

## Exercise 1

- (a) How many ways to arrange 3 bells? This is the number of 'changes' on 3 bells
- (b) Starting from 'rounds' (1 2 3), swap adjacent pairs of bells to obtain all possible changes on 3 bells and then finish with the bells in 'rounds'

1	2	3

- (c) Draw a line connecting the positions of bell 1 (the 'treble') in every row
- (d) Repeat (c) for any of the other bells
- (e) Can you find any other way of swapping the bells to achieve all changes?

1	2	3

**Exercise 2: Plain bob minimus – all the changes on 4 bells**

Complete the grid following the rules of the 'place notation' given in column 1.

- x means that pairs of adjacent bells swap
- numbers (e.g.'1' etc) mean that the bell in that position stays in the same position for the next change

	1	2	3	4
x	2	1	4	3
1x4	2	4	1	3
x	4	2	3	1
1x4	4	3	2	1
x	3	4	1	2
1x4	3	1	4	2
x	1	3	2	4
12x	1	3	4	2
x				
1x4				
x				
1x4				
x				
1x4				
x				
12x				

x				
1x4				
x				
1x4				
x				
1x4				
x				
12x				

How many times does the 'place notation' repeat?

Draw a line connecting the positions of the 'treble' (bell number 1)

Draw a line connecting the positions of bell 2

Chose another bell and draw a line connecting its positions



