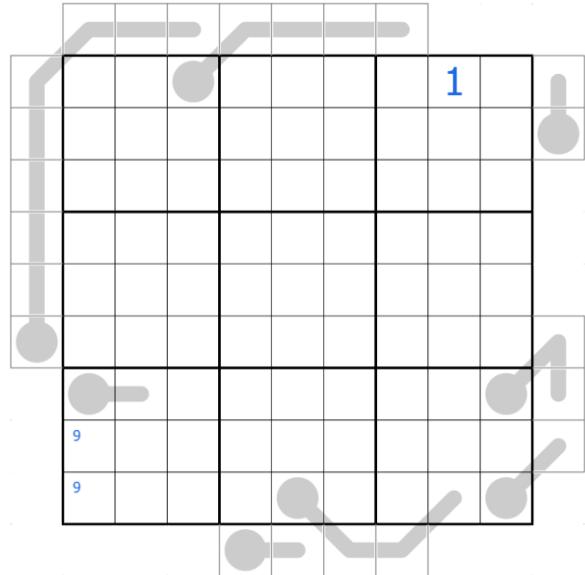


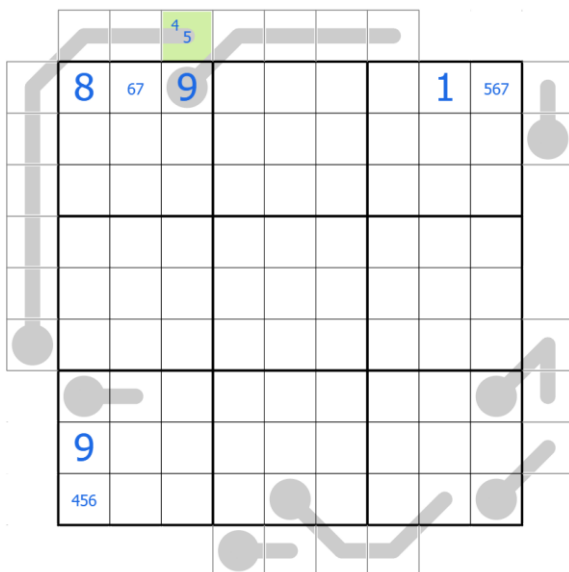
X-treme Temperatures – Solve Path

By MantaRay

1. In this guide, rows 0 and 10 are considered the rows above/below the grid and columns 0 and 10 refer to the columns outside of the grid.
2. To begin, note that 1 cannot be the first cell seen of an X-sum anywhere on a thermometer outside of the grid, apart from the bulb. 1 can therefore be placed in R1C8.
3. Similarly, 9 cannot exist as the first digit seen by a thermometer X-sum except for the thermo's tip. 9 in column 1 must therefore exist in R8-9C1.



4. At least one of 7 and 8 must appear as an X-sum first-seen cell in column 1. Therefore, the minimum value for the X-sum clue in R1C0 is 29 (with a 7 in R2C1 seeing digits that sum to 28) and the minimum value for R0C1 is 30. R1C1 is a minimum of 5.
5. Making a value of 30 in five, six, or seven cells (without using a 9) requires an 8 to be used. But this would place an 8 somewhere in the first five or six cells seen down column 1 (as R7C1 cannot be an 8) – thereby raising the minimum value of R0C1 to 38, which will always require a 9. But the 9 in column 1 is at least eight cells from R1C1.



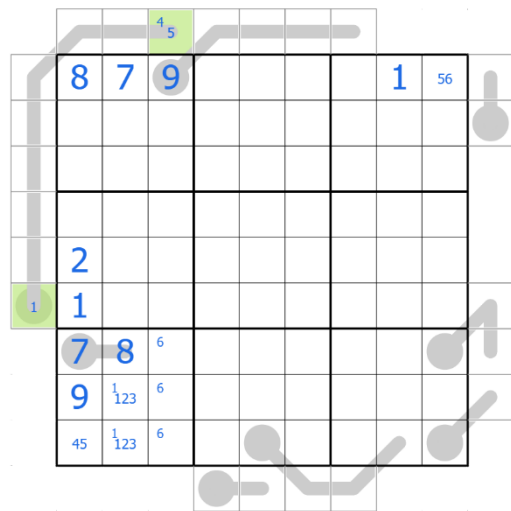
6. R1C1 is therefore 8. R1C0 is smaller than R0C1, which makes R1C9 larger than R9C1 (which cannot now be 9).

