MODES À TRANSPOSITIONS LIMITÉES DANS LES ESPACES MICRO-TEMPÉRÉS

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Abstract. Les tables qui suivent donnent les modes à transpositions limitées dans les espaces à tempérament égal de n degrés par octave. Ces espaces sont identifiés à $\mathbb{Z}_n$. On présente d'abord un résultat permettant le dénombrement de ces modes qu'on applique ensuite pour différentes valeurs de n correspondant à des espaces de 2 à 24 degrés par octave (espace des quarts de ton). On donne ensuite le nombre d'échelonnements total de k notes ainsi que le nombre et la liste des échelonnements à transpositions limitées. On termine par un dénombrement des modes à transpositions limitées dans les espaces à cinquièmes et sixièmes de ton.

Soit n un entier naturel, le groupe cyclique C_n agit sur $\mathbb{Z}_n = \{0, 1, .., n\}$: deux assemblages de k notes sont équivalents s'ils se déduisent l'un de l'autre par transposition. Le théorème de dénombrement de Polya permet de calculer le polynôme caractéristique donnant la répartition de tous les échelonnements.

$$P(x) = \frac{1}{n}\sum_{d|n}\varphi(\frac{n}{d})(1 + x^{n/d})^d$$

où φ est la fonction d'Euler, c'est-à-dire que $\varphi(m)$ est le nombre d'entiers positifs pas plus grand que m et relativement premier avec m. Les coefficients a_k de ce polynôme correspondent au nombre d'échelonnements de k notes. On démontre le résultat suivant.

Théorème. Soit H l'ensemble des diviseurs de n strictement inférieurs à n et soit L_k l'ensemble des valeurs $\ell \in H$ telles que $\ell.k = 0 \ mod \ n$. Les nombres $x_{k,\ell}$ d'assemblages à transpositions limitées de k notes à ℓ transpositions vérifient pour chaque k l'équation

$$a_k - \frac{(n-1)!}{k!(n-k)!} = \sum_{\ell \in L_k}\left(1 - \frac{\ell}{n}\right)x_{k,\ell}$$

où $x_{k,\ell}$ sont des entiers non nuls.

A partir de ce résultat, il est possible de dénombrer la plupart des échelonnements à transpositions limitées, sauf dans quelques cas particuliers où les solutions de l'équation sont indéterminées. On a alors le choix entre plusieurs solutions. Un argument extérieur permet le plus souvent de lever l'indétermination et de conclure.

Théorème. L'ensemble $\mathbb{Z}_n$ admet un et seul mode à transpositions limitées si et seulement si n est premier.

La répartition des assemblages à transpositions limitées est donnée dans la table suivante.

n	ATL	ECH
3	1	3
4	2	5
5	1	7
6	4	13
7	1	19
8	5	35
9	3	59
10	8	107
11	1	187
12	16	351
13	1	631

n	ATL	ECH
14	20	1 181
15	9	2 191
16	35	4 115
17	1	7 711
18	69	14 601
19	1	27 595
20	110	52 487
21	21	99 879
22	188	190 745
23	1	364 723
24	381	699 251

Pour chaque valeur de n, les tables des sections suivantes donnent le nombre de modes ou d'assemblages à transpositions limitées (ATL) ainsi que le nombre total d'assemblages ou échelonnements (ECH). La dernière colonne donne le nombre de modes à transpositions limitées p fois transposables.

1. Modes de $\mathbb{Z}_3$

Pour $n = 3$, il n'y a qu'un seul mode à transpositions limitées. C'est le total chromatique {0, 1, 2}.

Notes	ECH	ATL	Détails
3	1	1	1 à 1 transp.
1, 2	1	0	0
Total	3	1	1

2. Modes de $\mathbb{Z}_4$

Pour $n = 4$, il y a deux modes à transpositions limitées sur les cinq échelonnements possibles. Le mode {0, 2} a deux transpositions et le mode chromatique {0, 1, 2, 3} une seule transposition.

