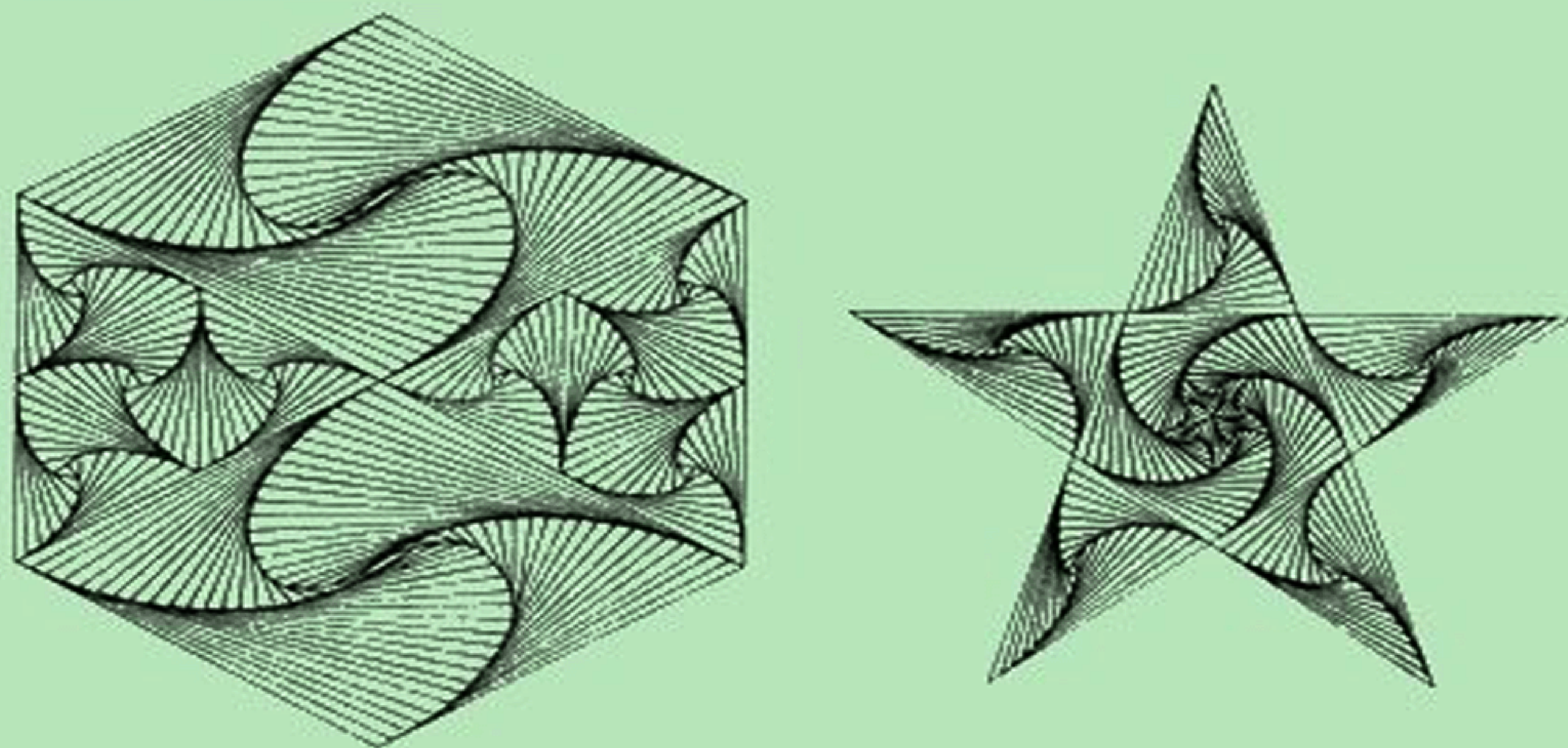


## MATHEMATICAL ART

Some of the pupils of Parkstone Grammar School, Broadstone, worked on the idea of the article on Mathematical Art in Issue No. 75, and sent some of their ideas to us. We found them most exciting and reproduce two of them below.