7. If R1C3 was not 9, then R1C2-3 would use a 6-7 pair. But the minimum sum of the values in R0C2-3 would be $38 + 39 = 77$, leaving five digits in box 7 that are not included in the X-sums and must sum to 13 which is impossible.

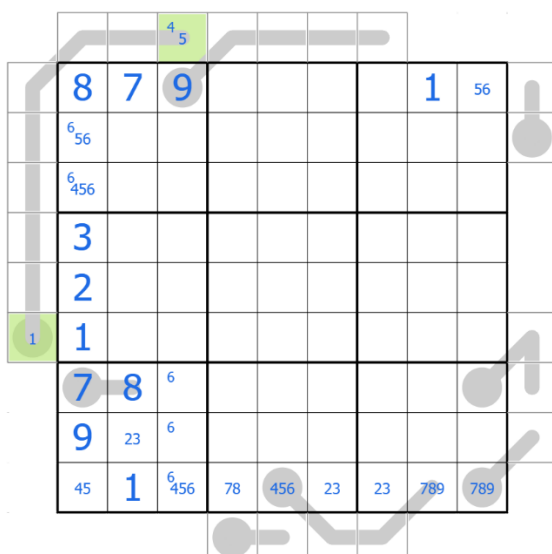
8. The digits in column 2 not seen by R0C2 must sum to less than R9C1 – which is now a minimum of 4.

9. R1C2 can no longer be a 6, as it would miss three cells that must sum to less than 6 which is impossible. R1C2 is therefore 7 and the X-sum clue is missing two cells that sum to at most 4 – so must be from 1-2-3, with a 1 included.
10. 7 in column 1 cannot be in box 1. If it was in R4C1, then the minimum sum of the X-sum clues in R2-3C0 would be $29 + 30 = 59$. But the available digits in box 1 sum to 21 – so even using a 5-6 pair in R2-3C1, the remaining 38 would need to be created in five cells in box 2 which is impossible. This problem is exacerbated by moving 7 further down the thermo, so 7 must therefore be placed in R7C1 (making R7C2 an 8). The 1 in column 1 must go in R6C1.

11. The maximum value for the two cell X-sum clue in column 1 is 11. 2 cannot be placed in R2C1 as there would be a 6 below it, which will see digits that sum to at least 21.
12. The 2 also cannot go in R3C1, as the maximum associated X-sum clue would be 7 (as 6 would go in R2C1) – but the 3 in column 1 will be placed in box 4 and create an X-sum clue of at least 9.



13. If 2 was not placed in R5C1, then whatever digit was placed there would necessitate an X-sum clue larger than 11.
14. A 3 in R2-3C1 would see a maximum of 14 ($3 + 5 + 6$), which is less than the minimum six cell X-sum clue value (21). Therefore, the 6 must exist in R2-3C1 and lives higher in the column than the 3. Now, the maximum three cell X-sum value in box 1 is 12. But if R3C1 is a 3, then R4C1 is a minimum of 4 – which would already see digits summing to at least 12 in box 4.



15. 3 is in R4C1 and R2-3C1 is from 4-5-6. If R2C1 is a 4, then R3C1 is a 6 with a minimum X-sum value of 21. But the maximum X-sum value for 4 in this case is $4 + 3 + 5 + 9 = 21$, which is too low.

