

THE PUZZLING SIDE OF CHESS

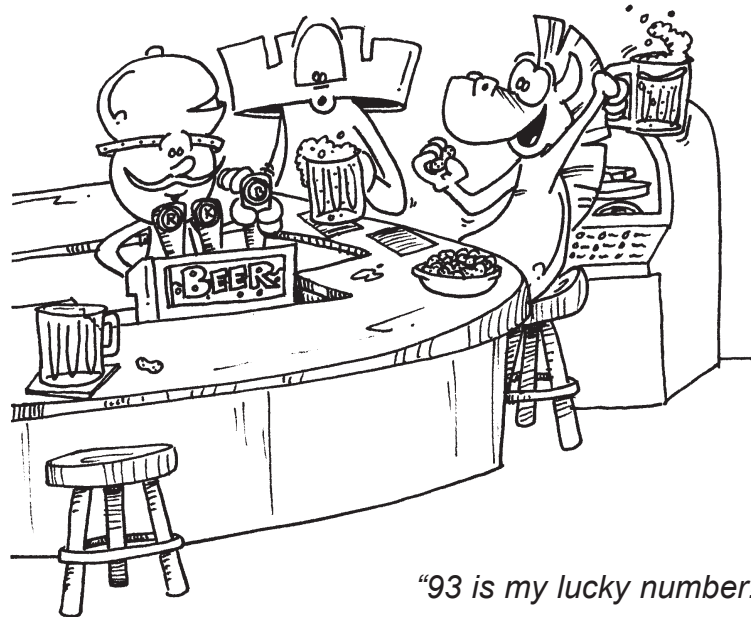
Jeff Coakley

MESH WEAVERS

number 186

January 30, 2020

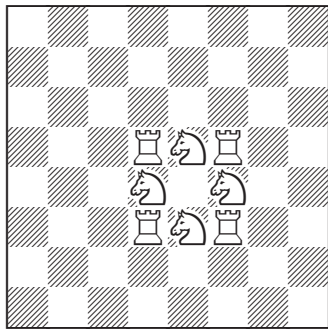
This column marks a milestone of sorts. From 2012 to 2015, the *Puzzling Side of Chess* was published 93 times at *ChessCafe.com*. Since then, there have been 93 more columns on my own website. Half there, half here, and forward we go.



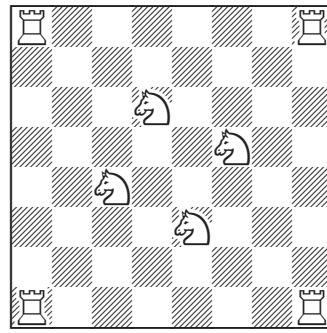
"93 is my lucky number!"

Today's menu features a series of problems called meshes. To fill the space between, our side themes are spiders and spaceships.

A *mesh* is similar to a defensive loop. Pieces are placed on the board so that each guards the same number of pieces and each is guarded the same number of times. Unlike a loop, there is no requirement for a continuous linear chain of defence, but the pieces in a mesh must all be part of a single interconnected web.



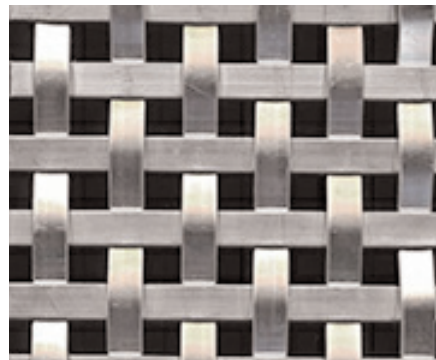
mesh



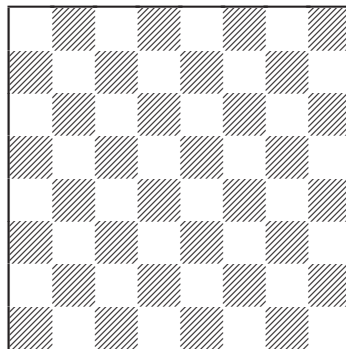
not a mesh

In both diagrams, each piece defends twice and is defended twice. However, the position on the right is not a mesh because there is no connection between the rooks and knights. It is actually two separate meshes (or loops). One with rooks, one with knights.

Double loops are impossible for the piece groups RB, RN, BN. See column 156. But meshes are possible with these pieces.



