2023 Hong Kong Mathematics Kangaroo Contest — Benjamin —

2023香港數學袋鼠競賽—小學高年級 2023香港数学袋鼠竞赛—小学高年级



Instruction | 說明 | 说明

- 1. DO NOT FLIP OPEN THIS FRONT COVER UNTIL YOUR PROCTOR TELLS YOU. 在未收到監考老師指示前,請不要翻開此封面。 在未收到监考老师指示前,请不要翻开此封面。
- 2. This is a 25 question multiple choice test. For each question, only one answer choice is correct. 這是一套包括25道選擇題的測試,每道題目只有一個正確答案。 这是一套包括25道选择题的测试,每道题目只有一个正确答案。
- 3. Mark your answer to each problem on the answer sheet with a pencil. Check blackened answers for accuracy and erase errors completely. Only answers that are properly marked on the answer sheet will be scored.. 請將每道題目的答案用鉛筆標註在答題卡上。請注意檢查塗寫的黑色長方塊的準確性,用橡皮完全擦掉錯誤的答案。只有恰當標註在答題卡上的答案才會被評分。 请将每道题目的答案用铅笔标注在答题卡上。请注意检查涂写的黑色长方块的准确性,用橡皮完全擦掉错误的答案。只有恰当标注在答题卡上的答案才会被评分。
- 4. Every question is given a point value. You will receive full points for correct answer, and zero point for blank or incorrect answer. The full score of this test is 100 points. 每道題目都有給定的分值。每題答對得滿分,答錯或空白得0分。本次測試的滿分為100分。 每道题目都有给定的分值。每题答对得满分,答错或空白得0分。本次测试的满分为100分。
- 5. Only scratch paper, graph paper, rulers, protractors, and erasers are allowed as aids. Calculators are NOT allowed. No problems on the test *require* the use of a calculator. 只能使用草稿紙、方格紙、尺、量角器和橡皮作為輔助工具。計算器是不允許使用的。測試中沒有任何問題必須需要使用計算器。 只能使用草稿纸、方格纸、尺、量角器和橡皮作为辅助工具。计算器是不允许使用的。测试中没有任何问题必须需要使用计算器。
- 6. Figures are not necessarily drawn to scale. 圖形不一定按比例繪製。 图形不一定按比例绘制。
- 7. Before beginning the test, make sure to write the Competition Code "Benjamin", your name and Competition ID with your signature on the answer sheet, especially to bubble in the 9-digit Competition ID completely! 在開始測試之前,請確保已將競賽代碼"Benjamin",姓名和准考證號填寫在答題卡上並簽名,特別是9位准考證號的每位數字已經塗好相應的黑色長方塊。
 在开始測試之前,请确保已將音賽代码"Benjamin",姓名和准考证号填写在答题卡上并签名,特
 - 在开始测试之前,请确保已将竞赛代码"Benjamin",姓名和准考证号填写在答题卡上并签名,特别是9位准考证号的每位数字已经涂好相应的黑色长方块。
- 8. You will have 75 minutes to complete the test once your proctor tells you to begin. 監考老師宣布開始後,你將有75分鐘的時間完成測試。 监考老师宣布开始后,你将有75分钟的时间完成测试。

Part 1: 8 problems, 3 points each

第一部分: 8 道題目, 每題 3 分 | 第一部分: 8 道题目, 每题 3 分

1. Matchsticks can be placed to build numbers, as shown. For example, to build the number 15, one needs seven matchsticks, and one needs the same number of matchsticks to build the number 8. What is the largest number that can be built with seven matchsticks?

如圖所示,用火柴棍可以擺出數。例如,用七根火柴棍可以組成數 15,用同樣數量的火柴棍可以組成數 8。問用七根火柴棍能組成的最大數是多少?

如图所示,用火柴棍可以摆出数。例如,用七根火柴棍可以组成数 15,用同样数量的火柴棍可以组成数 8。问用七根火柴棍能组成的最大数是多少?

