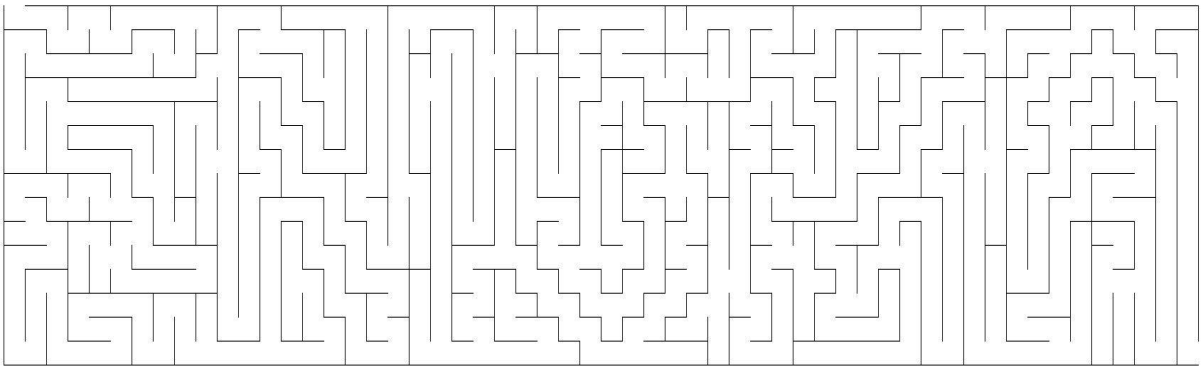
Enigma:
The Newsletter of PuzzleSIG



244

In base four it's a nokia phone

'Mathematical problems, or puzzles, are important to real mathematics, just as fables, stories, and anecdotes are important to the young in understanding real life'.

Terry Tao

November 2019

Electronic Version of this Newsletter
Email enigma.mensa@yahoo.co.uk and I'll send you a copy

About Enigma
Enigma is the newsletter of Puzzle SIG.
Puzzle SIG is the international special interest group for anyone interested in puzzles. The scope covers word puzzles and crossword puzzles, logic puzzles, Japanese puzzles, mathematical brain teasers, lateral thinking problems, quizzes and picture quizzes, discussion of physical / mechanical puzzles, computer / internet based puzzles and puzzle games, and puzzle books and publications. Contributions to the Enigma newsletter are always gratefully received, and whilst experimentation and innovation of puzzle types are more than welcome, traditional types of puzzles are equally appreciated.

SIGSec and Editor: Elliott Line
34 Hillside, Hartshill, CV10 0NN
www.elliottline.com
enigma.mensa@yahoo.co.uk
Deputy SIGSec: Paul Bostock

How to Join
You can join Puzzle SIG by contacting me with your name and membership number, and whether you want a postal or a email subscription, or via the members' area on the Mensa website, by emailing sigs@mensa.org.uk or completing a SIG membership application form and send it to British Mensa, St John's House, St John's Square, Wolverhampton WV2 4AH.

Welcome to Enigma 244

Hello and welcome to another issue of Enigma.

I was delighted earlier this month to be announced as the recipient of this year's Huggett Award from Mensa, for Outstanding Service to SIGs, for my work putting together this newsletter for the past eleven and a half years.
I remember back in 2008 when the previous SIGSec Philip Carter stepped down, and an appeal was put out for his replacement. I was going through a redundancy at the time and didn't feel like it was something I should take on. On the other hand, however, I loved EnigmaSIG (as it was then called) and didn't want to see it end. I responded to the call, but it was very much on an 'if you absolutely can't find anyone else to do it, I will' basis. Well, no one else responded so I found myself as SIGSec.