Twofold Rook/Bishop Mesh

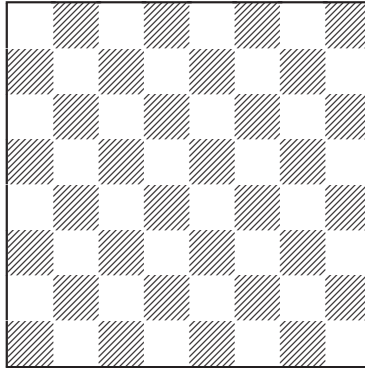


Place an equal number of rooks and bishops so that each piece is defended exactly twice and each defends exactly two others.

- A. 4 rooks and 4 bishops
- B. 6 rooks and 6 bishops
- C. 8 rooks and 8 bishops

As with most tasks of this type, the difficulty of a twofold mesh increases with the number of pieces. Part A is a piece of cake. Part B is a tough nut to crack. Part C may be a slice of stumper pie.

Twofold Rook/Knight Mesh



Place an equal number of rooks and knights so that each piece is defended exactly twice and each defends exactly two others.

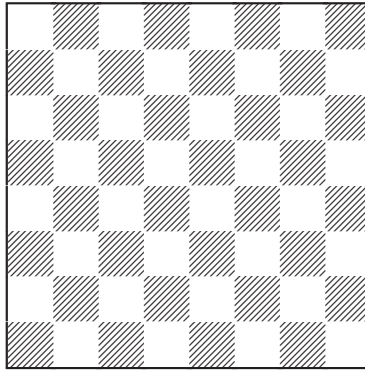
- A. 4 rooks and 4 knights
- B. 6 rooks and 6 knights
- C. 8 rooks and 8 knights



Hackled Mesh Weaver

The hackled mesh weaver (*Callobius bennetti*) is a small hairy spider found in California and the southern states from Texas to Florida. Its name derives from the tangled asymmetrical webs it spins.

Twofold Bishop/Knight Mesh



Place an equal number of bishops and knights so that each piece is defended exactly twice and each defends exactly two others.

- A. 4 bishops and 4 knights
- B. 6 bishops and 6 knights
- C. 8 bishops and 8 knights



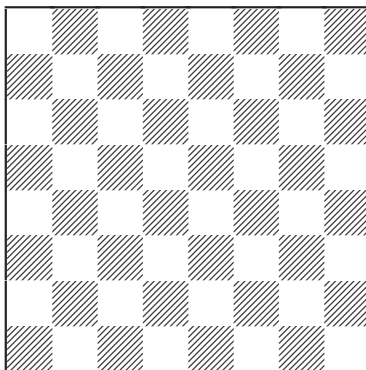
Tholian Mesh Weaver

The Mesh Weaver is a spacecraft flown in the role-playing game Star Trek Online, capable of spinning energy webs around enemy vessels. The pilots are spider-like beings from Tholia, a class Y planet in the Alpha Quadrant.

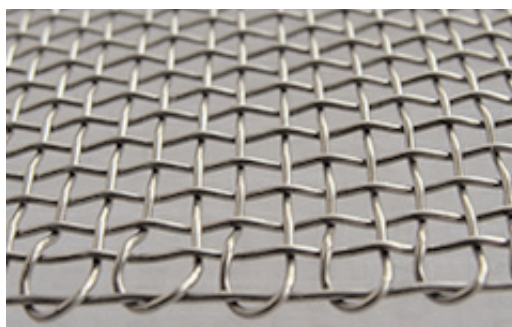
Weaving meshes with more than two connections per piece creates positions whose complexity exceeds that of most defensive loops.

In a threefold mesh, each piece guards and is guarded three times. The problems given here involve a single piece-type: king, queen, and knight. The task is impossible for rooks, bishops, and pawns.

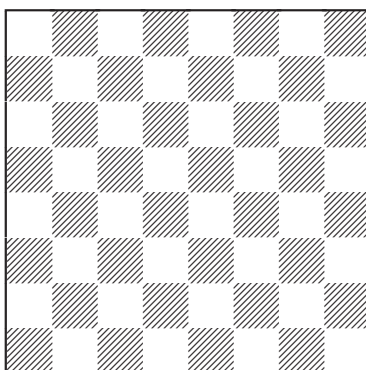
Threefold King Mesh



Place the maximum number of kings so that each is defended exactly three times and each defends exactly three others.

