Contents

Section outline

QM method

- Partition cubes into groups $\langle m : 1, n : D \rangle$ of m on-set and n DC-set minterms
- Combine adjacent terms between groups (matching in the position of 1's and don't cares) to get prime implicants
- Cover on-set minterms using prime implicants
  - reduce table by row dominance
    C_1 dominates C_2 if C_1 covers every on-set minterm covered by C_2
  - reduce table by column dominance
    m_2 is dominated m_1 if any P covering m_1 also covers m_2
    however, if C_2 is a bigger cube (due to DCs) it may still be retained
  - reduce table by dropping essential PMs
  - finally apply branch and bound (recursive application of covering needed)
    arbitrarily decide to keep or not to keep a cube
    bound exploration if the cost matches or exceeds the cost of an explored solution
  - Petrick's method may be used to generate all possible covers (especially for the cyclic core)

$f(a,b,c,d) = \sum_m (0,5,8,9,10,11,14,15)$

$\langle 0:1, 0:\mathrm{D} \rangle$				
m	**a**	**b**	**c**	**d**
0	0	0	0	0

$\langle 1:1, 0:\mathrm{D} \rangle$				
m	**a**	**b**	**c**	**d**
8	1	0	0	0

$f(a,b,c,d) = \sum_m (0,5,8,9,10,11,14,15)$

$\langle 0:1, 0:\mathrm{D} \rangle$				
m	**a**	**b**	**c**	**d**
0	0	0	0	0

$\langle 1:1, 0:\mathrm{D} \rangle$				
m	**a**	**b**	**c**	**d**
8	1	0	0	0

$f(a, b, c, d) = \sum_m (0, 5, 8, 9, 10, 11, 14, 15)$

$\langle 0 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
0	0	0	0	0

$\langle 1 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
8	1	0	0	0

$\langle 0 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
0, 8	-	0	0	0

$f(a,b,c,d) = \sum_m (0,5,8,9,10,11,14,15)$

$\langle 1:1,0:\mathrm{D}\rangle$				
m	**a**	**b**	**c**	**d**
8	1	0	0	0

$\langle 2:1,0:\mathrm{D}\rangle$				
m	**a**	**b**	**c**	**d**
5	0	1	0	1
9	1	0	0	1
10	1	0	1	0

$f(a,b,c,d) = \sum_m (0,5,8,9,10,11,14,15)$

⟨1 : 1, 0 : D⟩				
m	**a**	**b**	**c**	**d**
8	1	0	0	0

⟨2 : 1, 0 : D⟩				
m	**a**	**b**	**c**	**d**
5	0	1	0	1
9	1	0	0	1
10	1	0	1	0

$f(a,b,c,d) = \sum_m (0,5,8,9,10,11,14,15)$

$\langle 1:1,0:\mathrm{D}\rangle$				
m	**a**	**b**	**c**	**d**
8	1	0	0	0

$\langle 2:1,0:\mathrm{D}\rangle$				
m	**a**	**b**	**c**	**d**
5	0	1	0	1
9	1	0	0	1
10	1	0	1	0

$\langle 1:1,1:\mathrm{D}\rangle$				
cube	**a**	**b**	**c**	**d**
8, 9	1	0	0	-

$f(a,b,c,d) = \sum_m (0,5,8,9,10,11,14,15)$

$\langle 1:1,0:\mathrm{D}\rangle$				
m	**a**	**b**	**c**	**d**
8	1	0	0	0

$\langle 2:1,0:\mathrm{D}\rangle$				
m	**a**	**b**	**c**	**d**
5	0	1	0	1
9	1	0	0	1
10	1	0	1	0

$\langle 1:1,1:\mathrm{D}\rangle$				
cube	**a**	**b**	**c**	**d**
8, 9	1	0	0	-
8, 10	1	0	-	0

$f(a, b, c, d) = \sum_m (0, 5, 8, 9, 10, 11, 14, 15)$

$\langle 2 : 1, 0 : \mathrm{D} \rangle$				
m	**a**	**b**	**c**	**d**
5	0	1	0	1
9	1	0	0	1
10	1	0	1	0

$\langle 3 : 1, 0 : \mathrm{D} \rangle$				
m	**a**	**b**	**c**	**d**
11	1	0	1	1
14	1	1	1	0

$f(a, b, c, d) = \sum_m (0, 5, 8, 9, 10, 11, 14, 15)$

$\langle 2 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
5	0	1	0	1
9	1	0	0	1
10	1	0	1	0

$\langle 3 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
11	1	0	1	1
14	1	1	1	0

$f(a, b, c, d) = \sum_m (0, 5, 8, 9, 10, 11, 14, 15)$

$\langle 2 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
5	0	1	0	1
9	1	0	0	1
10	1	0	1	0

$\langle 3 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
11	1	0	1	1
14	1	1	1	0

$\langle 2 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
9, 11	1	0	-	1

$f(a, b, c, d) = \sum_m (0, 5, 8, 9, 10, 11, 14, 15)$

$\langle 2 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
5	0	1	0	1
9	1	0	0	1
10	1	0	1	0

$\langle 3 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
11	1	0	1	1
14	1	1	1	0

$\langle 2 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
9, 11	1	0	-	1
10, 11	1	0	1	-

$f(a, b, c, d) = \sum_m (0, 5, 8, 9, 10, 11, 14, 15)$

$\langle 2 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
5	0	1	0	1
9	1	0	0	1
10	1	0	1	0

$\langle 3 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
11	1	0	1	1
14	1	1	1	0

$\langle 2 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
9, 11	1	0	-	1
10, 11	1	0	1	-
10, 14	1	-	1	0

$f(a,b,c,d) = \sum_m (0,5,8,9,10,11,14,15)$

$\langle 3 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
11	1	0	1	1
14	1	1	1	0

$\langle 4 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
15	1	1	1	1

$f(a,b,c,d) = \sum_m (0,5,8,9,10,11,14,15)$

$\langle 3 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
11	1	0	1	1
14	1	1	1	0

$\langle 4 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
15	1	1	1	1

$f(a, b, c, d) = \sum_m (0, 5, 8, 9, 10, 11, 14, 15)$

$\langle 3 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
11	1	0	1	1
14	1	1	1	0

$\langle 4 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
15	1	1	1	1

$\langle 3 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
11, 15	1	-	1	1

$f(a, b, c, d) = \sum_m (0, 5, 8, 9, 10, 11, 14, 15)$

$\langle 3 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
11	1	0	1	1
14	1	1	1	0

$\langle 4 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
15	1	1	1	1

$\langle 3 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
11, 15	1	-	1	1
14, 15	1	1	1	-

$f(a, b, c, d) = \sum_m (0, 5, 8, 9, 10, 11, 14, 15)$

$\langle 1 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
8, 9	1	0	0	-
8, 10	1	0	-	0

$\langle 2 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
9, 11	1	0	-	1
10, 11	1	0	1	-
10, 14	1	-	1	0

$f(a, b, c, d) = \sum_m (0, 5, 8, 9, 10, 11, 14, 15)$

$\langle 1 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
8, 9	1	0	0	-
8, 10	1	0	-	0

$\langle 2 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
9, 11	1	0	-	1
10, 11	1	0	1	-
10, 14	1	-	1	0

$f(a, b, c, d) = \sum_m (0, 5, 8, 9, 10, 11, 14, 15)$

$\langle 1 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
8, 9	1	0	0	-
8, 10	1	0	-	0

$\langle 2 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
9, 11	1	0	-	1
10, 11	1	0	1	-
10, 14	1	-	1	0

$\langle 1 : 1, 2 : D \rangle$				
cube	**a**	**b**	**c**	**d**
8, 9, 10, 11	1	0	-	-

$f(a, b, c, d) = \sum_m (0, 5, 8, 9, 10, 11, 14, 15)$

$\langle 1 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
8, 9	1	0	0	-
8, 10	1	0	-	0

$\langle 2 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
9, 11	1	0	-	1
10, 11	1	0	1	-
10, 14	1	-	1	0

$\langle 1 : 1, 2 : D \rangle$				
cube	**a**	**b**	**c**	**d**
8, 9, 10, 11	1	0	-	-
8, 10, 9, 11	1	0	-	-

$f(a, b, c, d) = \sum_m (0, 5, 8, 9, 10, 11, 14, 15)$

$\langle 2 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
9, 11	1	0	-	1
10, 11	1	0	1	-
10, 14	1	-	1	0

$\langle 3 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
11, 15	1	-	1	1
14, 15	1	1	1	-

$f(a, b, c, d) = \sum_m (0, 5, 8, 9, 10, 11, 14, 15)$

$\langle 2 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
9, 11	1	0	-	1
10, 11	1	0	1	-
10, 14	1	-	1	0

$\langle 3 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
11, 15	1	-	1	1
14, 15	1	1	1	-

$f(a,b,c,d) = \sum_m (0,5,8,9,10,11,14,15)$

$\langle 2:1,1:D \rangle$				
cube	**a**	**b**	**c**	**d**
9, 11	1	0	-	1
10, 11	1	0	1	-
10, 14	1	-	1	0

$\langle 3:1,1:D \rangle$				
cube	**a**	**b**	**c**	**d**
11, 15	1	-	1	1
14, 15	1	1	1	-

