

## ASSIGNMENT 1: MISCELLANEOUS PROBLEMS

SEPTEMBER 26, 2021

### SIMPLE PROBLEMS

1. During daytime, a snail climbs 10cm up a post. During the night, it slides down 9cm. How long will it take the snail to reach the top of the pole if the height of the pole is 1m?
2. A spider sits an a corner of a cubical room. Find the shortest path for it to reach the exactly opposite corner. Is such a path unique?
3. A rectangular bar of chocolate consists of  $nm \times n$  squares. You want to break it into  $mn$  individual squares. At each step, you may pick up one piece you have and break it along any of the vertical or horizontal lines separating the squares.  
How many breaks do you need? What is the fastest way to do it?
4. How many ways are there to color the six faces of the cube in six colors, each used once? [Ways of coloring which can be obtained from each other by rotation of a cube are considered as the same coloring. ]
5. If we draw a parallelogram on a piece of graph paper, with vertices at the lattice points (i.e. where the ruled lines intersect), so that there are no other lattice points inside or on the boundary of it, what is the area of such a parallelogram? is it always the same?
6. The hour and minute hands of a clock are identical. How many times a day it happens that you **can not** tell time by this clock?
7. How many ways are there for to divide a convex  $n$ -gon into triangles by non-intersecting diagonals? [A diagonal is a segment connecting two of the vertices.]  
For a quadrilateral, the answer is 2. Can you find the answer for a pentagon? a hexagon? a general pattern?