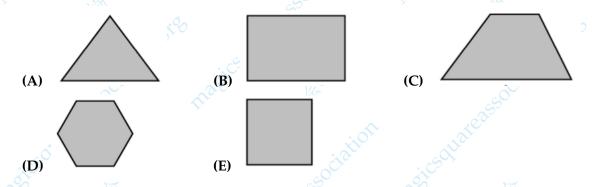


「Proposed by Austria | 奥地利供題 | 奥地利供题」

2. Which of the shapes below cannot be divided into two trapezoids/trepezia by a single straight line?

下面哪個圖形不能被一條直線分成兩個梯形?

下面哪个图形不能被一条直线分成两个梯形?



「Proposed by Georgia | 格魯吉亞供題 | 格鲁吉亚供题」

3. Francis wrote down three consecutive 2-digit numbers in their natural order, but instead of the digits she used symbols: $\Box \Diamond$, $\Diamond \triangle$, $\Diamond \Box$. Which number is next?

Francis 按照自然的順序寫下了三個連續的兩位數,但她用符號代替了數字: \bigcirc , \bigcirc , \bigcirc 。問哪個是接下來的數?

Francis 按照自然的顺序写下了三个连续的两位数,但她用符号代替了数字: $\square\lozenge$, $\lozenge\square$, $\lozenge\square$ 。问哪个是接下来的数?

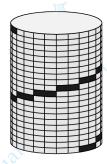
- **(A)** □♡
- **(B)** □□
- **(C)** ◊□
- (D) ♡◊
- **(E)** ♡♡

「Proposed by Germany | 德國供題 | 德国供题」

4. Claude climbs from the bottom to the top of the cylindrical tower shown. The steps are all equal sized. Nine steps are visible. How many steps are not visible?

如圖所示, Claude 從圓柱形塔的底部爬到頂部。台階都是同樣大小的。有九級台階是可見的。問看不見的台階有多少級?

如图所示, Claude 从圆柱形塔的底部爬到顶部。台阶都是同样大小的。有九级台阶是可见的。问看不见的台阶有多少级?



(A) 8

(B) 9

(C) 10

(D) 11

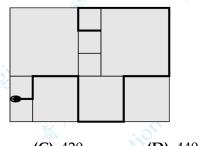
(E) 12

「Proposed by Canada | 加拿大供題 | 加拿大供题」

5. The Potters have a patio which is tiled with square tiles of three different sizes. The smallest squares have a perimeter of 80 cm. A snake rests on the patio, as shown in the diagram. What is the length of the snake in cm?

陶瓷工人有一個露台,上面鋪著三種不同尺寸的正方形瓷磚。最小的正方形的周長為80厘米。如圖所示,一條蛇躺在露台上。問蛇的長度是多少厘米?

陶瓷工人有一个露台,上面铺着三种不同尺寸的正方形瓷砖。最小的正方形的周长为80厘米。如图所示,一条蛇躺在露台上。问蛇的长度是多少厘米?



(A) 380

(B) 400

(C) 420

(D) 440

(E) 1680

「Proposed by Slovakia | 斯洛伐克供題 | 斯洛伐克供题」

6. The book consists of 250 pages. On the first day Lucas read 6% of the book. On the second day he read 20% of the rest part. And on the third day he read 11 pages more than previous day. How many percent of the book Lucas is left to read?

一本書共有 250 頁。第一天, Lucas 讀了這本書的 6%。第二天, 他讀了剩餘部分的 20%。 第三天, 他比前一天多讀了 11 頁。問 Lucas 還沒讀的頁數在書中所佔的百分比是多少?

一本书共有 250 页。第一天, Lucas 读了这本书的 6%。第二天, 他读了剩余部分的 20%。 第三天, 他比前一天多读了 11 页。问 Lucas 还没读的页数在书中所占的百分比是多少?

(A) 37%

(B) 48%

(C) 52%

(D) 55%

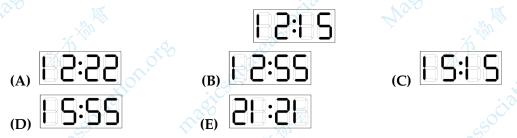
(E) 69%

「Proposed by Russia | 俄羅斯供題 | 俄罗斯供题」

7. When I look in a mirror, I can see the image of my digital clock standing on the table behind me, as shown. What image will I see when I look in the mirror 30 minutes later?