Over the eleven and a half years we have seen the membership more than quadruple, we have lost some dear friends, the SIG change name to PuzzleSIG (although 'Enigma' lives on in the name of the newsletter), we became an international SIG, and took on Paul Bostock as deputy SIGSec. I'd like to thank Paul for his efforts and I'd also like to thank every single person who has contributed puzzles or ideas to Enigma. I should also give a mention to SIGs officer Neil Matthews and SIGs administrator Manjit Johal whose help and support have been invaluable.
Spurred on by the success of Puzzle SIG I published three books of my own puzzles and I publish a Puzzle of the Week each Friday on my website. Some of my puzzles made it into the Guardian, courtesy of Alex Bellos, and now one of my puzzles is a great Android App: 'Paddocks'.
The puzzles in this issue are all mine, which is fine as I love creating puzzles, but I don't want people getting the wrong idea and thinking you can't send in your own puzzles – you can! The scope of the SIG is detailed on page two and is far more wide-ranging than the mostly maths puzzles in this particular issue would suggest. This newsletter would benefit from more varied contributions.

Please try all of the puzzles, and if you have any feedback, let me know.
As ever, if you get stuck and need a hint, drop me a line and I'll be happy to help.
Please keep your puzzles, answers, comments, queries, suggestions, etc coming in.

Happy puzzling
Elliott.

243.01 - COMPETITION: Unique Circle - Elliott Line

Eagle-eyed readers noticed that the solution was not in fact unique, but that the SMALLEST solution was diameter 159 (radius ~80, circumference ~500, area ~19856)

WELL DONE TO:
Johann Muller
Andrew Yeo
Aashish Diayar
Abhilash Unnikrishnan
Howard Somerset
Stjepan Mestrovic
Paul Clark
Bill Masters
Ivor Cornish
Agnijo Banerjee
Matt Francis
Roisin Carters
Christa Ramonat
Stuart Nelson

244.01 - COMPETITION: Digital Cube Sums - Elliott Line

244 (the number of this issue of Enigma), and 136 have an unusual property. Each is the sum of the cubes of the digits of the other.
$2^3 + 4^3 + 4^3 = 8 + 64 + 64 = 136$
$1^3 + 3^3 + 6^3 = 1 + 27 + 216 = 244$

Can you find another pair of numbers, one with three digits, the other with four digits, that also share this property?

This is a competition, but not for prizes, only bragging rights. Every correct answer I receive will get an honourable mention in the next issue of Enigma. Send your answer to me at enigma.mensa@yahoo.co.uk .

244.02 – 23 Days – Elliott Line

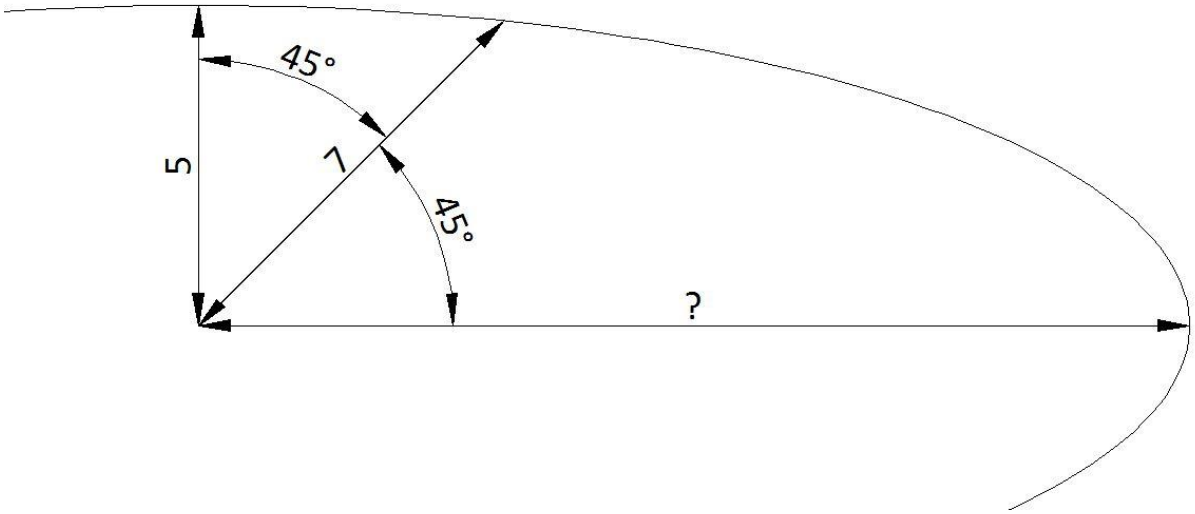
If we count a workday as a day that is not Saturday or Sunday and is not a Bank Holiday, the most you will see in a given calendar month is 23. This happens twice in 2019: July and October. In the UK there are Bank Holidays at New Year, Easter, May, August and Christmas. Is it possible for a calendar year to have no months with 23 workdays?

