



77 is the largest number that can't be written as a sum of distinct numbers whose reciprocals sum to 1

News

A lot of people recently have been watching the series *The Queen's Gambit* on Netflix. This is a series about chess, based on a novel by Walter Tevis.



The game of chess is many things, but one of those things is a very complex maths puzzle.¹ This means that when people program computers to play chess they will use techniques such as tree diagrams, a bit like the ones you may have been taught to draw when you are solving probability problems. The root of the tree will be the current position and from that the tree will have branches leading to every possible legal move. The computer will then use a set of rules to work out which is the best move to make.

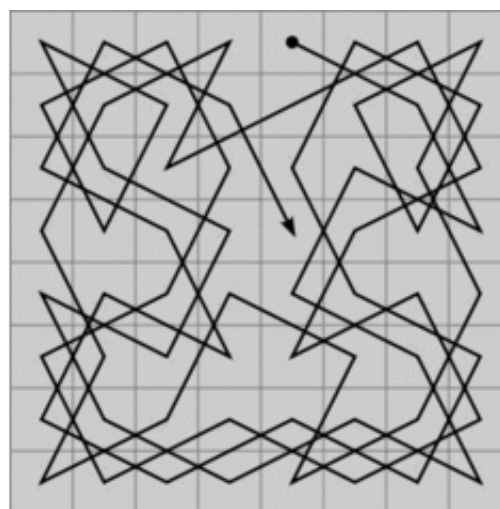
The game is played on a square board containing 64 smaller black and white squares, and pieces that are each assigned numerical values. There are many mathematical puzzles that involve chess or chess boards. The values given to the different pieces are written below.²



9 3 3 5 1

Maths Words

In mathematics, a **knight's tour** is a sequence of moves a knight can make on a chessboard, such that the knight visits each square in the sequence exactly once.³ In the following example, the knight is able to visit every square on the chess board.



How many $n \times n$ squares are there on a chess board?

Joke

**A moment of tension in the Vatican.
If the bishop moves forwards,
the queen can take him.**

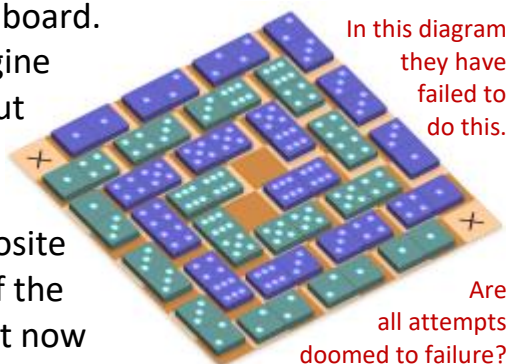


1. You can read all about the history of chess here: https://en.wikipedia.org/wiki/History_of_chess
2. The king is not assigned a value.
3. Find out more about knight's tours here: https://en.wikipedia.org/wiki/Knight%27s_tour

A Famous Puzzle

One very famous puzzle that uses a chess board is called the 'mutilated chessboard'. Imagine you have 32 dominoes. Each domino fits perfectly over two squares on the chess board.

Now imagine you cut out two squares from opposite corners of the board. Is it now possible to cover the remaining 62 squares with 31 dominoes?



Eight Queens Puzzle

In chess, the queen is the most powerful piece. It can move any number of squares⁴ in a straight line vertically, horizontally, or diagonally, as long as there are no other pieces in the way. If a piece is in the way, the queen can take that piece.

The eight queens problem asks if it is possible to place eight queens on an empty chess board so that none of them threaten each other.

It turns out that there are 92 solutions to this puzzle. See if you can find one.⁵



Did You Know?

On May 11, 1997, an IBM computer called Deep Blue beat the world chess champion Garry Kasparov after a six-game match: two wins for IBM, one for Kasparov and three draws.

4. Obviously this number is limited by the size of the board!

5. If you can't, you can look here: https://en.wikipedia.org/wiki/Eight_queens_puzzle

6. If you don't, why not learn over the Christmas holidays?

Quote

"Tactics is knowing what to do when there is something to do. Strategy is knowing what to do when there is nothing to do."

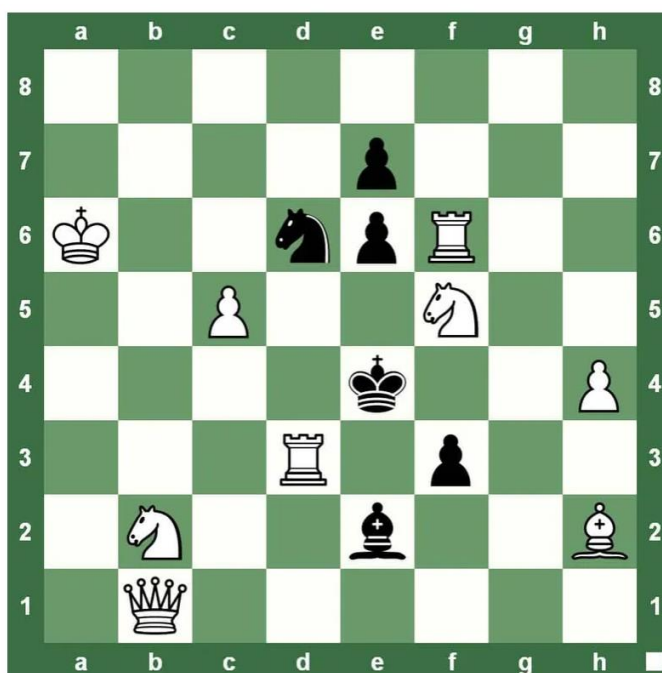
- Garry Kasparov



Spotting Patterns

Although chess is a mathematical game, not all mathematicians are good at chess, and not all great chess players are good mathematicians. One thing that chess players and mathematicians do have in common though is that they are good at spotting patterns.

If you know how to play chess⁶ and like examining patterns and solving problems, there are lots of websites full of chess problems you can look at. For example, in the following scenario, can you see how white can achieve checkmate in one move?



6. If you don't, why not learn over the Christmas holidays?