Lecture #1 Notes Summary

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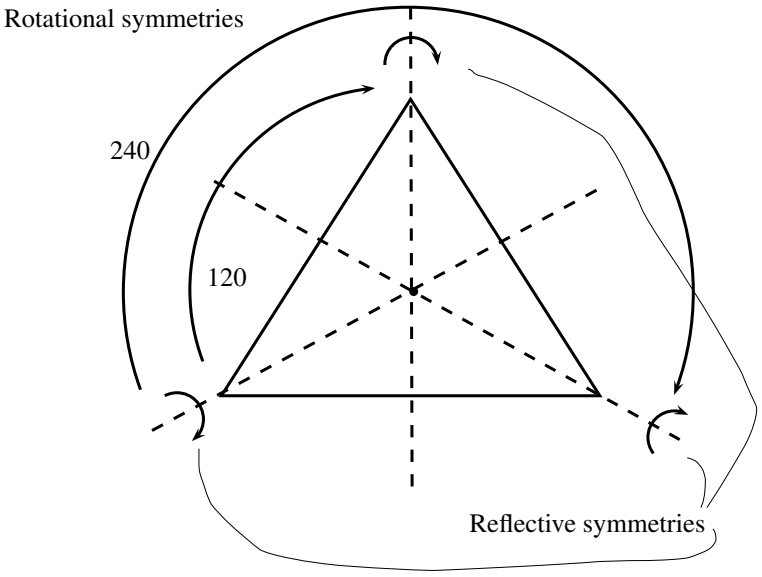
Topics Covered

Introduction I

There are three main parts to this course:

1. Geometry (extra Euclidean geometry)
   - Centres of triangles (mean, circumcentre, and so on)
   - Circles
2. Transformations in geometry
   - (Rotations, reflections, glide reflections, similarities)
3. Groups (abstract algebra)
   - e.g. Groups of symmetries:

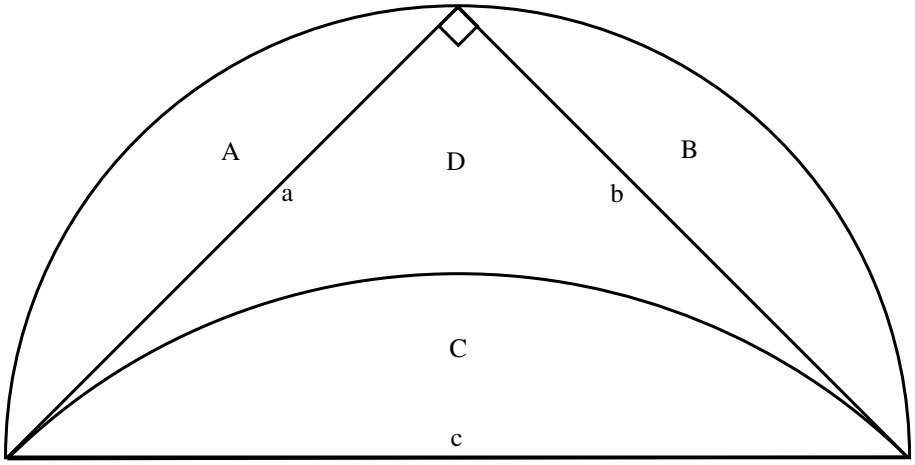
     Consider the reflective symmetries of an equilateral triangle.



   - There will also be material on freeze groups and wallpaper groups.

Historical Example: Lunes II

Please see the handout on Hippocrates Lunes (450BC). Find a square with the same area as a curved lune.



Examine areas A, B, C and D. This example will show that $C = A + B$ and hence the area of the lune $A + D + B = C + D$ which is the area of the triangle $\frac{1}{2} \times base \times height$.

Consider the Pythagorean relationship $c^2 = a^2 + b^2$.

The relationship between an area and the corresponding chord length is a quadrature i.e. $A = \lambda a^2$ where λ is the same for all three segments.