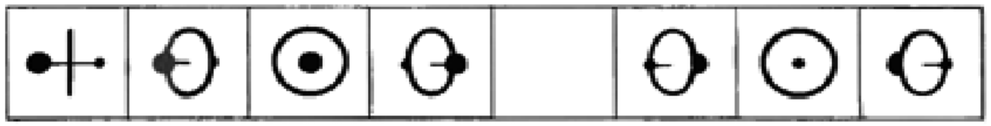
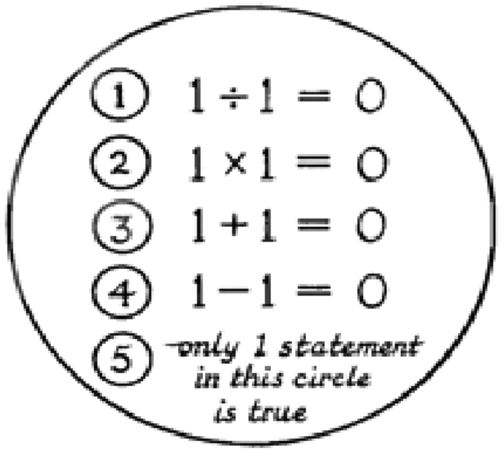
A POINT OF VIEW



What would be in the fifth box of this sequence ?

D.H.

A PARADOX



C.B.A.

THE STRAIGHT AND NARROW

If you draw straight lines through three dots, you get either one (the points are collinear) or three lines.

How many lines can you get from four dots? Draw diagrams to illustrate each answer.

D.H.

SUBSTITUTION

In the multiplication on the right, each different letter stands for a different digit. Find which digit each letter stands for.

```
  A A B
x   B
-------
  C C A
```

D.H.

EQUAL SHARES

ABCD is a rectangle. P is any point inside the rectangle. Draw a line that passes through P and divides the rectangle into two equal areas.

Would it have made a difference if the point P had been outside the rectangle, or on the perimeter of the rectangle? D.H.

MATHEMATICAL PIE

No. 102 *Editorial Address :* West View, Fiveways, Nr. Warwick **SUMMER, 1984**

AMAZING

1	2	5	6	7	8	10
3	3	4	5	6	9	10
4	5	5	6	7	8	11
10	9	8	7	16	17	18
11	10	11	8	15	21	19
10	11	12	13	14	20	20
11	12	19	20	21	22	21
12	13	20	21	22	23	24

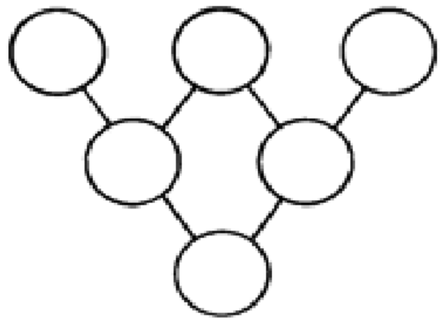
Starting at 1, can you traverse the grid through 2, 3, 4, etc., to 24 without passing through the same number twice?

C.B.A.

WHAT A DIFFERENCE ?

Put the numbers 1, 2, 3, 4, 5 and 6 in the six circles on the right so that each number is used once and each number is the difference of the two numbers immediately above it.

D.H.



PYTHAGOREAN TRIPLES

Four boys are given three circular pies of the same thickness to share. The radii of the pies are a, b and c units of length. It is noticed that $c^2 = a^2 + b^2$! How should they divide the pies to that they each receive the same amount?

R.H.C.

A DICEY PROBLEM – 1

Two dice are thrown, but it is not the two numbers on the top faces that are added together, instead all the numbers on the ten visible faces are added. Being a gambling person which is the best total for you to bet on and what are the odds of being correct?

G.F.

A DICEY PROBLEM – 2

You know that on a die, the sum of the opposite faces is 7. Can you make a die, so that the numbers on the faces are different, but the product of opposite faces is the same?

A.M.A.

ROMAN NUMERALS

Which year that has passed requires the largest number of symbols when expressed in Roman numerals?

R.H.C.

THE LAST STRAW

The last digit of 3^1 is 3, of 3^2 it is 9, of 3^3 it is 7 and of 3^4 it is 1.
What is the last digit of 3^{55}?

D.H.

LARGE NUMBERS

If you had 1 000 000 seconds to live, would you spend it (a) 1 week by the sea, (b) 10 days in Spain, (c) a fortnight skiing, (d) a month on a cruise or (e) a year travelling round the world?

Now work out the time in larger units.

