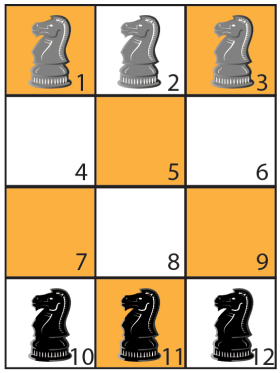
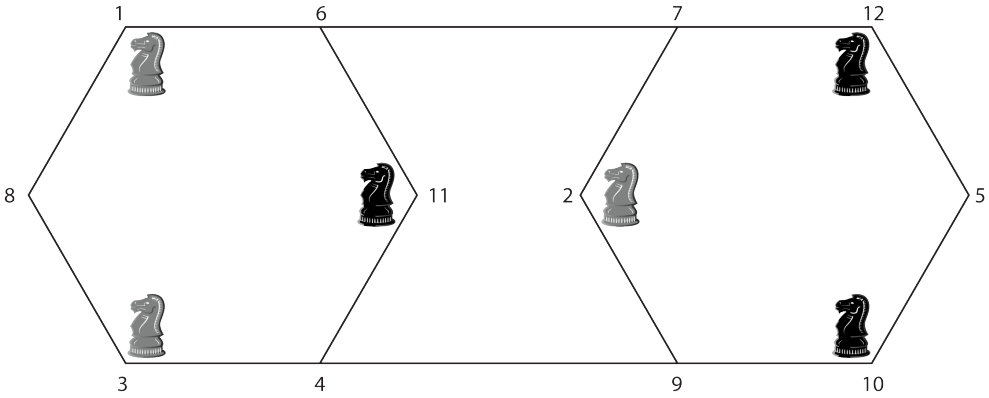
CHESS PUZZLE - WORKSHEET

A Chess Puzzle

Using legal knight moves, what is the smallest number of moves needed to exchange the positions of the three black and the three white knights?





CHESS PUZZLE - TEACHER NOTES

POINT 1:

The puzzle is isomorphic to the network shown above. The students should confirm that the moves allowed on the network mirror exactly the moves allowed on the chess board.

POINT 2:

It is possible to set this problem exactly 'as is'. However, it is also a good strategy to tell students that the problem can be solved in 16 moves.

POINT 3:

It can be useful to think of the problem with only one set of knights on the board (so there is no interference from the other coloured knights). What is the minimum number of moves that will take the black pieces to the white positions? At this stage, it is necessary to realise that a strategy like 1→12 [3 moves], 2→10 [2 moves], 3→11 [2 moves] gives a total of 7 moves.

POINT 4:

Students will realise that mirroring the above moves for the white pieces will not work. Here it can help if the students know the solution is 16 moves.

POINT 5:

The next step is to see that the single colour solution cannot be done in 8 moves. This means that the solution is asymmetric. One colour must use 7 moves with the pieces only moving towards their target nodes on the network. The other colour must do the same but with one 'there and back' diversion to allow the passage of another piece. This diversion is shown in red in the sample solution below. The black targets are as in Point 3. The white targets are: 10→3, 11→1, 12→2.

A solution:

Move no.	My Move	Move no.	My Move	Move no.	My Move	Move no.	My Move
1	1→6	6	4→11	11	12→7	16	7→12
2	6→7	7	10→9	12	2→9	17	
3	11→6	8	9→4	13	9→10	18	
4	6→1	9	4→3	14	7→2	19	
5	3→4	10	7→6	15	6→7	20	

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