BLT-sets of Q(4, 23)

Anton Betten

April 26, 2015

Contents

Chapter 1

Summary

There are 3 BLT-sets.

Chapter 2

Invariants

Chapter 3

The BLT-Sets

3.1 Isomorphism Type 0

Stabilizer has order 582912
Plane intersection type is 24
Plane invariant is

$$\begin{bmatrix} 24 \end{bmatrix}$$

$\rightarrow$	1_1
24_0	1

$\downarrow$	1_1
24_0	24

$C_0 = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23\}_{24}$
$C_1 = \{0\}_1$

$\rightarrow$	1_1
24_0	1

$\downarrow$	1_1
24_0	24

$C_0 = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23\}_{24}$
$C_1 = \{0\}_1$
Column cell 1:
Order of the group that is induced on the object is 12144
Number of ancestors on 5-sets is 6.
Number of orbits on 5-sets is 6.
With 1 orbits on the object
Orbit lengths: 24
The points by ranks:

i	Rank	i	Rank	i	Rank	i	Rank
0	0	6	191	12	197	18	194
1	1	7	185	13	186	19	200
2	180	8	198	14	192	20	183
3	181	9	188	15	187	21	201
4	182	10	195	16	193	22	184
5	189	11	190	17	199	23	196

The points:

$$P_0 = (0, 1, 0, 0, 0)P_1 = (0, 0, 1, 0, 0)P_2 = (0, 1, 9, 22, 9)P_3 = (0, 1, 8, 11, 16)$$
$$P_4 = (0, 1, 1, 15, 3)P_5 = (0, 1, 4, 16, 17)P_6 = (0, 1, 13, 21, 18)P_7 = (0, 1, 6, 19, 13)$$
$$P_8 = (0, 1, 2, 6, 15)P_9 = (0, 1, 18, 5, 1)P_{10} = (0, 1, 3, 10, 2)P_{11} = (0, 1, 13, 2, 5)$$
$$P_{12} = (0, 1, 16, 14, 12)P_{13} = (0, 1, 3, 13, 21)P_{14} = (0, 1, 4, 7, 6)P_{15} = (0, 1, 12, 20, 4)$$
$$P_{16} = (0, 1, 18, 18, 22)P_{17} = (0, 1, 1, 8, 20)P_{18} = (0, 1, 12, 3, 19)P_{19} = (0, 1, 8, 12, 7)$$
$$P_{20} = (0, 1, 2, 17, 8)P_{21} = (0, 1, 9, 1, 14)P_{22} = (0, 1, 16, 9, 11)P_{23} = (0, 1, 6, 4, 10)$$

Stabilizer of order 582912 is generated by:

$$g_1 = \begin{bmatrix} 7 & 0 & 0 & 0 & 0 \\ 0 & 16 & 0 & 0 & 0 \\ 0 & 0 & 16 & 0 & 0 \\ 0 & 0 & 0 & 16 & 0 \\ 0 & 0 & 0 & 0 & 16 \end{bmatrix}$$

with 576 fixed points

$$g_2 = \begin{bmatrix} 12 & 0 & 0 & 0 & 0 \\ 0 & 6 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 11 & 0 \\ 0 & 0 & 0 & 0 & 11 \end{bmatrix}$$

with 4 fixed points

$$g_3 = \begin{bmatrix} 10 & 0 & 0 & 16 & 6 \\ 0 & 14 & 0 & 0 & 0 \\ 0 & 0 & 14 & 0 & 0 \\ 3 & 0 & 0 & 2 & 7 \\ 8 & 0 & 0 & 14 & 2 \end{bmatrix}$$

with 530 fixed points

$$g_4 = \begin{bmatrix} 11 & 0 & 0 & 19 & 10 \\ 0 & 14 & 0 & 0 & 0 \\ 0 & 0 & 14 & 0 & 0 \\ 5 & 0 & 0 & 13 & 14 \\ 21 & 0 & 0 & 5 & 13 \end{bmatrix}$$

