

第一屆全港小學數學挑戰賽(2014-2015)
The First Annual Hong Kong Primary Mathematics Challenge (2014-2015)

決賽 (二零一五年三月廿八日)
Final (28th March, 2015)

小六組	組別項目	題目紙
Primary 6	Group Event	Question Paper

參賽者須知 Instructions to Contestants

1. 在比賽過程中，參賽者必須將准考證放在桌上。
 You should place your Admission Form on your desk for the whole session.
2. 於比賽期間必須關掉所有手提電話、通訊工具及其他響鬧裝置。
 During the competition, you should switch off your mobile phone and any other electronic or communication devices that can emit sound.
3. 本項目以筆試形式舉行，須於限時 45 分鐘內完成所有題目。
 Contestants should finish ALL questions in this 45-minutes written test.
4. 在答題紙上填寫學校名稱、參賽者姓名及班級、參賽者編號、隊伍編號、比賽試場、座位編號。
 Write your name, class, admission number, team number, venue, seat number and school name on the front cover of your answer sheet.
5. 參賽者於比賽時只准使用大會提供之草稿紙。
 You can only use the rough work sheets provided by the organizer.
6. 參賽者不可於比賽中使用計算機。
 The use of calculators is NOT allowed.
7. 每題只需把答案填寫在大會提供之答題紙上，否則不予評分。參賽者不需填寫計算步驟。
 Put your answers on the answer sheet provided, otherwise, the answers will not be marked. You are not required to show your working out.
8. 除非問題特別聲明，分數的答案須化至最簡。
 Unless otherwise stated by the question, answers in the form of fractions should be expressed in their simplest form.
9. 除特殊情況外，參賽者於本項目完結前不能提早交卷或離場。
 Under normal circumstances, contestants are not allowed to leave the contest venue before the end of this session.
10. 違反比賽規則者有可能被取消參賽資格。
 Any contestant who violates the rules and regulations of the competition might risks disqualification.
11. 參賽者如對比賽過程或試題內容有任何疑問或爭議，參賽者須於當天比賽結束後立即向大會提出，否則不予受理。大會保留是次比賽的所有最終決定權。
 If you have any queries, you should contact the officer-in-charge immediately after the competition. Late queries will not be entertained. The decision of the organizing committee will be final.

時限：四十五分鐘
Time allowed: 45 minutes

總分：400
Total marks: 400

1. 已知 2015 年 1 月 1 日是星期四。問 2006 年 1 月 1 日至 2015 年 12 月 31 日共有多少個星期日？
(30 分)

It is known that 1st January 2015 is Thursday. How many Sundays are there from 1st January 2006 to 31st December 2015?
(30 marks)

2. 如果 $\frac{ab}{a+b} = \frac{1}{5}$, $\frac{bc}{b+c} = \frac{1}{7}$, $\frac{ac}{a+c} = \frac{1}{8}$; 求 $\frac{abc}{ab+bc+ca}$ 的值。
(30 分)

If $\frac{ab}{a+b} = \frac{1}{5}$, $\frac{bc}{b+c} = \frac{1}{7}$, $\frac{ac}{a+c} = \frac{1}{8}$, find the value of $\frac{abc}{ab+bc+ca}$.
(30 marks)

3. 試求 $\left(1 - \frac{1}{2^2}\right)\left(1 - \frac{1}{3^2}\right) \times \dots \times \left(1 - \frac{1}{2014^2}\right)\left(1 - \frac{1}{2015^2}\right)$ 的值。
(30 分)

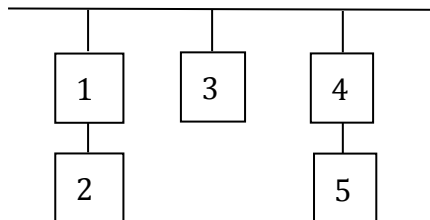
Evaluate $\left(1 - \frac{1}{2^2}\right)\left(1 - \frac{1}{3^2}\right) \times \dots \times \left(1 - \frac{1}{2014^2}\right)\left(1 - \frac{1}{2015^2}\right)$.
(30 marks)

4. 已知 $\frac{1}{7} = 0.\dot{1}4285\dot{7}$, 將 $\frac{30}{7}$ 化成循環小數後, 求它小數點後第一百位。
(25 分)

Given $\frac{1}{7} = 0.\dot{1}4285\dot{7}$, if $\frac{30}{7}$ is converted to recurring decimal, find the hundredth digit after the decimal point.
(25 marks)

5. 於某一次射擊比賽中, 5 個靶子掛成三直列 (如圖)。射手必須按下列規則擊碎靶子：
每次先挑選一列, 然後必須首先擊碎該列最低的一個靶子, 之後可繼續擊碎該列其餘的靶子, 或挑選其他列進行射擊。

若每次都遵循這一規則, 則擊碎全部靶子可以有多少種不同的次序? (30 分)



In a shooting competition, 5 targets are placed in 3 columns as shown. A player must shoot according to the following rules:

Before shooting, he chooses a column of targets. He must start shooting the lowest target of the column chosen. Then he may continue to shoot the remaining target of the same column, or choose another column of targets to shoot.

