ATIAM

PARCOURS DU MASTER SCIENCES ET TECHNOLOGIES
UPMC • IRCAM • TELECOM PARISTECH

LE CONTINUUM DES GAMMES

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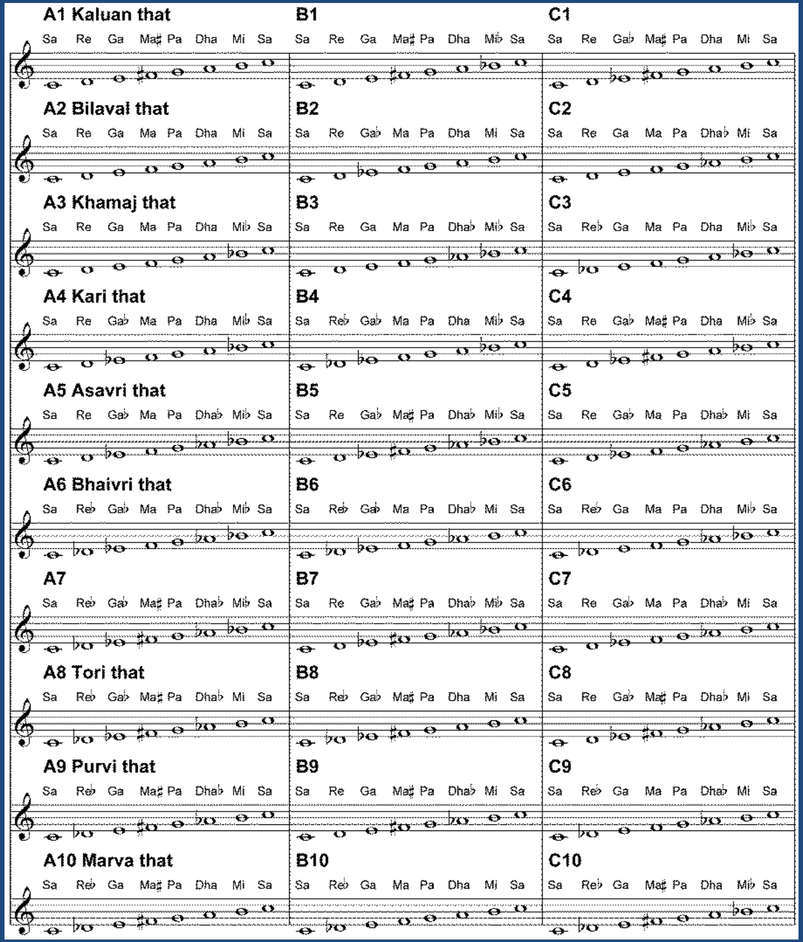
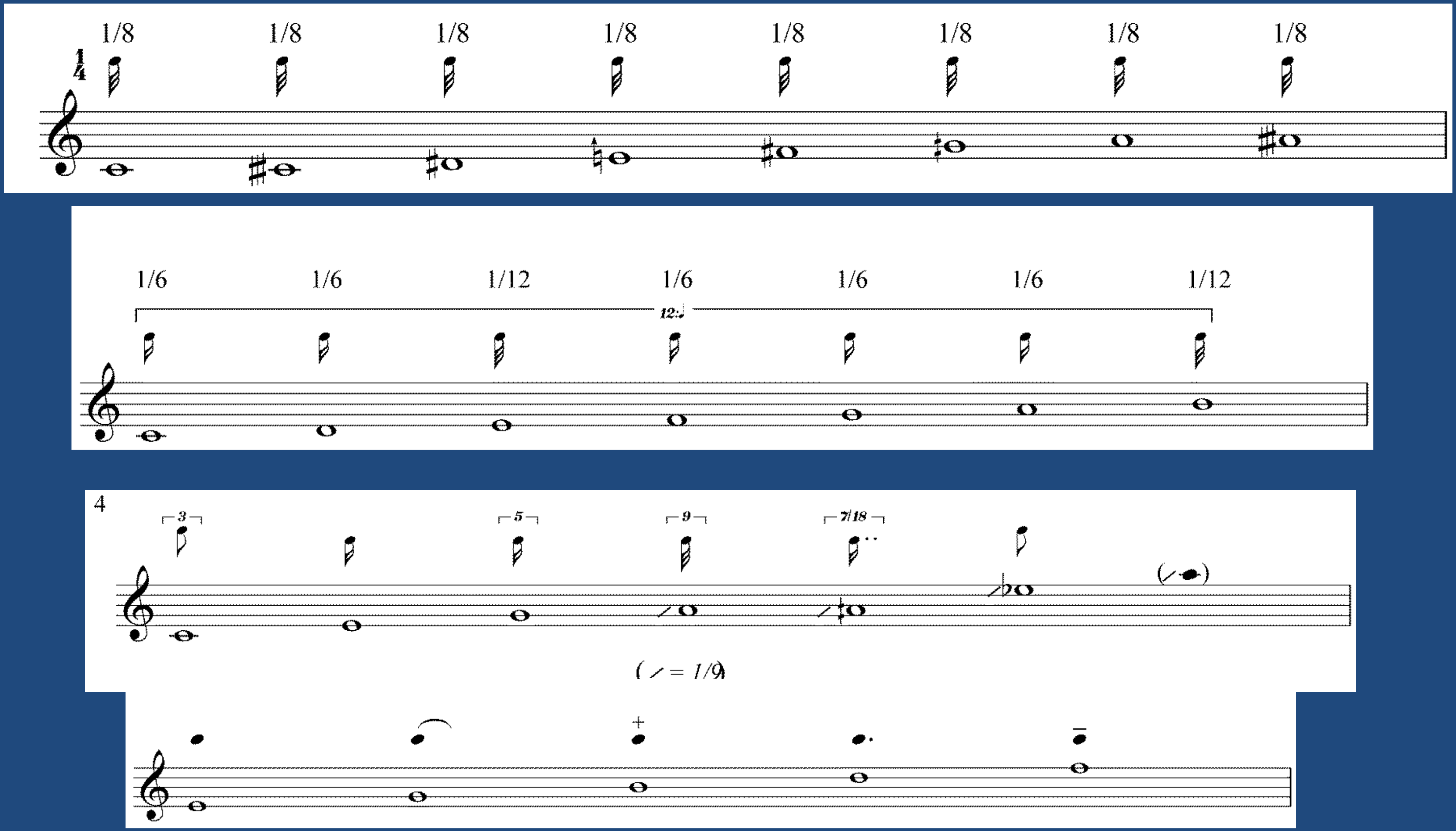
Universidad Nacional
Autónoma de México
UNAM

30 THATS, MUSIQUE DU NORD DE L’INDE

NAZIR JAIRAZBHOY (1927-2009) : permutohèdres

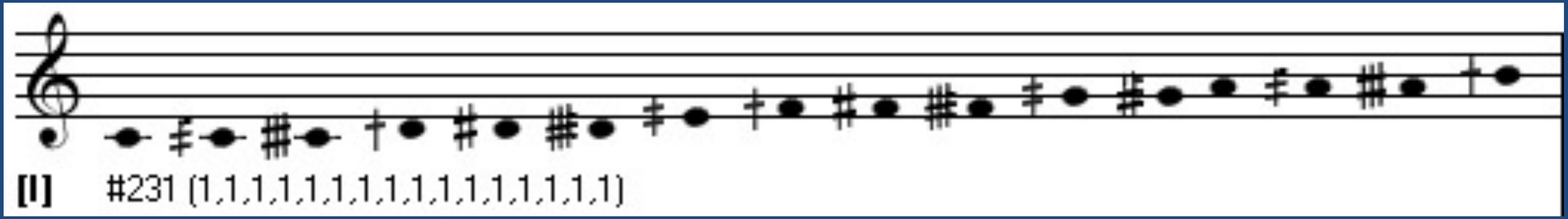

A1 Kaluan that
Sa Re Ga Ma♯ Pa Dha Mi Sa
B1
Sa Re Ga Ma♯ Pa Dha Mi♭ Sa
C1
Sa Re Ga♭ Ma♯ Pa Dha Mi Sa
A2 Bilaval that
Sa Re Ga Ma Pa Dha Mi Sa
B2
Sa Re Ga♭ Ma Pa Dha Mi Sa
C2
Sa Re Ga Ma Pa Dha♭ Mi Sa
A3 Khamaj that
Sa Re Ga Ma Pa Dha Mi♭ Sa
B3
Sa Re Ga Ma Pa Dha♭ Mi♭ Sa
C3
Sa Re♭ Ga Ma Pa Dha Mi♭ Sa
A4 Kari that
Sa Re Ga♭ Ma Pa Dha Mi♭ Sa
B4
Sa Re♭ Ga♭ Ma Pa Dha Mi♭ Sa
C4
Sa Re Ga♭ Ma♯ Pa Dha Mi♭ Sa
A5 Asavri that
Sa Re Ga♭ Ma Pa Dha♭ Mi♭ Sa
B5
Sa Re Ga♭ Ma♯ Pa Dha♭ Mi♭ Sa
C5
Sa Re Ga♭ Ma Pa Dha♭ Mi Sa
A6 Bhaivri that
Sa Re♭ Ga♭ Ma Pa Dha♭ Mi♭ Sa
B6
Sa Re♭ Ga♭ Ma Pa Dha♭ Mi Sa
C6
Sa Re♭ Ga Ma Pa Dha Mi♭ Sa
A7
Sa Re♭ Ga♭ Ma♯ Pa Dha♭ Mi♭ Sa
B7
Sa Re Ga♭ Ma♯ Pa Dha♭ Mi♭ Sa
C7
Sa Re Ga♭ Ma Pa Dha♭ Mi Sa
A8 Tori that
Sa Re♭ Ga♭ Ma♯ Pa Dha♭ Mi Sa
B8
Sa Re♭ Ga♭ Ma♯ Pa Dha Mi Sa
C8
Sa Re Ga♭ Ma♯ Pa Dha♭ Mi Sa
A9 Purvi that
Sa Re♭ Ga Ma♯ Pa Dha♭ Mi Sa
B9
Sa Re Ga Ma♯ Pa Dha♭ Mi Sa
C9
Sa Re♭ Ga Ma Pa Dha♭ Mi Sa
A10 Marva that
Sa Re♭ Ga Ma♯ Pa Dha Mi Sa
B10
Sa Re♭ Ga Ma Pa Dha Mi Sa
C10
Sa Re♭ Ga Ma♯ Pa Dha Mi♭ Sa

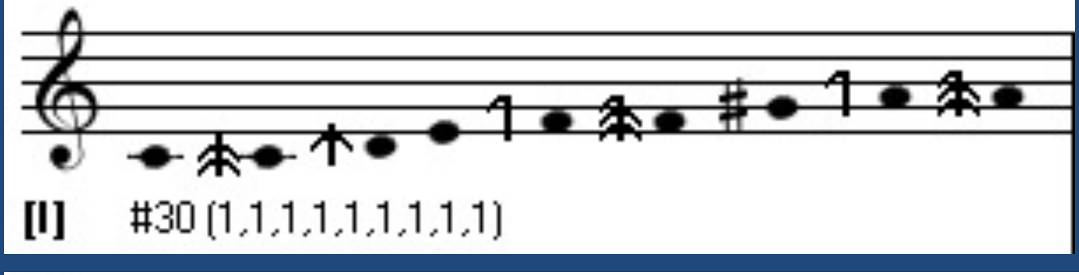
TYPES DE GAMMES (rythme et son), exemples :
1/8 ton, diatonique, non octaviante, hauteurs relatives

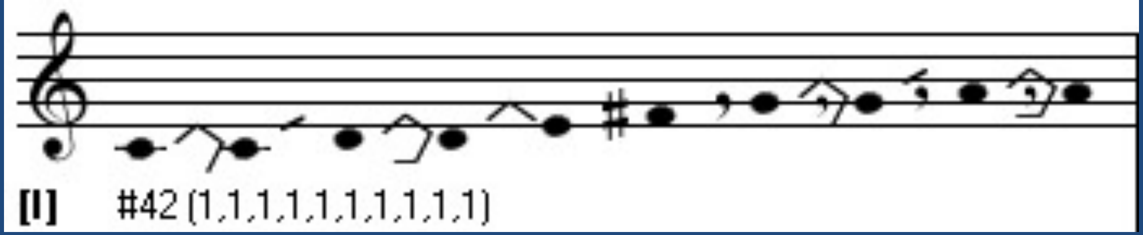


1/8 1/8 1/8 1/8 1/8 1/8 1/8 1/8
1/6 1/6 1/12 1/6 1/6 1/6 1/12
12:♩
4
3
5
9
7/18
(⁄ = 1/9)

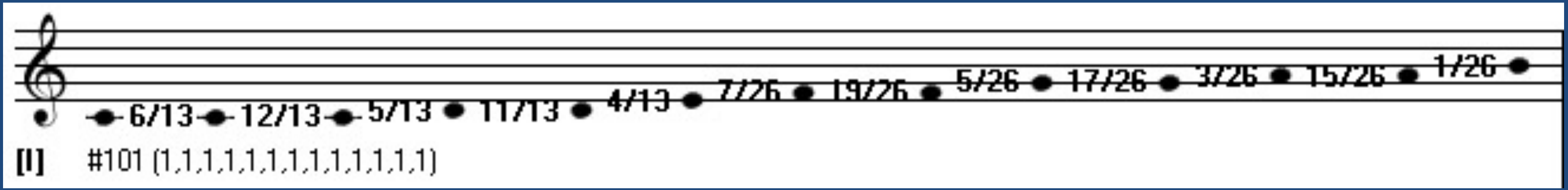
GAMMES (D) ENTRE 3 ET 24 TERMES
NOTATION EN BASE 2, 3, 5
exemples : D16, D9, D10


[I]
#231 (1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1)

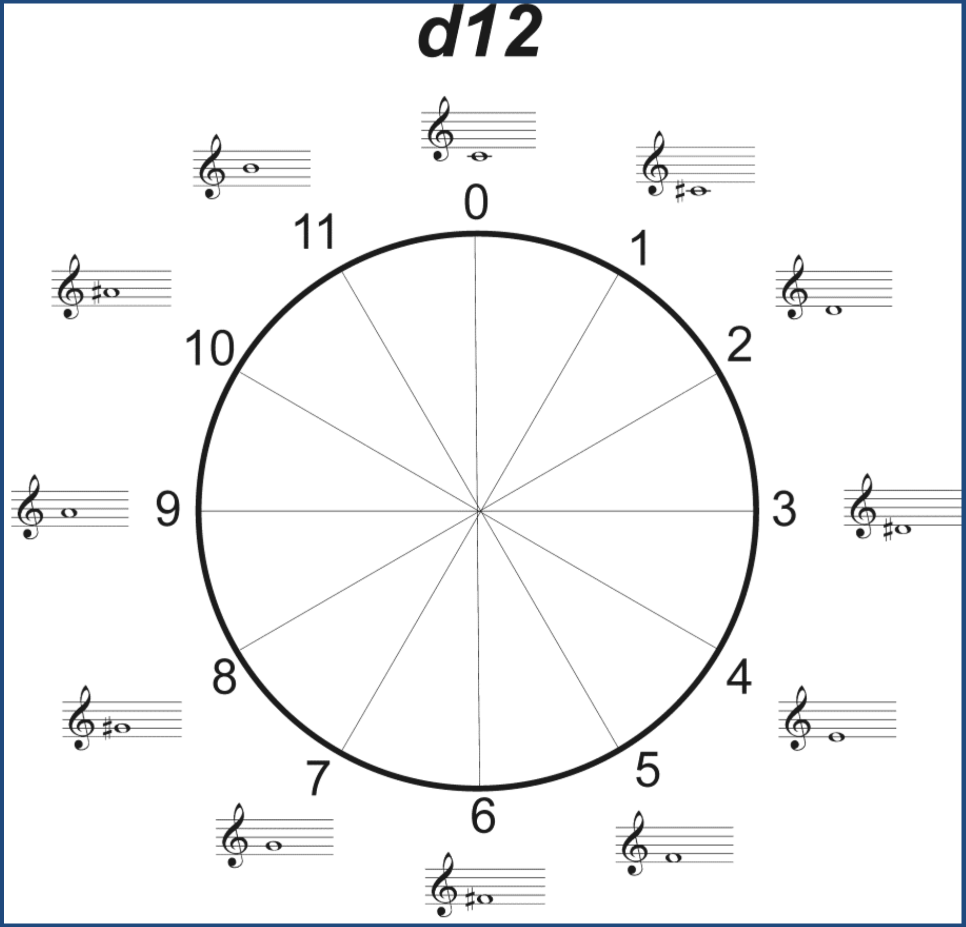

[I]
#30 (1,1,1,1,1,1,1,1,1)


[I]
#42 (1,1,1,1,1,1,1,1,1,1)

NOTATION EN FRACTIONS DE TON
exemple : D13

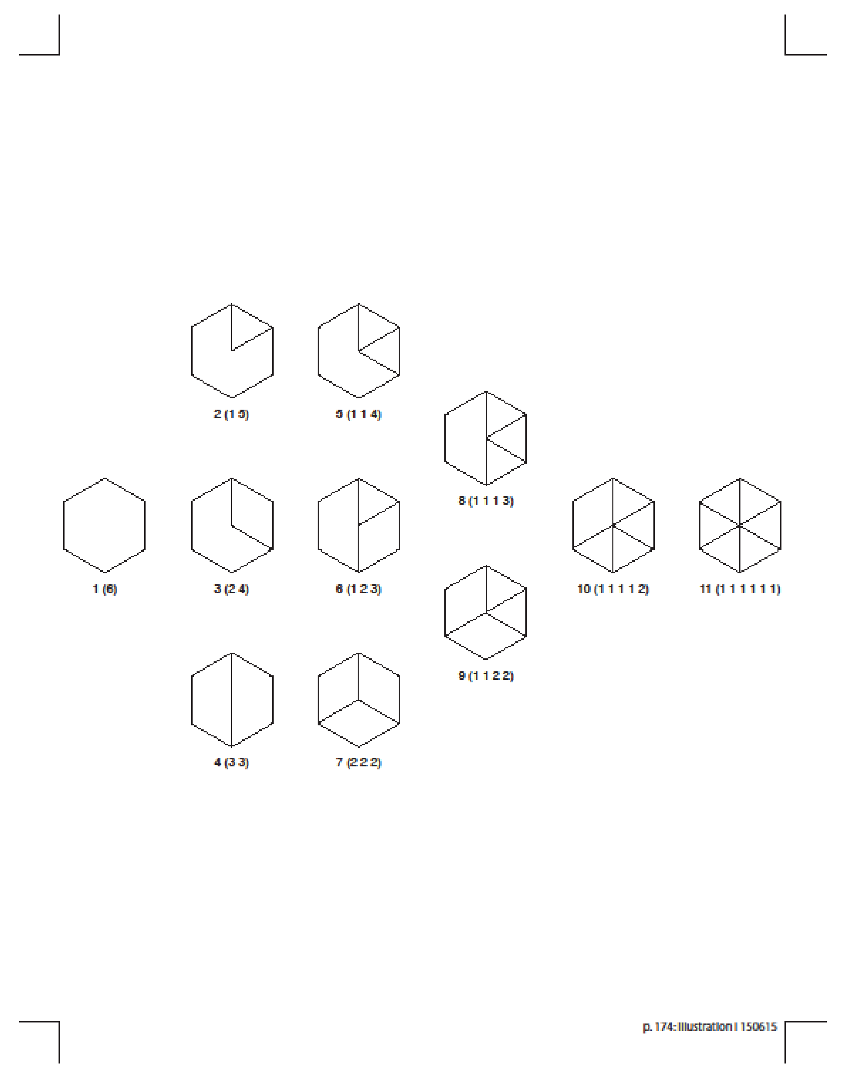

6/13
12/13
5/13
11/13
4/13
7/26
19/26
5/26
17/26
3/26
15/26
1/26
[I]
#101 (1,1,1,1,1,1,1,1,1,1,1,1,1)

REPRÉSENTATION CYCLIQUE
GAMME DE DOUZE SONS, D12


d12
0
1
2
3
4
5
6
7
8
9
10
11

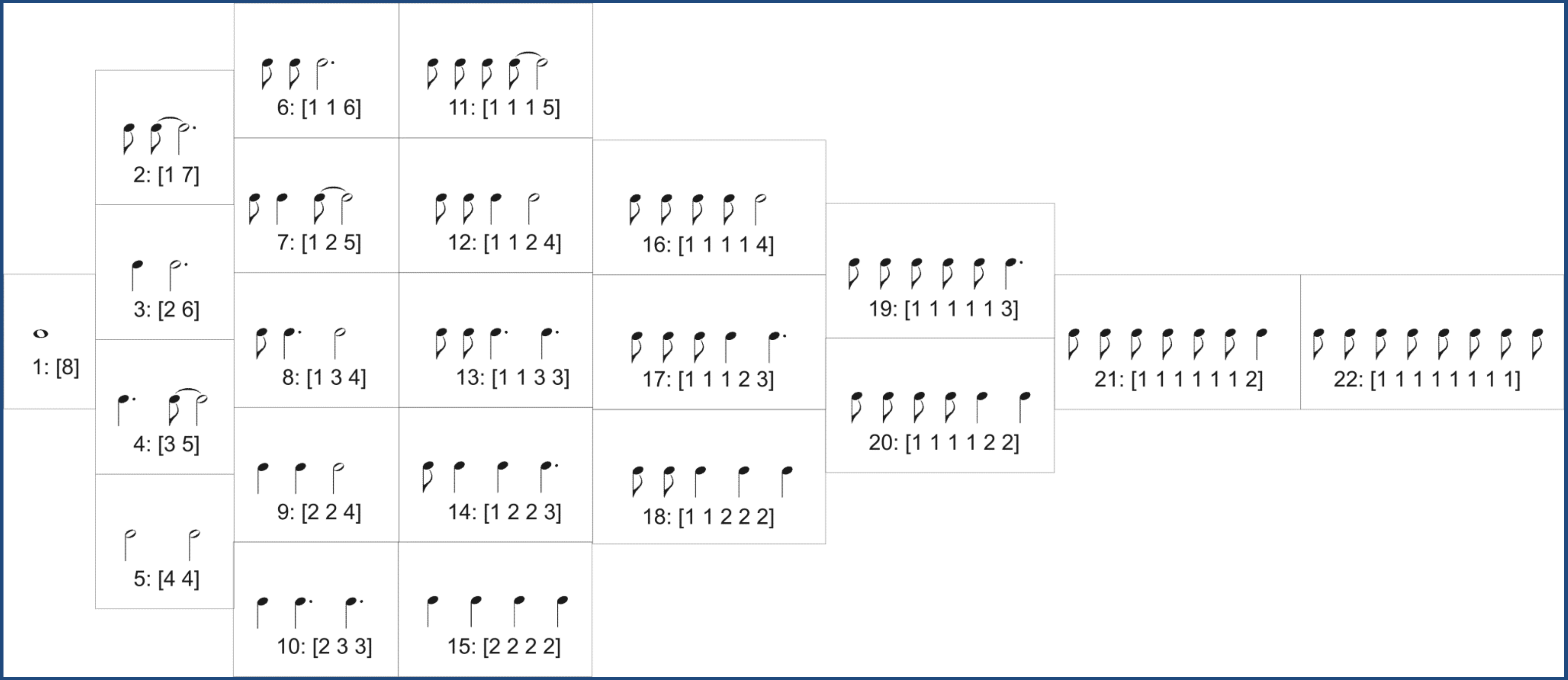
PARTITIONS DE L'INTERVALLE DE DUPLICATION INTERVALLES DE HAUTEUR (OU AUTRE INTERVALLE) , OU DE DURÉE

exemple : gamme de six termes D6

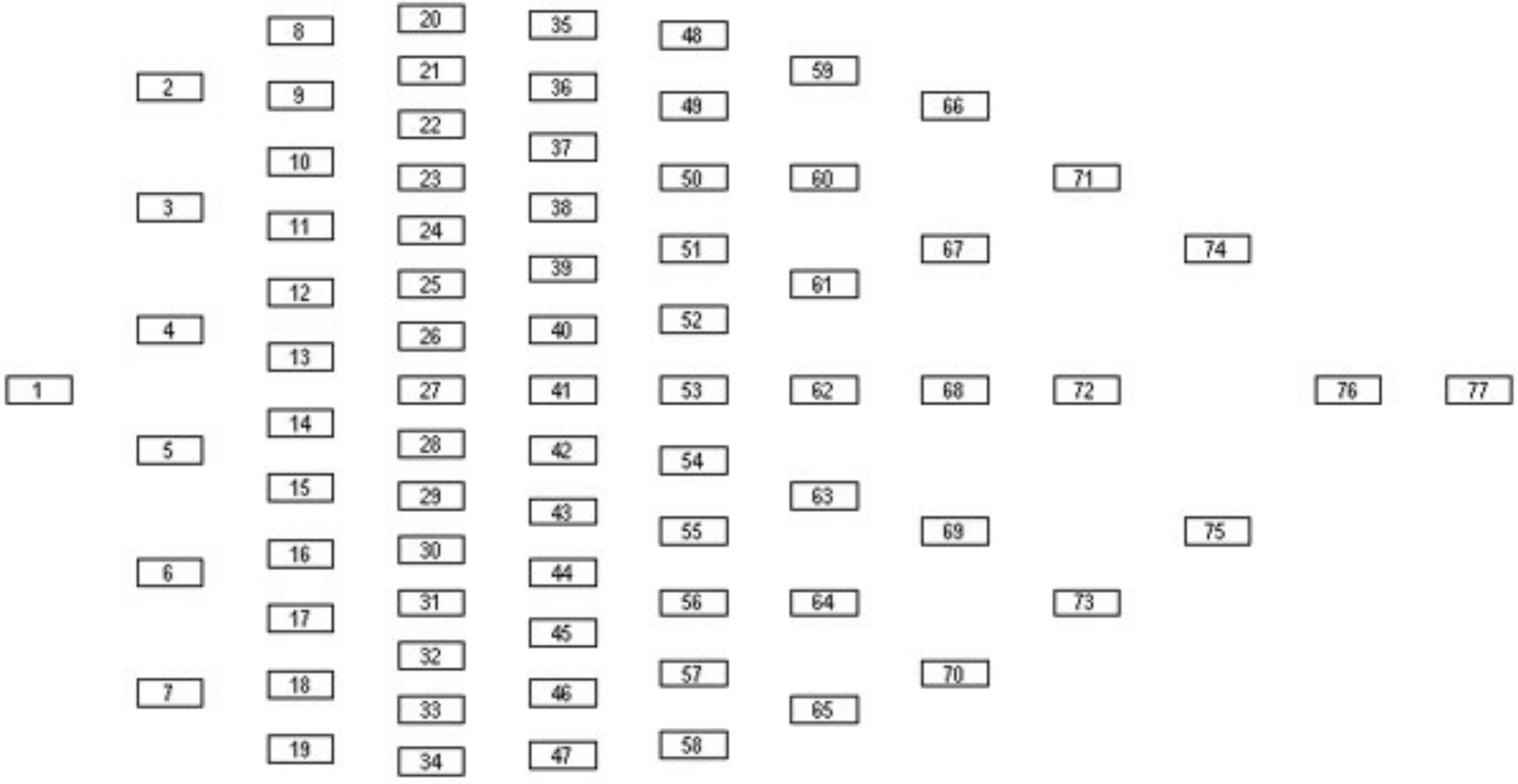

2 (1 5)
5 (1 1 4)
8 (1 1 1 3)
1 (6)
3 (2 4)
6 (1 2 3)
10 (1 1 1 1 2)
11 (1 1 1 1 1 1)
9 (1 1 2 2)
4 (3 3)
7 (2 2 2)

p. 174:Illustration I 150615

POTENTIEL COMBINATOIRE, GAMME DE DURÉES
exemple : D8, 22 IDENTITÉS D'INTERVALLES


1: [8]
2: [1 7]
3: [2 6]
4: [3 5]
5: [4 4]
6: [1 1 6]
7: [1 2 5]
8: [1 3 4]
9: [2 2 4]
10: [2 3 3]
11: [1 1 1 5]
12: [1 1 2 4]
13: [1 1 3 3]
14: [1 2 2 3]
15: [2 2 2 2]
16: [1 1 1 1 4]
17: [1 1 1 2 3]
18: [1 1 2 2 2]
19: [1 1 1 1 1 3]
20: [1 1 1 1 2 2]
21: [1 1 1 1 1 1 2]
22: [1 1 1 1 1 1 1 1]

