CONTENTS

Preface ix

Acknowledgments xiii

1 Mathematical and Biological Introduction 1

1.1 Interpreting Population-Genetic Statistics 1

1.2 A Note about Assumed Background 3

1.3 Definitions 3

1.4 Standard Inequalities 7

1.5 Genetic Diversity and Genetic Homogeneity 8

1.6 Genetic Differentiation and Genetic Similarity 13

1.7 Do Statistics "Depend" on Allele Frequencies? 18

1.8 Exercises 19

2 Homozygosity and the Most Frequent Allele 21

2.1 Arbitrarily Many Distinct Alleles 22

2.2 A Fixed Value I for the Number of Distinct Alleles 33

2.3 Example from Human Populations 40

2.4 Implications 43

2.5 Exercises 46

3 Variations on Homozygosity: J_A, J_B, and J_C 48

3.1 Bounds on J_C/J_B in Terms of J_A 51

3.2 Example from Drosophila 58

3.3 Implications 60

3.4 Exercises 61

4 The *i*th Most Frequent Allele 62

4.1 Lower Bound on J in Terms of p_i 63

4.2 Upper Bound on J in Terms of p_i 66

4.3 Lower and Upper Bounds on p_i in Terms of J 75

	4.4 Example from Human Populations	85
	4.5 Implications	86
	4.6 Exercises	90
5	α-homozygosity	92
	5.1 Convexity Inequalities	93
	5.2 Arbitrarily Many Distinct Alleles	94
	5.3 A Fixed Value I for the Number of Distinct Alleles	99
	5.4 Example from Human Populations	103
	5.5 Implications	105
	5.6 Exercises	106
6	Estimated Homozygosity	108
	6.1 Samples	109
	6.2 Number of Distinct Alleles Constrained by Sample Size	111
	6.3 A Fixed Value I for the Number of Distinct Alleles	117
	6.4 Example from Human Populations	119
	6.5 Implications	120
	6.6 Exercises	122
7	Conclusions	124
	7.1 Summary of Mathematical Results	124
	7.2 Summary of Mathematical Methods	126
	7.3 Benefits of the Mathematical Bounds Approach	128
	7.4 The Continuing Importance of Summary Statistics	137
	7.5 Strategies for Improved Use of Summary Statistics	138
Notation		141
Solutions to Exercises		145
Bibliography		155
Author Index		163
Subject Index		167