

數學廳

腦筋挑戰站



Mathematics Hall

Brain Teasers

教師指南
Teachers' Guide





簡介

在科學的範疇中，數學可算是其中一項相當富趣味性和奇妙的學科。驟眼看上去，數學所包含的只是一些簡單的數字或圖形，但不同的數字或圖形排列方式卻可演變成複雜和奇妙的算式。因此，學習數學除了可訓練個人的邏輯思考外，更重要的是可培養個人解決困難的能力和技巧，好讓日後能夠應付更多和更複雜的問題和困難。「腦筋挑戰站」設立的目的是希望透過一系列既有趣，又富挑戰性的遊戲來刺激參與者解決困難的能力和技巧，從而幫助他們面對和解決日常生活所遇到的問題和困難。「腦筋挑戰站」包括三十多件難度不一的展品，如立體拼圖、智慧環、移動小棒、數字及邏輯推理等謎題。

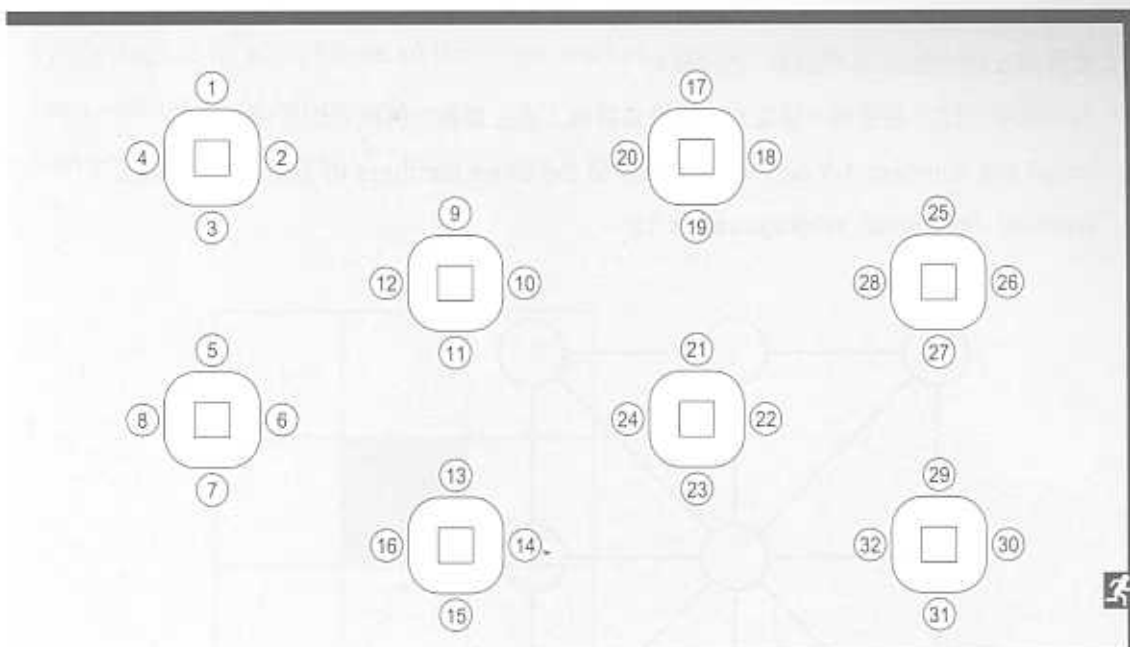
Introduction

Mathematics is a very interesting and special subject among all other science topics. Most people think mathematics is just a group of numbers or simple geometric figures. However, these simple algebras or figures could become some complicated, elusive and impalpable arithmetic. Hence, learning mathematics not just can develop the logical mind of oneself, but the most important is to improve the ability and technique on problem solving of oneself which may help him / her to solve many other complicated problems encountered in future. With the aim of stimulating active participation by the participants and improving their techniques and abilities in problem solving, the Hong Kong Science Museum has presented a set of exhibits named "Brain Teasers" in Mathematics Hall. The "Brain Teasers" is a collection comprises of about 30 puzzles with different degrees of difficulty. Exhibits include sticks, metal loops, 3-dimensional, numbering and logical puzzles. This collection offers an opportunity for individuals to be challenged and to have fun practicing on their problem-solving skills. Participants may need to discard their preconceived ideas and inferences imposed on the problem, and to acquire a new way of thinking and strategies in order to solve the puzzles.



