Chapter 1

Understanding Kakuro

Kakuro puzzles may look familiar, and they may look easy, but don't be fooled. While the elements that you use to solve the puzzles are simple numbers, how you go about using them can be a bit tricky. This chapter covers a few of the kakuro-solving ground rules, giving you all the strategy tools you need.

The Aim of Kakuro

A kakuro puzzle looks a lot like a crossword puzzle, with interlocking horizontal rows and vertical columns of squares (called *blocks*). Like a crossword, if a square is in both a row and a column, the character for that square must work for both the row and the column. But there the similarity ends, because all the characters that you put in the individual squares are numbers.

The original U.S. title of the puzzle – 'Cross Sums' – hints at the nature of kakuro. In the black squares around the edges of the blocks are numbers, called *clues*. These clues tell you the sum of the numbers in that block. In other words, if the clue is a 9, the correct answers to the individual squares in that block will add up to 9. *Across clues* are represented by the numbers printed on the black squares above the diagonal line and *down clues* are those below the line.

Kakuro has only one other trivial little rule to puzzle puzzlers: You cannot repeat any number in a given block. When you've correctly filled in every square so that the numbers in all the blocks equal their clues without repeating numbers in any block, you've completed the puzzle. Figure 1-1 shows a completed kakuro puzzle.

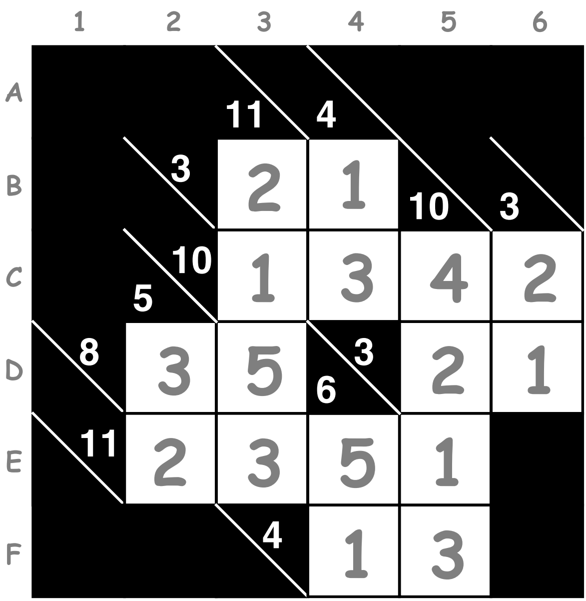

Figure 1-1: A completed kakuro puzzle.

Solving a Kakuro

Those blocks don't fill themselves in, you know. So this section presents you with the basic tools you need to tackle your first kakuro puzzles.

Understanding the clues

So how do you know which number goes where in a given kakuro puzzle? By following the clues on the grid.

As an example, say the clue is 3. This clue has two empty squares adjacent to it that make up the block. The only possible solution to a 3 in two squares is 1 and 2 (1 + 2 = 3). Similarly the solution to 4 in two squares is 1 and 3 (1 + 3 = 4). This can be the *only* solution to 4 because 2 + 2 would break the rule of no number being repeated in any block. Simple!

REMEMBER

I mentioned *4 in two* in the previous paragraph. That's the way I'll express the clues from here on, so when you see *38 in six* you'll know that I mean 38 (the clue) has a block of six digits as its solution.

Getting down to basics

Two types of calculations help you through the world of kakuro:

- Combinations
- Fixed values

The following sections explain what you need to know about each to solve a kakuro.

Working out combinations

The numbers that you place in the boxes of a given block are called *combinations*. Two combinations are shown in the preceding section ‘Understanding the clues’: 1 and 2 making 3, and 1 and 3 making 4. Another example might be 10 in three, where the combination is 1, 2, and 7.

Some combinations (3 in two and 4 in two, for example) are sums that can only be worked out with specific numbers. For example, 3 in two can only be accomplished using 1 and 2, while 4 in two can only be 1 and 3. No other combinations work for these numbers without breaking the rule of not repeating digits. If a block has a clue that can only be solved with one combination of numbers (such as 3 in two and 4 in two), those combinations are referred to as *known combinations*.

Clues that have known combinations are extremely useful, so useful that I’ve provided you with a chart of them in Figure 1-9 (near the end of this chapter).

‘Very interesting’, you might say, ‘but how does that help me solve kakuro?’ Well, if two known combinations cross one another and they share only one digit, the square where they coincide must be the value of that digit. Say, for example, a 4 in two (1, 3) crosses a 38 in six (3, 5, 6, 7, 8, 9). The square where they cross must have the value of 3, because that’s the only digit that they share. However, if the 4 in two crosses a 6 in three (1, 2, 3), the square in common could be either a 1 or a 3.