D12 : 77 IDENTITÉS (rythme ou son)
DE 1 TERME À 12 TERMES


1
2
3
4
5
6
7
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9
10
11
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13
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15
16
17
18
19
20
21
22
23
24
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40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
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66
67
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72
73
74
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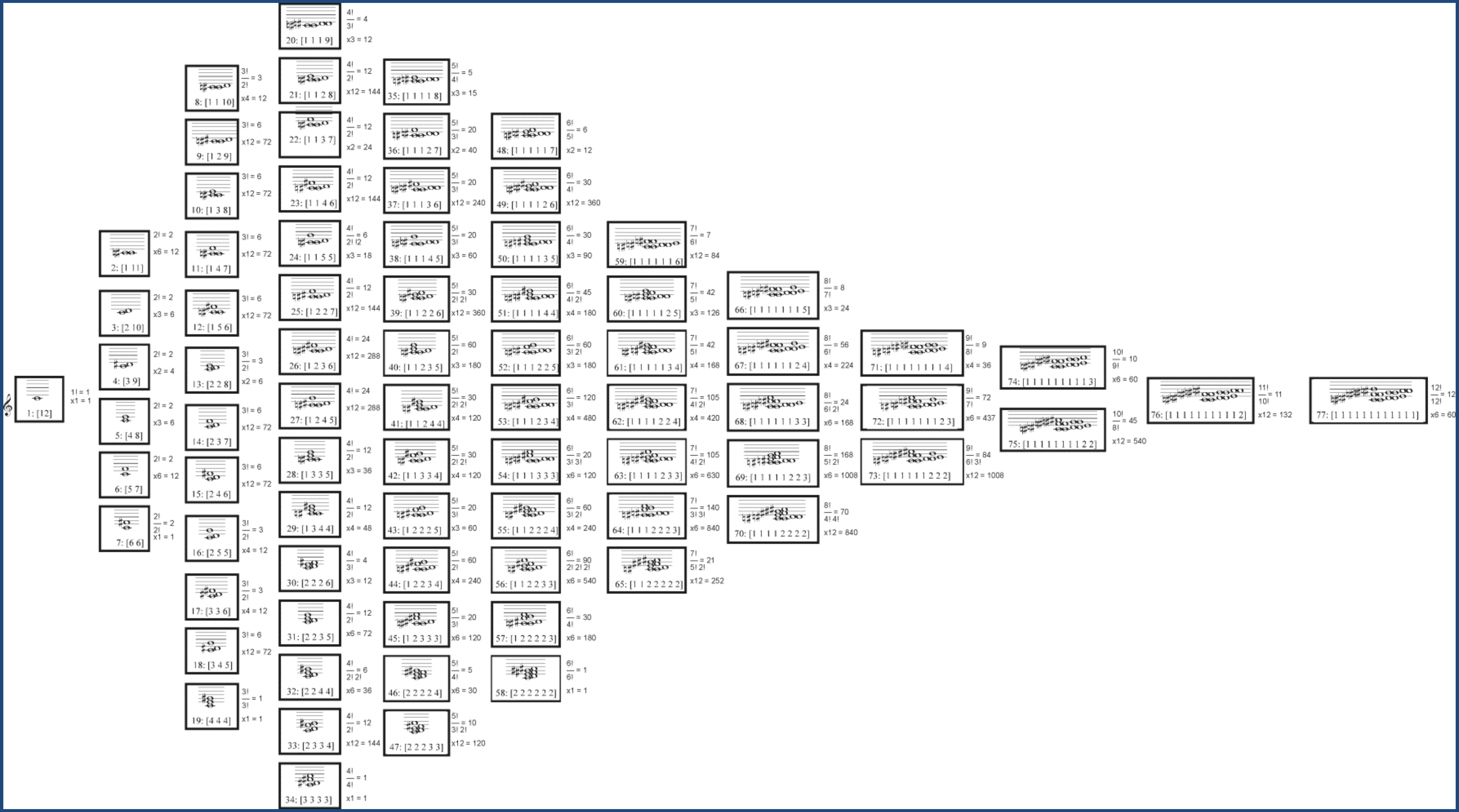
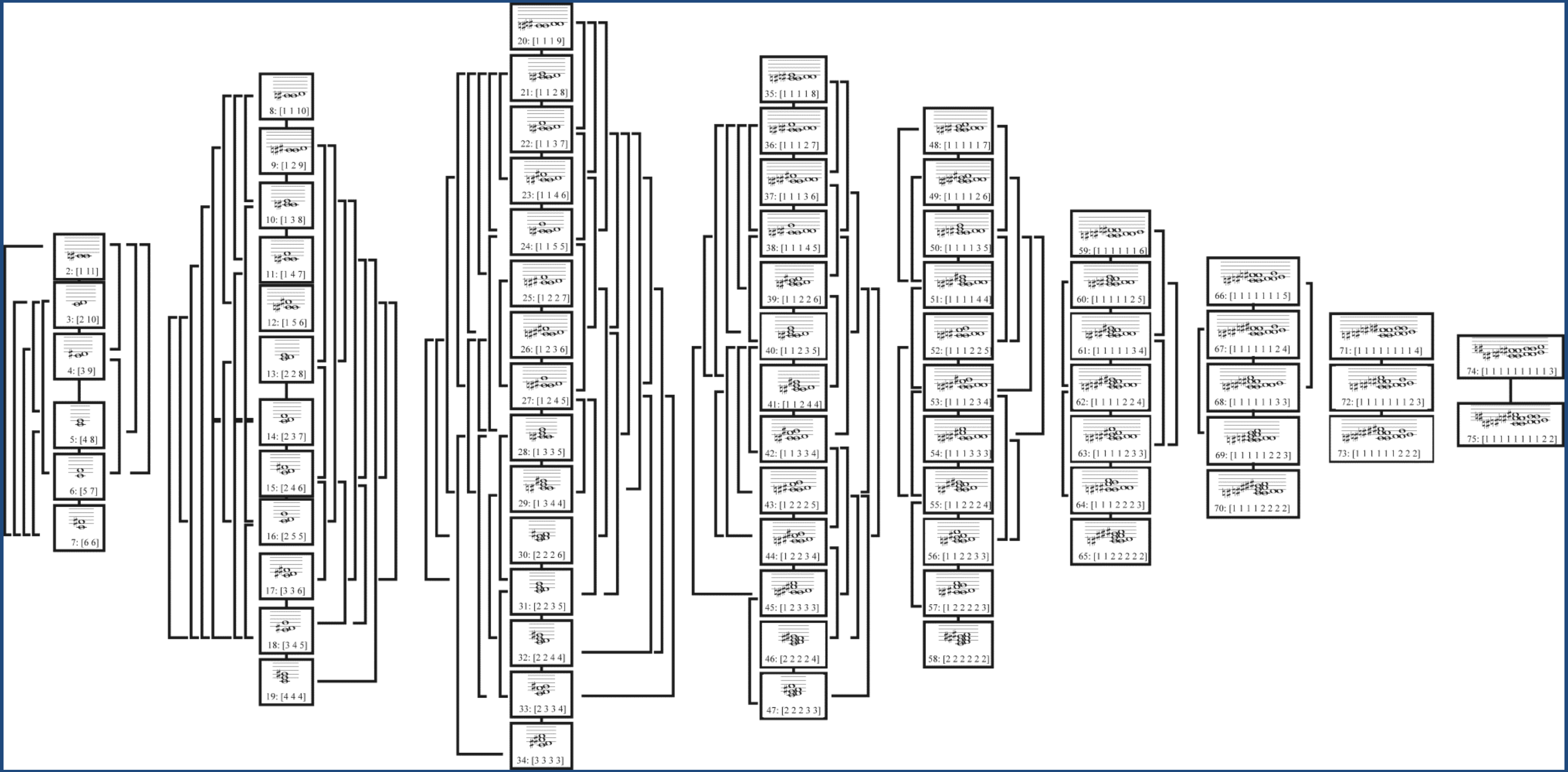
76
77

D12 : POTENTIEL COMBINATOIRE
77 IDENTITÉS D’INTERVALLES

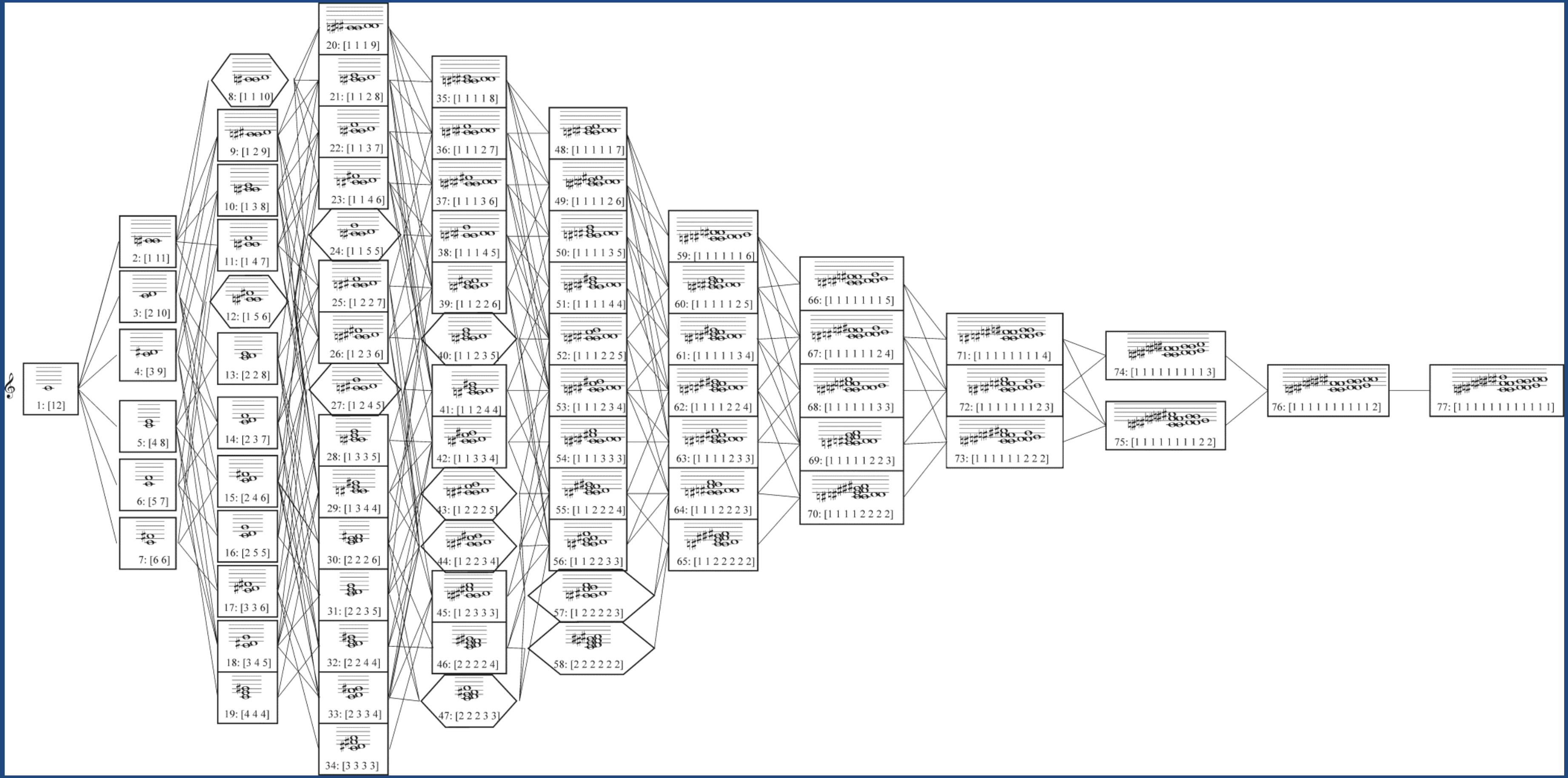

1: [12]
1! = 1
x1 = 1
2: [1 11]
2! = 2
x6 = 12
3: [2 10]
2! = 2
x3 = 6
4: [3 9]
2! = 2
x2 = 4
5: [4 8]
2! = 2
x3 = 6
6: [5 7]
2! = 2
x6 = 12
7: [6 6]
$\frac{2!}{2!} = 2$
x1 = 1
8: [1 1 10]
$\frac{3!}{2!} = 3$
x4 = 12
9: [1 2 9]
3! = 6
x12 = 72
10: [1 3 8]
3! = 6
x12 = 72
11: [1 4 7]
3! = 6
x12 = 72
12: [1 5 6]
3! = 6
x12 = 72
13: [2 2 8]
$\frac{3!}{2!} = 3$
x2 = 6
14: [2 3 7]
3! = 6
x12 = 72
15: [2 4 6]
3! = 6
x12 = 72
16: [2 5 5]
$\frac{3!}{2!} = 3$
x4 = 12
17: [3 3 6]
$\frac{3!}{2!} = 3$
x4 = 12
18: [3 4 5]
3! = 6
x12 = 72
19: [4 4 4]
$\frac{3!}{3!} = 1$
x1 = 1
20: [1 1 1 9]
$\frac{4!}{3!} = 4$
x3 = 12
21: [1 1 2 8]
$\frac{4!}{2!} = 12$
x12 = 144
22: [1 1 3 7]
$\frac{4!}{2!} = 12$
x2 = 24
23: [1 1 4 6]
$\frac{4!}{2!} = 12$
x12 = 144
24: [1 1 5 5]
$\frac{4!}{2!\,!2} = 6$
x3 = 18
25: [1 2 2 7]
$\frac{4!}{2!} = 12$
x12 = 144
26: [1 2 3 6]
4! = 24
x12 = 288
27: [1 2 4 5]
4! = 24
x12 = 288
28: [1 3 3 5]
$\frac{4!}{2!} = 12$
x3 = 36
29: [1 3 4 4]
$\frac{4!}{2!} = 12$
x4 = 48
30: [2 2 2 6]
$\frac{4!}{3!} = 4$
x3 = 12
31: [2 2 3 5]
$\frac{4!}{2!} = 12$
x6 = 72
32: [2 2 4 4]
$\frac{4!}{2!\,2!} = 6$
x6 = 36
33: [2 3 3 4]
$\frac{4!}{2!} = 12$
x12 = 144
34: [3 3 3 3]
$\frac{4!}{4!} = 1$
x1 = 1
35: [1 1 1 1 8]
$\frac{5!}{4!} = 5$
x3 = 15
36: [1 1 1 2 7]
$\frac{5!}{3!} = 20$
x2 = 40
37: [1 1 1 3 6]
$\frac{5!}{3!} = 20$
x12 = 240
38: [1 1 1 4 5]
$\frac{5!}{3!} = 20$
x3 = 60
39: [1 1 2 2 6]
$\frac{5!}{2!\,2!} = 30$
x12 = 360
40: [1 1 2 3 5]
$\frac{5!}{2!} = 60$
x3 = 180
41: [1 1 2 4 4]
$\frac{5!}{2!\,2!} = 30$
x4 = 120
42: [1 1 3 3 4]
$\frac{5!}{2!\,2!} = 30$
x4 = 120
43: [1 2 2 2 5]
$\frac{5!}{3!} = 20$
x3 = 60
44: [1 2 2 3 4]
$\frac{5!}{2!} = 60$
x4 = 240
45: [1 2 3 3 3]
$\frac{5!}{3!} = 20$
x6 = 120
46: [2 2 2 2 4]
$\frac{5!}{4!} = 5$
x6 = 30
47: [2 2 2 3 3]
$\frac{5!}{3!\,2!} = 10$
x12 = 120
48: [1 1 1 1 1 7]
$\frac{6!}{5!} = 6$
x2 = 12
49: [1 1 1 1 2 6]
$\frac{6!}{4!} = 30$
x12 = 360
50: [1 1 1 1 3 5]
$\frac{6!}{4!} = 30$
x3 = 90
51: [1 1 1 1 4 4]
$\frac{6!}{4!\,2!} = 45$
x4 = 180
52: [1 1 1 2 2 5]
$\frac{6!}{3!\,2!} = 60$
x3 = 180
53: [1 1 1 2 3 4]
$\frac{6!}{3!} = 120$
x4 = 480
54: [1 1 1 3 3 3]
$\frac{6!}{3!\,3!} = 20$
x6 = 120
55: [1 1 2 2 2 4]
$\frac{6!}{3!\,2!} = 60$
x4 = 240
56: [1 1 2 2 3 3]
$\frac{6!}{2!\,2!\,2!} = 90$
x6 = 540
57: [1 2 2 2 2 3]
$\frac{6!}{4!} = 30$
x6 = 180
58: [2 2 2 2 2 2]
$\frac{6!}{6!} = 1$
x1 = 1
59: [1 1 1 1 1 1 6]
$\frac{7!}{6!} = 7$
x12 = 84
60: [1 1 1 1 1 2 5]
$\frac{7!}{5!} = 42$
x3 = 126
61: [1 1 1 1 1 3 4]
$\frac{7!}{5!} = 42$
x4 = 168
62: [1 1 1 1 2 2 4]
$\frac{7!}{4!\,2!} = 105$
x4 = 420
63: [1 1 1 1 2 3 3]
$\frac{7!}{4!\,2!} = 105$
x6 = 630
64: [1 1 1 2 2 2 3]
$\frac{7!}{3!\,3!} = 140$
x6 = 840
65: [1 1 2 2 2 2 2]
$\frac{7!}{5!\,2!} = 21$
x12 = 252
66: [1 1 1 1 1 1 1 5]
$\frac{8!}{7!} = 8$
x3 = 24
67: [1 1 1 1 1 1 2 4]
$\frac{8!}{6!} = 56$
x4 = 224
68: [1 1 1 1 1 1 3 3]
$\frac{8!}{6!\,2!} = 24$
x6 = 168
69: [1 1 1 1 1 2 2 3]
$\frac{8!}{5!\,2!} = 168$
x6 = 1008
70: [1 1 1 1 2 2 2 2]
$\frac{8!}{4!\,4!} = 70$
x12 = 840
71: [1 1 1 1 1 1 1 1 4]
$\frac{9!}{8!} = 9$
x4 = 36
72: [1 1 1 1 1 1 1 2 3]
$\frac{9!}{7!} = 72$
x6 = 437
73: [1 1 1 1 1 1 2 2 2]
$\frac{9!}{6!\,3!} = 84$
x12 = 1008
74: [1 1 1 1 1 1 1 1 1 3]
$\frac{10!}{9!} = 10$
x6 = 60
75: [1 1 1 1 1 1 1 1 2 2]
$\frac{10!}{8!} = 45$
x12 = 540
76: [1 1 1 1 1 1 1 1 1 1 2]
$\frac{11!}{10!} = 11$
x12 = 132
77: [1 1 1 1 1 1 1 1 1 1 1 1]
$\frac{12!}{12!} = 12$
x6 = 60

RÉSEAU VERTICALE ENTRE IDENTITÉS
D12 : 75 identités à distance *d1*


2: [1 11]
3: [2 10]
4: [3 9]
5: [4 8]
6: [5 7]
7: [6 6]
8: [1 1 10]
9: [1 2 9]
10: [1 3 8]
11: [1 4 7]
12: [1 5 6]
13: [2 2 8]
14: [2 3 7]
15: [2 4 6]
16: [2 5 5]
17: [3 3 6]
18: [3 4 5]
19: [4 4 4]
20: [1 1 1 9]
21: [1 1 2 8]
22: [1 1 3 7]
23: [1 1 4 6]
24: [1 1 5 5]
25: [1 2 2 7]
26: [1 2 3 6]
27: [1 2 4 5]
28: [1 3 3 5]
29: [1 3 4 4]
30: [2 2 2 6]
31: [2 2 3 5]
32: [2 2 4 4]
33: [2 3 3 4]
34: [3 3 3 3]
35: [1 1 1 1 8]
36: [1 1 1 2 7]
37: [1 1 1 3 6]
38: [1 1 1 4 5]
39: [1 1 2 2 6]
40: [1 1 2 3 5]
41: [1 1 2 4 4]
42: [1 1 3 3 4]
43: [1 2 2 2 5]
44: [1 2 2 3 4]
45: [1 2 3 3 3]
46: [2 2 2 2 4]
47: [2 2 2 3 3]
48: [1 1 1 1 1 7]
49: [1 1 1 1 2 6]
50: [1 1 1 1 3 5]
51: [1 1 1 1 4 4]
52: [1 1 1 2 2 5]
53: [1 1 1 2 3 4]
54: [1 1 1 3 3 3]
55: [1 1 2 2 2 4]
56: [1 1 2 2 3 3]
57: [1 2 2 2 2 3]
58: [2 2 2 2 2 2]
59: [1 1 1 1 1 1 6]
60: [1 1 1 1 1 2 5]
61: [1 1 1 1 1 3 4]
62: [1 1 1 1 2 2 4]
63: [1 1 1 1 2 3 3]
64: [1 1 1 2 2 2 3]
65: [1 1 2 2 2 2 2]
66: [1 1 1 1 1 1 1 5]
67: [1 1 1 1 1 1 2 4]
68: [1 1 1 1 1 1 3 3]
69: [1 1 1 1 1 2 2 3]
70: [1 1 1 1 2 2 2 2]
71: [1 1 1 1 1 1 1 1 4]
72: [1 1 1 1 1 1 1 2 3]
73: [1 1 1 1 1 1 2 2 2]
74: [1 1 1 1 1 1 1 1 1 3]
75: [1 1 1 1 1 1 1 1 2 2]

RÉSEAU HORIZONTALE ENTRE IDENTITÉS

D12 : 77 identités à distance *d1*


1: [12]
2: [1 11]
3: [2 10]
4: [3 9]
5: [4 8]
6: [5 7]
7: [6 6]
8: [1 1 10]
9: [1 2 9]
10: [1 3 8]
11: [1 4 7]
12: [1 5 6]
13: [2 2 8]
14: [2 3 7]
15: [2 4 6]
16: [2 5 5]
17: [3 3 6]
18: [3 4 5]
19: [4 4 4]
20: [1 1 1 9]
21: [1 1 2 8]
22: [1 1 3 7]
23: [1 1 4 6]
24: [1 1 5 5]
25: [1 2 2 7]
26: [1 2 3 6]
27: [1 2 4 5]
28: [1 3 3 5]
29: [1 3 4 4]
30: [2 2 2 6]
31: [2 2 3 5]
32: [2 2 4 4]
33: [2 3 3 4]
34: [3 3 3 3]
35: [1 1 1 1 8]
36: [1 1 1 2 7]
37: [1 1 1 3 6]
38: [1 1 1 4 5]
39: [1 1 2 2 6]
40: [1 1 2 3 5]
41: [1 1 2 4 4]
42: [1 1 3 3 4]
43: [1 2 2 2 5]
44: [1 2 2 3 4]
45: [1 2 3 3 3]
46: [2 2 2 2 4]
47: [2 2 2 3 3]
48: [1 1 1 1 1 7]
49: [1 1 1 1 2 6]
50: [1 1 1 1 3 5]
51: [1 1 1 1 4 4]
52: [1 1 1 2 2 5]
53: [1 1 1 2 3 4]
54: [1 1 1 3 3 3]
55: [1 1 2 2 2 4]
56: [1 1 2 2 3 3]
57: [1 2 2 2 2 3]
58: [2 2 2 2 2 2]
59: [1 1 1 1 1 1 6]
60: [1 1 1 1 1 2 5]
61: [1 1 1 1 1 3 4]
62: [1 1 1 1 2 2 4]
63: [1 1 1 1 2 3 3]
64: [1 1 1 2 2 2 3]
65: [1 1 2 2 2 2 2]
66: [1 1 1 1 1 1 1 5]
67: [1 1 1 1 1 1 2 4]
68: [1 1 1 1 1 1 3 3]
69: [1 1 1 1 1 2 2 3]
70: [1 1 1 1 2 2 2 2]
71: [1 1 1 1 1 1 1 1 4]
72: [1 1 1 1 1 1 1 2 3]
73: [1 1 1 1 1 1 2 2 2]
74: [1 1 1 1 1 1 1 1 1 3]
75: [1 1 1 1 1 1 1 1 2 2]
76: [1 1 1 1 1 1 1 1 1 1 2]
77: [1 1 1 1 1 1 1 1 1 1 1 1]

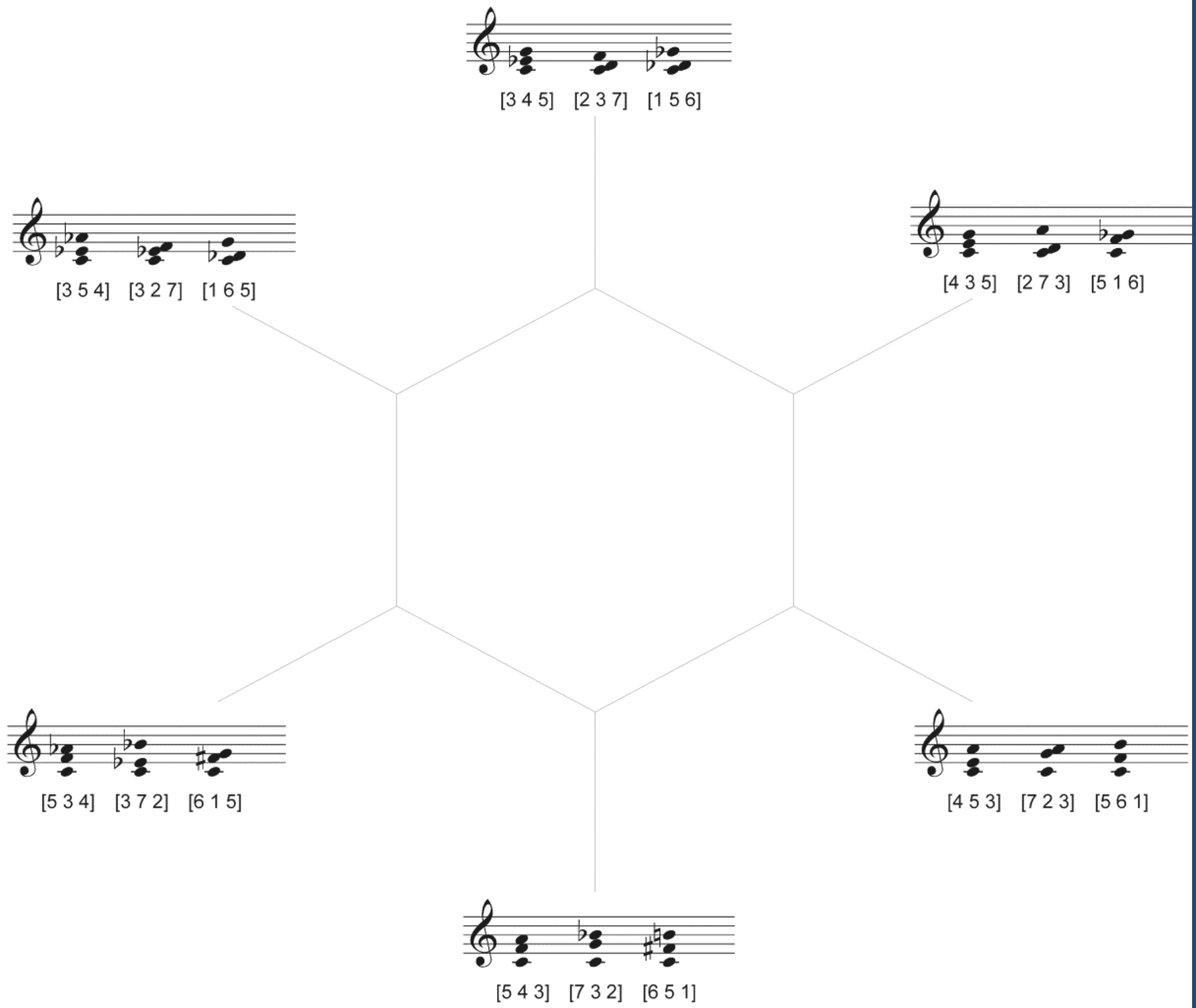
TRANSITIONS CONTINUES À DISTANCE MINIMALE *d1*

- ***permutation*** **: (1,4) *d1* (4,1)**
- ***substitution*** : **(1,4) *d1* (2,3)**
- ***partition*** : **(5) *d1* (1,4)**
- ***fusion*** : **(1,4) *d1* (5)**
- ***addition*** d’unité minimale : **(1,4) *d1* (2,4)**
- ***soustraction*** d’unité minimale : **(2,4) *d1* (1,4)**
- ***division*** d’intervalles : **(4,4,4) *d1* (2,2,2)**
- ***multiplication*** d’intervalles : **(1,2,3) *d1* (2,4,6)**

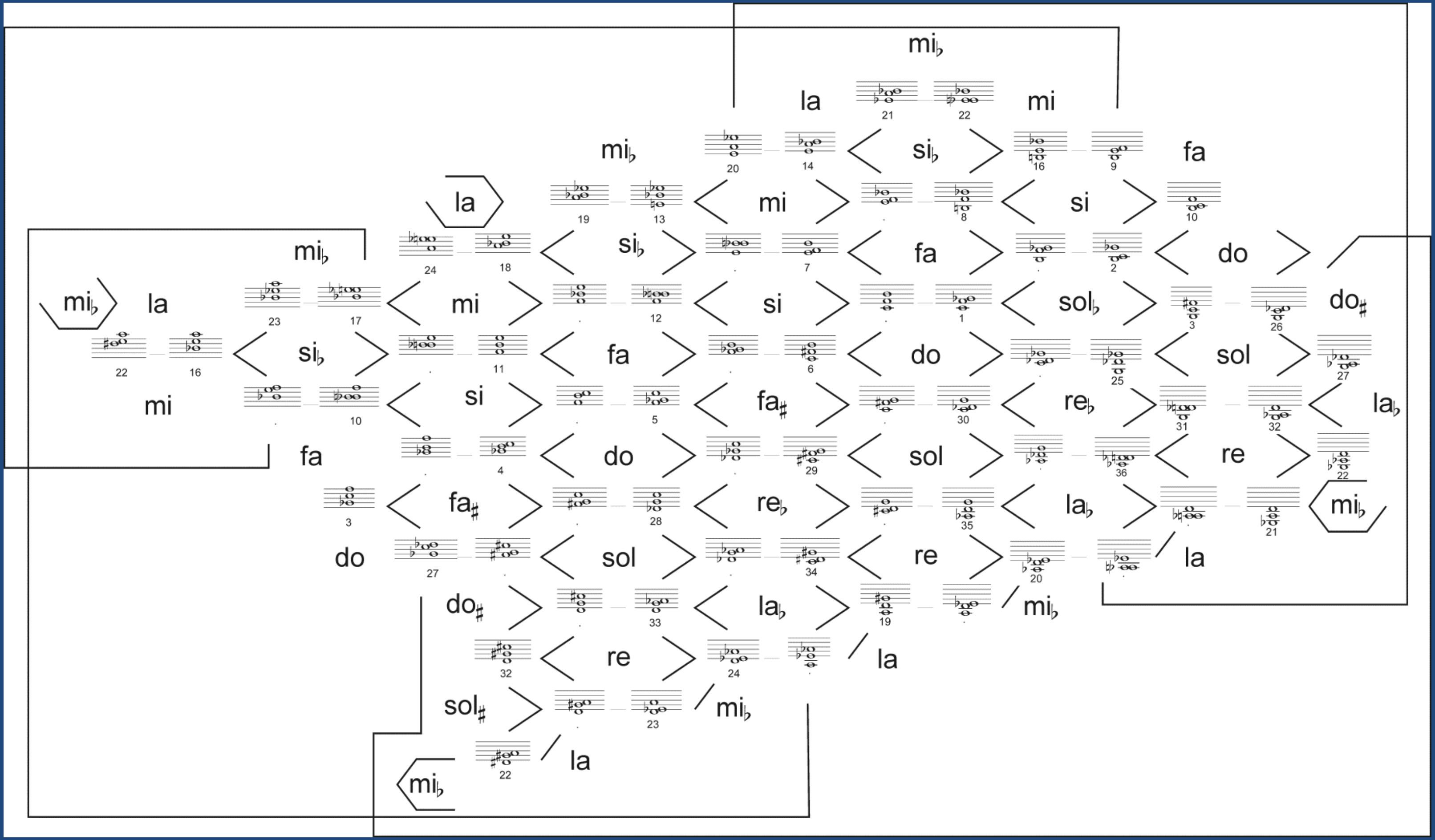
PERMUTAHÈDRE HEXAGONALE :