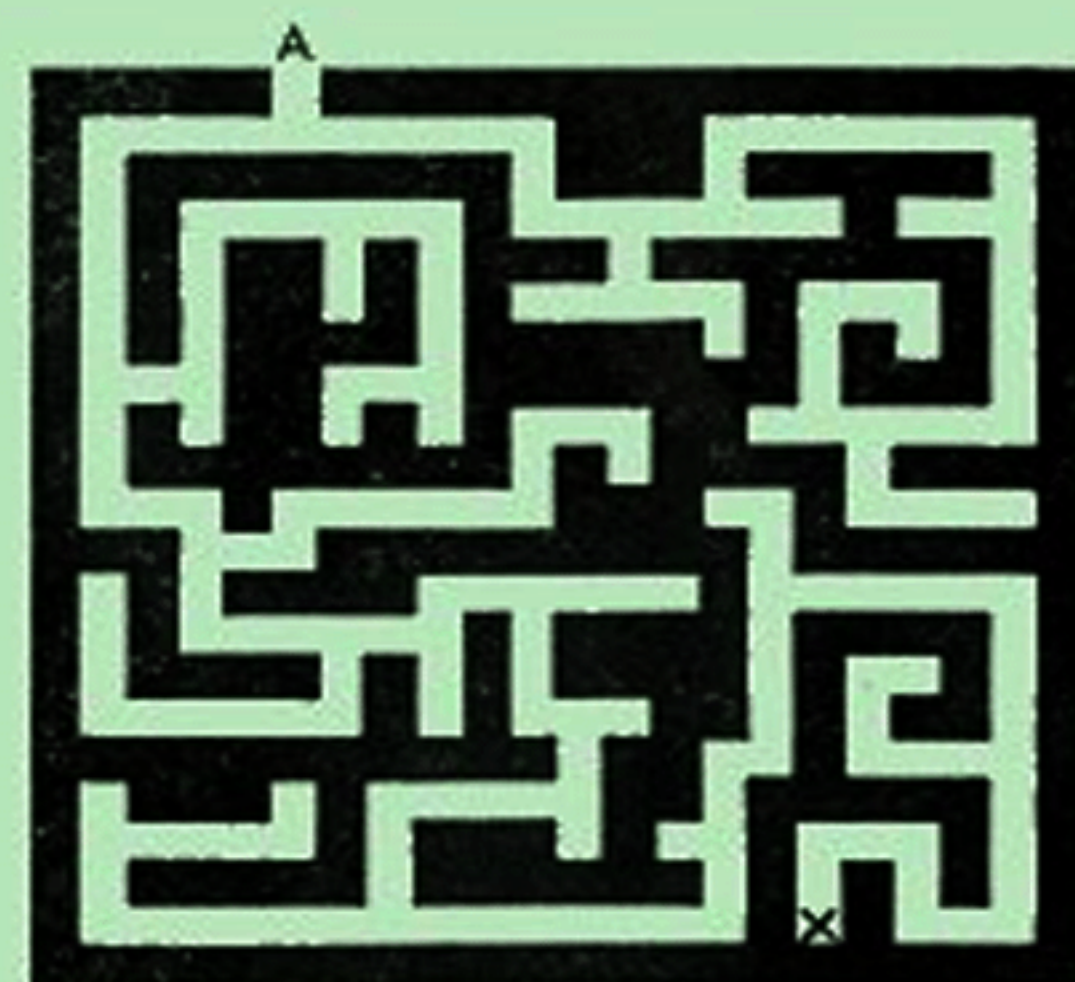


Wendy Sibley designed the one on the left and Helen Williams the one on the right. They have each received a book token.

## MAZES

The article in Issue No. 77 on Mazes brought a number of ideas, two of which are reproduced below. The one on the left was submitted by M. Farquhar of Kilmacolm, Renfrewshire, and the one on the right by Philip Attwood of Orpington, Kent. The two codes are 662 and 1767 in base ten. Can you follow the way through them? Book tokens have been sent for these ideas.

Ed.



628

join the mathematical pie  
in the mathematical pie  
s the mathematical pie  
e mathematical pie  
t mathematical pie