Notes	ECH	ATL	Détails
4	1	1	1 à 1 transp.
1, 3	1	0	0
2	2	1	1 à 2 tansp.
Total	5	2	2

Modes de 2 notes.
m1=[0, 2] de structure [2, 2]

Modes de 4 notes.
m2=[0, 1, 2, 3] de structure [1, 1, 1, 1]

3. Modes de $\mathbb{Z}_5$

Pour $n = 5$, il y a un seul mode à transpositions limitées. C'est le total chromatique $\{0, 1, 2, 3, 4\}$.

Notes	ECH	ATL	Détails
5	1	1	1 à 1 transp.
1, 4	1	0	0
2, 3	2	0	0
Total	7	1	1

4. Modes de $\mathbb{Z}_6$

Pour $n = 6$, il y a quatre modes à transpositions limitées. Le total chromatique $\{0, 1, 2\}$ est une fois transposable. Les modes $\{0, 3\}$ et $\{0, 1, 3, 4\}$ ont trois transpositions. Le mode $\{0, 2, 4\}$a deux transpositions.

Notes	ECH	ATL	Détails
6	1	1	1 à 1 transp.
1, 5	1	0	0
2, 4	3	1	1 à 3 transp.
3	4	1	1 à 2 transp.
Total	13	4	4

Modes de 2 notes.
m1=[0, 3] de structure [3, 3]

Modes de 3 notes.
m2=[0, 2, 4] de structure [2, 2, 2]

Modes de 4 notes.
m3=[0, 1, 3, 4] de structure [1, 2, 1, 2]

Modes de 6 notes.
m4=[0, 1, 2, 3, 4, 5] de structure [1, 1, 1, 1, 1, 1]

5. Modes de $\mathbb{Z}_7$

Pour $n = 7$, il y a un seul mode à transpositions limitées. C'est le total chromatique.

Notes	ECH	ATL	Détails
7	1	1	1 à 1 transp.
1, 6	1	0	0
2, 5	3	0	0
3, 4	5	0	0
Total	19	1	1

6. Modes de $\mathbb{Z}_8$

Pour $n = 8$, il y a cinq modes à transpositions limitées.

Notes	ECH	ATL	Détails
8	1	1	1 à 1 transp.
1, 7	1	0	0
2, 6	4	1	1 à 4 transp.
3, 5	7	0	0
4	10	2	1 (2 tr.), 1 (4 tr.)
Total	35	5	5

Modes de 2 notes.
m1=[0, 4] de structure [4, 4]

Modes de 4 notes.
m2=[0, 2, 4, 6] de structure [2, 2, 2, 2]
m3=[0, 1, 4, 5] de structure [1, 3, 1, 3]

Modes de 6 notes.
m4=[0, 1, 2, 4, 5, 6] de structure [1, 1, 2, 1, 1, 2]

Modes de 8 notes.
m5=[0, 1, 2, 3, 4, 5, 6, 7] de structure [1, 1, 1, 1, 1, 1, 1, 1]

7. Modes de $\mathbb{Z}_9$

Pour $n = 9$, il y a trois modes à transpositions limitées.

Notes	ECH	ATL	Détails
9	1	1	1 à 1 transp.
1, 8	1	0	0
2, 7	4	0	0
3, 6	10	1	1 à 3 transp.
4, 5	14	0	0
Total	59	3	3

Modes de 3 notes.
m1=[0, 3, 6] de structure [3, 3, 3]

Modes de 6 notes.
m2=[0, 1, 3, 4, 6, 7] de structure [1, 2, 1, 2, 1, 2]

Modes de 9 notes.
m3=[0, 1, 2, 3, 4, 5, 6, 7, 8] de structure [1, 1, 1, 1, 1, 1, 1, 1, 1]

8. Modes de $\mathbb{Z}_{10}$

Pour $n = 10$, il y a huit modes à transpositions limitées.