244.03 – Crazy Currency – Elliott Line

In Elbonia they only have three denominations of coins: 15 ELB, 21 ELB and 35 ELB. Although each pair of these coins have a common factor, all three do not. This means that if the value is high enough, any value can be expressed exactly with no change required. But what is the highest amount that cannot be expressed exactly?

244.04 – Ellipse – Elliott Line

Below is a portion of an ellipse. The semi-minor axis has length 5. A 45 degree diagonal line from the centre to the edge of the ellipse has length 7.
What is the length of the semi-major axis?

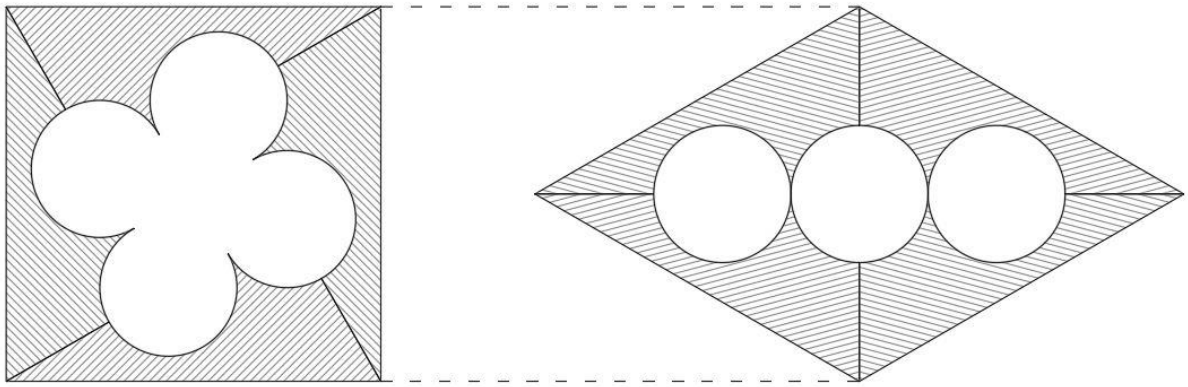


If it helps, the general equation for an ellipse is:
$(x/a)^2 + (y/b)^2 = 1$, where a and b are the two semi-axes.

244.05 – Four Leaf Clover – Elliott Line

Four identical pieces forming a square with a four-leaf-clover shaped hole can be rearranged (after flipping half the pieces) into a rhombus with three circular holes. The shorter diagonal of the rhombus is the same as the side length of the square.

Rounded to the nearest whole number percentage, what proportion of the square is shaded?



244.06 – How Many Coins – Elliott Line

I have a number of coins. I throw them all, count how many heads and how many tails and multiply those two numbers together. I calculate what the expected (average) answer should be and discover it is exactly three times the number of coins. How many coins do I have?

