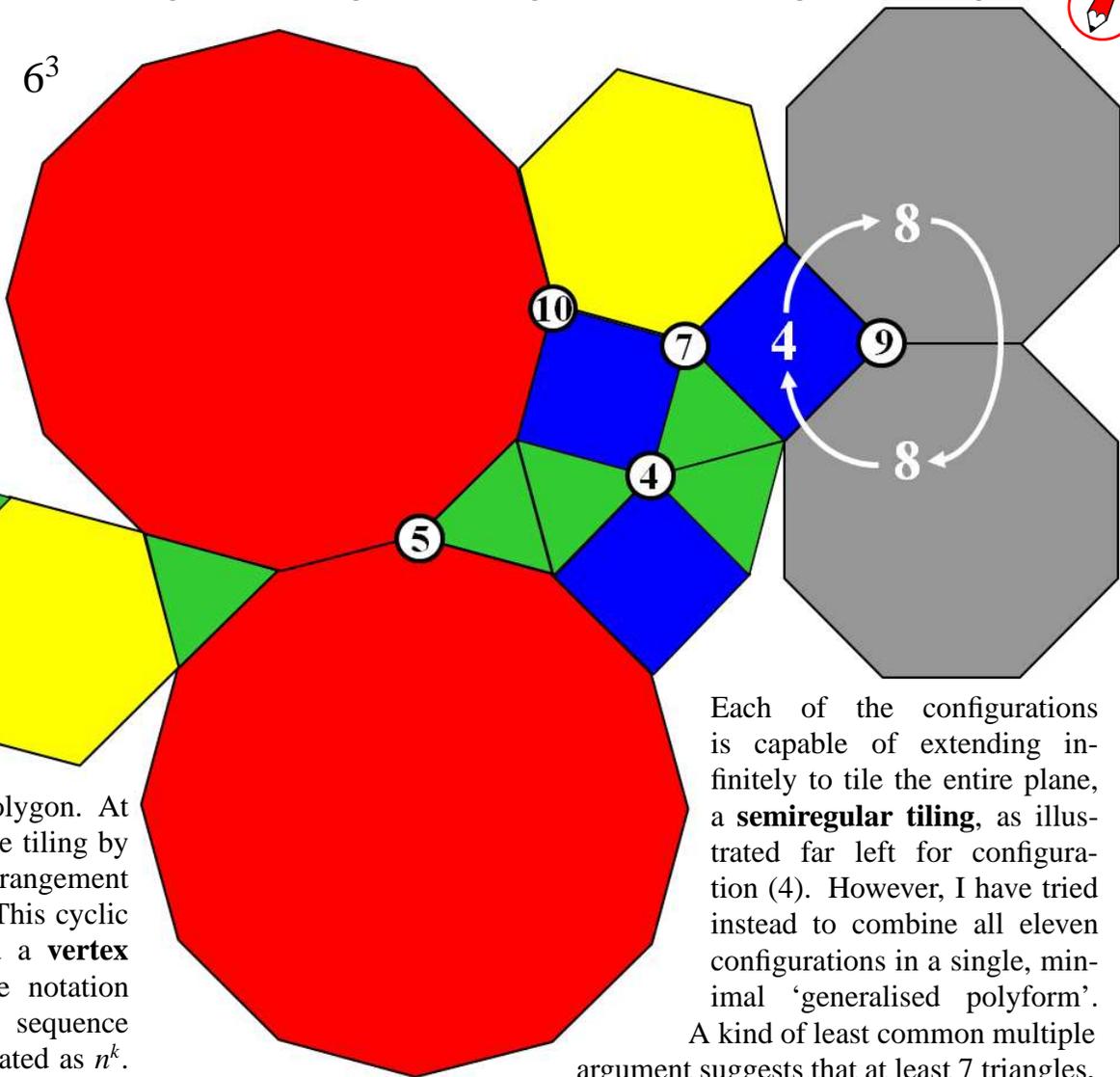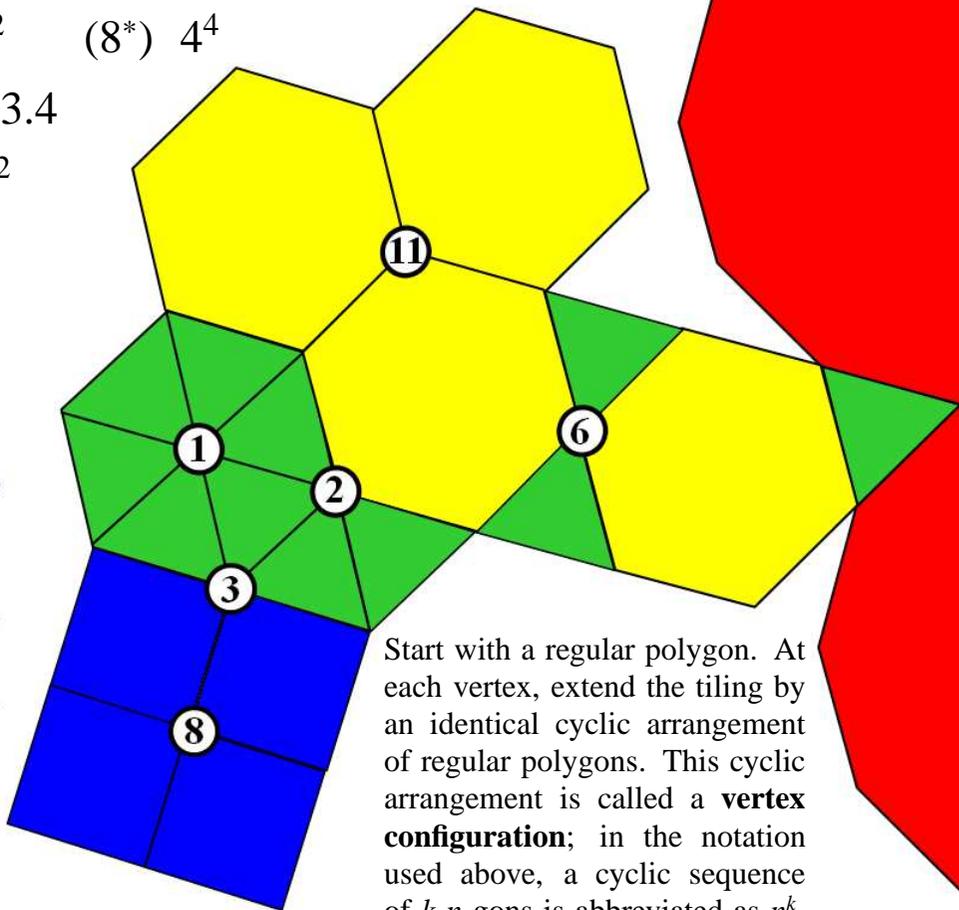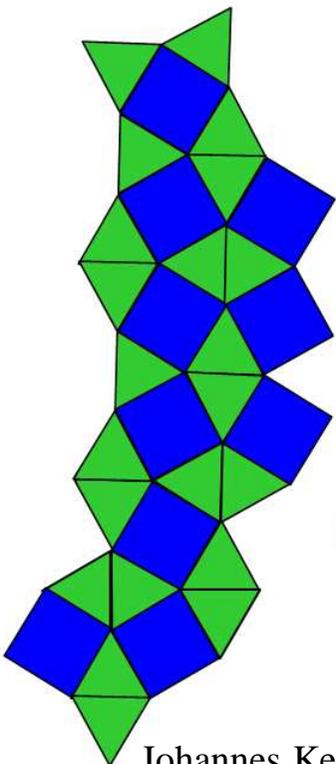# THEOREM OF THE DAY

