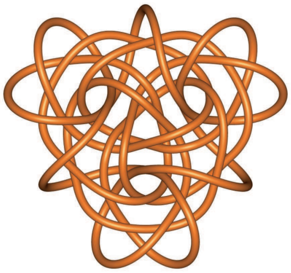
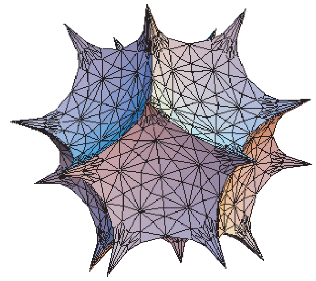
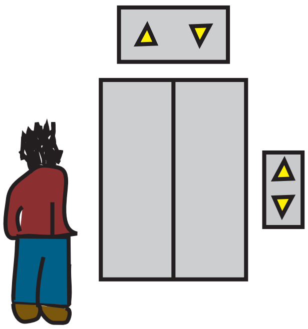


# Willamette Math Problem of the Week



## April 7 2008
## Higher Elevation



An apartment building has 7 elevators which each stop at 6 different floors, and it's possible to travel from any floor to any other floor without switching elevators. What's the maximum number of floors of the building?

Submit all solutions before the appearance of the next problem to Josh Laison in person, by e-mail (jlaison@willamette.edu), or by telegraph. The first correct solution gets a prize; all correct solutions get fame and glory. Preference for the prize goes to problem-solvers who haven't won one yet.

**Solution to *Triangle Triangle*:** Suppose the two triangles $ABC$ and $DEF$ have been inscribed in the circle. We start at an arbitrary point on the circumference of the circle, and traverse it counterclockwise, writing down the six vertices of the triangles in the order we see them. We can rule out the case when the vertices of the triangles coincide, since that happens with probability zero. The triangles do not intersect if and only if we see the three vertices $A$, $B$, and $C$ consecutively.

There are 6! possible lists we could generate in this way. For the triangles to not intersect, the set of vertices $\{A, B, C\}$ could occur in any one of 6 positions, and then the vertices $A$, $B$, and $C$ could be arranged in 3! ways and the vertices $D$, $E$, and $F$ could be arranged in 3! ways. Therefore the probability that the triangles do not intersect is

$$\frac{6 \cdot 3! \cdot 3!}{6!} = \frac{3}{10}.$$

So the probability that the triangles do intersect is $\frac{7}{10}$.

Past problems of the week, solutions, and solvers can be found at http://www.willamette.edu/~jlaison/problem.html