當我看鏡子時,我可以看到在我身後的桌子上的數字時鐘的顯示如圖所示。問30分鐘後我在鏡子裡會看到什麼影像?

当我看镜子时,我可以看到在我身后的桌子上的数字时钟的显示如图所示。问30分钟后我在镜子里会看到什么影像?



「Proposed by Iran | 伊朗供題 | 伊朗供题」

8. Maria, Peter, Richard and Tina were playing football in the classroom and broke a window. When the principal asked who did it, she got the following responses. Maria: "It was Peter: "It was Richard: "It wasn't me." Tina: "It wasn't me." Only one child was telling the truth. Who broke the window?

Maria, Peter, Richard, Tina 在教室裡玩足球, 打破了一扇窗戶。當校長詢問是誰幹的時候, 她得到了如下的回應。Maria: "是 Peter。" Peter: "是 Richard。" Richard:"不是我。" Tina: "不是我。" 只有一個孩子說的是實話。問誰打破了窗戶??

Maria, Peter, Richard, Tina 在教室里玩足球, 打破了一扇窗户。当校长询问是谁干的时候, 她得到了如下的回应。Maria: "是 Peter。" Peter: "是 Richard。" Richard:"不是我。" Tina: "不是我。" 只有一个孩子说的是实话。问谁打破了窗户?

(A) Maria

(B) Peter

(C) Richard

(D) Tina

(E) cannot be certain | 無法確定 | 无法确定

「Proposed by Slovakia | 斯洛伐克供題 | 斯洛伐克供题」

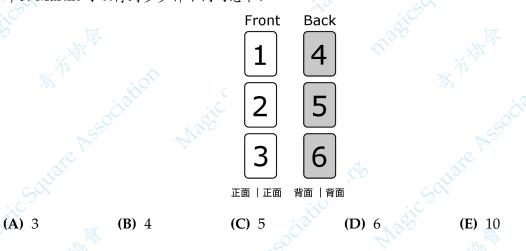
Part 2: 9 problems, 4 points each

第二部分: 9 道題目, 每題 4 分 | 第二部分: 9 道题目, 每题 4 分

9. Martin has three cards with numbers written on both sides. The card with number 1 on one side has number 4 on the opposite side, the card with 2 on has 5 on the opposite side and the card with 3 on has 6 on the opposite side. Martin randomly places three cards on the table and adds up the three numbers he sees. How many different sums can Martin get?

Martin 有三張卡片,兩面都寫著數。正面是1的卡片背面是4,正面是2的卡片背面是5, 正面是3的卡片背面是6。Martin 隨機的將三張牌放在桌上,然後將他看到的三個數相加。 那麼 Martin 可以得到多少種不同的總和?

Martin 有三张卡片,两面都写着数。正面是1的卡片背面是4,正面是2的卡片背面是5,正面是3的卡片背面是6。Martin 随机的将三张牌放在桌上,然后将他看到的三个数相加。那么 Martin 可以得到多少种不同的总和?



「Proposed by Norway | 挪威供題 | 挪威供题」

10. A wooden fence consists of a series of vertical planks, each joined to the next post by four horizontal planks. The first and last plank in the fence are vertical. Which of the following could be the total number of planks in the fence?

在木柵欄中,有一系列垂直的木板立在地上,每兩塊垂直的木板之間由四塊水平的木板連接。木柵欄中的第一塊和最後一塊木板都是垂直的。問以下哪項可能是木柵欄中木板的總數?

在木栅栏中,有一系列垂直的木板立在地上,每两块垂直的木板之间由四块水平的木板连接。木栅栏中的第一块和最后一块木板都是垂直的。问以下哪项可能是木栅栏中木板的总数?

(A) 96

(B) 97

(C) 98

(D) 99

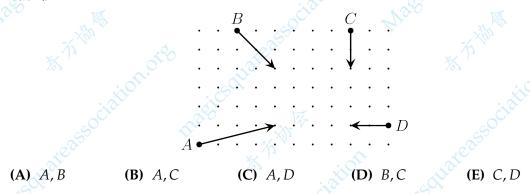
(E) 100

「Proposed by Italy | 意大利供題 | 意大利供题」

11. The diagram below shows the initial position, the direction of travel and how far four bumper cars move in five seconds. Which two cars will collide?

