A travel company noticed that clients normally expected at least THREE of the following conditions for a summer holiday: Economical costs (c), Good food (f), Attractive scenery(s), Fine weather (w); OR "Economical costs AND Attractive scenery"; OR "Economical costs AND Fine weather".

cfsw + cfsw' + cfs'w + cf'sw + c'fsw + cf'sw' + cf's'w

The second term of the expression means Economical costs AND Good food AND Attractive scenery AND Weather which is NOT fine.

Easily constructed from a shallow cardboard box (e.g. a chocolate box) and a few sheets of card, this model will indicate when the holiday expectations are satisfied.

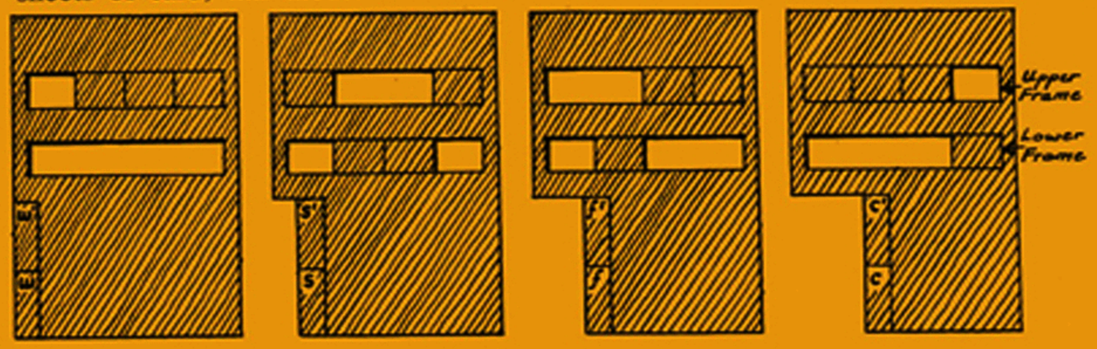


Fig. iii *Fig. iv* *Fig. v* *Fig. vi*

Fig. i shows how the opposite walls of the lid of the box are cut away with a sharp knife to form TWO slots, and a sheet of greaseproof paper is stuck over a rectangular window in the top. A much larger window is cut in the base of the box and left uncovered, Fig. ii.

Four pieces of card (Fig. iii to vi) are then cut so that the overall width of each is equal to the width of the slots in the box and the length of each is at least 1½ times the width of the box. The cards are marked out so that when the upper frames are coincident with the rectangular window, the positions w', s', f', and c' are in line with the lower edge of the lid (Fig. vii); and when the lower frames are coincident with the rectangular window, the positions of w, s, f and c are in line with the lower edge of the lid. The light areas shown on the cards are cut away with a sharpe knife.

Fig. vii

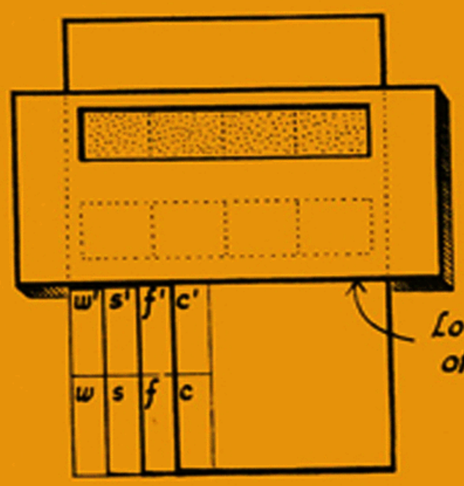
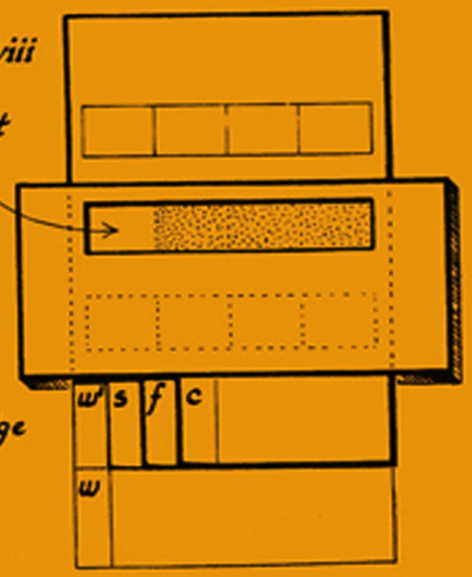


Fig. viii



To operate the Selector, place all four cards in the slots between the lid and base of the box (Fig. vii). Slide the cards into the position shown in Fig. viii, hold the Selector up and a section of the rectangular window will show a light to indicate that expection cfsw' is satisfied.

