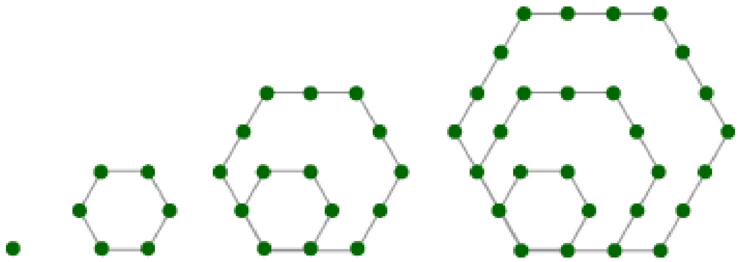
Please answer the following questions by Wednesday January 19th. Show all your work on a separate piece of paper.

1. In 1990 the diameter of the trunk of an old growth cedar tree was measured to be 49 cm. In 2002 its diameter was 55 cm. Assuming linear growth find an expression for the diameter of the tree in terms of the number of years, n since 1990. When will the tree be 100 metres wide?

2. Identify each of the following as geometric or arithmetic, write down a general formula for the nth term u_n and the nth partial sum S_n
   (a) $14 + 25 + 36 + \cdots$
   (b) $27 + 36 + 48 + \cdots$

3. Find the limit of the following infinite series
$$9 + 6 + 4 + \cdots$$

4. The following figures illustrate what are called hexagonal numbers. Find a general expression for the nth hexagonal number. Hint: Use the fact that the hexagonal numbers are the sum of an arithmetic progression.



5. The following series of figures illustrates how to construct what is called the Koch snowflake. In the second generation three triangles, each with an area 1/9th the original triangle, are added to the three sides. In the third and subsequent generations smaller triangles, which are 1/9th the area of the previous triangles are added to each edge. Find the area of each figure and hence find an expression for the limiting area as this process is carried on indefinitely. (Hint: The areas added are in a geometric progression. Find the first term and the common ratio and then evaluate the infinite sum. This is a challenging problem, so play around with it for a while. Redrawing the figures and counting the new triangles at each step will help. Give it your best shot!