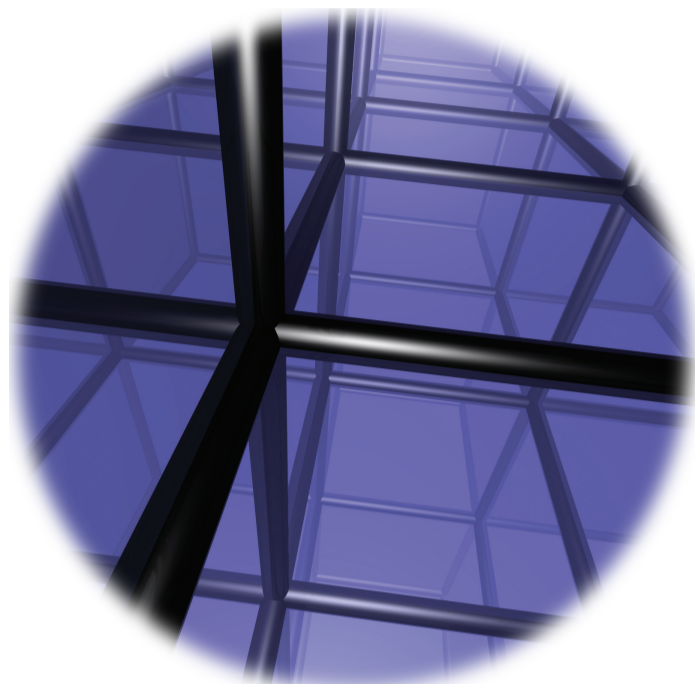




# How can 3d shapes meet?

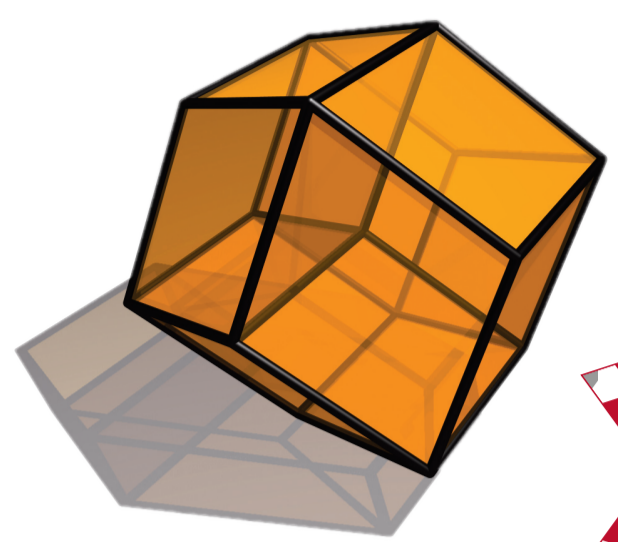
Just as we can look at 2d shapes round a point we can consider 3d shapes round an edge. Four cubes round an edge meet up. This can be extended to fill 3d space:



## Cubic Lattice

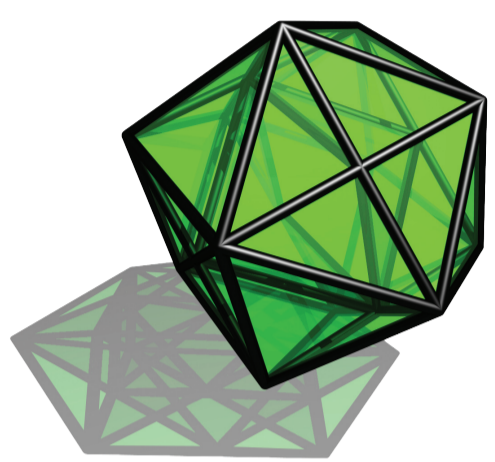
infinite cubes  
4 round each edge

Three cubes round an edge do not meet up, but we can fold again, into a fourth dimension, to give the *Tesseract*. We can't see this but we can see 3d shadows.



## Tesseract

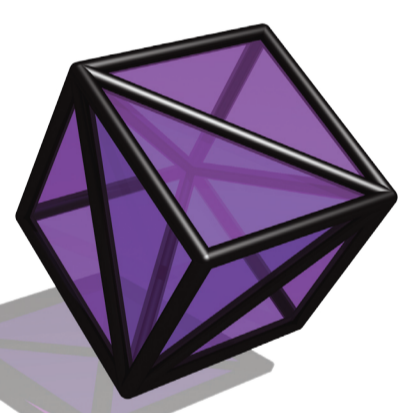
8 cubes  
3 round each edge  
(4d version of square and cube)



## 24-cell

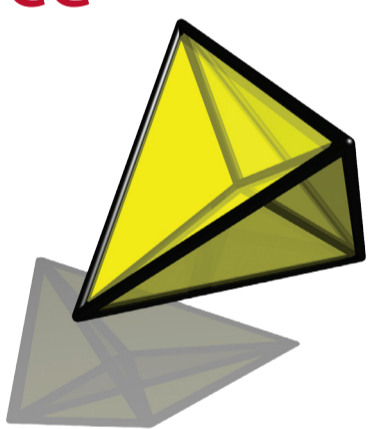
24 octahedra  
3 round each edge

Using these ideas and mathematical imagination we can find all possible regular shapes. There are six in 4d, but only three in each higher dimension, can you work out what they are?