Notes	ECH	ATL	Détails
10	1	1	1 à 1 transp.
1, 9	1	0	0
2, 8	5	1	1 à 5 transp.
3, 7	12	0	0
4, 6	22	2	2 à 5 transp.
5	26	1	1 à 2 transp.
Total	107	8	8

Modes de 2 notes.
m1=[0, 5] de structure [5, 5]

Modes de 4 notes.
m2=[0, 2, 5, 7] de structure [2, 3, 2, 3]
m3=[0, 1, 5, 6] de structure [1, 4, 1, 4]

Modes de 5 notes.
m4=[0, 2, 4, 6, 8] de structure [2, 2, 2, 2, 2]

Modes de 6 notes.
m5=[0, 1, 3, 5, 6, 8] de structure [1, 2, 2, 1, 2, 2]
m6=[0, 1, 2, 5, 6, 7] de structure [1, 1, 3, 1, 1, 3]

Modes de 8 notes.
m7=[0, 1, 2, 3, 5, 6, 7, 8] de structure [1, 1, 1, 2, 1, 1, 1, 2]

Modes de 10 notes.
m8=[0, 1, 2, 3, 4, 5, 6, 7, 8, 9] de structure [1, 1, 1, 1, 1, 1, 1, 1, 1, 1]

9. Modes de $\mathbb{Z}_{11}$

Pour $n = 11$, il y a un seul mode à transpositions limitées. C'est le total chromatique.

Notes	ECH	ATL	Détails
11	1	1	1 à 1 transp.
1, 10	1	0	0
2, 9	5	0	0
3, 8	15	0	0
4, 7	30	0	0
5, 6	42	0	0
Total	187	1	1

10. Modes de $\mathbb{Z}_{12}$

Pour $n = 12$ (Système tempéré), il y a deux cas d'indétermination à lever. Pour $k = 4$, on a

$$3x_{4,3} + 2x_{4,6} = 7$$

Cette équation a pour solution

$$\begin{cases} x_{4,3} = 1 + 2n_1 \\ x_{4,6} = 2 - 3n_1 \end{cases}$$

où $n_1 \in \mathbb{Z}$. Comme $x_{4,3} = 1$, on a $n_1 = 0$. Le deuxième cas d'indétermination est obtenu pour $k = 6$. L'équation

$$5x_{6,2} + 4x_{6,4} + 3x_{6,6} = 18$$

a pour solution

$$\begin{cases} x_{6,2} = n_1 \\ x_{6,4} = n_1 + 3n_2 \\ x_{6,6} = 6 - 3n_1 - 4n_2 \end{cases}$$

avec $n_1, n_2 \in \mathbb{Z}$. Comme $x_{6,2} = 1$, on a $n_1 = 1$. La valeur entière de $x_{6,4}$ devant être positive, on a nécessairement $n_2 = 0$. D'où les solutions $x_{6,2} = 1$, $x_{6,4} = 1$, $x_{6,6} = 3$.

Notes	ECH	ATL	Détails
12	1	1	1 à 1 transp.
1, 11	1	0	0
2, 10	6	1	1 à 6 transp.
3, 9	19	1	1 à 4 transp.
4, 8	43	3	1 (3 tr.), 2 (6 tr.)
5, 7	66	0	0
6	80	5	1 (2 tr.), 1 (4 tr.), 3 (6 tr.)
Total	351	16	16

Modes de 2 notes.
m1=[0, 6] de structure [6, 6]

Modes de 3 notes.
m2=[0, 4, 8] de structure [4, 4, 4]

Modes de 4 notes.
m3=[0, 3, 6, 9] de structure [3, 3, 3, 3]
m4=[0, 2, 6, 8] de structure [2, 4, 2, 4]
m5=[0, 1, 6, 7] de structure [1, 5, 1, 5]

