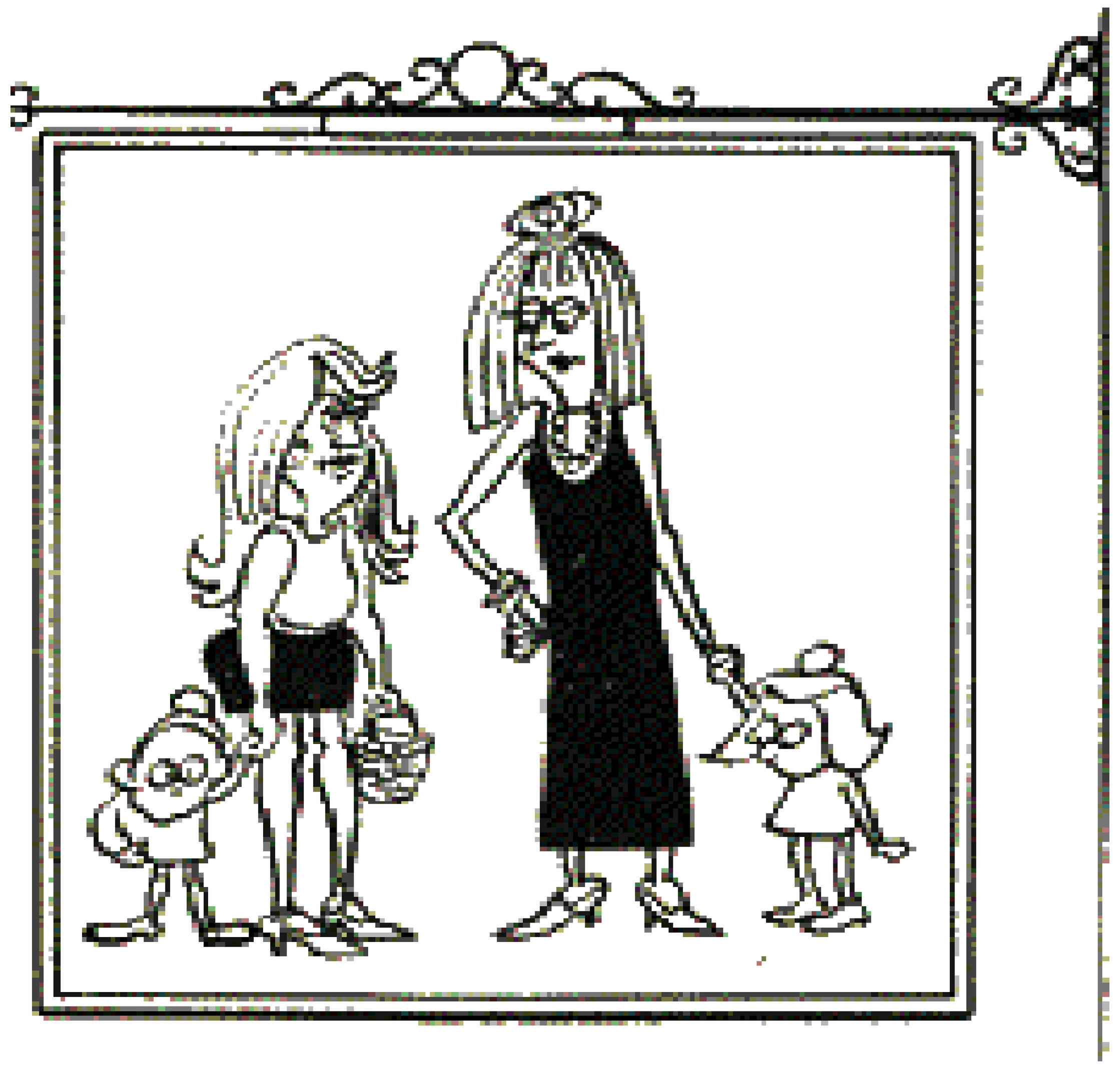
MATHEMATICAL PSALM

This " Mathematical Psalm " is the work of a 15-year old boy at the Christ Apostolic Grammar School, Ibadan, Nigeria and was first printed in the School magazine.

