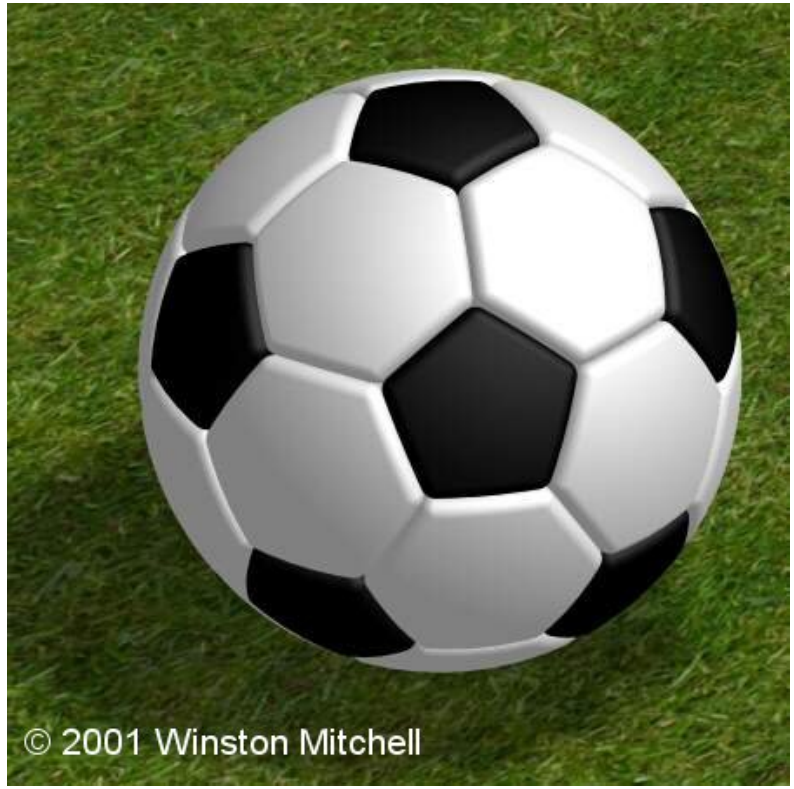
Maths190: Great Ideas Shaping Our World



Maths 190 Lecture 11

Question of the day: What is the most symmetric figure you can draw in the plane? What if you can use only straight lines?

A **regular polygon** is a shape in the plane, with the sides being straight line pieces of equal length and with all the interior angles between sides being equal.

How many regular polygons are there?

Symmetry is Strength

A variation of the question of the day: What is the most symmetric three-dimensional object? What if all the sides of the object have to be flat?

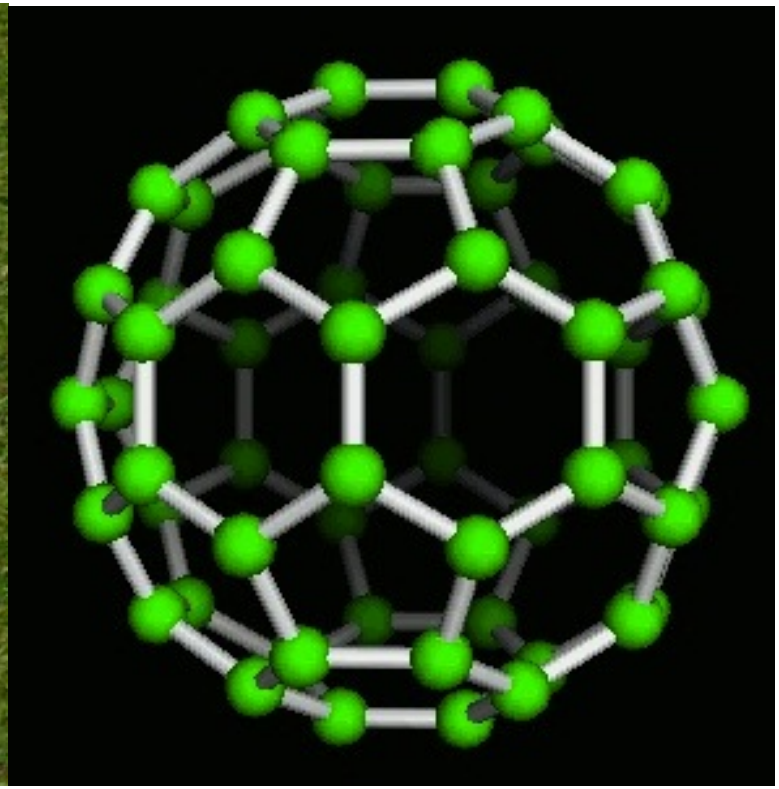
A **regular solid or polyhedra** is a three-dimensional object with all the surfaces being identical (flat) regular polygons and with the number of edges coming out of a vertex being the same for all vertices.

How many regular solids are there?

Features of the regular solids

Solid	Vertices	Edges	Faces	Number of Faces per Vertex	Number of Sides per Face
Tetrahedron					
Cube					
Octahedron					
Dodecahedron					
Icosahedron					

Truncated icosahedron: Buckyball



Important ideas from today:

- There are five regular (or Platonic) solids: the tetrahedron, cube, octahedron, dodecahedon and icosahedron.
- No other solids can be created with identical, regular polygonal faces meeting together so that the number of edges meeting at any vertex of the solid is the same.
- There are some interesting relationships between the numbers of edges, vertices and faces for the Platonic solids. For instance, $V - E + F = 2$, where V is the number of vertices, E is the number of edges, and F is the number of faces of a solid.