(For instance if there were three coins, there are eight possibilities:
HHH TTT HHT HTH THH TTH THT HTT
The first two result in 3 x 0 = 0, and the other six result in 2 x 1 = 2, so the average answer is 1.5)

244.07 – Quotation Wordsearch – Elliott Line

A quotation has been hidden in the large grid below. The first word can be read off (left, right, up, down, but not diagonally), and its letters eliminated. Later words in the quotation may not be made of consecutive letters until the letters of previous words have been eliminated. All the letters in the grid will be used exactly once then eliminated.
As an example, the phrase 'In the nick of time' has been hidden in the example grid:

I	N	O	T	F
T	I	M	H	E
K	C	I	E	N

"In the nick of time"

A	T	S	G	N	I	H	T	E
N	H	A	I	N	T		S	T
D	E	T	M	O	H		U	I
E	R	W	O	N	L	Y	A	N
H	U	O	M	A	E	N	R	I
U	N	I	V	E	R	S	E	F
T	U	N	O	T	B	A	E	N
F	O	D	R	M	E	R		I
Y	T	I	D	I	P	U	T	S

"4, 3, 6, 3, 8: 3, 8, 3, 5, 9. 3, 2, 3, 4, 5, 3, 6"

244.08 – Six Integers – Elliott Line

$x^2 = a^2 + 4b + 1$