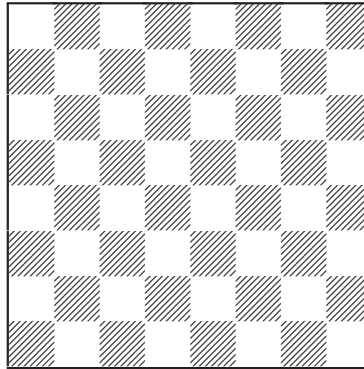


Threefold Queen Mesh



Place the maximum number of queens so that each is defended exactly three times and each defends exactly three others.

Threefold Knight Mesh



- A. Place eight knights so that each is defended exactly three times and each defends exactly three others.
- B. Place the maximum number of knights so that each is defended exactly three times and each defends exactly three others.



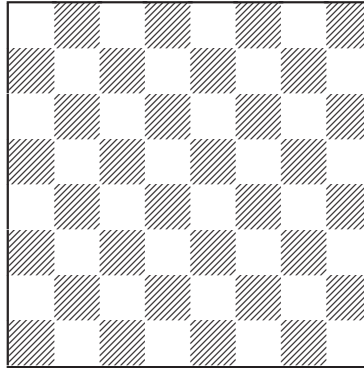
Ziggy Stardust and the Spiders from Mars

The Spiders From Mars, featuring guitarist Mick Ronson, were the backing band for David Bowie during the 1970s.

Their name is based on a 1954 UFO sighting at a soccer game in Florence, Italy. The “Martian spaceships” that the crowd saw were later explained away as the webs of migrating spiders.

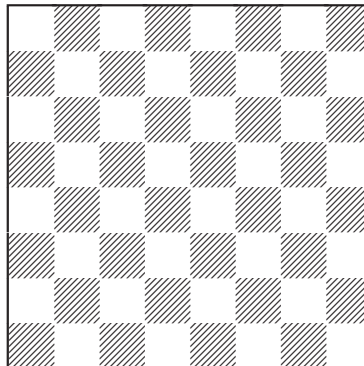
The next and final level of weave complexity is the fourfold mesh, a task that was investigated by several mathematicians 40 years ago. Only knights and queens can play this game.

Fourfold Knight Mesh



Place the maximum number of knights so that each is defended exactly four times and each defends exactly four others.

Fourfold Queen Mesh



Place the maximum number of queens so that each is defended exactly four times and each defends exactly four others.



Fivefold meshes are impossible. Except perhaps in cross-dimensional flights of Tholian mesh weavers.

SOLUTIONS

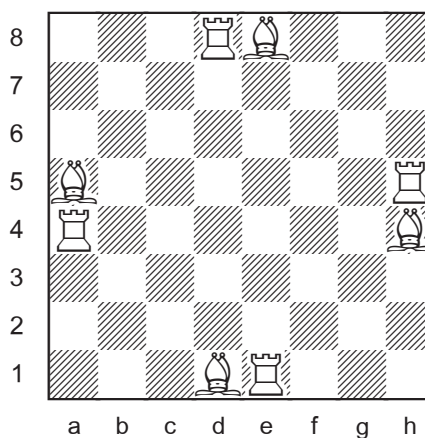
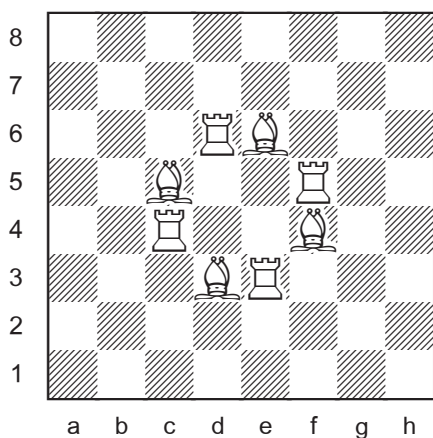
Unless noted otherwise, all problems by J. Coakley, *Puzzling Side of Chess* 2020.

PDF hyperlinks. You can advance to the solution of any puzzle by clicking on the underlined title above the diagram. To return to the puzzle, click on the title above the solution diagram.