I BELIEVE in Maths.
the hardest of all subjects,
producer of tough problems.
Arithmetic, the only science of numbers,
is full of numerals;
this will never drag me back.
But algebra is a study of values of numbers,
x, y, z,
which is my enemy;
I have to put more effort.
From where cometh my help upon this conspicuous subject ?
But my help comes from the Almighty Father,
maker of heaven and earth,
who will direct my brain to algebra.
But I put the most of my interest on geometry
which is full of tough calculations;
where I have to deal with the properties of lines and angles.
Surely I have no trouble on this,
though the composition of all, including
Trigonometry, pure, applied and additional maths.,
is a great embarrassment.
But still I will fear no problem
for figure tables are with me;
the pen and pencils are not dry.
I believe in maths.,
the science of space and numbers;
the craziest of subjects, and the
organiser of men's everlasting better life.

Samuel Olu Ogunbusola

MATHEMATICAL INN SIGNS



Maxi-ma and Mini-ma

Coat an' gent (cotangent)

mathematical pie

No. 58 | Editorial Address : 100, Burman Road, Shirley, Solihull, Warwickshire, England | AUTUMN, 1969

THIS TAKES THE CAKE !

Turning the next corner, Alice saw that her way was barred by an iron grid, Her vexation at this was almost enough to make her cry again, but luckily her attention was caught by a buzzing, mumbling noise. " . .,M, A,A, M, T, M, E, E, T, M, M, E " it went.

Goodness! thought Alice, fully expecting to be confronted by a spelling bee. She looked around and saw a small square cake hopping about from space to space on the grid. Alice noticed that he was not hopping normally but turning over on one of his edges after the other.

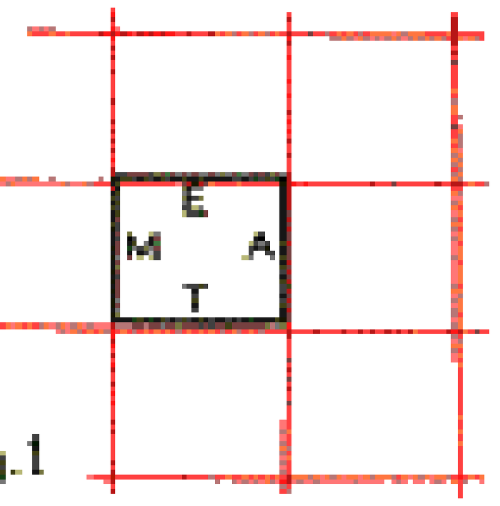


Fig.1

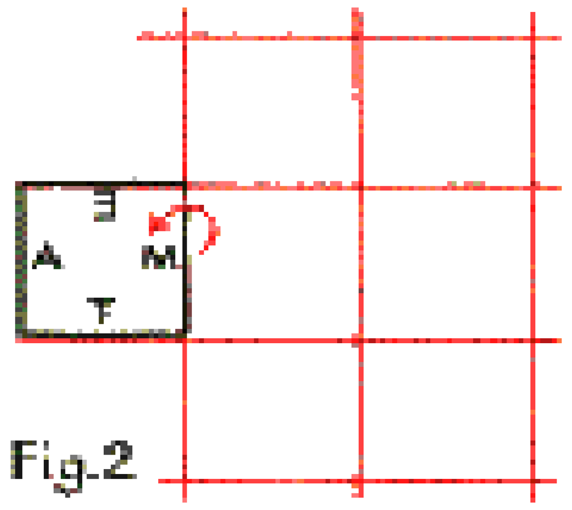


Fig.2

" M.TEA " she reads, with some difficulty, from the letters on his edge as he flopped about. "Should that be Mr. ? . . . perhaps he's French in origin". Aloud, she politely asked, " Excuse me, is there another way round ? " The griddle-tea-cake stopped. " Another commuter, I suppose " he snapped. " I've directed numbers of them through lately. Got your references ? No ? We can't let people through unless they associate with the right group. You'll just have to be un-Abel to do it yourself! "

With that he flipped quickly away.