You can sometimes use this same principle for blocks that involve numbers without known combinations. Even if you can’t come up with the final value for a square, you can at least narrow the possible candidates. For example, if you have a 10 in three, which is not a known combination, the candidate numbers for the three squares would be some combination involving 1, 2, 3, 5, 6, or 7. If a 3 in two crosses that 10 in three, the only candidates possible for the square where the two blocks coincide are the 1 and 2.

TECHNICAL STUFF

Candidates are the possible number choices you can insert into any square.

Figuring out fixed values

Another important concept is the *fixed value*. This is where a square's value is locked by the rules of kakuro – essentially, knowing what a square's value is by knowing all of the other numbers which it can't be.

Think of this as the process of elimination. For example, if the clue calls for the known combination of 7 in three – a known combination involving a 1, 2, and a 4 – and you've already got the 1 and the 2 accounted for, you know the remaining square must have a value of 4.

Working through Your First Kakuro

Take a look at a simple kakuro puzzle at Figure 1-2. They don't come much simpler than this, but it serves to illustrate all the points discussed in this chapter. For the purposes of explanation, I've numbered the grid: rows are A–F and columns 1–6.

Working through known combinations

Known combinations are so important that you should look for them first. The process of entering the candidates from any known combinations allows you to narrow down your choices and solve any easy clues straight away.

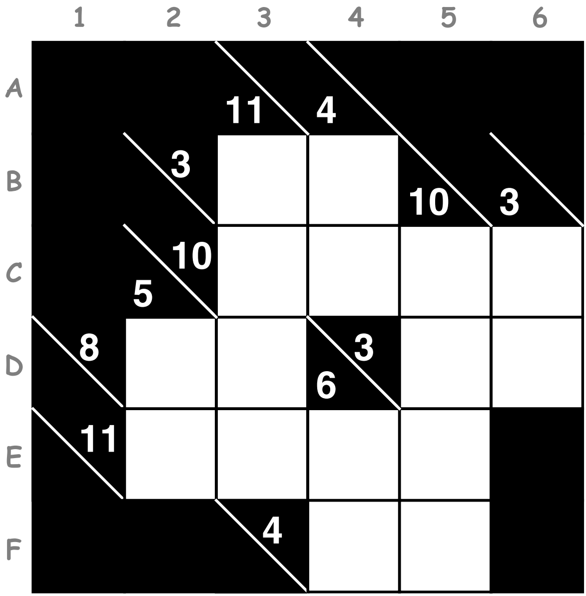

Figure 1-2: Your puzzle awaits. Tempted?

TIP

The example puzzle in Figure 1-2 has a load of known combinations: a bunch of 3s and 4s in two and a couple of 10s and 11s in four. Entering all the candidate numbers for these squares leaves just one completely unknown number in square D2, but stick with the known combinations first before looking at that one!

Looking at all the known combinations, only one square exists where you can make use of the rule about single common numbers: B4, where 4 in two and 3 in two both uniquely share the number 1. I've filled this – along with all the candidates – in on Figure 1-3. First number solved.

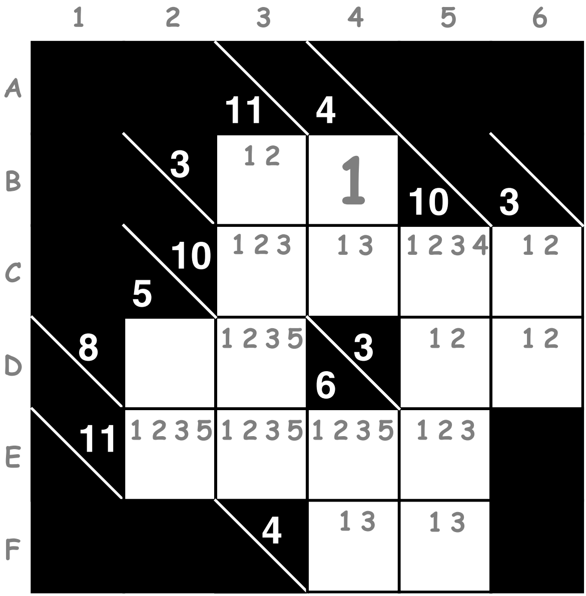

Figure 1-3: The candidates are placed, and one number is already solved.