Modes de 6 notes.
m6=[0, 2, 4, 6, 8, 10] de structure [2, 2, 2, 2, 2, 2]
m7=[0, 1, 3, 6, 7, 9] de structure [1, 2, 3, 1, 2, 3]
m8=[0, 1, 4, 6, 7, 10] de structure [1, 3, 2, 1, 3, 2]
m9=[0, 1, 2, 6, 7, 8] de structure [1, 1, 4, 1, 1, 4]
m10=[0, 1, 4, 5, 8, 9] de structure [1, 3, 1, 3, 1, 3]

Modes de 8 notes.
m11=[0, 1, 2, 4, 6, 7, 8, 10] de structure [1, 1, 2, 2, 1, 1, 2, 2]

m12=[0, 1, 3, 4, 6, 7, 9, 10] de structure [1, 2, 1, 2, 1, 2, 1, 2]
m13=[0, 1, 2, 3, 6, 7, 8, 9] de structure [1, 1, 1, 3, 1, 1, 1, 3]

Modes de 9 notes.
m14=[0, 1, 2, 4, 5, 6, 8, 9, 10] de structure [1, 1, 2, 1, 1, 2, 1, 1, 2]

Modes de 10 notes.
m15=[0, 1, 2, 3, 4, 6, 7, 8, 9, 10] de structure [1, 1, 1, 1, 2, 1, 1, 1, 1, 2]

Modes de 12 notes.
m16=[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11] de structure [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1]

11. Modes de $\mathbb{Z}_{13}$

Pour $n = 13$, il y a un seul mode à transpositions limitées. C'est le total chromatique.

Notes	ECH	ATL	Détails
13	1	1	1 à 1 transp.
1, 12	1	0	0
2, 11	6	0	0
3, 10	22	0	0
4, 9	55	0	0
5, 8	99	0	0
6, 7	132	0	0
Total	631	1	1

12. Modes de $\mathbb{Z}_{14}$

Pour $n = 14$, il y a 20 modes à transpositions limitées.

Notes	ECH	ATL	Détails
14	1	1	1 à 1 transp.
1, 13	1	0	0
2, 12	7	1	1 à 7 transp.
3, 11	26	0	0
4, 10	73	3	3 à 7 transp.
5, 9	143	0	0
6, 8	217	5	5 à 7 transp.
7	246	1	1 à 2 transp.
Total	1181	20	20

Modes de 2 notes.
m1=[0, 7] de structure [7, 7]

Modes de 4 notes.
m2=[0, 3, 7, 10] de structure [3, 4, 3, 4]
m3=[0, 2, 7, 9] de structure [2, 5, 2, 5]
m4=[0, 1, 7, 8] de structure [1, 6, 1, 6]

Modes de 6 notes.

m5=[0, 2, 4, 7, 9, 11] de structure [2, 2, 3, 2, 2, 3]
m6=[0, 1, 4, 7, 8, 11] de structure [1, 3, 3, 1, 3, 3]
m7=[0, 1, 3, 7, 8, 10] de structure [1, 2, 4, 1, 2, 4]
m8=[0, 1, 5, 7, 8, 12] de structure [1, 4, 2, 1, 4, 2]
m9=[0, 1, 2, 7, 8, 9] de structure [1, 1, 5, 1, 1, 5]

Modes de 7 notes.
m10=[0, 2, 4, 6, 8, 10, 12] de structure [2, 2, 2, 2, 2, 2, 2]

Modes de 8 notes.
m11=[0, 1, 3, 5, 7, 8, 10, 12] de structure [1, 2, 2, 2, 1, 2, 2, 2]
m12=[0, 1, 2, 4, 7, 8, 9, 11] de structure [1, 1, 2, 3, 1, 1, 2, 3]
m13=[0, 1, 2, 5, 7, 8, 9, 12] de structure [1, 1, 3, 2, 1, 1, 3, 2]
m14=[0, 1, 3, 4, 7, 8, 10, 11] de structure [1, 2, 1, 3, 1, 2, 1, 3]
m15=[0, 1, 2, 3, 7, 8, 9, 10] de structure [1, 1, 1, 4, 1, 1, 1, 4]