IDENTITÉS DE NIVEAU 3 : a b c

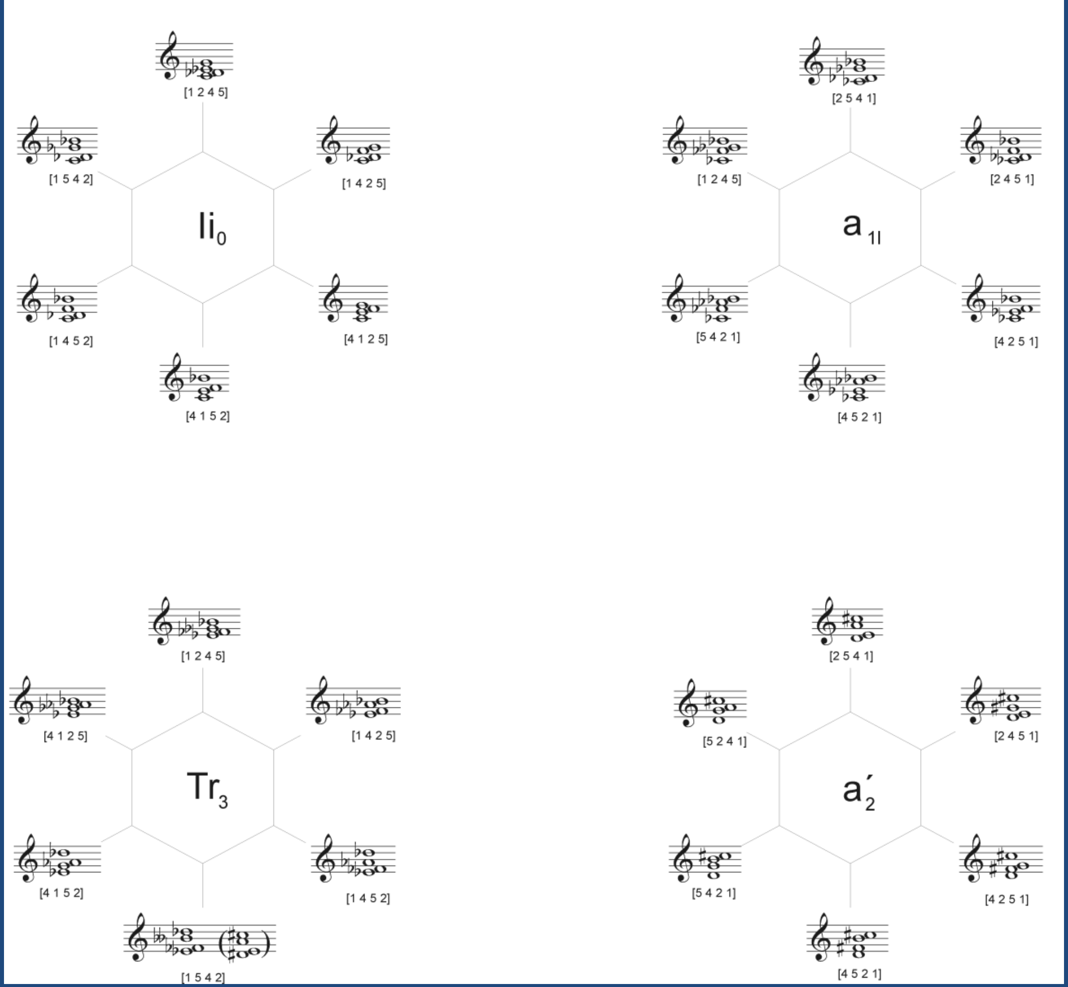
3 intervalles différents entre eux , ex : 3 4 5, 2 3 7, 1 5 6


[3 4 5] [2 3 7] [1 5 6]
[3 5 4] [3 2 7] [1 6 5]
[4 3 5] [2 7 3] [5 1 6]
[5 3 4] [3 7 2] [6 1 5]
[4 5 3] [7 2 3] [5 6 1]
[5 4 3] [7 3 2] [6 5 1]

PERMUTOHÈDRE a b c AVEC SES 12 TRANSPOSITIONS, 72 nœuds (ex : 1 5 6)


mi♭
la 21 22 mi
mi♭ 20 14 si♭ 16 9 fa
la 19 13 mi 8 si 10
mi♭ 24 18 si♭ 7 fa 2 do
mi♭ la 23 17 mi 12 si 1 sol♭ 3 26 do♯
22 16 si♭ 11 fa 6 do 25 sol 27
mi 10 si 5 fa♯ 30 re♭ 31 32 la♭
fa 4 do 29 sol 36 re 22
3 fa♯ 28 re♭ 35 la♭ 21 mi♭
do 27 sol 34 re 20 la
do♯ 33 la♭ 19 mi♭
32 re 24 la
sol♯ 23 mi♭
22 la
mi♭

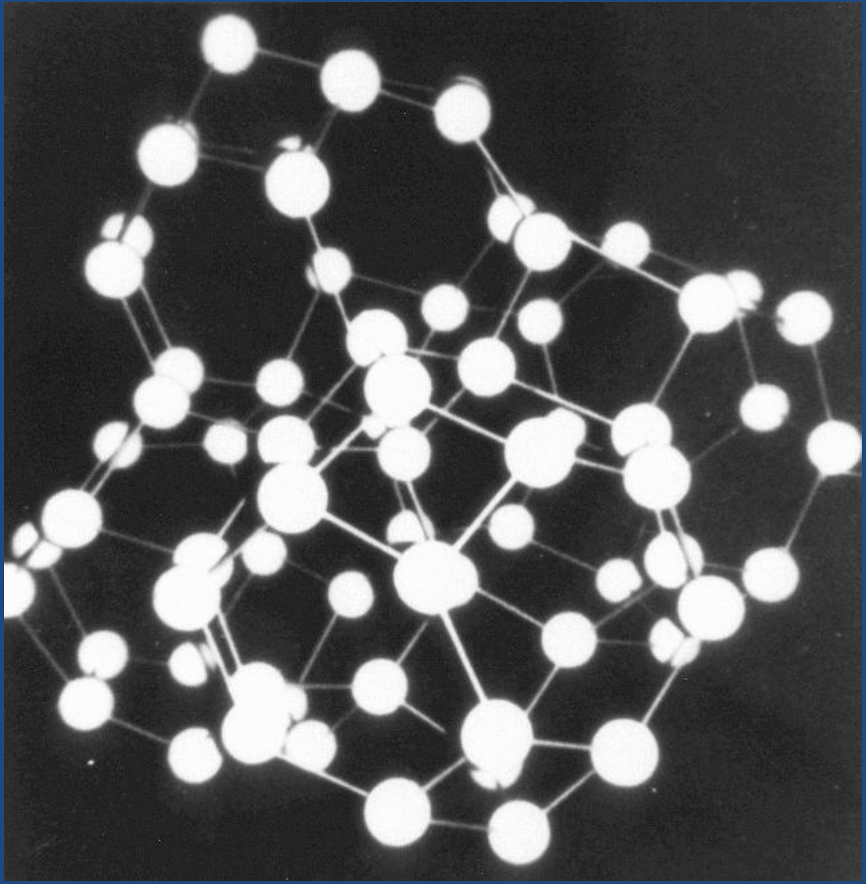
PERMUTOHÈDRE a b c d FRAGMENTS
exemple : 1 2 4 5



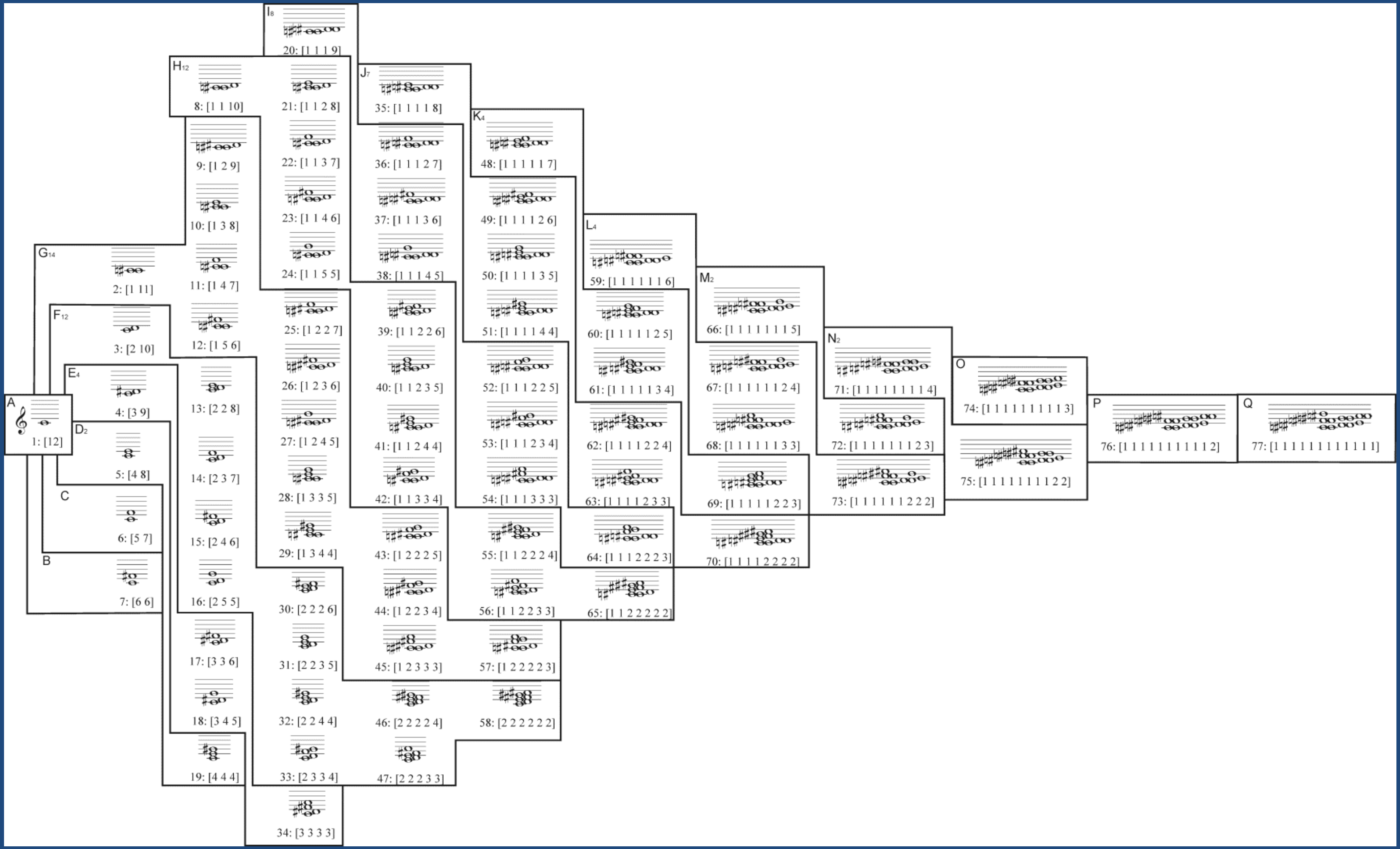
[1 2 4 5]
[1 5 4 2]
[1 4 2 5]
Ii_0
[1 4 5 2]
[4 1 2 5]
[4 1 5 2]
[2 5 4 1]
[1 2 4 5]
[2 4 5 1]
a_{1I}
[5 4 2 1]
[4 2 5 1]
[4 5 2 1]
[1 2 4 5]
[4 1 2 5]
[1 4 2 5]
Tr_3
[4 1 5 2]
[1 4 5 2]
[1 5 4 2]
[2 5 4 1]
[5 2 4 1]
[2 4 5 1]
a'_2
[5 4 2 1]
[4 2 5 1]
[4 5 2 1]

PERMUTOHÈDRE : IDENTITÉ a b c d (fragment), exemple : 1 2 3 6 ou 1 2 4 5

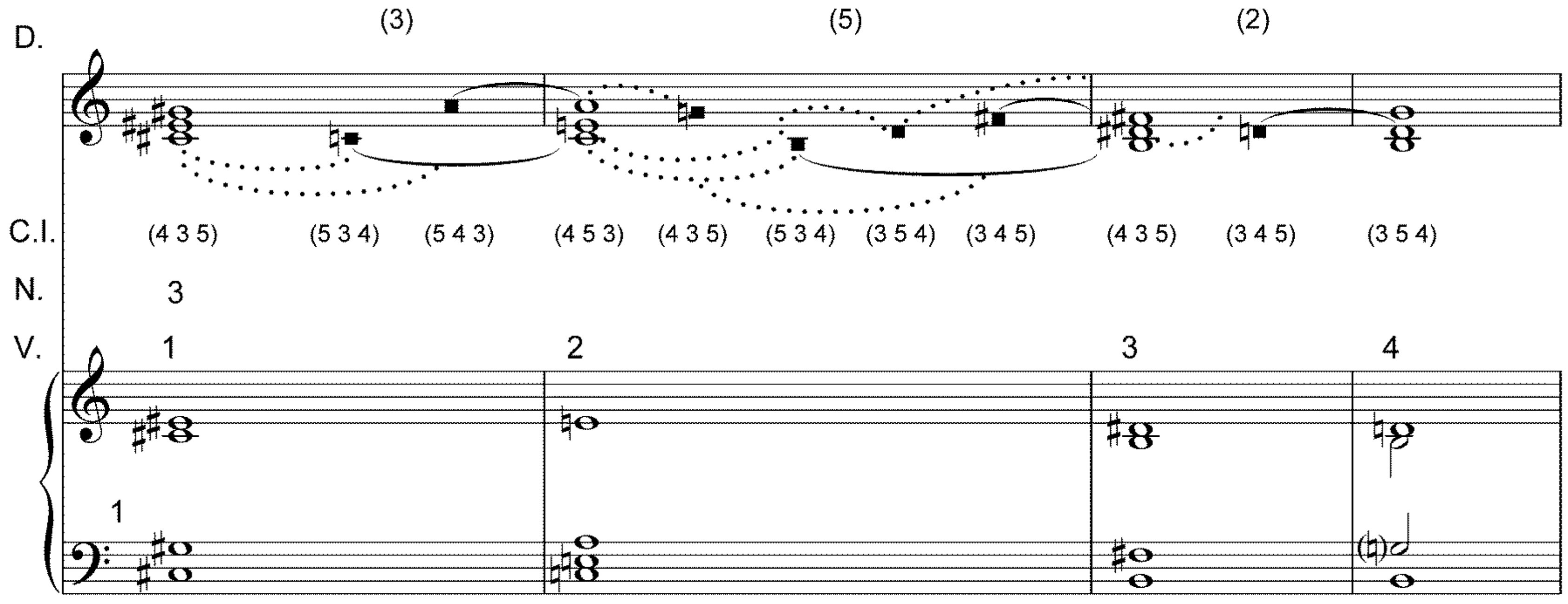
Construit par E. González, Mexico 1980

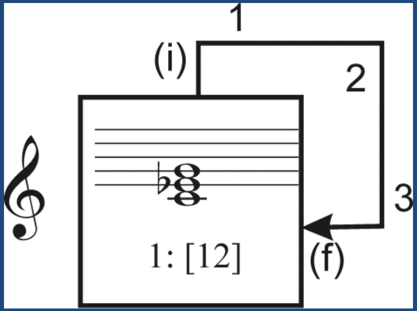


DIVISION DU POTENTIAL COMBINATOIRE EN 17 ZONES

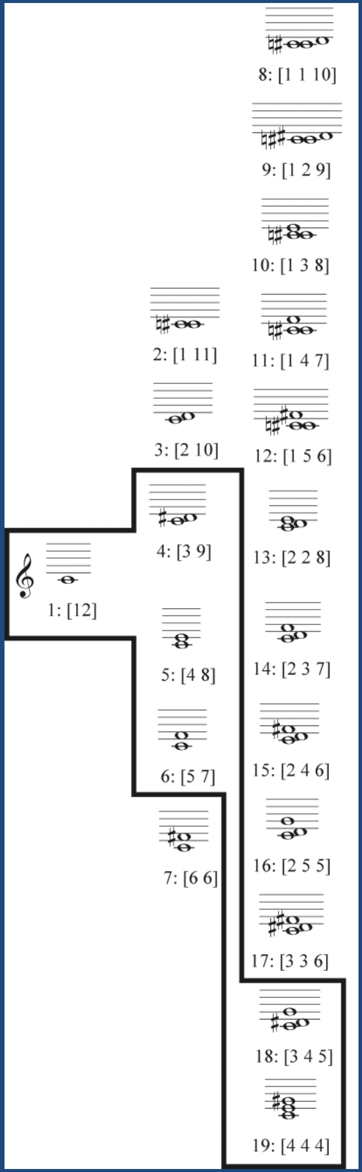

A
1: [12]
B
7: [6 6]
C
6: [5 7]
D2
5: [4 8]
E4
4: [3 9]
F12
3: [2 10]
G14
2: [1 11]
H12
8: [1 1 10]
9: [1 2 9]
10: [1 3 8]
11: [1 4 7]
12: [1 5 6]
13: [2 2 8]
14: [2 3 7]
15: [2 4 6]
16: [2 5 5]
17: [3 3 6]
18: [3 4 5]
19: [4 4 4]
I8
20: [1 1 1 9]
21: [1 1 2 8]
22: [1 1 3 7]
23: [1 1 4 6]
24: [1 1 5 5]
25: [1 2 2 7]
26: [1 2 3 6]
27: [1 2 4 5]
28: [1 3 3 5]
29: [1 3 4 4]
30: [2 2 2 6]
31: [2 2 3 5]
32: [2 2 4 4]
33: [2 3 3 4]
34: [3 3 3 3]
J7
35: [1 1 1 1 8]
36: [1 1 1 2 7]
37: [1 1 1 3 6]
38: [1 1 1 4 5]
39: [1 1 2 2 6]
40: [1 1 2 3 5]
41: [1 1 2 4 4]
42: [1 1 3 3 4]
43: [1 2 2 2 5]
44: [1 2 2 3 4]
45: [1 2 3 3 3]
46: [2 2 2 2 4]
47: [2 2 2 3 3]
K4
48: [1 1 1 1 1 7]
49: [1 1 1 1 2 6]
50: [1 1 1 1 3 5]
51: [1 1 1 1 4 4]
52: [1 1 1 2 2 5]
53: [1 1 1 2 3 4]
54: [1 1 1 3 3 3]
55: [1 1 2 2 2 4]
56: [1 1 2 2 3 3]
57: [1 2 2 2 2 3]
58: [2 2 2 2 2 2]
L4
59: [1 1 1 1 1 1 6]
60: [1 1 1 1 1 2 5]
61: [1 1 1 1 1 3 4]
62: [1 1 1 1 2 2 4]
63: [1 1 1 1 2 3 3]
64: [1 1 1 2 2 2 3]
65: [1 1 2 2 2 2 2]
M2
66: [1 1 1 1 1 1 1 5]
67: [1 1 1 1 1 1 2 4]
68: [1 1 1 1 1 1 3 3]
69: [1 1 1 1 1 2 2 3]
70: [1 1 1 1 2 2 2 2]
N2
71: [1 1 1 1 1 1 1 1 4]
72: [1 1 1 1 1 1 1 2 3]
73: [1 1 1 1 1 1 2 2 2]
O
74: [1 1 1 1 1 1 1 1 1 3]
75: [1 1 1 1 1 1 1 1 2 2]
P
76: [1 1 1 1 1 1 1 1 1 1 2]
Q
77: [1 1 1 1 1 1 1 1 1 1 1 1]

CARLO GESUALDO : MORO LASSO, RESEAU DE L'IDENTITE 3 4 5

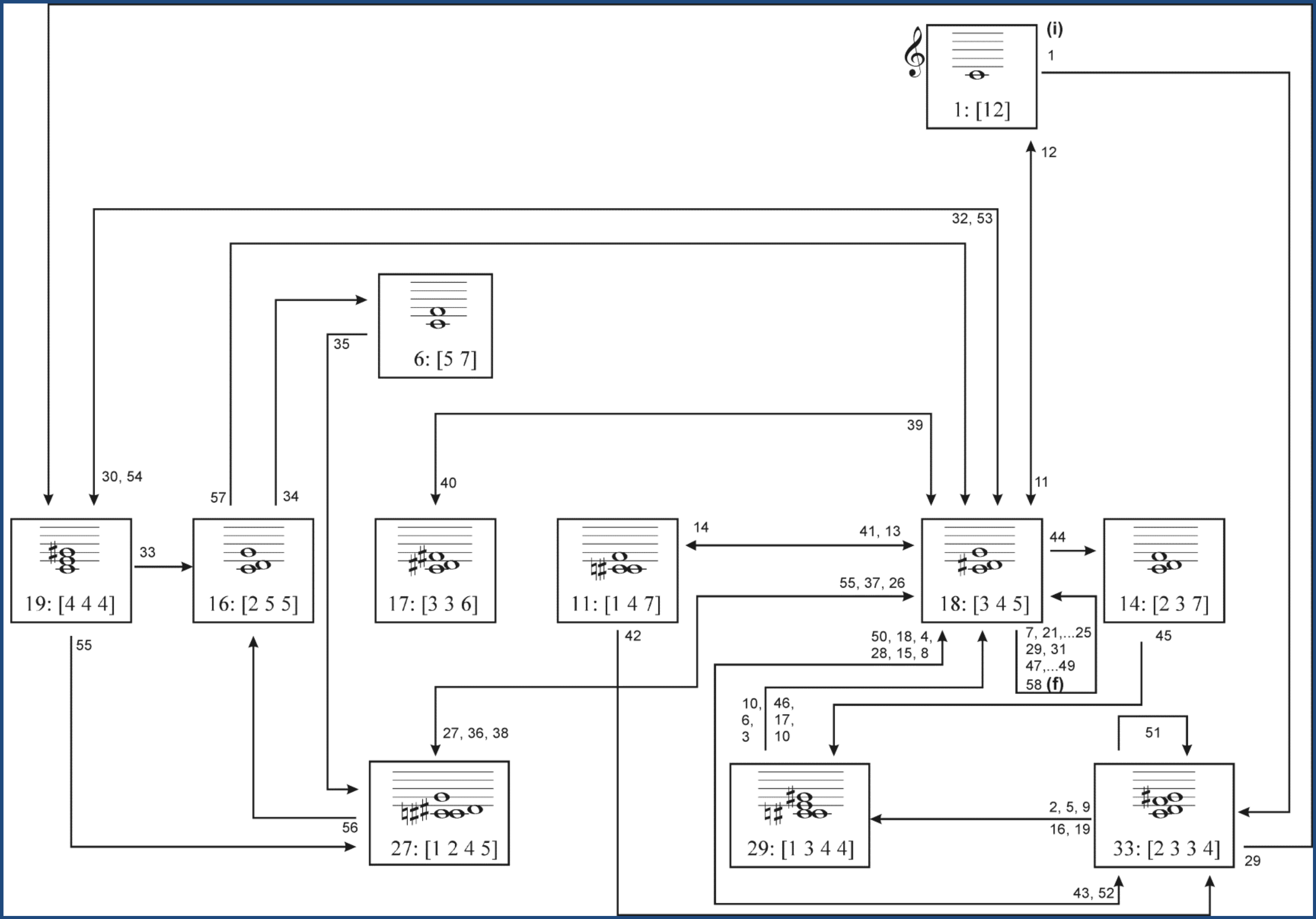

D.
(3)
(5)
(2)
C.I.
(4 3 5)
(5 3 4)
(5 4 3)
(4 5 3)
(4 3 5)
(5 3 4)
(3 5 4)
(3 4 5)
(4 3 5)
(3 4 5)
(3 5 4)
N.
3
V.
1
2
3
4
1



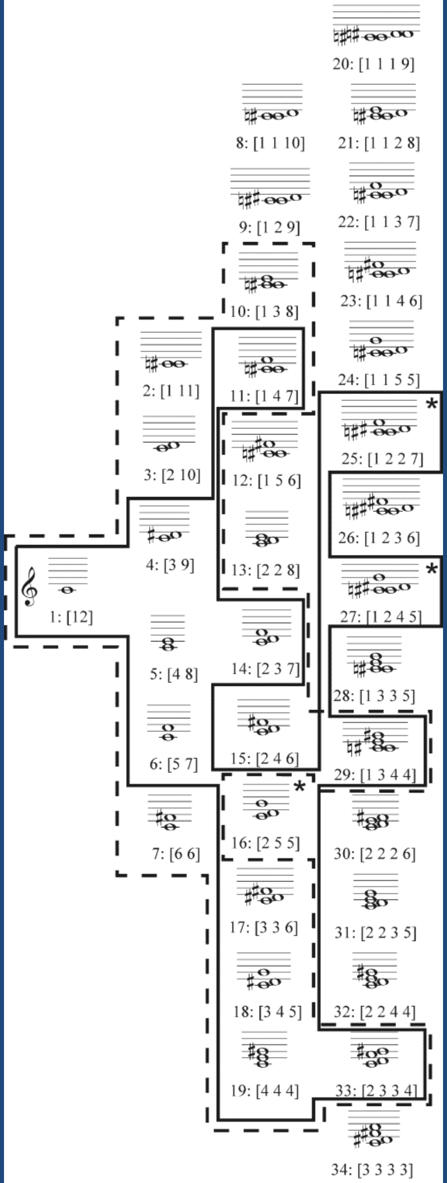
IDENTITÉS CONSONANTES DU POTENTIEL D12 : 6/77


1: [12]
2: [1 11]
3: [2 10]
4: [3 9]
5: [4 8]
6: [5 7]
7: [6 6]
8: [1 1 10]
9: [1 2 9]
10: [1 3 8]
11: [1 4 7]
12: [1 5 6]
13: [2 2 8]
14: [2 3 7]
15: [2 4 6]
16: [2 5 5]
17: [3 3 6]
18: [3 4 5]
19: [4 4 4]

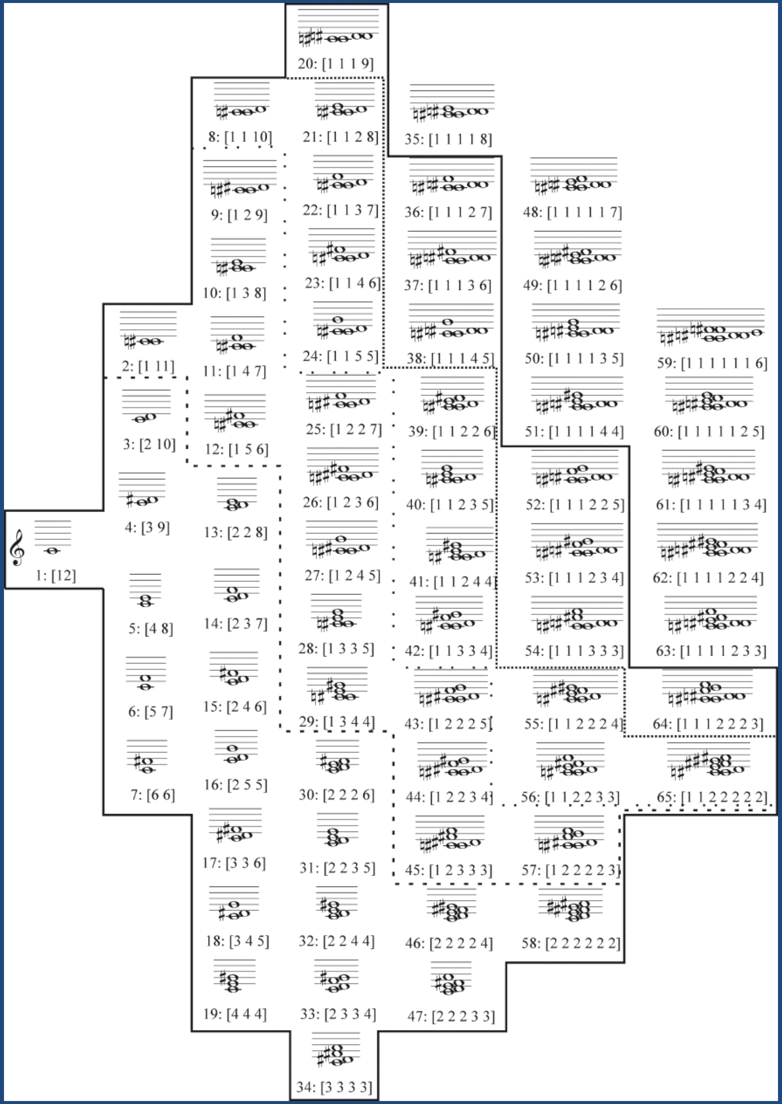
MORO LASSO : RESEAU DES IDENTITÉS
exemple : fragment 3


(i)
1
1: [12]
12
32, 53
6: [5 7]
35
39
40
30, 54
57
34
11
33
19: [4 4 4]
16: [2 5 5]
17: [3 3 6]
11: [1 4 7]
14
41, 13
18: [3 4 5]
44
14: [2 3 7]
55, 37, 26
55
42
50, 18, 4,
28, 15, 8
7, 21,...25
29, 31
47,...49
58 (f)
45
10,
6,
3
46,
17,
10
27, 36, 38
51
2, 5, 9
16, 19
56
27: [1 2 4 5]
29: [1 3 4 4]
33: [2 3 3 4]
29
43, 52

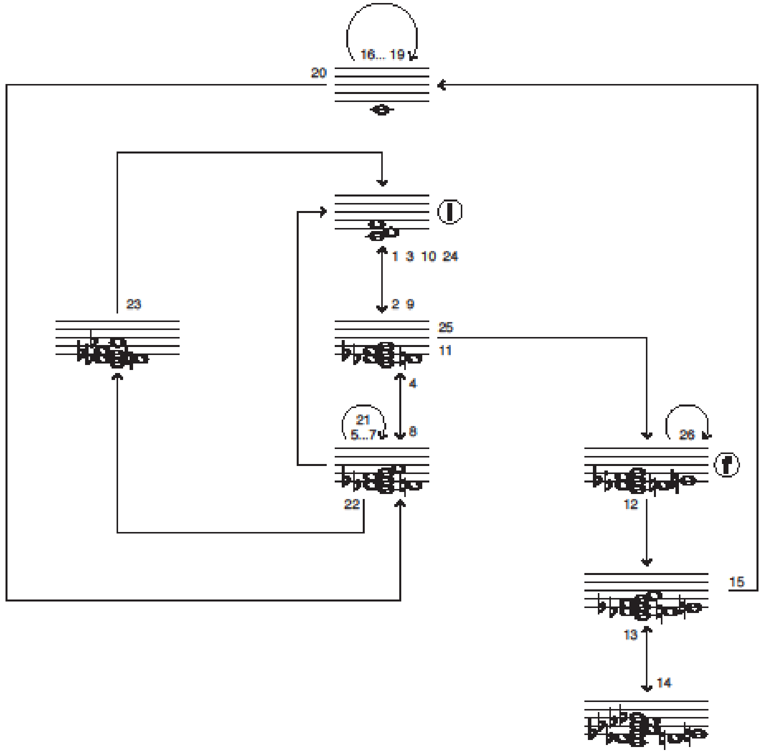
MORO LASSO : PROJECTION DE L’EXPLORATION ET IDENTITÉS INEXPLORÉES


1: [12]
2: [1 11]
3: [2 10]
4: [3 9]
5: [4 8]
6: [5 7]
7: [6 6]
8: [1 1 10]
9: [1 2 9]
10: [1 3 8]
11: [1 4 7]
12: [1 5 6]
13: [2 2 8]
14: [2 3 7]
15: [2 4 6]
*
16: [2 5 5]
17: [3 3 6]
18: [3 4 5]
19: [4 4 4]
20: [1 1 1 9]
21: [1 1 2 8]
22: [1 1 3 7]
23: [1 1 4 6]
24: [1 1 5 5]
*
25: [1 2 2 7]
26: [1 2 3 6]
*
27: [1 2 4 5]
28: [1 3 3 5]
29: [1 3 4 4]
30: [2 2 2 6]
31: [2 2 3 5]
32: [2 2 4 4]
33: [2 3 3 4]
34: [3 3 3 3]