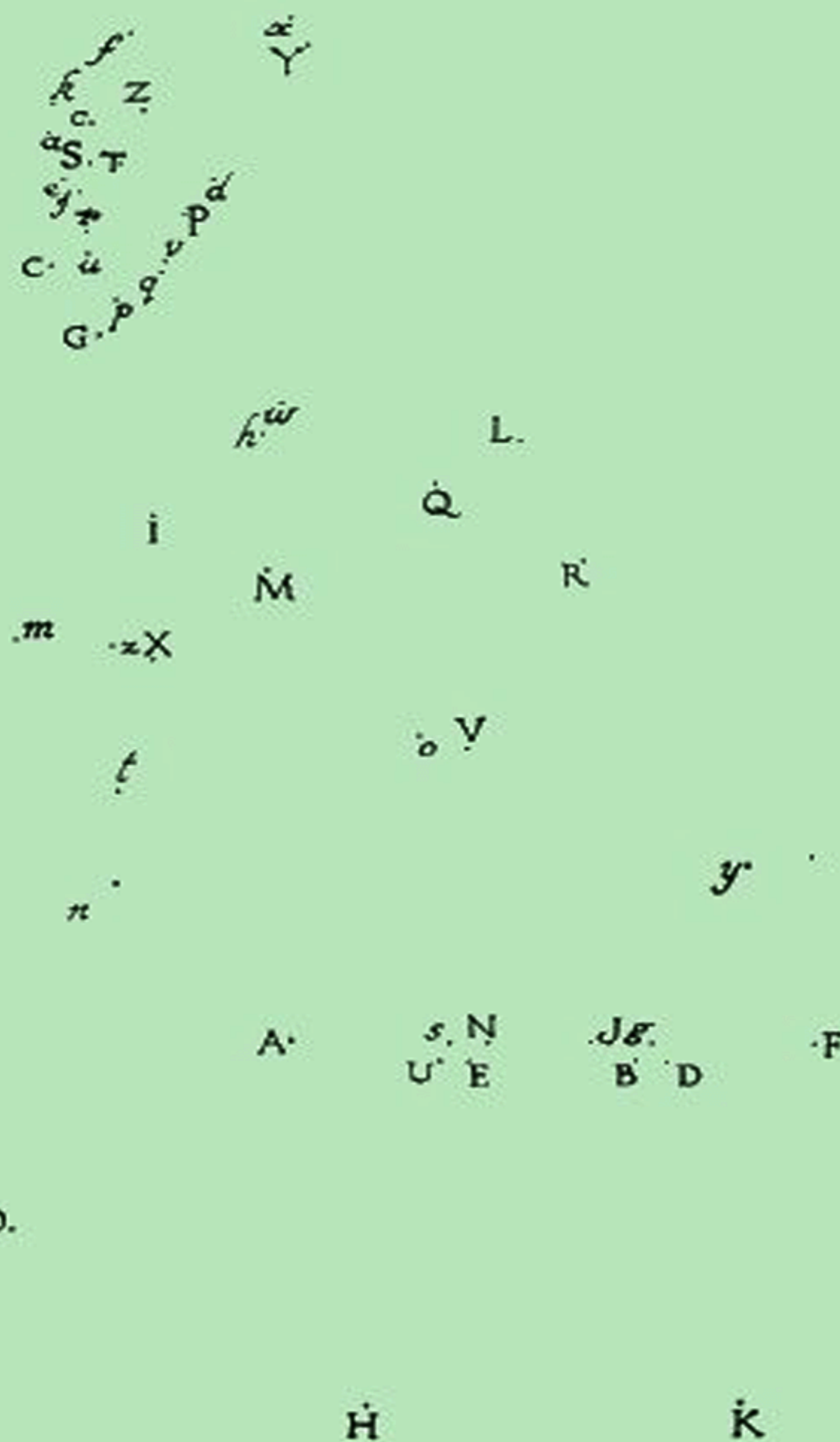


No. 79

Editorial Address: West View,  
Fiveways, Nr. Warwick

AUTUMN, 1976

## AN ATTRACTIVE PLOT



621



On the front page is a diagram with letters. This is a code and the clues are given below. Work out the solution to the clues, then join 1 to 2, 2 to 3, etc., and what do you get?

CLUES FOR POINT JOINING (fill in answer alongside letter)

- |   |   |
|---|---|
| a : Baker's dozen                             | A : 3.c   |
| b : 3.e                                       | B : 4.e+1   |
| c : first two-digit prime                     | C : 7.π   |
| d : $2^5 \times 2^3 \times 2^4 \times 4^{-4}$ | D : 3.a   |
| e : $(41^2 - 40^2)^{\frac{1}{2}}$             | E : 2.h   |
| f : 2.C                                       | F : 2.q   |
| g : 5.j+1                                     | G : Difference of 2 squares                             |
| h : Reverse the digits of a square number     | H : 5.u   |
| i : $\frac{1}{4}$ ("ton")                     | I : $3^3 - 2^3$   |
| j : $(\frac{1}{2})^{-3}$                      | J : 2.l   |
| k : L.C.M. of 2, 4, 6                         | K : 2.I   |
| l : doubly unlucky                            | L : 2.r   |
| m : $3^2 - 2^3$                               | M : 7.u-2   |
| n : 2.T                                       | N : 2.d   |
| o : 2.i                                       | O : 2.Z   |
| p : $(441)^{0.5}$                             | P : H.C.F. of 51 and 170                                |
| q : one score                                 | Q : first odd prime                                     |
| r : $(81)^{\frac{1}{2}} - (8)^{\frac{1}{2}}$  | R : $1^3 + 3^1$   |
| s : 3.P                                       | S : $\log_2 1024$                                       |
| t : 5.v+1                                     | T : $\frac{1}{2}$ (exterior angle of a regular hexagon) |
| u : $49^{\frac{1}{2}}$                        | U : 2.P   |
| v : $12. \sin 30^\circ$                       | V : 6.j   |
| w : sum of first two primes                   | W : 2.T-1   |
| x : 4.c-1                                     | X : 7.u   |
| y : 2.p                                       | Y : 5.e   |
| z : $\sqrt{4}$                                | Z : $\sqrt{200}$ to 2 sig. figs. A.A.S.                 |

"That makes us all square now!"



"I'm twice the man you are!"

## SOLUTIONS TO PROBLEMS IN ISSUE No. 78

### NUMBER PROBLEM

The figure 5 should have read 6 in the problem and the solution is

$$\begin{array}{r} 2 \\ 5 \\ 8 \\ 6 \end{array} \begin{array}{r} 3 \\ 1 \\ 4 \end{array} \begin{array}{r} 7 \\ 7 \end{array}$$

### EQUALITY OF THE SEXES

The mother and boy win. Set up two inequalities for the two cases given and derive another for the third case.

### HOW?

The lighthouse and the pier were on opposite sides of the hotel.

### ROMAN FAR AND WIDE

Invert the page and the equation becomes true.

### RE-ORGANISATION

Move the discs 1 10 and 7 in a clockwise direction to give

$$\begin{array}{r} 7 \\ 4 \\ 8 \\ 10 \end{array} \begin{array}{r} 2 \\ 5 \\ 9 \end{array} \begin{array}{r} 3 \\ 6 \end{array} \begin{array}{r} 1 \\ 6 \end{array}$$

### SENIOR CROSS FIGURE No. 70

	1	3	3	1	8	
9		4		1	7	2
1	2	9	6		3	7
1		4	1	4		1
2	9		1	9	2	8
5	6	1		6		3
	7	7	8	4	1	

