LECTURE 3
HOMEWORK - PUZZLES

You may be asked a number of puzzles of varied difficulties during an interview process for quantitative roles, which may also involve coding. Upon occasion the interviewer may test your knowledge of both mathematics vs. coding.

1) **How would you sum up numbers from 1-100?**
   We have already encountered this question as part of your programming tasks. While indeed this possible to solve it using a `for` loop there is a much more elegant mathematical solution, called the Gauss formula.

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

   Question: **are you able to derive the formula?**
   Hint: think of a simpler case of summing numbers 1 to 10, and begin with summing pairs (1+9), (2+8), … etc

   The approach to majority of interview puzzles usually lies in examining the same question for the simplest case possible and then extending it to the given problem.

2) **You have a 10x10x10 macrocube composed of 1x1x1 microcubes. The outermost layer of cubes falls off. How many cubes are on the ground?**

   Hint 1: It is best to solve this using rigorous mathematics, rather than trying to image what happens to the cube.
   Hint 2: Think of the face that each face loses 1 layer of cubes, therefore resulting in the new cube of edge length 8.
   Hint 3: Question is about volume of a cube.

3) **You have 8 Red and 11 Blue socks in a draw. The room is dark and you cannot see the colour of your stocks. What is the minimum number of socks to guarantee at least 1 matching pair?**

   Hint 1: This is a combinatorics problem.
   Hint 2: Start from the simplest case of drawing out 2 socks, examine all possibilities and keep building up the number of drawn stocks.

4) **A bug is sitting in a corner of a cubic room (it cannot fly). What is the shortest path to the extreme opposite corner (the one furthest from him)?**

   Hint: This time it is a spatial awareness question.