$\langle 2:1,2:D \rangle$				
cube	**a**	**b**	**c**	**d**
10,11,14,15	1	-	1	-

$f(a, b, c, d) = \sum_m (0, 5, 8, 9, 10, 11, 14, 15)$

$\langle 2 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
9, 11	1	0	-	1
10, 11	1	0	1	-
10, 14	1	-	1	0

$\langle 3 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
11, 15	1	-	1	1
14, 15	1	1	1	-

$\langle 2 : 1, 2 : D \rangle$				
cube	**a**	**b**	**c**	**d**
10,11,14,15	1	-	1	-
10,14,11,15	1	-	1	-

$f(a,b,c,d) = \sum_m (0,5,8,9,10,11,14,15)$

PIs	0	5	8	9	10	11	14	15
8, 9, 10, 11			X	(X)	X	X		
10, 11, 14, 15					X	X	(X)	(X)
0, 8	(X)		X					
5		(X)						

$$f = a\bar{b} + ac + \bar{b}\bar{c}\bar{d} + \bar{a}b\bar{c}d$$

$f(a,b,c,d) = \sum_m (1,2,3,7,8,9,10,11,14,15)$

$\langle 1 : 1,0 : D \rangle$				
m	**a**	**b**	**c**	**d**
1	0	0	0	1
2	0	0	1	0
8	1	0	0	0

$\langle 2 : 1,0 : D \rangle$				
m	**a**	**b**	**c**	**d**
3	0	0	1	1
9	1	0	0	1
10	1	0	1	0

$f(a, b, c, d) = \sum_m (1, 2, 3, 7, 8, 9, 10, 11, 14, 15)$

$\langle 1 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
1	0	0	0	1
2	0	0	1	0
8	1	0	0	0

$\langle 2 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
3	0	0	1	1
9	1	0	0	1
10	1	0	1	0

$f(a,b,c,d) = \sum_m (1,2,3,7,8,9,10,11,14,15)$

$\langle 1:1,0:D \rangle$				
m	**a**	**b**	**c**	**d**
1	0	0	0	1
2	0	0	1	0
8	1	0	0	0

$\langle 2:1,0:D \rangle$				
m	**a**	**b**	**c**	**d**
3	0	0	1	1
9	1	0	0	1
10	1	0	1	0

$\langle 1:1,1:D \rangle$				
cube	**a**	**b**	**c**	**d**
1, 3	0	0	-	1

$f(a,b,c,d) = \sum_m (1,2,3,7,8,9,10,11,14,15)$

$\langle 1:1,0:D \rangle$				
m	**a**	**b**	**c**	**d**
1	0	0	0	1
2	0	0	1	0
8	1	0	0	0

$\langle 2:1,0:D \rangle$				
m	**a**	**b**	**c**	**d**
3	0	0	1	1
9	1	0	0	1
10	1	0	1	0

$\langle 1:1,1:D \rangle$				
cube	**a**	**b**	**c**	**d**
1, 3	0	0	-	1
1, 9	-	0	0	1

$f(a,b,c,d) = \sum_m (1,2,3,7,8,9,10,11,14,15)$

$\langle 1:1,0:D \rangle$				
m	**a**	**b**	**c**	**d**
1	0	0	0	1
2	0	0	1	0
8	1	0	0	0

$\langle 2:1,0:D \rangle$				
m	**a**	**b**	**c**	**d**
3	0	0	1	1
9	1	0	0	1
10	1	0	1	0

$\langle 1:1,1:D \rangle$				
cube	**a**	**b**	**c**	**d**
1, 3	0	0	-	1
1, 9	-	0	0	1
2, 3	0	0	1	-

$f(a,b,c,d) = \sum_m (1,2,3,7,8,9,10,11,14,15)$

$\langle 1:1,0:D \rangle$				
m	**a**	**b**	**c**	**d**
1	0	0	0	1
2	0	0	1	0
8	1	0	0	0

$\langle 2:1,0:D \rangle$				
m	**a**	**b**	**c**	**d**
3	0	0	1	1
9	1	0	0	1
10	1	0	1	0

$\langle 1:1,1:D \rangle$				
cube	**a**	**b**	**c**	**d**
1, 3	0	0	-	1
1, 9	-	0	0	1
2, 3	0	0	1	-
2, 10	-	0	1	0

$f(a,b,c,d) = \sum_m (1,2,3,7,8,9,10,11,14,15)$

$\langle 1:1,0:D \rangle$				
m	**a**	**b**	**c**	**d**
1	0	0	0	1
2	0	0	1	0
8	1	0	0	0

$\langle 2:1,0:D \rangle$				
m	**a**	**b**	**c**	**d**
3	0	0	1	1
9	1	0	0	1
10	1	0	1	0

$\langle 1:1,1:D \rangle$				
cube	**a**	**b**	**c**	**d**
1, 3	0	0	-	1
1, 9	-	0	0	1
2, 3	0	0	1	-
2, 10	-	0	1	0
8, 9	1	0	0	-

$f(a, b, c, d) = \sum_m (1, 2, 3, 7, 8, 9, 10, 11, 14, 15)$

$\langle 1 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
1	0	0	0	1
2	0	0	1	0
8	1	0	0	0

$\langle 2 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
3	0	0	1	1
9	1	0	0	1
10	1	0	1	0

$\langle 1 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
1, 3	0	0	-	1
1, 9	-	0	0	1
2, 3	0	0	1	-
2, 10	-	0	1	0
8, 9	1	0	0	-
8, 10	1	0	-	0

$f(a,b,c,d) = \sum_m (1,2,3,7,8,9,10,11,14,15)$

$\langle 2 : 1,0 : D \rangle$				
m	**a**	**b**	**c**	**d**
3	0	0	1	1
9	1	0	0	1
10	1	0	1	0

$\langle 3 : 1,0 : D \rangle$				
m	**a**	**b**	**c**	**d**
7	0	1	1	1
11	1	0	1	1
14	1	1	1	0

$f(a,b,c,d) = \sum_m (1,2,3,7,8,9,10,11,14,15)$

$\langle 2 : 1,0 : D \rangle$				
m	**a**	**b**	**c**	**d**
3	0	0	1	1
9	1	0	0	1
10	1	0	1	0

$\langle 3 : 1,0 : D \rangle$				
m	**a**	**b**	**c**	**d**
7	0	1	1	1
11	1	0	1	1
14	1	1	1	0

$f(a,b,c,d) = \sum_m (1,2,3,7,8,9,10,11,14,15)$

$\langle 2:1,0:\mathrm{D}\rangle$				
m	**a**	**b**	**c**	**d**
3	0	0	1	1
9	1	0	0	1
10	1	0	1	0

$\langle 3:1,0:\mathrm{D}\rangle$				
m	**a**	**b**	**c**	**d**
7	0	1	1	1
11	1	0	1	1
14	1	1	1	0

$\langle 2:1,1:\mathrm{D}\rangle$				
cube	**a**	**b**	**c**	**d**
3, 7	0	-	1	1

$f(a,b,c,d) = \sum_m (1,2,3,7,8,9,10,11,14,15)$

$\langle 2:1,0:\mathrm{D}\rangle$				
m	**a**	**b**	**c**	**d**
3	0	0	1	1
9	1	0	0	1
10	1	0	1	0

$\langle 3:1,0:\mathrm{D}\rangle$				
m	**a**	**b**	**c**	**d**
7	0	1	1	1
11	1	0	1	1
14	1	1	1	0

$\langle 2:1,1:\mathrm{D}\rangle$				
cube	**a**	**b**	**c**	**d**
3, 7	0	-	1	1
3, 11	-	0	1	1

$f(a,b,c,d) = \sum_m (1,2,3,7,8,9,10,11,14,15)$

$\langle 2:1,0:\mathrm{D}\rangle$				
m	**a**	**b**	**c**	**d**
3	0	0	1	1
9	1	0	0	1
10	1	0	1	0

$\langle 3:1,0:\mathrm{D}\rangle$				
m	**a**	**b**	**c**	**d**
7	0	1	1	1
11	1	0	1	1
14	1	1	1	0

$\langle 2:1,1:\mathrm{D}\rangle$				
cube	**a**	**b**	**c**	**d**
3, 7	0	-	1	1
3, 11	-	0	1	1
9, 11	1	0	-	1

$f(a, b, c, d) = \sum_m (1, 2, 3, 7, 8, 9, 10, 11, 14, 15)$

$\langle 2 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
3	0	0	1	1
9	1	0	0	1
10	1	0	1	0

$\langle 3 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
7	0	1	1	1
11	1	0	1	1
14	1	1	1	0

$\langle 2 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
3, 7	0	-	1	1
3, 11	-	0	1	1
9, 11	1	0	-	1
10, 11	1	0	1	-

$f(a, b, c, d) = \sum_m (1, 2, 3, 7, 8, 9, 10, 11, 14, 15)$

$\langle 2 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
3	0	0	1	1
9	1	0	0	1
10	1	0	1	0

$\langle 3 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
7	0	1	1	1
11	1	0	1	1
14	1	1	1	0

$\langle 2 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
3, 7	0	-	1	1
3, 11	-	0	1	1
9, 11	1	0	-	1
10, 11	1	0	1	-
10, 14	1	-	1	0