展品位置圖

Floor Plan



編號 Item	展品名稱 Name of Exhibit	編號 Item	展品名稱 Name of Exhibit
1	以一頂百 Balancing Nails	17	分合十字 Take-Apart Cross
2	駁馬奔騰 Galloping Horse	18	無獨有偶 Even Number of Pegs
3	魔陣 Sum is Fifteen	19	顛倒三角 Ten-Disk Triangle
4	面面俱合 Blocks and Holes	20	三角形或六角形 Triangle or Hexagon
5	三角迷陣 Tricky Triangles	21	策騎之難 Horse and Rider
6	四方或三角 Square or Triangle	22	十八之輻 Sum is Eighteen
7	取勝之道 Take-Away	23	八個三角形 Eight Triangles
8	拼合立方體 Make a Cube	24	馬蹄鐵 Horseshoes
9	建造錐體 Make a Pyramid	25	獨一無二 Six Pegs
10	組合成"T" Make a T	26	四式混算 Four Equations
11	還欠一根 Remove Six	27	砌出正方形 Form a Square
12	顛倒黑白 Jumping Pegs	28	深藏不露(二) Box the Blocks
13	變幻方形 Shifting Squares	29	農夫過河 Crossing the River
14	深藏不露(一) Four Blocks in a Box	30	同色相鄰 Colour Match
15	心心相扣 Linked Hearts	31	天作之合 A Perfect Fit
16	十全十美 Ten Pegs in Each Row	32	難題 Disorder



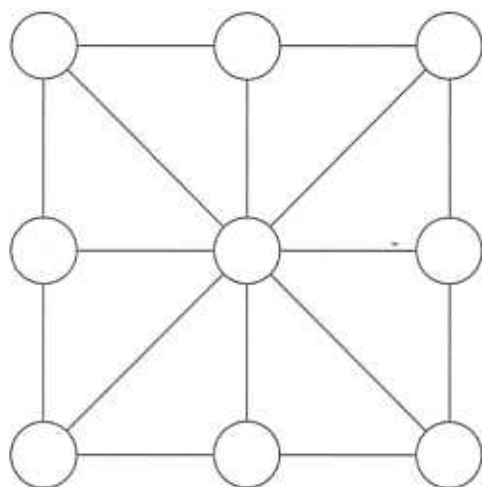
精選展品介紹

Briefs of Selected Exhibits

1. 魔陣(展品3號) **Sum is Fifteen** (Exhibit 3)

放入數字1至9，使任何一條直線、橫線或斜線上的三個數字的總和均為15。

Insert the numbers 1-9 so that the sum of the three numbers in any straight line (vertical, horizontal, or diagonal) is 15.



2. 顛倒黑白(展品12號) **Jumping Pegs** (Exhibit 12)

開始時小柱是這樣的排列：

Start with the pegs like this:



小柱最後要這樣排列：

End with the pegs like this:



請依循下列規則：

- 白小柱只可向左行而黑小柱只可向右行。
- 每次小柱只可移動一格或跳過一根小柱。

Follow these rules:

- White pegs can only move to the left and black pegs can only move to the right.
- Pegs can only move one space at a time or jump over one peg at a time.



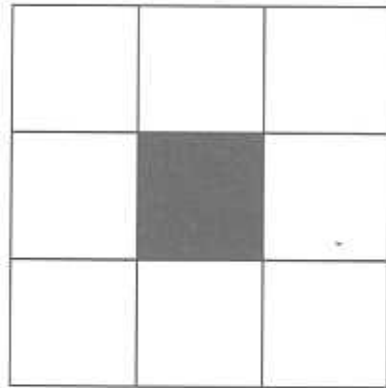
3. 十全十美(展品16號) Ten Pegs in Each Row (Exhibit 16)

把小柱放在全部八個方格內，使每一直行或橫列的小柱數目均為10。

你可以用36根小柱完成任務嗎？用32根可以嗎？24根又怎樣？

Place pegs in all eight boxes so that there are ten pegs in each of the four rows, vertically and horizontally.

Can you do it with 36 pegs? With 32 pegs? With 24 pegs?



4. 顛倒三角(展品19號) Ten-Disk Triangle (Exhibit 19)

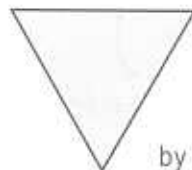
只移動三片圓碟，使

變成

Go from this



to this



by moving only three disks.