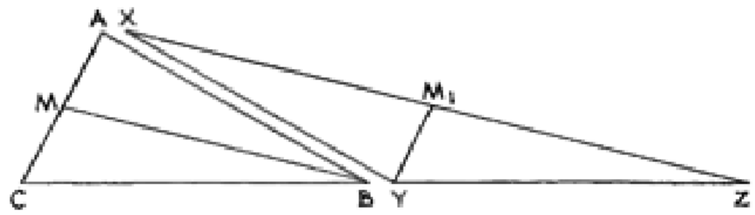
After a builder had completed a house, he had 1 000 000 cubic millimetres of sand left over. Without working out the volume in larger units decide whether he would need (a) a shovel, (b) a van, (c) a lorry or (d) a wheel barrow to dispose of it.

Now check to see if you were correct.

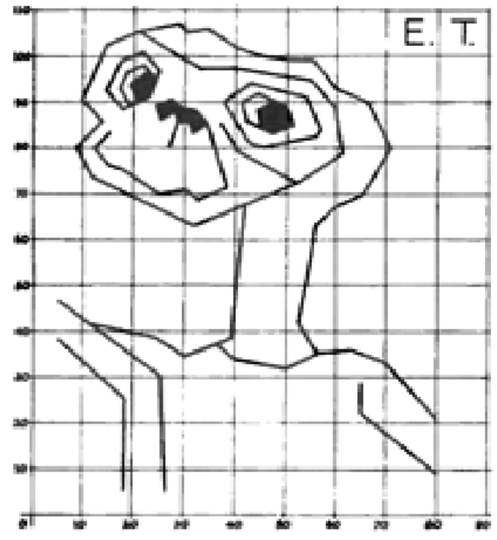
C.B.A.

Halves All the Way The sides of the black triangle are $\frac{1}{8}$th of the lengths of the originally triangle's sides. The area is $(\frac{1}{8})^2$ or $\frac{1}{64}$th of the area of the original triangle.

Supplementary Triangles BM = $\frac{1}{2}$ XZ and $YM_1 = \frac{1}{2}$ AC.



Elliott's Friend



Roll-a-Coin The probability is one quarter.

1984 The date reads 25.03.1984 and uses all the digits except 6 and 7. Summer Time commenced on that day. The middle of the year is midnight June 30–July 1.

A Weighty Problem Add the three readings together and divide by 2. This gives the total weight of the three. The dog weighs 15, the boy 50 and the girl 32 kilograms.

True or False 1. True only if the numbers are bigger than one. 2. True only if the original number is bigger than one. 3. True only if the original number is bigger than one.

Jumbled Numbers 1583 + 1763 = 3346.

Junior Cross-Figure No. 72 x = 18, a = −2 and b = 5.
Across: 1, 218; 4, 334; 6, 21; 7, 49; 9, 6450 (p = 7).
Down: 2, 832; 3, 54; 5, 3125; 8, 96.
An ingenious clue for 1 Down is $b^b - a^{2b} + a = 2104$.

B.A.

THE CHINESE CALENDAR

The Chinese have a happy legend connected with their calendar. It tells of a day when Buddha invited all the animals to a great feast to celebrate the New Year. On this day only twelve animals arrived, so Buddha rewarded each one by naming a year in its honour, like this: Pig (1971, 1983), Rat (1972, 1984), Ox (1973, 1985), Tiger (1974, 1986), Rabbit (1975, 1987), Dragon (1976, 1988), Snake (1977, 1989), Horse (1978, 1990), Goat (1979, 1991), Monkey (1980, 1992), Cockerel (1981, 1993), Dog (1982, 1994). These are some years in this century from this series. Find the animal whose name is given to the year in which you were born.

The Chinese year has twelve months; six of these have thirty whole days each and the other six twenty-nine whole days: $(30 \times 6 = 180) + (29 \times 6 = 174) = 354$ days. These are called "lunar months" because their length is found by counting the number of whole days between one new moon and the next. The length of a true lunar month is: 29 days, 12 hours and 45 minutes. As we have to make a calendar we say that this is about 29½ days, or 59 days for two lunar months. There are six pairs of lunar months in a year, so there are 354 days in a lunar year. Notice that the 45 minutes over in each month is not counted here so one can only say: "about 29½ days" Adjustments must be made from time to time; this makes it hard to fit the Chinese calendar into the one we use in Britain.

The Chinese New Year's Day is a very important day for the Chinese, wherever they may be. In big cities especially, there are colourful and noisy processions with bands and fireworks as well as fun and feasting.

	1982	1983	1984	1985
Lunar New Year	25 Jan.	12 Feb.	2 Feb.	?
Animal	Dog	Pig	Rat	Ox

Find the date of the lunar New Year from this pattern.