下圖顯示了四輛碰碰車的初始位置、行進方向和在五秒鐘內行進的距離。問哪兩輛碰碰車會相撞?

下图显示了四辆碰碰车的初始位置、行进方向和在五秒钟内行进的距离。问哪两辆碰碰车会相撞?

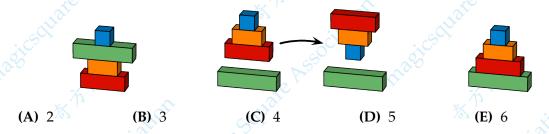


「Proposed by Denmark | 丹麥供題 | 丹麦供题」

12. Gordon has four blocks, stacked as shown on the left. In a single move, Gordon can take some, or all, of the blocks from the top of the stack and place them upside down, as shown in the middle. He wants the blocks to be stacked in the order as shown on the right. What is the smallest number of moves he needs to make to get to the new order?

Gordon 有四塊積木,按照左圖所示的順序堆疊。每一步移動, Gordon 可以從堆疊積木的頂部拿起部分或全部積木塊, 然後將它們倒置,如中間圖所示。他希望積木能按照右圖所示的順序堆疊。為了實現積木的新順序,他最少需要幾步移動?

Gordon 有四块积木,按照左图所示的顺序堆叠。每一步移动, Gordon 可以从堆叠积木的顶部拿起部分或全部积木块, 然后将它们倒置, 如中间图所示。他希望积木能按照右图所示的顺序堆叠。为了实现积木的新顺序, 他最少需要几步移动?

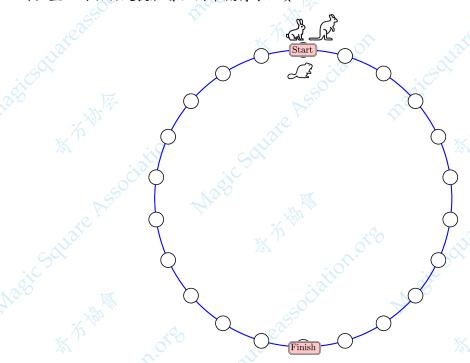


「Proposed by Canada | 加拿大供題 | 加拿大供题」

13. A rabbit, a beaver and a kangaroo are having a competition. The beaver moves one space at a time, the rabbit moves two spaces at a time and the kangaroo moves three spaces at a time. They all start from the point marked Start. The winner is the animal who lands exactly on the point marked Finish in the smallest number of complete moves. Who wins the competition?

兔子、海狸和袋鼠正在進行比賽。海狸每次移動一格,兔子每次移動兩格,袋鼠每次移動 三格。它們都從標記為 Start 的位置出發。在移動次數最少的情況下恰好到達標記為 Finish 的位置上的動物是獲勝者。問誰贏得了比賽?

兔子、海狸和袋鼠正在进行比赛。海狸每次移动一格,兔子每次移动两格,袋鼠每次移动三格。它们都从标记为 Start 的位置出发。在移动次数最少的情况下恰好到达标记为 Finish 的位置上的动物是获胜者。问谁赢得了比赛?



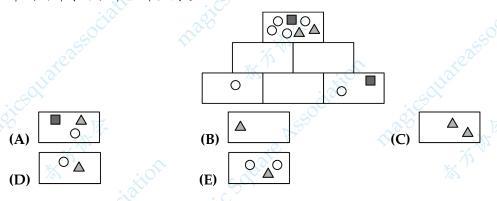
- (A) the beaver 海狸 | 海狸
- (B) the rabbit | 兔子 | 兔子
- (C) the kangaroo | 袋鼠 | 袋鼠
- (D) the kangaroo and the rabbit | 袋鼠和兔子 | 袋鼠和兔子
- (E) the kangaroo and the beaver | 袋鼠和海狸 | 袋鼠和海狸

「Proposed by Switzerland | 瑞士供題 | 瑞士供题」

14. Tina wants to draw figures in the six boxes of the pyramid shown. Each box should contain all of the figures in the two boxes directly below it and nothing more. She has drawn the figures in some of the boxes already. Which figures should she draw in the box in the middle of the bottom row?