PROJECTION DE L’EXPLORATION DE L’ESPACE TONALE : ID: 1 1 2 2 2 2 2 et 1 1 1 2 2 2 3


1: [12]
2: [1 11]
3: [2 10]
4: [3 9]
5: [4 8]
6: [5 7]
7: [6 6]
8: [1 1 10]
9: [1 2 9]
10: [1 3 8]
11: [1 4 7]
12: [1 5 6]
13: [2 2 8]
14: [2 3 7]
15: [2 4 6]
16: [2 5 5]
17: [3 3 6]
18: [3 4 5]
19: [4 4 4]
20: [1 1 1 9]
21: [1 1 2 8]
22: [1 1 3 7]
23: [1 1 4 6]
24: [1 1 5 5]
25: [1 2 2 7]
26: [1 2 3 6]
27: [1 2 4 5]
28: [1 3 3 5]
29: [1 3 4 4]
30: [2 2 2 6]
31: [2 2 3 5]
32: [2 2 4 4]
33: [2 3 3 4]
34: [3 3 3 3]
35: [1 1 1 1 8]
36: [1 1 1 2 7]
37: [1 1 1 3 6]
38: [1 1 1 4 5]
39: [1 1 2 2 6]
40: [1 1 2 3 5]
41: [1 1 2 4 4]
42: [1 1 3 3 4]
43: [1 2 2 2 5]
44: [1 2 2 3 4]
45: [1 2 3 3 3]
46: [2 2 2 2 4]
47: [2 2 2 3 3]
48: [1 1 1 1 1 7]
49: [1 1 1 1 2 6]
50: [1 1 1 1 3 5]
51: [1 1 1 1 4 4]
52: [1 1 1 2 2 5]
53: [1 1 1 2 3 4]
54: [1 1 1 3 3 3]
55: [1 1 2 2 2 4]
56: [1 1 2 2 3 3]
57: [1 2 2 2 2 3]
58: [2 2 2 2 2 2]
59: [1 1 1 1 1 1 6]
60: [1 1 1 1 1 2 5]
61: [1 1 1 1 1 3 4]
62: [1 1 1 1 2 2 4]
63: [1 1 1 1 2 3 3]
64: [1 1 1 2 2 2 3]
65: [1 1 2 2 2 2 2]

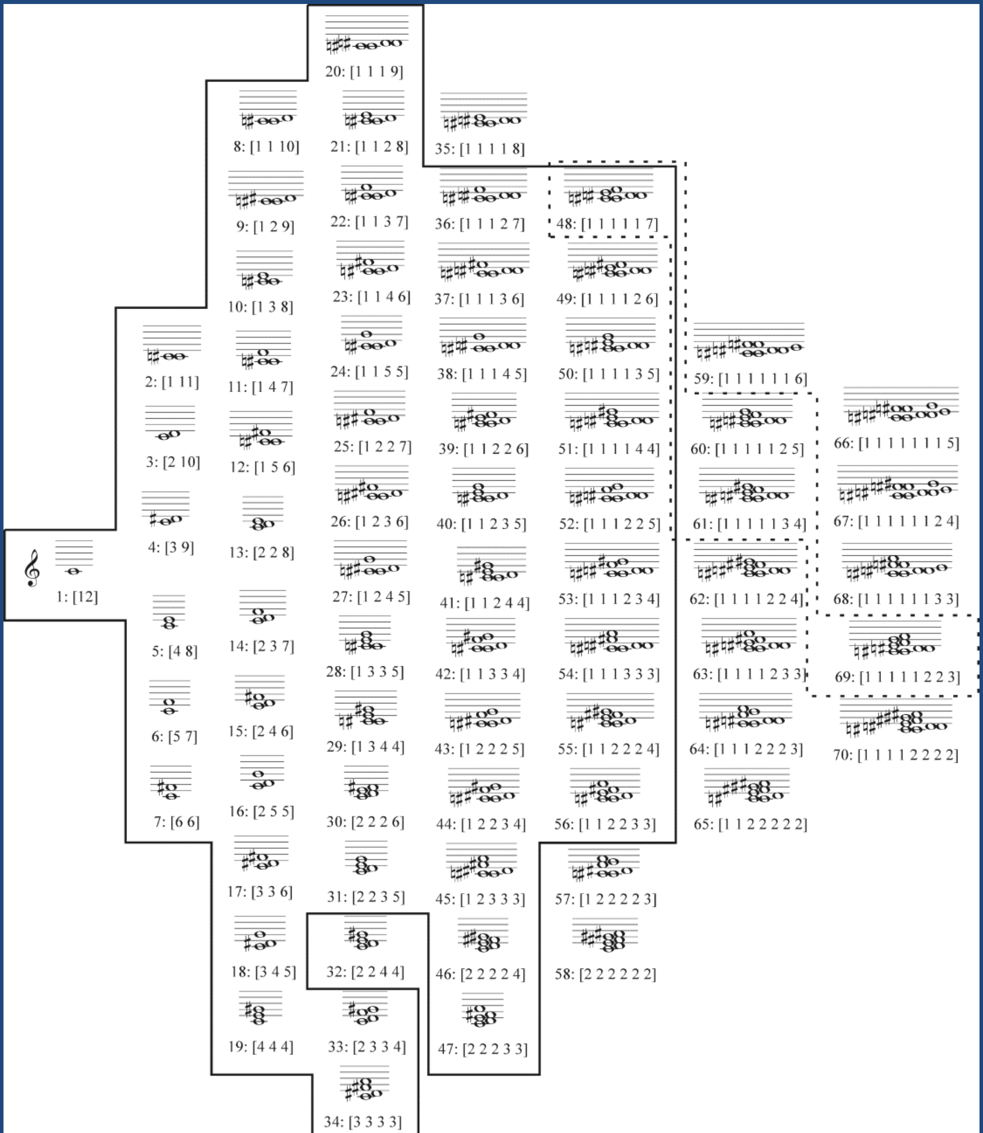
Schoenberg, opus 19, pièce 6


16... 19
20
I
1 3 10 24
2 9
23
25
11
4
21
5...7
8
26
f
22
12
15
13
14

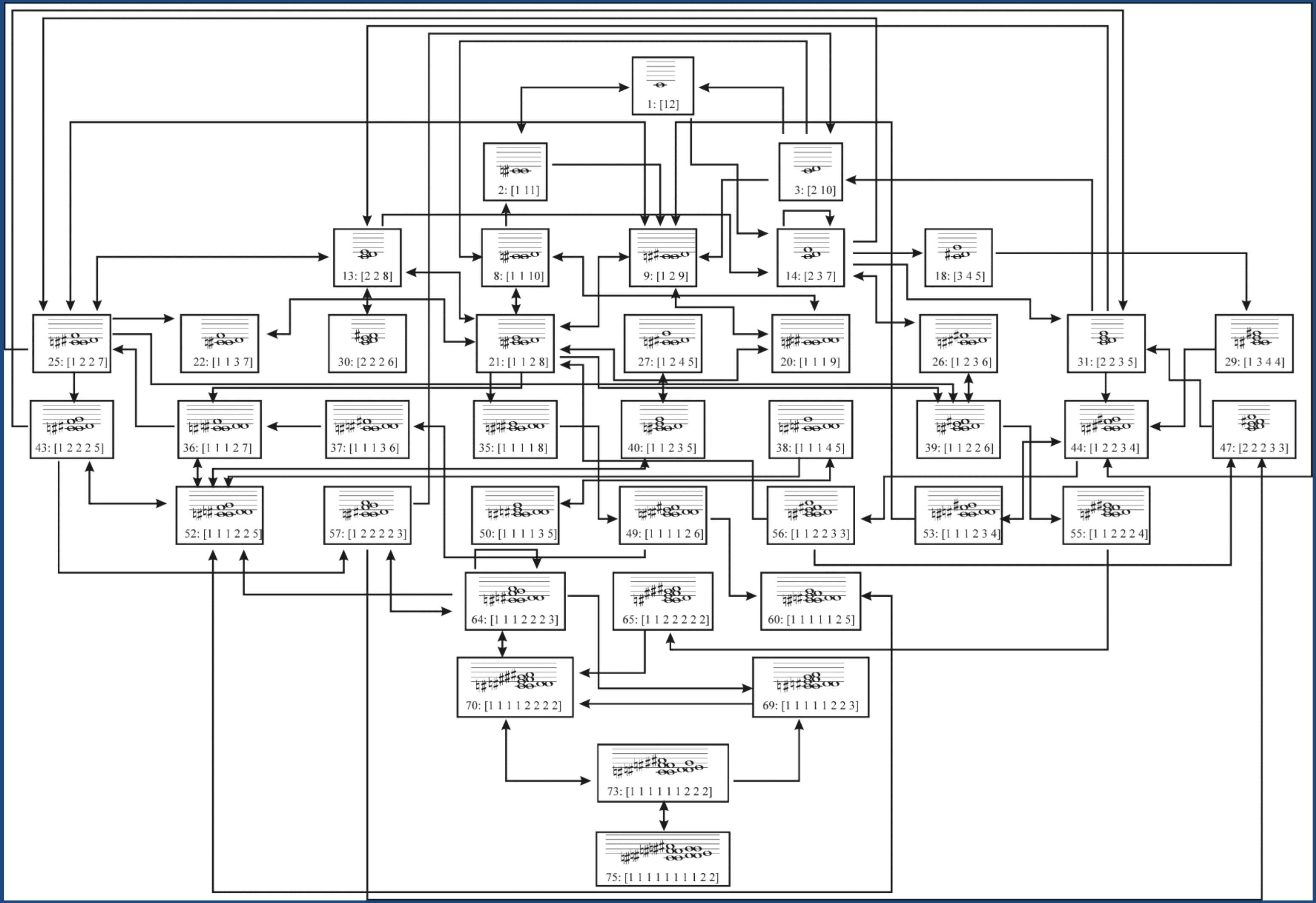
p. 368: vl 191016

XENAKIS : IKHOOR, TRIO À CORDES

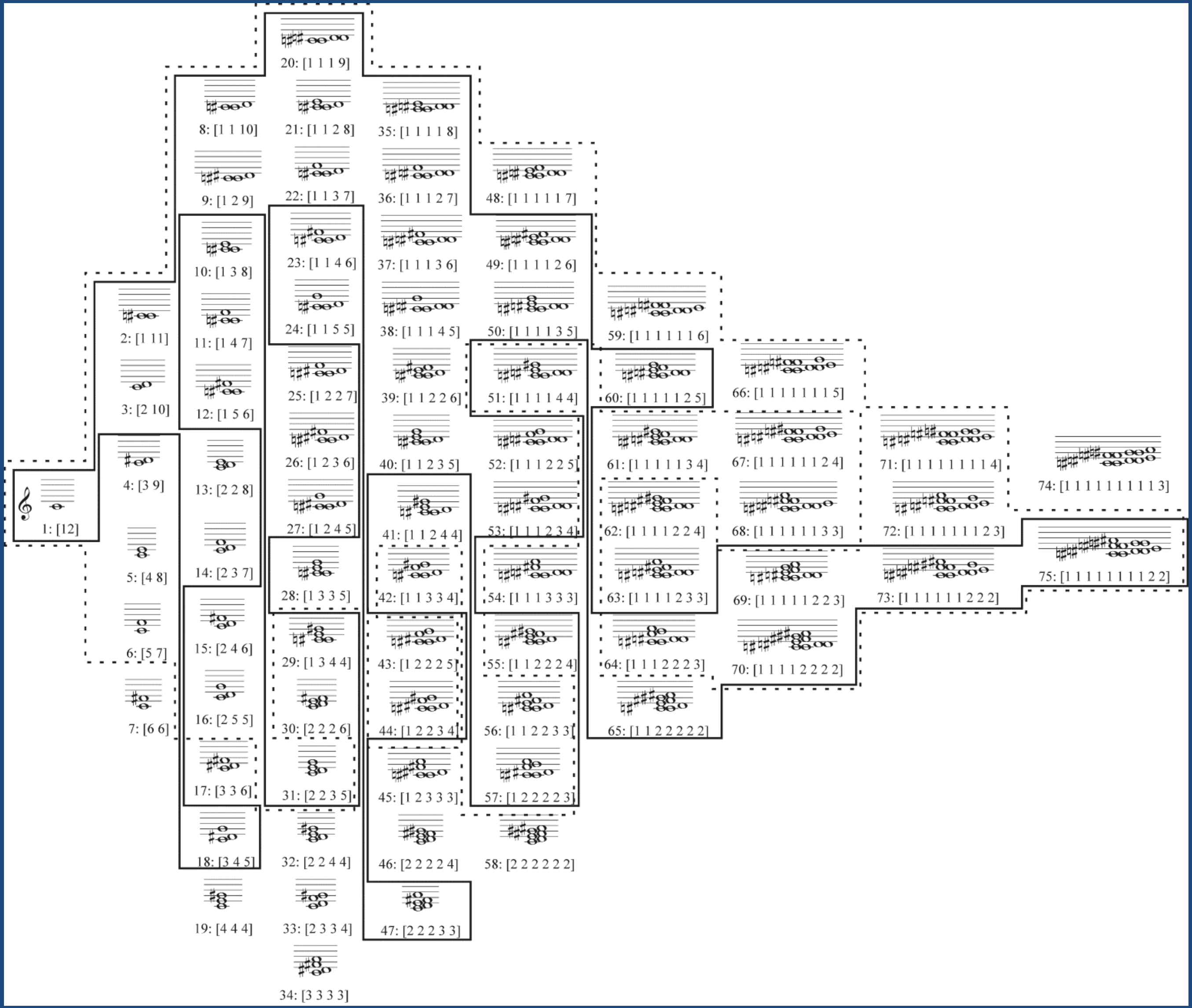
PROJECTION DE L'EXPLORATION EN 6 NIVEAUX DE DENSITÉ


1: [12]
2: [1 11]
3: [2 10]
4: [3 9]
5: [4 8]
6: [5 7]
7: [6 6]
8: [1 1 10]
9: [1 2 9]
10: [1 3 8]
11: [1 4 7]
12: [1 5 6]
13: [2 2 8]
14: [2 3 7]
15: [2 4 6]
16: [2 5 5]
17: [3 3 6]
18: [3 4 5]
19: [4 4 4]
20: [1 1 1 9]
21: [1 1 2 8]
22: [1 1 3 7]
23: [1 1 4 6]
24: [1 1 5 5]
25: [1 2 2 7]
26: [1 2 3 6]
27: [1 2 4 5]
28: [1 3 3 5]
29: [1 3 4 4]
30: [2 2 2 6]
31: [2 2 3 5]
32: [2 2 4 4]
33: [2 3 3 4]
34: [3 3 3 3]
35: [1 1 1 1 8]
36: [1 1 1 2 7]
37: [1 1 1 3 6]
38: [1 1 1 4 5]
39: [1 1 2 2 6]
40: [1 1 2 3 5]
41: [1 1 2 4 4]
42: [1 1 3 3 4]
43: [1 2 2 2 5]
44: [1 2 2 3 4]
45: [1 2 3 3 3]
46: [2 2 2 2 4]
47: [2 2 2 3 3]
48: [1 1 1 1 1 7]
49: [1 1 1 1 2 6]
50: [1 1 1 1 3 5]
51: [1 1 1 1 4 4]
52: [1 1 1 2 2 5]
53: [1 1 1 2 3 4]
54: [1 1 1 3 3 3]
55: [1 1 2 2 2 4]
56: [1 1 2 2 3 3]
57: [1 2 2 2 2 3]
58: [2 2 2 2 2 2]
59: [1 1 1 1 1 1 6]
60: [1 1 1 1 1 2 5]
61: [1 1 1 1 1 3 4]
62: [1 1 1 1 2 2 4]
63: [1 1 1 1 2 3 3]
64: [1 1 1 2 2 2 3]
65: [1 1 2 2 2 2 2]
66: [1 1 1 1 1 1 1 5]
67: [1 1 1 1 1 1 2 4]
68: [1 1 1 1 1 1 3 3]
69: [1 1 1 1 1 2 2 3]
70: [1 1 1 1 2 2 2 2]

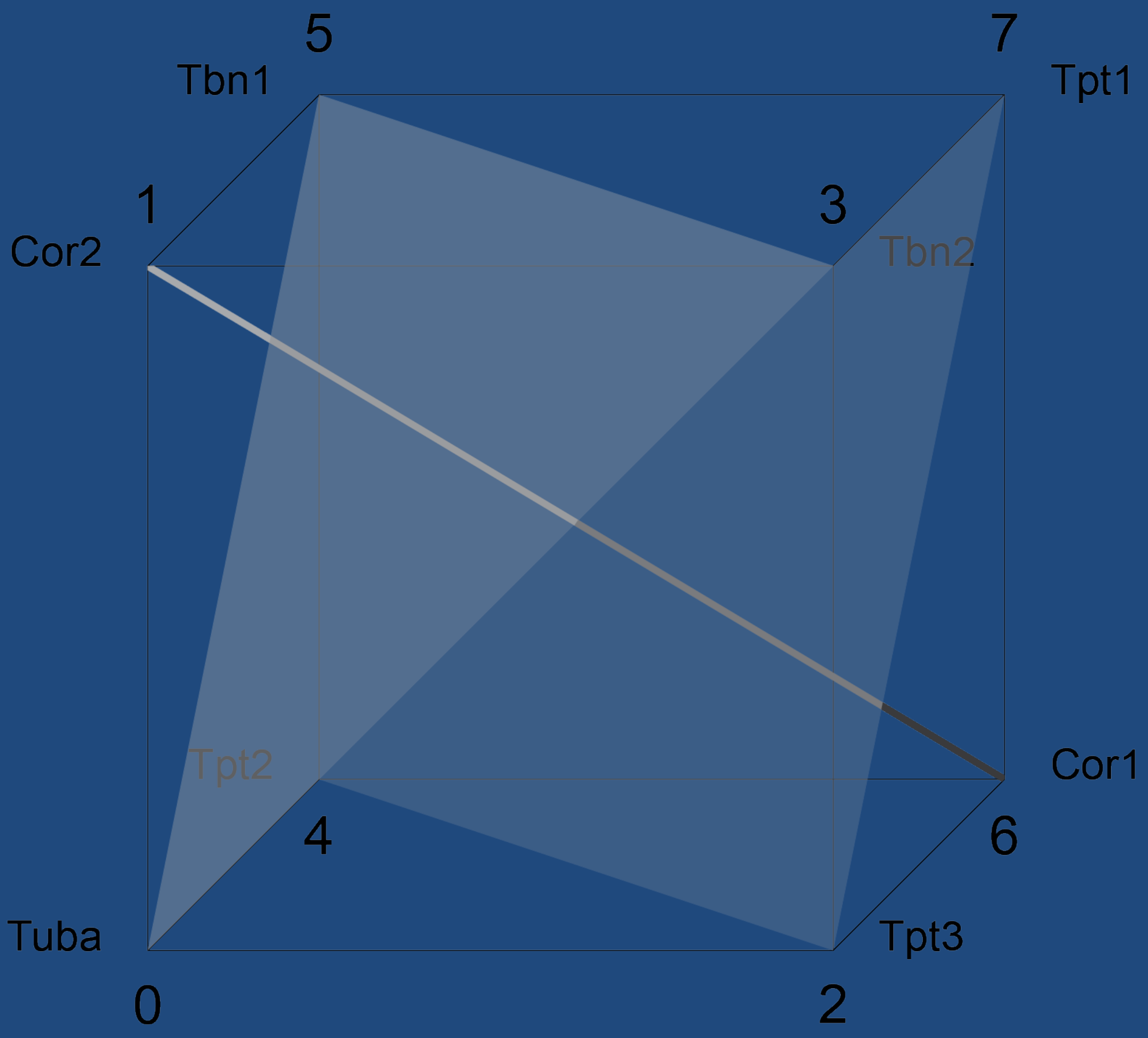
GYÖRGY LIGETI : LUX AETERNA, RESEAU D’IDENTITÉS


1: [12]
2: [1 1 11]
3: [2 10]
13: [2 2 8]
8: [1 1 10]
9: [1 2 9]
14: [2 3 7]
18: [3 4 5]
25: [1 2 2 7]
22: [1 1 3 7]
30: [2 2 2 6]
21: [1 1 2 8]
27: [1 2 4 5]
20: [1 1 1 9]
26: [1 2 3 6]
31: [2 2 3 5]
29: [1 3 4 4]
43: [1 2 2 2 5]
36: [1 1 1 2 7]
37: [1 1 1 3 6]
35: [1 1 1 1 8]
40: [1 1 2 3 5]
38: [1 1 1 4 5]
39: [1 1 2 2 6]
44: [1 2 2 3 4]
47: [2 2 2 3 3]
52: [1 1 1 2 2 5]
57: [1 2 2 2 2 3]
50: [1 1 1 1 3 5]
49: [1 1 1 1 2 6]
56: [1 1 2 2 3 3]
53: [1 1 1 2 3 4]
55: [1 1 2 2 2 4]
64: [1 1 1 2 2 2 3]
65: [1 1 2 2 2 2 2]
60: [1 1 1 1 1 2 5]
70: [1 1 1 1 2 2 2 2]
69: [1 1 1 1 1 2 2 3]
73: [1 1 1 1 1 1 2 2 2]
75: [1 1 1 1 1 1 1 1 2 2]

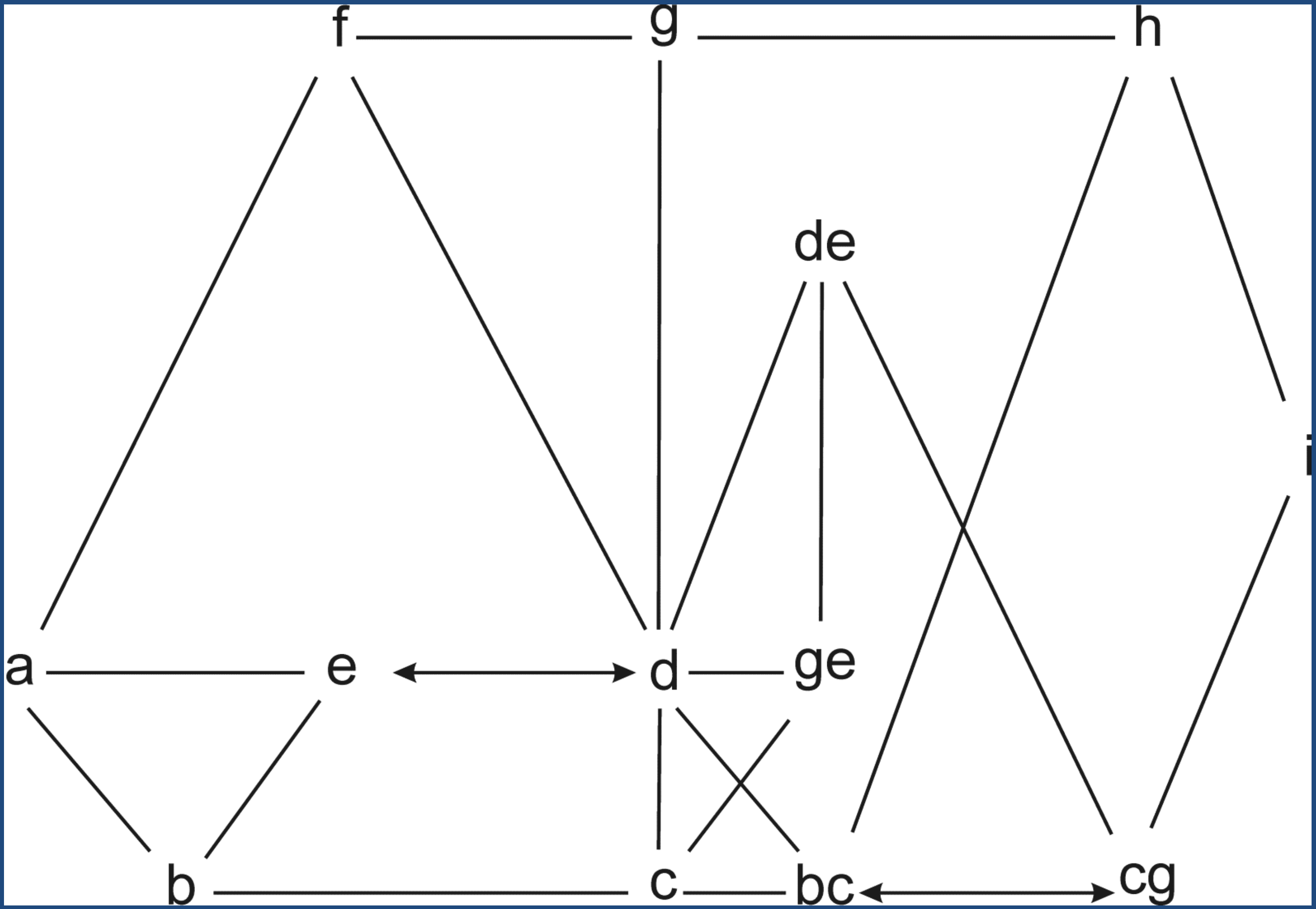
GYÖRGY LIGETI : LUX AETERNA, 16 VOIX
PROJECTION ENTRE L'EXPLORATION ET SON POTENTIEL: 10 NIVEAUX


1: [12]
2: [1 11]
3: [2 10]
4: [3 9]
5: [4 8]
6: [5 7]
7: [6 6]
8: [1 1 10]
9: [1 2 9]
10: [1 3 8]
11: [1 4 7]
12: [1 5 6]
13: [2 2 8]
14: [2 3 7]
15: [2 4 6]
16: [2 5 5]
17: [3 3 6]
18: [3 4 5]
19: [4 4 4]
20: [1 1 1 9]
21: [1 1 2 8]
22: [1 1 3 7]
23: [1 1 4 6]
24: [1 1 5 5]
25: [1 2 2 7]
26: [1 2 3 6]
27: [1 2 4 5]
28: [1 3 3 5]
29: [1 3 4 4]
30: [2 2 2 6]
31: [2 2 3 5]
32: [2 2 4 4]
33: [2 3 3 4]
34: [3 3 3 3]
35: [1 1 1 1 8]
36: [1 1 1 2 7]
37: [1 1 1 3 6]
38: [1 1 1 4 5]
39: [1 1 2 2 6]
40: [1 1 2 3 5]
41: [1 1 2 4 4]
42: [1 1 3 3 4]
43: [1 2 2 2 5]
44: [1 2 2 3 4]
45: [1 2 3 3 3]
46: [2 2 2 2 4]
47: [2 2 2 3 3]
48: [1 1 1 1 1 7]
49: [1 1 1 1 2 6]
50: [1 1 1 1 3 5]
51: [1 1 1 1 4 4]
52: [1 1 1 2 2 5]
53: [1 1 1 2 3 4]
54: [1 1 1 3 3 3]
55: [1 1 2 2 2 4]
56: [1 1 2 2 3 3]
57: [1 2 2 2 2 3]
58: [2 2 2 2 2 2]
59: [1 1 1 1 1 1 6]
60: [1 1 1 1 1 2 5]
61: [1 1 1 1 1 3 4]
62: [1 1 1 1 2 2 4]
63: [1 1 1 1 2 3 3]
64: [1 1 1 2 2 2 3]
65: [1 1 2 2 2 2 2]
66: [1 1 1 1 1 1 1 5]
67: [1 1 1 1 1 1 2 4]
68: [1 1 1 1 1 1 3 3]
69: [1 1 1 1 1 2 2 3]
70: [1 1 1 1 2 2 2 2]
71: [1 1 1 1 1 1 1 1 4]
72: [1 1 1 1 1 1 1 2 3]
73: [1 1 1 1 1 1 2 2 2]
74: [1 1 1 1 1 1 1 1 1 3]
75: [1 1 1 1 1 1 1 1 2 2]