### JUNIOR CROSS FIGURE No. 69

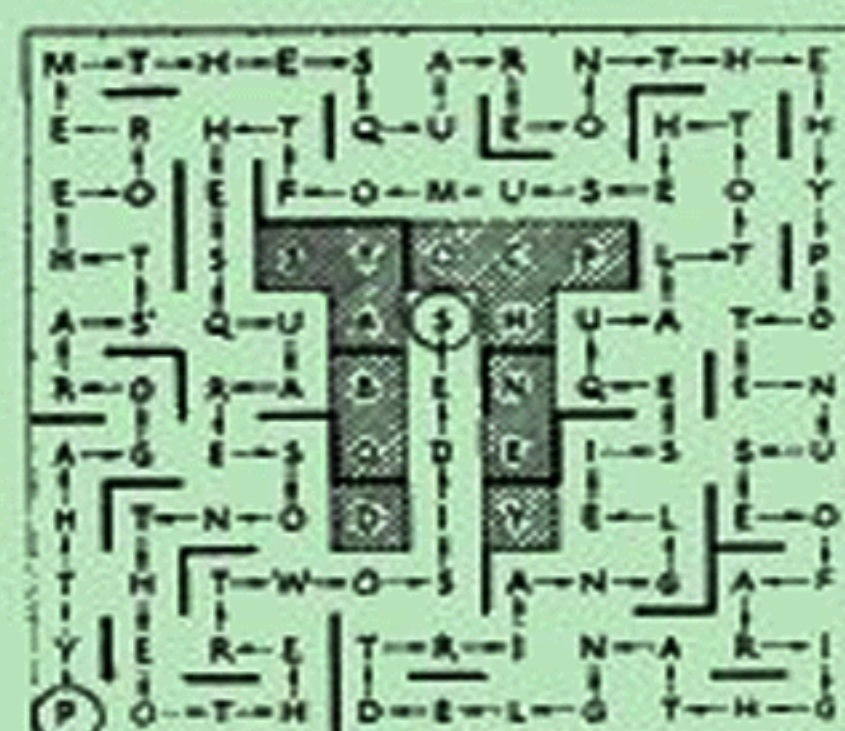
2	5		1	2	5
1	1	6	8		2
	8		9	1	8
6	4	8		6	
8		1	2	9	6
6	0	0		2	4

### HONOURS EVEN

JS	KH	AD	QC
AH	QS	JC	KD
QD	AC	KS	JH
KC	JD	QH	AS

where A is ace, K is king, Q is queen, and J is Jack, S is spades, H is hearts, D is diamonds and C is clubs.

### A SPELLING MAZE





## WELCOME TO THE FOLD

Take a piece of paper about 20 cm by 15 cm high and fold it "top to bottom" into a rectangle ABCD, see fig. 1. Fold the corner B down below CD as in fig. 2.



Fig. 1

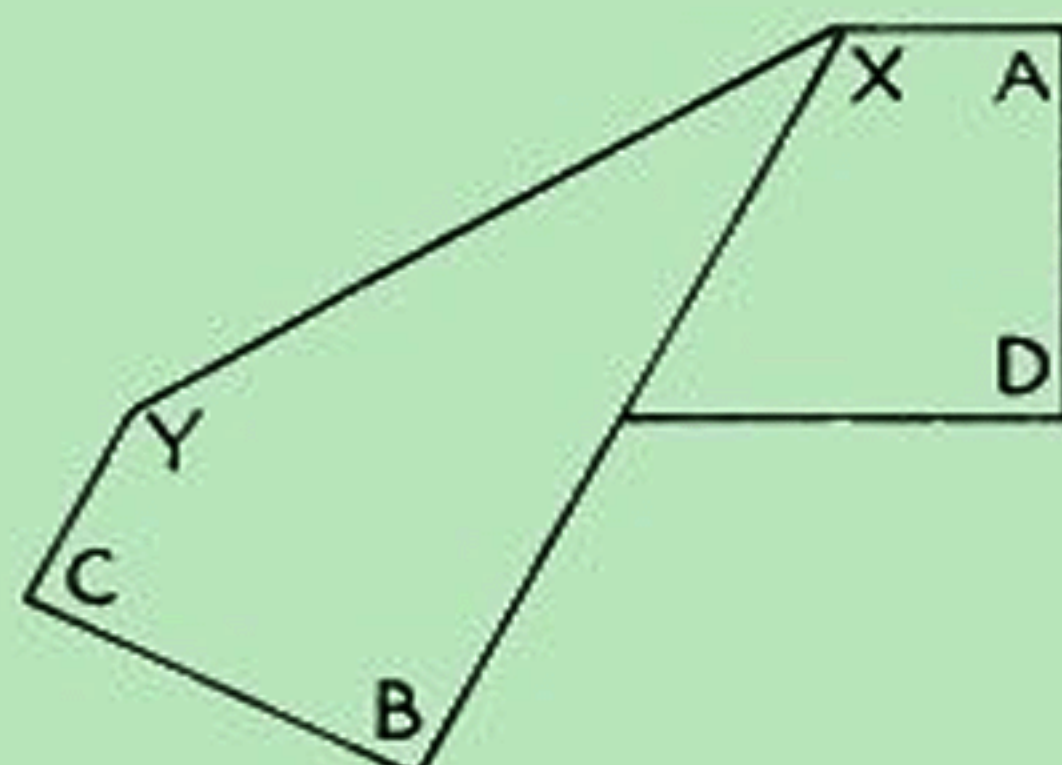


Fig. 2

Fold the corner A down so that XA lies along XB as in Fig. 3.