Tina 想在如圖所示的金字塔的六個方框裡面畫圖形。每個方框中要包含其正下方兩個方框中的所有圖形,並且沒有其它的圖形了。她已經在一些方框裡畫了圖形。她應該在最底行中間的那個方框中畫哪些圖形?

Tina 想在如图所示的金字塔的六个方框里面画图形。每个方框中要包含其正下方两个方框中的所有图形,并且没有其它的图形了。她已经在一些方框里画了图形。她应该在最底行中间的那个方框中画哪些图形?

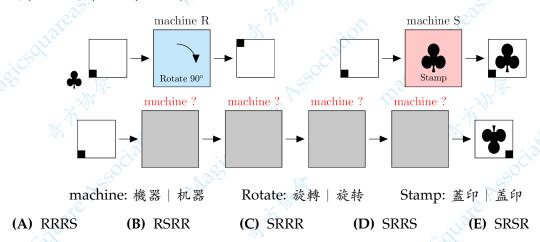


「Proposed by Germany | 德國供題 | 德国供题」

15. Else has two machines. Machine R rotates the paper 90° clockwise. Machine S stamps the paper with a . In which order are the machines used to create the image shown?

Else 有兩台機器。機器 R 將紙張順時針旋轉 90°。機器 S 在紙上蓋個 ♣,為創建所示的圖像,機器操作的順序是怎樣的?

Else 有两台机器。机器 R 将纸张顺时针旋转 90°。机器 S 在纸上盖个♣,为创建所示的图像,机器操作的顺序是怎样的?

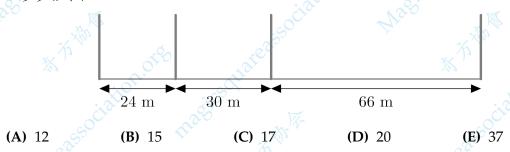


「Proposed by Denmark | 丹麥供題 | 丹麦供题」

16. Four stakes are placed along a 120m track, as shown. What is the smallest number of stakes that should be added so that the track is divided into sections of equal length?

如圖所示,沿著 120 米的軌道放置有四根木椿。要將軌道分成等長的部分,最少還需要添加多少根木椿?

如图所示,沿着120米的轨道放置有四根木桩。要将轨道分成等长的部分,最少还需要添加多少根木桩?

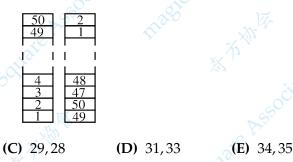


「Proposed by Poland 」波蘭供題 | 波兰供题」

17. On a table there is a tower made of blocks numbered from 1 to 50. Emma builds a new tower in the following way. She takes two blocks from the top of the original tower and puts them on the table as the base of the new tower. She continues by taking the two top blocks from the remainder of the original tower and putting them on the top of the new tower, as seen in the diagram. Which of the following pairs of numbers are on adjacent blocks in the new tower?

在桌子上有一座由編號從1到50的積木組成的塔。Emma 按照以下方式建造一座新塔。如圖所示,她從原塔的頂部取出兩塊積木,並將它們放在桌子上作為新塔的底座。然後她從原塔頂部的其餘部分取出兩塊,並將它們放在新塔的最上面,依此類推。問以下哪兩個數位於新塔的相鄰積木上?

在桌子上有一座由编号从1到50的积木组成的塔。Emma 按照以下方式建造一座新塔。如图所示,她从原塔的顶部取出两块积木,并将它们放在桌子上作为新塔的底座。然后她从原塔顶部的其余部分取出两块,并将它们放在新塔的最上面,依此类推。问以下哪两个数位于新塔的相邻积木上?



