1. Distinct first terms are given for 2 non-decreasing sequences of nonnegative integers. Each sequence has the property that each term beginning with the third is the sum of the previous two terms, and the seventh term of each sequence is n. What is the smallest possible value of n? Show your work.

2. (a) What is a group?
   (b) What is a natural transformation?
   (c) If H is a fixed group, show that G ----> H x G defines a functor H x - : Grp ----> Grp and
   (d) Show that each homomorphism f: H ----> G of groups defines a natural transformation H x - ----> G x -.


4. Solve the equilateral circle problem.

5. Solve the petals problem.
3. **Golden Triangles**

Find the ratio of the sides of these equilateral triangles arranged inside a circle as shown.
4. Equilateral circle

Circles of radius $r$ are arranged in a pyramid with $N$ rows and circumscribed by a large circle. The case $N=4$ is pictured. Find the area of the shaded area in terms of $r$, when there are $N$ rows.
5. Petals

Four congruent ellipses are arranged as shown. What is the radius of the circle?

Hint: First, show that if a line $y = mx + b$ is tangent to an ellipse $(x/c)^2 + (y/d)^2 = 1$, then it must satisfy $b^2 = c^2m^2 + d^2$. 