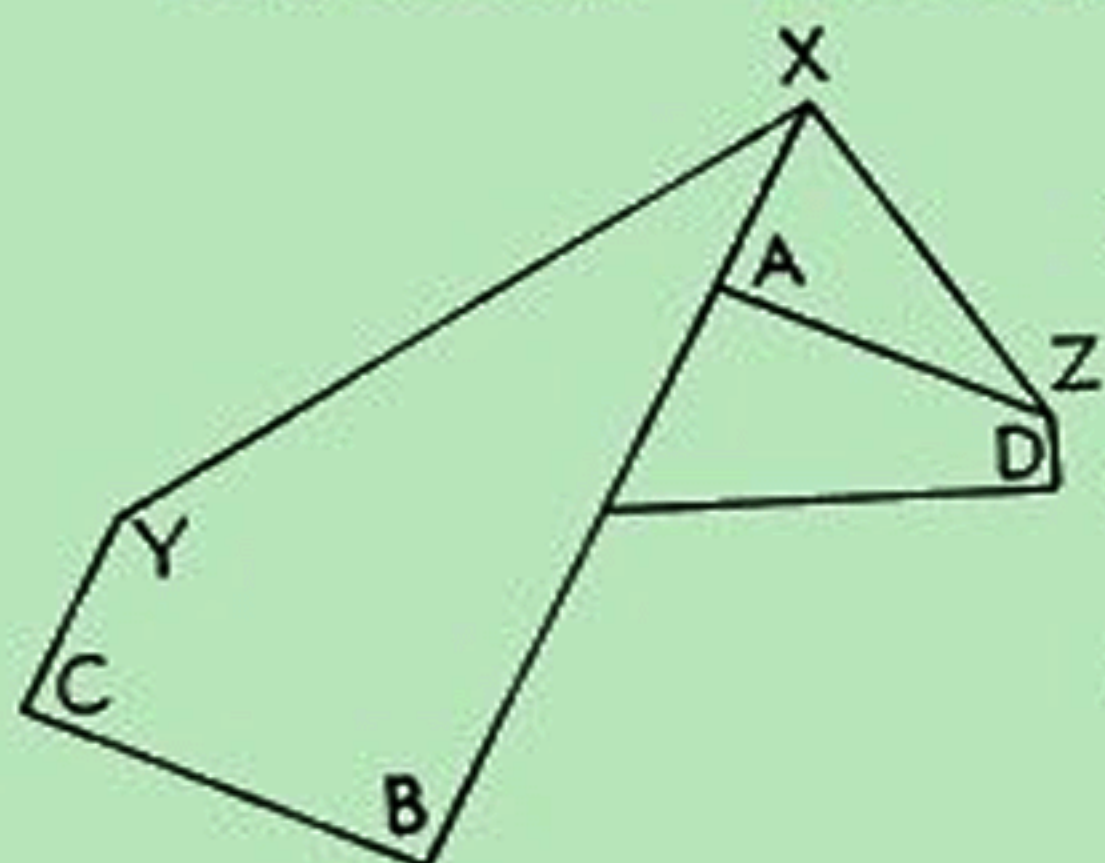


Fig. 3

Investigate the shapes which result if cuts are made in the following ways:

- One straight line at right angles to XA.
- Two straight lines, meeting on XA, at right angles to XZ and XY.
- In other ways not at right angles to any of the folds.

The pattern of curves below produces the "monkey mask" and other similar patterns produce butterflies.