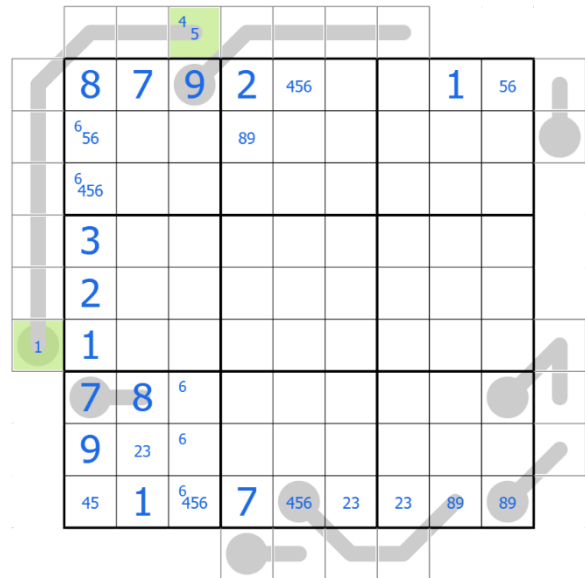
16. The two cells on the thermometer in R10C6-7 must be single-digit values larger than 1, so R9C6-7 is a 2-3 pair and R9C8 is at least 7. 1 in box 7 is placed in R9C2, leaving R9C4 to be 4-5-6. There are now only three cells in row 9 that can accommodate 7-8-9, leaving R9C3 as 4-5-6.

17. R9C4 cannot be a 9, as R10C5 cannot be larger than 45 (and 45 already exists as an X-sum clue). If R9C4 was 8, the minimum value of R10C4 would be 39 – which is the maximum value available to R10C5. R9C4 is therefore 7.

18. 2 in row 1 must exist under the thermometer in row 0 but has a maximum X-sum value of 11, so must be placed in either R1C4 or R1C5 to satisfy the thermometer.

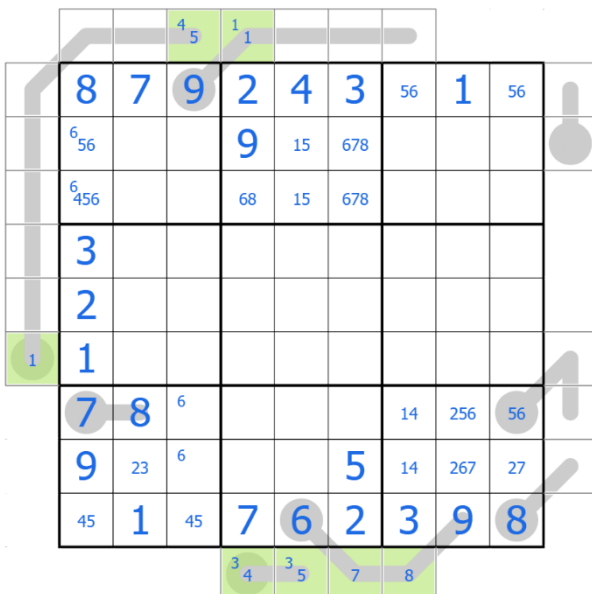
19. The minimum number of cells seen by R1C4 and R9C4 is 9, meaning that the minimum sum of R0C4 and R10C4 is 45. As R0C5 is larger than R0C4 and R10C5 is larger than R10C4, there must be at least ten cells seen – meaning R1C5 and R9C5 must sum to at least 10.

20. R1C5 must therefore be from 4-5-6, meaning R1C4 is 2 and R2C4 is either 8 or 9.



21. R10C4 is at least 34, meaning R10C5 is at least 35 so R9C5 cannot be a 4. If R9C5 was a 5, then it would need to see 5-6-7-8-9. But that would place 4 in R1C5, meaning that there would be no overlapping cell(s) between the opposing X-sum clues in column 5.

22. R9C5 being a 6 forces the X-sums in row 9 and disambiguates the 8-9 pair in box 9. R7-8C7 is a 1-4 pair, and 3 in row 1 is placed in R1C6. 4 in row 1 must live in R1C5. Now, the maximum value of the three cells not seen by R9C5 is 10 – which is also the minimum sum that can be created.



23. R9C5 now sees digits summing to 35, meaning that R10C4 is 34. R2C4 must be a 9 to accommodate the other 11 in column 4. There is a 6-7-8 triple left in box 2, where the 7 must exist in R2-3C6.

24. R7C9 is now from 2-5-6. If it was 2, then the X-sum clue in R7C10 would either be 7 or 8 – both of which already exist in the puzzle. This creates a 5-6 pair in column 9, limiting R8C9 to 2 or 7.

25. If R8C9 was a 2, then R8C2 would be a 3. If R8C9 was a 7, then the X-sum clue could not be 34 so R8C2 could not be a 2 – in either case, R8C2 is a 3.