$y^2 = b^2 + 4c + 1$

$z^2 = c^2 + 4a + 1$

a, b, c, x, y, z are all positive integers

$a > b > c$

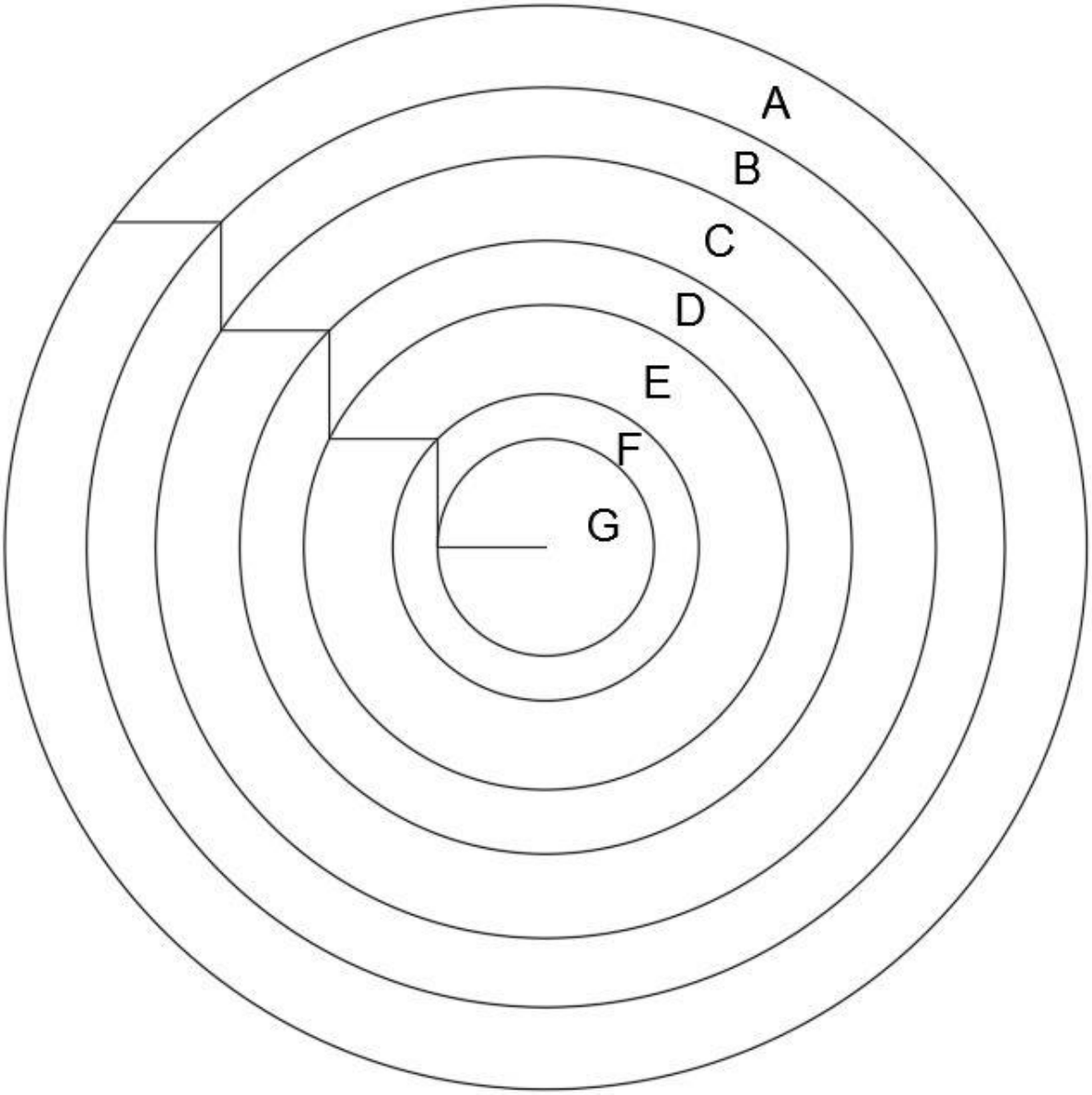
$x > y > z$

What are the values of the six integers?

(There is a really neat algebraic trick you can use here. First see if you can calculate x in terms of a).

244.09 – Staircase Rings – Elliott Line

In the following diagram, the 'staircase' is made up of horizontal and vertical lines of equal length. The ends of these lines determine the radius of each of the rings, whose shared centre is the end of the final horizontal line.
If the overall shape has an area of 100, what is the area of each of the individual regions A to G?

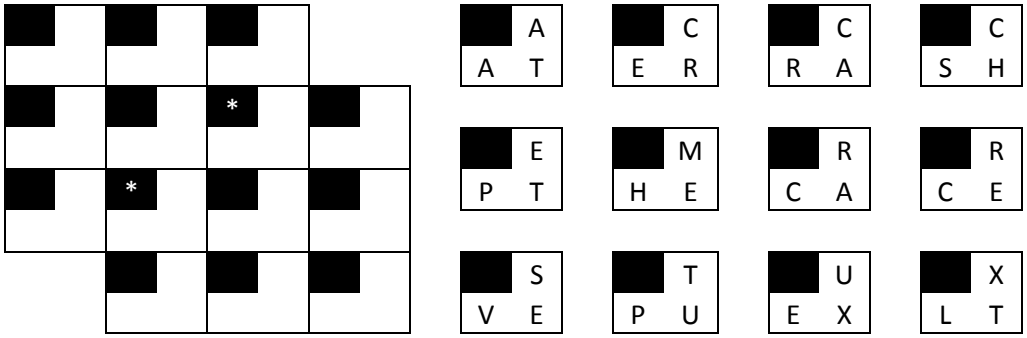


244.10 – Winston Churchill – Elliott Line

I have a six letter word, a clue to which is: 'Something Winston Churchill often was'.
If I change the first letter of my word to the letter that follows it in the alphabet, and then reverse the entire word, I get a new word.
What was my word?