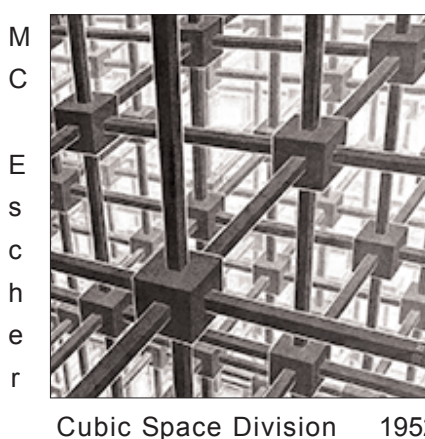
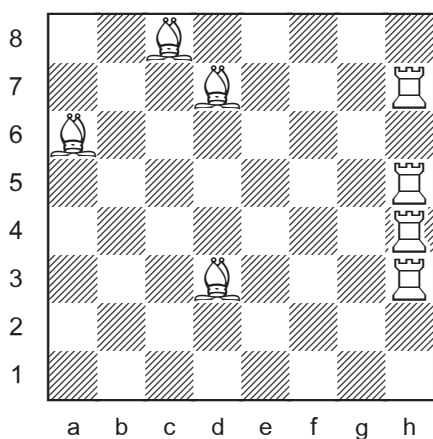
Archives. Past columns and a detailed index of problem-types and composers are available in the *Puzzling Side of Chess* archives.

Twofold Rook/Bishop Mesh

A. 4R 4B



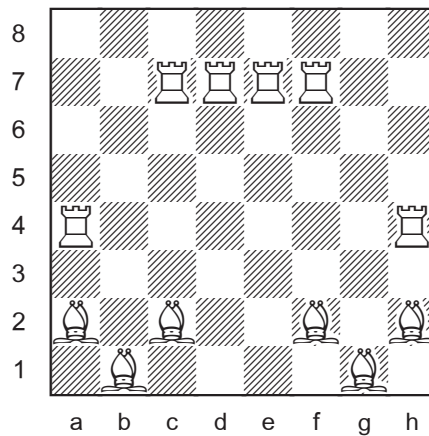
4 rooks, 4 bishops
Each defended twice, each defending twice.



Cubic Space Division 1952

Twofold Rook/Bishop Mesh

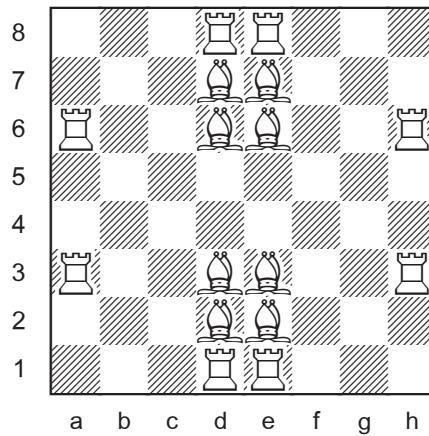
B. 6R 6B



6 rooks, 6 bishops
Each defended twice, each defending twice.

Twofold Rook/Bishop Mesh

C. 8R 8B



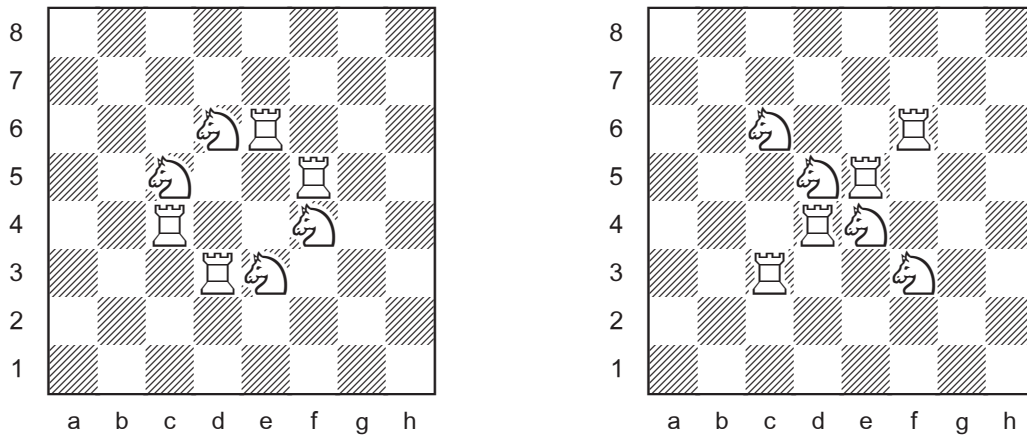
8 rooks, 8 bishops
Each defended twice, each defending twice.



