CAMBRIDGE
Cambridge University Press & Assessment
978-1-108-42906-1 — Symmetry in Graphs
Ted Dobson , Aleksander Malnič , Dragan Marušič
Table of Contents
More Information

Contents

	Preface		*page* ix
1	**Introduction and Constructions**		**1**
	1.1	Basic Definitions	4
	1.2	Cayley Digraphs	11
	1.3	Double Coset Digraphs	19
	1.4	Orbital Digraphs	26
	1.5	Metacirculant Digraphs	31
	1.6	Exercises	38
2	**The Petersen Graph, Blocks, and Actions of A_5**		**45**
	2.1	The Automorphism Group of the Petersen Graph	46
	2.2	Blocks and Imprimitive Groups	48
	2.3	More Ways of Finding Blocks	54
	2.4	Primitive and Quasiprimitive Groups	59
	2.5	Actions of A_5	66
	2.6	Orbital Digraphs of A_5	74
	2.7	Exercises	82
3	**Some Motivating Problems**		**87**
	3.1	Cubic s-Arc-transitive Graphs	88
	3.2	Arc-, Edge-, and Half-arc-transitive Graphs	92
	3.3	Introduction to the Hamiltonicity Problem	102
	3.4	Vertex-transitive Graphs That Are Not Hamiltonian	103
	3.5	Connected Cayley Graphs of Abelian Groups Are Hamiltonian	110
	3.6	Block Quotient Digraphs	112
	3.7	The Spiral Path Argument and Frucht Notation	119
	3.8	Semiregular Elements	123
	3.9	Exercises	128

© in this web service Cambridge University Press & Assessment www.cambridge.org

CAMBRIDGE
Cambridge University Press & Assessment
978-1-108-42906-1 — Symmetry in Graphs
Ted Dobson , Aleksander Malnič , Dragan Marušič
Table of Contents
More Information

4 Graphs with Imprimitive Automorphism Group 132
4.1 Permutation Isomorphism and Equivalent Representations 133
4.2 Wreath Products of Digraphs and Groups 141
4.3 The Embedding Theorem 149
4.4 Groups of Prime Degree and Digraphs of Prime Order 152
4.5 The Automorphism Group of the Heawood Graph 158
4.6 Exercises 163

5 The End of the Beginning 167
5.1 The Automorphism Group of Wreath Product Graphs 168
5.2 2-Closed Permutation Groups 173
5.3 Generalized Wreath Products 179
5.4 Primitive Groups and the O'Nan–Scott Theorem 188
5.5 Covers 197
5.6 Exercises 208

6 Other Classes of Graphs 214
6.1 The Coxeter Graph 214
6.2 Kneser Graphs and Odd Graphs 223
6.3 The Johnson Graphs 225
6.4 Levi Graphs 237
6.5 The Generalized Petersen Graphs 248
6.6 Fermat Graphs 262
6.7 Exercises 268

7 The Cayley Isomorphism Problem 272
7.1 Graph Isomorphims in Quasipolynomial Time 273
7.2 Introduction and Basic Definitions 274
7.3 Basic Tools 277
7.4 Non-CI-groups With Respect to Graphs 283
7.5 Groups of Order a Product of Two Primes 286
7.6 Pálfy's Theorem 296
7.7 Isomorphisms of Circulant Digraphs 303
7.8 Exercises 317

8 Automorphism Groups of Vertex-Transitive Graphs 322
8.1 Normal Cayley Digraphs 322
8.2 The Transfer 328
8.3 More Tools and Automorphism Groups of Circulants of Order p^2 333
8.4 Automorphism Groups of Cayley Digraphs of $\mathbb{Z}_p^2$ 341
8.5 Automorphism Groups of Circulant Digraphs 346
8.6 Exercises 353

© in this web service Cambridge University Press & Assessment www.cambridge.org

CAMBRIDGE
Cambridge University Press & Assessment
978-1-108-42906-1 — Symmetry in Graphs
Ted Dobson , Aleksander Malnič , Dragan Marušič
Table of Contents
More Information

9 Classifying Vertex-Transitive Graphs 357
9.1 Digraphs of Prime Power Order 357
9.2 Graphs of Order a Product of Two Distinct Primes 365
9.3 Circulant Digraphs of Order n with $\gcd(n, \varphi(n)) = 1$ 372
9.4 Exercises 376

10 Symmetric Graphs 378
10.1 The 17 Families of Cubic Symmetric Graphs 379
10.2 Cubic Symmetric Graphs of Small Girth 381
10.3 Rigid Cells 385
10.4 Valency Preserving Quotienting 391
10.5 Symmetric Graphs of Larger Valencies 395
10.6 Exercises 399

11 Hamiltonicity 401
11.1 Historic Perspectives 401
11.2 The Lifting Cycle Technique 406
11.3 Vertex-Transitive Graphs of Particular Orders 415
11.4 Specific Approaches for Cayley Graphs 421
11.5 Embeddings on Surfaces 425
11.6 A Final Observation 435
11.7 Exercises 435

12 Semiregularity 437
12.1 Historic Perspectives 437
12.2 Orders of (Di)graphs 443
12.3 Valency of Graphs 444
12.4 Types of Group Actions 448
12.5 Further Directions 449
12.6 Exercises 450

13 Graphs with Other Types of Symmetry: Half-arc-transitive Graphs and Semisymmetric Graphs 451
13.1 Historic Perspectives 451
13.2 Half-arc-transitive Graphs: A Geometric Approach 453
13.3 Quartic Half-arc-transitive Graphs 458
13.4 Semisymmetric Graphs 462
13.5 Exercises 465

© in this web service Cambridge University Press & Assessment www.cambridge.org

CAMBRIDGE
Cambridge University Press & Assessment
978-1-108-42906-1 — Symmetry in Graphs
Ted Dobson , Aleksander Malnič , Dragan Marušič
Table of Contents
More Information

14 Fare You Well **468**
14.1 Algebraic Graph Theory: Towards CFSG-Free Arguments 468
14.2 Even/Odd Automorphisms Problem 472

References 474
Index of Graphs 497
Index of Symbols 500
Select Author Index 503
Index of Terms 506

© in this web service Cambridge University Press & Assessment www.cambridge.org