D.I.B.

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MATHEMATICAL PIE

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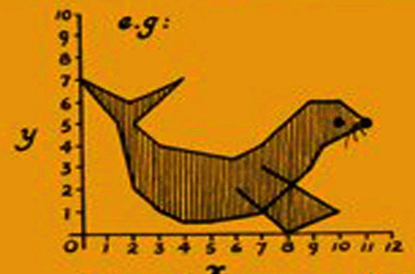
TRANSFORMATION

submitted by Carena

Transformation is a simple way of making things stretch or shrink, grow long or short, fat or thin, or to move about. The first step is to draw an object or animal, anything, by plotting points.



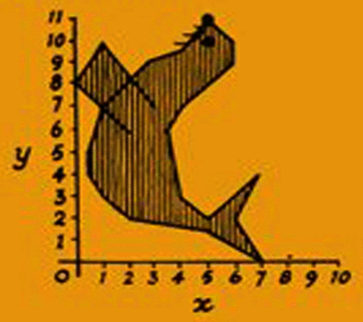
co-ordinates for my seal

x	11	10	9	7	6	3	2	4	2	0	½	2	3	4	5	7	9	9½	11	10	6	8	10	7
y	6	6	6	4	3½	4	5	7	6	7	5	2	1	½	½	1	3	4	5	5	2	0	1	3

To make my seal long and thin, I will halve my y co-ordinate and double my x co-ordinates. Then my seal will look like this.

x	22	20	18	14	12	6	4	8	4	0	3	4	6	8	10	14	18	19	22	20	12	16	20	14
y	2½	3	3	2	1¼	2	2½	3½	3	3½	2½	1	½	¼	¼	½	1½	2	2½	2½	1	0	½	1½

To make my seal stand on its tail, I swop over the x and the y co-ordinates.



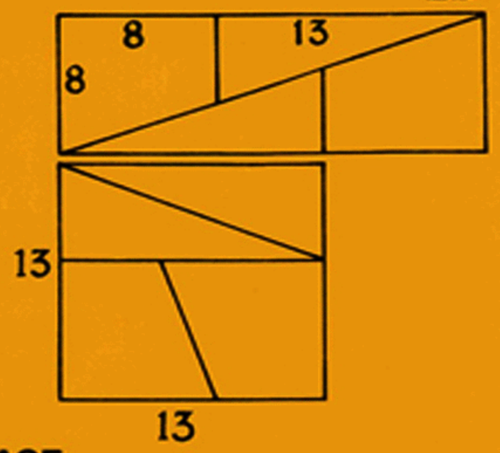
x	5	6	6	4	3½	4	5	7	6	7	5	2	1	½	½	1	3	4	5	5	2	0	1	3
y	11	10	9	7	6	3	2	4	2	0	½	2	3	4	5	7	9	9½	11	10	6	8	10	7

Using this simple technique, it is possible to change one kind of dog into another or one fish into a different one. Book tokens will be awarded to the senders of any ideas that are used.

ED

Sum thing wrong Fibonacci ?

Take a rectangle 21 cm by 8 cm and divide it as shown. Then rearrange the pieces to form a square 13 cm by 13 cm. This may add up but it does not multiply correctly. Why?



SMILE PLEASE

The f-number in photography (e.g. f 22 on a sunny day, f 4 in dull conditions, depending on the film used) is obtained by dividing the focal length of the lens by the diameter of the aperture just in front of or just behind the lens:

$$\text{f number} = \frac{\text{focal length}}{\text{diameter of aperture}}$$

If the focal length of a lens is 240 mm what must be the diameter of the aperture for f 8 to be obtained?

Why does the aperture increase when the f number decreases?

A.M.A.

SPORTING LIFE

My friend had been out shooting and when he came home he had two score heads and eight dozen feet. How many birds and how many rabbits did he shoot?

R.H.C.

ENCOMPASSED

Take a sheet of paper and a pair of compasses. Find the positions of the four vertices of a square using the compasses only. No folding of the paper is permitted.

R.H.C.

CUBES

$17^3 = 4913$. If you add together the digits 4 9 1 and 3, you get 17. Can you find other numbers which when cubed give a number whose digits add up to the original number?

Put another way, can you find any other numbers whose cube root is the same as the sum of its digits?

Hints:- If you have a calculator, or a set of cube tables you should have no difficulty finding several numbers less than 30 among others.