" What a-crostic *he* was ! " sighed Alice " Have to be unable ? Whatever did he mean ? "

Fig. 1 shows the cake. Every time he said " M " he flipped over on the edge marked M as in Fig. 2 and similarly for the other letters. Cut out a model of the cake, colour the two sides differently and label the edges with the letters as shown on both sides. Place your model cake near the centre of a sheet of squared paper. How would the cake move if he said " E,A, T,M,E" ? Investigate "M,E,A,T", "T,A,M,E", "M,A,T,E" and "T,E,A,M" starting from the same original position each time. "What do you notice ?

Try " M,A " and " A,M "; " T,A " and " A,T " and other two letter combinations. Which letters cannot be interchanged? What happens with " E,E "; " A,A ", etc? Make up some words and sentences and see what the cake would do. Here is a suggestion:

" MEET A TEAM AT TEA " said the cake.

" That's no better than saying nothing at all " replied Alice. Book tokens will be sent to the senders of the best explanations.

E.G.

HICCUPS

For this game we shall need 3 cups, 3 pennies, 3 match-box trays or any 3 objects which have two ways up.

∪ ∩ ∩

Place your cups so that two are inverted and one upright, as shown.

Now by inverting two cups simultaneously get your three cups the right way up in one move.

That was easy, wasn't it? Can you do it in exactly two moves, moving two cups each time? Can you do it in exactly three moves, 4 moves, etc.? Is it always possible?

Can you find a general strategy for the solution?

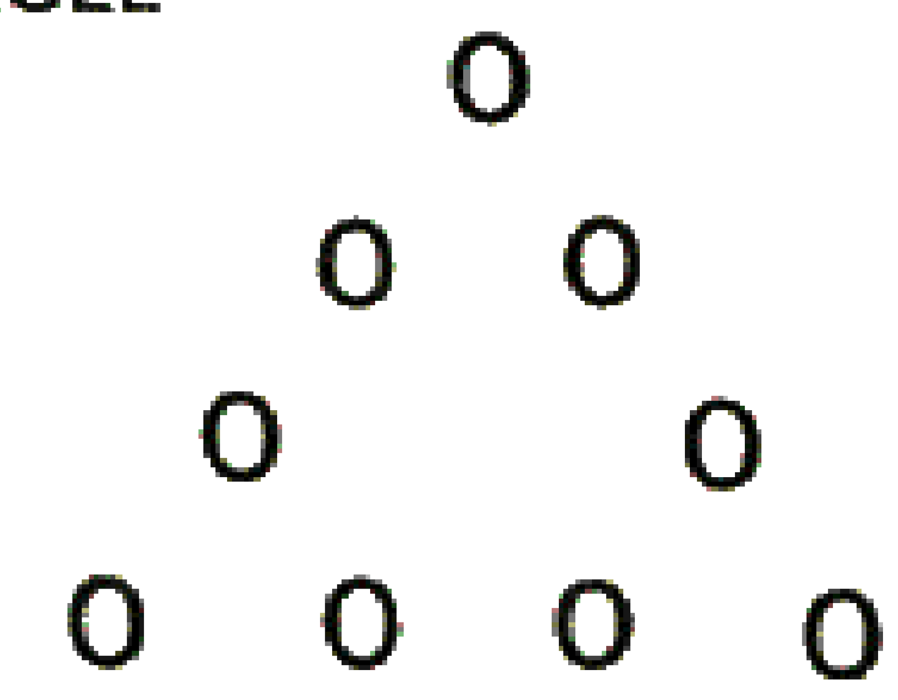
R.M.S.

MAGIC TRIANGLE

Write each of the digits 1 to 9 in the circles shown in such a way that each side has a total of 20.

Can you find an arrangement which does not include 5 at a vertex ?

R.H.C.



FACTORIALS !

$5! = 1 \times 2 \times 3 \times 4 \times 5 = 120$, i.e. the answer ends in one zero. How many zeros will there be at the end of 50!, 500! Generalise the result.

R.H.C.

