注意：

允許學生個人、非營利性的圖書館或公立學校合理使用本基金會網站所提供之各項試題及其解答。**可直接下載而不須申請。**

重版、系統地複製或大量重製這些資料的任何部分，必須獲得財團法人臺北市九章數學教育基金會的授權許可。

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International Young Mathematicians' Convention
Junior Level

Individual Contest
Time limit: 90 minutes

Information:

- You are allowed 90 minutes for this paper, consisting of 8 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 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 spaces 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.

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

1. Suppose every term in the sequence 1, 2, 1, 2, 2, 2, 1, 2, 2, 2, 2, 2, 1, … is either 1 or 2. If there are exactly $(2k-1)$ twos between the k-th one and the $(k+1)$-th one, find the sum of its first 2016 terms.

2. Find all ordered triples (x, y, z) of integers satisfying
$$x^2 + y^2 + z^2 + 3 < xy + 3y + 2z.$$

3. There are 2016 bus in a row. Each weighs an integral numbers of kilograms. Except for the rightmost one, the sum of the weight of each bus and twice the weight of its right neighbour is 36000 kg. Determine the weight of the rightmost bus in kg.

4. Let n be a positive integer which is not less than 2016 so that $\dfrac{n-2016}{2116-n}$ is a positive square integral number. Find the sum of all of the possible values of n.

5. All vertices of a dodecahedron are white initially. Some vertices of the dodecahedron are to be painted red so that each face contains a red vertex. What is the largest number of vertices that are white?

6. A 9-digit number consists of the digits 1, 2, 3, …, 9 in some order. Consider all triples of consecutive digits and find the sum of these seven 3-digit numbers. What is the smallest possible value of this sum?

7. The diagram below shows a triangle divided by seven lines. Four of them join the top vertex to points which divide the base into five equal parts. Three of them are parallel to the base and evenly spaced. If the area of the whole triangle is 900 cm^2, what is the area, in cm^2, of the shaded quadrilateral?
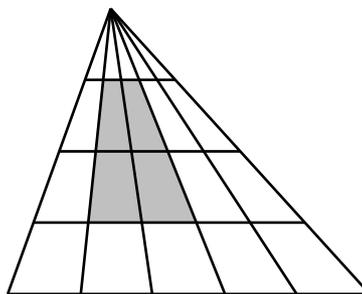
8. The four dots at the corners of a 5 by 5 array are removed, as shown in the diagram below. In how many different ways can we choose 3 of the remaining 21 points such that they lie on a straight line?