

KENKEN SOLVING TIPS

Terms you will need to know

Cage: One of the heavily-outlined sections of the KenKen grid.

Candidate(s): The possible numbers that could be in a cell.

Cell: A single square in a KenKen grid.

KenKen is a math-based puzzle, similar to Sudoku in that each row and column must have the digits appear exactly once, with no repeats. Within the grid are heavily outlined cages that generally include a mathematical operator (+, -, x, or #) and the result of using that operator on all the digits within the cage. Digits can be repeated within a cage, as long as they don't appear more than once in a row or column.

Although the operator and the result are provided, the digits in the cage do not have to be in the order that would reflect that mathematical sentence. For example, in a 2-digit cage represented as 5-, the digits could be 1 and 6 or 6 and 1.

GETTING STARTED

The example puzzle to the right is a 4x4 puzzle, so the digits 1-4 will appear exactly once in each row and column. In the first row, cell A4 is a single cage with a 1 indicated and no mathematical operator, so you can write a 1 in that cell. Similarly, in the last row, a 3 can be written in cell D2.

Staying in the last row, cells D3 and D4 are in a cage that adds up to 6. The only two digits from 1-4 that add up to 6 without repeats are 2 and 4, so D3 and D4 are 2 and 4 in some order. We don't know which order yet, so you can write them small as candidates in those cells. Since we've already placed a 3 in that row, and we know that 2 and 4 go in cells D3 and D4 in some order, D1 must be a 1 (since that's the only digit left in 1-4). D1 is in a cage with C1, and those two cells subtract in some order to make 2, so cell C1 must be 3 ($3 - 1 = 2$).

Staying in the first column, A1 and B1 must be 2 and 4 in some order (since we've already placed the 1 and 3 in that column). We don't know which order yet, so write them in as small candidates. Those two cells, along with B2, are in a cage adding up to 10, so B2 must be 4 ($2 + 4 + 4 = 10$). This means B1 can't be 4 (there can't be two 4s in one row), so B1 is 2 and A1 is 4.

In the first row, A2 can't be 3 (it shares a column with the 3 in D2), so it must be 2, and A3 is 3 (the only digit left for that row). In row C, C2 is 1 (the only digit left in column 2), and it shares a cage with C3 subtracting to 3, so C3 must be 4 ($4 - 1 = 3$). C4 must be 2 (the only digit left for that row).

Earlier, we filled in the candidates 2 and 4 for D3. Now that we've placed a 4 in C3, we can eliminate 4 as a possibility for D3 (in the same column), so D3 is 2 and D4 is 4. B3 is 1 (the only digit left for that column), and B4 is 3 (the only digit left for that row).

EXAMPLE

	1	2	3	4
A	10+	1-		1
B			6+	
C	2-	3-		
D		3	6+	

EXAMPLE SOLUTION

10+	1-		1
4	2	3	1
		6+	
2	4	1	3
2-	3-		
3	1	4	2
	3	6+	
1	3	2	4

MORE SOLVING TIPS

We will explain how to complete the following KenKen puzzle, step by step. As we proceed, the diagram will be shown at different stages of the solving process.

	1	2	3	4	5	6
A	11+			10+		
B	2÷	15×	13+		3÷	9+
C				12×		
D	5+				8+	
E	2-		4-		1-	
F	9+		7+		3-	

It is always helpful to write in your candidates for cells in which you have more than one option, which makes it easier to go back to those cells later and eliminate candidates based on other cells you've filled in. While a number of the mathematical equations in a puzzle will have multiple possible combinations (1 and 6 can be multiplied together to get 6, for example, but so can 2 and 3), some of the equations in a puzzle will have only one possible combination. In this puzzle, cells B2 and C2 multiply to equal 15, and the only two digits from 1-6 that multiply to equal 15 are 3 and 5, so B2 and C2 are 3 and 5, in some order.