with 530 fixed points

$$g_5 = \begin{bmatrix} 19 & 0 & 0 & 17 & 15 \\ 0 & 8 & 0 & 0 & 0 \\ 0 & 8 & 8 & 5 & 1 \\ 4 & 1 & 0 & 17 & 18 \\ 3 & 5 & 0 & 13 & 17 \end{bmatrix}$$

with 2 fixed points

$$g_6 = \begin{bmatrix} 9 & 0 & 0 & 8 & 3 \\ 0 & 3 & 0 & 0 & 0 \\ 0 & 9 & 12 & 14 & 12 \\ 13 & 6 & 0 & 4 & 21 \\ 4 & 7 & 0 & 19 & 4 \end{bmatrix}$$

with 2 fixed points

$$g_7 = \begin{bmatrix} 13 & 0 & 0 & 12 & 16 \\ 0 & 19 & 10 & 4 & 10 \\ 0 & 11 & 19 & 6 & 15 \\ 15 & 15 & 10 & 1 & 16 \\ 17 & 6 & 4 & 9 & 1 \end{bmatrix}$$

with 0 fixed points

3.2 Isomorphism Type 1

Stabilizer has order 1152
Plane intersection type is $12^2\ 4^{36}\ 3^{1440}$
Plane invariant is

$$\begin{bmatrix} 12 & 0 \\ 0 & 12 \end{bmatrix}$$

$\rightarrow$	2_1
24_0	1

$\downarrow$	2_1
24_0	12

$C_0 = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23\}_{24}$
$C_1 = \{0, 1\}_2$

$\rightarrow$	2_1	36_2
24_0	1	6

$\downarrow$	2_1	36_2
24_0	12	4

$C_0 = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23\}_{24}$
$C_1 = \{0, 37\}_2$
$C_2 = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36\}_{36}$
Column cell 1:
Column cell 2:
Order of the group that is induced on the object is 1152

Number of ancestors on 5-sets is 140.
Number of orbits on 5-sets is 139.
With 1 orbits on the object
Orbit lengths: 24
The points by ranks:

i	Rank	i	Rank	i	Rank	i	Rank
0	0	6	191	12	4884	18	11604
1	1	7	185	13	3597	19	5359
2	180	8	198	14	5948	20	9268
3	181	9	188	15	8361	21	10119
4	182	10	195	16	6286	22	6376
5	189	11	190	17	5607	23	6717

The points:

$$P_0 = (0,1,0,0,0)P_1 = (0,0,1,0,0)P_2 = (0,1,9,22,9)P_3 = (0,1,8,11,16)$$

$$P_4 = (0,1,1,15,3)P_5 = (0,1,4,16,17)P_6 = (0,1,13,21,18)P_7 = (0,1,6,19,13)$$

$$P_8 = (0,1,2,6,15)P_9 = (0,1,18,5,1)P_{10} = (0,1,3,10,2)P_{11} = (0,1,13,2,5)$$

$$P_{12} = (1,19,17,11,4)P_{13} = (1,2,3,2,8)P_{14} = (1,17,14,20,3)P_{15} = (1,10,15,15,16)$$

$$P_{16} = (1,3,16,19,18)P_{17} = (1,1,13,17,10)P_{18} = (1,22,10,19,15)P_{19} = (1,20,7,2,10)$$

$$P_{20} = (1,13,8,12,20)P_{21} = (1,6,9,8,19)P_{22} = (1,21,20,6,18)P_{23} = (1,4,6,3,7)$$

Stabilizer of order 1152 is generated by:

$$g_1 = \begin{bmatrix} 20 & 0 & 0 & 14 & 11 \\ 0 & 5 & 0 & 0 & 0 \\ 0 & 0 & 5 & 0 & 0 \\ 17 & 0 & 0 & 4 & 14 \\ 7 & 0 & 0 & 5 & 4 \end{bmatrix}$$

with 530 fixed points

$$g_2 = \begin{bmatrix} 14 & 0 & 0 & 2 & 18 \\ 0 & 18 & 0 & 0 & 0 \\ 0 & 0 & 18 & 0 & 0 \\ 14 & 0 & 0 & 16 & 5 \\ 22 & 0 & 0 & 10 & 16 \end{bmatrix}$$