Whilst you are thinking about cubes; $3^3 + 4^3 + 5^3 = ?$
What is so special about the answer?

R.H.C.

TRY THIS FOR SIZE

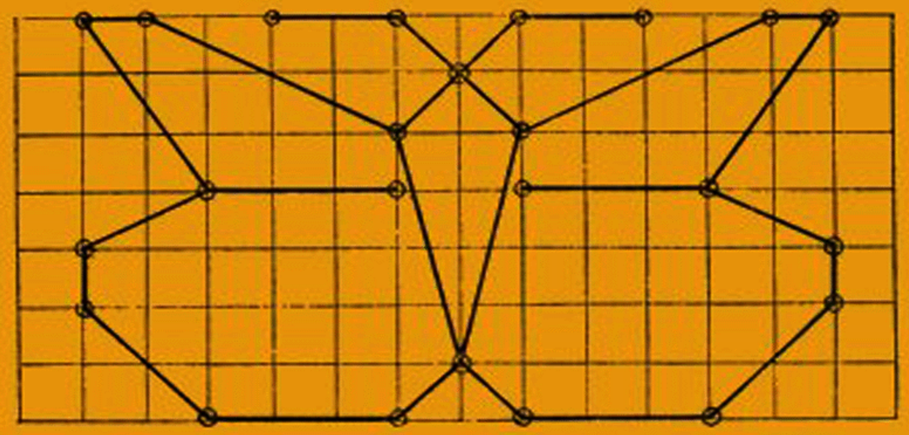
The pattern is $\frac{22}{2}$ $\frac{222}{3}$ $\frac{2222}{4}$

JUNIOR CROSS FIGURE No. LXVII

Clues Across: 1. MDCCXX; 7. DCCCXX; 8. CCCXXV; 9. CXXXII; 10. CXXIII; 11. XXXVII
Clues Down: 1. MDCCCX; 2. DCCXXX; 3. CCCXXX; 4. CCXXIV; 5. XXXIII; 6. XXVIII

B.A.

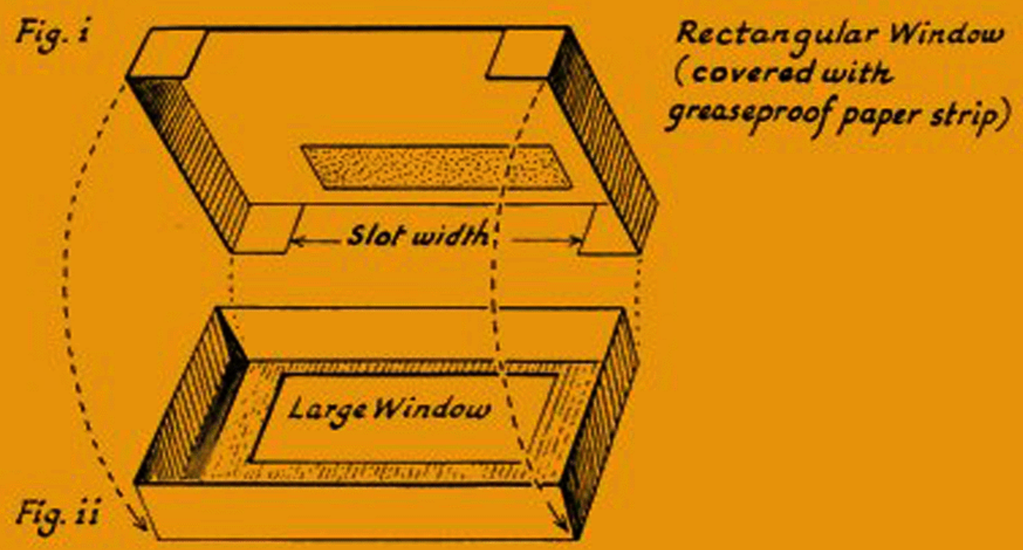
PICTOCODE No. 3



BOOLEAN SELECTOR

An algebra which uses letters for statements and symbols for the words "and", "or" and "not", was first developed by George Boole (1815 - 64), a Lincoln mathematician. However, it was almost a century before the applications of Boolean algebra were fully appreciated in the design of automatic control systems and computers.

Representing the statements by the given letters, and "OR" by "+" and "AND" by "x", the following information can be expressed symbolically. As with ordinary algebra, ab means a x b. There are no indices, but a raised dash after a letter indicates the complement: for example, a' means everything except a, i.e. "NOT a".



