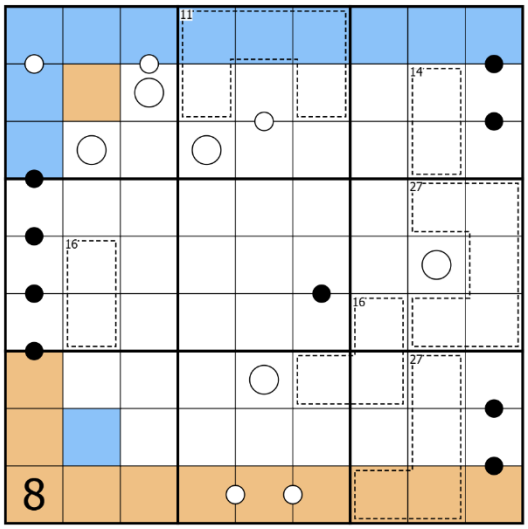
Yan Ying – Solve Path

By MantaRay

1. To begin, note that R3-7C1 cannot all be of the same shading, as the maximum allowable number of consecutive black Kropki dots is 3 (1-2-4-8).

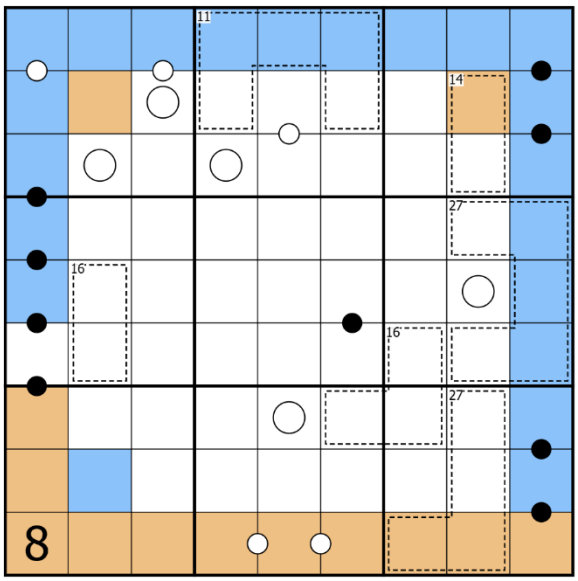


2. Similarly, it is impossible to have the entirety of column 9 be a single colour as one of the black Kropki dot sequences would break.

3. This provides the maximum two shading changes allowed around the border. The border from R3C1 to R1C9 can therefore be coloured in one colour, while R7C1 to R9C9 must be of the opposite colour (it is still to be determined which is shaded).

4. R1C4-6 and R9C4-6 are of opposite shading, so must have the same values, which is either 1-2-3 or 2-3-4. If they had a value of 2-3-4, then the R2C4 and R2C6 would both need a value of 1. This would need to consist of a copycat 1 and an unshaded 1 – both of which would require two 1s in either column 4 or 6.

5. R1C4-6 and R9C4-6 must have the value of 1-2-3. Now, if the orange shading took R8C9 then the values of R1-2C1 and R8-9C9 must be both consecutive and in a 1:2 ratio, meaning they must be a 1-2 pair. But whichever colour is unshaded will require a 1-2-3 triple in its row, as well as a 1-2 pair in either R1C1 or R9C9. R8C9 is therefore blue, which completes the colouring of column 9.

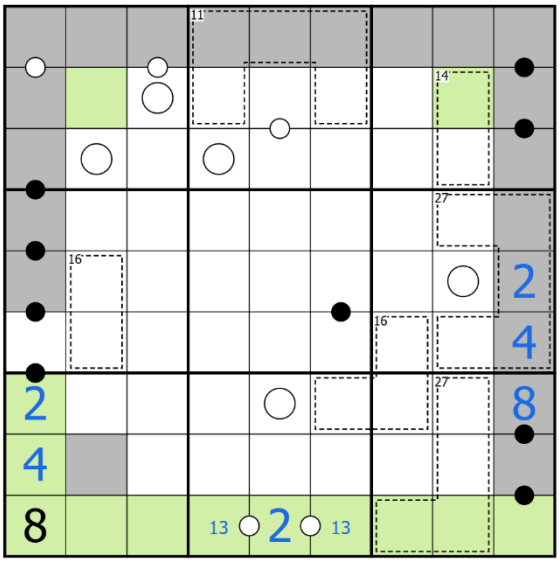


6. If the orange region took R5C1, then there would need to exist a five-cell run of digits that could satisfy consecutive black Kropki dots (either R5-9C1 or R1-5C9) which is impossible.