$f(a,b,c,d) = \sum_m (1,2,3,7,8,9,10,11,14,15)$

$\langle 3:1,0:\mathrm{D}\rangle$				
m	**a**	**b**	**c**	**d**
7	0	1	1	1
11	1	0	1	1
14	1	1	1	0

$\langle 4:1,0:\mathrm{D}\rangle$				
m	**a**	**b**	**c**	**d**
15	1	1	1	1

$f(a,b,c,d) = \sum_m (1,2,3,7,8,9,10,11,14,15)$

$\langle 3:1,0:\mathrm{D}\rangle$				
m	**a**	**b**	**c**	**d**
7	0	1	1	1
11	1	0	1	1
14	1	1	1	0

$\langle 4:1,0:\mathrm{D}\rangle$				
m	**a**	**b**	**c**	**d**
15	1	1	1	1

$f(a,b,c,d) = \sum_m (1,2,3,7,8,9,10,11,14,15)$

$\langle 3:1,0:\mathrm{D}\rangle$				
m	**a**	**b**	**c**	**d**
7	0	1	1	1
11	1	0	1	1
14	1	1	1	0

$\langle 4:1,0:\mathrm{D}\rangle$				
m	**a**	**b**	**c**	**d**
15	1	1	1	1

$\langle 3:1,1:\mathrm{D}\rangle$				
cube	**a**	**b**	**c**	**d**
7, 15	-	1	1	1

$f(a,b,c,d) = \sum_m (1,2,3,7,8,9,10,11,14,15)$

⟨3 : 1, 0 : D⟩				
m	**a**	**b**	**c**	**d**
7	0	1	1	1
11	1	0	1	1
14	1	1	1	0

⟨4 : 1, 0 : D⟩				
m	**a**	**b**	**c**	**d**
15	1	1	1	1

⟨3 : 1, 1 : D⟩				
cube	**a**	**b**	**c**	**d**
7, 15	-	1	1	1
11, 15	1	-	1	1

$f(a,b,c,d) = \sum_m (1,2,3,7,8,9,10,11,14,15)$

⟨3 : 1, 0 : D⟩				
m	**a**	**b**	**c**	**d**
7	0	1	1	1
11	1	0	1	1
14	1	1	1	0

⟨4 : 1, 0 : D⟩				
m	**a**	**b**	**c**	**d**
15	1	1	1	1

⟨3 : 1, 1 : D⟩				
cube	**a**	**b**	**c**	**d**
7, 15	-	1	1	1
11, 15	1	-	1	1
14, 15	1	1	1	-

$f(a, b, c, d) = \sum_m (1, 2, 3, 7, 8, 9, 10, 11, 14, 15)$

$\langle 1 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
1, 3	0	0	-	1
1, 9	-	0	0	1
2, 3	0	0	1	-
2, 10	-	0	1	0
8, 9	1	0	0	-
8, 10	1	0	-	0

$\langle 2 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
3, 7	0	-	1	1
3, 11	-	0	1	1
9, 11	1	0	-	1
10, 11	1	0	1	-
10, 14	1	-	1	0

$f(a, b, c, d) = \sum_m (1, 2, 3, 7, 8, 9, 10, 11, 14, 15)$

$\langle 1 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
1, 3	0	0	-	1
1, 9	-	0	0	1
2, 3	0	0	1	-
2, 10	-	0	1	0
8, 9	1	0	0	-
8, 10	1	0	-	0

$\langle 2 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
3, 7	0	-	1	1
3, 11	-	0	1	1
9, 11	1	0	-	1
10, 11	1	0	1	-
10, 14	1	-	1	0

$f(a, b, c, d) = \sum_m (1, 2, 3, 7, 8, 9, 10, 11, 14, 15)$

$\langle 1 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
1, 3	0	0	-	1
1, 9	-	0	0	1
2, 3	0	0	1	-
2, 10	-	0	1	0
8, 9	1	0	0	-
8, 10	1	0	-	0

$\langle 2 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
3, 7	0	-	1	1
3, 11	-	0	1	1
9, 11	1	0	-	1
10, 11	1	0	1	-
10, 14	1	-	1	0

$\langle 1 : 1, 2 : D \rangle$				
cube	**a**	**b**	**c**	**d**
1, 3, 9 ,11	-	0	-	1

$f(a,b,c,d) = \sum_m (1,2,3,7,8,9,10,11,14,15)$

$\langle 1:1, 1:D \rangle$				
cube	**a**	**b**	**c**	**d**
1, 3	0	0	-	1
1, 9	-	0	0	1
2, 3	0	0	1	-
2, 10	-	0	1	0
8, 9	1	0	0	-
8, 10	1	0	-	0

$\langle 2:1, 1:D \rangle$				
cube	**a**	**b**	**c**	**d**
3, 7	0	-	1	1
3, 11	-	0	1	1
9, 11	1	0	-	1
10, 11	1	0	1	-
10, 14	1	-	1	0

$\langle 1:1, 2:D \rangle$				
cube	**a**	**b**	**c**	**d**
1, 3, 9 ,11	-	0	-	1
2, 3, 10 ,11	-	0	1	-

$f(a, b, c, d) = \sum_m (1, 2, 3, 7, 8, 9, 10, 11, 14, 15)$

$\langle 1 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
1, 3	0	0	-	1
1, 9	-	0	0	1
2, 3	0	0	1	-
2, 10	-	0	1	0
8, 9	1	0	0	-
8, 10	1	0	-	0

$\langle 2 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
3, 7	0	-	1	1
3, 11	-	0	1	1
9, 11	1	0	-	1
10, 11	1	0	1	-
10, 14	1	-	1	0

$\langle 1 : 1, 2 : D \rangle$				
cube	**a**	**b**	**c**	**d**
1, 3, 9 ,11	-	0	-	1
2, 3, 10 ,11	-	0	1	-
8, 9, 10 ,11	1	0	-	-

$f(a, b, c, d) = \sum_m (1, 2, 3, 7, 8, 9, 10, 11, 14, 15)$

$\langle 2 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
3, 7	0	-	1	1
3, 11	-	0	1	1
9, 11	1	0	-	1
10, 11	1	0	1	-
10, 14	1	-	1	0

$\langle 3 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
7, 15	-	1	1	1
11, 15	1	-	1	1
14, 15	1	1	1	-

$f(a, b, c, d) = \sum_m (1, 2, 3, 7, 8, 9, 10, 11, 14, 15)$

$\langle 2 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
3, 7	0	-	1	1
3, 11	-	0	1	1
9, 11	1	0	-	1
10, 11	1	0	1	-
10, 14	1	-	1	0

$\langle 3 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
7, 15	-	1	1	1
11, 15	1	-	1	1
14, 15	1	1	1	-

$f(a, b, c, d) = \sum_m (1, 2, 3, 7, 8, 9, 10, 11, 14, 15)$

$\langle 2 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
3, 7	0	-	1	1
3, 11	-	0	1	1
9, 11	1	0	-	1
10, 11	1	0	1	-
10, 14	1	-	1	0

$\langle 3 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
7, 15	-	1	1	1
11, 15	1	-	1	1
14, 15	1	1	1	-

$\langle 2 : 1, 2 : D \rangle$				
cube	**a**	**b**	**c**	**d**
3, 7, 11, 15	-	-	1	1

$f(a,b,c,d) = \sum_m (1,2,3,7,8,9,10,11,14,15)$

$\langle 2:1, 1:D \rangle$				
cube	**a**	**b**	**c**	**d**
3, 7	0	-	1	1
3, 11	-	0	1	1
9, 11	1	0	-	1
10, 11	1	0	1	-
10, 14	1	-	1	0

$\langle 3:1, 1:D \rangle$				
cube	**a**	**b**	**c**	**d**
7, 15	-	1	1	1
11, 15	1	-	1	1
14, 15	1	1	1	-

$\langle 2:1, 2:D \rangle$				
cube	**a**	**b**	**c**	**d**
3, 7, 11, 15	-	-	1	1
10, 11, 14, 15	1	-	1	-

$f(a,b,c,d) = \sum_m (1,2,3,7,8,9,10,11,14,15)$

PIs	1	2	3	7	8	9	10	11	14	15
1, 3, 9, 11	(X)		X			X		X		
2, 3, 10, 11		(X)	X				X	X		
8, 9, 10, 11					(X)	X	X	X		
3, 7, 11, 15			X	(X)				X		X
10, 11, 14, 15							X	X	(X)	X

$f = \bar{B}D + \bar{B}R + A\bar{B} + RD + AR$

$f(a,b,c,d) = \sum_m(4,6,9,10,11,13) + \sum_d(2,12,15)$

$\langle 1 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
2	0	0	1	0
4	0	1	0	0

$\langle 2 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
6	0	1	1	0
9	1	0	0	1
10	1	0	1	0
12	1	1	0	0

$f(a,b,c,d) = \sum_m(4,6,9,10,11,13) + \sum_d(2,12,15)$

$\langle 1 : 1,0 : D \rangle$				
m	**a**	**b**	**c**	**d**
2	0	0	1	0
4	0	1	0	0

$\langle 2 : 1,0 : D \rangle$				
m	**a**	**b**	**c**	**d**
6	0	1	1	0
9	1	0	0	1
10	1	0	1	0
12	1	1	0	0