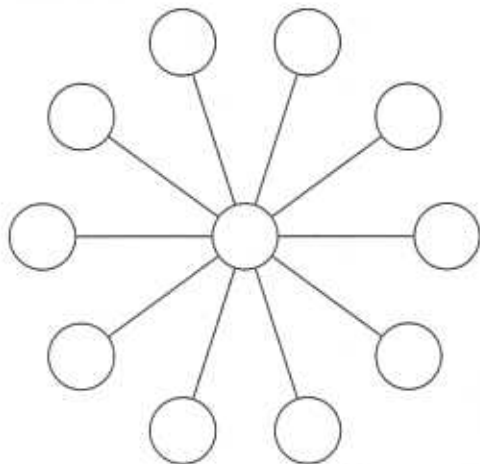




5 十八之輻(展品22號) **Sum is Eighteen** (Exhibit 22)

把數字1至11放入孔內，使每條直線上三個數字的總和均為18。

Insert the numbers 1-11 so that the sum of the three numbers in any straight line is 18.



6. 八個三角形(展品23號) **Eight triangles** (Exhibit 23)

一個等邊三角形的三邊長度是相等的。

排列六根小棒，使它們組成八個任何大小的等邊三角形。

An equilateral triangle has three sides of equal length.

Arrange the six sticks so that they form eight equilateral triangles of any size.



7. 四式混算(展品26號) **Four Equations** (Exhibit 26)

把數字1至9放在孔內，使四條等式(三條橫式和一條直式)全部成立。

Place the number 1 through 9 on the board so that all four equations (three horizontal and one vertical) are correct.

$$\square - \square = \square$$

×

$$\square \div \square = \square$$

||

$$\square + \square = \square$$

其他數學資源網址

Other Resource on Mathematics

數學教育資訊網站 (香港科技大學製作)

<http://www.edp.ust.hk/math/>

教育統籌局—課程發展「數學教育」

http://cd.ed.gov.hk/math/kla_c.asp

Interactive Mathematics Miscellany and Puzzles

<http://www.cut-the-knot.org/front.shtml>

NRICH Site

<http://www.nrich.maths.org.uk/public/index.php>

Gourdreau Museum of Mathematics in Art and Science

<http://www.mathmuseum.org>

International Mathematical Olympiad

<http://imo.math.ca/>





趣味科學題

Mathematics Puzzles

1. 數學等式 A Maths Equation



黑板上寫了以下的一個等式，請問如何只移動一個數字，便能使等式成立？


(條件：不可把數字對調，不可移動減號和等號)

The following equation was written on the blackboard, how could you just change the position of a number only to make the equation valid?

(Hint: Can't change the position of the numbers and the symbols "-" and "=")

$$101 - 102 = 1$$

2. 檸檬 Lemon



一位先生和一位小姐面對面而坐。先生問道小姐：「妳有多少歲了？」

小姐不好意思答，只在紙上寫了一個英文單字："LEMON"

先生想了一想，便道：「哦！我知妳多少歲了。」

到底這位小姐是多少歲呢？

A man sat face to face with a lady, he asked her, "How old are you?"

The lady felt so ashamed and just write down a word "LEMON"

The man had thought for a while and said, "Oh! I know how old are you."

So, do you know the age of this lady?



3. 四則運算 Calculation

把1,2,3,4,5,7,8,15填在下面的空格中，使每一個算式均成立。

Put the numbers 1, 2, 3, 4, 5, 7, 8 & 15 into the blank box below to make it valid.

運算方向
Calculating Direction

	+		=	
=				÷
×				=
	=		-	

4. 麥比烏斯帶 Moebius Band

準備一條寬約1厘米的顏色紙條，把其中一端扭轉後把紙條兩端黏在一起(圖1)。

數一數這個環有多少面？沿著環中央將紙環剪開(圖2)，結果會怎樣？

在日常生活中，麥比烏斯帶有甚麼用途呢！

Prepare a strip of coloured paper with around 1cm in width and give one end a half twist (Figure 1).

Glue the ends together to form a band. How many surfaces do you have?

Cut the band in two lengthwise (Figure 2). What do you get?

Make another Moebius band and cut it in three lengthwise. How many bands do you have now?

How does the Moebius Band apply in our daily lives?

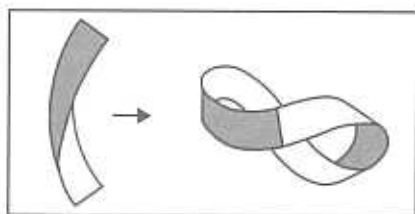


圖1 Figure 1

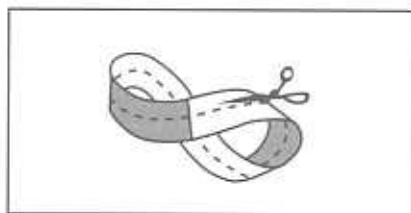


圖2 Figure 2



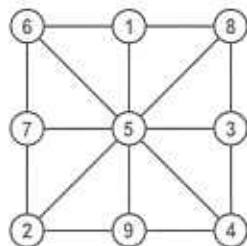


「精選展品」解答 Solutions for Selected Exhibits

1. 魔陣 Sum is Fifteen

提示：每條直線上兩端數字的總和均應相等。

Hint: The sum of the two numbers at the end of each straight line should be equal.