7. There now exists an effective seven-cell run of black Kropki dots in column 1 and column 9, which must be formed of either the values [1-2-4-8-4-2-1] or [8-4-2-1-2-4-8].

8. If the values start and end with 1, then orange must be the shaded region and R1C9 would be a 1. But if orange is the shaded region, then R1C4-6 must be a 1-2-3 triple – which places two 1s in row 1.

9. Therefore, the values start and end with 8 – which means R9C1 must be a true 8 and blue is the shaded region (which means the colouring can now be adjusted to match). R9C5 must be a 2 (with a 1-3 pair either side) and R7-8C1 can be filled as a 2 and 4 respectively. R5-7C9 must be 2-4-8.

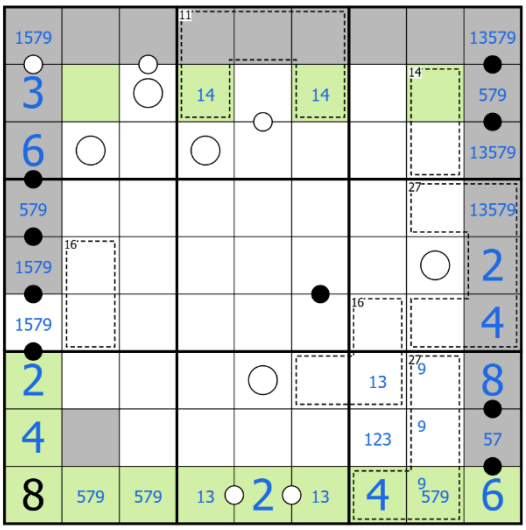


10. R9C9 is a black Kropki-suitable digit, which must be 6. This places 3 in R2C1 and 6 in R3C1 (as these must be in a 1:2 ratio for R7-8C9). R8C9 must be either 5 or 7, to satisfy the white Kropki dot in column 1.

11. The uncoloured cells in the box 2 11-cage must sum to 5. As both R8C4 and R8C6 already see 1-2-3-4, both R2C4 and R2C6 are unshaded and contain a 1-4 pair.

12. Columns 1 and 9 can be fully pencil-marked, as can row 9 (noting that there must be an unshaded 4 in the box 9 27-cage). R4C1 cannot be a 1 as either R6C1 or R4C9 must contain a 1 (to satisfy the black Kropki dots).

13. R1C3 has the value of R9C7. If R9C7 was not 4, then R2C3 must have an even value larger than 2 – and the only option is an unshaded 8. But the circle in R2C3 means that R3C3 must also be unshaded, making R3C2 a circle-housing shaded cell that only sees two shaded cells – placing a second 2 in row 7 (specifically R7C8).



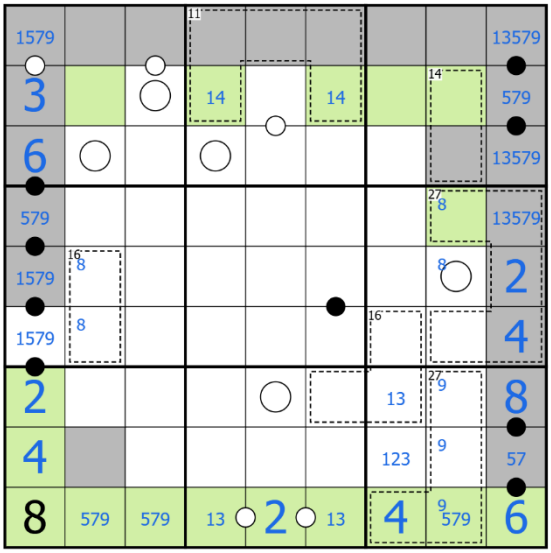
14. The values in R7-9C8 must now have a total value of 23, meaning that there is exactly one shaded cell in either R7C8 or R8C8. The values summing to 23 are either 5-9-9 or 7-7-9. In each case, there must be an unshaded 9 in the cage and at least one of 7 and 9 in R2-3C2.

15. Box 9 now has a virtual 5-7-9 triple, allowing R7C7 and R8C7 to be pencil-marked. Now, if R2C3 is unshaded it must be a 5 and if it is shaded then R8C7 must be a 3. Note that if R2C3 is unshaded, then R3C3 cannot also be unshaded (as it would cause the same shading issue with R3C2).