244.11 – Wordwall – Elliott Line

Reassemble this word wall using the bricks provided. Unfortunately the bricks that go in the positions marked with an asterisk are missing, and must be reconstructed.



~~~~SOLUTIONS~~~~SOLUTIONS~~~~SOLUTIONS~~~~

244.02 – 23 Days – Elliott Line

We only need to consider months with 31 days, as shorter months can never have 23 workdays anyway. Of those, January, May, August and December always contain a bank holiday. That just leaves March, July and October. Whenever July starts on a Thursday, Friday or Saturday, both July and October will have more than eight weekend days and consequently fewer than 23 workdays. Unfortunately this can never coincide with March having more than eight weekend days. So finally we come to Easter. Good Friday occasionally falls within the month of March. As long as this sometimes coincides with July starting on a Thursday, Friday or Saturday it is possible to go a whole calendar year with no 23 workday months. The next time this happens is the year 2027, when Good Friday falls on March 26th, July has nine weekend days and October has ten weekend days.

244.03 – Crazy Currency – Elliott Line

You cannot make 139ELB from those coins. Anything higher than that can be made exactly.

244.04 – Ellipse – Elliott Line

One way to solve it is to recognise that an ellipse is merely a circle that has been stretched or squashed in some direction. The question mark represent some length, let's call it 'a'. If we were to shorten this by a factor of, say, 'c', we would end up with a circle. In other words a/c = 5.

In the ellipse, the diagonal length of 7 can be split into its x and y components. As it is at 45 degrees, these will be equal, and each is equal to 7/(sqrt(2)).

When the ellipse is squashed, the vertical component will remain as 7/(sqrt(2)) but the horizontal component will be 7/c(sqrt(2)) and the diagonal will become a radius of the circle and so equal 5. This gives us a right angled triangle, and using Pythagoras we can work out that c = 7. Since a/c = 5, a = 5c, which is 35.

244.05 – Four Leaf Clover – Elliott Line

55% (55.03552…)

244.06 – How Many Coins – Elliott Line

I have 13 coins:

The possibilities are

13 x 0 = 0, probability: 2/8192

12 x 1 = 12, probability: 26/8192

11 x 2 = 22, probability: 156/8192

10 x 3 = 30, probability: 572/8192

9 x 4 = 36, probability: 1430/8192

8 x 5 = 40, probability: 2574/8192

7 x 6 = 42, probability: 3432/8192

The sum of each of the products multiplied by its probability is exactly 39, which is 3 x 13.

~~~~SOLUTIONS~~~~SOLUTIONS~~~~SOLUTIONS~~~~

244.07 – Quotation Wordsearch – Elliott Line

Only two things are infinite: the universe and human stupidity. And I'm not sure about the former.

244.08 – Six Integers – Elliott Line

$x^2 = a^2 + 4b + 1$

$y^2 = b^2 + 4c + 1$

$z^2 = c^2 + 4a + 1$

a, b, c, x, y, z are all positive integers

$a > b > c$ and $x > y > z$

What are the values of the six integers?

Since $(a+2)^2 = a^2 + 4a + 4$

x is clearly somewhere between a and (a+2). As they are both integers x = a+1.

Now $x^2 = a^2 + 2a + 1$, therefore $a = 2b$

By precisely the same reasoning $y = b+1$ and $b = 2c$, therefore $a = 4c$

Plugging that in to the z^2 equation we have:

$Z^2 = c^2 + 16c + 1$

If we try the same trick as before, substituting $z = (c+k)$ for various values of k, we find that (c+1) is too small and that (c+8) is too large.

Trying $z = (c+k)$ for each of the values k = 2 to 7 and then solving for c only two of these result in an integer value for c: when k=5, c=4 and when k=7, c=24.

Plugging the first of these options into the original equations results in y and z both being 9, contrary to the condition that $y > z$, therefore the unique answer is that:

a = 96, b = 48, c = 24, x = 97, y = 49, z = 31

~~~~SOLUTIONS~~~~SOLUTIONS~~~~SOLUTIONS~~~~

244.09 – Staircase Rings – Elliott Line

A=28
B=20
C=20
D=12
E=12
F=4
G=4

244.10 – Six Letter Word – Elliott Line

QUOTED (becomes DETOUR when Q is changed to R and word reversed)

244.11 – Wordwall – Elliott Line

■	C	■	C	■	C						
R	A	S	H	E	R						
■	M	■	A	*	E	■	S				
H	E	A	T	W	A	V	E				
■	R	*	E	■	T	■	X				
C	A	T	A	P	U	L	T				
		■	U	■	R	■	E				
		E	X	C	E	P	T				