Problem 1
Let the sequence of integers \( \{a(r,s) : s = 1, 2, \ldots, 2^{r-1}, r = 1, 2, \ldots \} \) be given by \( a(1,1) = 1 \),

\[
a(r+1,s) = a(r, \lfloor s+1/2 \rfloor) + 1 \quad \text{if } s \text{ is odd}, \quad \text{else} \quad a(r+1,s) = a(r+1,s-1) \ast a(r, s/2) + 1.
\]

Show that the sum of reciprocals

\[
1/a(r,1) + 1/a(r,2) + \ldots + 1/a(r, 2^{r-1})
\]
converges to \( \pi/4 \) as \( r \) approaches to infinity.

Problem 2
Construct 24 circles each touching exactly four others. (In space or on a plane, it doesn't matter.)

Problem 3
Construct five points forming the vertices of a regular pentagon using compass only.