Modes de 10 notes.
m16=[0, 1, 2, 3, 5, 7, 8, 9, 10, 12] de structure [1, 1, 1, 2, 2, 1, 1, 1, 2, 2]
m17=[0, 1, 2, 4, 5, 7, 8, 9, 11, 12] de structure [1, 1, 2, 1, 2, 1, 1, 2, 1, 2]
m18=[0, 1, 2, 3, 4, 7, 8, 9, 10, 11] de structure [1, 1, 1, 1, 3, 1, 1, 1, 1, 3]

Modes de 12 notes.
m19=[0, 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12] de structure [1, 1, 1, 1, 1, 2, 1, 1, 1, 1, 1, 2]

Modes de 14 notes.
m20=[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13] de structure [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1]

13. Modes de $\mathbb{Z}_{15}$

Pour $n = 15$, il y a 9 modes à transpositions limitées. On a la répartition suivante

Notes	ECH	ATL	Détails
15	1	1	1 à 1 transp.
1, 14	1	0	0
2, 13	7	0	0
3, 12	31	1	1 à 5 transp.
4, 11	91	0	0
5, 10	201	1	1 à 3 transp.
6, 9	335	2	2 à 5 transp.
7, 8	429	0	0
Total	2191	9	9

Modes de 3 notes.
m1=[0, 5, 10] de structure [5, 5, 5]

Modes de 5 notes.
m2=[0, 3, 6, 9, 12] de structure [3, 3, 3, 3, 3]

Modes de 6 notes.
m3=[0, 2, 5, 7, 10, 12] de structure [2, 3, 2, 3, 2, 3]

m4=[0, 1, 5, 6, 10, 11] de structure [1, 4, 1, 4, 1, 4]

Modes de 9 notes.
m5=[0, 1, 3, 5, 6, 8, 10, 11, 13] de structure [1, 2, 2, 1, 2, 2, 1, 2, 2]
m6=[0, 1, 2, 5, 6, 7, 10, 11, 12] de structure [1, 1, 3, 1, 1, 3, 1, 1, 3]

Modes de 10 notes.
m7=[0, 1, 3, 4, 6, 7, 9, 10, 12, 13] de structure [1, 2, 1, 2, 1, 2, 1, 2, 1, 2]

Modes de 12 notes.
m8=[0, 1, 2, 3, 5, 6, 7, 8, 10, 11, 12, 13] de structure [1, 1, 1, 2, 1, 1, 1, 2, 1, 1, 1, 2]

Modes de 15 notes.
m9=[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14] de structure [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1]

14. Modes de $\mathbb{Z}_{16}$

Pour $n = 16$, il y a 35 modes à transpositions limitées. Pour $k = 4$, l'équation

$$3x_{4,4} + 2x_{4,8} = 9$$

a pour solution

$$\begin{cases} x_{4,4} = 1 + 2n_1 \\ x_{4,8} = 3 - 3n_1 \end{cases}$$

avec $n_1 \in \mathbb{Z}$. Les seules valeurs entières sont obtenues pour $n_1 = 0$. D'où les solutions $x_{4,4} = 1$, $x_{4,8} = 3$. Pour $k = 8$, l'équation

$$7x_{8,2} + 6x_{8,4} + 4x_{8,8} = 45$$

a pour solution

$$\begin{cases} x_{8,2} = 1 + 2n_1 \\ x_{8,4} = 1 + n_1 + 2n_2 \\ x_{8,8} = 8 - 5n_1 - 3n_2 \end{cases}$$

avec $n_1, n_2 \in \mathbb{Z}$. Les seules valeurs entières sont obtenues pour $n_1 = n_2 = 0$. D'où les solutions $x_{8,2} = 1$, $x_{8,4} = 1$, $x_{8,8} = 8$.