$f(a,b,c,d) = \sum_m(4,6,9,10,11,13) + \sum_d(2,12,15)$

$\langle 1:1,0:D \rangle$				
m	**a**	**b**	**c**	**d**
2	0	0	1	0
4	0	1	0	0

$\langle 2:1,0:D \rangle$				
m	**a**	**b**	**c**	**d**
6	0	1	1	0
9	1	0	0	1
10	1	0	1	0
12	1	1	0	0

$\langle 1:1,1:D \rangle$				
cube	**a**	**b**	**c**	**d**
2, 6	0	-	1	0

$f(a,b,c,d) = \sum_m(4,6,9,10,11,13) + \sum_d(2,12,15)$

$\langle 1:1,0:D \rangle$				
m	**a**	**b**	**c**	**d**
2	0	0	1	0
4	0	1	0	0

$\langle 2:1,0:D \rangle$				
m	**a**	**b**	**c**	**d**
6	0	1	1	0
9	1	0	0	1
10	1	0	1	0
12	1	1	0	0

$\langle 1:1,1:D \rangle$				
cube	**a**	**b**	**c**	**d**
2, 6	0	-	1	0
2, 10	-	0	1	0

$f(a,b,c,d) = \sum_m(4,6,9,10,11,13) + \sum_d(2,12,15)$

⟨1 : 1, 0 : D⟩				
m	**a**	**b**	**c**	**d**
2	0	0	1	0
4	0	1	0	0

⟨2 : 1, 0 : D⟩				
m	**a**	**b**	**c**	**d**
6	0	1	1	0
9	1	0	0	1
10	1	0	1	0
12	1	1	0	0

⟨1 : 1, 1 : D⟩				
cube	**a**	**b**	**c**	**d**
2, 6	0	-	1	0
2, 10	-	0	1	0
4, 6	0	1	-	0

$f(a,b,c,d) = \sum_m(4,6,9,10,11,13) + \sum_d(2,12,15)$

⟨1 : 1, 0 : D⟩				
m	**a**	**b**	**c**	**d**
2	0	0	1	0
4	0	1	0	0

⟨2 : 1, 0 : D⟩				
m	**a**	**b**	**c**	**d**
6	0	1	1	0
9	1	0	0	1
10	1	0	1	0
12	1	1	0	0

⟨1 : 1, 1 : D⟩				
cube	**a**	**b**	**c**	**d**
2, 6	0	-	1	0
2, 10	-	0	1	0
4, 6	0	1	-	0
4, 12	-	1	0	0

$f(a,b,c,d) = \sum_m(4,6,9,10,11,13) + \sum_d(2,12,15)$

$\langle 2:1,0:\mathrm{D}\rangle$				
m	**a**	**b**	**c**	**d**
6	0	1	1	0
9	1	0	0	1
10	1	0	1	0
12	1	1	0	0

$\langle 3:1,0:\mathrm{D}\rangle$				
m	**a**	**b**	**c**	**d**
11	1	0	1	1
13	1	1	0	1

$f(a,b,c,d) = \sum_m(4,6,9,10,11,13) + \sum_d(2,12,15)$

⟨2 : 1, 0 : D⟩				
m	**a**	**b**	**c**	**d**
6	0	1	1	0
9	1	0	0	1
10	1	0	1	0
12	1	1	0	0

⟨3 : 1, 0 : D⟩				
m	**a**	**b**	**c**	**d**
11	1	0	1	1
13	1	1	0	1

$f(a,b,c,d) = \sum_m(4,6,9,10,11,13) + \sum_d(2,12,15)$

$\langle 2:1,0:D \rangle$				
m	**a**	**b**	**c**	**d**
6	0	1	1	0
9	1	0	0	1
10	1	0	1	0
12	1	1	0	0

$\langle 3:1,0:D \rangle$				
m	**a**	**b**	**c**	**d**
11	1	0	1	1
13	1	1	0	1

$\langle 2:1,1:D \rangle$				
cube	**a**	**b**	**c**	**d**
9, 11	1	0	-	1

$f(a,b,c,d) = \sum_m(4,6,9,10,11,13) + \sum_d(2,12,15)$

⟨2 : 1, 0 : D⟩				
m	**a**	**b**	**c**	**d**
6	0	1	1	0
9	1	0	0	1
10	1	0	1	0
12	1	1	0	0

⟨3 : 1, 0 : D⟩				
m	**a**	**b**	**c**	**d**
11	1	0	1	1
13	1	1	0	1

⟨2 : 1, 1 : D⟩				
cube	**a**	**b**	**c**	**d**
9, 11	1	0	-	1
9, 13	1	-	0	1

$f(a,b,c,d) = \sum_m(4,6,9,10,11,13) + \sum_d(2,12,15)$

$\langle 2:1,0:D \rangle$				
m	**a**	**b**	**c**	**d**
6	0	1	1	0
9	1	0	0	1
10	1	0	1	0
12	1	1	0	0

$\langle 3:1,0:D \rangle$				
m	**a**	**b**	**c**	**d**
11	1	0	1	1
13	1	1	0	1

$\langle 2:1,1:D \rangle$				
cube	**a**	**b**	**c**	**d**
9, 11	1	0	-	1
9, 13	1	-	0	1
10, 11	1	0	1	-

$f(a,b,c,d) = \sum_m(4,6,9,10,11,13) + \sum_d(2,12,15)$

$\langle 2:1,0:D \rangle$				
m	**a**	**b**	**c**	**d**
6	0	1	1	0
9	1	0	0	1
10	1	0	1	0
12	1	1	0	0

$\langle 3:1,0:D \rangle$				
m	**a**	**b**	**c**	**d**
11	1	0	1	1
13	1	1	0	1

$\langle 2:1,1:D \rangle$				
cube	**a**	**b**	**c**	**d**
9, 11	1	0	-	1
9, 13	1	-	0	1
10, 11	1	0	1	-
12, 13	1	1	0	-

$f(a,b,c,d) = \sum_m(4,6,9,10,11,13) + \sum_d(2,12,15)$

$\langle 3:1,0:\mathrm{D}\rangle$				
m	**a**	**b**	**c**	**d**
11	1	0	1	1
13	1	1	0	1

$\langle 4:1,1:\mathrm{D}\rangle$				
m	**a**	**b**	**c**	**d**
15	1	1	1	1

$f(a,b,c,d) = \sum_m(4,6,9,10,11,13) + \sum_d(2,12,15)$

$\langle 3:1,0:\mathrm{D}\rangle$				
m	**a**	**b**	**c**	**d**
11	1	0	1	1
13	1	1	0	1

$\langle 4:1,1:\mathrm{D}\rangle$				
m	**a**	**b**	**c**	**d**
15	1	1	1	1

$f(a, b, c, d) = \sum_m(4, 6, 9, 10, 11, 13) + \sum_d(2, 12, 15)$

$\langle 3 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
11	1	0	1	1
13	1	1	0	1

$\langle 4 : 1, 1 : D \rangle$				
m	**a**	**b**	**c**	**d**
15	1	1	1	1

$\langle 3 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
11, 15	1	-	1	1

$f(a, b, c, d) = \sum_m(4, 6, 9, 10, 11, 13) + \sum_d(2, 12, 15)$

$\langle 3 : 1, 0 : D \rangle$				
m	**a**	**b**	**c**	**d**
11	1	0	1	1
13	1	1	0	1

$\langle 4 : 1, 1 : D \rangle$				
m	**a**	**b**	**c**	**d**
15	1	1	1	1

$\langle 3 : 1, 1 : D \rangle$				
cube	**a**	**b**	**c**	**d**
11, 15	1	-	1	1
13, 15	1	1	-	1

$f(a,b,c,d) = \sum_m(4,6,9,10,11,13) + \sum_d(2,12,15)$

$\langle 2:1,1:D \rangle$				
cube	**a**	**b**	**c**	**d**
9, 11	1	0	-	1
9, 13	1	-	0	1
10, 11	1	0	1	-
12, 13	1	1	0	-

$\langle 3:1,1:D \rangle$				
cube	**a**	**b**	**c**	**d**
11, 15	1	-	1	1
13, 15	1	1	-	1

$f(a,b,c,d) = \sum_m(4,6,9,10,11,13) + \sum_d(2,12,15)$

⟨2 : 1, 1 : D⟩				
cube	**a**	**b**	**c**	**d**
9, 11	1	0	-	1
9, 13	1	-	0	1
10, 11	1	0	1	-
12, 13	1	1	0	-

⟨3 : 1, 1 : D⟩				
cube	**a**	**b**	**c**	**d**
11, 15	1	-	1	1
13, 15	1	1	-	1

$f(a,b,c,d) = \sum_m(4,6,9,10,11,13) + \sum_d(2,12,15)$

⟨2 : 1, 1 : D⟩				
cube	**a**	**b**	**c**	**d**
9, 11	1	0	-	1
9, 13	1	-	0	1
10, 11	1	0	1	-
12, 13	1	1	0	-

⟨3 : 1, 1 : D⟩				
cube	**a**	**b**	**c**	**d**
11, 15	1	-	1	1
13, 15	1	1	-	1

⟨2 : 1, 2 : D⟩				
cube	**a**	**b**	**c**	**d**
9,11,13,15	1	-	-	1

$f(a,b,c,d) = \sum_m(4,6,9,10,11,13) + \sum_d(2,12,15)$

$\langle 2:1,1:D \rangle$				
cube	**a**	**b**	**c**	**d**
9, 11	1	0	-	1
9, 13	1	-	0	1
10, 11	1	0	1	-
12, 13	1	1	0	-