with 24 fixed points

$$g_3 = \begin{bmatrix} 22 & 0 & 0 & 3 & 4 \\ 0 & 17 & 0 & 0 & 0 \\ 0 & 0 & 17 & 0 & 0 \\ 2 & 0 & 0 & 9 & 20 \\ 13 & 0 & 0 & 17 & 9 \end{bmatrix}$$

with 530 fixed points

$$g_4 = \begin{bmatrix} 21 & 0 & 0 & 7 & 17 \\ 0 & 10 & 0 & 0 & 0 \\ 0 & 22 & 10 & 2 & 5 \\ 20 & 5 & 0 & 19 & 8 \\ 15 & 2 & 0 & 16 & 19 \end{bmatrix}$$

with 24 fixed points

$$g_5 = \begin{bmatrix} 21 & 0 & 0 & 7 & 17 \\ 0 & 10 & 15 & 3 & 19 \\ 0 & 0 & 10 & 0 & 0 \\ 20 & 0 & 19 & 19 & 8 \\ 15 & 0 & 3 & 16 & 19 \end{bmatrix}$$

with 24 fixed points

$$g_6 = \begin{bmatrix} 13 & 0 & 0 & 0 & 0 \\ 0 & 21 & 5 & 2 & 5 \\ 0 & 15 & 21 & 9 & 11 \\ 0 & 11 & 5 & 2 & 7 \\ 0 & 9 & 2 & 14 & 2 \end{bmatrix}$$

with 26 fixed points

$$g_7 = \begin{bmatrix} 5 & 0 & 0 & 9 & 12 \\ 0 & 22 & 15 & 12 & 7 \\ 0 & 14 & 22 & 1 & 14 \\ 17 & 14 & 7 & 11 & 15 \\ 7 & 1 & 12 & 7 & 11 \end{bmatrix}$$

with 2 fixed points

$$g_8 = \begin{bmatrix} 0 & 13 & 11 & 13 & 21 \\ 12 & 11 & 5 & 21 & 19 \\ 2 & 15 & 11 & 22 & 8 \\ 19 & 19 & 21 & 9 & 5 \\ 3 & 13 & 11 & 20 & 20 \end{bmatrix}$$

with 2 fixed points

3.3 Isomorphism Type 2

Stabilizer has order 1152
Plane intersection type is $6^{16}\ 4^{234}\ 3^{768}$
Plane invariant is too big (16 planes)

$\rightarrow$	16_1
24_0	4

$\downarrow$	16_1
24_0	6

$C_0 = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23\}_{24}$
$C_1 = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15\}_{16}$

$\rightarrow$	16_1	234_2
24_0	4	39

$\downarrow$	16_1	234_2
24_0	6	4

$C_0 = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23\}_{24}$
$C_1 = \{59, 60, 62, 63, 77, 79, 80, 81, 100, 133, 135, 136, 137, 174, 240, 249\}_{16}$
$C_2 = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42,$
Column cell 1:
Column cell 2:
Order of the group that is induced on the object is 1152
Number of ancestors on 5-sets is 81.
Number of orbits on 5-sets is 81.
With 1 orbits on the object
Orbit lengths: 24
The points by ranks:

i	Rank	i	Rank	i	Rank	i	Rank
0	0	6	3954	12	8441	18	10596
1	1	7	192	13	5962	19	7824
2	180	8	9999	14	11713	20	4892
3	181	9	7421	15	5364	21	3601
4	182	10	5960	16	4897	22	11719
5	3607	11	5360	17	8430	23	9661

The points:

$$P_0 = (0,1,0,0,0)P_1 = (0,0,1,0,0)P_2 = (0,1,9,22,9)P_3 = (0,1,8,11,16)$$
$$P_4 = (0,1,1,15,3)P_5 = (1,16,9,2,8)P_6 = (1,13,16,15,6)P_7 = (0,1,4,7,6)$$
$$P_8 = (1,1,3,1,19)P_9 = (1,2,6,18,21)P_{10} = (1,21,19,20,3)P_{11} = (1,22,21,2,10)$$
$$P_{12} = (1,8,2,9,16)P_{13} = (1,14,17,20,3)P_{14} = (1,16,4,11,15)P_{15} = (1,7,20,2,10)$$
$$P_{16} = (1,20,7,5,4)P_{17} = (1,16,1,9,16)P_{18} = (1,7,21,4,9)P_{19} = (1,7,21,18,2)$$
$$P_{20} = (1,10,14,5,4)P_{21} = (1,3,2,2,8)P_{22} = (1,9,2,11,15)P_{23} = (1,15,22,17,13)$$

