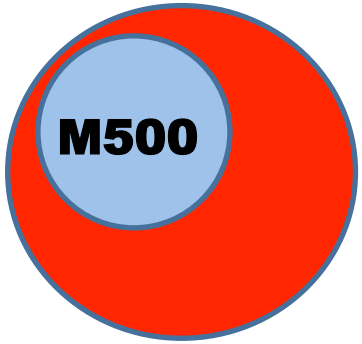
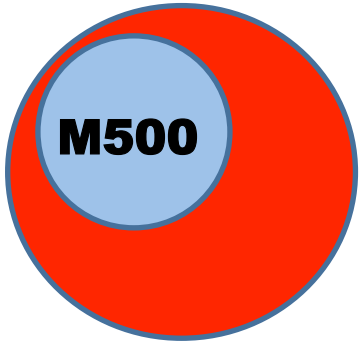


Diary of a MathsJam virgin
OR
"Never ask a question unless you know the answer"
OR
"Thank God for OEIS and Google"

Colin Aldridge

For more details visit us at *www.**m500**.org.uk/*



The M500 Society

The M500 Society: Supporting OU Mathematics students since 1973

- **OU Revision Weekend**
- **Winter Mathematics Weekend 8th to 10th Jan 2016 Nottingham University**
- **Quarterly Magazine**

Some Winter Weekend Topics

- **How many Triangles and Quadrilaterals in a 3 by 3 pin board**
- **Why can't I help Running :- Its all to do with gravity**
- **Tessallating shapes and why there are only 17 types of wallpaper**
- **Galaxy Song (Monty Python) Is it all mathematically correct**
- **Ancient Mathematics :- Egyptian fractions and Roman multiplication**
- **The Mathematics of Angry birds projectiles**

Answers to the Competition

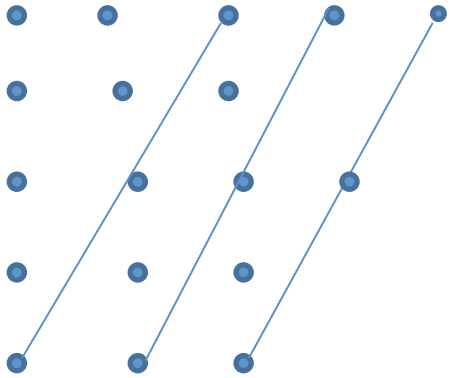
- 3x3 is “easy”
  - Do it by drawing
  - Pick 3 from 9 and subtract the straight lines
  - 9x8x7/(1x2x3) – 8 (2N+2)
- 4x4 isn’t too hard?
  - 16x15x14/(1x2x3) minus collinear points
    - 2N +2 lines of 4 = 10 x4 collinear points (pick 3 from 4)
    - And 4 of 3 point diagonals
    - = 560 -44 =514

Answer to 16x16?

- We have a 4 point series so we can look it up in OEIS
  - Number of ways to place two non-attacking queens on an n X n board **0**, **0**, **8**, **44**, 140, 340, 700, 1288, 2184, 3480, 5280, 7700, 10868, 14924, 20020, **26320**
  - a(n) = C(n, 3)*(3*n-1).

The problem with 5 x5 and beyond

- What about



- There are 3 x 4 = 12
- So for 5x5 then its 152 not 140

A Problem solved and a problem raised

- OEIS
- Number of collinear point-triples in an n X n grid. **0**, **8**, **44**, **152**, 372, 824, 1544, 2712, 4448, 6992, 10332, 15072, 21012, 28688, **38520**
- **16x16 is C(256,3) – 38520 = 2,725,000**
- **C(n^2,3) -** 2*sum(sum((n - k + 1)*(n - m + 1)*igcd(k - 1, m - 1), k= 2.. n), m= 2.. n) - n^2*(n^2 - 1)/6;
- **BUT WHY?**