The Math Circle at Canisius,
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			5			7		
		2			4			
	7			3				6
6			9				2	
		3				4		
	4				6			8
2				1			4	
			8			1		
		6			9			

Sudoku and its cousins

Partly based on an article
by Laura Taalman,
"Taking Sudoku Seriously"
in Math Horizons,
September 2007 issue.

1. In a Sudoku puzzle, you fill in the 9 by 9 grid so that every row, every column, and every 3 by 3 box contains the digits 1 to 9. An example is given above; can you solve it?

2. How many different completed Sudoku grids can there be?
In 2005, it was shown that there are more that 5×10^{27} of them!

			2
	1		
		4	
3			

So let's investigate something simpler.
A Shidoku puzzle is like Sudoku,
but using digits 1 through 4 in a 4 by 4 grid,
with four 4 by 4 boxes.
Here is an example; can you solve it?

3. Every completed Shidoku gird is equivalent to one with the top left block equal to
by interchanging the digits 1,2,3,4. Try it on the answer to problem 2.

1	2
3	4

4. Every completed Shidoku gird with top left block equal to

1	2
3	4

is equivalent to one with

1	2	3	4
3	4		
2			
4			

first column and row like

by swapping rows
and swapping columns.

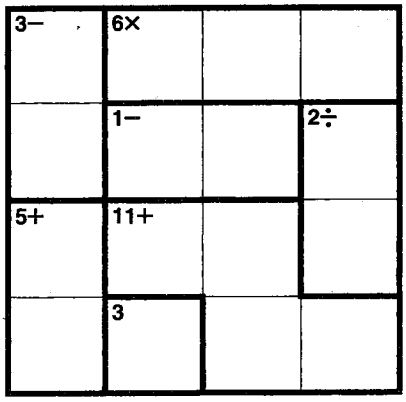
Try it on the answer to problem 3.

5. There is more than one way to complete
the partial shidoku grid shown in problem 4;
so it's not a good Shidoku puzzle.
But can you find the three ways to complete it?

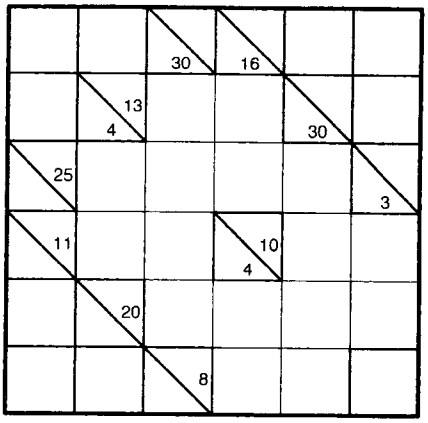
1	2	3	4
3	4		
2			
4			

1	2	3	4
3	4		
2			
4			

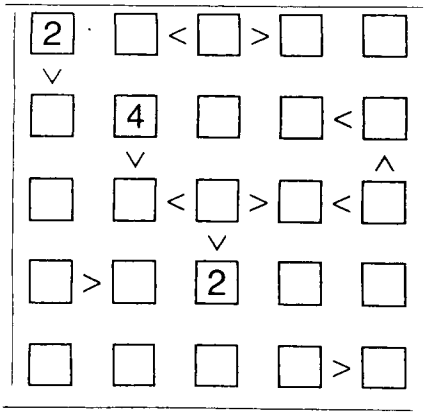
6. In KenKen4 you fill the 4 by 4 grid with digits 1 through 4
with none repeated in any row or column,
and so that the digits within each heavily outlined box
will produce the target number shown,
by using addition, subtraction, multiplication, or division,
as indicated in the box. Here is an example;
can you solve it?



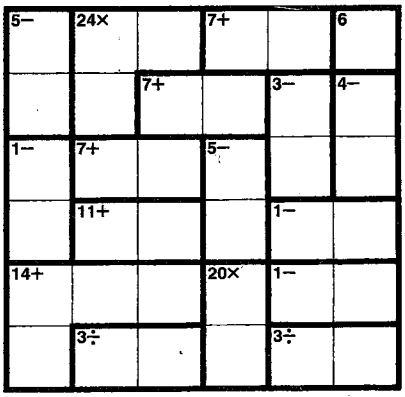
7. KenKen6 is like KenKen4,
but using digits 1 through 6
in a 6 by 6 grid.
Here is an example;
can you solve it?



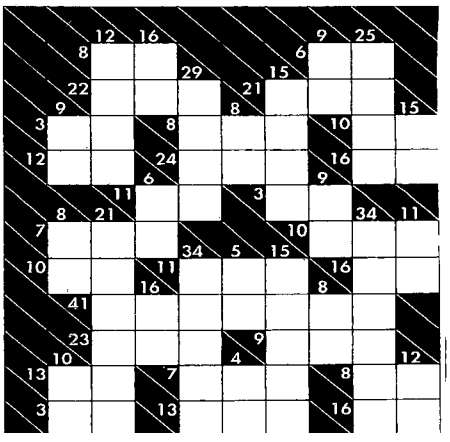
8. In Futoshiki, you fill in the grid so that
every row and column contains
the numbers 1 through 5.
The "greater than" and "less than" signs
show where a number is larger or smaller
than its neighbor.
Here is an example; can you solve it?



9. In a completed Kakuro puzzle,
each block contains a digit from 1 through 9,
with no digit repeated in a word (down or across).
The sum of the digits in a word should be
the number shown in the clue
on the left side of "across" words, and
on the top side of "down" words.
Here is a small Kakuro example; can you solve it?



10. Here is a larger Kakuro example; can you solve it?



4	3	1	2
2	1	3	4
1	2	4	3
3	4	2	1

ans. to 2