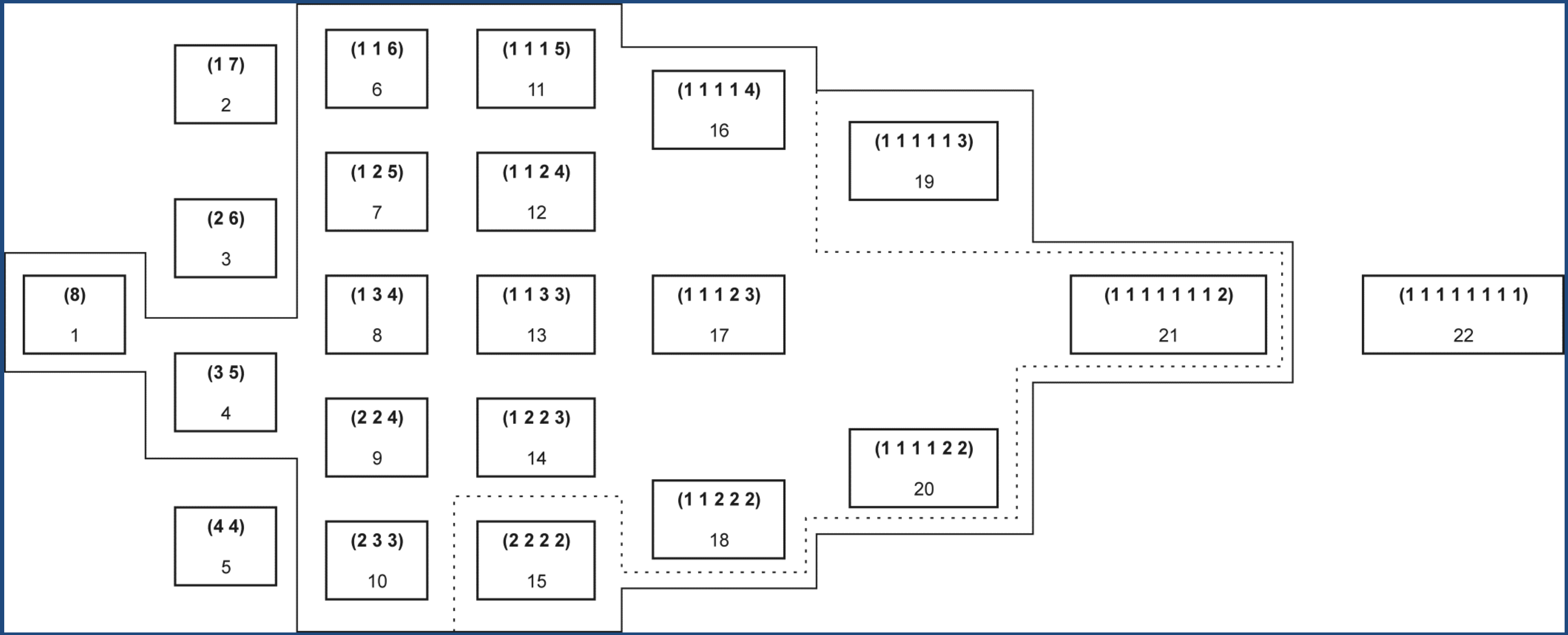
ESTRADA : CANTO NACIENTE, OCTUOR À CUIVRES SPATIALISATION À 3 DIMENSIONS


5
7
Tbn1
Tpt1
1
3
Cor2
Tbn2
Tpt2
Cor1
4
6
Tuba
Tpt3
0
2

RELATIONS TEXTURES - SPACES : CANTO NACIENTE


f
g
h
de
i
a
e
d
ge
b
c
bc
cg

CANTO NACIENTE : IDENTITÉS DES INTERVALLES D’ESPACE



(8)
1

(1 7)
2

(2 6)
3

(3 5)
4

(4 4)
5

(1 1 6)
6

(1 2 5)
7

(1 3 4)
8

(2 2 4)
9

(2 3 3)
10

(1 1 1 5)
11

(1 1 2 4)
12

(1 1 3 3)
13

(1 2 2 3)
14

(2 2 2 2)
15

(1 1 1 1 4)
16

(1 1 1 2 3)
17

(1 1 2 2 2)
18

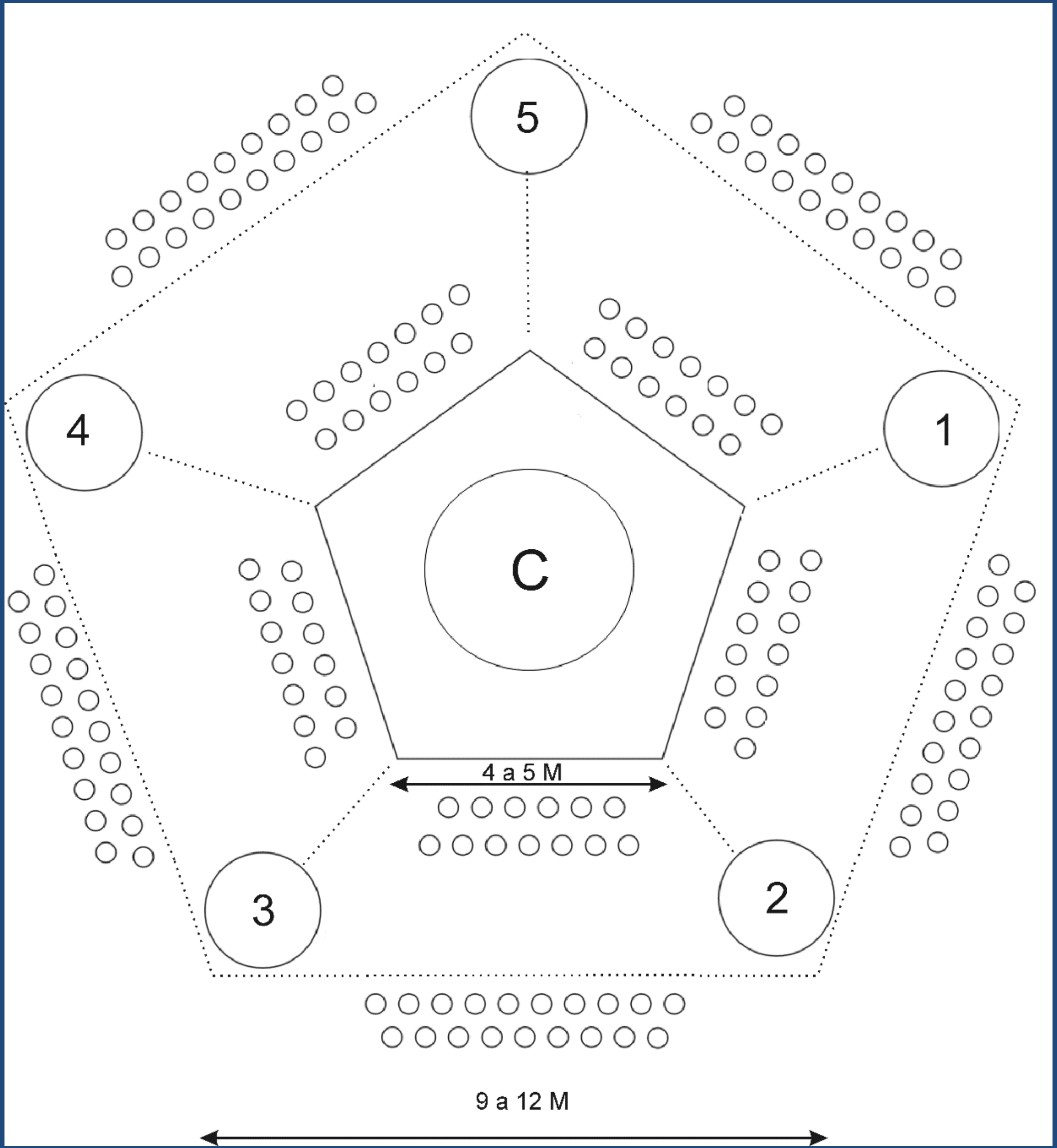
(1 1 1 1 1 3)
19

(1 1 1 1 2 2)
20

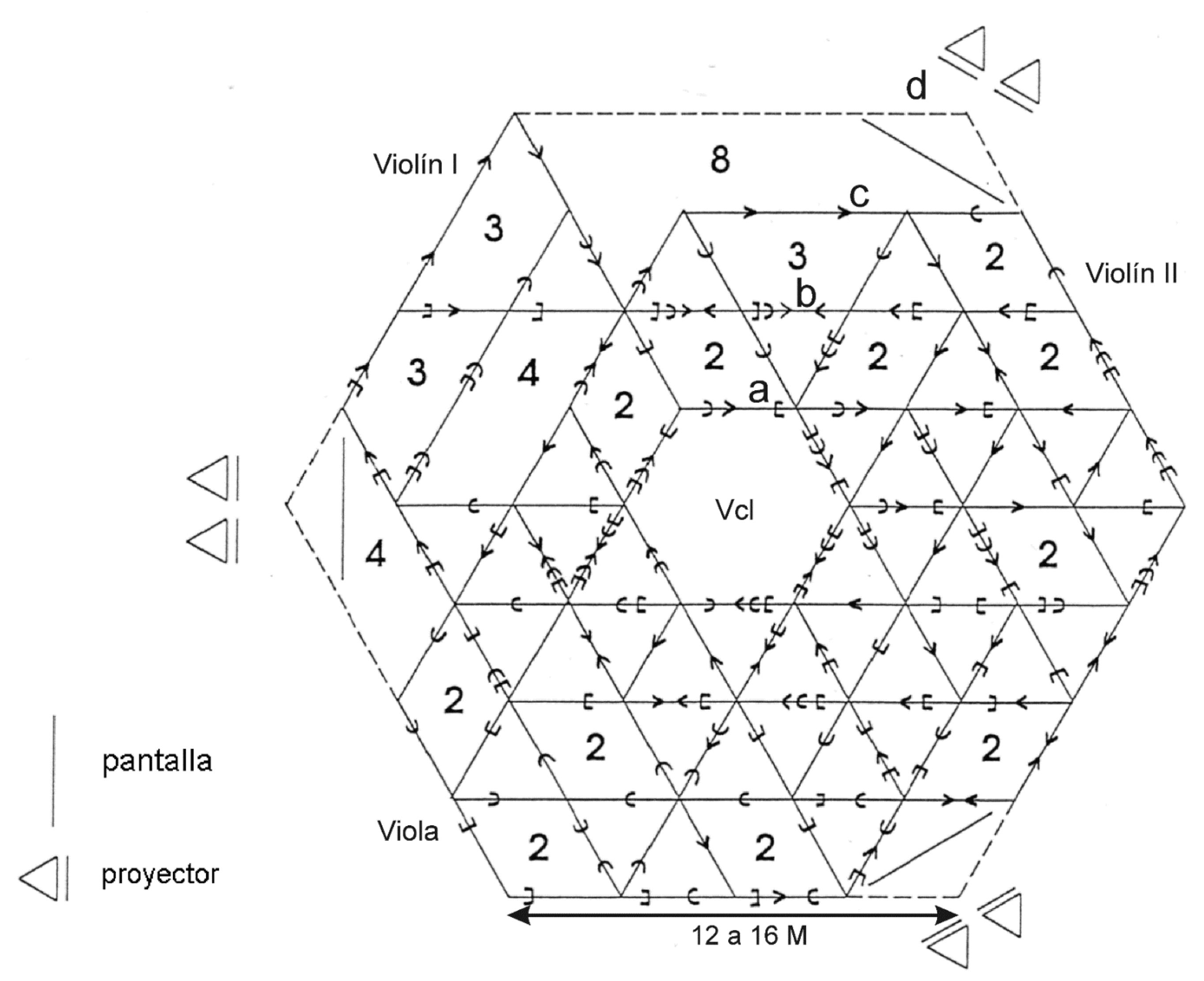
(1 1 1 1 1 1 1 2)
21

(1 1 1 1 1 1 1 1)
22

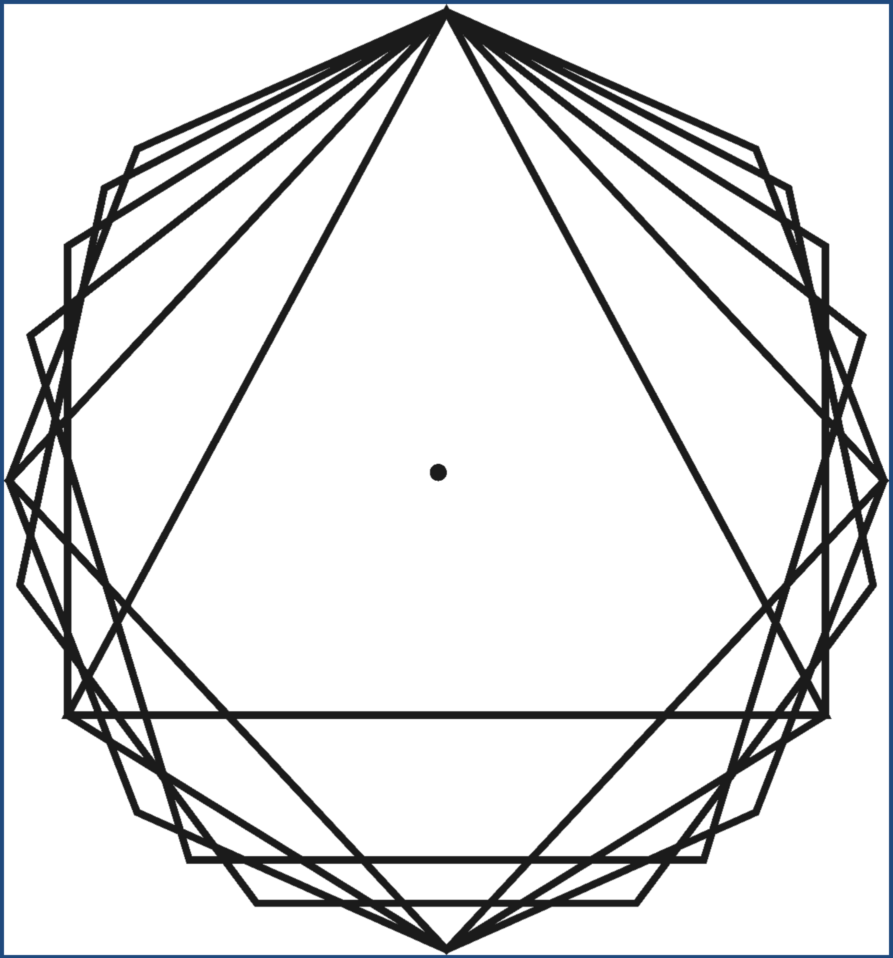
eolo'oolin, 6 percussions


5
4
1
C
3
2
4 a 5 M
9 a 12 M

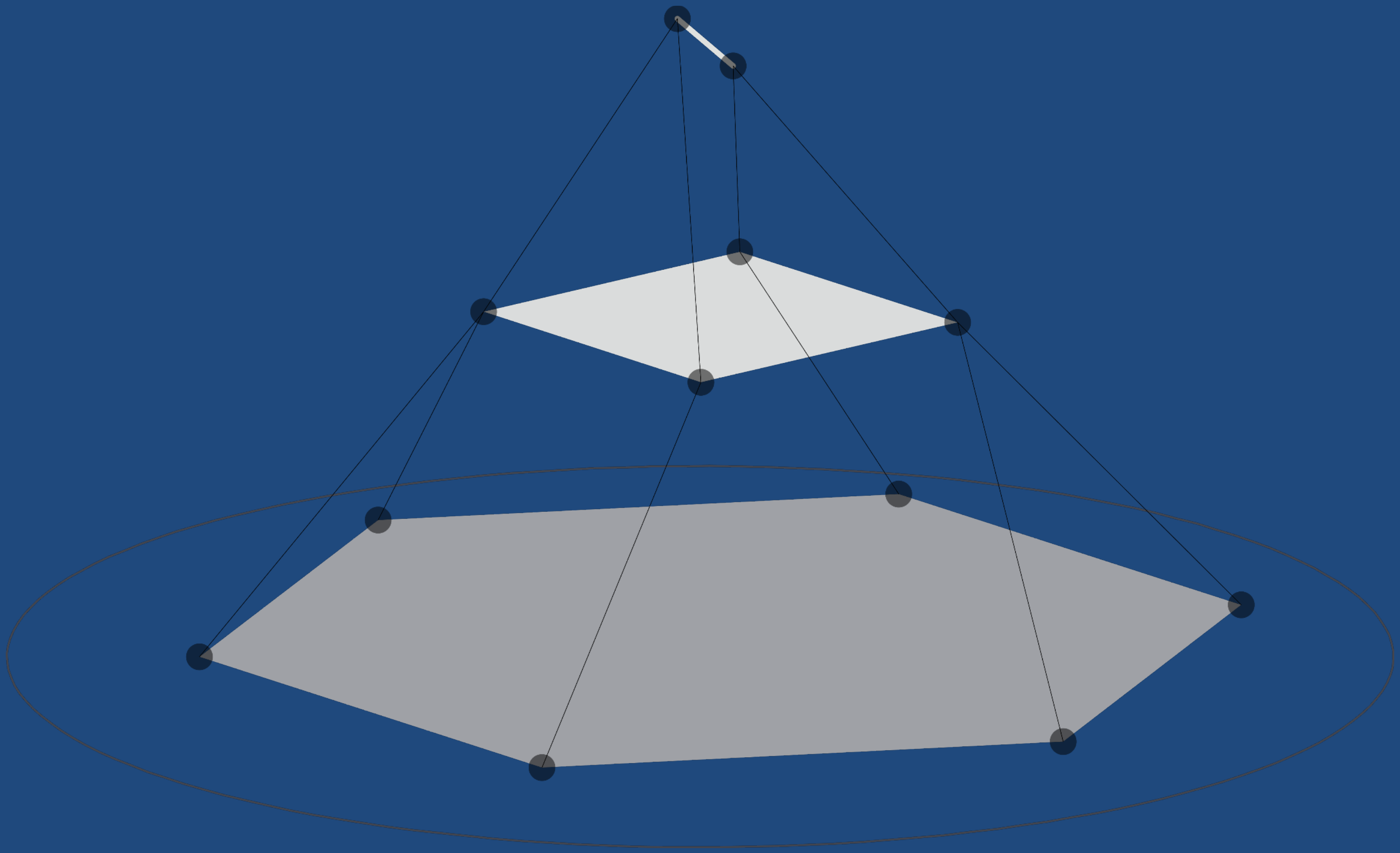
ishini'ioni, quatuor à cordes


d
Violín I
8
c
3
3
2
Violín II
b
3
4
2
2
2
2
a
Vcl
4
2
2
pantalla
2
2
Viola
2
2
proyector
12 a 16 M

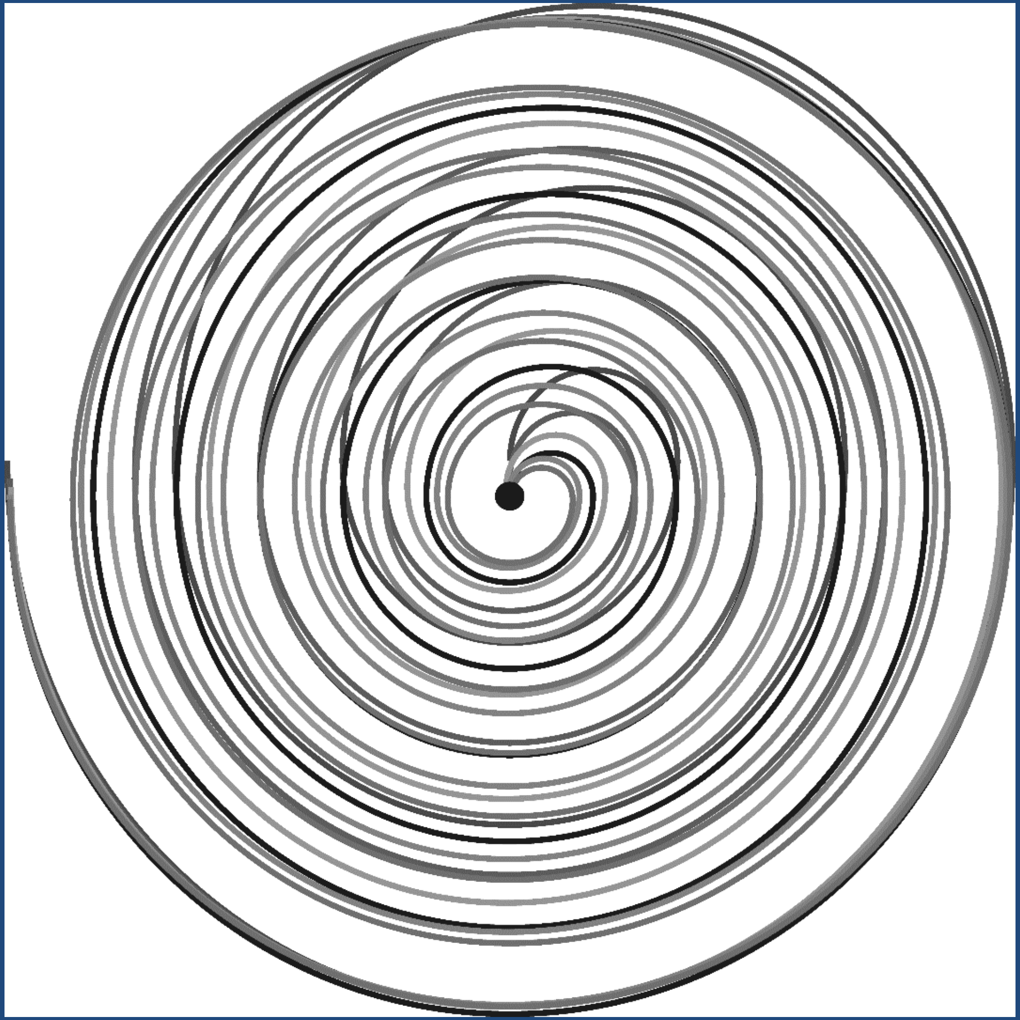
Discontinuum



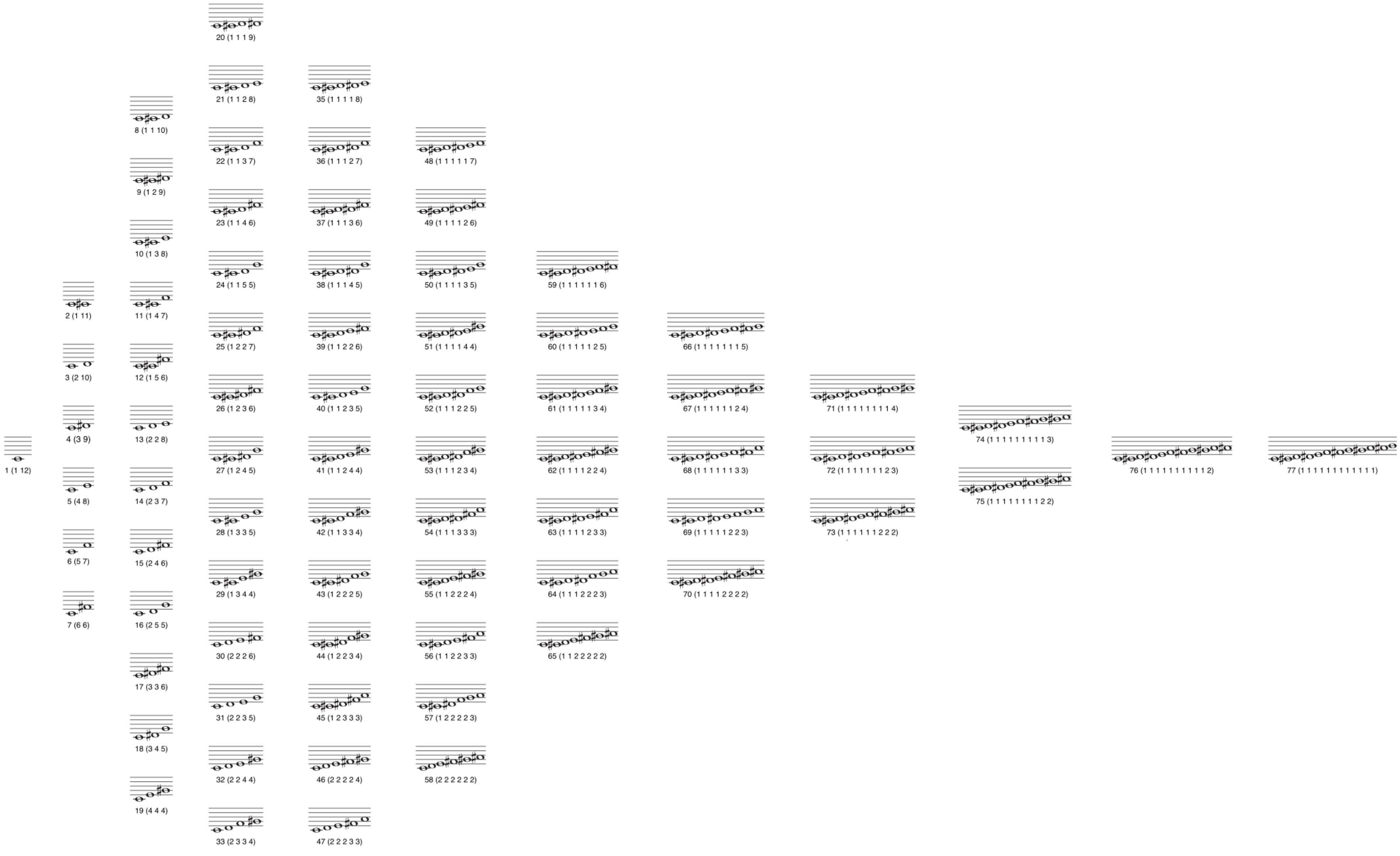
Murmullos del páramo, opéra



Continuum



Exemples d'analyse


1 (1 12)
2 (1 11)
3 (2 10)
4 (3 9)
5 (4 8)
6 (5 7)
7 (6 6)
8 (1 1 10)
9 (1 2 9)
10 (1 3 8)
11 (1 4 7)
12 (1 5 6)
13 (2 2 8)
14 (2 3 7)
15 (2 4 6)
16 (2 5 5)
17 (3 3 6)
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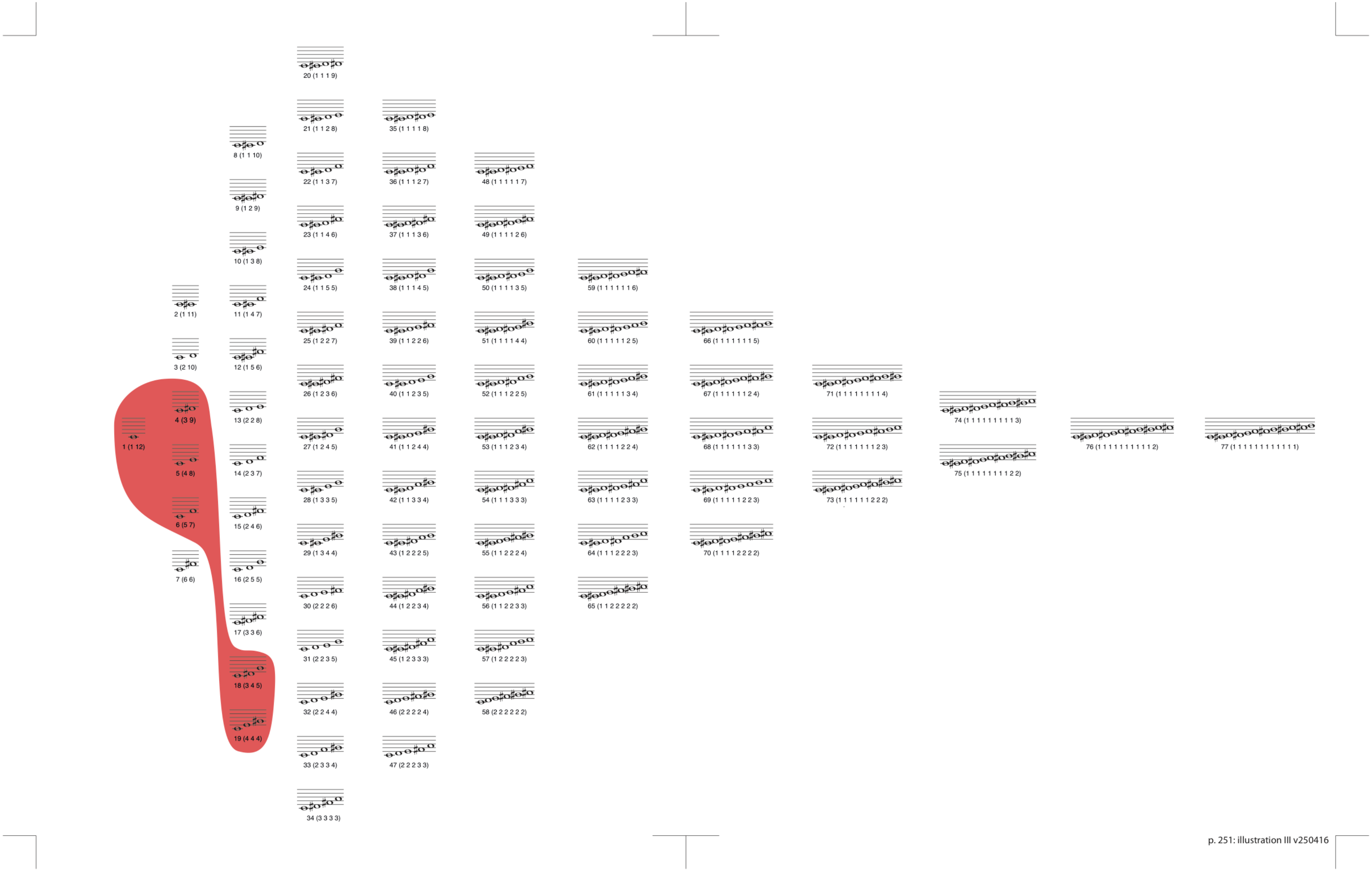
Exemples d’analyse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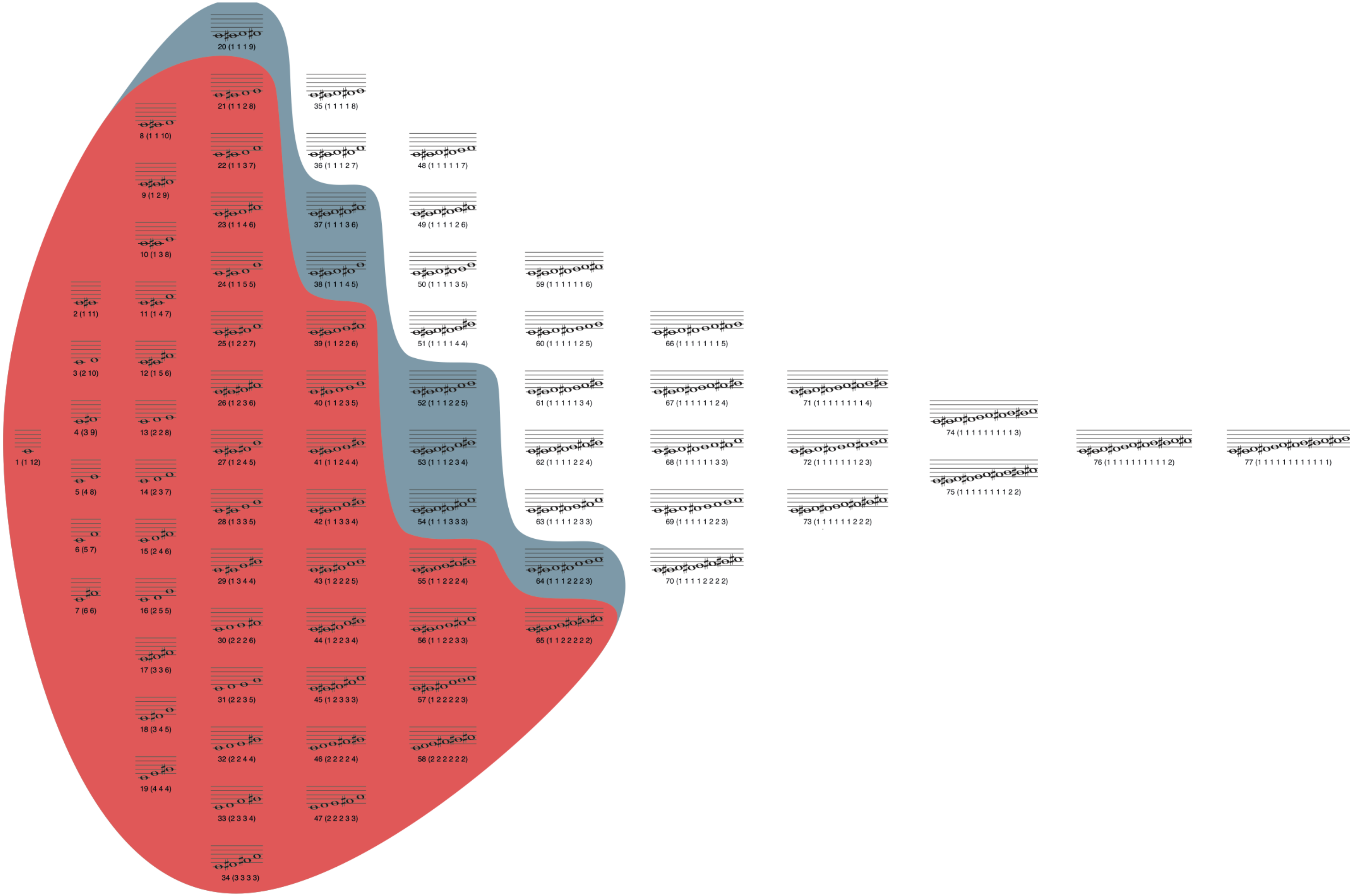
p. 251: illustration III v250416

