

第十屆全港小學數學挑戰賽(2023-2024)
The 10th Hong Kong Primary Mathematics Challenge (2023-2024)

決賽 (二零二三年十二月二日)
Final (2nd December, 2023)

小六組	組別項目	試卷
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、參賽者編號、座位編號。
Write your name, admission number, 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 sheet 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 the steps in your calculations.
8. 作答時，每題的答案均須以 0 至 9999 之間的整數表示，小於 1000 的答案均須補「0」以湊足四位數字。
Each answer must be given as an integer between 0 and 9999. In case of an answer less than 1000, leading zeros should be included to make up four digits.
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 risk 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：45 分鐘
Time Allowed: 45 minutes

總分：400
Total marks: 400

1. 將 k 塊曲奇分給 200 名學生，每名學生至少分得一塊曲奇，且沒有 4 名學生分得相同數目的曲奇，求 k 的最小值。 (16 分)

Divide k cookies among 200 students such that each student receives at least one cookie and no four students obtain same number of cookies. Find the least value of k . (16 marks)

2. 已知 X 和 Y 為正整數，使得 $X^2 - Y^2 = 2024$ ，求 X 的最大值。 (16 分)

It is known that X and Y are positive integers such that $X^2 - Y^2 = 2024$, find the greatest value of X . (16 marks)

3. 一本圖書共 600 頁，第一天看了全書的 $\frac{1}{5}$ ，第二天看了剩下的 $\frac{1}{4}$ ，請問第二天看了多少頁？ (22 分)

A book has a total of 600 pages. On the first day, you read $\frac{1}{5}$ of the book, and on the second

day, you read $\frac{1}{4}$ of the remaining pages. How many pages did you read on the second day?

(22 marks)

4. 以 72 為分母的最簡真分數有多少個？ (24 分)

Find the number of simplified proper fractions with denominator equals 72. (24 marks)

5. 有一批糖果，已知總數多於 500 粒。若分給 5 個人，就剩餘一粒；若分給 10 個人，也是剩餘 1 粒；但若分給 13 人，就會剩餘 3 粒。問這批糖果最少有多少粒？ (24 分)

There is a batch of candies, and it is known that the total number is more than 500 pieces. If divided among 5 people, there is 1 candy left; if divided among 10 people, there is also 1 candy left; but if divided among 13 people, there are 3 candies left. What is the minimum number of candies in this batch? (24 marks)

6. 有四個正整數的平均值為 2023。若將其中一個數替換成 4，則這四個正整數的平均值變為 1518。請問原來被替換成 4 的那個數是多少？ (20 分)

The mean of four positive integers is 2023. If one of the numbers is replaced by 4, then the new mean is 1518. What is the original number which is replaced by 4? (20 marks)

7. 設 $a = (202320242021)(202320242025) - (202320242020)(202320242026)$ ，求 a 。

(24 分)

Find the value of a if

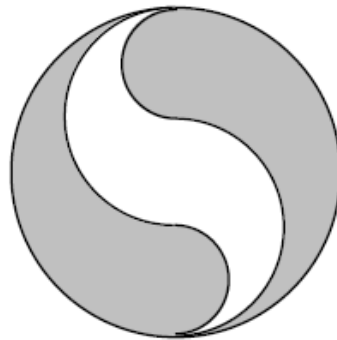
$a = (202320242021)(202320242025) - (202320242020)(202320242026)$ (24 marks)

8. 小明初始時擁有一些蘋果與一些香蕉，已知它們的總數量在 100 與 200 顆 之間且這些蘋果與香蕉的顆數比為 8 : 5，接著小明每天都隨意從中吃掉二顆，但不一定都是相同種類。在第 3 天吃掉其中的二顆後，蘋果與香蕉的顆數比變成 7 : 4。請問初始時小明擁有的蘋果與香蕉總共有多少顆？ (30 分)

Mark has some number of apples and bananas. It is known that the total number of those fruits is between 100 to 200 initially and the ratio for the number of apples to the number of bananas is 8 : 5. Then he randomly eats two of them each day, but not necessarily of the same kind. On the 3rd day, after he eats two of them, the ratio becomes 7 : 4. How many apples and bananas in total does Mark have initially? (30 marks)

9. 已知大圓的半徑為 3 cm。若白色區域的所有圓心都位於大圓的同一條直徑上，且由半徑為 1cm 的兩個半圓、半徑為 2 cm 的兩個半圓所圍出，如下圖所示。求陰影區域的面積？(取 $\pi = 3$ 。) (30 分)