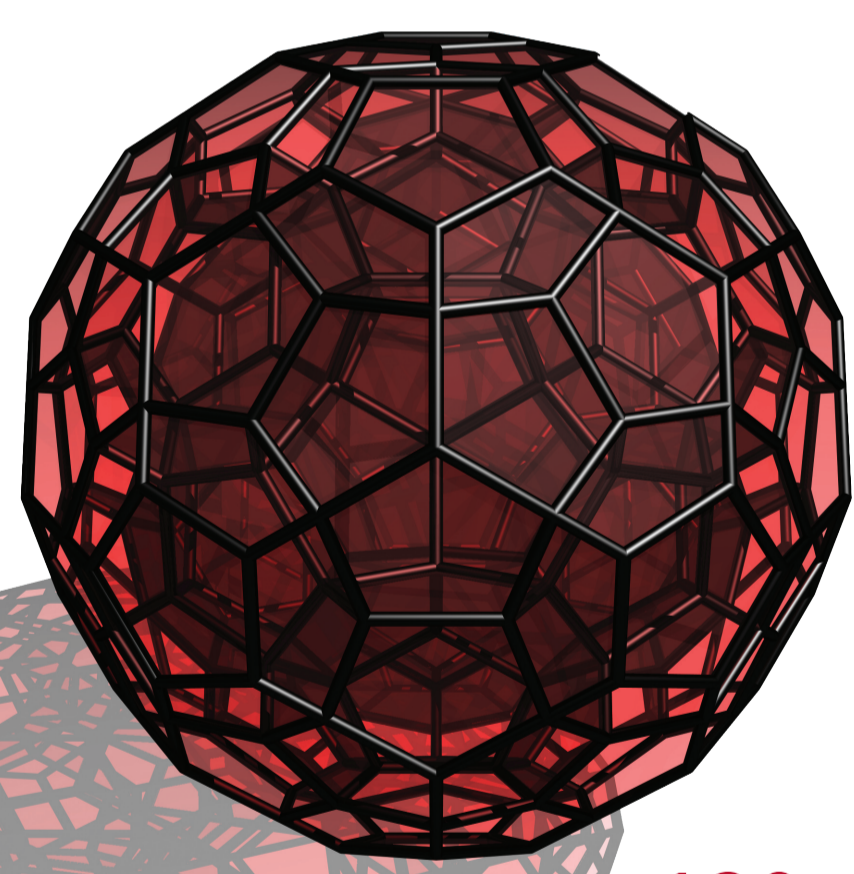
## 16-cell

16 tetrahedra  
4 round each edge  
(4d version of octahedron)



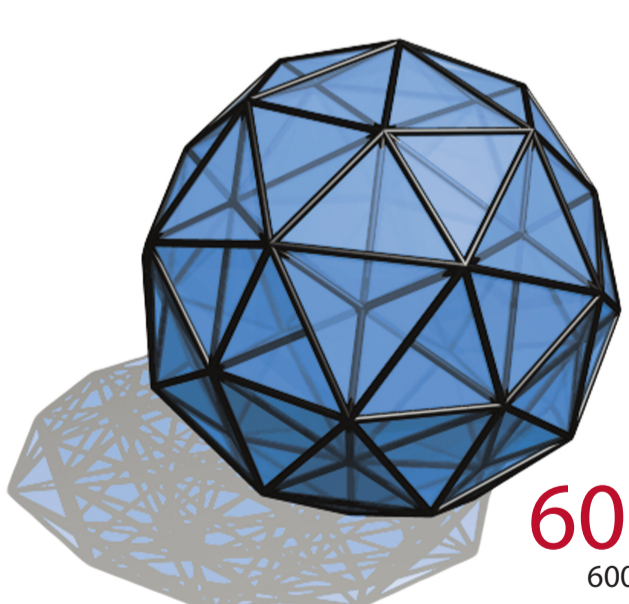
## 5-cell

5 tetrahedra  
3 round an edge  
(4d version of triangle/tetrahedron)



## 120-cell

120 dodecahedra  
3 round each edge



## 600-cell

600 tetrahedra  
5 round an edge

### Alicia Boole Stott 1860-1940

Alicia Boole Stott was a British mathematician and daughter of the mathematician George Boole. She had a phenomenal intuition for higher dimensional space, finding the six regular polytopes in 4d and proving there were no others. She was also able to make models of their three dimensional cross-sections.

