Malaysia International Mathematics Olympiad Competition 2017
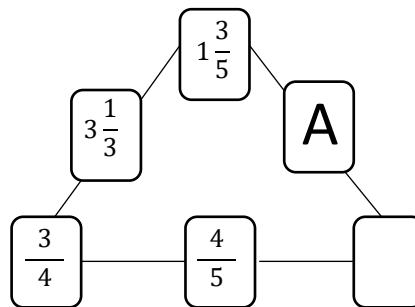
26th November, 2017
11.10 am – 12.10 pm

- Upper Primary Paper-

TEAM CONTEST

Time：60 minutes

Jointly Organised by :
Persatuan Matematik Olimpiad Malaysia (PERMATO)
Sekolah Jenis Kebangsaan (Cina) Lai Meng Bukit Jalil, Kuala Lumpur
Sekolah Jenis Kebangsaan (Cina) Lick Hung，Subang Jaya
E Mathematics Olympiad System

马来西亚数学奥林匹克学会
黎明华文学校
力行国民型华文学校
数学奥林匹克学研中心
联合主办

Instructions:

- Do not turn to the first page until you are told to do so.
- Remember to write down your team name in the space indicated on every page.
- There are 10 problems in the Team Contest, arranged in increasing order of difficulty. Each question is printed on a separate sheet of paper. Each problem is worth 10 points. **For all problems only numerical answers are required.**
- The four team members are allowed 10 minutes to discuss and distribute the first 8 problems among themselves. Each student must attempt at least one problem. Each will then have 35 minutes to write the answers of their allotted problem independently with no further discussion or exchange of problems. The four team members are allowed 15 minutes to solve the last 2 problems together.
- No calculator or calculating device or electronic devices are allowed.
- Answer must be in pencil or in blue or black ball point pen.
- All papers shall be collected at the end of this test.

For Juries Use Only

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

School（学校）：_____ Student ID （编号）：_____

Name（姓名）：_____

1. What is the fraction written on card A, if the products of the three fractions on either side of the triangle are the same?

   将写有分数的卡片，排成下面的图形。三角形的边上每 3 个分数的乘积都相等。问卡片 A 的数字是多少？

Answer：_____

School（学校）： _____ Student ID （编号）： _____

Name（姓名）： _____

2. n is a positive integer, $[n]$ is the largest integer not greater than n, so that

$$\left[\frac{n}{2}\right] + \left[\frac{n}{3}\right] + \left[\frac{n}{4}\right] + \left[\frac{n}{5}\right] + \left[\frac{n}{6}\right] = 69,$$

What is the product of all the possible values of n ?

已知 n 为正整数，$[n]$ 表示不超过 n 的最大整数。使得

$$\left[\frac{n}{2}\right] + \left[\frac{n}{3}\right] + \left[\frac{n}{4}\right] + \left[\frac{n}{5}\right] + \left[\frac{n}{6}\right] = 69,$$ 试求 n 的所有可能值的乘积。

Answer： _____

3. ABCD is a square of side length $14\,cm$. Semicircles with diameters BC and DC are drawn outside $ABCD$. Another $\frac{3}{4}$–circle with center A and radius AB is drawn outside $ABCD$. If N is the midpoint of an arc DC and M is the midpoint of an arc BC, find the area of the shaded region shown in the figure (use $\pi = \frac{22}{7}$).

正方形 ABCD 的边长为 14 cm，正方形外面有以 BC 和 DC 为直径的半圆，以及以 A 为圆心，AB 长为半径的 $\frac{3}{4}$ 圆。若 N、M 分别是弧 DC 与 BC 的中点，求阴影部分面积。（$\pi = \frac{22}{7}$ ）
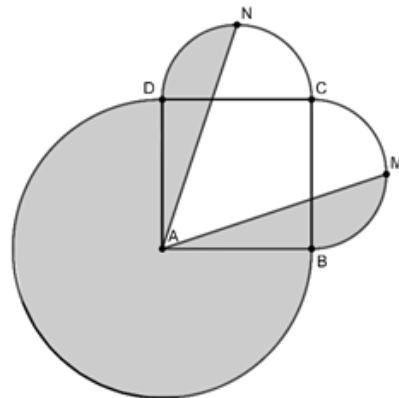
Answer ： _____cm^2