The Classification of Semiregular Tilings *There are eight semiregular tilings and three regular tilings of the Euclidean plane, specified as follows:*

(1*) 3^6 (6)   3.6.3.6   (9) 4.8^2 (11*) 6^3

(2) $3^4.6$ (7)   3.4.6.4 (10) 4.6.12

(3) $3^3.4^2$ (8*) 4^4

(4) $3^2.4.3.4$

(5) 3.12^2

* regular

Start with a regular polygon. At each vertex, extend the tiling by an identical cyclic arrangement of regular polygons. This cyclic arrangement is called a **vertex configuration**; in the notation used above, a cyclic sequence of *k* *n*-gons is abbreviated as n^k. E.g., the configuration at vertex 9 above is 4, 8, 8 = 4.8^2.

Each of the configurations is capable of extending infinitely to tile the entire plane, a **semiregular tiling**, as illustrated far left for configuration (4). However, I have tried instead to combine all eleven configurations in a single, minimal 'generalised polyform'. A kind of least common multiple argument suggests that at least 7 triangles, 5 squares, 4 hexagons, 2 octagons and 2 dodecagons are needed, a total of 20 polygons. But I have used 31 — perhaps you can do better?

Johannes Kepler classified the regular (configurations 1, 8 and 11) and semiregular tilings (also known as *Archimedean*) in chapter 2 of his 1619 *Harmonices Mundi* (in which also appears his third law of planetary motion). This classification was rediscovered independently by Paul Robin (in 1887), Alfredo Andreini (in 1905) and Duncan Sommerville (in 1906).