ANAGRAMS

If you add and also multiply the two numbers 2 and 47, you get 49 and 94 which have the same two digits. Can you find any more pairs of numbers with the same property?

R.H.C.

SIM

When you get tired of the usual pencil-and-paper games, why not try SIM? It's a game for two players, and you need two different coloured pens or pencils (one each).

The game starts with six dots drawn in an "Approximately regular" hexagon. Each player in turn draws a straight line joining any two of the dots, and they continue in this way, each trying to AVOID completing a triangle of their own colour. By the way, I mean a triangle with three of the six dots at its corners, smaller triangles where lines cross each other DON'T count.

Only one line can be drawn between two particular points — no overlapping on top of your opponents moves — and of course the player who makes a mistake and completes a one-colour triangle loses the games.

After you have tried SIM a few times, you might like to have a go at an even SIMpler game by each player TRYING to complete a triangle. Maybe this should be called MIS-SIM?

E.G.

SOLUTIONS TO PROBLEMS IN ISSUE No. 83

For 8, 1, 12, 12, 15, 23, 5, 5, 14?

i)

4	9	2
3	5	7
8	1	6

ii)

B	M	I
O	H	A
G	C	N

iii)

O	A	K
E	I	M
G	Q	C

it's MAGIC!

For the sixth former The friction at each hand is the same, hence that hand will slip first where the reaction is smaller.

Tops and Tails — 4 pigs and 20 hens

Translation — The boy thought that sum meant difference and the girl thought it meant product. The numbers were 20 and 9.

WINNING WAYS
With no restriction, any cup could be presented to either club, hence the number of ways is 2^4 or 16. With the restriction, the number of ways is 16 - 2 = 14.

DIG FOR THE ANSWER
The hole was finally 2·4 metres deep.

OLD MEASURE CROSS FIGURE
Clues Across: 1. 12; 2. 16; 4. 121; 6. 4; 7. 1760; 9. 1728; 10. 220; 12. 48; 13. 72.
Clues Down: 1. 11; 3. 640; 5. 112; 8. 782; 9. 144; 11. 27.

NOT SO OBVIOUS

Can a fraction whose numerator is less than its denominator be equal to a fraction whose numerator is greater than its denominator?

Is the answer in the negative?

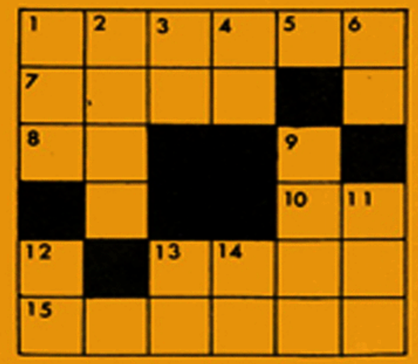
R.H.C.

LONG WINTER EVENINGS

Cutie Pie is knitting a scarf. The first night, she knits half of it and continues to knit half of the remaining length every night. How long will it be before she finishes the scarf?

A.M.A.

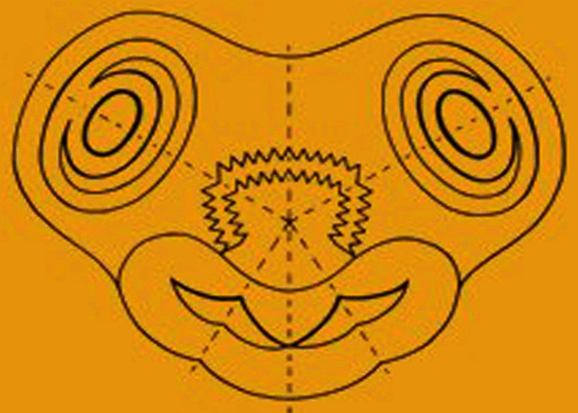
POWERS AND PRIMES CROSS FIGURE



CLUES ACROSS
1. 28^4
7. 11^3
8. 2^5
10. 6^2
12. 2^3
13. 13^3
15. 13^5

CLUES DOWN
Note 1 is not a prime.
1. Third prime after 600
2. Fifth prime after 1300
3. Thirteenth odd prime
4. First prime after 60
5. Second odd prime
6. Next prime after 4 down
9. Prime just before 1400
11. Next prime after 670
12. Third prime before 100
13. Three time third odd prime
14. Four times first odd prime

A.M.A.