2. 顛倒黑白 Jumping Pegs

提示：除最後幾步外，不要把相同顏色的小柱放在一起。

Hint: Don't move the pegs so that two pegs of the same colour are next to each other until the last few moves.



按下列次序移動柱子：

Move the pegs according to the following sequence:

4 → 5; 6 → 4; 7 → 6; 5 → 7; 3 → 5; 2 → 3;
4 → 2; 6 → 4; 8 → 6; 9 → 8; 7 → 9; 5 → 7;
3 → 5; 1 → 3; 2 → 1; 4 → 2; 6 → 4; 8 → 6;
7 → 8; 5 → 7; 3 → 5; 4 → 3; 6 → 4; 5 → 6.

3. 十全十美 Ten Pegs in Each Row

提示：在角位的方格會被計算兩次。方格內的數字代表小柱的數目。

Hint: The boxes at the corners count twice. The number shown in box equals to no. of pegs.

1	8	1	2	6	2	4	2	4
8		8	6		6	2		2
1	8	1	2	6	2	4	2	4

36根小柱 36 pegs 32根小柱 32 pegs 24根小柱 24 pegs

4. 顛倒三角 Ten-Disk Triangle

提示：重疊兩個圖形，找出不同之處。

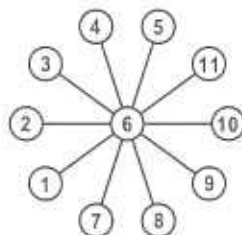
Hint: Overlap the two figures pictorially to find out the difference.



5. 十八之福 Sum is Eighteen

提示：每條直線上兩端數字的總和均應相等。

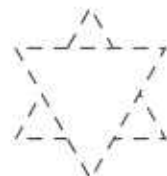
Hint: The sum of the two numbers at the end of each diagonal line should be equal.



6. 八個三角形 Eight triangles

提示：小棒可以重疊。

Hint: Sticks can be overlapped.



7. 四式混算 Four Equations

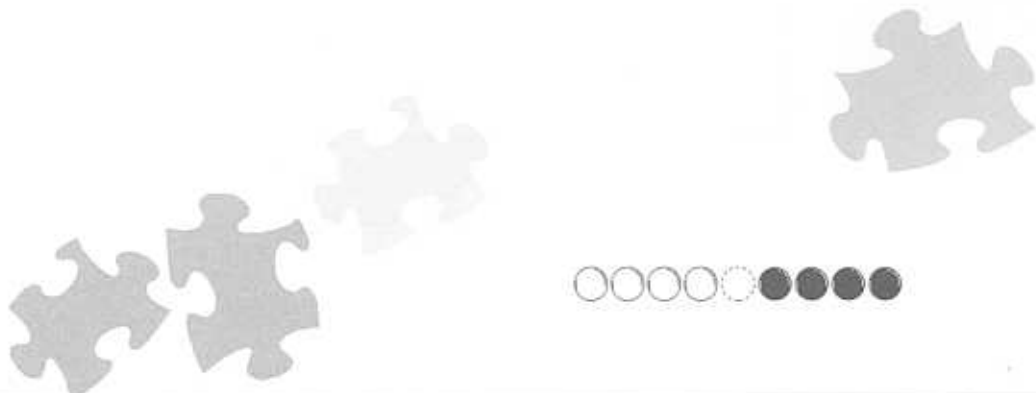
提示：首先滿足最棘手的條件。

Hint: Satisfy the hardest criterion first.

$$\boxed{9} - \boxed{5} = \boxed{4}$$

$$\boxed{6} \div \boxed{3} = \boxed{2}$$

$$\boxed{7} + \boxed{1} = \boxed{8}$$



「趣味科學題」答案 Solutions for Mathematics Puzzles

1. $101 - 10^2 = 1$

2. 37 因為那先生把字倒著看
because the man read the word in an upside down way

NOW3T

3.

8	+	7	=	15
=			÷	
2			3	
x			=	
4	=	1	-	5

8	+	7	=	15
=			÷	
4			5	
x			=	
2	=	1	-	3

4. 電腦打印機的色帶通常是一條莫比烏斯帶，它的優點是可使用的表面比一條普通的帶長了一倍。
The ribbon in a computer impact printer is usually a Moebius band. The twist of the Moebius band makes the useable surface of the ribbon twice as long as that of a plain ribbon.