16. Now let's look at the 16-cage in box 2. It cannot be completely shaded or unshaded (as this would require a 7-9 pair in either R5-6C2 or R4-5C8). The cage therefore contains one cell of each shading.

17. If the 16-cage used values of 7 and 9 then the unshaded cell must be a 9, as there already exists a 9 in column 8. This would place a 7 in one of R4-5C8, making the unshaded cells in the box 9 27-cage a 5-9 pair – which then requires a 9 in R2-3C2, placing two 9s in column 2.

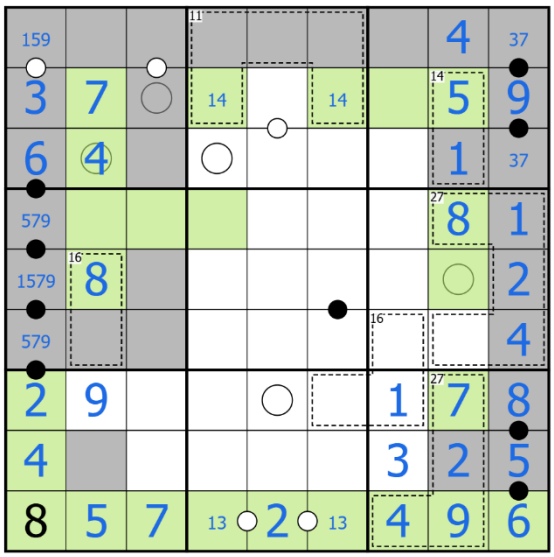
18. The 16-cage must therefore be two 8 values, placing an 8 in both R5-6C2 and R4-5C8. Now the 14-cage in box 2 cannot be two unshaded cells, as both 8 and 9 already exist in column 8.



19. R2C7 must now be unshaded (along with R4C8). This now resolves the shading of R2C3 – if it was unshaded, it would be a 5. It could not see R3C3 (as this would make R3C2 shaded and place a 2 in R7C8) so would see all its unshaded cells in row 2. But now that R2C7 is unshaded, it would see seven unshaded cells – not five.

20. R2C3 is now shaded, placing 1, 2 and 3 in box 9. The 2 being in the 27-cage means that R8C8 must be shaded and R2C2 is either 7 or 9. R3C3 must be the third and final shaded cell seen by R2C3, making R4C3 (along with R3-4C2) unshaded.

21. R3C2 sees three unshaded cells but cannot be a 3, so R5C2 must be unshaded – which fixes the colouring of the 16-cage, and places 4 in R3C2 and the 8s in boxes 4 and 6. R6C1 and R5-6C3 must all be shaded, which means R4C9 is 1. R6C1 is not a 1, as shaded cells cannot contain a digit equal to their value. R5C8 cannot be shaded, as it can only see a maximum of seven shaded cells.

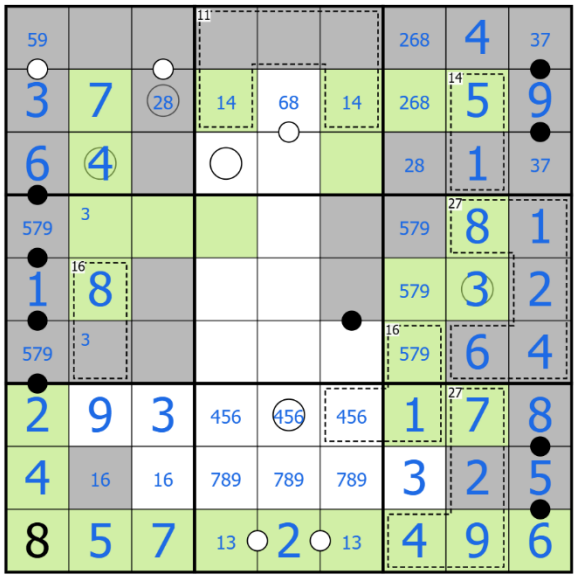


22. 1 and 4 can be placed in box 2. R2C8 must be either 5 or 7, and R7C2 must be 7 or 9. This leaves a 7-9 pair in column 2, placing 5 in R9C2.

23. If the 14-cage was comprised of two 7 values, then both R9C3 and R9C8 would contain a 9. This fixes R2C8 as a 5 and R7C3 as a 9, placing several digits throughout the grid.

24. 3 can be placed in R7C3, leaving a 1-6 pair in box 7. R5-6C8 are a 3-6 pair, and 3 in box 2 must live in column 2.