$\langle 3:1,1:D \rangle$				
cube	**a**	**b**	**c**	**d**
11, 15	1	-	1	1
13, 15	1	1	-	1

$\langle 2:1,2:D \rangle$				
cube	**a**	**b**	**c**	**d**
9,11,13,15	1	-	-	1
9,13,11,15	1	-	-	1

$f(a,b,c,d) = \sum_m(4,6,9,10,11,13) + \sum_d(2,12,15)$

PIs	4	6	9	10	11	13
2, 6		X				
2, 10				X		
4, 6	X	X				
4, 12	X					
9, 11, 13, 15			(X)		X	X
10, 11				X	X	
12, 13						X

- $\langle 9, 11, 13, 15\rangle$ dominates $\langle 12, 13\rangle$
- $\langle 10, 11\rangle$ dominates $\langle 2, 10\rangle$
- $\langle 4, 6\rangle$ dominates $\langle 4, 12\rangle$ and $\langle 2, 6\rangle$

$f = a\,d + \bar{a}\,b\,\bar{d}$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 0:1,0:\mathrm{D}\rangle$					
m	**a**	**b**	**c**	**d**	**e**
0	0	0	0	0	0

$\langle 1:1,0:\mathrm{D}\rangle$					
m	**a**	**b**	**c**	**d**	**e**
1	0	0	0	0	1
2	0	0	0	1	0
8	0	1	0	0	0

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 0:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
0	0	0	0	0	0

$\langle 1:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
1	0	0	0	0	1
2	0	0	0	1	0
8	0	1	0	0	0

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 0:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
0	0	0	0	0	0

$\langle 1:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
1	0	0	0	0	1
2	0	0	0	1	0
8	0	1	0	0	0

$\langle 0:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
0, 1	0	0	0	0	-

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 0:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
0	0	0	0	0	0

$\langle 1:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
1	0	0	0	0	1
2	0	0	0	1	0
8	0	1	0	0	0

$\langle 0:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
0, 1	0	0	0	0	-
0, 2	0	0	0	-	0

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 0:1, 0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
0	0	0	0	0	0

$\langle 1:1, 0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
1	0	0	0	0	1
2	0	0	0	1	0
8	0	1	0	0	0

$\langle 0:1, 1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
0, 1	0	0	0	0	-
0, 2	0	0	0	-	0
0, 8	0	-	0	0	0

$f(a, b, c, d, e) = \sum_m (0, 1, 2, 3, 6, 8, 9, 10, 11, 17, 20, 21, 23, 25, 28, 30, 31)$

$\langle 1 : 1, 0 : D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
1	0	0	0	0	1
2	0	0	0	1	0
8	0	1	0	0	0

$\langle 2 : 1, 0 : D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
3	0	0	0	1	1
6	0	0	1	1	0
9	0	1	0	0	1
10	0	1	0	1	0
17	1	0	0	0	1
20	1	0	1	0	0

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 1:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
1	0	0	0	0	1
2	0	0	0	1	0
8	0	1	0	0	0

$\langle 2:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
3	0	0	0	1	1
6	0	0	1	1	0
9	0	1	0	0	1
10	0	1	0	1	0
17	1	0	0	0	1
20	1	0	1	0	0

$\langle 1:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
1, 3	0	0	0	-	1

$f(a, b, c, d, e) = \sum_m (0, 1, 2, 3, 6, 8, 9, 10, 11, 17, 20, 21, 23, 25, 28, 30, 31)$

$\langle 1 : 1, 0 : D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
1	0	0	0	0	1
2	0	0	0	1	0
8	0	1	0	0	0

$\langle 2 : 1, 0 : D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
3	0	0	0	1	1
6	0	0	1	1	0
9	0	1	0	0	1
10	0	1	0	1	0
17	1	0	0	0	1
20	1	0	1	0	0

$\langle 1 : 1, 1 : D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
1, 3	0	0	0	-	1
1, 9	0	-	0	0	1

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 1:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
1	0	0	0	0	1
2	0	0	0	1	0
8	0	1	0	0	0

$\langle 2:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
3	0	0	0	1	1
6	0	0	1	1	0
9	0	1	0	0	1
10	0	1	0	1	0
17	1	0	0	0	1
20	1	0	1	0	0

$\langle 1:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
1, 3	0	0	0	-	1
1, 9	0	-	0	0	1
1, 17	-	0	0	0	1

$f(a, b, c, d, e) = \sum_m (0, 1, 2, 3, 6, 8, 9, 10, 11, 17, 20, 21, 23, 25, 28, 30, 31)$

$\langle 1 : 1, 0 : D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
1	0	0	0	0	1
2	0	0	0	1	0
8	0	1	0	0	0

$\langle 2 : 1, 0 : D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
3	0	0	0	1	1
6	0	0	1	1	0
9	0	1	0	0	1
10	0	1	0	1	0
17	1	0	0	0	1
20	1	0	1	0	0

$\langle 1 : 1, 1 : D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
1, 3	0	0	0	-	1
1, 9	0	-	0	0	1
1, 17	-	0	0	0	1
2, 3	0	0	0	1	-

$f(a, b, c, d, e) = \sum_m (0, 1, 2, 3, 6, 8, 9, 10, 11, 17, 20, 21, 23, 25, 28, 30, 31)$

$\langle 1 : 1, 0 : D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
1	0	0	0	0	1
2	0	0	0	1	0
8	0	1	0	0	0

$\langle 2 : 1, 0 : D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
3	0	0	0	1	1
6	0	0	1	1	0
9	0	1	0	0	1
10	0	1	0	1	0
17	1	0	0	0	1
20	1	0	1	0	0

$\langle 1 : 1, 1 : D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
1, 3	0	0	0	-	1
1, 9	0	-	0	0	1
1, 17	-	0	0	0	1
2, 3	0	0	0	1	-
2, 6	0	0	-	1	0

$f(a, b, c, d, e) = \sum_m (0, 1, 2, 3, 6, 8, 9, 10, 11, 17, 20, 21, 23, 25, 28, 30, 31)$

⟨1 : 1, 0 : D⟩					
m	**a**	**b**	**c**	**d**	**e**
1	0	0	0	0	1
2	0	0	0	1	0
8	0	1	0	0	0

⟨2 : 1, 0 : D⟩					
m	**a**	**b**	**c**	**d**	**e**
3	0	0	0	1	1
6	0	0	1	1	0
9	0	1	0	0	1
10	0	1	0	1	0
17	1	0	0	0	1
20	1	0	1	0	0

⟨1 : 1, 1 : D⟩					
cube	**a**	**b**	**c**	**d**	**e**
1, 3	0	0	0	-	1
1, 9	0	-	0	0	1
1, 17	-	0	0	0	1
2, 3	0	0	0	1	-
2, 6	0	0	-	1	0
2, 10	0	-	0	1	0

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 1:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
1	0	0	0	0	1
2	0	0	0	1	0
8	0	1	0	0	0

$\langle 2:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
3	0	0	0	1	1
6	0	0	1	1	0
9	0	1	0	0	1
10	0	1	0	1	0
17	1	0	0	0	1
20	1	0	1	0	0

$\langle 1:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
1, 3	0	0	0	-	1
1, 9	0	-	0	0	1
1, 17	-	0	0	0	1
2, 3	0	0	0	1	-
2, 6	0	0	-	1	0
2, 10	0	-	0	1	0
8, 9	0	1	0	0	-

$f(a, b, c, d, e) = \sum_m (0, 1, 2, 3, 6, 8, 9, 10, 11, 17, 20, 21, 23, 25, 28, 30, 31)$

$\langle 1 : 1, 0 : D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
1	0	0	0	0	1
2	0	0	0	1	0
8	0	1	0	0	0

$\langle 2 : 1, 0 : D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
3	0	0	0	1	1
6	0	0	1	1	0
9	0	1	0	0	1
10	0	1	0	1	0
17	1	0	0	0	1
20	1	0	1	0	0

$\langle 1 : 1, 1 : D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
1, 3	0	0	0	-	1
1, 9	0	-	0	0	1
1, 17	-	0	0	0	1
2, 3	0	0	0	1	-
2, 6	0	0	-	1	0
2, 10	0	-	0	1	0
8, 9	0	1	0	0	-
8, 10	0	1	0	-	0

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 2:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
3	0	0	0	1	1
6	0	0	1	1	0
9	0	1	0	0	1
10	0	1	0	1	0
17	1	0	0	0	1
20	1	0	1	0	0

$\langle 3:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
11	0	1	0	1	1
21	1	0	1	0	1
25	1	1	0	0	1
28	1	1	1	0	0

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 2:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
3	0	0	0	1	1
6	0	0	1	1	0
9	0	1	0	0	1
10	0	1	0	1	0
17	1	0	0	0	1
20	1	0	1	0	0

$\langle 3:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
11	0	1	0	1	1
21	1	0	1	0	1
25	1	1	0	0	1
28	1	1	1	0	0

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 2:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
3	0	0	0	1	1
6	0	0	1	1	0
9	0	1	0	0	1
10	0	1	0	1	0
17	1	0	0	0	1
20	1	0	1	0	0

