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# Basic Geometry

Examples and Exercises

# Geometry 1

**Concepts, Elements, and Applications**

Christian Posthoff

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Berichte aus der Mathematik

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## Foreword

The purpose of this book is to be a teaching and practice book for the subject “Geometry”, one of the oldest and most interesting subareas of Mathematics. It has many artistic features (see Fig. 0.1) and contributes to all fields of fine arts (see Fig. 0.2), but it is also very necessary for many industrial fields, and it can contribute a lot to the (mathematical) education of students. And there is, in contrast to other parts of Mathematics, a direct visibility of many concepts.



**Figure 0.1** Decorated Parallels (Oman)

We will start at zero with the basic concepts. New concepts are introduced based on previous explanations. The reader has the choice to skip parts that he already understands, however, in order to be on the safe side, he (she) should try to solve the problems of such sections. If they are too easy he can skip the problems. If they are too difficult, then he should try to understand the solutions or go back to previous explanations.

Mathematics and Geometry in the context of these texts should not be or remain a nightmare which it is at present for many people. They should get a lot more fun out of it. They are also an integral part of a comprehensive humanistic education.

We include also the working with program systems that deal with geom-



**Figure 0.2** Graphic Ornaments

etry. Many of such programs are available, from simple drawing systems up to highly sophisticated systems for construction and civil engineering (see Fig. 0.3). We try to use only smaller systems that can be used for free via the Internet. The respective hints will be found in the text. The professional education in geometry is the last step and should be in the hands of specialists in the respective fields.



**Figure 0.3** An Artistically Designed Circular Stair

We omitted a comprehensive bibliography or list of sources since all the mathematical publications that are available in the Internet can be considered as public property. It is very useful to use the Internet for special questions, a full textbook for geometry would need many hundred pages. Therefore we restrict the size of the texts and split the field in a sequence of lectures.

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