PI & e

In issue No. 57, we asked for new mnemonics for π and other numbers. The response was most encouraging, the longest being a fifteen word mnemonic for π which reflects the attitude of many individuals to the decimal equivalent of irrational numbers; it was submitted by P. G. Little of Sutton Coldfield and reads

'For a long time I stood wondering to myself about the inane accuracy involving decimal fractions'.

J. J. M. Matthews of Malvern waxed lyrical with
'Sir: I send a rhyme excelling
in sacred truth and rigid spelling'.

John Grint of Harrogate suggested the mnemonic for e
'By Jupiter, I remember my mnemonic' $e = 2.71828$.

Some of the suggestions were grammatically incorrect or sounded contrived so that the mnemonic was more difficult to remember than the figures. We thank everyone who submitted suggestions and would be pleased to receive further offerings of mnemonics for numbers other than π, e.g. surds.

Book tokens have been sent to the authors of the mnemonics that we have used.

B.A.

MORE POWERS

153 is an interesting number, writes Mr. B. W. Jacobs of Sandye Place School, Bedfordshire, for it is equal to the sum of the cubes of its digits. Apart from 1, can you find other numbers with this property?

Can you suggest other interesting relations between numbers and their digits ?

THE CASE OF ASS

submitted by H. I. Kotkin, London

ABC and XYZ are two triangles such that AB=XY, BC=YZ, and $\angle$ ABC is the supplement of $\angle$ XYZ. If the median BM of triangle ABC is 7 cm., find XZ.

SOLUTIONS TO PROBLEMS IN ISSUE No. 57

THE ABSOLUTE LIMIT $\frac{x^2+x-2}{x^2+2x-3} = \frac{(x+2)\ (x-1)}{(x+3)\ (x-1)} = \frac{(x+2)}{(x+3)}$

As x approaches 1, the fraction approaches ¾ but the graph has a hole in it at this point.

SENIOR CROSS FIGURE No. 53

Clues Across: 2. 1234321; 6. 441; 7. 1444; 10. 21; 11. 15832; 12. 10; 13. 151; 14. 31; 15. 15129; 16. 11; 17. 00; 18. 1209; 21. 111; 22. 1481544.

Clues Down: 1. 343; 2. 1111; 3. 314159265; 4. 38; 5. 12321; 8. 451; 9. 1331; 10. 2050; 12. 11001; 13. 121; 16. 1914; 19. 919; 20. 28.

A NEW LOOK AT AN OLD PROBLEM—(5, 6) can be written $\frac{5}{6}$, then (5, 6) × (1, 2) = (5, 12) and (5, 6) + (1, 2) =)5, 3).

The operation ° is commutative but the operation * is not.

The expressions can be interchanged if qc = br and ap = ds.

JUNIOR CROSS FIGURE No. 50:

Clues Across: 1. 109; 3. 56; 5. 2530; 6. 564; 8. 244; 10. 8675; 11. 58; 12. 652.

Clues Down: 1. 185; 2. 924; 3. 5304; 4. 60; 7. 6468; 8. 256; 9. 452; 10 85.

SUBSTITUTION—As there are eleven symbols, the smallest base in which the problem can be considered is eleven.

B.A.

After the Norman Conquest, attempts were made to give more standardisation to the English system of weights and measures which often varied considerably from one locality to another. With such very poor communications and virtually no formal education, it is not surprising that the acceptance of standards took a long time. Even today, the ' gill ' represents one-quarter of a pint in some parts of Britain and one-half of a pint in others.

The grain was the weight of a dry barleycorn. An early pound weight was the tower pound used at the mint in the Tower of London. It was equivalent to 5400 grains. During the Thirteenth Century the Troy weights were introduced from the French town of Troyes where fairs were held. Twelve ounces (Latin uncia, a twelfth) made a pound Troy (5760 grains).