Stabilizer of order 1152 is generated by:

$$g_1 = \begin{bmatrix} 14 & 0 & 0 & 2 & 18 \\ 0 & 18 & 0 & 0 & 0 \\ 0 & 0 & 18 & 0 & 0 \\ 14 & 0 & 0 & 16 & 5 \\ 22 & 0 & 0 & 10 & 16 \end{bmatrix}$$

with 24 fixed points

$$g_2 = \begin{bmatrix} 12 & 0 & 0 & 19 & 10 \\ 0 & 14 & 0 & 0 & 0 \\ 0 & 0 & 14 & 0 & 0 \\ 5 & 0 & 0 & 1 & 21 \\ 21 & 0 & 0 & 19 & 1 \end{bmatrix}$$

with 530 fixed points

$$g_3 = \begin{bmatrix} 15 & 0 & 0 & 18 & 1 \\ 0 & 17 & 0 & 0 & 0 \\ 0 & 17 & 17 & 2 & 5 \\ 12 & 5 & 0 & 7 & 9 \\ 9 & 2 & 0 & 18 & 7 \end{bmatrix}$$

with 24 fixed points

$$g_4 = \begin{bmatrix} 4 & 19 & 0 & 12 & 15 \\ 0 & 9 & 0 & 0 & 0 \\ 16 & 6 & 9 & 15 & 10 \\ 10 & 15 & 0 & 11 & 16 \\ 16 & 13 & 0 & 3 & 22 \end{bmatrix}$$

with 2 fixed points

$$g_5 = \begin{bmatrix} 16 & 0 & 0 & 22 & 14 \\ 0 & 10 & 11 & 18 & 22 \\ 0 & 14 & 14 & 3 & 19 \\ 16 & 15 & 11 & 19 & 19 \\ 12 & 6 & 9 & 15 & 19 \end{bmatrix}$$

with 0 fixed points

$$g_6 = \begin{bmatrix} 19 & 0 & 0 & 9 & 12 \\ 0 & 14 & 14 & 3 & 19 \\ 0 & 22 & 0 & 0 & 0 \\ 6 & 14 & 0 & 15 & 16 \\ 16 & 1 & 0 & 9 & 15 \end{bmatrix}$$