25. R5C1 must be a 1, otherwise the 27-cage total in box 6 is upwards of 29. The running total of the 27-cage is odd (8 + the three odd digits in R4-6C1). R6C8 must have an even value. If R6C8 was 3, then it would need to be shaded – but simultaneously the 3 in box 4 would be placed in R4C2, which is the mirrored cell of R6C8.

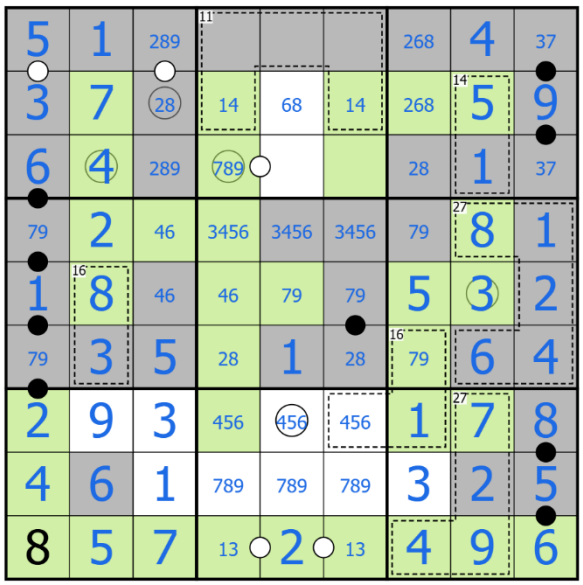


26. R6C8 can no longer be unshaded, as R5C8 would see four unshaded cells. This means that R5C7 is unshaded and R5C6 is shaded, allowing for several cells to be coloured.

27. If R4C5 was unshaded, then R3C5 would also be unshaded and there would be no way for the unshaded region to reach R2C4. R4C5 must therefore be shaded, providing the route for the top-left unshaded region to reach the lower rows.

28. R6C8 being shaded means that R4C2 must be even, placing 3 in box 4. The only even digit available is 2, as R6C8 cannot copycat a second 6. This brings the sum of known values in the box 6 27-cage to 11, meaning R4C1 and R6C1 are a 7-9 pair. R1C1 is a 5, and column 2 can be filled in.

29. R6C3 is a 5, which places 5 in R5C7 (as it cannot copycat itself).



30. Box 5 can be fully pencil-marked, by noting that the shading of R5C6 means that R5C4 must be either 4 or 6. There is an X-wing on 1s in columns 4 and 6, placing 1 in R6C5.

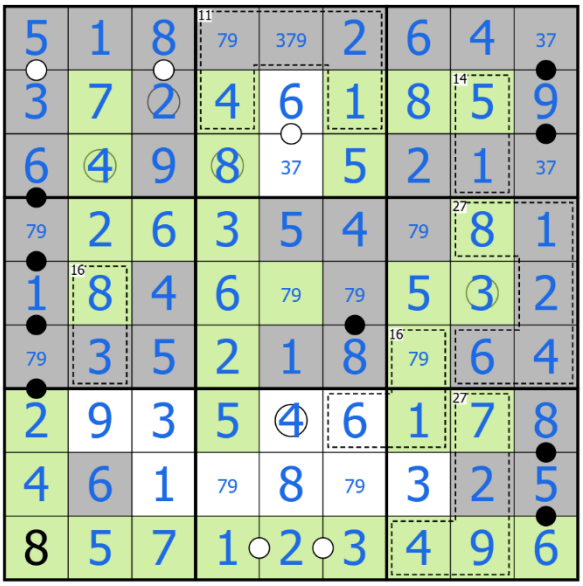
31. R3C4 sees at least four unshaded cells, meaning it contains a digit from 5-7-8-9. R6C4 must therefore be unshaded (as otherwise R3C4 would see either four or six unshaded cells).

32. This forces R6C5-6 to be shaded, and R7C4 to be unshaded (removing 5 from R3C4).

33. R6C6 being shaded means that R4-5C4 must be in a 1:2 ratio, making R4C4 a 3 and R5C4 a 6. This fixes the 1-3 pair in box 8 and the 1-4 pair in box 2, and places 5 in R7C4.

34. R3C4 must see exactly eight unshaded cells (it cannot see seven or nine), making R3C4 an 8. This cannot be consecutive with a digit in R7C5, meaning that R3C5 is the unshaded digit and R8C4 is shaded.