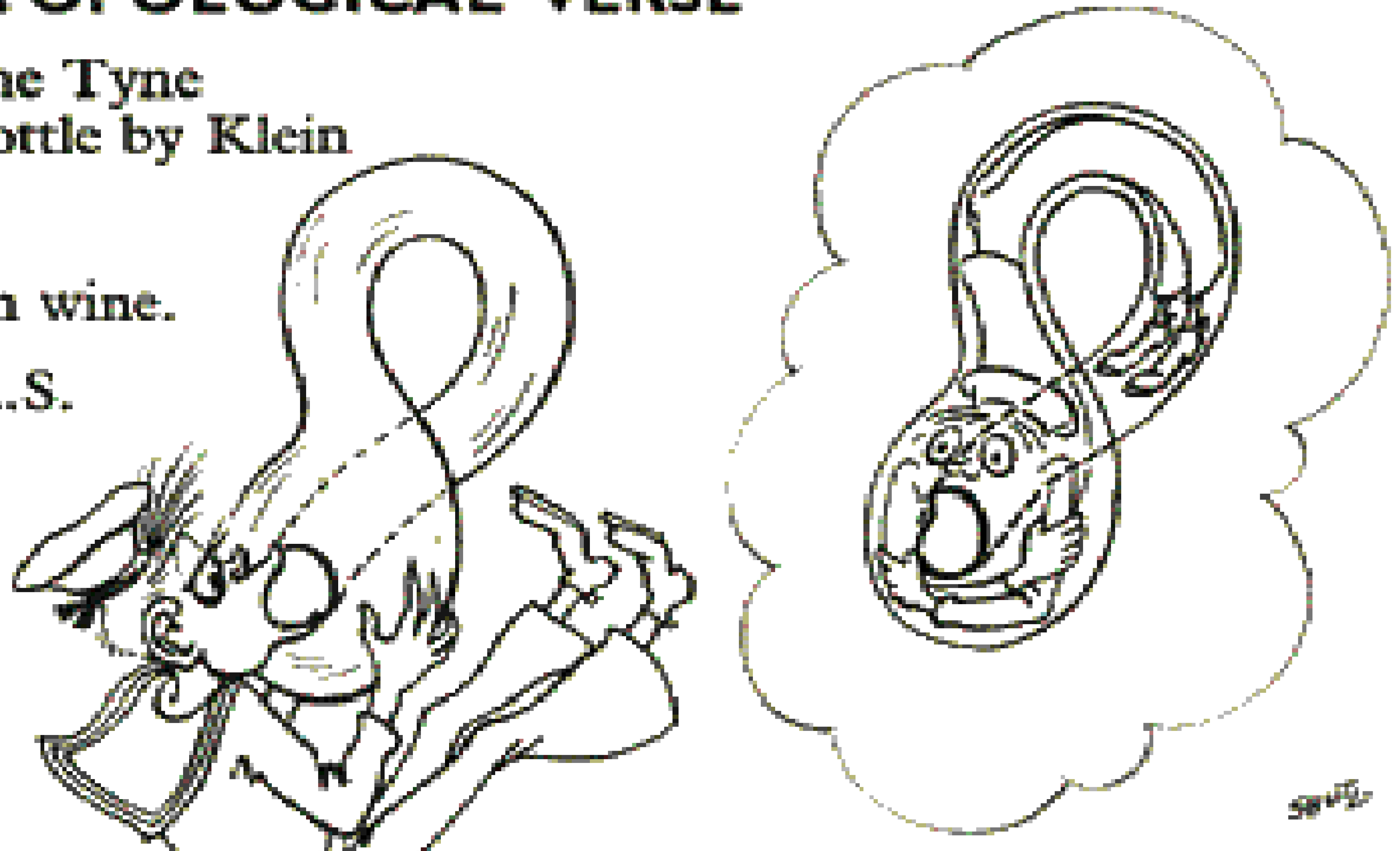
The early years of the Fourteenth Century saw the steady replacement of Troy weight by averdepois (goods of weight), a system brought from Bayonne but known to be Spanish. 16 ounces give the avoirdupois (modern spelling) pound (7000 grains). Although the averdepois system had long since superseded the Troy weights in commercial use, it was not until 1878 that it was given full legal status as the standard of reference.