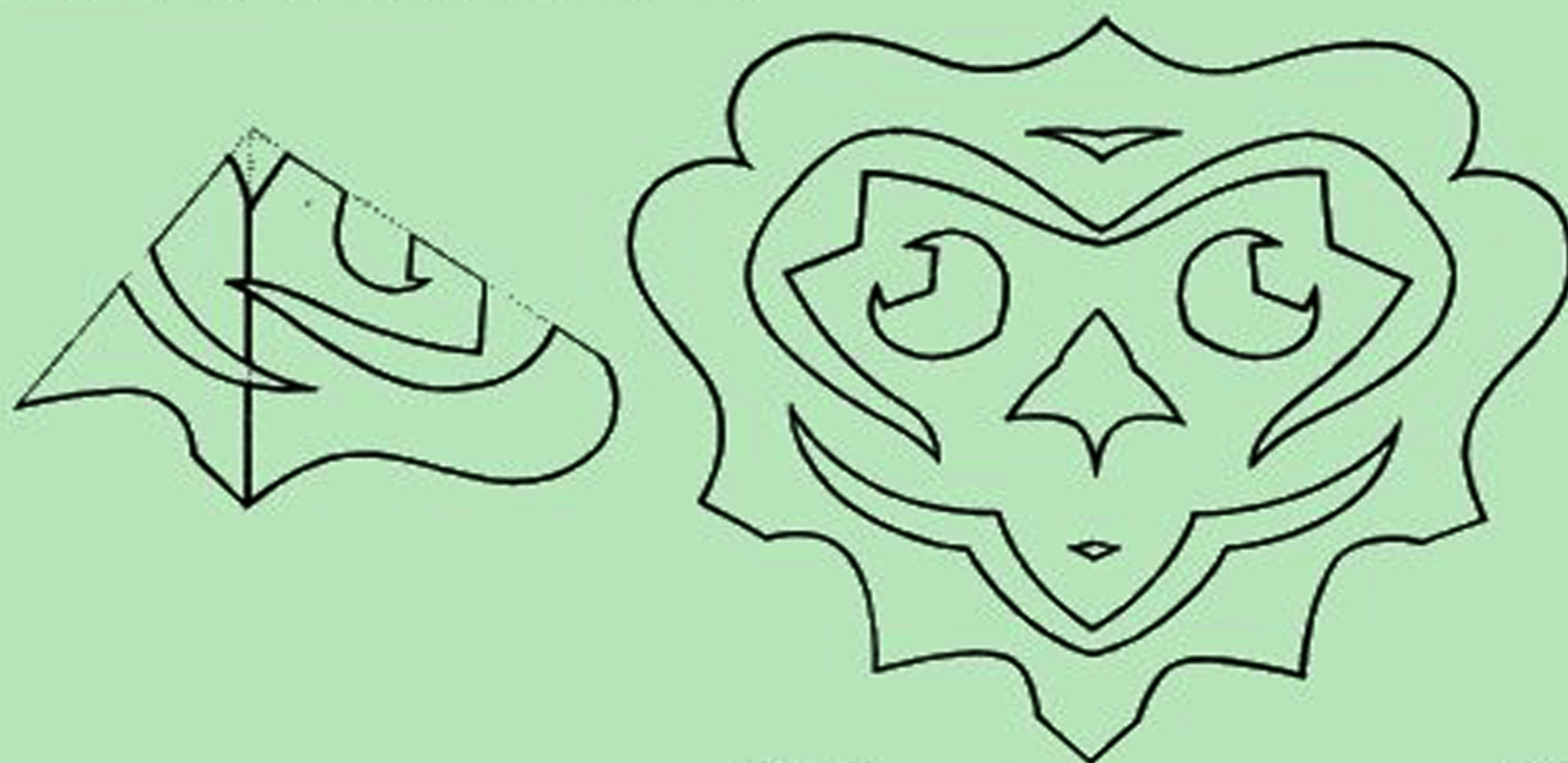


Fig. 4

E.G.

## GOING METRIC

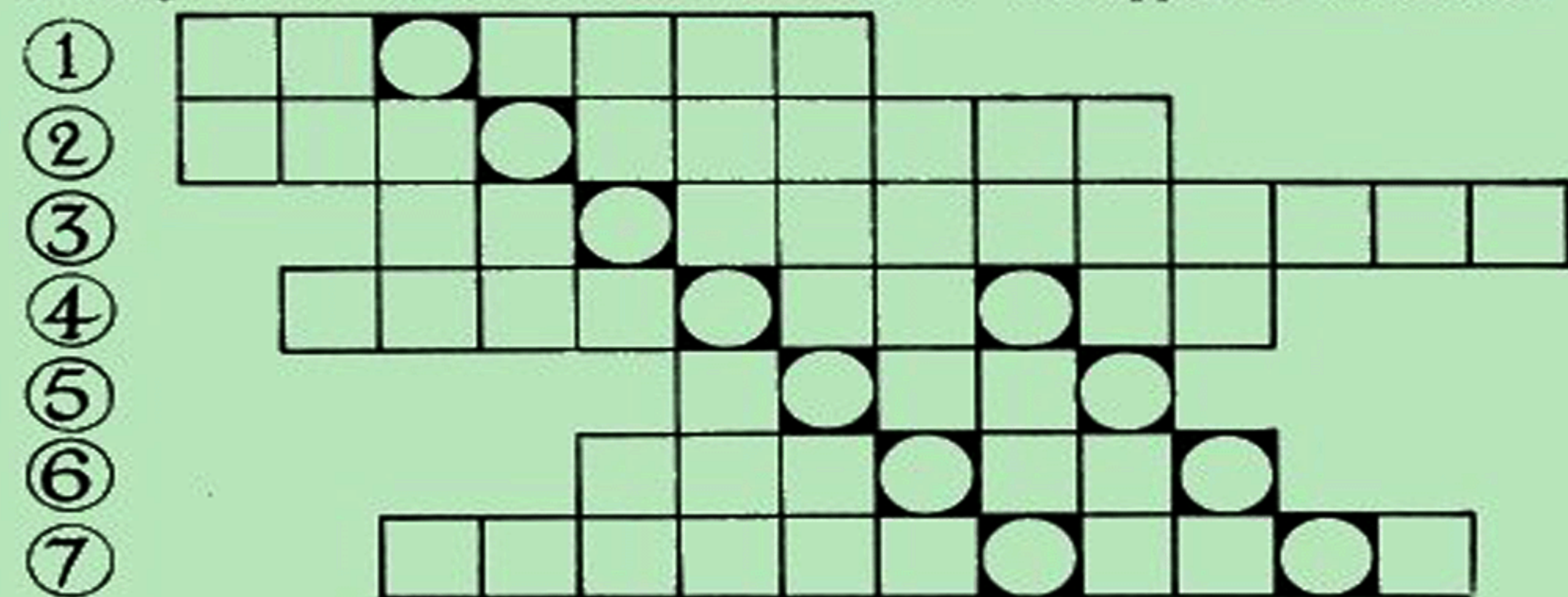
Cutie Pie and her sister Bunny, called Rabbit Pie, were measuring themselves for a new dress. One of them obtained a reading of 96.5. Which one do you think it was and what were the other "vital" statistics.

B.A.



## FAMOUS NAMES

Each clue gives an anagram of the name of a famous Mathematician, and the ideas for which he is best known. When the names are entered in the grid, another Mathematician—of sorts!—will appear in the circles.