with 2 fixed points

Chapter 4

The BLT-Sets in Numeric Form

0, 1, 180, 181, 182, 189, 191, 185, 198, 188, 195, 190, 197, 186, 192, 187, 193, 199, 194, 200, 183, 201, 184, 196
0, 1, 180, 181, 182, 189, 191, 185, 198, 188, 195, 190, 4884, 3597, 5948, 8361, 6286, 5607, 11604, 5359, 9268, 10119, 6376, 6717
0, 1, 180, 181, 182, 3607, 3954, 192, 9999, 7421, 5960, 5360, 8441, 5962, 11713, 5364, 4897, 8430, 10596, 7824, 4892, 3601, 11719, 9661

```
INT BLT_23_size = 24;
INT BLT_23_nb_reps = 3;
INT BLT_23_reps[] = {
0, 1, 180, 181, 182, 189, 191, 185, 198, 188, 195, 190, 197, 186, 192, 187, 193, 199, 194, 200, 183, 201, 184, 196
0, 1, 180, 181, 182, 189, 191, 185, 198, 188, 195, 190, 4884, 3597, 5948, 8361, 6286, 5607, 11604, 5359, 9268, 101
0, 1, 180, 181, 182, 3607, 3954, 192, 9999, 7421, 5960, 5360, 8441, 5962, 11713, 5364, 4897, 8430, 10596, 7824, 48
};
const BYTE *BLT_23_stab_order[] = {
"582912",
"1152",
"1152",
};
INT BLT_23_stab_gens[] = {
 7,  0,  0,  0,  0,  0, 16,  0,  0,  0,  0,  0, 16,  0,  0,  0,  0,  0, 16,  0,  0,  0,  0,  0, 16,
12,  0,  0,  0,  0,  0,  6,  0,  0,  0,  0,  0,  1,  0,  0,  0,  0,  0, 11,  0,  0,  0,  0,  0, 11,
10,  0,  0, 16,  6,  0, 14,  0,  0,  0,  0,  0, 14,  0,  0,  3,  0,  0,  2,  7,  8,  0,  0, 14,  2,
11,  0,  0, 19, 10,  0, 14,  0,  0,  0,  0,  0, 14,  0,  0,  5,  0,  0, 13, 14, 21,  0,  0,  5, 13,
19,  0,  0, 17, 15,  0,  8,  0,  0,  0,  0,  8,  8,  5,  1,  4,  1,  0, 17, 18,  3,  5,  0, 13, 17,
 9,  0,  0,  8,  3,  0,  3,  0,  0,  0,  0,  9, 12, 14, 12, 13,  6,  0,  4, 21,  4,  7,  0, 19,  4,
13,  0,  0, 12, 16,  0, 19, 10,  4, 10,  0, 11, 19,  6, 15, 15, 15, 10,  1, 16, 17,  6,  4,  9,  1,
20,  0,  0, 14, 11,  0,  5,  0,  0,  0,  0,  0,  5,  0,  0, 17,  0,  0,  4, 14,  7,  0,  0,  5,  4,
14,  0,  0,  2, 18,  0, 18,  0,  0,  0,  0,  0, 18,  0,  0, 14,  0,  0, 16,  5, 22,  0,  0, 10, 16,
22,  0,  0,  3,  4,  0, 17,  0,  0,  0,  0,  0, 17,  0,  0,  2,  0,  0,  9, 20, 13,  0,  0, 17,  9,
21,  0,  0,  7, 17,  0, 10,  0,  0,  0,  0, 22, 10,  2,  5, 20,  5,  0, 19,  8, 15,  2,  0, 16, 19,
21,  0,  0,  7, 17,  0, 10, 15,  3, 19,  0,  0, 10,  0,  0, 20,  0, 19, 19,  8, 15,  0,  3, 16, 19,
13,  0,  0,  0,  0,  0, 21,  5,  2,  5,  0, 15, 21,  9, 11,  0, 11,  5,  2,  7,  0,  9,  2, 14,  2,
 5,  0,  0,  9, 12,  0, 22, 15, 12,  7,  0, 14, 22,  1, 14, 17, 14,  7, 11, 15,  7,  1, 12,  7, 11,
 0, 13, 11, 13, 21, 12, 11,  5, 21, 19,  2, 15, 11, 22,  8, 19, 19, 21,  9,  5,  3, 13, 11, 20, 20,
14,  0,  0,  2, 18,  0, 18,  0,  0,  0,  0,  0, 18,  0,  0, 14,  0,  0, 16,  5, 22,  0,  0, 10, 16,
12,  0,  0, 19, 10,  0, 14,  0,  0,  0,  0,  0, 14,  0,  0,  5,  0,  0,  1, 21, 21,  0,  0, 19,  1,
15,  0,  0, 18,  1,  0, 17,  0,  0,  0,  0, 17, 17,  2,  5, 12,  5,  0,  7,  9,  9,  2,  0, 18,  7,
 4, 19,  0, 12, 15,  0,  9,  0,  0,  0, 16,  6,  9, 15, 10, 10, 15,  0, 11, 16, 16, 13,  0,  3, 22,
16,  0,  0, 22, 14,  0, 10, 11, 18, 22,  0, 14, 14,  3, 19, 16, 15, 11, 19, 19, 12,  6,  9, 15, 19,
19,  0,  0,  9, 12,  0, 14, 14,  3, 19,  0, 22,  0,  0,  0,  6, 14,  0, 15, 16, 16,  1,  0,  9, 15,
};
INT BLT_23_stab_gens_fst[] = { 0, 7, 15};
INT BLT_23_stab_gens_len[] = { 7, 8, 6};
INT BLT_23_make_element_size = 0;
```