The outer circle has radius 3 cm. The white region is outlined by half circles whose radii are 1 cm and 2 cm and whose centres lie on the same diameter of the outer circle, as shown in the figure. Find the area of shaded region. (Take $\pi = 3$.) (30 marks)



10. 已知在 P, Q, R 為圓周上的三點。若 PQ 是該圓形的直徑，則角 PRQ 必為直角。現在在一圓形的圓周上等分 12 點，並在每點按順時針寫上 1, 2, 3, ..., 12。若該兩點上的數字不是互質，則用一條直線連起。連起所有直線後，會有多少個用該 12 點作為頂點的直角三角形？ (28 分)

It is given that P, Q, R are the three points on a circumference of a circle. If PQ is the diameter of the circle, then angle PRQ must be a right angle. Now we equally distribute 12 points on a circumference of a circle, and label the points by 1, 2, 3, ..., 12 clockwise. If the numbers labeled on the points are not coprime, then the points will be joined by a straight line. After joining the points by the straight line, how many right angle triangles will be formed by using that 12 points as its vertices? (28 marks)

11. 若 $a + b + c = 0$ 及 $a \neq b \neq c \neq 0$ ，求 $\frac{a^4 + b^4 + c^4}{a^2b^2 + b^2c^2 + c^2a^2}$ 的值。 (28 分)

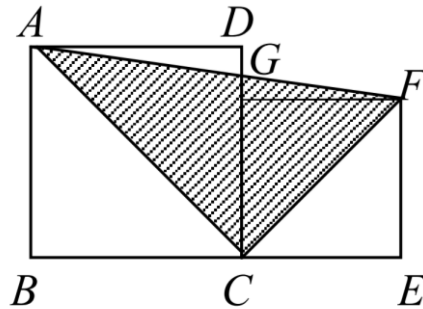
(已知 $(x + y)^2 = x^2 + 2xy + y^2$)

If $a + b + c = 0$ and $a \neq b \neq c \neq 0$, find the value of $\frac{a^4 + b^4 + c^4}{a^2b^2 + b^2c^2 + c^2a^2}$.

(Given that $(x + y)^2 = x^2 + 2xy + y^2$) (28 marks)

12. 如圖，大正方形的邊長為 6 cm，小正方形的邊長為 5 cm。請問陰影部分的面積為多少 cm^2 ? (32 分)

Refer to the figure. The side length of the large square is 6 cm and the side length of the small square is 5 cm. Find the area of the shaded region, in cm^2 . (32 marks)

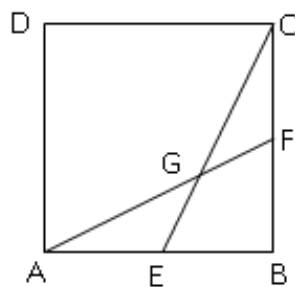


13. 對於任何正整數 a 及 b 。如果 $\frac{b-a}{a+1}$ 是一個正整數，則稱 a 為 b 的「次因數」。例如，7 是 47 的次因數 ($\frac{47-7}{7+1}=5$ 是一個正整數)。請問 2023 的所有「次因數」之和是多少? (36 分)

For any positive integers a and b . If $\frac{b-a}{a+1}$ is a positive integer, then a is called the "secondary factor" of b . For example, 7 is a factor of 47 ($\frac{47-7}{7+1}=5$ is a positive integer). What is the sum of all "secondary factors" of 2023? (36 marks)

14. 圖中 $ABCD$ 是邊長為 12 cm 的正方形。 E 和 F 分別是 AB 和 BC 的中點。 AF 與 CE 相交於 G 。求四邊形 $AGCD$ 的面積。(34 分)

$ABCD$ is a square of side 12 cm. E and F are the mid-points of AB and BC respectively. AF and CE intersect at G . Find the area of the quadrilateral $AGCD$. (34 marks)



15. 甲和乙兩車分別從 C 、 D 兩地同時開出，相向而行。7 小時後相遇，然後又以原速繼續行駛了 2 小時，這時甲車距 D 地還有 240 米，乙車距 C 地還有 360 米。 C 、 D 兩地相距多少米? (36 分)

Car A and car B depart from C and D respectively at the same time and travel towards each other. They meet after 7 hours, and then continue driving at the original speed for 2 hours. Car A is now 240 meters from D and Car B is 360 meters from C . How many meters are C and D apart?

(36 marks)

試卷完 END OF PAPER