Problem 1 (Going in circles). What is the smallest radius $r$ so that 3 disks of radius $r$ can completely cover a disk of radius 1?

Problem 2 (Making a difference). Suppose $a$, $b$, $c$, and $d$ are distinct positive integers satisfying
\[
\frac{1}{a} + \frac{1}{b} + \frac{1}{c} + \frac{1}{d} < 1.
\]
Define the difference $D$ as
\[
D = 1 - \frac{1}{a} - \frac{1}{b} - \frac{1}{c} - \frac{1}{d},
\]
and write $D = r/s$ in lowest terms. If $a$, $b$, $c$, and $d$ are chosen so that $D$ is as small as possible, what is $r + s$?
Problem 3 (Descent into madness). How many equilateral triangles can be formed using the integer points which lie in the cube $[0, 4] \times [0, 4] \times [0, 4]$? Note: The integer points on the surface of the cube are also included for a total of 125 integer points.