「Proposed by Poland | 波蘭供題 | 波兰供题」

(B) 29, 26

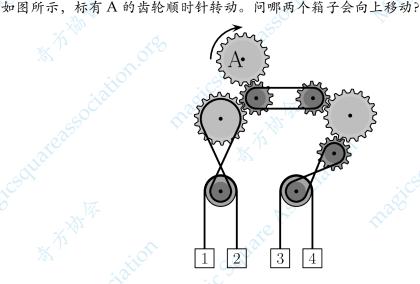
(A) 27,30

Part 3: 8 problems, 5 points each

第三部分: 8 道題目, 每題 5 分 | 第三部分: 8 道题目, 每题 5 分

18. The gear marked with A is turned clockwise, as shown. Which two boxes will move upwards?

如圖所示,標有 A 的齒輪順時針轉動。問哪兩個箱子會向上移動?



- **(A)** 1, 3
- **(D)** 2, 4

(B) 1, 4

- **(C)** 2, 3
- (E) cannot be determined | 無法確定 | 无法确定

「Proposed by China 中國供題 中国供题」

19. In a second hand shop, two hats are sold for the same price as five skirts, three skirts for the same price as eight t-shirts and two t-shirts for the same price as three scarfs. Which of the following collections is the most valuable?

在一家二手店,兩頂帽子的售價與五條裙子的售價相同,三條裙子的售價與八件恤衫的售價相同,兩件恤衫的售價與三條圍巾的售價相同。問以下哪個組合價值最高?

在一家二手店,两顶帽子的售价与五条裙子的售价相同,三条裙子的售价与八件恤衫的售价相同,两件恤衫的售价与三条围巾的售价相同。问以下哪个组合价值最高?

- (A) thirty-seven scarfs | 三十七條圍巾 | 三十七条围巾
- (B) a hat and five skirts | 一項帽子和五條裙子 | 一顶帽子和五条裙子
- (C) a hat and thirty scarfs | 一項帽子和三十條圍巾 | 一顶帽子和三十条围巾
- (D) three skirts and three scarfs | 三條裙子和三條圍巾 | 三条裙子和三条围巾
- (E) eight skirts and six t-shirts | 八條裙子和六件恤衫 | 八条裙子和六件恤衫 |

「Proposed by Iran | 伊朗供題 | 伊朗供题」

20. Sonia and Robert are playing a game. They can alternately take 1, 2, 3, 4 or 5 tiles from a pile of tiles. Whoever takes the last tile or tiles loses. At one point of the game, there are 10 tiles left in the pile and it is Sonia's turn to take some tiles. How many tiles should Sonia leave to Robert to be sure that she will win?

Sonia 和 Robert 在玩遊戲。他們交替的從一堆瓷磚中取出 1, 2, 3, 4 或 5 塊瓷磚。誰拿走了最後的瓷磚,誰就輸了。在遊戲的某個時刻,堆中還剩下 10 塊磁磚,並且輪到 Sonia 拿瓷磚。問 Sonia 應該留下多少塊瓷磚給 Robert 才能確定她會贏?

Sonia 和 Robert 在玩游戏。他们交替的从一堆瓷砖中取出 1, 2, 3, 4 或 5 块瓷砖。谁拿走了最后的瓷砖,谁就输了。在游戏的某个时刻,堆中还剩下 10 块磁砖,并且轮到 Sonia 拿瓷砖。问 Sonia 应该留下多少块瓷砖给 Robert 才能确定她会赢?

- **(A)** 5
- **(B)** 6
- (C) 7
- **(D)** 8
- **(E)** 9

「Proposed by Catalonia | 加泰羅尼亞供題 | 加泰罗尼亚供题 |

21. Which of the following four shapes has the greatest area?

以下四個圖形中, 哪個圖形的面積最大?

以下四个图形中,哪个图形的面积最大?