$\langle 3:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
11	0	1	0	1	1
21	1	0	1	0	1
25	1	1	0	0	1
28	1	1	1	0	0

$\langle 2:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
3, 11	0	-	0	1	1

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 2:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
3	0	0	0	1	1
6	0	0	1	1	0
9	0	1	0	0	1
10	0	1	0	1	0
17	1	0	0	0	1
20	1	0	1	0	0

$\langle 3:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
11	0	1	0	1	1
21	1	0	1	0	1
25	1	1	0	0	1
28	1	1	1	0	0

$\langle 2:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
3, 11	0	-	0	1	1
9, 11	0	1	0	-	1

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 2:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
3	0	0	0	1	1
6	0	0	1	1	0
9	0	1	0	0	1
10	0	1	0	1	0
17	1	0	0	0	1
20	1	0	1	0	0

$\langle 3:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
11	0	1	0	1	1
21	1	0	1	0	1
25	1	1	0	0	1
28	1	1	1	0	0

$\langle 2:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
3, 11	0	-	0	1	1
9, 11	0	1	0	-	1
9, 25	-	1	0	0	1

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 2:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
3	0	0	0	1	1
6	0	0	1	1	0
9	0	1	0	0	1
10	0	1	0	1	0
17	1	0	0	0	1
20	1	0	1	0	0

$\langle 3:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
11	0	1	0	1	1
21	1	0	1	0	1
25	1	1	0	0	1
28	1	1	1	0	0

$\langle 2:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
3, 11	0	-	0	1	1
9, 11	0	1	0	-	1
9, 25	-	1	0	0	1
10, 11	0	1	0	1	-

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 2:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
3	0	0	0	1	1
6	0	0	1	1	0
9	0	1	0	0	1
10	0	1	0	1	0
17	1	0	0	0	1
20	1	0	1	0	0

$\langle 3:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
11	0	1	0	1	1
21	1	0	1	0	1
25	1	1	0	0	1
28	1	1	1	0	0

$\langle 2:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
3, 11	0	-	0	1	1
9, 11	0	1	0	-	1
9, 25	-	1	0	0	1
10, 11	0	1	0	1	-
17, 21	1	0	-	0	1

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 2:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
3	0	0	0	1	1
6	0	0	1	1	0
9	0	1	0	0	1
10	0	1	0	1	0
17	1	0	0	0	1
20	1	0	1	0	0

$\langle 3:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
11	0	1	0	1	1
21	1	0	1	0	1
25	1	1	0	0	1
28	1	1	1	0	0

$\langle 2:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
3, 11	0	-	0	1	1
9, 11	0	1	0	-	1
9, 25	-	1	0	0	1
10, 11	0	1	0	1	-
17, 21	1	0	-	0	1
17, 25	1	-	0	0	1

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 2:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
3	0	0	0	1	1
6	0	0	1	1	0
9	0	1	0	0	1
10	0	1	0	1	0
17	1	0	0	0	1
20	1	0	1	0	0

$\langle 3:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
11	0	1	0	1	1
21	1	0	1	0	1
25	1	1	0	0	1
28	1	1	1	0	0

$\langle 2:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
3, 11	0	-	0	1	1
9, 11	0	1	0	-	1
9, 25	-	1	0	0	1
10, 11	0	1	0	1	-
17, 21	1	0	-	0	1
17, 25	1	-	0	0	1
20, 21	1	0	1	0	-

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 2:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
3	0	0	0	1	1
6	0	0	1	1	0
9	0	1	0	0	1
10	0	1	0	1	0
17	1	0	0	0	1
20	1	0	1	0	0

$\langle 3:1,0:D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
11	0	1	0	1	1
21	1	0	1	0	1
25	1	1	0	0	1
28	1	1	1	0	0

$\langle 2:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
3, 11	0	-	0	1	1
9, 11	0	1	0	-	1
9, 25	-	1	0	0	1
10, 11	0	1	0	1	-
17, 21	1	0	-	0	1
17, 25	1	-	0	0	1
20, 21	1	0	1	0	-
20, 28	1	-	1	0	0

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 3:1,0:\mathrm{D}\rangle$					
m	**a**	**b**	**c**	**d**	**e**
11	0	1	0	1	1
21	1	0	1	0	1
25	1	1	0	0	1
28	1	1	1	0	0

$\langle 4:1,0:\mathrm{D}\rangle$					
m	**a**	**b**	**c**	**d**	**e**
23	1	0	1	1	1
30	1	1	1	1	0

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 3 : 1,0 : D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
11	0	1	0	1	1
21	1	0	1	0	1
25	1	1	0	0	1
28	1	1	1	0	0

$\langle 4 : 1,0 : D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
23	1	0	1	1	1
30	1	1	1	1	0

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 3:1,0:\mathrm{D}\rangle$					
m	**a**	**b**	**c**	**d**	**e**
11	0	1	0	1	1
21	1	0	1	0	1
25	1	1	0	0	1
28	1	1	1	0	0

$\langle 4:1,0:\mathrm{D}\rangle$					
m	**a**	**b**	**c**	**d**	**e**
23	1	0	1	1	1
30	1	1	1	1	0

$\langle 3:1,1:\mathrm{D}\rangle$					
cube	**a**	**b**	**c**	**d**	**e**
21, 23	1	0	1	-	1

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 3:1,0:\mathrm{D}\rangle$					
m	**a**	**b**	**c**	**d**	**e**
11	0	1	0	1	1
21	1	0	1	0	1
25	1	1	0	0	1
28	1	1	1	0	0

$\langle 4:1,0:\mathrm{D}\rangle$					
m	**a**	**b**	**c**	**d**	**e**
23	1	0	1	1	1
30	1	1	1	1	0

$\langle 3:1,1:\mathrm{D}\rangle$					
cube	**a**	**b**	**c**	**d**	**e**
21, 23	1	0	1	-	1
28, 30	1	1	1	-	0

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 4 : 1, 0 : D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
23	1	0	1	1	1
30	1	1	1	1	0

$\langle 5 : 1, 0 : D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
31	1	1	1	1	1

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 4 : 1, 0 : D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
23	1	0	1	1	1
30	1	1	1	1	0

$\langle 5 : 1, 0 : D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
31	1	1	1	1	1

$f(a, b, c, d, e) = \sum_m (0, 1, 2, 3, 6, 8, 9, 10, 11, 17, 20, 21, 23, 25, 28, 30, 31)$

$\langle 4 : 1, 0 : D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
23	1	0	1	1	1
30	1	1	1	1	0

$\langle 5 : 1, 0 : D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
31	1	1	1	1	1

$\langle 4 : 1, 1 : D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
23, 31	1	-	1	1	1

$f(a, b, c, d, e) = \sum_m (0, 1, 2, 3, 6, 8, 9, 10, 11, 17, 20, 21, 23, 25, 28, 30, 31)$

$\langle 4 : 1, 0 : D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
23	1	0	1	1	1
30	1	1	1	1	0

$\langle 5 : 1, 0 : D \rangle$					
m	**a**	**b**	**c**	**d**	**e**
31	1	1	1	1	1

$\langle 4 : 1, 1 : D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
23, 31	1	-	1	1	1
30, 31	1	1	1	1	-

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 0 : 1, 1 : D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
0, 1	0	0	0	0	-
0, 2	0	0	0	-	0
0, 8	0	-	0	0	0

$\langle 1 : 1, 1 : D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
1, 3	0	0	0	-	1
1, 9	0	-	0	0	1
1, 17	-	0	0	0	1
2, 6	0	0	-	1	0
2, 10	0	-	0	1	0
8, 9	0	1	0	0	-
2, 3	0	0	0	1	-
8, 10	0	1	0	-	0

$f(a, b, c, d, e) = \sum_m (0, 1, 2, 3, 6, 8, 9, 10, 11, 17, 20, 21, 23, 25, 28, 30, 31)$

$\langle 0 : 1, 1 : D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
0, 1	0	0	0	0	-
0, 2	0	0	0	-	0
0, 8	0	-	0	0	0

$\langle 1 : 1, 1 : D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
1, 3	0	0	0	-	1
1, 9	0	-	0	0	1
1, 17	-	0	0	0	1
2, 6	0	0	-	1	0
2, 10	0	-	0	1	0
8, 9	0	1	0	0	-
2, 3	0	0	0	1	-
8, 10	0	1	0	-	0

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 0:1, 1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
0, 1	0	0	0	0	-
0, 2	0	0	0	-	0
0, 8	0	-	0	0	0

$\langle 1:1, 1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
1, 3	0	0	0	-	1
1, 9	0	-	0	0	1
1, 17	-	0	0	0	1
2, 6	0	0	-	1	0
2, 10	0	-	0	1	0
8, 9	0	1	0	0	-
2, 3	0	0	0	1	-
8, 10	0	1	0	-	0

$\langle 0:1, 2:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
0, 1, 8, 9	0	-	0	0	-

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 0:1, 1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
0, 1	0	0	0	0	-
0, 2	0	0	0	-	0
0, 8	0	-	0	0	0

$\langle 1:1, 1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
1, 3	0	0	0	-	1
1, 9	0	-	0	0	1
1, 17	-	0	0	0	1
2, 6	0	0	-	1	0
2, 10	0	-	0	1	0
8, 9	0	1	0	0	-
2, 3	0	0	0	1	-
8, 10	0	1	0	-	0

