

Writing out bell ringing sequences

Bell ringing methods are written out in tables of rows.

Every bell strikes once in each row, the order of striking running from left to right. The number in a column signifies the bell striking at this position: 1 is the highest pitch, 2 the next highest and so on. If there are eight bells, the pattern '12345678' sounds like a descending major scale. Hundreds of years ago the ringers got rather bored by this, which is when change ringing started.

When ringing "methods", the bells change order. From one row to the next a bell will do one of three things:

1. Stay in the same place
2. Swap places with the bell sounding before it (strike one place earlier in the sequence)
3. Swap places with the bell sounding after it (strike one place later in the sequence)

There are two ways to move bells around:

1. The changes are called out by a conductor: this can change one pair of bells at a time
2. The ringers follow a pre-defined sequence, or "method", where there are multiple changes on each row. All the ringers need to know what they're doing!

There are patterns for sequences of changes, or "methods", and these methods have names, some of them rather arcane. There is a book which is a standard directory containing diagrams of scores of methods that you will find in every tower - it has the descriptive title "Diagrams".

Methodoku

The three rules above allow us to make a puzzle: the Methodoku.

In a methodoku we write the rows of a fragment of method ringing, but miss out a lot of bells from the sequence. The challenge is, using the three rules, to fill in the blanks.

Easy					
1	2	3	4	5	6
	1	3		4	6
2	3	1		5	
	3		1	5	6
	2		5	1	6
	2	5		6	1
	3	5		4	1
3			5	1	4
3			1	5	4
	6	1	2	4	
	1	6	2	5	
1		2		5	4
1		2		5	4

Medium					
1	2	3	4	5	6
	1			5	
		1			
	2	5	1		4
	2			1	
2	3		6	4	1
	2				1
	6			1	
	3		1		
		1			5
	1				4
1			3		5
1	2			5	

Medium					
1	2	3	4	5	6
	1			5	
	3	1		5	6
	3		1		
	2			1	
2		6			1
3					1
	2	5		1	
2			1		4
		1	5		
	1				
1	2				
1	4		6		

Hard					
1	2	3	4	5	6
	1				
		1			
2		6	1		
	2			1	
	3				1
	4		5		1
	3			1	
			1		
	2	1			
	1				
1					3
1		5	6		

Extra Hard

Extra Hard							
1	2	3	4	5	6	7	8
	1			6			
	4	1					
2			1				7
2				1			
	2		3		1		
2		3				1	6
4							1
2			5		6		1
	2		8			1	
				3	1		
	8			1			
	2		1		6		
		1				6	
	1					6	
1	4	5		8			7
1			5	8			6