The Annual General Meeting of the Apathetic Society at Entropy College meets on, "Friday on or before the Full Moon in May". When was it held in 1984? The members might wish to know, because notice was not sent to them. S.H.F.

SOLUTIONS TO PROBLEMS IN ISSUE No. 101

Odd One Out No. 4 (1) $^{24}/_{36}$ as the others simplify to $^{2}/_{3}$, (2) $^{1}/_{4}$ as it is the only one bigger than $^{1}/_{2}$, (3) 0.2 as it is the only one which does not have a numerator of 1 when expressed as a fraction, (4) $1^{5}/_{7}$ as it is the only one which does not have a numerator 11 when expressed as an improper fraction.

WHAT'S IN A NAME?

JUNIOR CROSS-FIGURE No. 73

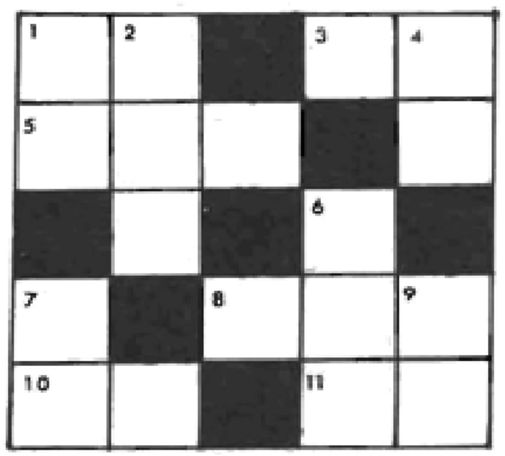
CLUES ACROSS

1. 6^2
3. 7^2
5. $10^2 + 4^2 + 2^2$
8. 12^2
10. $8^2 - 3^2$
11. $9^2 - 8^2$

CLUES DOWN

1. $(\frac{1}{2} \times 8^2) - 1^2$
2. 25^2
4. $10^2 - 1^2$
6. 29^2
7. 5^2
9. $(2 \times 8^2) - 9^2$

A.M.A.



