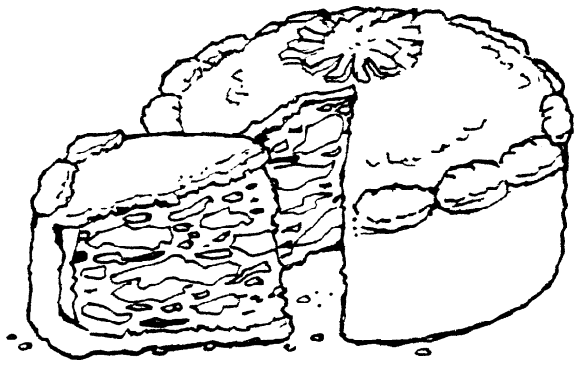
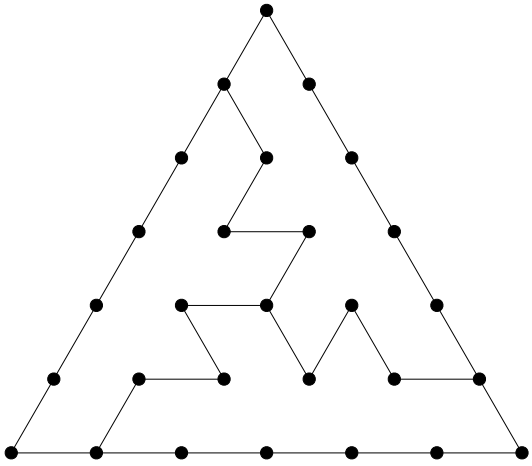


MATHEMATICAL PIE

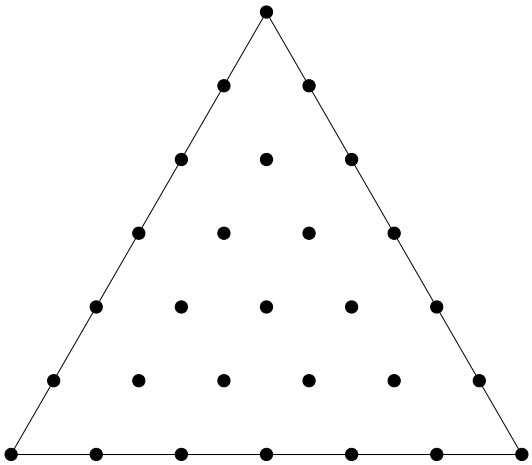
No 188 The Mathematical Association 259 London Road, Leicester LE2 3BE **SPRING 2013**

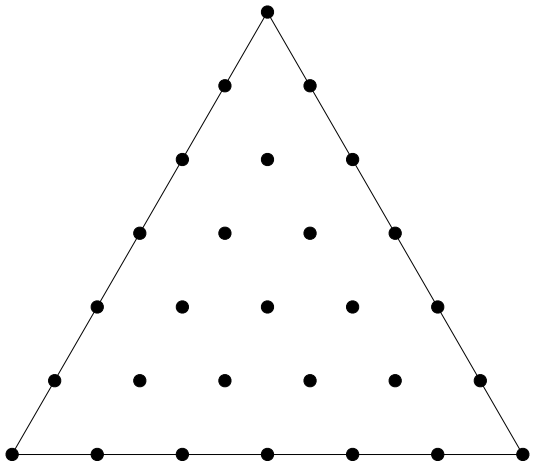
Tri-sectioning

Here is one of the more complicated ways of dissecting a 28-dot 'dotty triangle' into three congruent pieces (joining dot-to-dot with lines parallel to the sides, of course).



How many more ways can you find? Below are two empty grids for you to experiment with.





Four Rules OK

Each number stands for a letter. All the words are ones you might meet in maths lessons. They read horizontally and usually go on past the end of a line, so that they finish on the next one. Each word begins in the next square, straight after the one that has just finished. Three letters have been given to get you started.