Notes	ECH	ATL	Détails
16	1	1	1 à 1 transp.
1, 15	1	0	0
2, 14	8	1	1 à 8 transp.
3, 13	35	0	0
4, 12	116	4	1 (4), 3 (8)
5, 11	273	0	0
6, 10	504	7	7 à 8 transp.
7, 9	715	0	0
8	810	10	1 (2), 1 (4), 8 (8)
Total	4115	35	35

Modes de 2 notes.
m1=[0, 8] de structure [8, 8]

Modes de 4 notes.

m2=[0, 4, 8, 12] de structure [4, 4, 4, 4]
m3=[0, 3, 8, 11] de structure [3, 5, 3, 5]
m4=[0, 2, 8, 10] de structure [2, 6, 2, 6]
m5=[0, 1, 8, 9] de structure [1, 7, 1, 7]

Modes de 6 notes.
m6=[0, 2, 5, 8, 10, 13] de structure [2, 3, 3, 2, 3, 3]
m7=[0, 2, 4, 8, 10, 12] de structure [2, 2, 4, 2, 2, 4]
m8=[0, 1, 4, 8, 9, 12] de structure [1, 3, 4, 1, 3, 4]
m9=[0, 1, 5, 8, 9, 13] de structure [1, 4, 3, 1, 4, 3]
m10=[0, 1, 3, 8, 9, 11] de structure [1, 2, 5, 1, 2, 5]
m11=[0, 1, 6, 8, 9, 14] de structure [1, 5, 2, 1, 5, 2]
m12=[0, 1, 2, 8, 9, 10] de structure [1, 1, 6, 1, 1, 6]

Modes de 8 notes.
m13=[0, 2, 4, 6, 8, 10, 12, 14] de structure [2, 2, 2, 2, 2, 2, 2, 2]
m14=[0, 1, 3, 5, 8, 9, 11, 13] de structure [1, 2, 2, 3, 1, 2, 2, 3]
m15=[0, 1, 3, 6, 8, 9, 11, 14] de structure [1, 2, 3, 2, 1, 2, 3, 2]
m16=[0, 1, 4, 6, 8, 9, 12, 14] de structure [1, 3, 2, 2, 1, 3, 2, 2]
m17=[0, 1, 2, 5, 8, 9, 10, 13] de structure [1, 1, 3, 3, 1, 1, 3, 3]
m18=[0, 1, 4, 5, 8, 9, 12, 13] de structure [1, 3, 1, 3, 1, 3, 1, 3]
m19=[0, 1, 2, 4, 8, 9, 10, 12] de structure [1, 1, 2, 4, 1, 1, 2, 4]
m20=[0, 1, 2, 6, 8, 9, 10, 14] de structure [1, 1, 4, 2, 1, 1, 4, 2]
m21=[0, 1, 3, 4, 8, 9, 11, 12] de structure [1, 2, 1, 4, 1, 2, 1, 4]
m22=[0, 1, 2, 3, 8, 9, 10, 11] de structure [1, 1, 1, 5, 1, 1, 1, 5]

Modes de 10 notes.
m23=[0, 1, 2, 4, 6, 8, 9, 10, 12, 14] de structure [1, 1, 2, 2, 2, 1, 1, 2, 2, 2]
m24=[0, 1, 3, 4, 6, 8, 9, 11, 12, 14] de structure [1, 2, 1, 2, 2, 1, 2, 1, 2, 2]
m25=[0, 1, 2, 3, 5, 8, 9, 10, 11, 13] de structure [1, 1, 1, 2, 3, 1, 1, 1, 2, 3]
m26=[0, 1, 2, 3, 6, 8, 9, 10, 11, 14] de structure [1, 1, 1, 3, 2, 1, 1, 1, 3, 2]
m27=[0, 1, 2, 4, 5, 8, 9, 10, 12, 13] de structure [1, 1, 2, 1, 3, 1, 1, 2, 1, 3]
m28=[0, 1, 2, 5, 6, 8, 9, 10, 13, 14] de structure [1, 1, 3, 1, 2, 1, 1, 3, 1, 2]
m29=[0, 1, 2, 3, 4, 8, 9, 10, 11, 12] de structure [1, 1, 1, 1, 4, 1, 1, 1, 1, 4]