Now look at F4. This square helps demonstrate the concept of fixed values. The candidates for F4 must be 1 and 3, the only two numbers that work for 4. But look at the down clue that coincides with this square, a 6 in two. If you used a 3 in square F4, then to add up to six you'd have to use another 3 in square E4, which would mean two 3s in the block, and that isn't allowed. So because you can't repeat numbers, the value at F4 can't be a 3, so it must be a 1. And that means that E4 must be a 5 and F5 must be a 3; and as you have the 1 in B4, then B3 must be a 2 and C4 must be a 3. Great! That's five more squares solved, as shown in Figure 1-4.

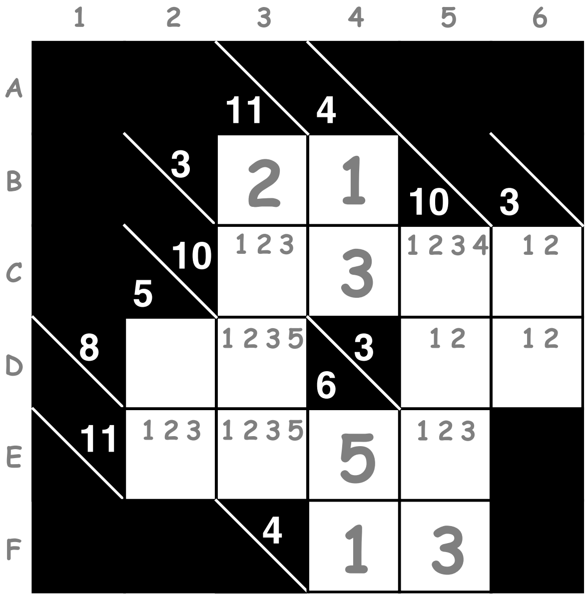

Figure 1-4: Fixed values help solve a few more squares.

Reducing candidates

Now that some numbers have been solved, use the rule of non-repetition to reduce the options for candidates in unsolved squares. For example, as column 5 already has a 3, no other square in column 5 can be a three. That means your options look like like Figure 1-5.

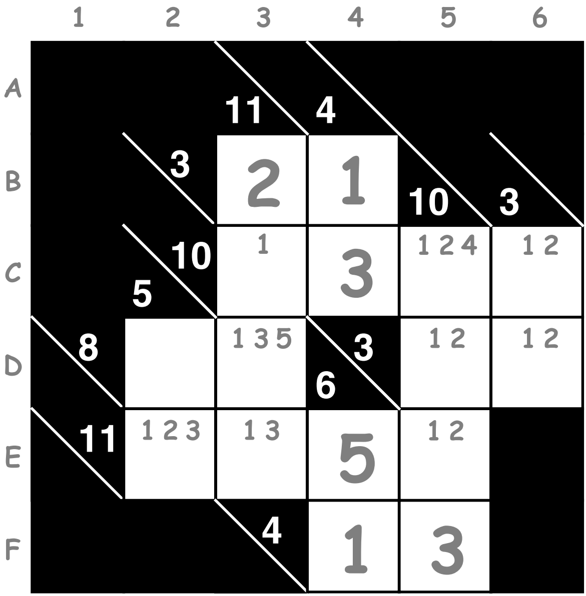

Figure 1-5: Knowing that numbers can't be repeated in a block narrows down your choice of candidates.

You've probably noticed that the process of reducing candidates revealed some more solved squares: at C3 the only candidate left is a 1, so that has to be the solution for that square. That reduces the options at D3 and E3, leaving only a 3 at E3, therefore resolving the square at D3 to 5. Also, a lone 4 is at C5 – if it doesn't appear anywhere else in either of the blocks that coincide at C5, then that has to be the number for that square. That's the state of play recorded in Figure 1-6.

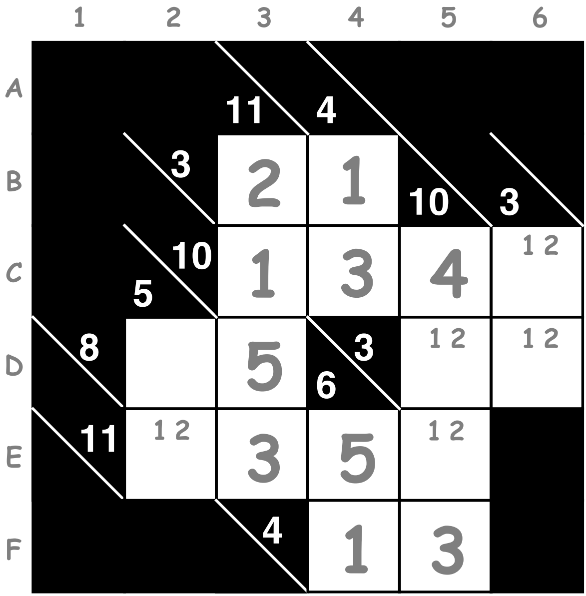

Figure 1-6: Reducing the candidates solves a few more squares.

