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Robert W Fathauer* (tessellations@cox.net), 3913 E. Bronco Trail, Phoenix, AZ 85044.

Fractal Tilings Based on Prototiles with Angles that are Multiples of 36 Degrees.

Fractal tilings ("f-tilings") are described based on single prototiles derived from polygons having angles that are multiples of 36 degrees. These f-tilings are constructed by iterative arrangement of successively-smaller generations of tiles about a central group of largest-generation tiles. They do not cover the infinite plane, but rather are bounded and contain singular points. Within their boundaries, which are fractal curves, they contain neither gaps nor overlaps, and the f-tilings examined here are all edge-to-edge. We have previously described several families of f-tilings based on prototiles with a variety of angles. In variants of these earlier f-tilings based on prototiles with angles that are multiples of 36 degrees, the tiles generally wrap around after several generations to form local regions in which overlaps occur. This problem is circumvented by constructing prototiles that shrink sufficiently rapidly and are shaped such that they never fully wrap around no matter how many iterations are performed. Some of the resulting f-tilings possess overall 5-fold rotational symmetry and some possess overall 2-fold rotational symmetry. The rotation angles between tiles of successive generations are multiples of 36 degrees in some examples and irrational in others. (Received September 26, 2005)