$\langle 0:1, 2:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
0, 1, 8, 9	0	-	0	0	-
0, 1, 2, 3	0	0	0	-	-

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 0:1, 1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
0, 1	0	0	0	0	-
0, 2	0	0	0	-	0
0, 8	0	-	0	0	0

$\langle 1:1, 1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
1, 3	0	0	0	-	1
1, 9	0	-	0	0	1
1, 17	-	0	0	0	1
2, 6	0	0	-	1	0
2, 10	0	-	0	1	0
8, 9	0	1	0	0	-
2, 3	0	0	0	1	-
8, 10	0	1	0	-	0

$\langle 0:1, 2:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
0, 1, 8, 9	0	-	0	0	-
0, 1, 2, 3	0	0	0	-	-
0, 2, 8, 10	0	-	0	-	0

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 1:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
1, 3	0	0	0	-	1
1, 9	0	-	0	0	1
1, 17	-	0	0	0	1
2, 6	0	0	-	1	0
2, 10	0	-	0	1	0
8, 9	0	1	0	0	-
2, 3	0	0	0	1	-
8, 10	0	1	0	-	0

$\langle 2:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
3, 11	0	-	0	1	1
9, 11	0	1	0	-	1
9, 25	-	1	0	0	1
10, 11	0	1	0	1	-
17, 21	1	0	-	0	1
17, 25	1	-	0	0	1
20, 21	1	0	1	0	-
20, 28	1	-	1	0	0

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 1:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
1, 3	0	0	0	-	1
1, 9	0	-	0	0	1
1, 17	-	0	0	0	1
2, 6	0	0	-	1	0
2, 10	0	-	0	1	0
8, 9	0	1	0	0	-
2, 3	0	0	0	1	-
8, 10	0	1	0	-	0

$\langle 2:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
3, 11	0	-	0	1	1
9, 11	0	1	0	-	1
9, 25	-	1	0	0	1
10, 11	0	1	0	1	-
17, 21	1	0	-	0	1
17, 25	1	-	0	0	1
20, 21	1	0	1	0	-
20, 28	1	-	1	0	0

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 1:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
1, 3	0	0	0	-	1
1, 9	0	-	0	0	1
1, 17	-	0	0	0	1
2, 6	0	0	-	1	0
2, 10	0	-	0	1	0
8, 9	0	1	0	0	-
2, 3	0	0	0	1	-
8, 10	0	1	0	-	0

$\langle 1:1,2:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
1, 3, 9, 11	0	-	0	-	1

$\langle 2:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
3, 11	0	-	0	1	1
9, 11	0	1	0	-	1
9, 25	-	1	0	0	1
10, 11	0	1	0	1	-
17, 21	1	0	-	0	1
17, 25	1	-	0	0	1
20, 21	1	0	1	0	-
20, 28	1	-	1	0	0

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 1:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
1, 3	0	0	0	-	1
1, 9	0	-	0	0	1
1, 17	-	0	0	0	1
2, 6	0	0	-	1	0
2, 10	0	-	0	1	0
8, 9	0	1	0	0	-
2, 3	0	0	0	1	-
8, 10	0	1	0	-	0

$\langle 1:1,2:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
1, 3, 9, 11	0	-	0	-	1
1, 9, 17, 25	-	-	0	0	1

$\langle 2:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
3, 11	0	-	0	1	1
9, 11	0	1	0	-	1
9, 25	-	1	0	0	1
10, 11	0	1	0	1	-
17, 21	1	0	-	0	1
17, 25	1	-	0	0	1
20, 21	1	0	1	0	-
20, 28	1	-	1	0	0

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 1:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
1, 3	0	0	0	-	1
1, 9	0	-	0	0	1
1, 17	-	0	0	0	1
2, 6	0	0	-	1	0
2, 10	0	-	0	1	0
8, 9	0	1	0	0	-
2, 3	0	0	0	1	-
8, 10	0	1	0	-	0

$\langle 1:1,2:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
1, 3, 9, 11	0	-	0	-	1
1, 9, 17, 25	-	-	0	0	1
2, 10, 3, 11	0	-	0	1	-

$\langle 2:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
3, 11	0	-	0	1	1
9, 11	0	1	0	-	1
9, 25	-	1	0	0	1
10, 11	0	1	0	1	-
17, 21	1	0	-	0	1
17, 25	1	-	0	0	1
20, 21	1	0	1	0	-
20, 28	1	-	1	0	0

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 1:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
1, 3	0	0	0	-	1
1, 9	0	-	0	0	1
1, 17	-	0	0	0	1
2, 6	0	0	-	1	0
2, 10	0	-	0	1	0
8, 9	0	1	0	0	-
2, 3	0	0	0	1	-
8, 10	0	1	0	-	0

$\langle 1:1,2:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
1, 3, 9, 11	0	-	0	-	1
1, 9, 17, 25	-	-	0	0	1
2, 10, 3, 11	0	-	0	1	-
8, 9, 10, 11	0	1	0	-	-

$\langle 2:1,1:D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
3, 11	0	-	0	1	1
9, 11	0	1	0	-	1
9, 25	-	1	0	0	1
10, 11	0	1	0	1	-
17, 21	1	0	-	0	1
17, 25	1	-	0	0	1
20, 21	1	0	1	0	-
20, 28	1	-	1	0	0

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 0 : 1,2 : D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
0, 1, 8, 9	0	-	0	0	-
0, 1, 2, 3	0	0	0	-	-
0, 2, 8, 10	0	-	0	-	0

$\langle 1 : 1,2 : D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
1, 3, 9, 11	0	-	0	-	1
1, 9, 17, 25	-	-	0	0	1
2, 10, 3, 11	0	-	0	1	-
8, 9, 10, 11	0	1	0	-	-

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

$\langle 0 : 1,2 : D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
0, 1, 8, 9	0	-	0	0	-
0, 1, 2, 3	0	0	0	-	-
0, 2, 8, 10	0	-	0	-	0

$\langle 1 : 1,2 : D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
1, 3, 9, 11	0	-	0	-	1
1, 9, 17, 25	-	-	0	0	1
2, 10, 3, 11	0	-	0	1	-
8, 9, 10, 11	0	1	0	-	-

$\langle 0 : 1,3 : D \rangle$					
cube	**a**	**b**	**c**	**d**	**e**
0, 1, 8, 9, 2, 10, 3, 11	0	-	0	-	-

$f(a, b, c, d, e) = \sum_m (0, 1, 2, 3, 6, 8, 9, 10, 11, 17, 20, 21, 23, 25, 28, 30, 31)$

2, 6	P_1
17, 21	P_2
20, 21	P_3
20, 28	P_4
21, 23	P_5
28, 30	P_6
23, 31	P_7
30, 31	P_8
1, 9, 17, 25	P_9
0, 1, 8, 9, 2, 10, 3, 11	P_{10}

$$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$$

PIs	0	1	2	3	6	8	9	10	11	17	20	21	23	25	28	30	31
P_1			X		X												
P_2										X		X					
P_3											X	X					
P_4											X				X		
P_5												X	X				
P_6															X	X	
P_7													X				X
P_8																X	X
P_9		X					X			X				X			
P_{10}	X	X	X	X		X	X	X	X								

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	0	1	2	3	6	8	9	10	11	17	20	21	23	25	28	30	31
P_1			X		X												
P_2										X		X					
P_3											X	X					
P_4											X				X		
P_5												X	X				
P_6															X	X	
P_7													X				X
P_8																X	X
P_9		X					X			X				X			
P_{10}	(X)	X	X	X		X	X	X	X								

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	0	1	2	3	6	8	9	10	11	17	20	21	23	25	28	30	31
P_1			X		X												
P_2										X		X					
P_3											X	X					
P_4											X				X		
P_5												X	X				
P_6															X	X	
P_7													X				X
P_8																X	X
P_9		X					X			X				X			
P_{10}	(X)	X	X	X		X	X	X	X								

P_{10} is an essential cube

$f = \bar{a}\,\bar{c} +$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	6	17	20	21	23	25	28	30	31
P_1	X								
P_2		X		X					
P_3			X	X					
P_4			X				X		
P_5				X	X				
P_6							X	X	
P_7					X				X
P_8								X	X
P_9		X				X			

$f = \bar{a}\,\bar{c} +$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	6	17	20	21	23	25	28	30	31
P_1	(X)								
P_2		X		X					
P_3			X	X					
P_4			X				X		
P_5				X	X				
P_6							X	X	
P_7					X				X
P_8								X	X
P_9		X				X			

$f = \bar{a}\,\bar{c} +$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	6	17	20	21	23	25	28	30	31
P_1	(X)								
P_2		X		X					
P_3			X	X					
P_4			X				X		
P_5				X	X				
P_6							X	X	
P_7					X				X
P_8								X	X
P_9		X				X			

P_1 is an essential cube

$f = \bar{a}\,\bar{c} + \bar{a}\,\bar{b}\,d\,\bar{e} +$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	17	20	21	23	25	28	30	31
P_2	X		X					
P_3		X	X					
P_4		X				X		
P_5			X	X				
P_6						X	X	
P_7				X				X
P_8							X	X
P_9	X				X			