Mesh weaver (family Dictynidae) of Ontario

Twofold Rook/Knight Mesh

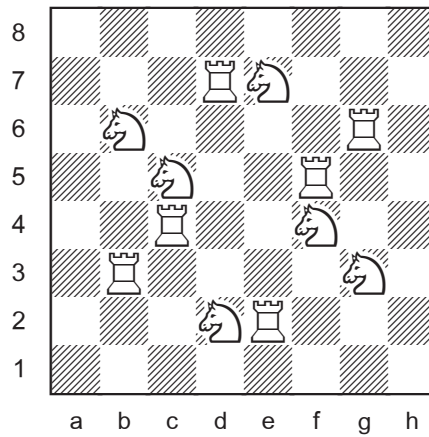
A. 4R 4N



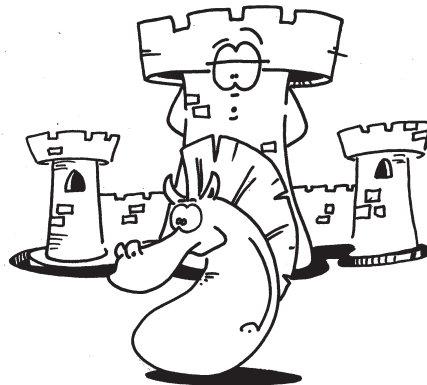
4 rooks, 4 knights
Each defended twice, each defending twice.

Twofold Rook/Knight Mesh

B. 6R 6N

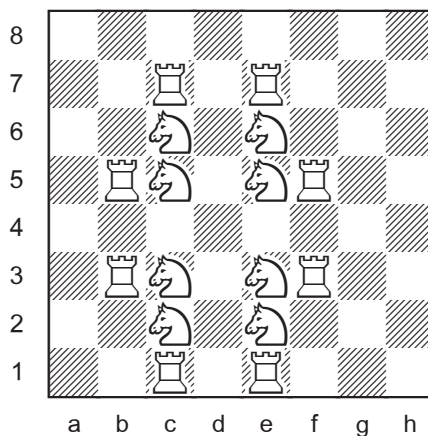


6 rooks, 6 knights
Each defended twice, each defending twice.



Twofold Rook/Knight Mesh

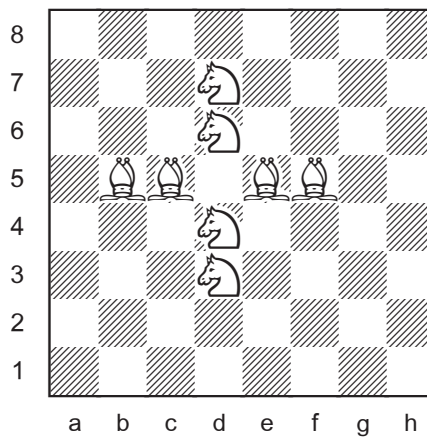
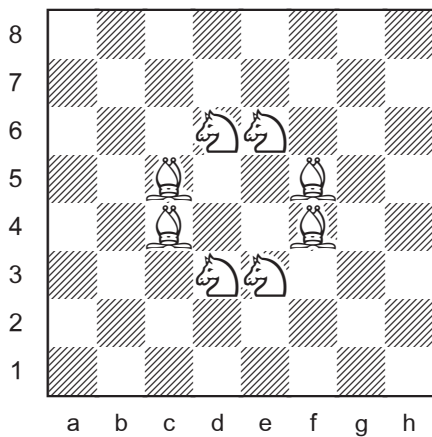
C. 8R 8N



8 rooks, 8 knights
Each defended twice, each defending twice.

Twofold Bishop/Knight Mesh

A. 4B 4N

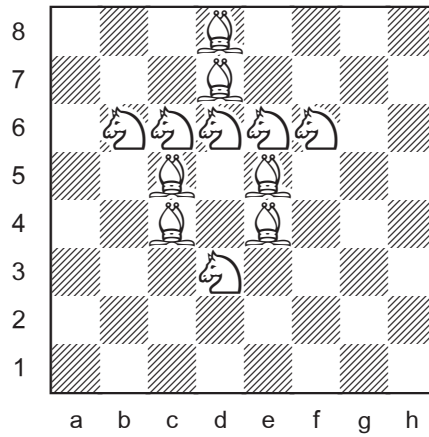


4 bishops, 4 knights
Each defended twice, each defending twice.