The history of metrology is such an extensive topic that no more than a brief outline can be given in these pages, but the following references are suggested for further reading: Historical Metrology by A. E. Berriman; History of Mathematics Vol. II by D. E. Smith; Encyclopaedia Britannica; Inductive Metrology (1877) by W. M. Flinders Petrie; Domesday Book and Beyond (1897) by F. W. Maitland. D.I.B.

TOPOLOGICAL VERSE

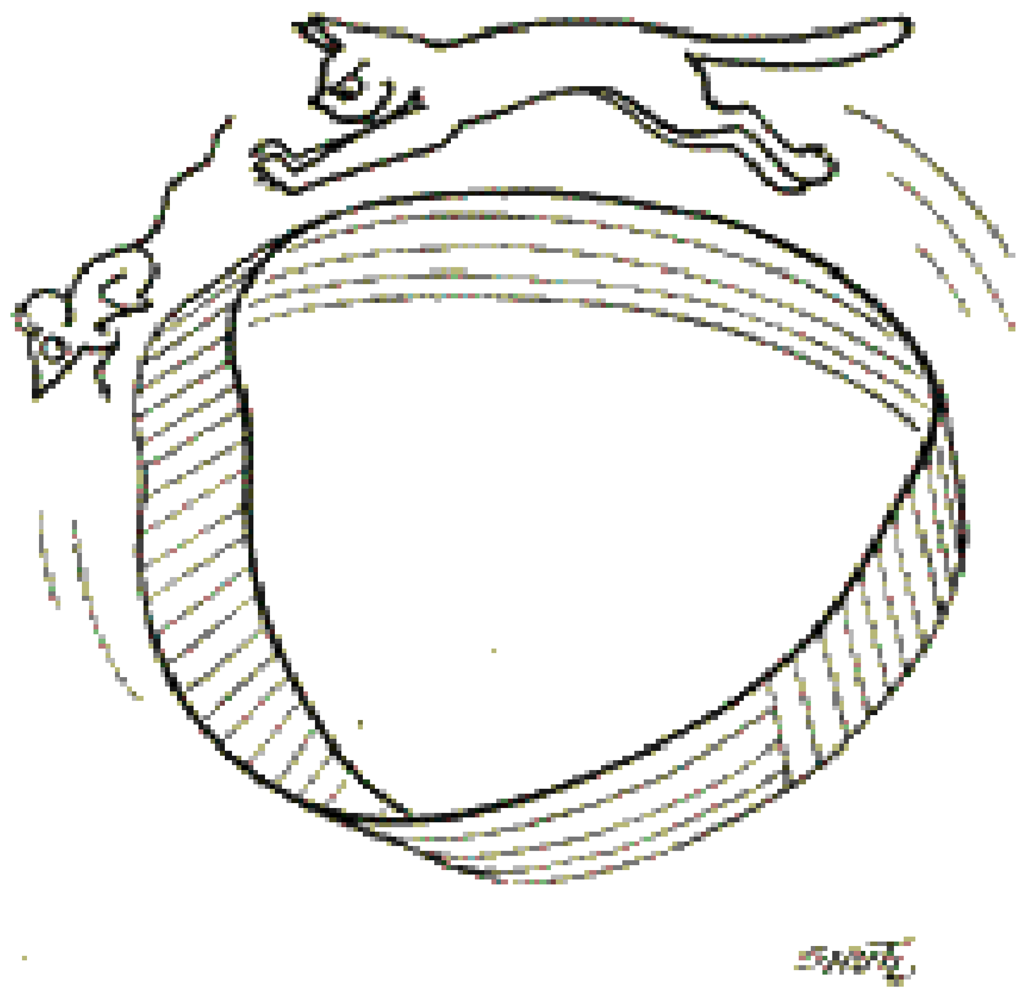
A Jolly Jack Tar from the Tyne
Tried to drink from a bottle by Klein
As he loosened his grip
It slid over his lip
And now he is pickled in wine.

A.A.S.



On a Mobius strip,
A cat took a trip,
He walked from the mouse, it was clear,
He went on his way,
For a year and a day,
And crept up on his prey from the rear.