Exemples d’analyse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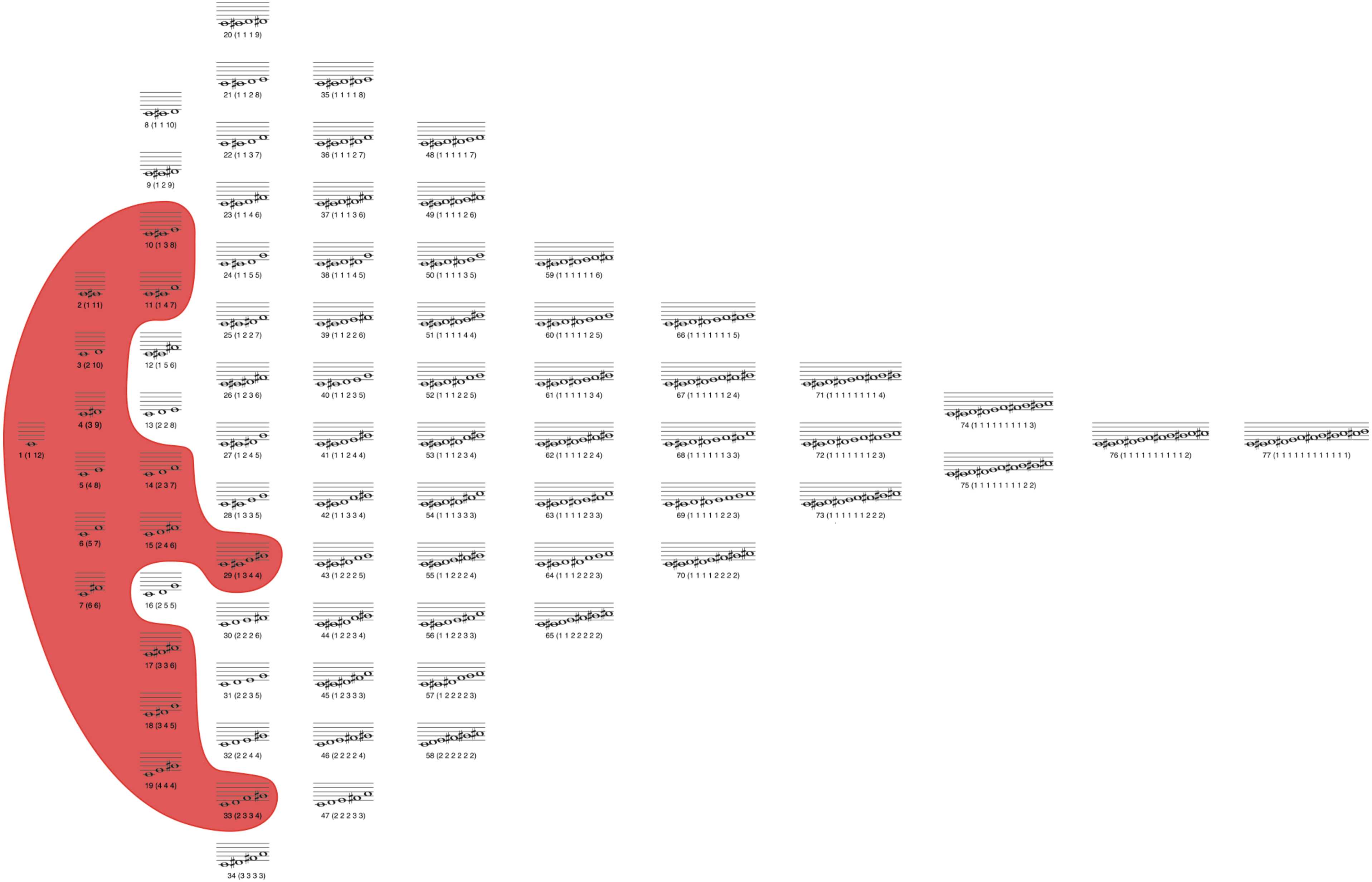
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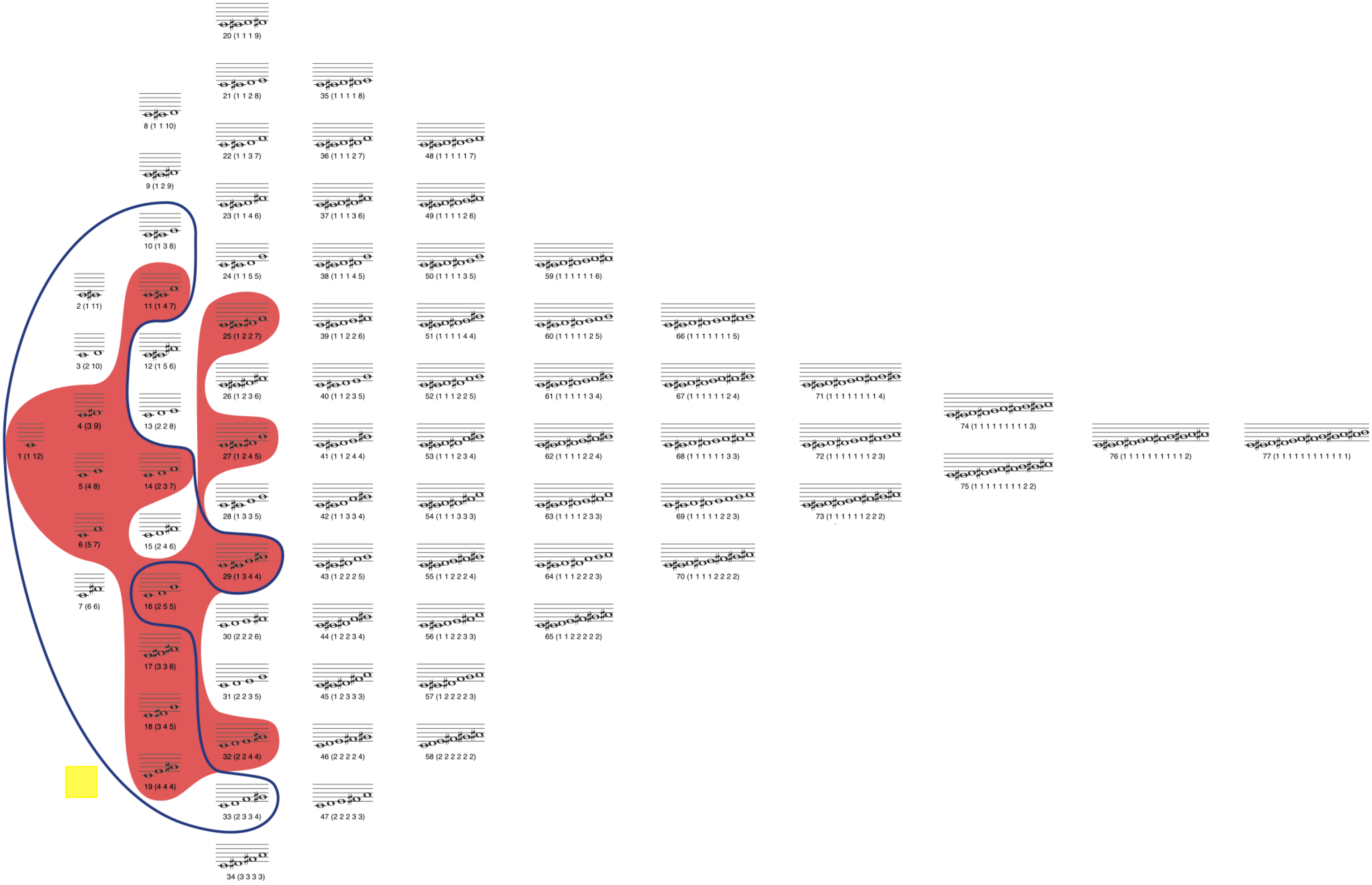
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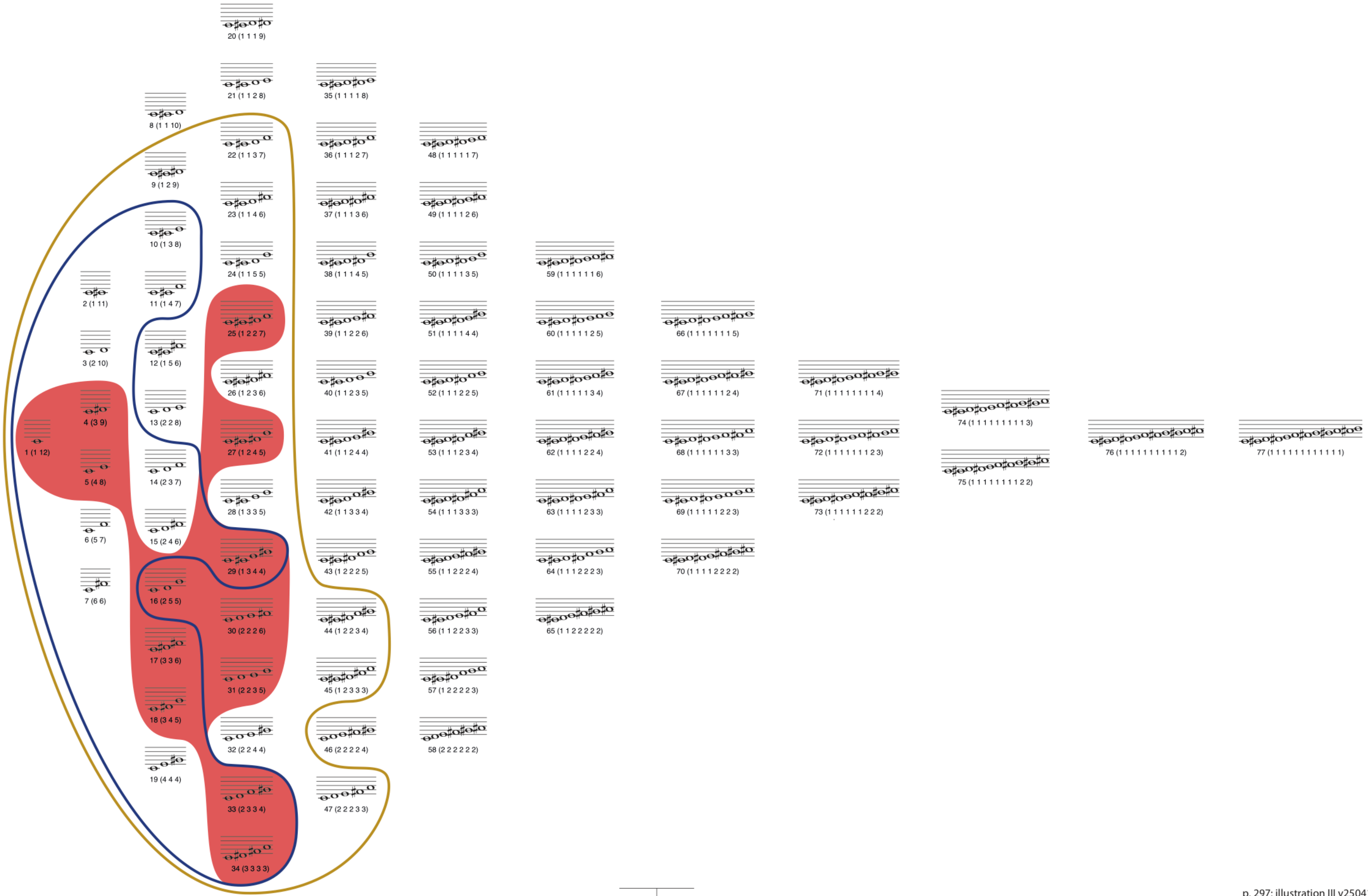
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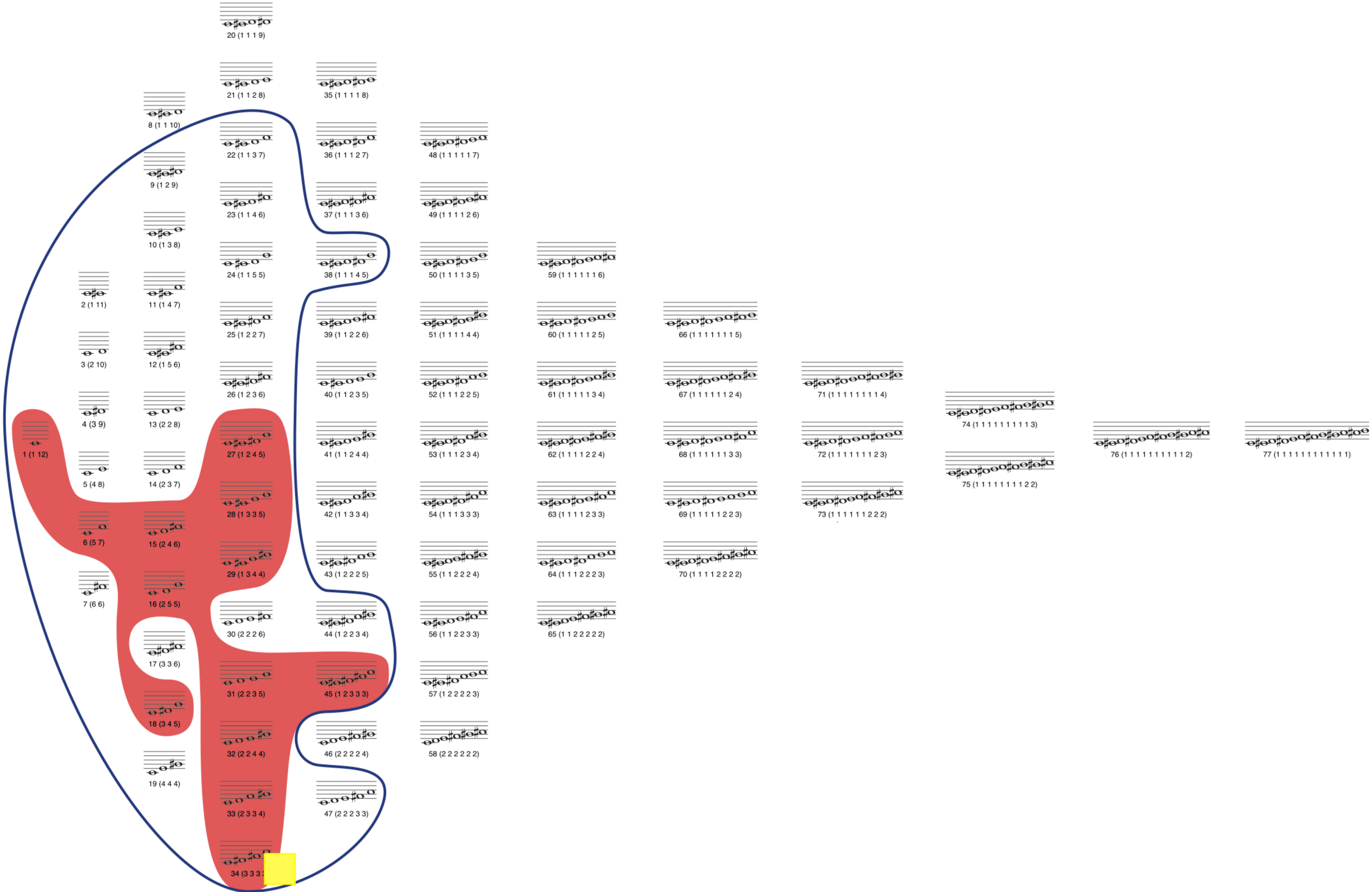
p. 297: illustration III v2504

Exemples d’analyse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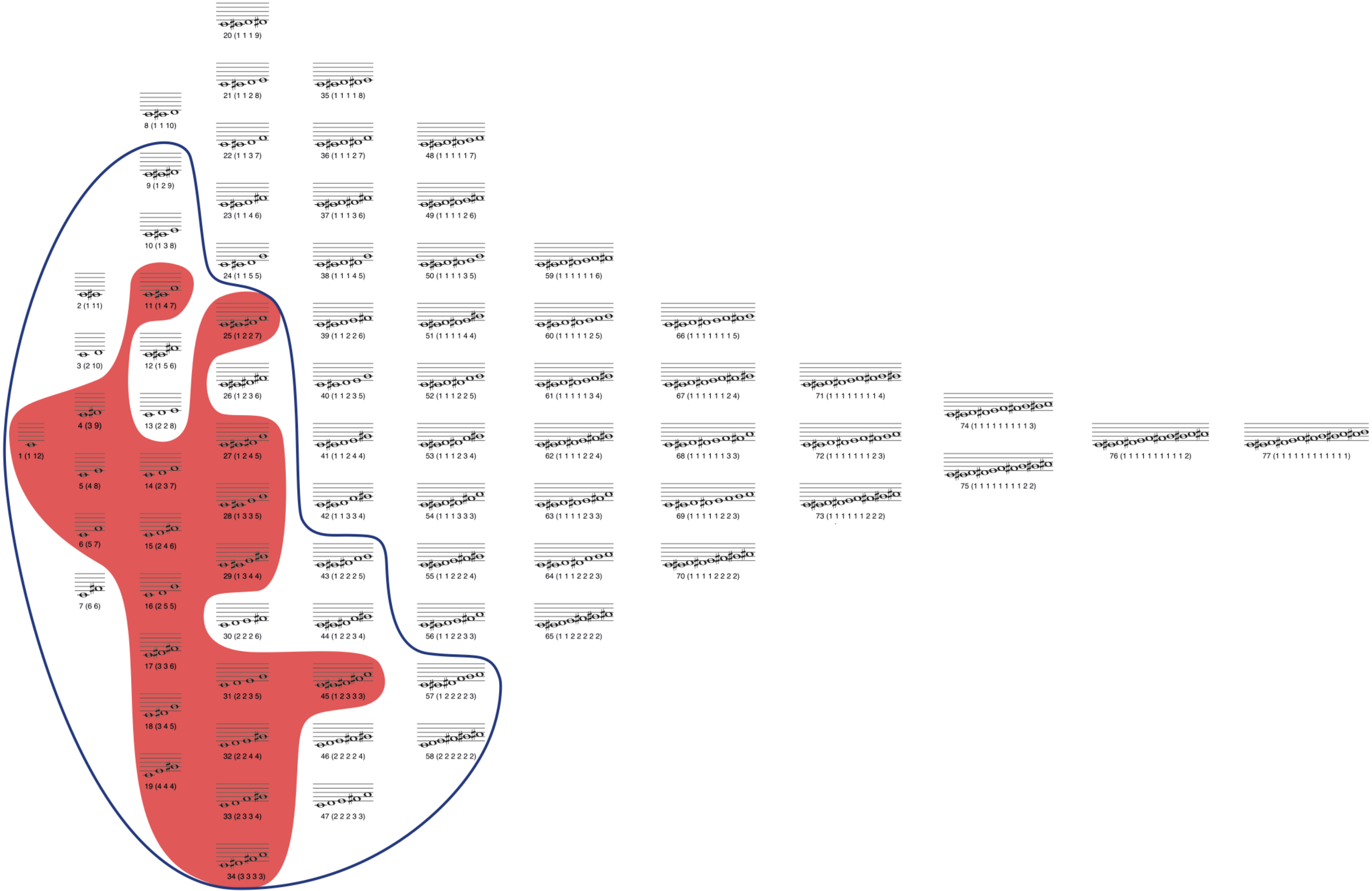
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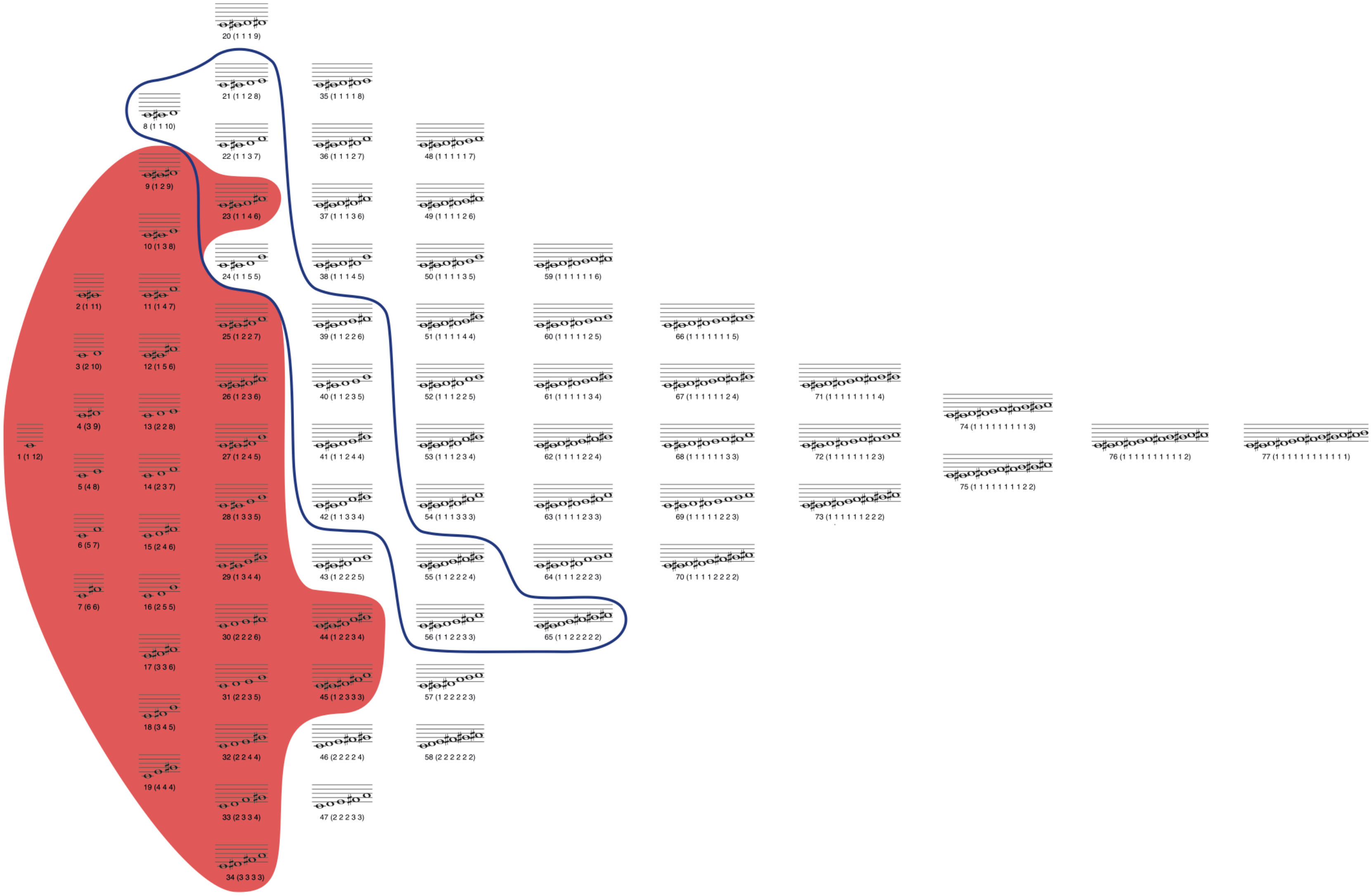
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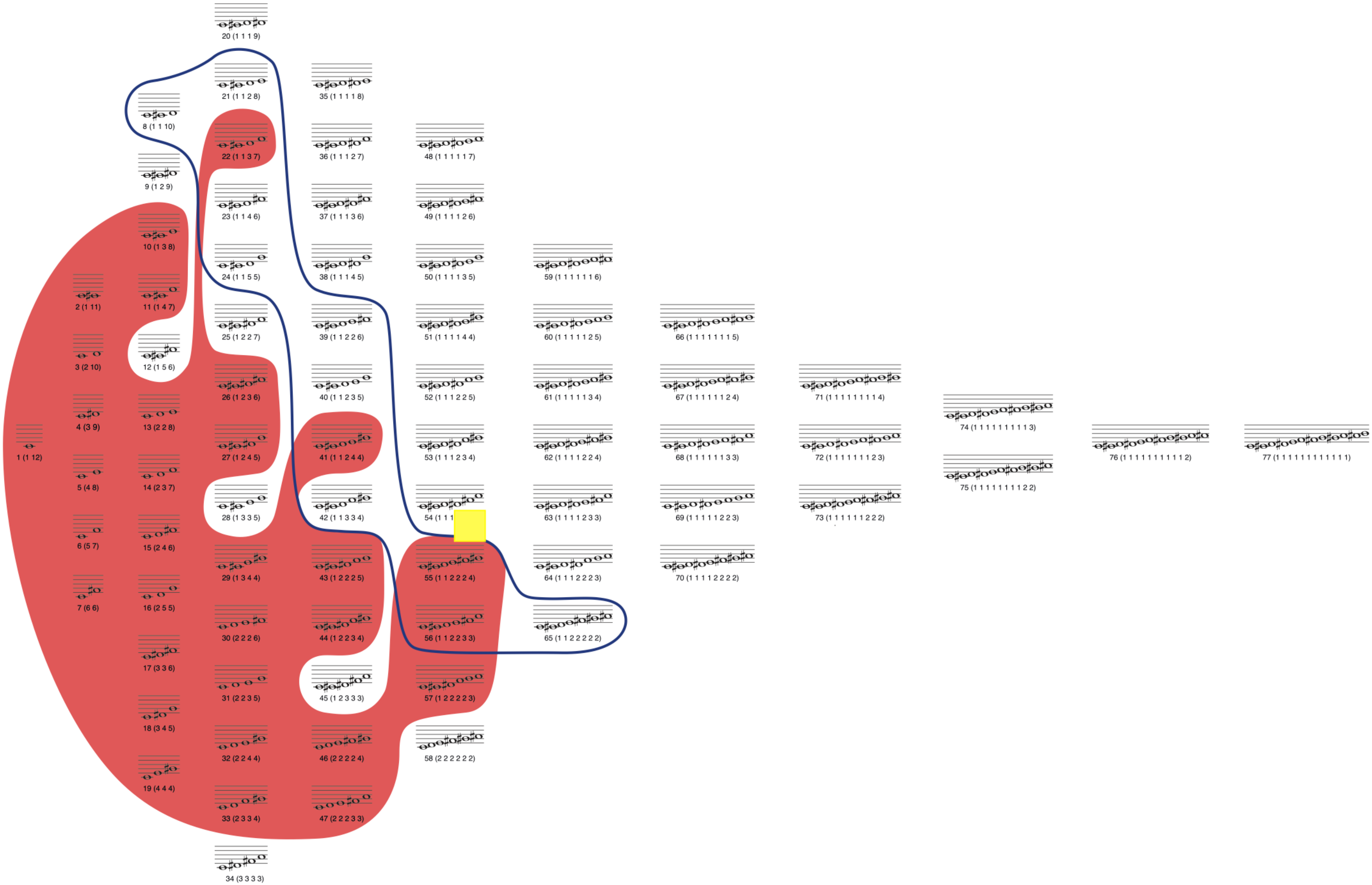
p. 320: illustration III v250416