When you have filled them all in you will be able to read four more maths words in some columns, and there will be yet another maths word in the table at the bottom.

W.R.

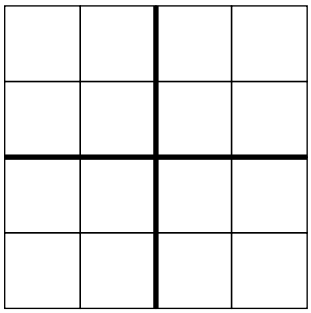
20	2	23	20	12	17	3	1	17	14	18	20	3
2	4	17	12	26	18	4	6	12	20	15	26	3
2	26	12	17	10	18	20	15	26	3	2	4	6
7	17	17	24	9	20	15	26	7	20	22	17	1 T
16 W	6 O	12	9	8	17	20	12	9	1	17	21	17
4	6	3	20	1	9	4	20	15	3	9	7	17
4	20	1	6	4	5	17	18	1	20	22	6	3
18	4	6	8	20	8	26	15	26	1	25	6	2
2	8	4	20	12	19	17	1	18	26	18	6	26
3	1	19	26	1	17	5	20	15	11	10	17	13
17	3	4	20	1	26	6	18	25	4	20	7	26
2	7	20	18	20	4	4	6	16	5	17	20	2
12	6	3	10	1	20	3	1	20	3	22	15	17

1 T	2	3	4	5	6 O	7	8	9	10	11	12	13
14	15	16 W	17	18	19	20	21	22	23	24	25	26

A	N
B	~~O~~
C	P
D	Q
E	R
F	S
G	~~T~~
H	U
I	V
J	~~W~~
K	X
L	Y
M	Z

Minimum Sudoku?

This little sudoku uses just 1, 2, 3 and 4 with the same rules as the usual 9×9 grid.



What is the lowest number of cells that must be given so that the rest can be worked out correctly?

H.K.M.

Square Numbers

1. Which number(s) is (are) equal to its (their) squares?
2. Which number(s) is (are) equal to half its (their) squares?
3. Which number(s) is (are) equal to a third of its (their) squares?
4. Which number(s) is (are) equal to a quarter of its (their) squares?
5. Which number(s) is (are) equal to an nth of its (their) squares?

P.F.

Number Grid

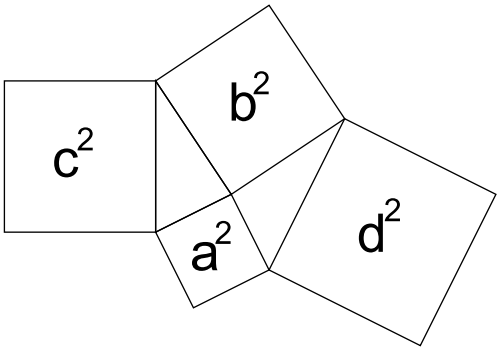
Can you place the numbers 1 to 16 into this grid so that all the row and column labels are satisfied?

V.L.

	Prime	Square	Conse-cutive	Greater than 9
Odd				
Triangular				
Add to 38				
Even				