Using math beyond that given in the cages can be helpful in solving. In a 6x6 KenKen grid, you can use the knowledge that the digits 1-6 add up to 21 to help you (this is often referred to as the **Rule of 21**). In row F, cells F1 and F2 add up to 9, and cells F3 and F4 add up to 7, so those four cells together add up to 16. Therefore, the remaining two cells in that row, F5 and F6, must add up to 5 ($21 - 16 = 5$). Those two cells are in a cage subtracting to 3, so they could be 6 and 3, 5 and 2, or 4 and 1 (the only possibilities to subtract to 3). Since they must also add up to 5 according to the Rule of 21, they must be 4 and 1, in some order.

NOTE: Multiplication has a similar rule to the Rule of 21 known as the **Rule of 720**. In a 6x6 grid, the digits 1-6 multiply to 720. Remember that you must continue to multiply when applying this rule to more than one row or column — two rows of a 6x6 KenKen multiply to 518,400 (720×720), and three rows multiply to 373,248,000 ($720 \times 720 \times 720$).

You can use the Rule of 21 (or the Rule of 720) even in a group that mixes addition and subtraction with multiplication and division. In row D, cells D1 and D2 add up to 5 and cells D5 and D6 add up to 8, so cells D3 and D4 must add up to 8 ($21 - 5 = 16$, and $16 - 8 = 8$). The only possibilities for two non-repeating digits to add up to 8 are 2 and 6 or 3 and 5. Since cells D3 and D4 are in a cage that multiplies to 12, and 12 is not evenly divisible by 5, cells D3 and D4 must be 2 and 6, in some order. In order to complete the cage, C4 must be 1 ($2 \times 6 \times 1 = 12$). Cells D3 and D4 having only candidates 2 and 6 makes them a **naked pair** in that row—since D3 and D4 are 2 and 6, in some order, no other cell in that row can be a 2 or a 6. Cells D5 and D6 add up to 8, and the only two-digit combination that adds up to 8 without using 2 or 6 is 3 and 5, so D5 and D6 are 3 and 5, in some order, leaving D1 and D2 as 1 and 4 (the only remaining candidates for that row), in some order.

Similarly, in row F, cells F3 and F4 add up to 7, and can't be 1 and 6 or 3 and 4 (1 and 4 are a naked pair in cells F5 and F6), so they must be 2 and 5 (the only remaining possibilities to add up to 7), in some order. F2 is either 3 or 6 (the only remaining values after eliminating the naked pairs of 2 and 5 and 4 and 1 in that row), but can't be 3 (3 and 5 form a naked pair in column 2 in cells B2 and C2), so it must be 6, and F1 must be 3 ($6 + 3 = 9$).

	1	2	3	4	5	6
A	11+			10+		
B	2÷	15× 35	13+		3÷	9+
C		35		12× 1		
D	5+				8+	
E	14	14	26	26	35	35
F	2-		4-		1-	
F	9+	3	7+		3-	
F		6	25	25	14	14

In row D, we know that 2 is in D3 or D4 and in row F, we know that 2 is in F3 or F4, forming an **X-Wing** for columns 3 and 4 — the value (in this case 2) must appear in one of those cells in each of the two columns, and therefore can be eliminated from any other cell in the two columns. This means that 2 can't be in E3 or E4, so the cage of cells E3 and E4 that subtracts to equal 4 can't be 6 and 2, and must therefore be 5 and 1 (the only other possibility to subtract to equal 4), in some order. The 1 can't be in E4 (C4 is 1), so the 1 is in E3 and the 5 is in E4. Earlier, we determined that the candidates for F4 were 2 and 5, so F4 must be 2, and F3 must be 5. Using the 2 in F4, we can eliminate the candidate 2 from D4, leaving 6 as the value for that cell, and 2 as the value for D3.