For the Jamjar

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

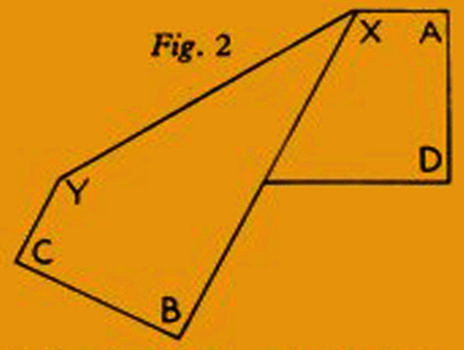
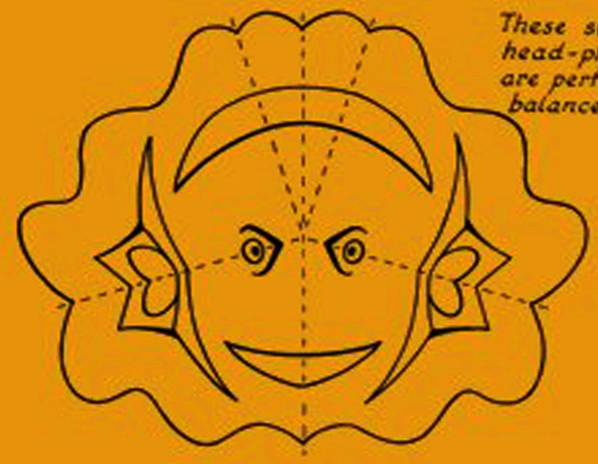


Fig. 2



These stereo head-phones are perfectly balanced !

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

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

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

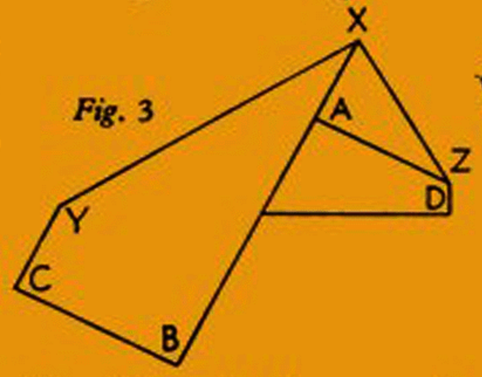
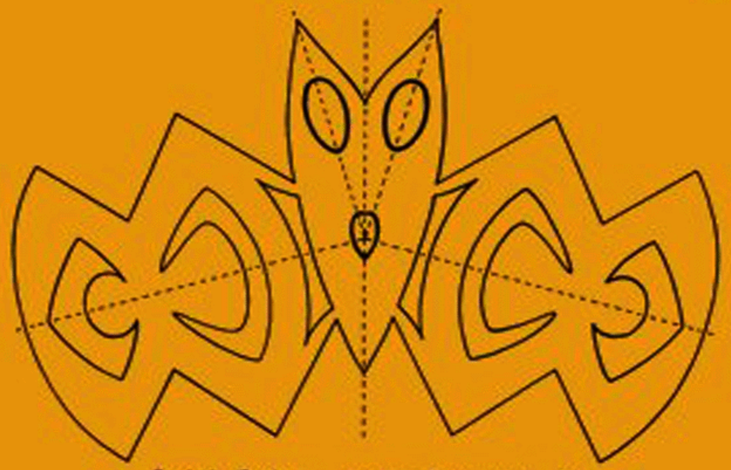


Fig. 3

By cutting the folded paper in curved sections the masks shown can be produced.

E.G.



Quick Robin — to the Batmobile !

I'm just a butterfly at heart !

SQUARE ONE, SQUARE TWO

Two square floors have to be paved with stones each one metre square. The total number of stones is 2120 but each side of one square is 12 metres longer than each side of the other floor.

What are the dimensions of the two floors?

R.H.C.

TREASURE TROVE

Jim was learning to count with the help of five barrels. Long John said that the treasure was in the five hundredth barrel. But there are not five hundred barrels, thought Jim. He could count up to 500 if he counted

A	B	C	D	E
1	2	3	4	5
9	8	7	6	
	10	11	12	13
17	16	15	14	

Which barrel contained the treasure?

R.H.C.

MULTIPLICATION MADE EASY

In the olden days, mathematicians were only taught multiplication tables as far as 5 x 5 so that a written method had to be used when they wanted to multiply two numbers such as 7 and 8. Robert Recorde gives a method as follows:-

7	Subtract each	3	The units digit if formed by multiplying together these two remainders, 3 x 2 = 6.
8	from 10	2	The other figure of the product is found by subtracting diagonally either way, (7 - 2)
			or (8 - 3) = 5. Answer 56.

Now try 9 x 6. Experienced mathmematicians may like to work out the reason for its success.

R.H.C.