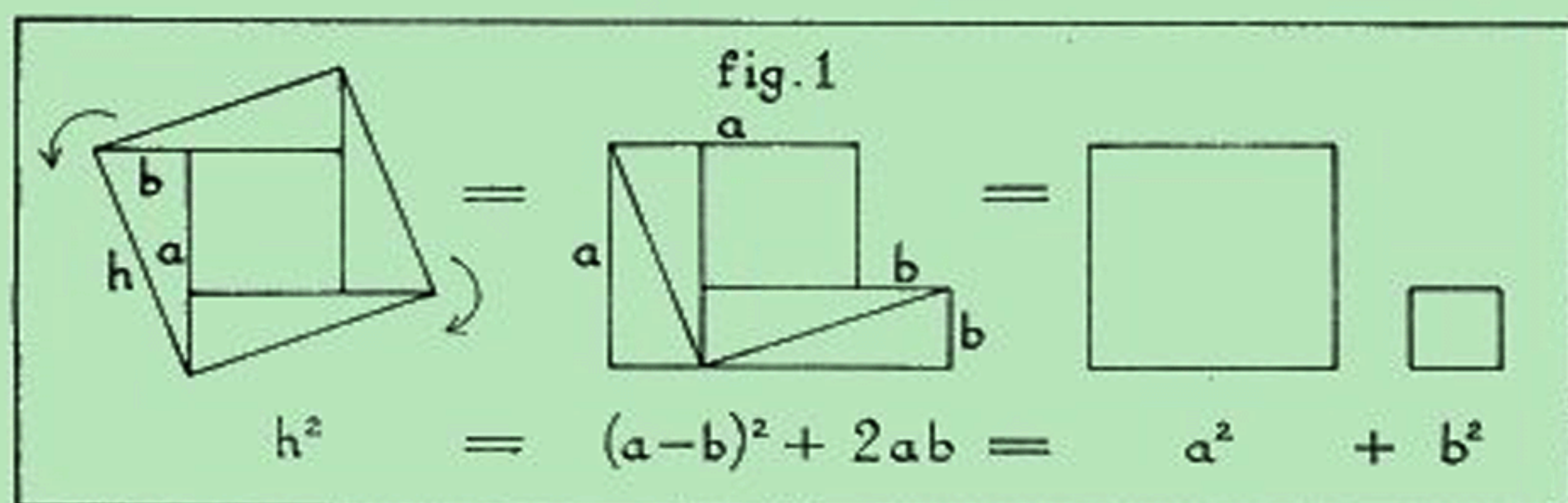
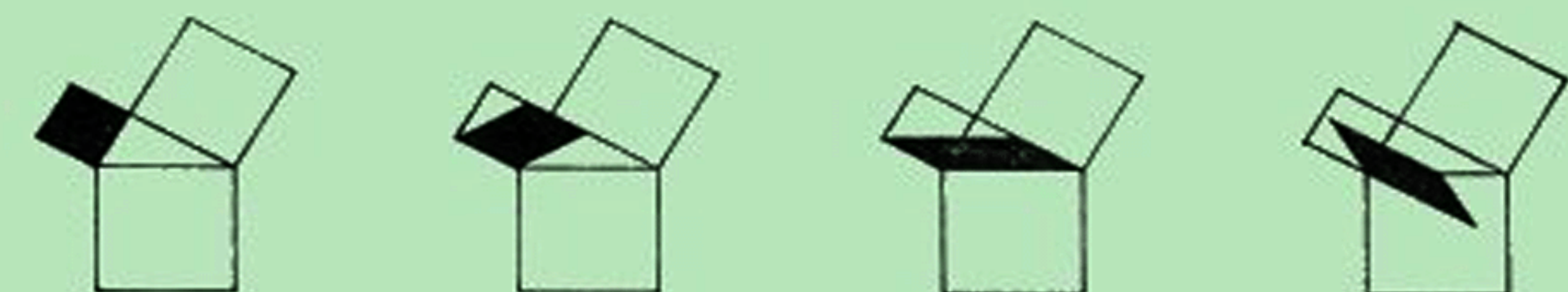


1. CREED OR—the sign for equals.
2. A GHOST PRAY—right-angled triangles.
3. THE STONES ARE—"sieving" for primes.
4. NO RICE CUPS—astronomy.
5. PAL TO—regular solids.
6. OIL GATE—gravity and the pendulum.
7. SHAVE BY LOCK—non-Euclidean geometry.

D.R.D.

