

## Contents

Chapter 1.	Introduction	1
Chapter 2.	Almost quasisimple groups containing elements with simple spectra	5
Chapter 3.	Preliminary results on condition (S+)	9
Chapter 4.	$G_{\text{geom}}$ and $G_{\text{arith}}$	13
Chapter 5.	Structure of $G_{\text{geom}}$	15
Chapter 6.	Rationality, moments, and reduction mod $\ell$ of hypergeometric sheaves	25
Chapter 7.	Descents of hypergeometric sheaves	37
Chapter 8.	The notational scheme for descents	49
Chapter 9.	Proving finiteness of $G_{\text{geom}}$	51
Chapter 10.	The alternating group $A_6$	57
Chapter 11.	The alternating group $A_7$	63
Chapter 12.	The Mathieu group $M_{11}$	71
Chapter 13.	The Mathieu group $M_{22}$	73
Chapter 14.	The Mathieu group $M_{23}$	77
Chapter 15.	The Mathieu group $M_{24}$	79
Chapter 16.	The MacLaughlin group $\text{McL}$	81
Chapter 17.	The Janko group $J_2$	87
Chapter 18.	The Janko group $J_3$	91
Chapter 19.	The Rudvalis group $\text{Ru}$	97
Chapter 20.	The special linear group $\text{PSL}_3(4)$	103
Chapter 21.	The special unitary group $\text{PSU}_4(3)$	113
Chapter 22.	The symplectic group $\text{Sp}_6(2)$	119

Chapter 23.	The orthogonal group $\Omega_8^+(2)$	123
Chapter 24.	The exceptional group $G_2(3)$	127
Chapter 25.	The exceptional group $G_2(4)$ and its subgroup $SU_3(4)$	131
Chapter 26.	The “exceptional” group $SU_3(3) \cdot 2 \cong G_2(2)$	139
Chapter 27.	The Suzuki group ${}^2B_2(8)$	143
Chapter 28.	The “exceptional” group $SL_2(8) \cdot 3 \cong {}^2G_2(3)$	147
Chapter 29.	The Conway group $Co_1$ and the Suzuki group $Suz$	151
Chapter 30.	Complex reflection groups	153
Chapter 31.	Further local systems for $Sp_6(2)$ , $SU_3(3)$ , ${}^2G_2(3)$ , and $2A_7$	165
Chapter 32.	Further multi-parameter local systems	175
Bibliography		183