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-- 5.8 Compact Hyperbolic Surfaces -- 5.9 Discussion -- 6. Paths and Geodesics -- 6.1 Topological Classification of Surfaces -- 6.2 Geometric Classification of Surfaces -- 6.3 Paths and Homotopy -- 6.4 Lifting Paths and Lifting Homotopies -- 6.5 The Fundamental Group -- 6.6 Generators and Relations for the Fundamental Group -- 6.7 Fundamental Group and Genus -- 6.8 Closed Geodesic Paths -- 6.9 Classification of Closed Geodesic Paths -- 6.10 Discussion -- 7. Planar and Spherical Tessellations -- 7.1 Symmetric Tessellations -- 7.2 Conditions for a Polygon to Be a Fundamental Region -- 7.3 The Triangle Tessellations -- 7.4 Poincaré's Theorem for Compact Polygons -- 7.5 Discussion -- 8. Tessellations of Compact Surfaces -- 8.1 Orbifolds and Desingularizations -- 8.2 From Desingularization to Symmetric Tessellation -- 8.3 Desingularizations as (Branched) Coverings -- 8.4 Some Methods of Desingularization -- 8.5 Reduction to a Permutation Problem -- 8.6 Solution of the Permutation Problem -- 8.7 Discussion -- References.

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### Sommario/riassunto

Geometry used to be the basis of a mathematical education; today it is not even a standard undergraduate topic. Much as I deplore this situation, I welcome the opportunity to make a fresh start. Classical geometry is no longer an adequate basis for mathematics or physics—both of which are becoming increasingly geometric—and geometry can no longer be divorced from algebra, topology, and analysis. Students need a geometry of greater scope, and the fact that there is no room for geometry in the curriculum until the third or fourth year at least allows us to assume some mathematical background. What geometry should be taught? I believe that the geometry of surfaces of constant curvature is an ideal choice, for the following reasons: 1. It is basically simple and traditional. We are not forgetting euclidean geometry but extending it enough to be interesting and useful. The extensions offer the simplest possible introduction to fundamentals of modern geometry: curvature, group actions, and covering spaces. 2. The prerequisites are modest and standard. A little linear algebra (mostly  $2 \times 2$  matrices), calculus as far as hyperbolic functions, basic group theory (subgroups and cosets), and basic topology (open, closed, and compact sets).

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