26. Placing 3 in R8C2 forces R9C1 to be a 5 (as it needs to be larger than the sum of digits not seen by the R1C2 X-sum clue). This finishes the digits in column 1 and makes R1C9 a 6. R7C9 is now 5. 8 can be placed in R8C5, leaving a 1-4 pair in row 8.

27. 1-3 and 2-5 can be paired up in box 1. This leaves a 4-6-9 triple and a 5-7-8 triple in box 4. The only valid digit for R5C2 is 4, as otherwise the X-sum clue in R5C0 would copy an existing value (either 8 or 11).

28. R1C10 has a value of 21, meaning R2C9 must be at most 4. The 4 in box 3 must live in R2C8-9.

29. R2C9 cannot be 2, as R2C10 would be a 6 – which already exists as an X-sum clue. If R2C9 was a 4, then it would see both the 7 and 8 in row 2, along with at least a 2. But this means the minimum X-sum value in R2C10 would be 21, which is too large.

30. R2C9 being 3 disambiguates the digits in box 1 and the 1-5 pair in box 2. If R3C4 was a 6, the X-sum clue in R3C0 would be 18 – but so would the X-sum clue in R0C6. R3C4 must therefore be 8, finishing box 2 and placing 8 in box 3.

31. R0C6 is now 16, meaning that R6C5 must be at most 15. The only digit that can be placed in R4C5 to not break the thermometer is 2 – giving R0C5 a value of 12.

32. R6C7 cannot be 2 or 7 as these would force R0C7 to have a value of 30 or 35, both of which have already been used.

33. There is a 2-6-7 triple in column 8, leaving a 3-5-8 triple remaining in box 6. Now the only place for a 2 in box 6 is R6C9. This places 7 in R8C9 and sorts the rest of box 3. 4 and 1 can be placed in box 6, leaving a 6-7-9 triple.

34. R6C8 must be an 8 – if it was 3 then R6C10 would not be larger than 5, and a 5 would repeat a 7 value X-sum. This fixes the 3-5-8 triple in column 8. R6C6 is now a naked single 4. The grid can now be fully pencil-marked.

35. R4C2-3 is either a 6-8 pair or a 7-9 pair, as any other combination would create a duplicated X-sum value (3-6-7 is 16 and 3-8-9 is 20).

36. If R4C2 is a 6, then R4C4 is a 1. If R4C2 is a 9, then R4C3 is a 7, R4C7 is a 6 and R4C4 is a 1. In either case, R4C4 is 1. Placing this digit disambiguates most of the puzzle, leaving behind a 2-6 deadly pattern.

37. The cells seen by R7C10 currently sum to 19. If R7C8 was 2, then R7C10 would be 21 – which already exists in R1C10. R7C8 must therefore be 6, finishing the puzzle.

	4	4	4	1	1	1											
	0	1	5	1	2	6											
3	9	8	7	9	2	4	3	5	1	6	2	1					
3	0	6	2	1	9	5	7	8	4	3	1	5					
2	0	4	5	3	8	1	6	2	7	9							
		3	6	9	7	8	1	6	2	1	8	9	6	7	9	5	4
6		2	4	5	7	8	5	6	7	9	8	9	6	7	9	3	1
1		1	6	9	5	7	3	5	3	7	4	6	9	8	2	1	0
		7	8	2	6	1	3	4	9	1	4	6	5	2	5		
		9	3	6	2	6	1	4	8	5	1	2	7	3	3		
		5	1	4	7	6	2	3	9	8							
					3	4	3	5	7	8							

The Final Solution Is:

	4	4	4	1	1	1	3					
	0	1	5	1	2	6	3	1				
3	9	8	7	9	2	4	3	5	1	6	2	1
3	0	6	2	1	9	5	7	8	4	3	1	5
2	0	4	5	3	8	1	6	2	7	9		
1	7	3	6	8	1	2	9	7	5	4		
6		2	4	5	6	7	8	9	3	1		
1		1	9	7	5	3	4	6	8	2	1	0
		7	8	2	3	9	1	4	6	5	2	5
		9	3	6	4	8	5	1	2	7	3	3
		5	1	4	7	6	2	3	9	8		
					3	4	3	5	7	8		