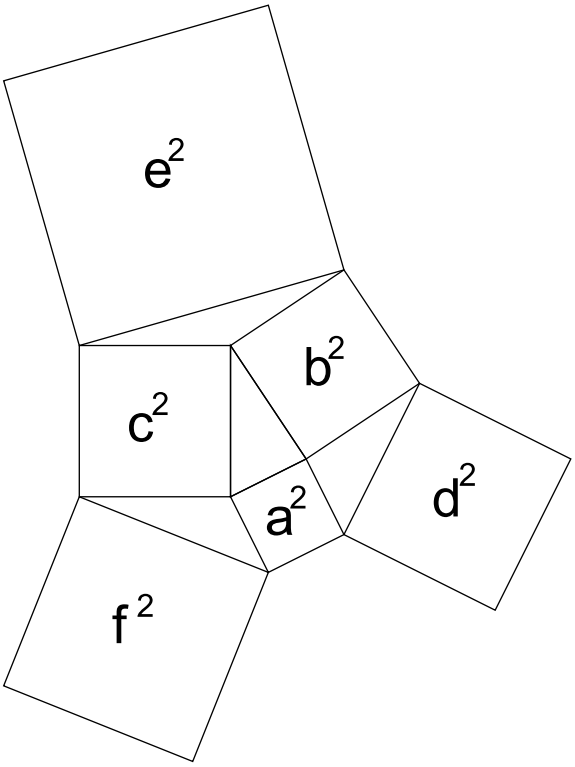
Even More Mean to Pythagoras

Two issues ago we drew diagrams to illustrate the fact that in any arrangement of squares like this:

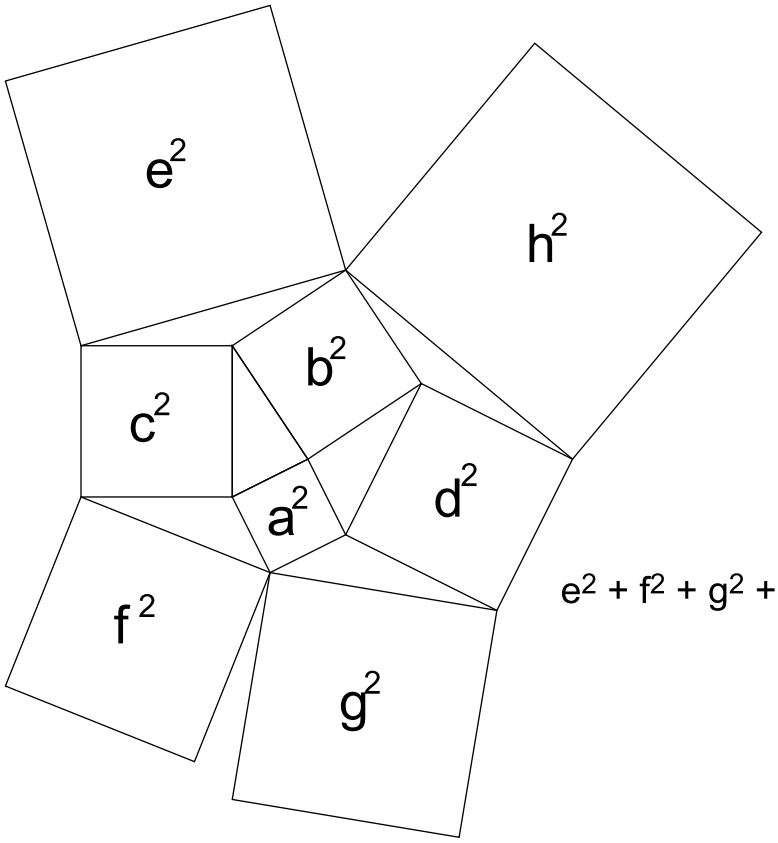


$a^2 + b^2$ is the mean of c^2 and d^2, or $2(a^2 + b^2) = c^2 + d^2$.

Using this fact most of our readers should find it easy to prove the following interesting results:



$d^2 + e^2 + f^2 = 3(a^2 + b^2 + c^2)$



$e^2 + f^2 + g^2 + h^2 = 10(a^2 + b^2)$

E.G.