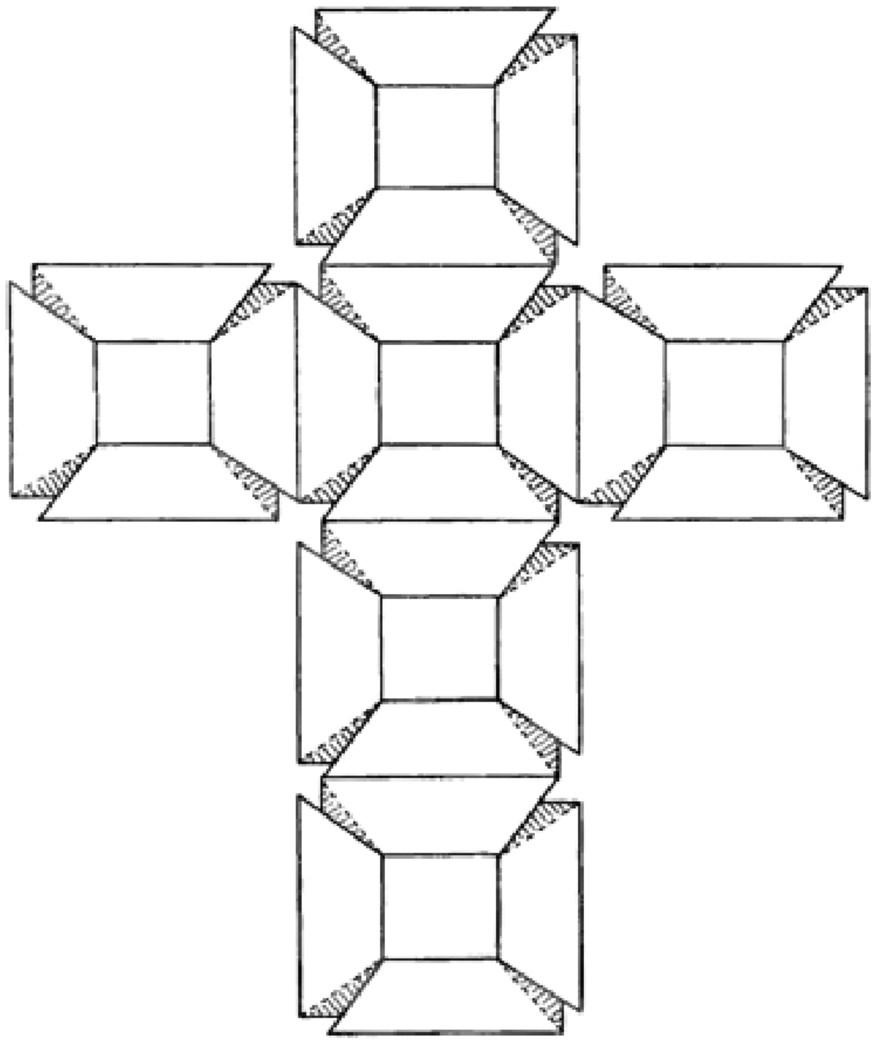
A FOUR-DIMENSIONAL CUBE

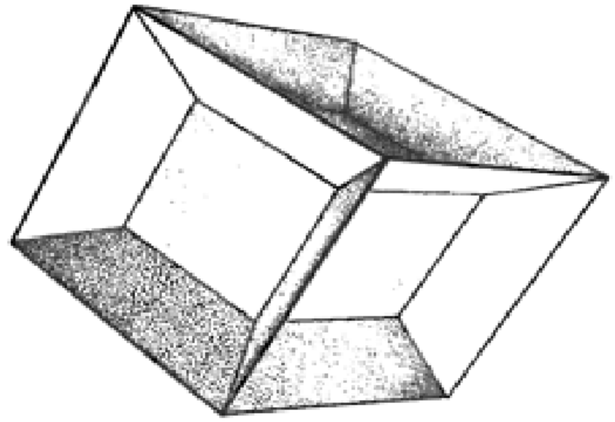
Living in a three-dimensional world, we cannot truly appreciate a four-dimensional universe. However, by investigating figures in the dimensions we experience, we are able to establish the form that a four-dimensional figure would take.

A straight line represents one dimension. Clearly, life in such a world would be quite *mono*tonous! Width and depth or height do not exist. In reality, with no width the line itself does not exist!

A square represents a two-dimensional world. In his story "Flatland", early this century the Reverend Edwin Abbott described such a world where the inhabitants would "move freely on the surface, but without the power of rising above or sinking below it, very much like shadows".

A cube represents a three-dimensional world. The three-dimensional effect can be obtained by distorting the faces of the figure. In a similar way, a landscape artist may use a vanishing point to create perspective.



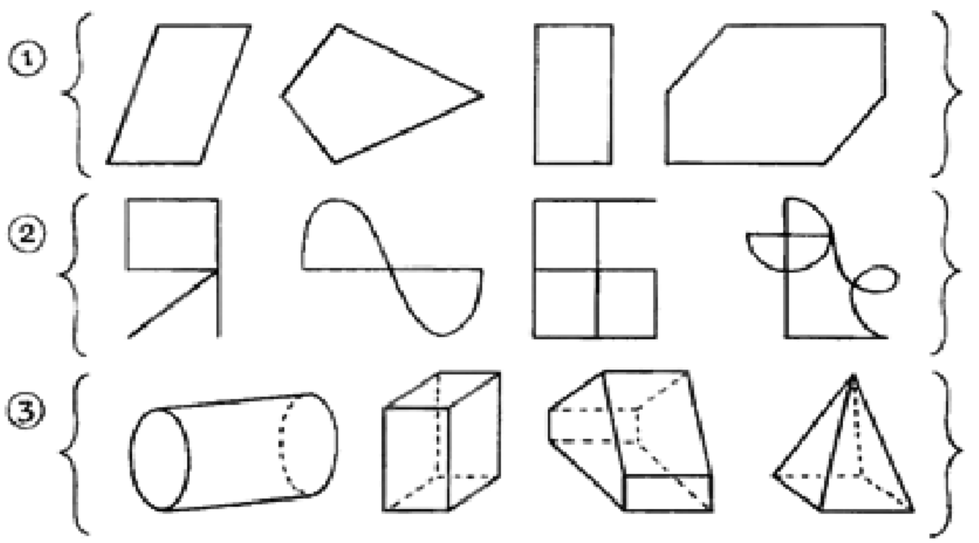


If the three-dimensional cube can be represented in two-dimensions, then why not represent a four-dimensional "cube" in three dimensions?

By following the build up of the dimensions that we can experience, it can be shown that the four-dimensional cube has four edges originating from each vertex. Comprising eight cubic cells, this "hypercube" can be constructed quite effectively from pipe-cleaners and straws, one cube placed in a rather larger cube with the respective vertices joined (see *Mathematical Pie* issue no. 51). Alternatively, it can be produced in paper or card from the net shown. The other diagram is a two-dimensional projection of the three-dimensional representation of a four-dimensional figure. D.I.B.

ODD ONE OUT No. 5

Which is the odd one out in each of these sets – and why?



E.G.