In row E, E1 and E2 subtract to equal 2. They can't be 5 and 3 (there is a 5 in E4) or 3 and 1 (there is a 1 in E3), so they must be either 6 and 4 or 4 and 2 (the only other possibilities to subtract to equal 2). In either case, 4 is a **locked candidate** that must appear in E1 or E2. E5 and E6 subtract to equal 1, but they can't be 6 or 5 or 5 and 4 (there is a 5 in E4), 2 and 1 (there is a 1 in E3), or 4 and 3 (4 is a locked candidate in E1 and E2), so they are 3 and 2, in some order. E1 and E2, then, must be 6 and 4, in some order. The 6 in row E isn't in E2 (there is a 6 in F2), so it is in E1 (the only remaining cell in row E) and E2 is 4 ($6 - 4 = 2$). Earlier, we had determined that the candidates for D2 were 1 and 4, so D2 must be 1 and D1 must be 4.

In column 1, the 5 can't be in B1 or C1 (those two cells are in a cage dividing to equal 2, and 5 can't be divided by a whole number to equal 2), so it's in A1. A1 is part of a three-digit cage adding to 11, and therefore A2 and A3 must add up to 6 ($11 - 5 = 6$). They can't be 1 and 5 (since there's already a 5 in A1), so they must be 2 and 4 (the only remaining possibilities to add up to 6), in some order. The 2 can't be in A3 (D3 is 2), so the 2 is in A2 and the 4 is in A3.

In column 4, the 4 isn't in A4 (there is a 4 in A3), so it is in B4, and 3 is in A4 (the only possibility left for column 4).

There is an X-Wing for 3s in rows D and E (in row D, 3 must be in D5 or D6, and in row E, 3 must be in E5 or E6), so 3 cannot appear in any other cells in columns 5 and 6. Because of this, B5 and C5, which are in a cage that divides to equal 3, cannot be 3 and 1, so they are 6 and 2 (the only other possibilities to divide to equal 3), in some order. This creates a naked pair of 2 and 6 in column 5. Earlier, we had determined that the candidates for E5 were 2 and 3, so E5 must be 3 and E6 must be 2. We had also determined earlier that the candidates for D5 were 3 and 5, so D5 must be 5 and D6 must be 3.

	1	2	3	4	5	6
A	¹¹⁺ 5	2	4	¹⁰⁺ 3		
B	^{2÷} 	^{15×} 	¹³⁺ 	4	^{3÷} 	⁹⁺
C		₃₅ 		^{12×} 1	₂₆ 	
D	⁵⁺ 4	1	2	6	⁸⁺ 5	3
E	²⁻ 6	4	⁴⁻ 1	5	¹⁻ 3	2
F	⁹⁺ 3	6	⁷⁺ 5	2	³⁻ 	

The 6 in row A can't be in A5 (there is a naked pair of 2 and 6 in B5 and C5), so it is in A6 and A5 is 1. Earlier, we had determined that the candidates for F5 were 1 and 4, so F5 must be 4 and F6 must be 1.

The 4 in column 6 can't be in B6 (there is a 4 in B4), so it is in C6 and B6 is 5 (the only possibility left for column 6). Earlier, we had determined that the candidates for B2 were 3 and 5, so B2 must be 3 and C2 must be 5.

The 3 in column 3 can't be in B3 (B2 is 3), so it is in C3 and B3, then, is 6 (the only possibility left for column 3). The 6 in column 5 can't be in B5 (B3 is 6), so it is in C5 and the 2 is in B5. The 2 in column 1 can't be in B1 (B5 is 2), so it is in C1 and the 1 is in B1.

SOLUTION

	1	2	3	4	5	6
A	¹¹⁺ 5	2	4	¹⁰⁺ 3	1	6
B	^{2÷} 1	^{15×} 3	¹³⁺ 6	4	^{3÷} 2	⁹⁺ 5
C	2	5	3	^{12×} 1	6	4
D	⁵⁺ 4	1	2	6	⁸⁺ 5	3
E	²⁻ 6	4	⁴⁻ 1	5	¹⁻ 3	2
F	⁹⁺ 3	6	⁷⁺ 5	2	³⁻ 4	1