Hasty Harry

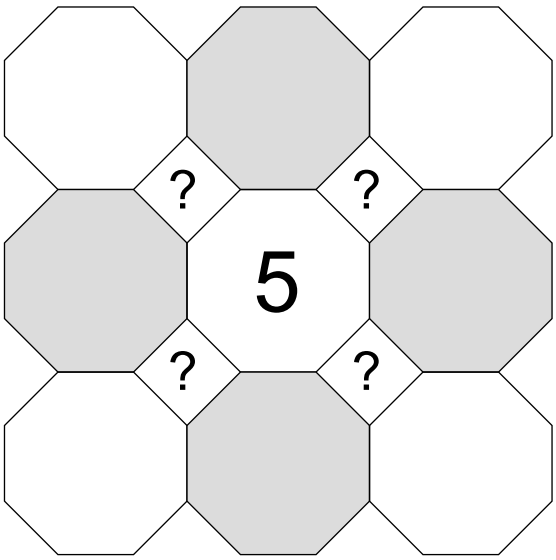
Rushing to finish his maths homework, Harry carelessly divides by a certain number instead of multiplying by the same number – which would have given the correct answer.

Compared to the correct answer Harry is in error by 96%

What did he divide by?

H.K.M.

Octagon Numbers



Place the numbers from 1 to 9 in the octagons so that the sums of the numbers in the four octagons that touch each square are the same.

The numbers in the shaded octagons are even.

W.R.

Not Prime

A number n is neither prime nor divisible by 3, and all its three digits are odd.

Furthermore, no matter in what order the digits are written the resulting number is not prime.

There are fewer than ten such numbers.

How many can you find?

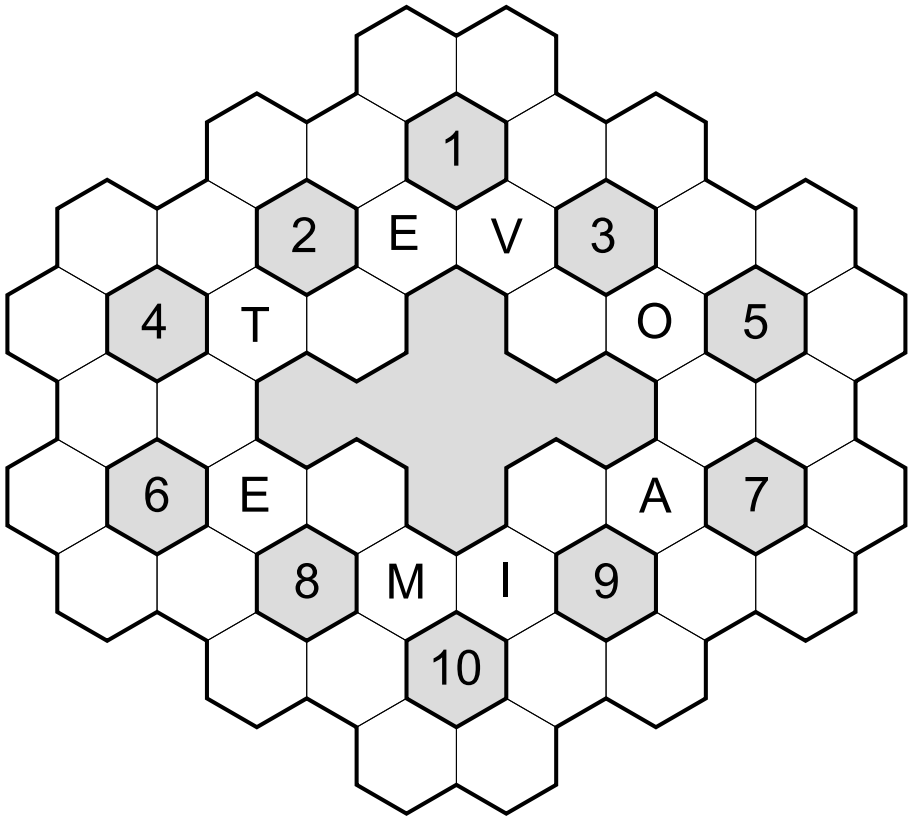
B.G.S.

Hexword

A six-letter word goes round each of the ten numbered hexagons.

The words overlap like a crossword, and most of them are mathematical. You have to decide whether the answer to any particular clue goes in a clockwise or anticlockwise sense around the numbered hexagon.