School（学校）：＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿ Student ID （编号）：＿＿＿＿＿＿

Name（姓名）：＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿

4. How many ways could the Spiderman gets the Green Goblin by following the arrows, without repeating any route ?

请问蜘蛛侠沿着箭头方向，一共有多少种不同的路线可以捉到外星人？不可重复已走过的路线或违反箭头的指示。
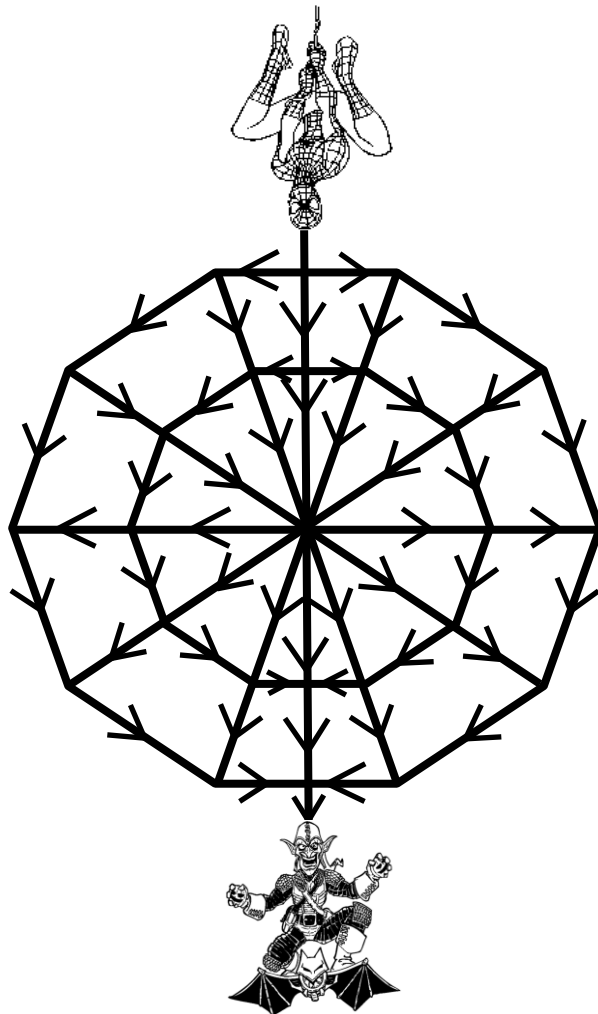
Answer ：＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿

School(学校)：_____ Student ID （编号）：_____

Name（姓名):_____

5. Among the integers that are larger than 2017, find the numbers which have equal quotient and remainder divided by 217. What is the sum of all these numbers?

请在大于 2017 的整数中，找出所有被 217 除后商与余数相等的数，则这些数的和是多少？

Answer ：_____

School(学校)：_____ Student ID （编号）：_____

Name （姓名)：_____

6. Colour the 6 surfaces of the cube with 6 different colours, capture the cube from different angles with a camera, develop all the pictures taken, pick photos with different colours combination, how many photos of these at most ?

将一个正方体的六个面，分别涂上六种不同的颜色，用照相机以不同的角度各拍一张照片。印制出照片后，把所拍摄的面的颜色种类不同的照片全部挑选出来，请问：最多可以选出多少张照片？

Example : The below 3 photos are considered photos of different colours combination.

例如：下面的三张照片，所拍摄到的面的颜色种类不同：

| 红 Red | | 红 Red | 黄 Yellow |
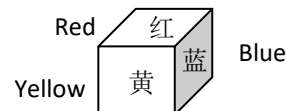
The below 2 photos are also considered as photos of different colours combination.

下面的两张照片，所拍摄到的面的颜色种类不同：
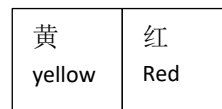
| 红 Red | 黄 Yellow | | 黄 yellow | 红 Red |

Answer : _____ piece(s)（张）

7. Below 4 persons are describing the same two-digit integer :

  A : has a remainder of 1 when divided by 2, has a remainder of 2 when divided by 3.

