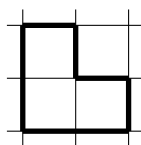


**MATH 6**  
**COLORING AND CUTTING**

HOMEWORK

1. In each square of a  $2011 \times 2011$  board there is a bug. At some moment each bug jumps into one of the adjacent squares. Explain why after that one of the squares will be empty. [Hint: how many bugs there were on black squares? on white squares?]
2. Can one color a quad ruled paper using 3 colors so that each  $1 \times 3$  rectangle contains squares of each of 3 colors?
3. Kathryn had a construction kit which has 12  $1 \times 3$  wooden tiles. Another student from our class has stolen one of the tiles and replaced it with an L-shaped one. Can Kathryn make a  $6 \times 6$  square using these tiles?



4. Can you cut an  $8 \times 8$  board into 15 horizontal and 17 vertical  $1 \times 2$  tiles?
5. You have a  $3 \times 3 \times 3$  cube with the central  $1 \times 1 \times 1$  small cube removed. Is it possible to cut it into  $1 \times 1 \times 2$  pieces?
6. A piece of cheese has the shape of a  $3 \times 3 \times 3$  cube with the central  $1 \times 1 \times 1$  small cube removed. A mouse starts eating the cheese eating one  $1 \times 1 \times 1$  cube at a time and then moving to a next one (so that the next one has a common face with the one it had just eaten). Can the mouse eat all the cheese?
7. In a computer game, a wizard is more powerful than an orc, so when a wizard fights an orc, he has 60% chance of winning. If a wizard fights one by one a group of 5 orcs, what are the chances that he will defeat them all?
8. In how many ways can one arrange 5 books on a shelf?
- \*9. In how many ways can you arrange 5 books on 2 shelves? Order on each shelf matters.