

Covering Chessboards with Dominoes

by Nick Fox

Appropriate for High School

Materials: 1 chessboard and 32 dominoes per group of four.

First divide the students into groups of four, and distribute the chessboards and dominoes around the room. Have the students try and cover the chessboard evenly with the dominoes. A domino covers two adjacent squares, and cannot overlap, or go outside the chessboard. The students should be able to find a cover very easily. Once every group has finished the initial activity, have the groups compare their covers with each other. The students will find that their covers differ from each other, and they will find out there are many ways to cover the chessboard.

Next, have the students try and cover the upper left square of the board with a piece of paper, and cover the lower right square as well. Have the students then try and cover the chessboard as before. The students will find there is no way to find a perfect cover because they would have to overlap the dominoes. Have the students try and reason why this cover isn't possible. Show them that the cover doesn't exist because each domino has to cover one black square and one white square. Once you take off the two corners, which are of the same color, you are left with 62 squares, but only 30 of them are one color, and 32 the other. This is now easy to see why this board has no cover with dominoes.

The next activity, is a more general one. Have the students try and see if they can cover an $m \times n$ board with dominoes. They will have to do this part of the activity with paper and pen, and reason within their group. The student will see that as long as one side of the chessboard is an even dimension, the board will have a perfect cover.

Finally, if time permits, have the students try and reason what conditions would be necessary to cover an $m \times n$ board with and size ominoes. Such as a triomino, or pentomino, which covers 3 or 5 adjacent squares respectively. They will find out that the size of the omino has to be a divisor of at least one of the sides in order for the cover to exist.

In conclusion, this activity will allow students to work with geometrical representations and will fine-tune their group work skills.