According to the rules, how many different ways of shooting all the targets are there? (30 marks)

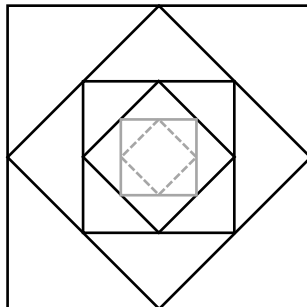
6. 三輛汽車 A 、 B 、 C 各以均速從甲地開往乙地，已知 C 於正午十二時出發， B 比 C 遲 5 分鐘出發，出發後 20 分鐘追上 C ； A 比 B 遲 10 分鐘出發，出發後 50 分鐘追上 C ，試求 A 於何時追上 B 。
(35 分)

3 cars A , B and C drove from City X to City Y at constant speeds. C started at 12:00 noon. B started 5 minutes later than C and met C after 20 minutes. A started 10 minutes after B started and met C after 50 minutes. When would A meet B ?
(35 marks)

7. 一個正整數是 75 的倍數，且有 75 個正因數，求這數的最小值。
(40 分)
A positive number is a multiple of 75 and it has 75 positive factors. Find the least possible value of the number.
(40 marks)

8. 一次數學測驗共有 4 條題目，學生每題可取 0、1、2 或 3 分，問學生共有多少個不同的方式在這 4 條題目中取得 8 分。
(30 分)
There are 4 questions in a Mathematics test. A student can score 0, 1, 2 or 3 marks for each question. For these 4 questions, find the number of different ways of scoring 8 marks.
(30 marks)

9. 將正方形四邊的中點相連可得一較小的正方形，依此方式不斷繪畫可得無數較小的正方形（見圖），若第一個正方形的周界為 160 cm，求第十個正方形的面積。
(30 分)
By joining the mid-points of the sides of a square, we can form a smaller square. Repeating the construction indefinitely, we can get an infinite number of smaller squares (see figure). If the perimeter of the first square is 160 cm, find the area of the 10th square.
(30 marks)



10. 如果 $f(x) = \frac{x}{1+x}$ ，求

$f(2015) + f(2014) + \cdots + f(2) + f(1) + f(0) + f(1) + f\left(\frac{1}{2}\right) + \cdots + f\left(\frac{1}{2014}\right) + f\left(\frac{1}{2015}\right)$ 的值。
(30 分)

If $f(x) = \frac{x}{1+x}$, find the value of

$f(2015) + f(2014) + \cdots + f(2) + f(1) + f(0) + f(1) + f\left(\frac{1}{2}\right) + \cdots + f\left(\frac{1}{2014}\right) + f\left(\frac{1}{2015}\right)$.

(30 marks)

11. *A*、*B*、*C* 三位教師住在香港島、九龍或新界；他們任教中文、英文或數學；如果
- (i) *A* 老師不是住在香港島，*B* 老師不是住在九龍；
 - (ii) 住在香港島的教師不教英文；
 - (iii) 住在九龍的教師是教數學；
 - (iv) *B* 老師不教中文。

請完成以下表格。

(40 分)

Three teachers *A*, *B* and *C* live in Hong Kong Island, Kowloon or New Territories. They teach Chinese, English or Mathematics. If

- (i) teacher *A* doesn't live in Hong Kong Island and teacher *B* doesn't live in Kowloon,
- (ii) the teacher who lives in Hong Kong Island doesn't teach English,
- (iii) the teacher who lives in Kowloon teaches Mathematics,
- (iv) teacher *B* doesn't teach Chinese.

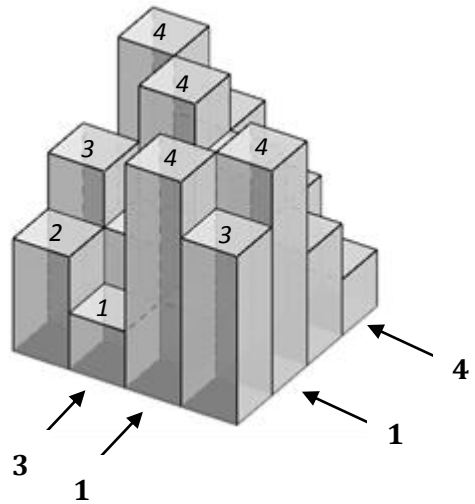
Complete the following table.

(40 marks)

	Live in 住在	Teach 任教
Teacher A A 老師		
Teacher B B 老師		
Teacher C C 老師		

12.

	1 ↓		3 ↓		
1 →	4	3	2	1	← 4
	1	4	3	2	
2 →	3	2	1	4	← 1
	2	1	4	3	
		3 ↑	1 ↑		



在以上 4×4 的方格中，1 至 4 分別代表高度為 1 至 4 的柱子。右圖表示其對應的立體圖像。方格外圍的數字表示沿箭號方向可看見多少根柱子(3 表示可看到 3 根不同高度的柱子、4 表示可看到 4 根不同高度的柱子，高的柱子會遮蓋較矮的柱子)。每一行或列 1、2、3、4 只會出現一次。
 In the above 4×4 table, 1 to 4 represents the pillar with height of 1 to 4 units respectively. The figure on the right side is the corresponding 3-dimensional diagram. The numbers surrounding the table tell you how many pillars you can see in the direction of the arrow. ('3' means 3 pillars with different heights can be seen, '4' means 4 pillars with different heights can be seen, you can't see a shorter pillar behind a taller one.) Every row/column contains 1 to 4 exactly once.

根據以上的規則，將 1 至 4 填入以下 4×4 的方格中。

(50 分)

According to the rules, fill 1 to 4 into the following 4×4 table.

(50 marks)

		3 ↓			
2 →					← 2
3 →					
					← 2
	3 ↑	3 ↑			

試卷完 END OF PAPER