35. Several digits can be placed throughout the grid.

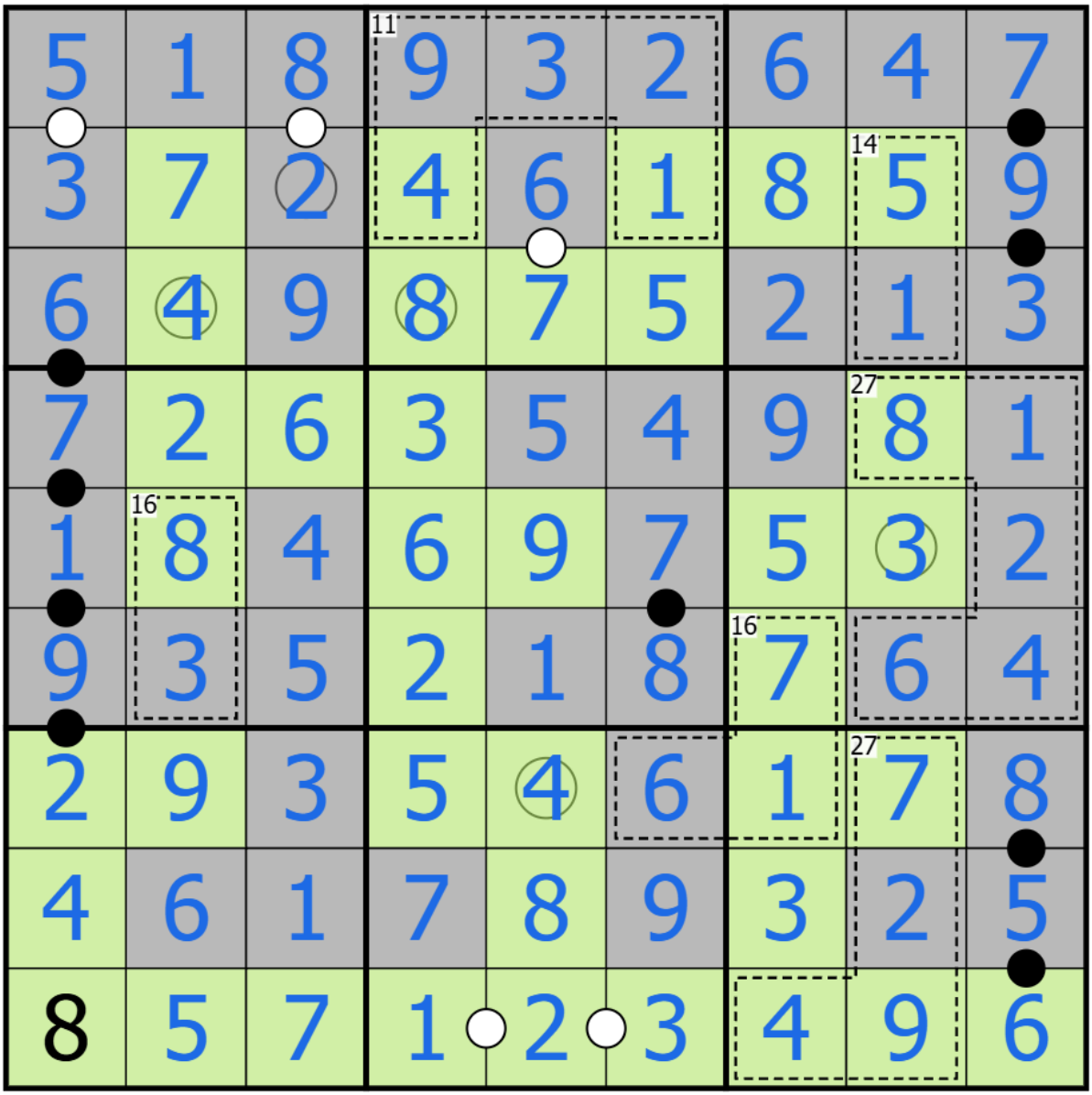


36. R2-3C5 must contain one cell of each shading. If R3C5 was the shaded cell, it would have a value of 4 which is not consecutive with the unshaded 6 in R2C5. R2C5 is therefore shaded and has a value of 8, making R3C5 an unshaded 7.

37. R7C5 cannot see seven shaded cells, so must be unshaded. Now the only way it can see four unshaded cells is if R8C5 is unshaded and both R7C3 and R7C6 are shaded. This completes the shading of the puzzle.

38. R7C6 is now shaded, meaning it has a value of 8. This fixes the 7-9 pairs in rows 4 and 6 and completes the puzzle.

The final solution is shown on the next page: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