Twofold Bishop/Knight Mesh

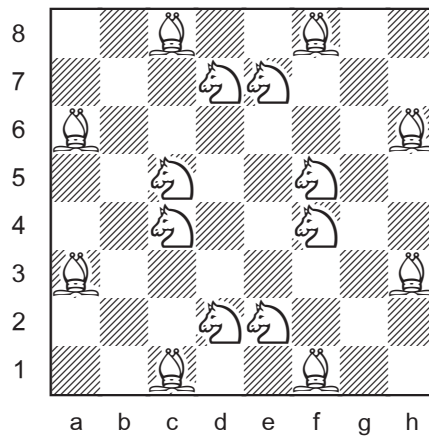
B. 6B 6N



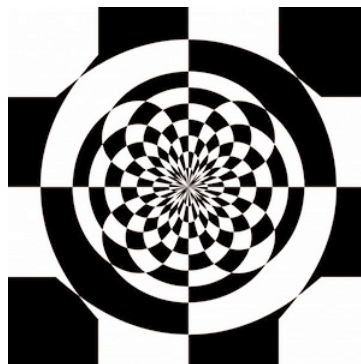
6 bishops, 6 knights
Each defended twice, each defending twice.

Twofold Bishop/Knight Mesh

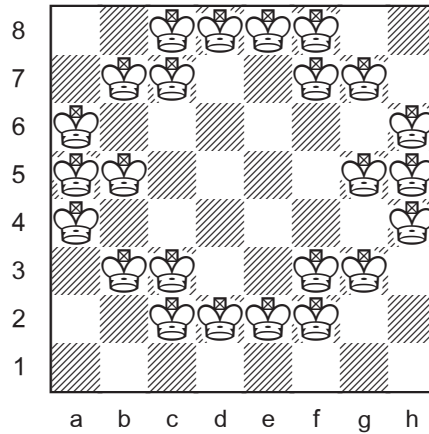
C. 8B 8N



8 bishops, 8 knights
Each defended twice, each defending twice.



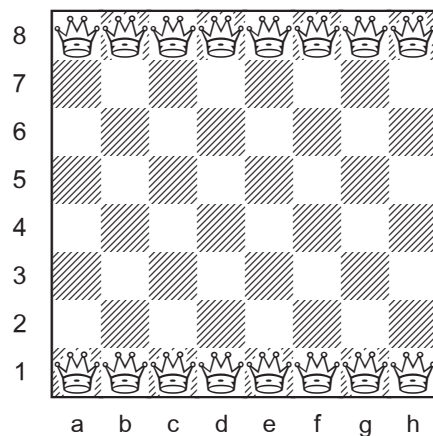
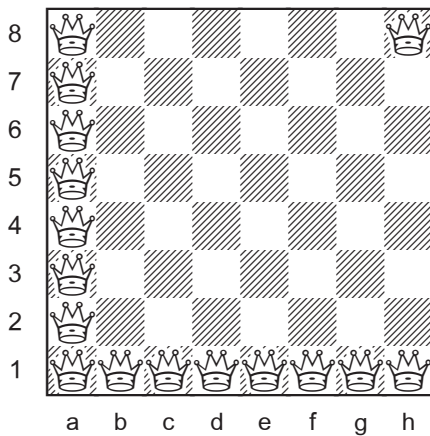
Threefold King Mesh



24 kings

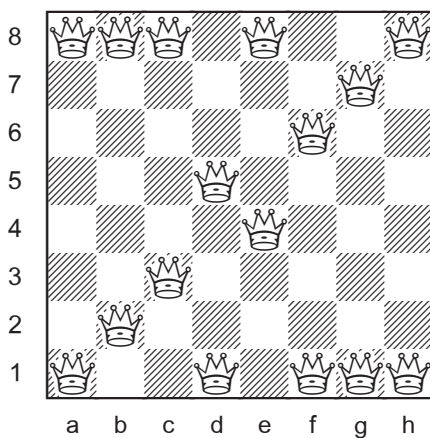
Each defended 3 times, each defending 3 times.
A royal conglomeration.