Exemples d’analyse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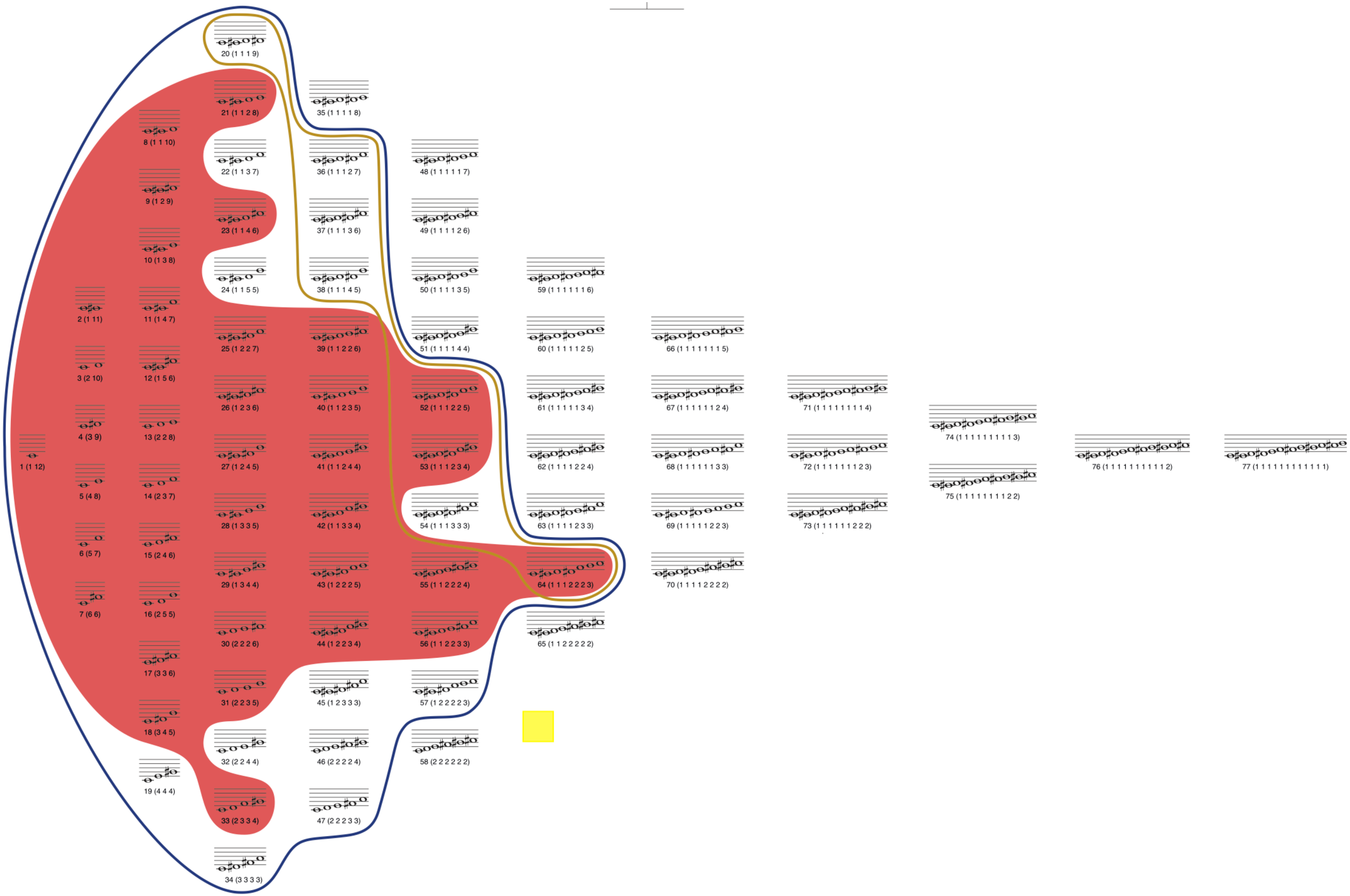
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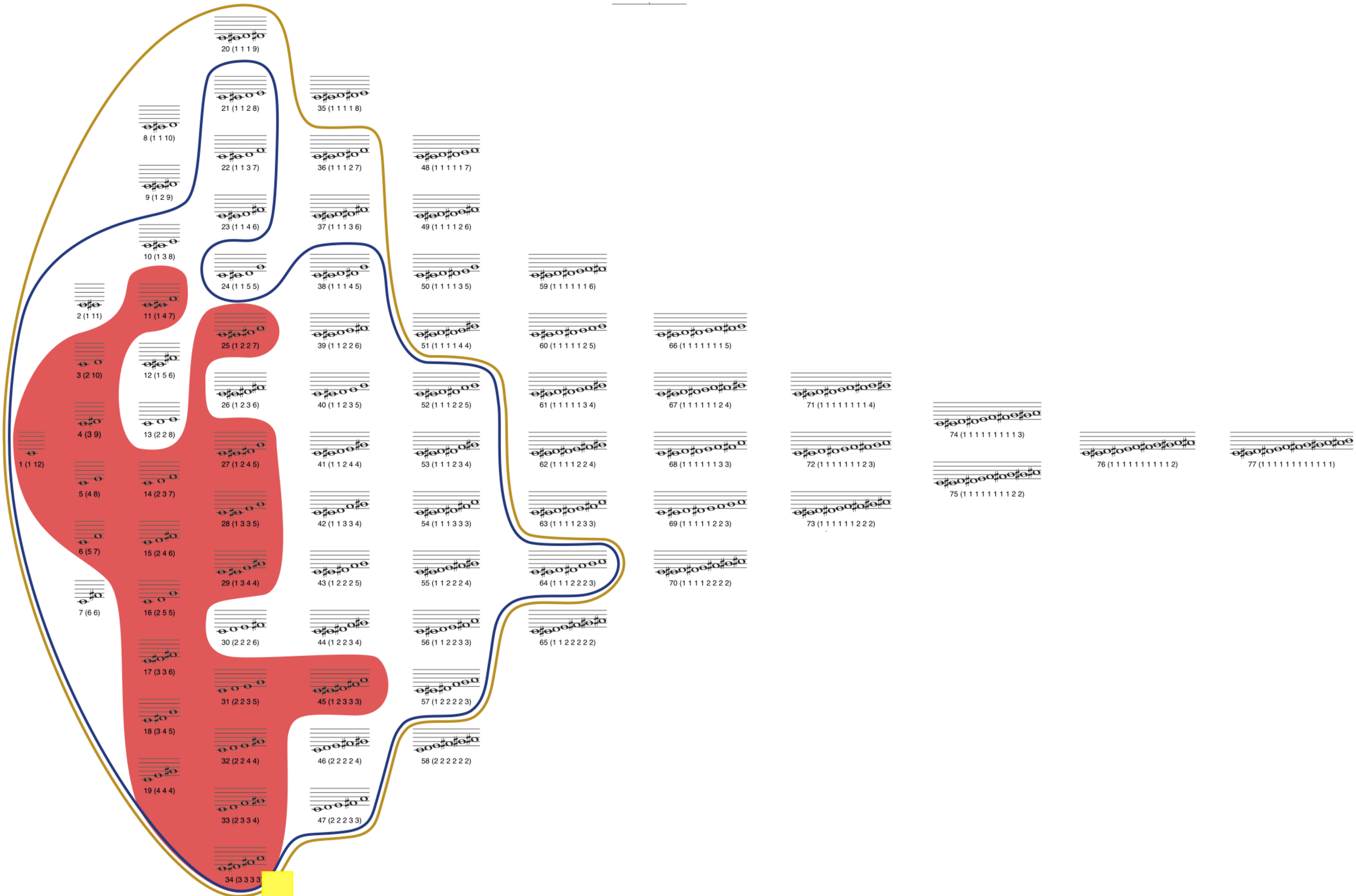
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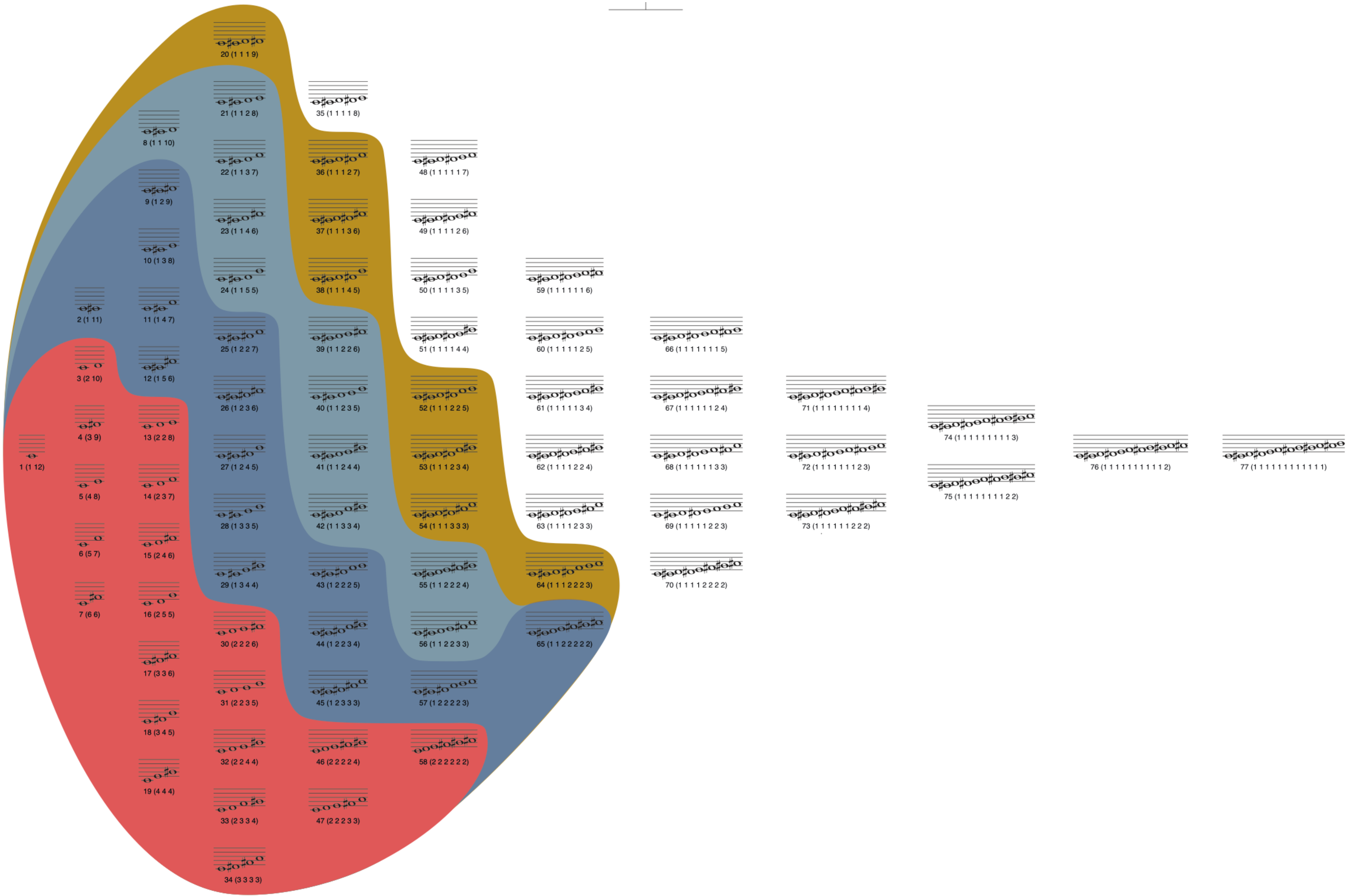
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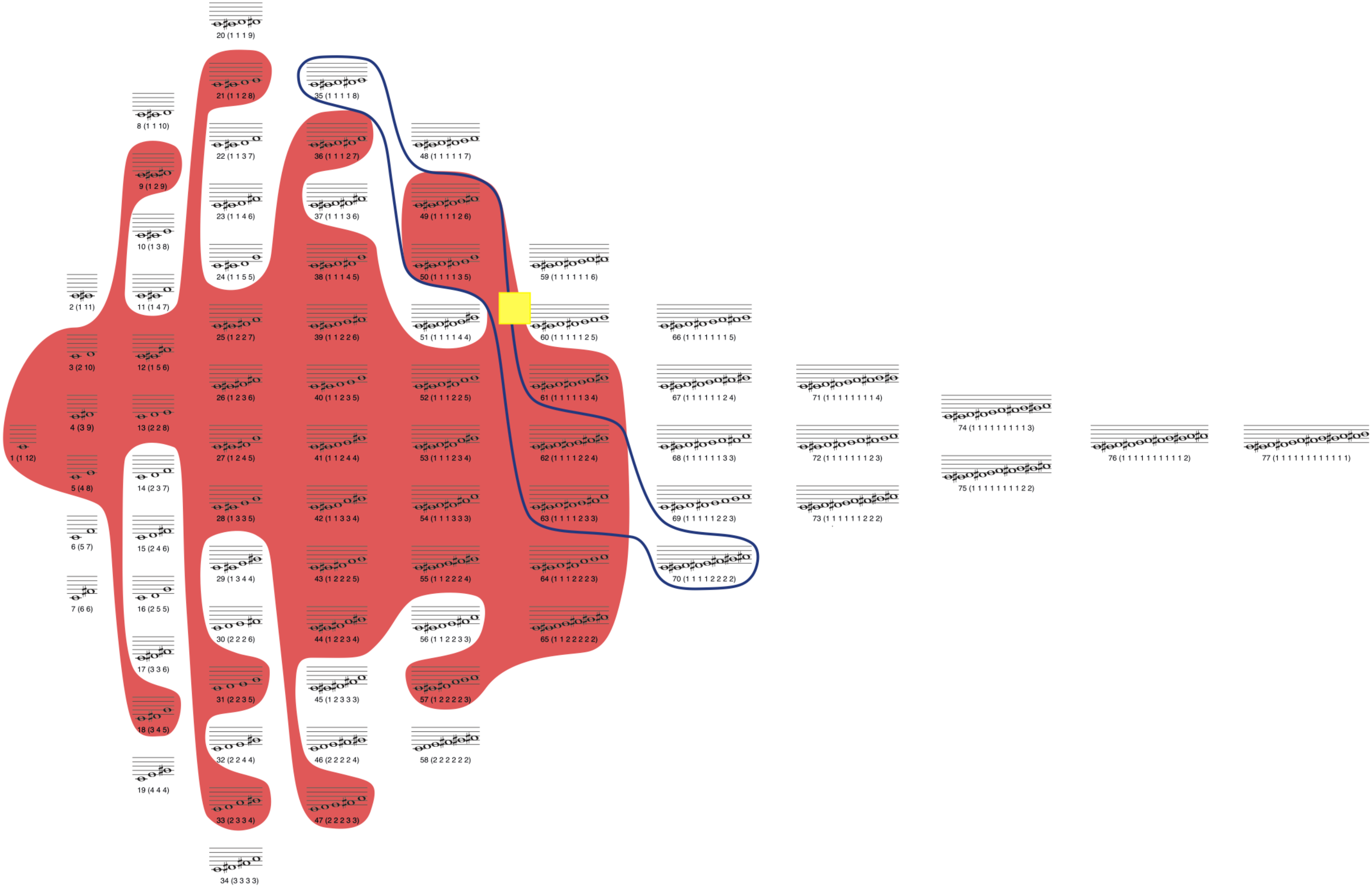
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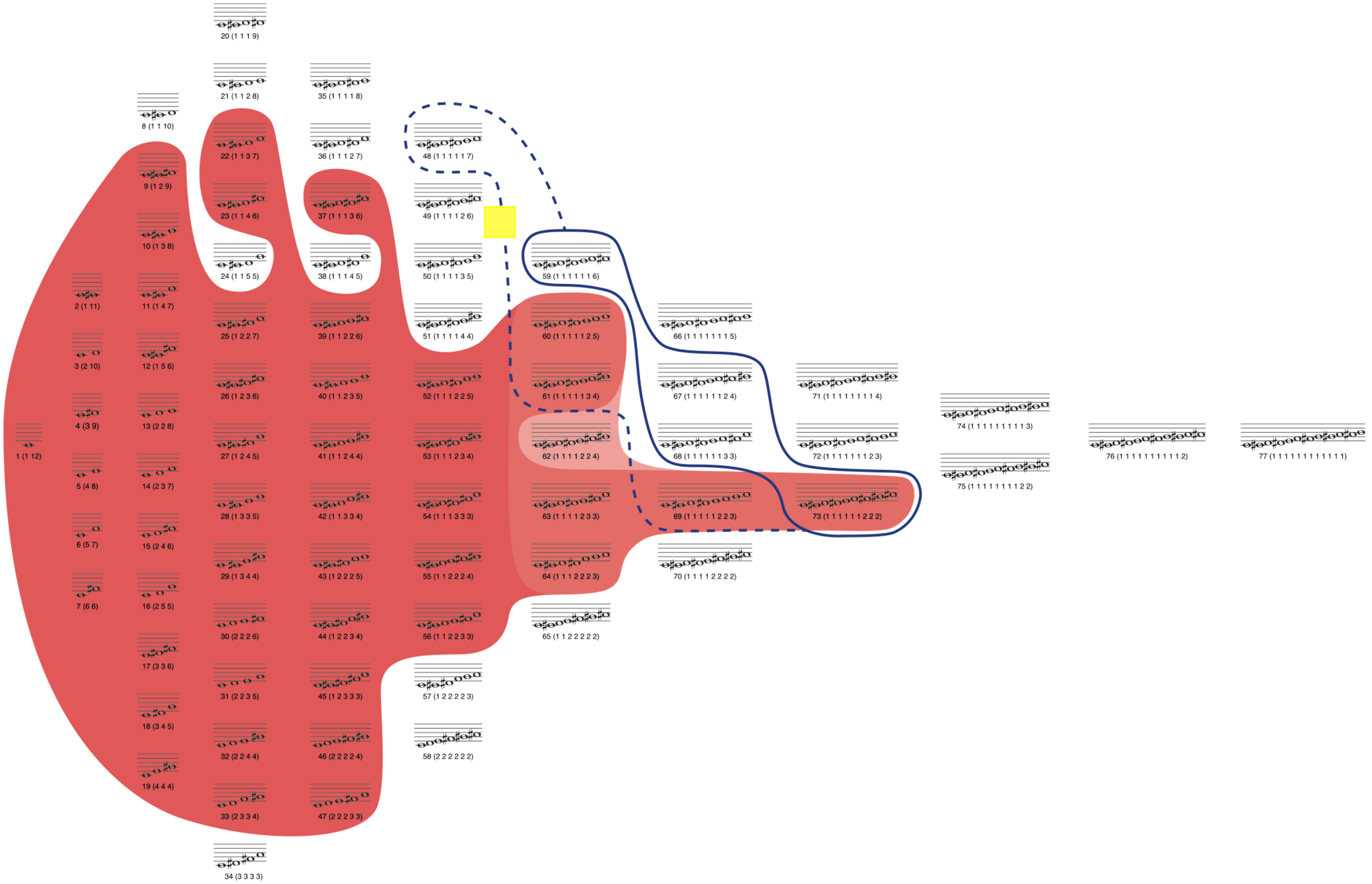
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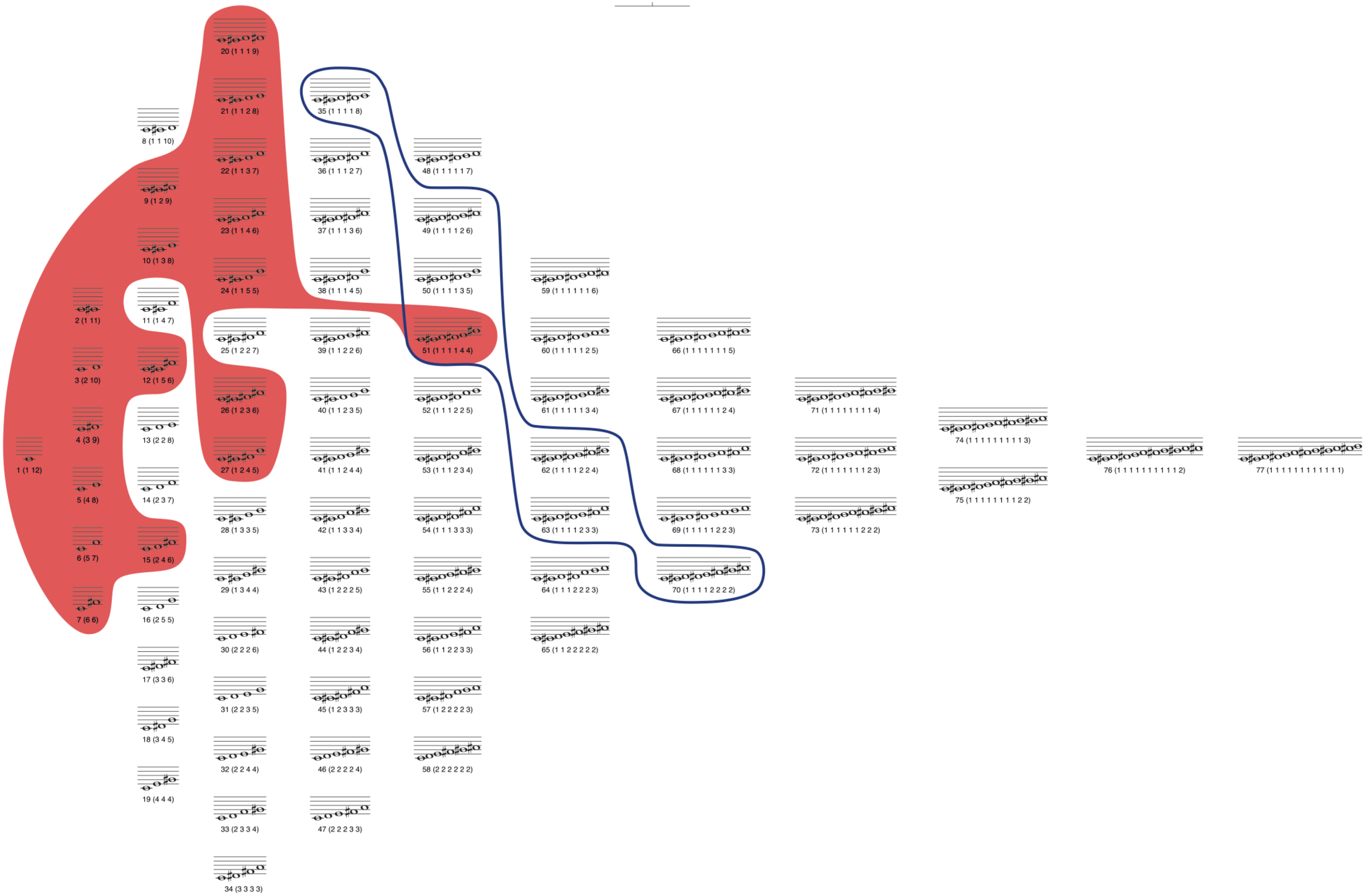
p. 372: illustration III v250416

Exemples d’analyse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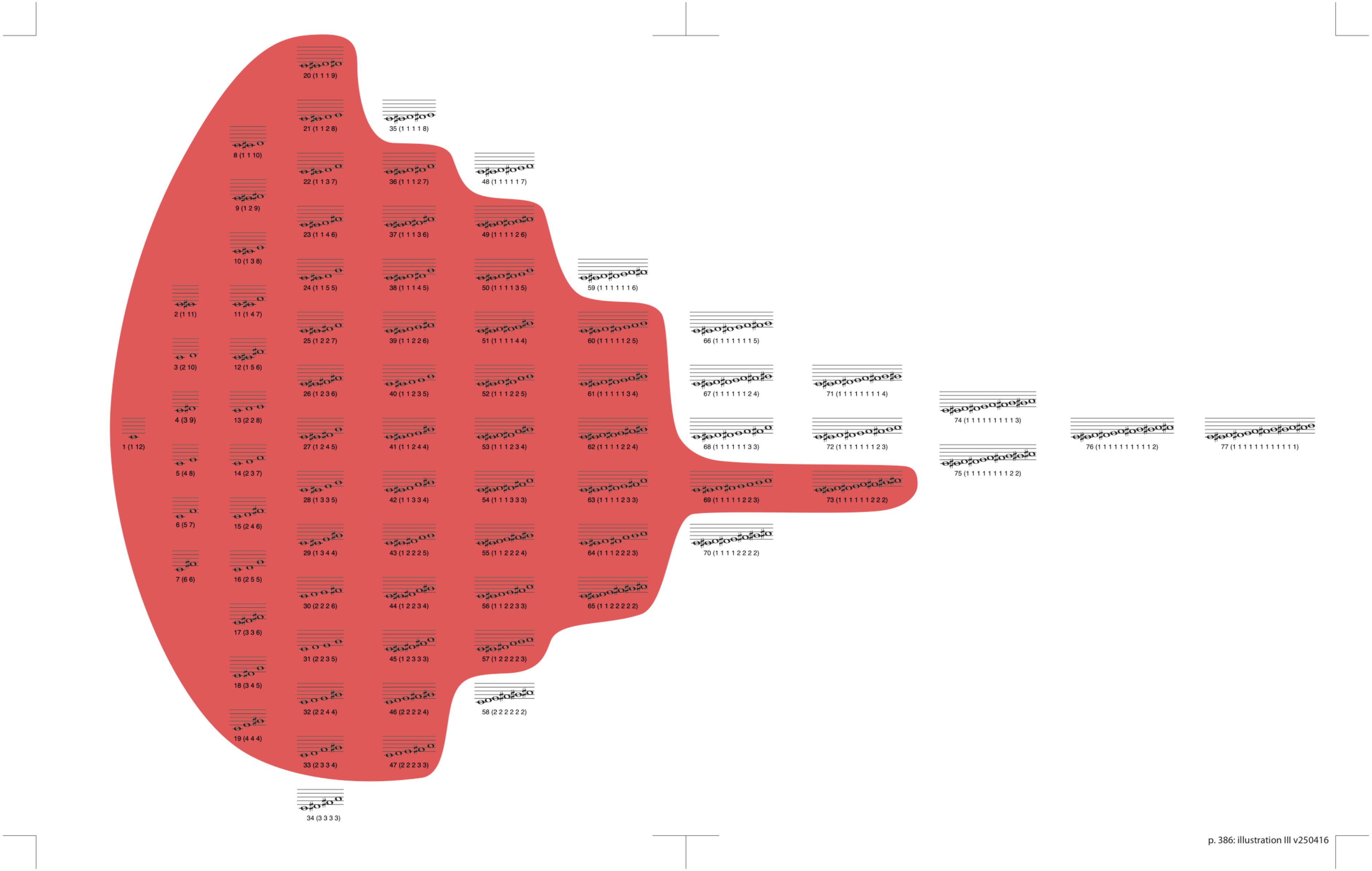
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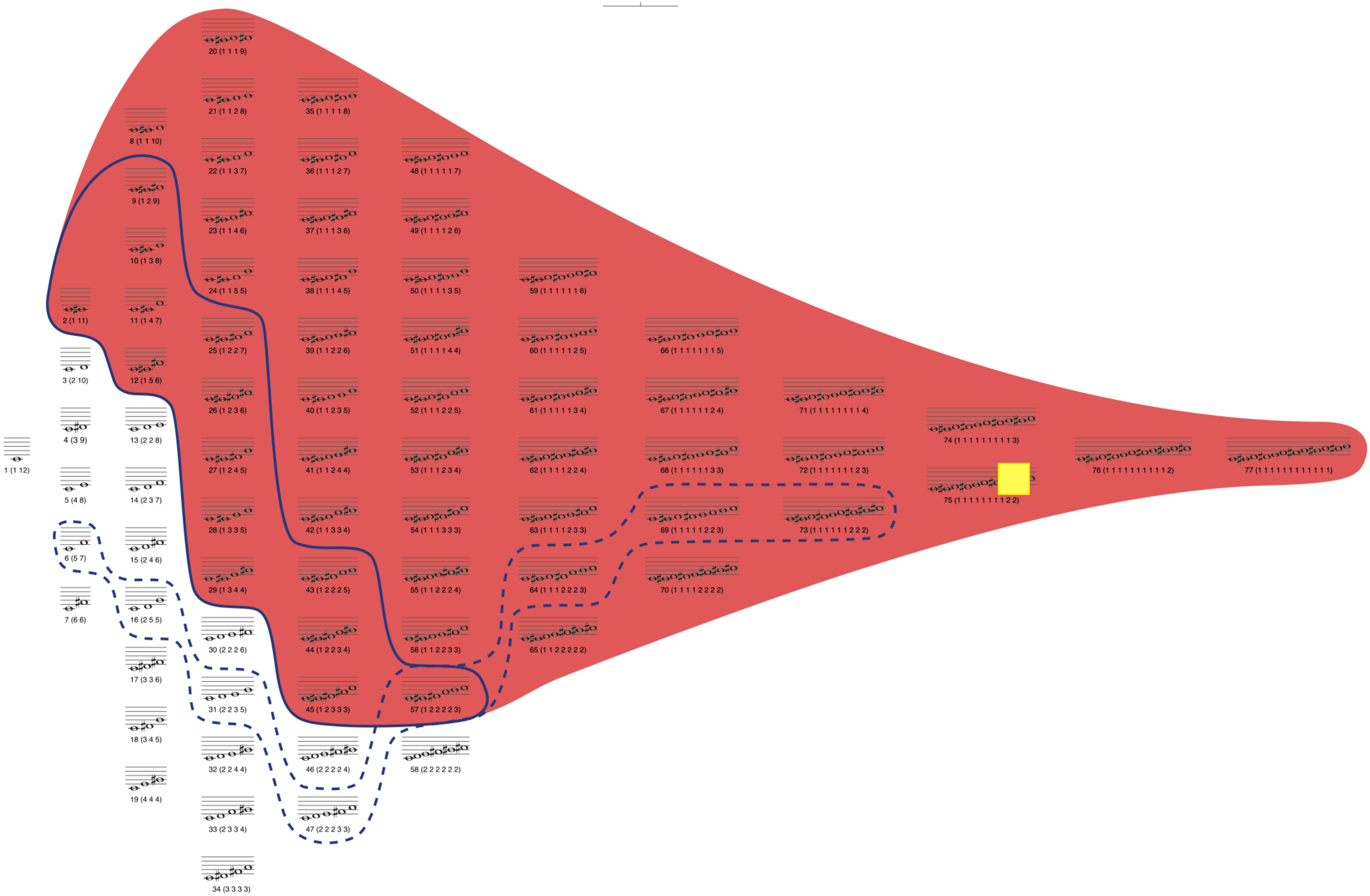
p. 386: illustration III v250416