  B : has a remainder of 3 when divided by 4, has a remainder of 4 when divided by 5.

  C : has a remainder of 5 when divided by 6, has a remainder of 6 when divided by 7.

  D : has a remainder of 7 when divided by 8, has a remainder of 8 when divided by 9.

All of them only gave one correct description, what is the two-digit integer they are referring?

有 A、B、C、D 4 个人，各对某个两位整数的性质用两句话叙述：

  A：“用 2 除余 1”，“用 3 除余 2”。
  B：“用 4 除余 3”，“用 5 除余 4”。
  C：“用 6 除余 5”，“用 7 除余 6”。
  D：“用 8 除余 7”，“用 9 除余 8”。

已知 4 个人中每人都只说对了一句话，而另一句话是错的。
请问这个两位整数是几?

Answer : ＿＿＿＿＿＿＿＿＿＿＿＿＿＿

School(学校)：_____ Student ID （编号）：_____

Name （姓名)：_____

8. The below 5 fractions are simplified proper fractions, in order to fulfil the inequality, please choose denominators which give minimum sum. A, B, C, D and E are positive integers, what is the sum of these 5 integers ?

$$\frac{1}{A} > \frac{2}{B} > \frac{3}{C} > \frac{4}{D} > \frac{5}{E} , \qquad A + B + C + D + E = ?$$

下式中五个分数都是最简真分数，要使不等式成立，请选择分母使得这些分母的和最小。

A、B、C、D、E 都是正整数，那么 A + B + C + D + E = ?

$$\frac{1}{A} > \frac{2}{B} > \frac{3}{C} > \frac{4}{D} > \frac{5}{E}$$

Answer :_____

9.   Below is a 3D Tic-Tac-Toe. 2 players take turns placing their markers in blank holes in the array. The first player to achieve four of his own markers in a row wins. The winning row can be horizontal, vertical, or diagonal on a single board as in regular tic-tac-toe, or vertically in a column, or a diagonal line through four boards. In order to have a marker at all of the winning lines, at least how many markers you will need to place ?

下图是 3 三维圈叉游戏。两人轮流把自己颜色的棋子放入空着的洞中，最先将 4 个同色的棋子连成一条直线的人获胜。连线的方法可以是水平的、垂直的、或是有角度的（如下图）。若要使所有可能的直线都至少包含一个你的棋子，你最少需要多少个棋子？
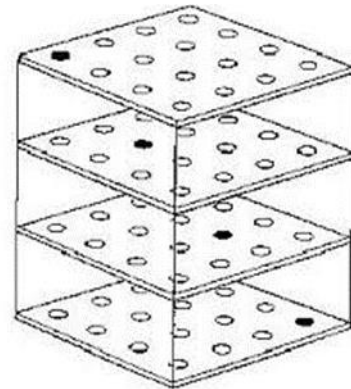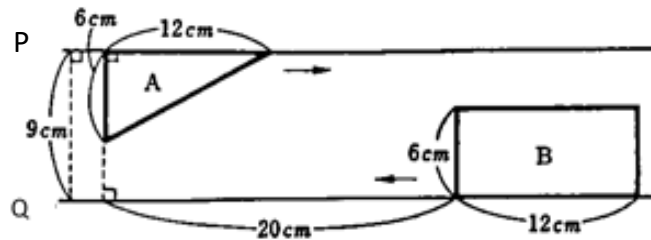

Answer ：_____

10. As shown in the below diagram, 2 parallel lines have a distance of 9cm. A right triangle, A is departing from P along the parallel line at the speed of 1cm per second, while a rectangle, B is departing towards Q along another parallel line at the speed of 3cm per second. What is the time range when the overlapping area of A & B is consistent ?

下图有两条平行线，相距9cm。其间有直角三角形A与长方形B。A沿P直线以每秒1cm的速度，B沿Q直线以每秒3cm的速度依箭头方向间始移动。A与B重叠之面积保持一定的值不变的时段是从间始移动后的几秒到几秒之间？

Answer ：＿＿＿＿＿＿＿＿＿＿＿