Threefold Queen Mesh



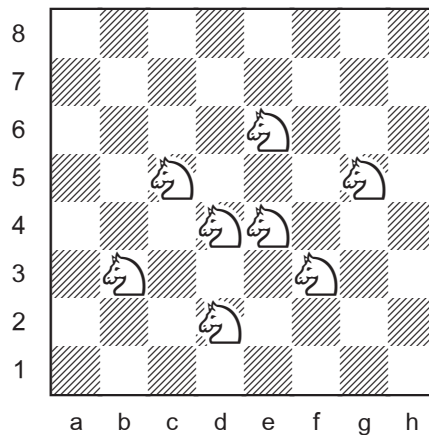
16 queens

Each defended 3 times, each defending 3 times.



Threefold Knight Mesh

A. 8N



8 knights

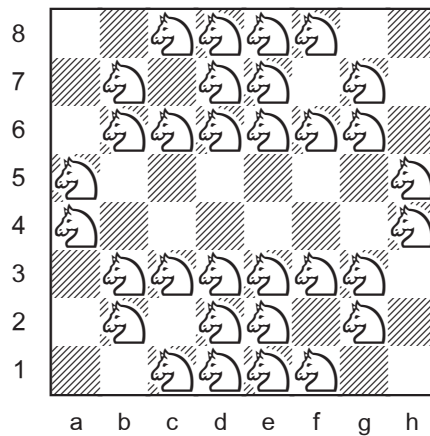
Each defended 3 times, each defending 3 times.

Threefold Knight Mesh

B. max N

Cornel Pacurar 2020

Puzzling Side of Chess



32 knights!

Each defended 3 times, each defending 3 times.

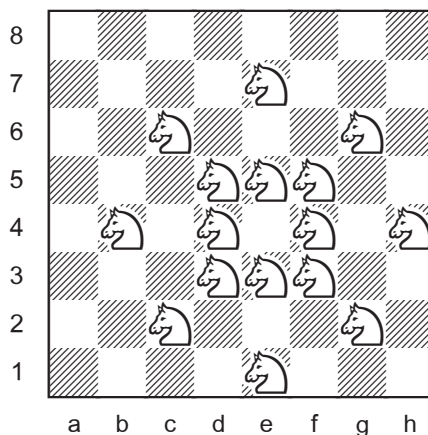
A captivating web by master weaver Cornel Pacurar.



Fourfold Knight Mesh

Scott Kim 1978

Mathematical Games (Martin Gardner)



16 knights

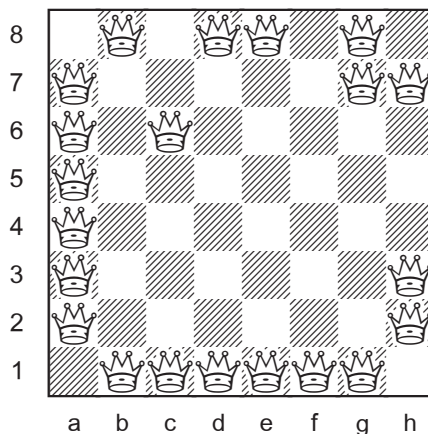
Each defended 4 times, each defending 4 times.

Perfect snowflake.

Fourfold Queen Mesh

Jeffrey Spencer & Kjell Rosquist 1981

The Last Recreations 1997 (Martin Gardner)



21 queens

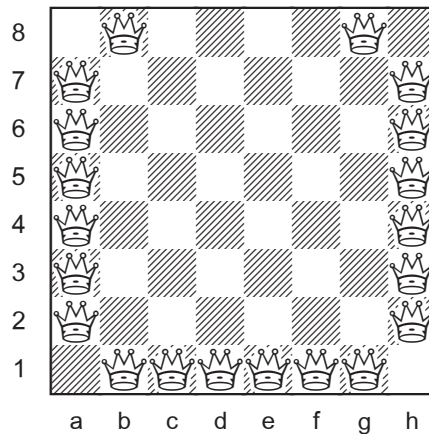
Each defended 4 times, each defending 4 times.

The puzzling thing about this solution is its lack of symmetry. The record positions for other mesh tasks are all symmetrical in one way or another. What if anything does this imply?

continued next page

None of the mesh records have been computer verified. Is there perhaps a symmetrical fourfold mesh with more than 21 queens? Or maybe non-symmetrical positions can be found to break records for other meshes.

Until I came across the Spencer/Rosquist solution, I was convinced that the 20 queen position below was the record for this task, believing that symmetry would always be the key to weaving an ultimate mesh. So much for idealism.



20 queens

Each defended 4 times, each defending 4 times.



Until next time!

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