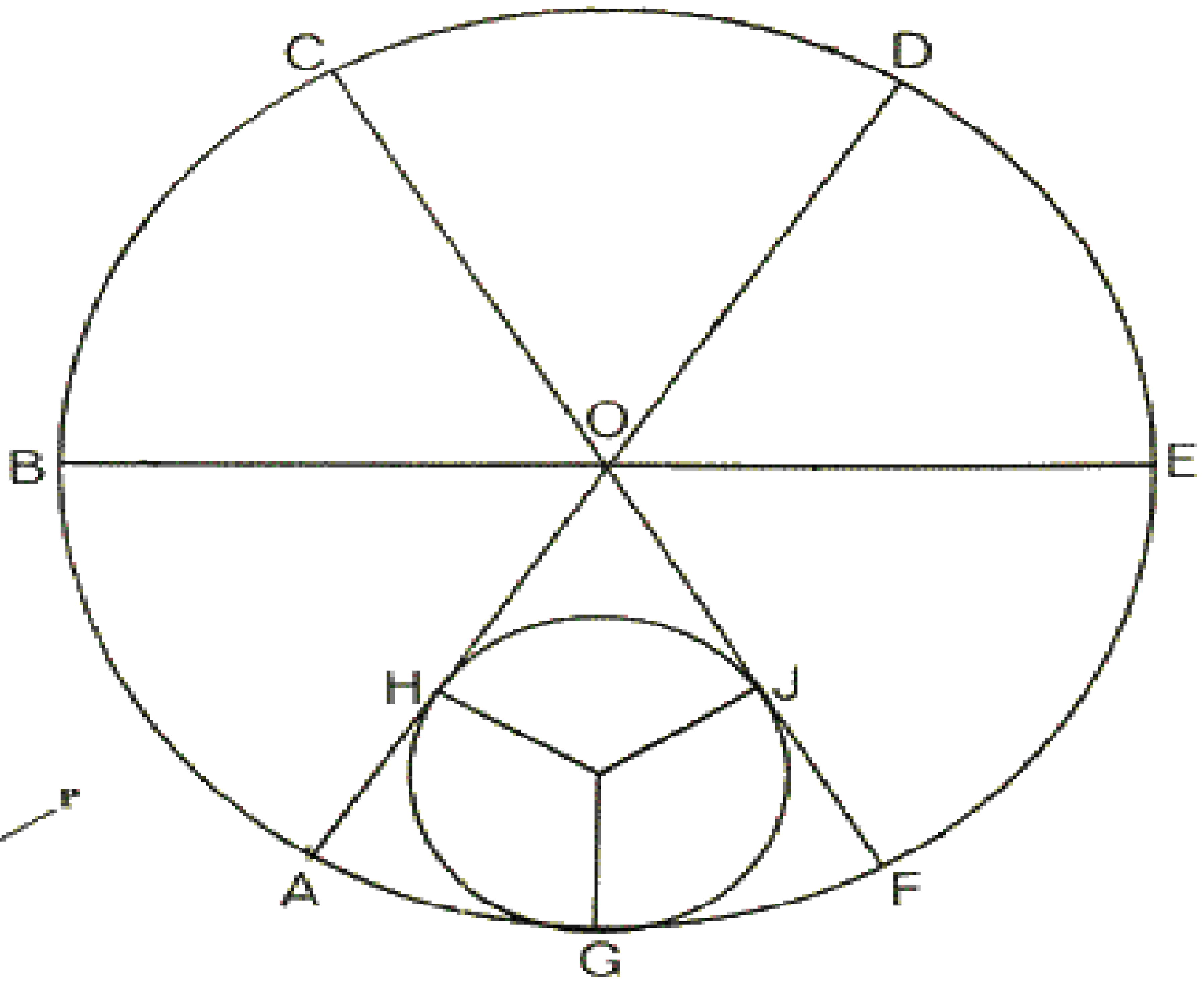
B.A.