Back to reducing candidates. At row C, you've already solved the 1 at C3, so the 1 at C6 can go, leaving the 2 at that square. This solves the square at D6, which in turn solves D5 and E5, as shown in Figure 1-7.

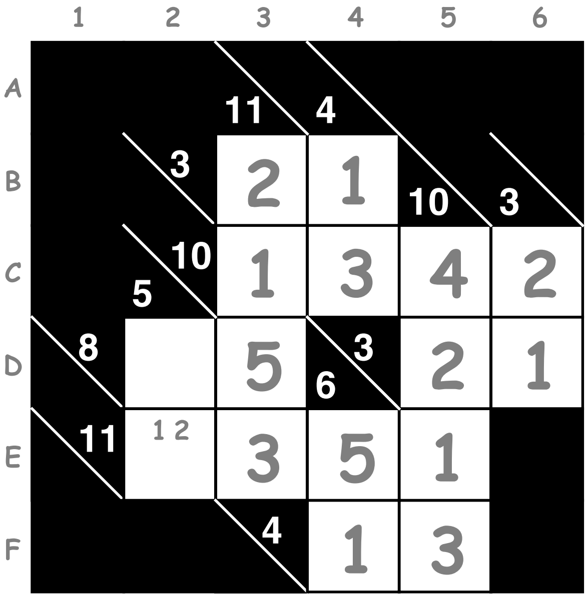

Figure 1-7: Filling in squares reduces other candidates and solves more blocks.

Now you're on the last lap. The square at E2 can only be a 2, as there is already a 1 in row E. And if E2 is a 2 then D2 must be a 3 to give a sum of 5 for that block. The 3 at D2 is proved by the 8 in two at D1, and Figure 1-8 shows you the way home.

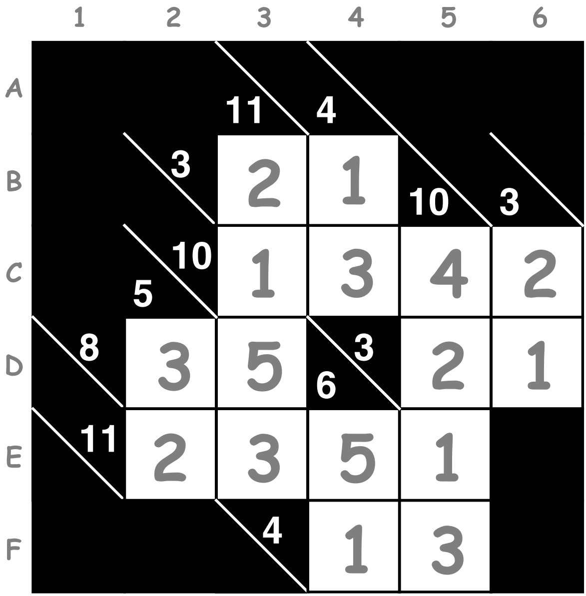

Figure 1-8: All done! Using a little skill and logic, the puzzle is solved.

Would that all kakuro were that simple, but this puzzle should serve to encourage you to make a start with confidence. Figure 1-9 shows known combinations to help you out. This chart may look daunting, but, as you practice kakuro, the numbers stick in your mind, and in no time at all you'll have no need to keep referring to it. I can almost guarantee that you've remembered the combinations for 3, 4, 10 and 11 already.

Clue	Cells	Combination
3	2	1, 2
4	2	1, 3
16	2	7, 9
17	2	8, 9
6	3	1, 2, 3
7	3	1, 2, 4
23	3	6, 8, 9
24	3	7, 8, 9
10	4	1, 2, 3, 4
11	4	1, 2, 3, 5
29	4	5, 7, 8, 9
30	4	6, 7, 8, 9
15	5	1, 2, 3, 4, 5
16	5	1, 2, 3, 4, 6
34	5	4, 6, 7, 8, 9
35	5	5, 6, 7, 8, 9
21	6	1, 2, 3, 4, 5, 6
22	6	1, 2, 3, 4, 5, 7
38	6	3, 5, 6, 7, 8, 9
39	6	4, 5, 6, 7, 8, 9
28	7	1, 2, 3, 4, 5, 6, 7
29	7	1, 2, 3, 4, 5, 6, 8
41	7	2, 4, 5, 6, 7, 8, 9
42	7	3, 4, 5, 6, 7, 8, 9
Any	8	1 to 9 (except 45 – clue)
Any	9	All of 1 to 9

Figure 1-9: Known combinations help you solve kakuro puzzles. Keep this handy!