

Contents

<i>Forward</i>	vii
<i>Preface</i>	ix
PART I INCIDENCE	1
Introduction	1
Chapter 1. Incidence and graph theory	3
1 Topological transformations	3
2 Basic graph theory	10
3 Directed graphs	22
4 Traversability	30
5 Distance	36
Chapter 2. Incidence in the plane	46
6 Maps	47
7 Planar graphs	53
8 Euler's formula	60
9 Polyhedra	64
Chapter 3. Further applications of graph theory	76
10 Bracing structures	76
11 Optimal route design	88
12 Mean distance	98
13 Triangulations and organization graphs	111
Chapter 4. Topology of surfaces	120
14 Surfaces	120
15 Maps on surfaces	131
16 Tesselations of the plane	137
17 Compact surfaces	144
PART II SYMMETRY	153
Introduction	153

Chapter 5. Symmetry and group theory	155
18 Planar isometries	155
19 Basic group theory	158
20 Reflections on the plane	168
21 The isometry group of the plane	187
Chapter 6. Symmetry in the plane	194
22 Discrete groups	194
23 The circular groups	203
24 The frieze groups	210
25 The wallpaper groups	219
Chapter 7. Symmetry in space	241
26 Space isometries	241
27 Discrete space groups	246
28 The layer groups	250
29 The rod groups	259
Chapter 8. Symmetry and enumeration	266
30 A combinatorial approach to symmetry	266
31 Graph symmetry	274
32 Enumeration	281
33 Fundamental architectural arrangements revisited	292
<i>Bibliography</i>	300
<i>Index of symbols</i>	302
<i>Index</i>	303