$f = \bar{a}\,\bar{c} + \bar{a}\,\bar{b}\,d\,\bar{e} +$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	17	20	21	23	25	28	30	31
P_2	X		X					
P_3		X	X					
P_4		X				X		
P_5			X	X				
P_6						X	X	
P_7				X				X
P_8							X	X
P_9	X				(X)			

$f = \bar{a}\,\bar{c} + \bar{a}\,\bar{b}\,d\,\bar{e} +$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	17	20	21	23	25	28	30	31
P_2	X		X					
P_3		X	X					
P_4		X				X		
P_5			X	X				
P_6						X	X	
P_7				X				X
P_8							X	X
P_9	X				(X)			

P_9 is an essential cube

$f = \bar{a}\,\bar{c} + \bar{a}\,\bar{b}\,d\,\bar{e} + \bar{c}\,\bar{d}\,e +$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	20	21	23	28	30	31
P_2		X				
P_3	X	X				
P_4	X			X		
P_5		X	X			
P_6				X	X	
P_7			X			X
P_8					X	X

$$f = \bar{a}\,\bar{c} + \bar{a}\,\bar{b}\,d\,\bar{e} + \bar{c}\,\bar{d}\,e +$$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	20	21	23	28	30	31
P_2		X				
P_3	X	X				
P_4	X			X		
P_5		X	X			
P_6				X	X	
P_7			X			X
P_8					X	X

P_3 dominates P_2

$f = \bar{a}\,\bar{c} + \bar{a}\,\bar{b}\,d\,\bar{e} + \bar{c}\,\bar{d}\,e +$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	20	21	23	28	30	31
P_3	X	X				
P_4	X			X		
P_5		X	X			
P_6				X	X	
P_7			X			X
P_8					X	X

$$f = \bar{a}\,\bar{c} + \bar{a}\,\bar{b}\,d\,\bar{e} + \bar{c}\,\bar{d}\,e +$$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	20	21	23	28	30	31
P_3	X	X				
P_4	X			X		
P_5		X	X			
P_6				X	X	
P_7			X			X
P_8					X	X

$$\mathbf{P_3}: f = \bar{a}\,\bar{c} + \bar{a}\,\bar{b}\,d\,\bar{e} + \bar{c}\,\bar{d}\,e + a\,\bar{b}\,c\,\bar{d} +$$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	23	28	30	31
P_4		X		
P_5	X			
P_6		X	X	
P_7	X			X
P_8			X	X

$\mathbf{P_3}: f = \bar{a}\bar{c} + \bar{a}\bar{b}d\bar{e} + \bar{c}\bar{d}e + a\bar{b}c\bar{d} +$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	23	28	30	31
P_4		X		
P_5	X			
P_6		X	X	
P_7	X			X
P_8			X	X

P_6 dominates P_4

$\mathbf{P_3}: f = \bar{a}\bar{c} + \bar{a}\bar{b}d\bar{e} + \bar{c}\bar{d}e + a\bar{b}c\bar{d} +$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	23	28	30	31
P_5	X			
P_6		X	X	
P_7	X			X
P_8			X	X

$$\mathbf{P_3}: f = \bar{a}\bar{c} + \bar{a}\bar{b}d\bar{e} + \bar{c}\bar{d}e + a\bar{b}c\bar{d} +$$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	23	28	30	31
P_5	X			
P_6		X	X	
P_7	X			X
P_8			X	X

P_7 dominates P_5

$\mathbf{P_3}: f = \bar{a}\,\bar{c} + \bar{a}\,\bar{b}\,d\,\bar{e} + \bar{c}\,\bar{d}\,e + a\,\bar{b}\,c\,\bar{d} +$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	23	28	30	31
P_6		X	X	
P_7	X			X
P_8			X	X

$\mathbf{P_3}: f = \bar{a}\,\bar{c} + \bar{a}\,\bar{b}\,d\,\bar{e} + \bar{c}\,\bar{d}\,e + a\,\bar{b}\,c\,\bar{d} +$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	23	28	30	31
P_6		X	X	
P_7	X			X
P_8			X	X

23 dominates 31

$\mathbf{P_3}: f = \bar{a}\,\bar{c} + \bar{a}\,\bar{b}\,d\,\bar{e} + \bar{c}\,\bar{d}\,e + a\,\bar{b}\,c\,\bar{d} +$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	23	28	30
P_6		X	X
P_7	X		
P_8			X

$\mathbf{P_3}: f = \bar{a}\,\bar{c} + \bar{a}\,\bar{b}\,d\,\bar{e} + \bar{c}\,\bar{d}\,e + a\,\bar{b}\,c\,\bar{d} +$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	23	28	30
P_6		X	X
P_7	X		
P_8			X

P_6 dominates P_8

P$_3$: $f = \bar{a}\,\bar{c} + \bar{a}\,\bar{b}\,d\,\bar{e} + \bar{c}\,\bar{d}\,e + a\,\bar{b}\,c\,\bar{d} +$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	23	28	30
P_6		X	X
P_7	X		

$\mathbf{P_3} : f = \bar{a}\,\bar{c} + \bar{a}\,\bar{b}\,d\,\bar{e} + \bar{c}\,\bar{d}\,e + a\,\bar{b}\,c\,\bar{d} +$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	23	28	30
P_6		(X)	(X)
P_7	(X)		

P_6 and P_7 are essential cubes

$P_3 : f = \bar{a}\bar{c} + \bar{a}\bar{b}d\bar{e} + \bar{c}\bar{d}e + a\bar{b}c\bar{d} + abc\bar{e} + acde$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	20	21	23	28	30	31
P_4	X			X		
P_5		X	X			
P_6				X	X	
P_7			X			X
P_8					X	X

$\mathbf{\bar{P}_3}: f = \bar{a}\,\bar{c} + \bar{a}\,\bar{b}\,d\,\bar{e} + \bar{c}\,\bar{d}\,e +$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	20	21	23	28	30	31
P_4	(X)			X		
P_5		X	X			
P_6				X	X	
P_7			X			X
P_8					X	X

$\mathbf{\bar{P}_3} : f = \bar{a}\,\bar{c} + \bar{a}\,\bar{b}\,d\,\bar{e} + \bar{c}\,\bar{d}\,e +$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	20	21	23	28	30	31
P_4	(X)			X		
P_5		X	X			
P_6				X	X	
P_7			X			X
P_8					X	X

P_4 is an essential cube

$\bar{P_3} : f = \bar{a}\,\bar{c} + \bar{a}\,\bar{b}\,d\,\bar{e} + \bar{c}\,\bar{d}\,e + a\,c\,\bar{d}\,\bar{e} +$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	21	23	30	31
P_5	X	X		
P_6			X	
P_7		X		X
P_8			X	X

$$\mathbf{\bar{P}_3} : f = \bar{a}\,\bar{c} + \bar{a}\,\bar{b}\,d\,\bar{e} + \bar{c}\,\bar{d}\,e + a\,c\,\bar{d}\,\bar{e} +$$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	21	23	30	31
P_5	(X)	X		
P_6			X	
P_7		X		X
P_8			X	X

$\bar{P_3} : f = \bar{a}\,\bar{c} + \bar{a}\,\bar{b}\,d\,\bar{e} + \bar{c}\,\bar{d}\,e + a\,c\,\bar{d}\,\bar{e} +$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	21	23	30	31
P_5	(X)	X		
P_6			X	
P_7		X		X
P_8			X	X

P_5 is an essential cube

$\bar{P}_3 : f = \bar{a}\,\bar{c} + \bar{a}\,\bar{b}\,d\,\bar{e} + \bar{c}\,\bar{d}\,e + a\,c\,\bar{d}\,\bar{e} + a\,\bar{b}\,c\,e +$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	30	31
P_6	X	
P_7		X
P_8	X	X

$\mathbf{\bar{P}_3}: f = \bar{a}\bar{c} + \bar{a}\bar{b}d\bar{e} + \bar{c}\bar{d}e + ac\bar{d}\bar{e} + a\bar{b}ce +$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	30	31
P_6	X	
P_7		X
P_8	X	X

P_8 dominates P_6 and P_7

$\mathbf{\bar{P}_3}$: $f = \bar{a}\,\bar{c} + \bar{a}\,\bar{b}\,d\,\bar{e} + \bar{c}\,\bar{d}\,e + a\,c\,\bar{d}\,\bar{e} +$

$f(a,b,c,d,e) = \sum_m (0,1,2,3,6,8,9,10,11,17,20,21,23,25,28,30,31)$

PIs	30	31
P_8	(X)	(X)

P_8 is an essential cube

$\mathbf{\bar{P}_3}: f = \bar{a}\,\bar{c} + \bar{a}\,\bar{b}\,d\,\bar{e} + \bar{c}\,\bar{d}\,e + a\,c\,\bar{d}\,\bar{e} + a\,\bar{b}\,c\,e + a\,b\,c\,d$

$\mathbf{P_3}: f = \bar{a}\,\bar{c} + \bar{a}\,\bar{b}\,d\,\bar{e} + \bar{c}\,\bar{d}\,e + a\,\bar{b}\,c\,\bar{d} + a\,b\,c\,\bar{e} + a\,c\,d\,e$

Both decisions lead to (distinct) solutions of the same cost