## CONTENTS

Preface xi
Standard Symbols xiii

### CHAPTER 1. PROJECTIVE PLANES AND AFFINE PLANES 1

- Projective Planes 1
- Affine Planes 6
- Subplanes of a Plane 9
- Exercises 12

### CHAPTER 2. COORDINATIZATION OF A PROJECTIVE PLANE: TERNARY RINGS 13

- Coordinatization of Projective Planes 13
- Coordinatization of Affine Planes 18
- Quasifields 18
- Duality and Coordinates 22
- Exercises 22

### CHAPTER 3. PERMUTATION GROUPS 24

- Burnside's Theorems 27
- Transitivity 29
- Primitivity 31
- Frobenius Groups 35
- Exercises 36

### CHAPTER 4. COLLINEATIONS AND PERSPECTIVITIES 37

- Collineations of Planes 37
- Collineations as Permutations 40
- Perspectivities 44
Involutory Collineations 47
Perspectivities in Collineation Groups 50
Exercises 51

CHAPTER 5. PERSPECTIVITIES AND TERNARY RINGS 53
(P, ℓ)−Transitivity 53
(P, ℓ)−Transitivity and Coordinatization 56
Desargues Configuration 63
Exercises 66

CHAPTER 6. TRANSLATION PLANES AND DUAL TRANSLATION PLANES 69
Translation Planes 69
Dual Translation Planes 75
The Bruck–Bose Representation 78
Exercises 78

CHAPTER 7. DERIVABILITY 79
The Theory of Derivation 79
Derivability and Dual Translation Planes 83
Some Informative Remarks 87

CHAPTER 8. THREE SPECIAL EXAMPLES 88
Exercises 97

CHAPTER 9. HISTORICAL INTERLUDE 98
Historical Outline 99

CHAPTER 10. ANDRÉ’S THEOREM 102

CHAPTER 11. FINITE AFFINE LINE TRANSITIVE COLLINEATION GROUPS 105
Exercises 111

CHAPTER 12. BLOCK ORBITS 112
Three Useful Lemmas 112
Block Orbits 113
Strong Block Orbits 117
Exercises 119

CHAPTER 13. BLOCK ORBITS AND TRANSLATION PLANES 120
Exercises 124

CHAPTER 14. RANK (r, s) COLLINEATION GROUPS 125

CHAPTER 15. COLLINEATION GROUPS PRIMITIVE ON AFFINE POINTS 135
CHAPTER 16. ADDITIONAL COMMENTS 140
Transitivity on Affine Quadrangles 140
Unsolved Questions 143
Transitive Projective Planes 146

Bibliography 149
Index 153