W.



diamond



the crown



lightning

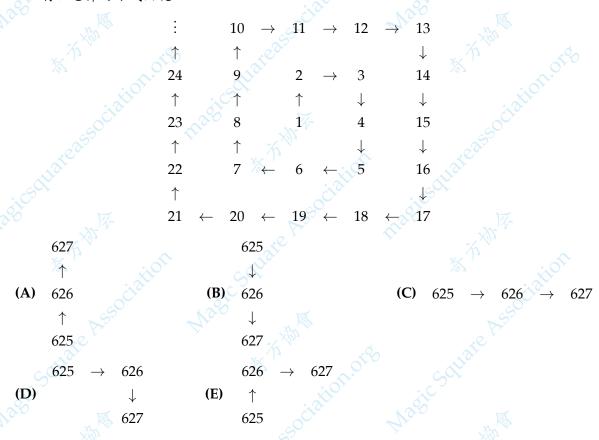
- (A) W
- (B) diamond
- (C) the crown
- (D) lightning
- (E) they all have the same area | 它們的面積相同 | 它们的面积相同 |

「Proposed by Denmark | 丹麥供題 | 丹麦供题」

22. A spiral of consecutive numbers is created, as shown, starting with 1. When the pattern of the spiral is continued, in which arrangement will the numbers 625, 626 and 627 appear?

如圖所示,從1開始的連續整數呈螺旋型排列。按規律將這個螺旋型繼續擴展,數625,626,627 將以怎樣的方式出現?

如图所示,从1开始的连续整数呈螺旋型排列。按规律将这个螺旋型继续扩展,数625,626,627 将以怎样的方式出现?

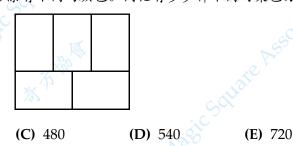


「Proposed by Serbia | 塞爾維亞供題 | 塞尔维亚供题」

23. The diagram shows five rectangles. Keith wants to colour the rectangles red, blue, green, yellow and gray so that any two adjacent rectangles are coloured different colours. In how many different ways can he do this?

下圖中有五個長方形。Keith 想給每個長方形塗上紅色、藍色、綠色、黃色、灰色中的一種顏色,使得任意兩個相鄰的長方形塗有不同的顏色。問他有多少種不同的染色方式?

下图中有五个长方形。Keith 想给每个长方形涂上红色、蓝色、绿色、黄色、灰色中的一种颜色,使得任意两个相邻的长方形涂有不同的颜色。问他有多少种不同的染色方式?



(B) 360

(A) 120

24. Let *A* be the 2023-digit integer whose digits are all 1, *B* be the 10-digit integer whose digits are all 1, and *S* be the sum of the digits of the product $A \times B$. What is the units digit of *S*?

設 A 是每個數字都是 1 的 2023 位數,B 是每個數字都是 1 的 10 位數,而 S 為乘積 $A \times B$ 的各位數字之和。問 S 的個位數字是多少?

设 A 是每个数字都是 1 的 2023 位数,B 是每个数字都是 1 的 10 位数,而 S 为乘积 $A \times B$ 的各位数字之和。问 S 的个位数字是多少?

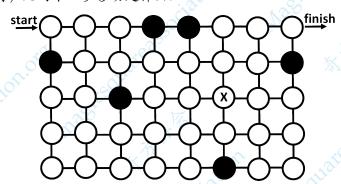
- **(A)** 0
- **(B)** 2
- **(C)** 4
- (D) 5
- **(E)** 7

「Proposed by Italy | 意大利供題 | 意大利供题」

25. An explorer wants to find a path through the maze shown from the point marked 'start' to the point marked 'finish'. She can only move horizontally or vertically and she can only pass through white circles. She also has to pass through all the white circles exactly once. When she reaches the circle marked X, what will her next move be?

探險家想要找到一條從"start"標記開始,到"finish"標記結束的通過迷宮的路徑。她只能水平或垂直移動,只能通過白色圓圈。她還必須恰好經過所有白色圓圈恰好一次。問當她到達標有X的圓圈時,她的下一步移動是什麼?

探险家想要找到一条从"start"标记开始,到"finish"标记结束的通过迷宫的路径。她只能水平或垂直移动,只能通过白色圆圈。她还必须恰好经过所有白色圆圈恰好一次。问当她到达标有X的圆圈时,她的下一步移动是什么?



- (A) ↓
- **(B)** ↑
- **(C)** ←
- (D) \rightarrow
- (E) there is no such path | 沒有這樣的路徑 | 沒有这样的路径

「Proposed by Greece | 希臘供題 | 希腊供题」