Exemples d’analyse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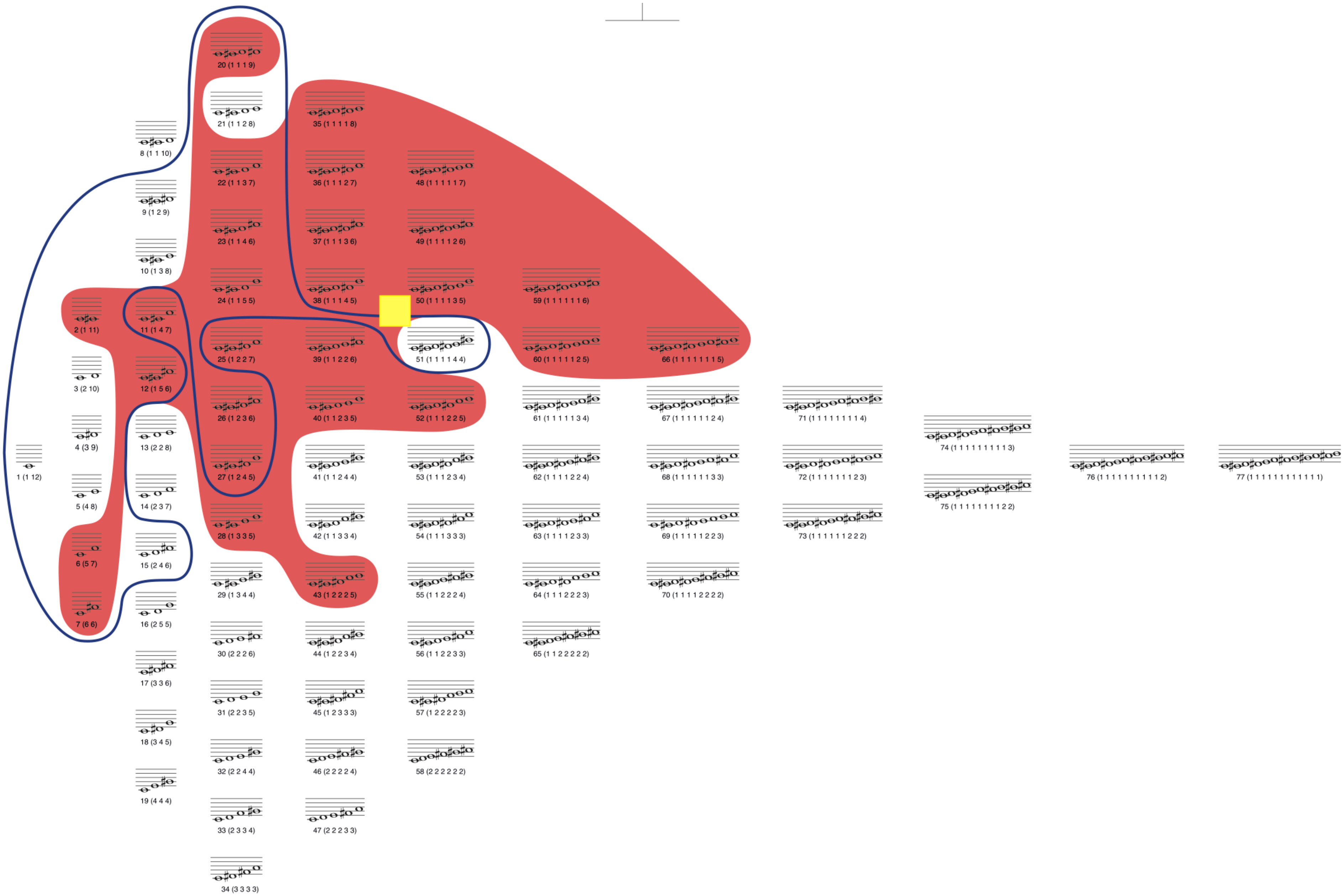
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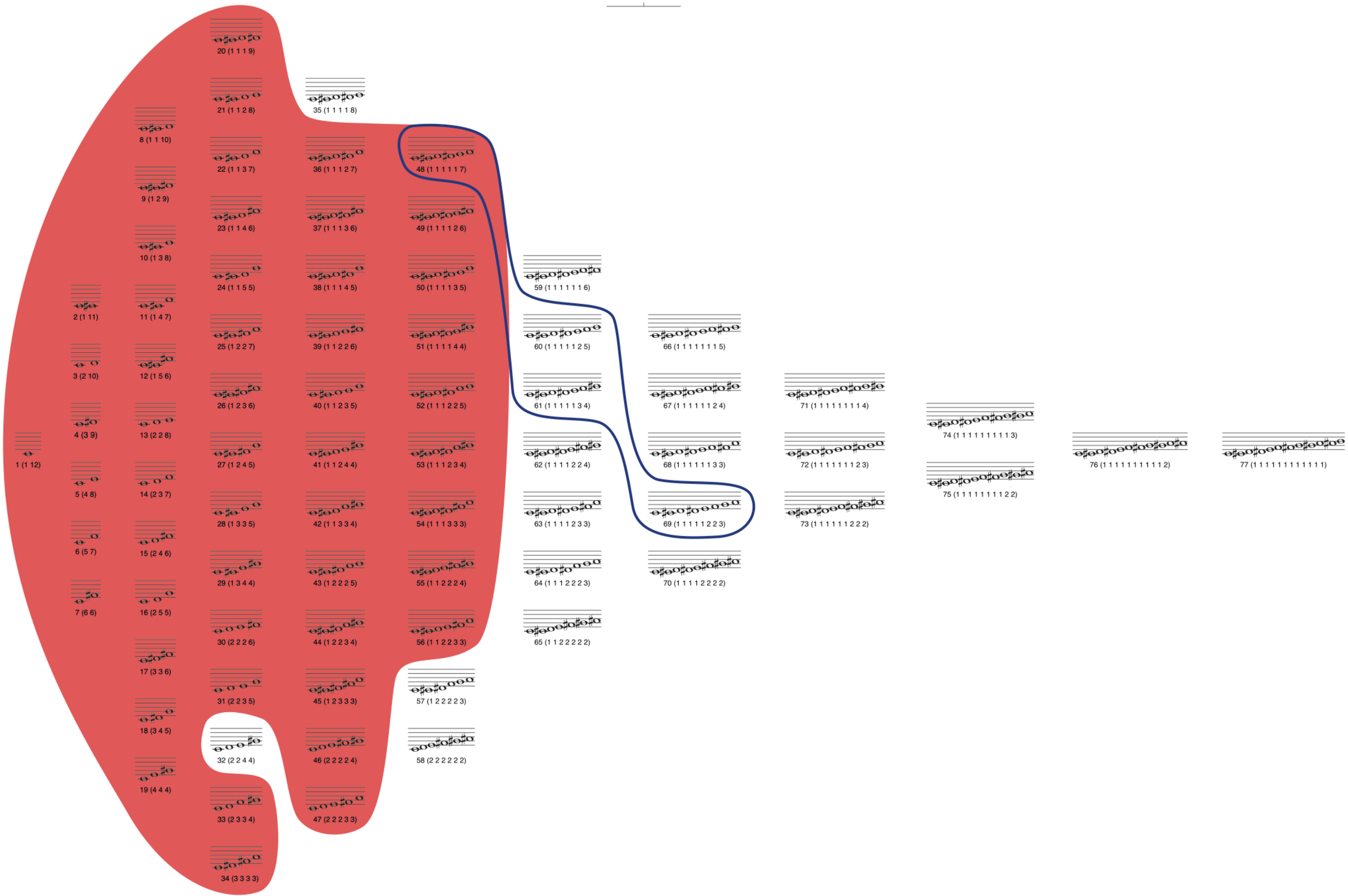
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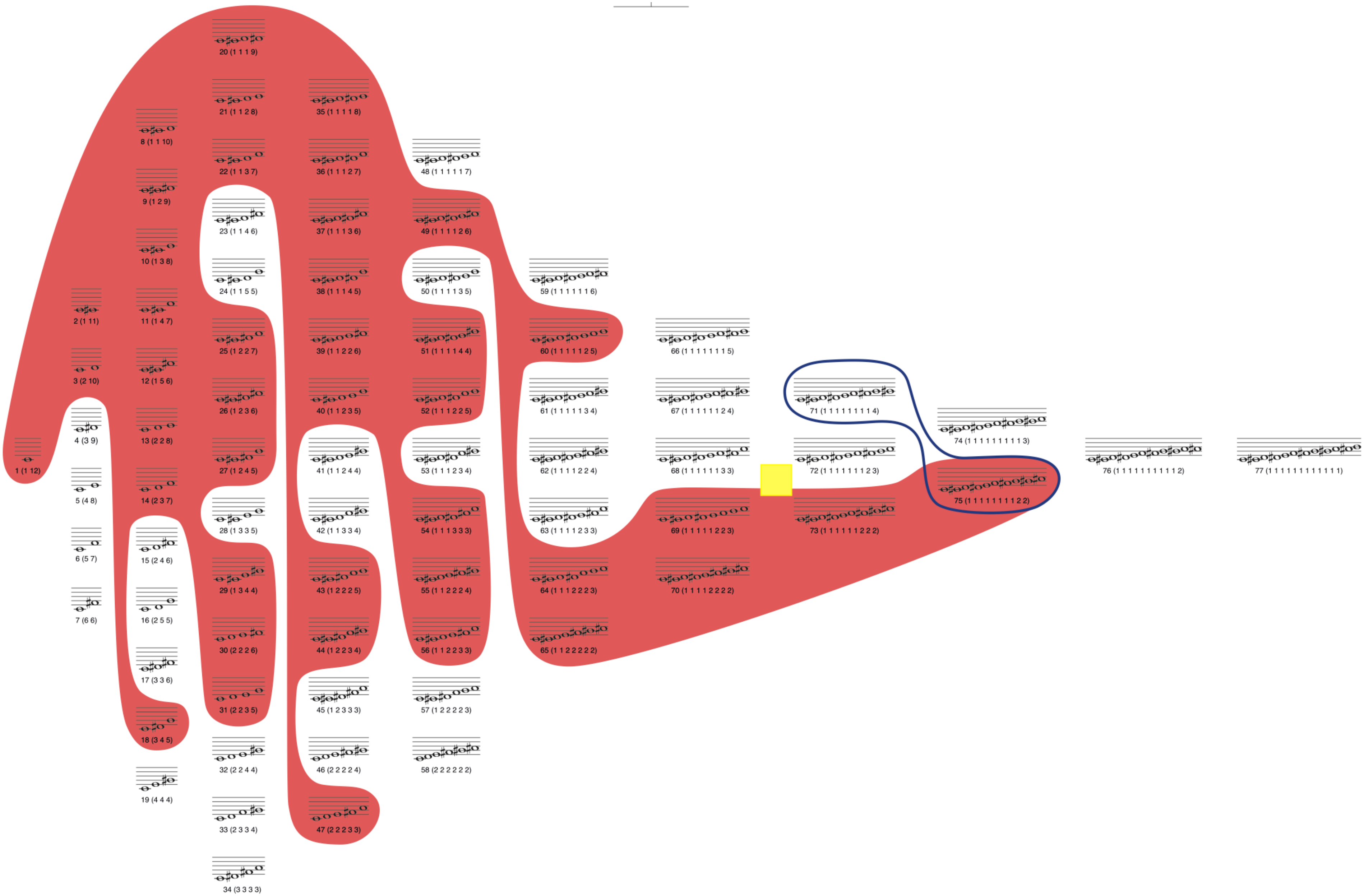
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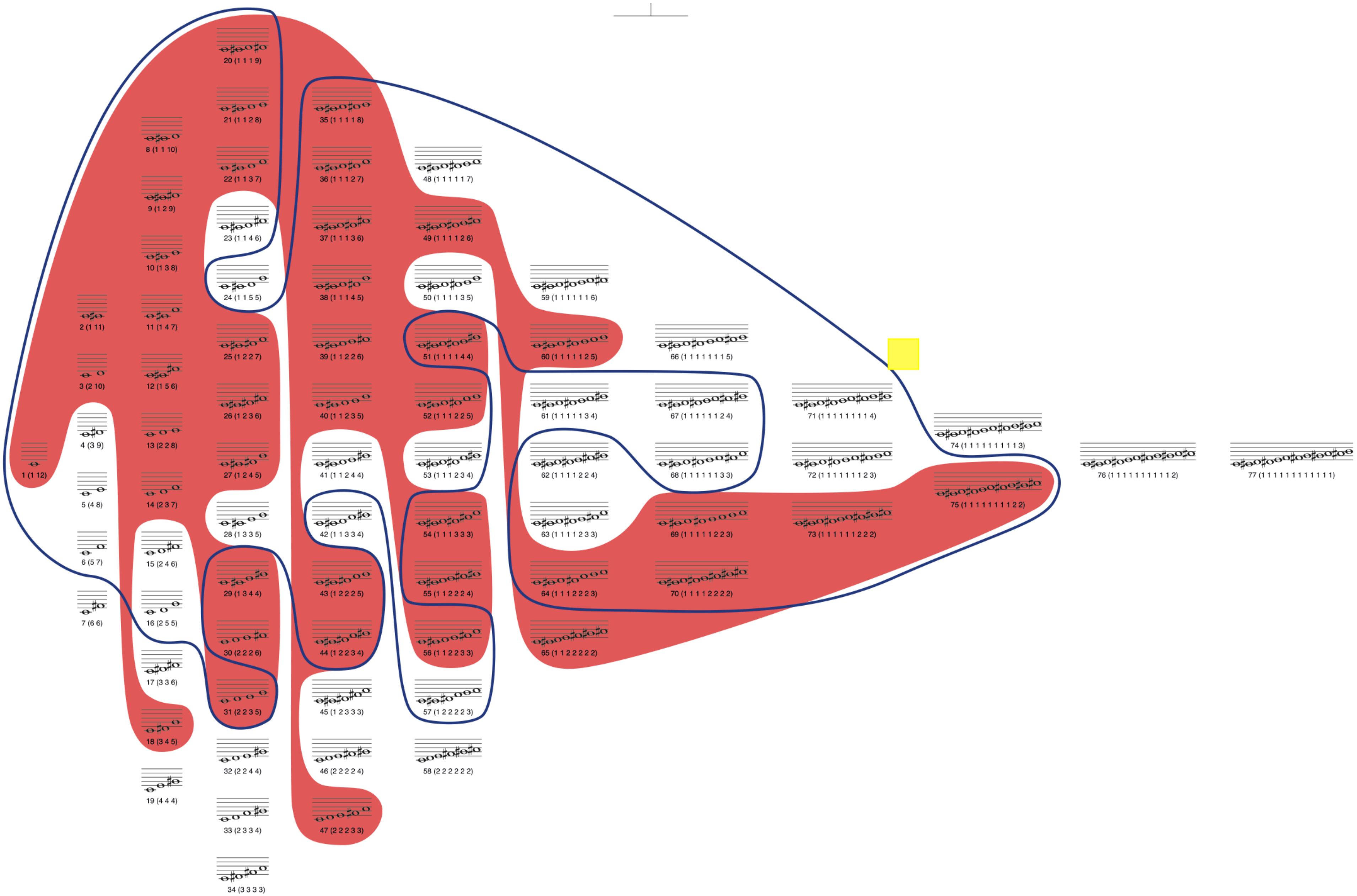
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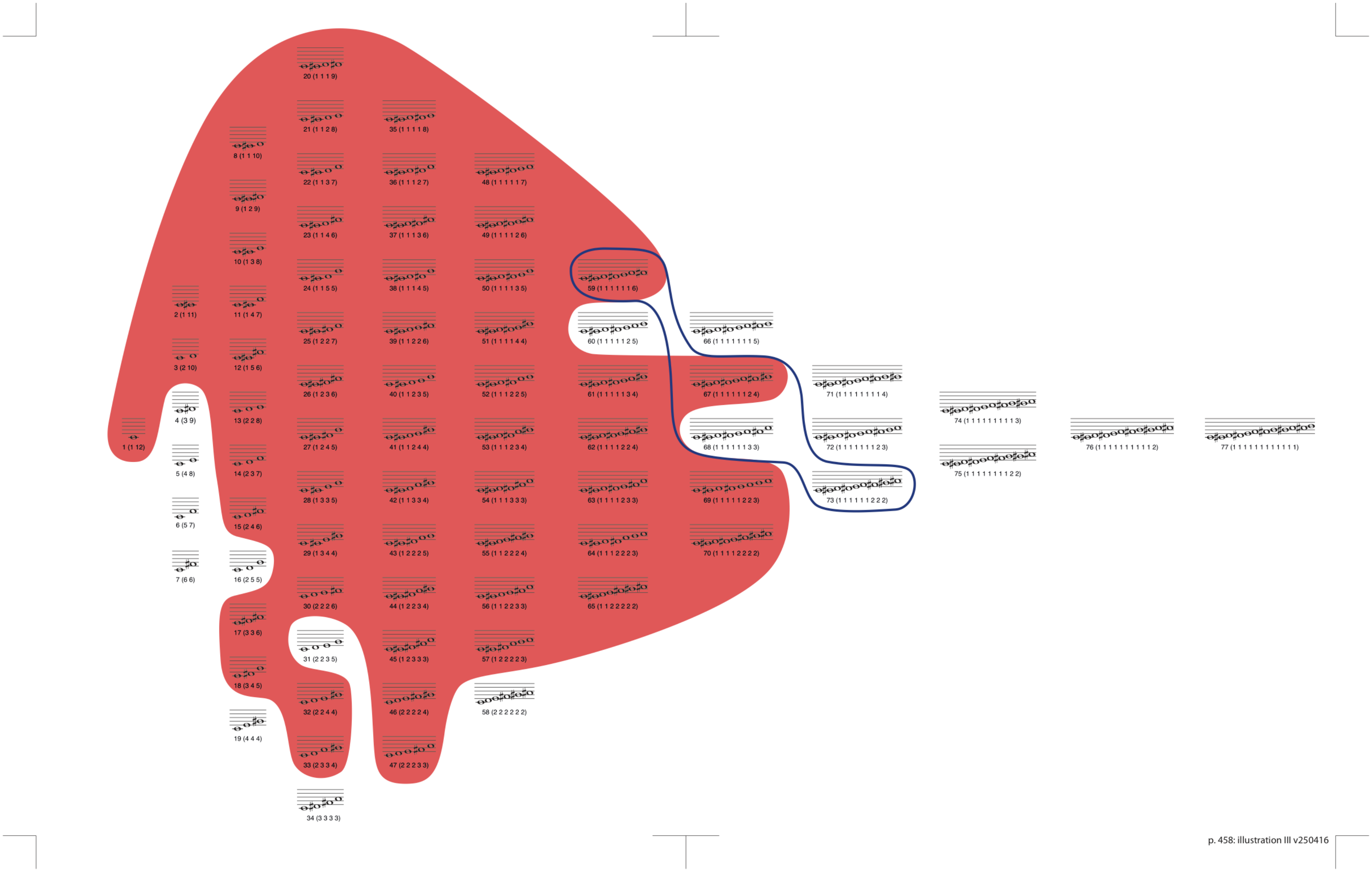
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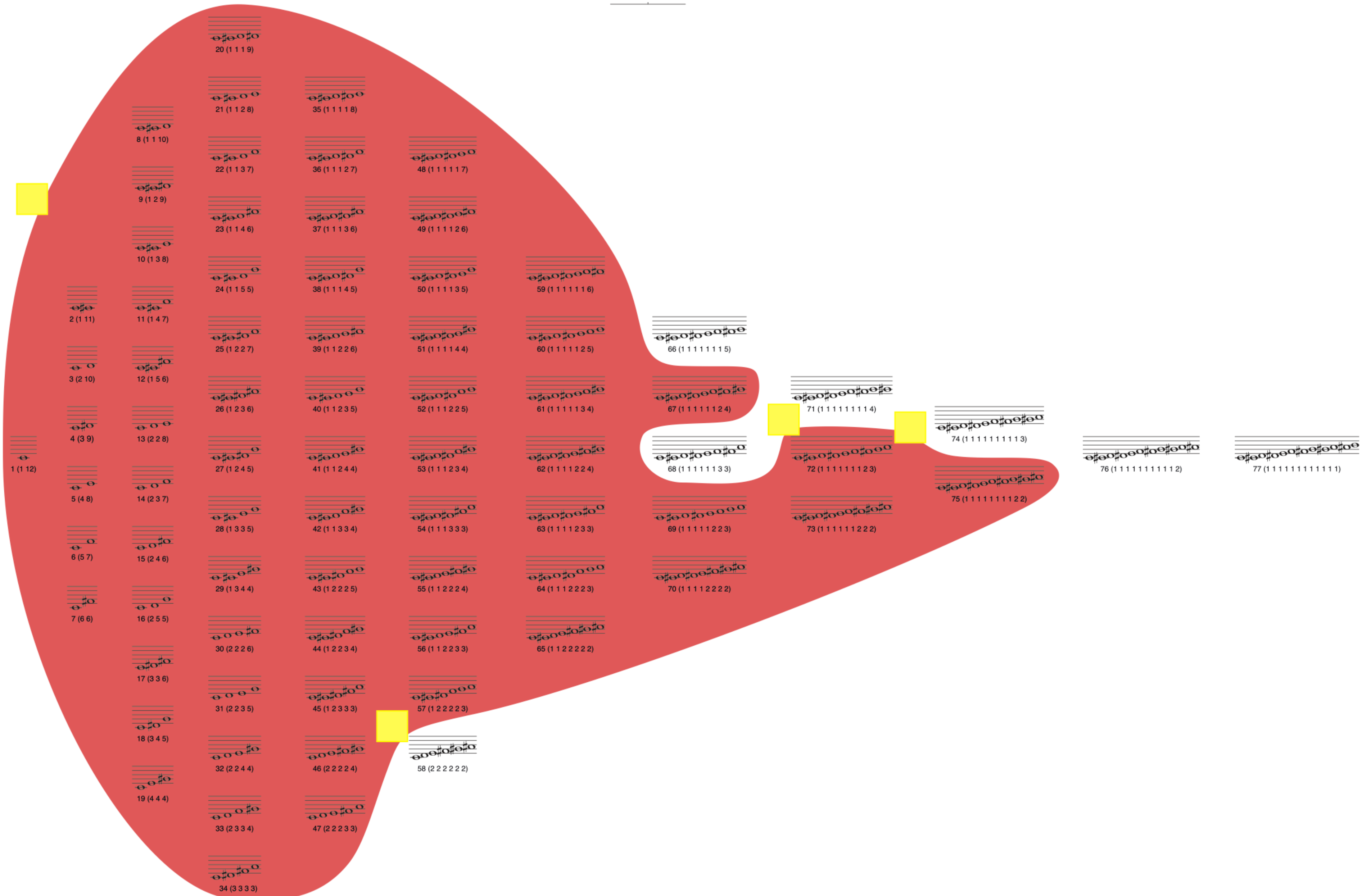
p. 458: illustration III v250416

Exemples d'analyse



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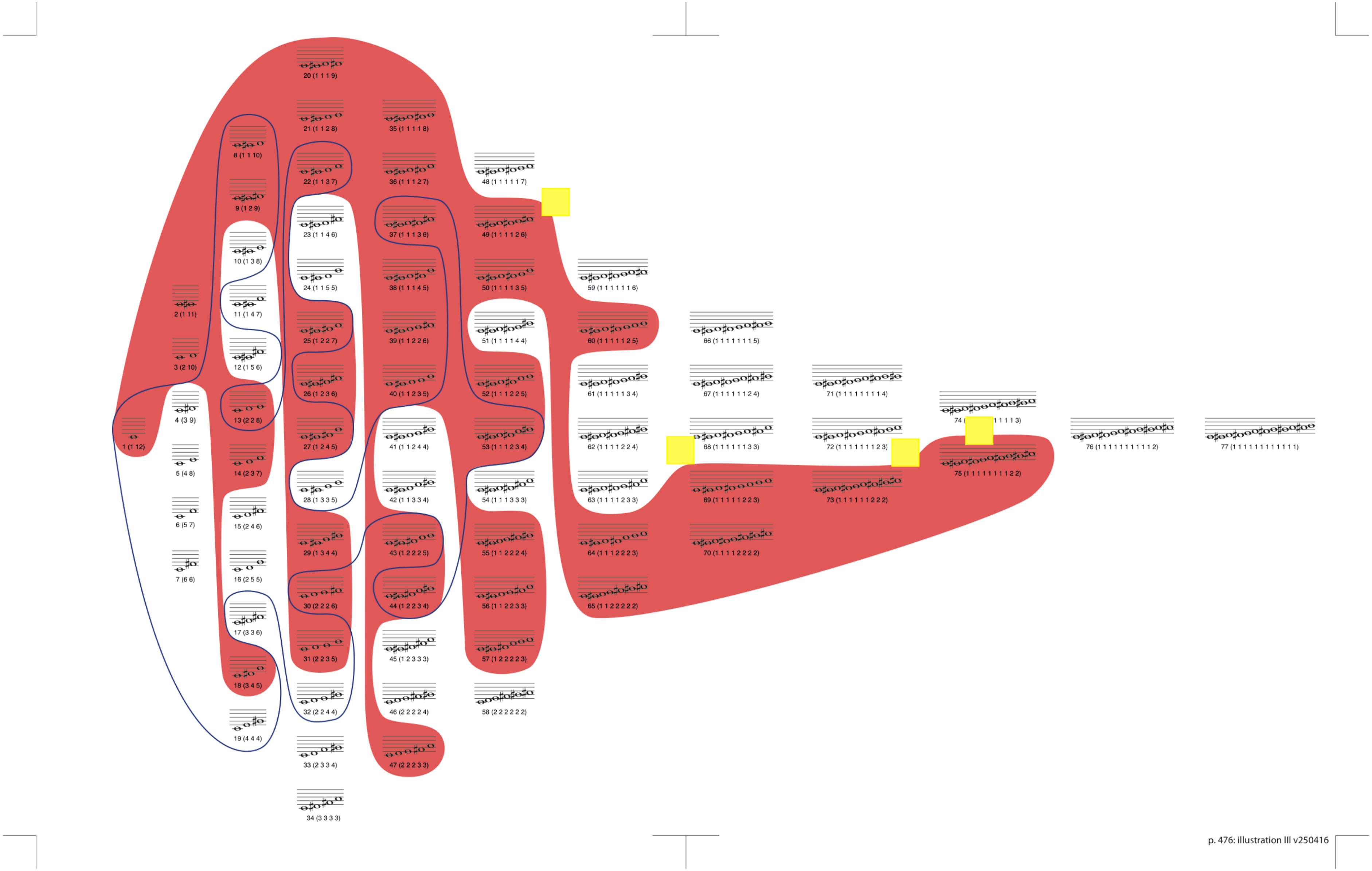
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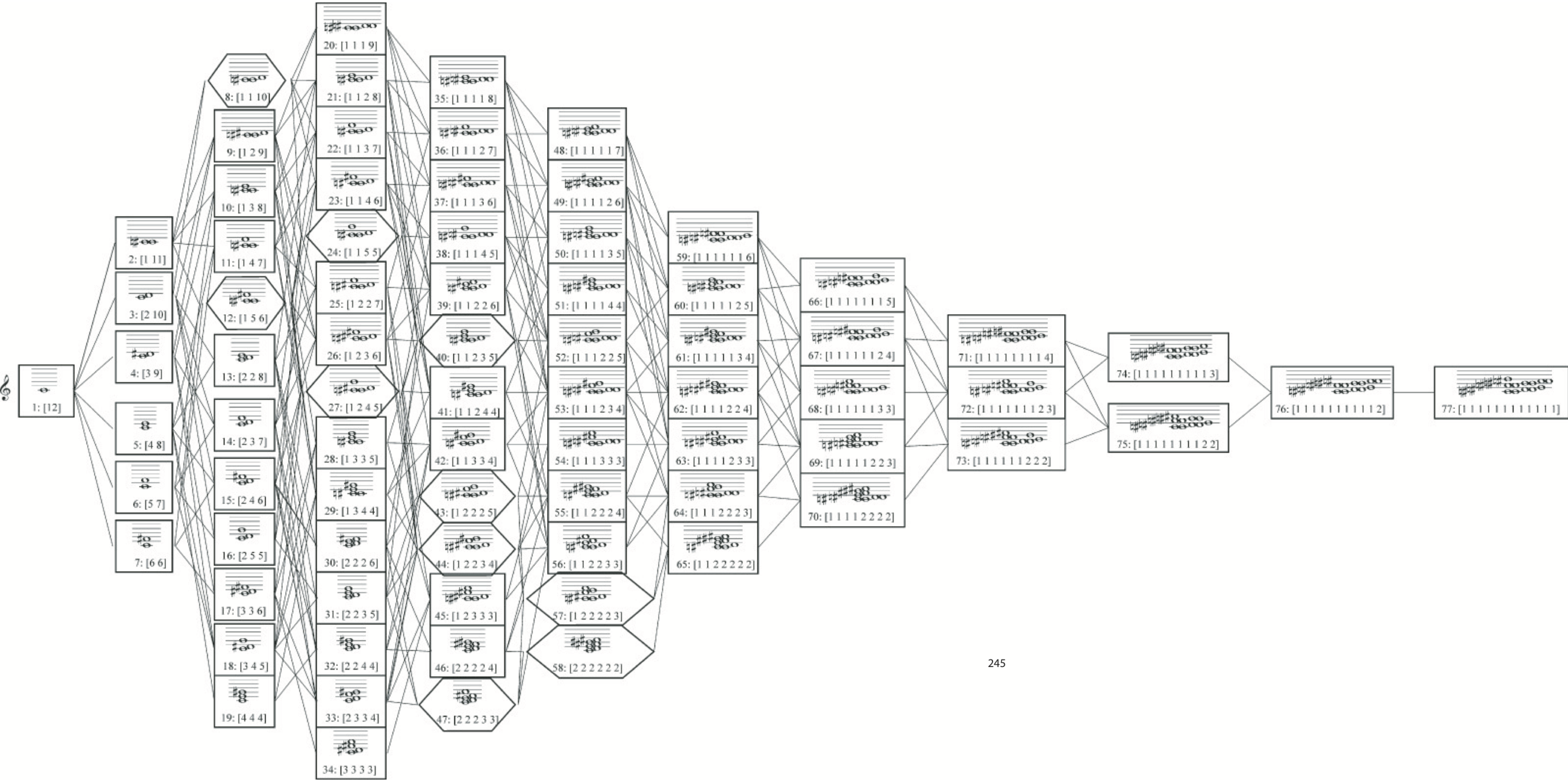
p. 476: illustration III v250416

Exemples d’analyse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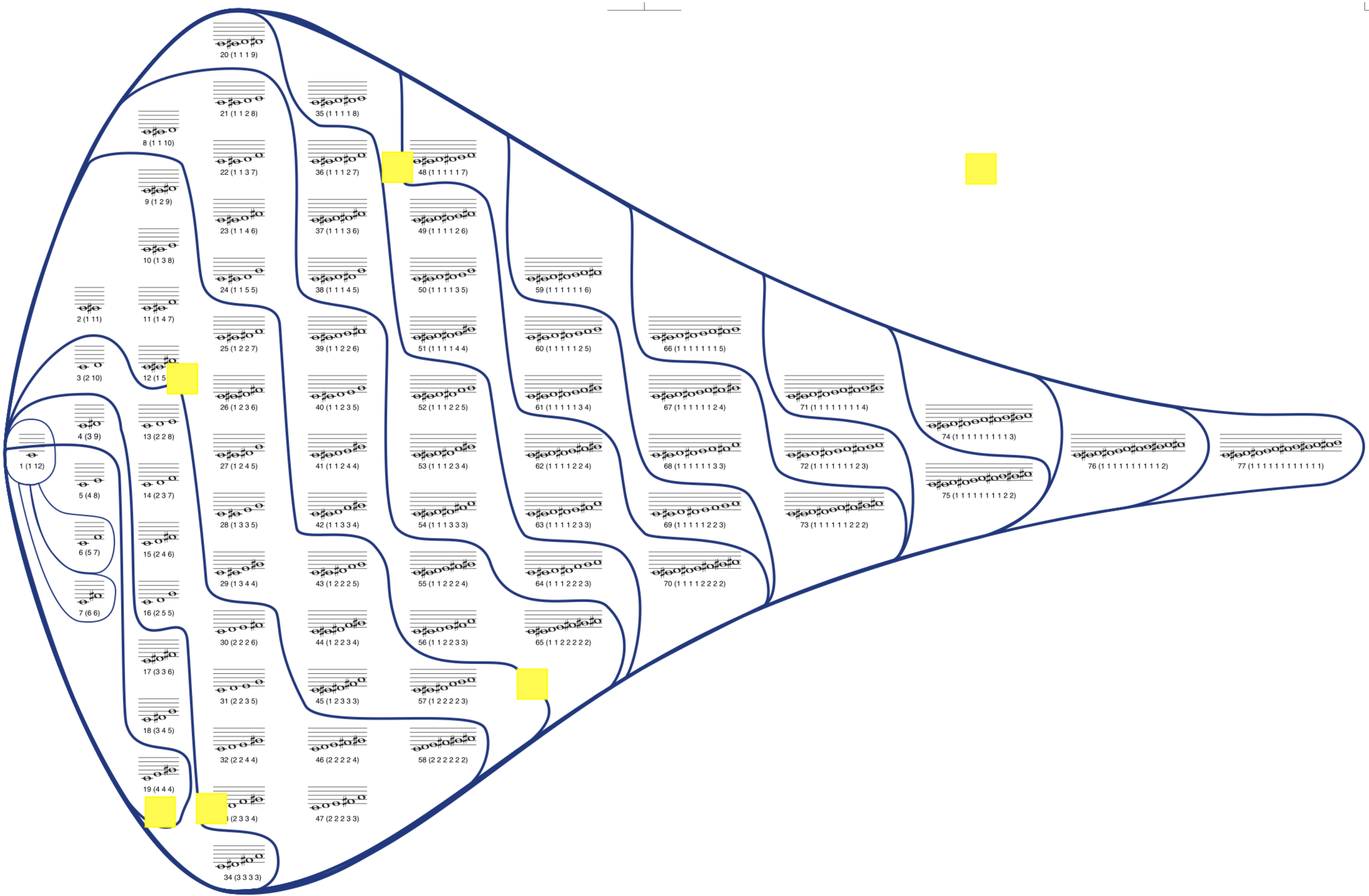
Exemples d'analyse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