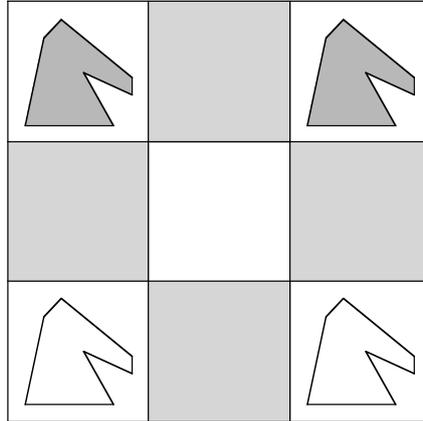


## A Topological Problem in Chess – courtesy of Henry Ernest Dudeney

*William Chen*

We consider the ancient chess problem as shown in the diagram below.



How can we make the white knights change places with the black knights in the fewest number of moves?

It turns out that a little topological insight makes this problem ridiculously easy.

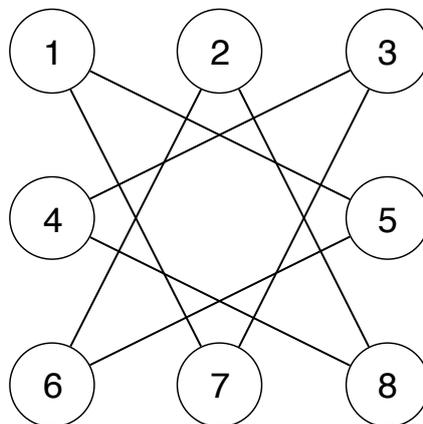
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What is topology? It is perhaps easier to answer a slightly different question. What is a topologist?

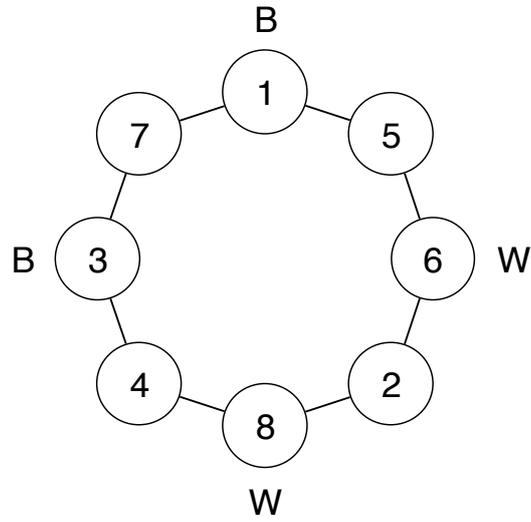
I shall not try to answer this question formally. Instead, imagine someone trying to put an object into the boot of his car. While it is blatantly obvious to everyone else that the object is far too big or of the wrong shape to fit into the boot, our topologist friend never gives up.

In topology, size, shape and volume are not discussed. The question is whether we can deform one structure into another under certain rules without affecting certain properties of the structure.

Anyone who knows the basic rules of chess will see that none of the knights can move into the middle square, so let us number the outside square from 1 to 8, and draw lines to link these to represent legitimate knight moves. We then have the picture below.



If we imagine that the eight buttons are joined by strings, then opening up the string will result in the situation shown in the picture below, with the black knights at positions 1 and 3, and the white knights at positions 6 and 8.



We now see immediately that we need to move the knights around the circle in either direction until they are exchanged. We can keep a record so that we can translate the moves back to the original square board.