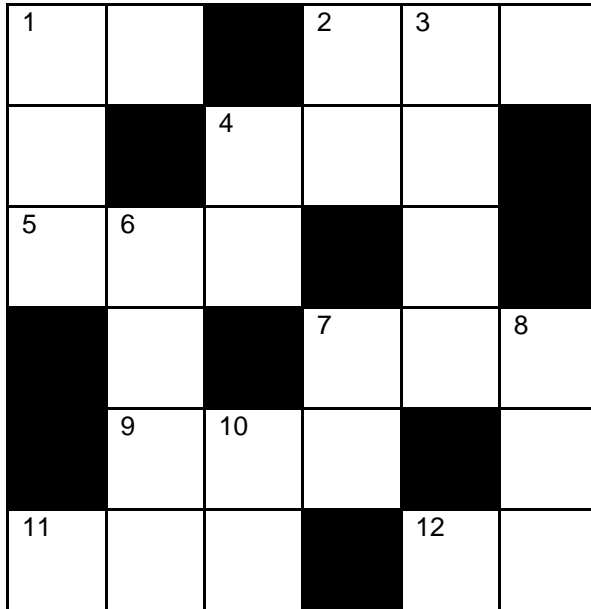


## CROSSNUMBER



### Across

1. A number whose square root is the sum of its digits
2. A perfect square that is also a Fibonacci number
4. A perfect cube whose digits sum to another perfect cube
5. This number is a palindrome
7. A perfect square
9. One less than a perfect square
11. The middle digit of this number is the sum of the other two digits
12. A multiple of 7

### Down

1. An even number whose prime factors include 31
2. A number between two prime numbers
3. This prime number has consecutive digits
4.  $n^4$  for some value of  $n$
6. A power of 2
7. A multiple of 18
8. Lowest common multiple of 2, 9 and 68
10. A prime number whose digits add to 5

## LITTLE MORETON HALL



### THE SPEARE OF DESTIYNE WHOSE RVLER IS KNOWLEDGE

This triangle containing the Spirit of Knowledge standing on a stable cube and holding the sphere of destiny and dividers can be seen at one end of the Long Gallery of Little Moreton Hall in Cheshire.

The design was copied from Robert Recorde's *Castle Of Knowledge* of 1556,

Robert Recorde's fourth book was about astronomy and navigation. He was a Welsh mathematician, who first used the equals sign (=) as we now know it.

Image courtesy of the Folger Library, Washington, D.C.



## MACMAHON'S COLOUR TRIANGLES

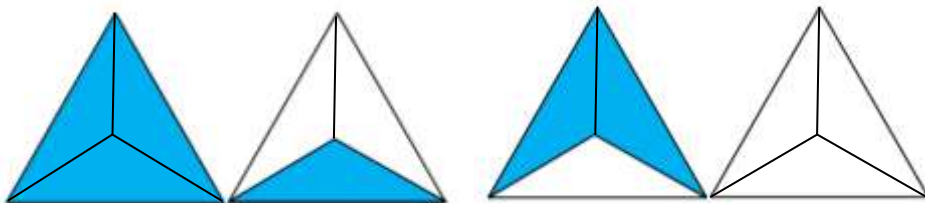
Major Percy MacMahon, who died in 1929, devoted a great deal of his life to the partitions of numbers and enumerative combinatorics (the number of ways that certain patterns can be found).

Further to a career in the army, he was elected a fellow of the Royal Society in 1890, and President of the London Mathematical Society from 1894 to 1896.

The problem below is referred to as MacMahon's Colour Triangles.

An equilateral triangle is divided into three congruent regions. Then each region is coloured red or yellow or blue. More than one region may be coloured in the same colour but rotation is not considered different.

Using just two colours (blue and white), a set of four triangles are possible.



Remember. rotation is not considered different.

### Activities

1. How many different triangles can be made using three different colours of your choice?  
(A resource sheet can be found on the SYMMetryplus website <https://www.m-a.org.uk/symmetry-plus> ).
2. Investigate the number of triangles that can be made using four and then five different colours.
3. Use your results to find the  $n^{\text{th}}$  term (the general rule). You might find it helpful to know that 76 distinct triangles are possible using six colours.
4. Use the rule to find how many different triangles can be made using 10 colours.
5. Use the internet to find out about the life and work of Major Percy MacMahon and one of his contemporaries Henry Dudeney (1857 - 1930).



Percy MacMahon

1854-1929

## SIMPLY SOLVE

Here are two of the 16 problems listed in the full version of *SYMmetryplus*.

5



A parent has three children. The oldest is three years older than the middle one, and the middle one is three years older than the youngest. Altogether, the three children's ages add to 57.

How old are the three children?

12



Jade, Kellie and Len share £330.

The amount Jade and Kellie receive is in the ratio 9:5.

The amount Kellie and Len receive is in the ratio 2:1.

How much does each receive?

This is a taster of the full version of *SYMmetryplus* that is a bright, colourful and lively magazine containing articles, puzzles, problems and competitions for all those who enjoy their mathematics. It is aimed at everyone interested in mathematics, but especially those aged 11 to 18. It has 20 colour pages in A4 format and is published three times a year (spring, summer and autumn).

The Society of Young Mathematicians (SYMS) is a society for all young people who enjoy mathematics, whether they are in a primary or secondary school. Members are part of a national organisation which motivates and encourages young mathematicians.

Every term members receive the SYMS Newsletter – *SYMmetryplus*, which contains short articles, news, things to do, calculator hints, book reviews, games, puzzles and competitions. Members also receive termly copies of the journal *Mathematical Pie*. Again, *Mathematical Pie* contains interesting mathematics problems, puzzles and articles. SYMS encourages and supports mathematical activities for mathematicians of all ages. Adults are very welcome to join SYMS.

SYMS members will receive *SYMmetryplus* and *Mathematical Pie* delivered direct to their homes. All young people interested in mathematics should join The Society of Young Mathematicians NOW!

Full membership is open to everyone and runs from 1<sup>st</sup> September to the following 31<sup>st</sup> August. Members receive all 3 issues of the journals, whatever time of year they join. Membership is £10.99 per year (£14.99 if outside the UK in Europe, £18.99 for airmail outside Europe).

For details on how to subscribe, visit <https://www.m-a.org.uk/SYMS>

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