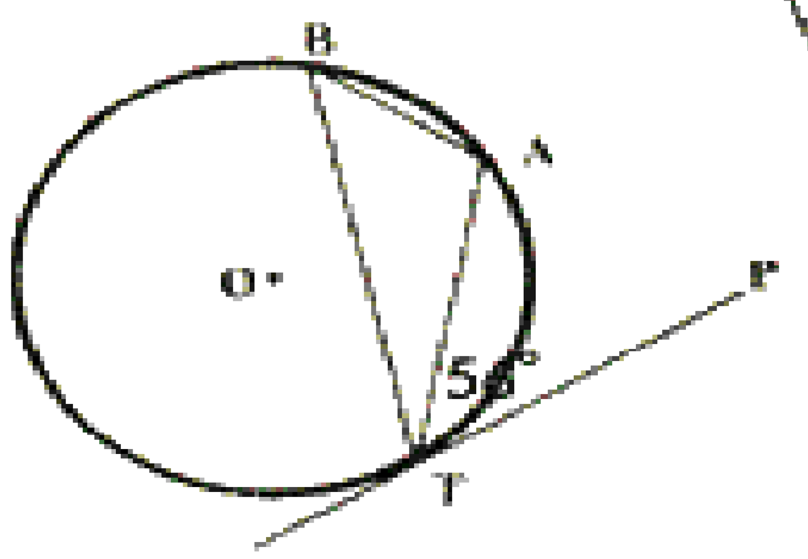


WHEELS WITHIN WHEELS

ABCDE are the vertices of a regular polygon. What fraction of the large circle is the smaller one?

R.H.C.





SENIOR CROSS FIGURE No. 54

1		2	■	3		4
	■	5	6		■	
7	8	■		■	9	
■	10		■	11		■
12		■	13	■	14	15
	■	16		17	■	
18			■	19		

Clues Across

1. Largest angle (to nearest degree) in triangle with sides of 7 cm., 13 cm. and 16 cm.
3. Length of chord AT.
5. Distance of chord AT from centre of circle.
7. Sum of roots of $10x^2-27x+18=0$.
9. Average speed (km. per hr.) if outward journey AB takes 8 min. at 28.50 km. per hr., and return BA is at a speed of 14.25 km. per hr.
10. $\sqrt[3]{\dfrac{5\times10^2\times3^3}{2^5}}$
11. The 133rd term of an A.P. if the 25th and 100th terms are 9 and 34 respectively.
12. Latitude of point on earth's surface with a rotational speed of 806 m.p.h. (Earth's radius = 3960 miles).
14. x position (larger first) of points of intersection of $y=(4-x)(2+x)$ and $y=3(4-x)$.
16. Area of a regular hexagon of side 8 cm.
18. Area of triangle in 1 Across.
19. Local time difference (minutes) between 52°N 10°W and 44°N 19°E.

Clues Down

1. Angle AOT in diagram.
2. Tan.A if $\cos A=\frac{5}{13}$.
3. Longer side of a kite with shorter side of 10 cm. and diagonals of 21 cm. and 16 cm.
4. Area of smaller segment formed by chord AT.
6. Radius of a sphere of volume 310 cu. cm.
8. Total compound interest (in £) on £30.00 at 8% per annum for 3 years.
9. Volume generated when $7y=3x+21$ is rotated about the y axis between $y=3$ and $y=6$.
12. Acceleration at 2 sec. if $v=9.6t^2-7$.
13. Angle ABT in diagram.
15. Minor arc AT.
16. $\sqrt{321}$ base-six.
17. $A=\frac{7B}{10}$; $B=3C$; $B+C=40$. Evaluate $A+B+C$.

D.I.B.

Ancient Weights and Measures

With the gradual adoption in Britain of the metric system of weights and measures, it is interesting to consider the origins of some of the old units which are being withdrawn from everyday use.

As civilisations developed in ancient times, man found the need to measure. Just as he had learned to count on his fingers, he recognised that his body provided a readily available measuring instrument. By comparing the cubits used by different races, some idea of the relative statures may be obtained. Many of these standards of antiquity, with their inevitable awkward relationships, are only just beginning to be replaced in the modern mechanised world which requires rapid standardised operations in multiples of ten.