the numbers on any two unit squares that share a common side differ by 1. It is known that one of the unit squares is already filled up with the number 3, and another one with the number 17, find the total sum of the numbers filled on both diagonals of the checkerboard.



Answer: _____

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Team：_____ Score：_____

2. Let $f$ be a function for all $x$ and $y$, where $x$ and $y$ are integers.
If $f(f(x)+y)-f(y+7)=x$ and $f(2)=5$, then what is the value of $f(2018)$?

Answer: _____

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# TEAM CONTEST

Team：_____ Score：_____

3. There are twelve married couples seated around a circular table such that each pair of the husband is seated exactly in front of his respective wife. If we allowed man and woman swap their seat, then what is the minimum number of swapping needed so that each pair of couple is seated next to each other?

Answer: _____ swaps

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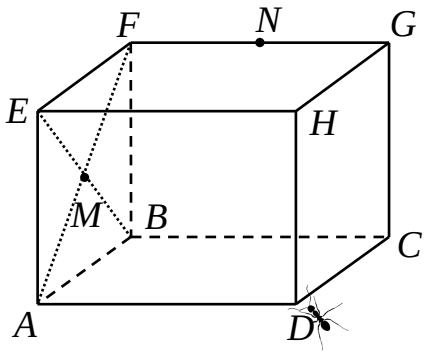
4. In the figure shown below, a cuboid *ABCD-EFGH* have side lengths $AE = 12$ cm, $AB = 14$ cm and $AD = 16$ cm. It is known that point *M* is the centre of the rectangle *ABCD* and point *N* is the midpoint of the line segment *FG*. It is also known that there is a piece of sugar at both points *M* and *N*, and there is an ant at point *D*. What is the minimum distance, in cm, that the ant must travel in order to get the sugar?




Answer: _____ cm

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## TEAM CONTEST

Team：_____ Score：_____

5. What is the remainder of the sum of the squares of 2018 positive integers when divided by 2018 if the difference between the product of any 2018 of them and the remaining one is divisible by 2018?

Answer: _____

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# TEAM CONTEST

Team：_____ Score：_____

6. We know that each of the other 25 students in Peter's class has a different number of friends in the class. What is the minimum possible number of friends Peter has in the class?

Answer: _____ friends