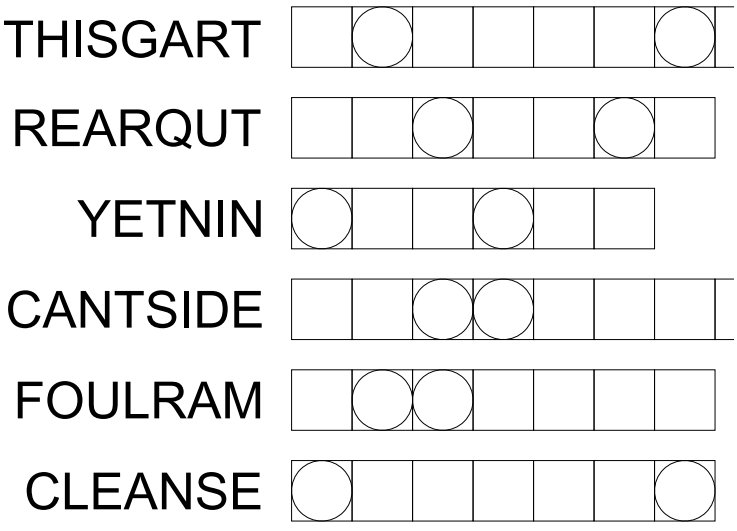
Some letters have been put in to give you a start.



1. One less than a dozen
2. Mathematician famous for the theory of gravity
3. This has magnitude and direction
4. Subject? No!
5. A portion of a circle ...
6. ... and the middle of one
7. One way of expressing fractions
8. Units of length
9. Subtracting is ‘ _____ away’
10. A (small?) unit of time

E.G.

Compound Disinterest?



Rearrange the letters to make a mathematical word. Then rearrange the letters that are in the circles to make the mathematician who has appeared in Mathematical Pie.

W.R.

Boastful Ages

Back in the year 1936, people born in 1892 were able to make an unusual mathematical boast, a boast that people born in 1980 will be able to make at some time during the 21st century.

Isambard Kingdom Brunel, the famous English engineer and bridge builder, would also have been able to make the same boast, had he noticed it.

Given that he was born in the 19th century, can you work out in which year?

P.F.

Used Car Salesmen

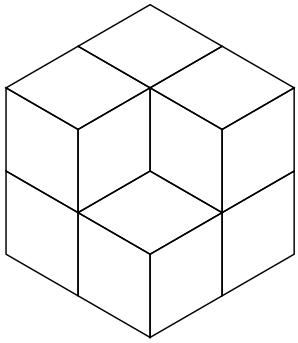
40 used car salesmen are at a party.

If a) at least one of the salesmen is honest, and b) given any two salesmen at least one is crooked, is it possible to say how many of the salesmen are honest?

H.K.M.

Hexasections

Here is a regular hexagon cut into twelve congruent rhombuses:



In how many different ways can a regular hexagon be cut to make twelve congruent rhombuses of this sort? Of course we would not think of reflections or rotations as 'different'.

E.G.

Who's the Winner?

Three friends each have a cubical dice.

Ann's is marked with two 6's, two 7's and two 2's.
Bethan's is marked with two 5's, two 9's and two 1's.
Cheryl's is marked with two 4's, two 8's and two 3's.

They play a little tournament: Ann v. Bethan, Bethan v. Cheryl and Cheryl v. Ann. In each of the three matches the players throw their dice once.

What results are most likely?

H.K.M.

MATHEMATICAL PIE (three issues per year)

Single copy: yearly subscription £4.00
Multiple copies (packs of ten):1–9 packs: £12.00 per pack
10–19 packs: £10.00 per pack
20 or more packs: £8.00 per pack

The Mathematical Association,
259 London Road, Leicester LE2 3BE
Tel: 0116 221 0013
Fax: 0116 212 2835
E-mail: office@m-a.org.uk; website: www.m-a.org.uk

MATHEMATICAL ASSOCIATION
supporting mathematics in education