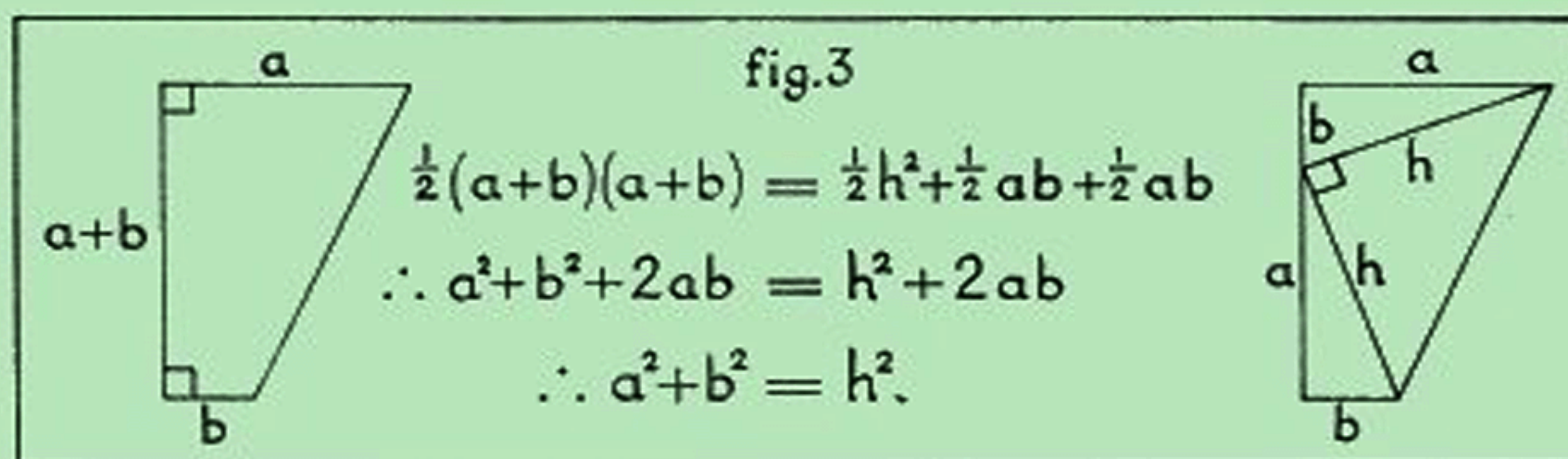
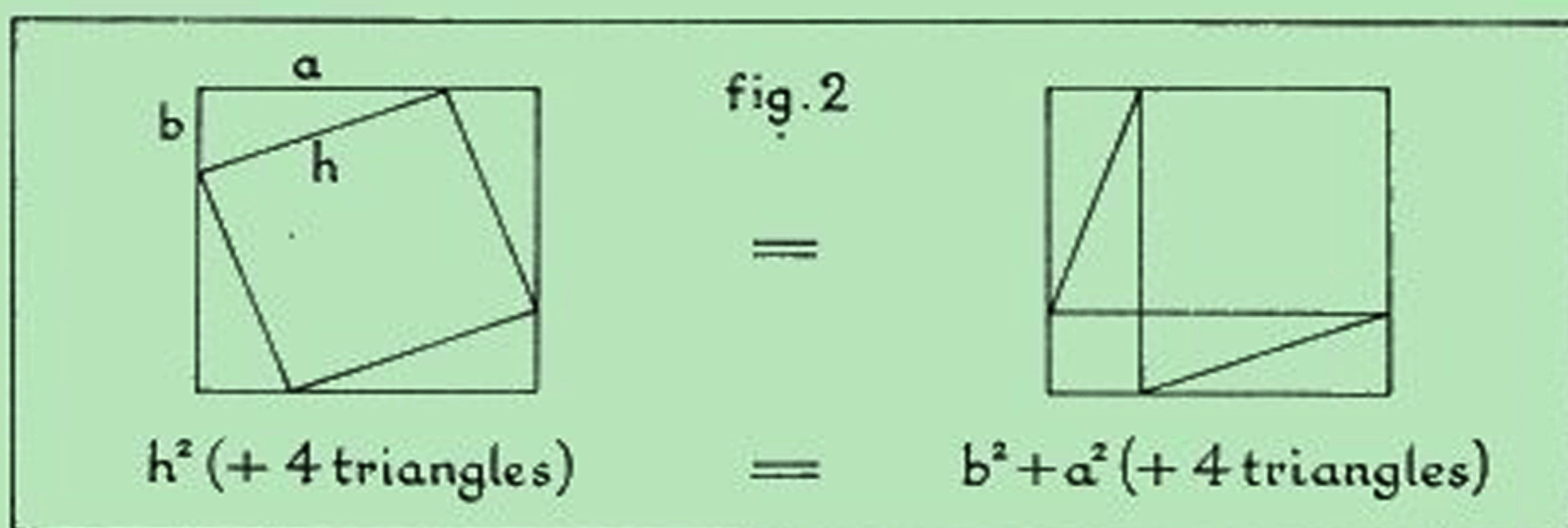


# PYTHAGORAS'S THEOREM



Probably the most famous theorem in Mathematics is the one named after the Greek Mathematician, Pythagoras, which expresses the relationship between the three sides of a right-angled triangle. The fact that the two shorter measurements, when squared and added, gives a result equal to the hypotenuse squared, is usually illustrated by drawing squares on the sides of the triangle as shown at the top left-hand corner of this page.

Many people through the ages have discovered ways of proving this theorem. Until recently, most schoolchildren would have known only one proof—Euclid's proof which showed how each of the smaller squares is equal to a particular part of the larger one. The frieze at the top and bottom of these pages shows how each square can be changed gradually into a rectangular section of the "square on the hypotenuse".



Two other proofs—both based on the fact that the triangles 90° angles gives 360° when multiplied by four—are illustrated in fig. 1 and fig. 2. Figure 2 is usually called the "Chinese square" method, and is often used in schools nowadays.

President Garfield of the U.S.A. is credited with the proof using the formula for the area of a trapezium: see fig. 3. That "all-rounder" Leonardo da Vinci, discovered a proof, too. You can try this experiment which is based on his proof. Draw any right-angled triangle on card and draw right-angled isosceles triangles on the two shorter sides as in fig. 4 i). By suitable drawing round parts of this shape, and moving it, you should be able to "double" the shape in two different ways to obtain diagrams like fig. 4 ii) and 4 iii). In each of these diagrams, draw straight lines joining Q to R' and R to Q'. You should now be able to complete the proof.

Finally, a fairly simple problem: can you discover the connections between the diagrams for Leonardo's and the "Presidential" proof, and the "Chinese Square" proof?

E.G.