Modes de 12 notes.
m30=[0, 1, 2, 3, 4, 6, 8, 9, 10, 11, 12, 14] de structure [1, 1, 1, 1, 2, 2, 1, 1, 1, 1, 2, 2]
m31=[0, 1, 2, 3, 5, 6, 8, 9, 10, 11, 13, 14] de structure [1, 1, 1, 2, 1, 2, 1, 1, 1, 2, 1, 2]
m32=[0, 1, 2, 4, 5, 6, 8, 9, 10, 12, 13, 14] de structure [1, 1, 2, 1, 1, 2, 1, 1, 2, 1, 1, 2]
m33=[0, 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 13] de structure [1, 1, 1, 1, 1, 3, 1, 1, 1, 1, 1, 3]

Modes de 14 notes.
m34=[0, 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14] de structure [1, 1, 1, 1, 1, 1, 2, 1, 1, 1, 1, 1, 1, 2]

Modes de 16 notes.

m35=[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15] de structure [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1]

15. Modes de $\mathbb{Z}_{17}$

Pour $n = 17$, il y a un seul mode à transpositions limitées.

Notes	ECH	ATL	Détails
17	1	1	1 à 1 transp.
1, 16	1	0	0
2, 15	8	0	0
3, 14	40	0	0
4, 13	140	0	0
5, 12	364	0	0
6, 11	728	0	0
7, 10	1144	0	0
8, 9	1430	0	0
Total	7711	1	1

16. Modes de $\mathbb{Z}_{18}$

Pour $n = 18$ (Système des tiers de ton), la détermination des modes à transpositions limitées conduit à résoudre deux équations entières. Pour $k = 6$, l'équation

$$5x_{6,3} + 4x_{6,6} + 3x_{6,9} = 40$$

a pour solution

$$\begin{cases} x_{6,3} = n_1 \\ x_{6,6} = 1 + n_1 + 3n_2 \\ x_{6,9} = 12 - 3n_1 - 4n_2 \end{cases}$$

avec $n_1, n_2 \in \mathbb{Z}$. Comme $x_{6,3} = 1$, on a $n_1 = 1$. La valeur entière de $x_{6,6}$ positive non nulle, par conséquent $n_2 = 0$. D'où les solutions $x_{6,3} = 1$, $x_{6,6} = 2$, $x_{6,9} = 9$. Pour $k = 9$, l'équation

$$4x_{9,2} + 3x_{9,6} = 13$$

a pour solution

$$\begin{cases} x_{9,2} = 1 + 3n_1 \\ x_{9,6} = 3 - 4n_1 \end{cases}$$

où $n_1 \in \mathbb{Z}$. Comme $x_{9,2} = 1$, on a $n_1 = 0$. D'où les solutions $x_{9,2} = 1$, $x_{9,6} = 3$.

Notes	ECH	ATL	Détails
18	1	1	1 à 1 transp.
1, 17	1	0	0
2, 16	9	1	1 à 9 transp.
3, 15	46	1	1 à 6 transp.
4, 14	172	4	4 à 9 transp.
5, 13	475	0	0
6, 12	1038	12	1 (3), 2 (6), 9 (4)
7, 11	1768	0	0
8, 10	2438	14	14 à 9 transp.
9	2704	4	1 (2), 3 (6)
Total	14 601	69	69

Modes de 2 notes.
m1=[0, 9] de structure [9, 9]

Modes de 3 notes.
m2=[0, 6, 12] de structure [6, 6, 6]

Modes de 4 notes.
m3=[0, 4, 9, 13] de structure [4, 5, 4, 5]
m4=[0, 3, 9, 12] de structure [3, 6, 3, 6]
m5=[0, 2, 9, 11] de structure [2, 7, 2, 7]
m6=[0, 1, 9, 10] de structure [1, 8, 1, 8]

Modes de 6 notes.
m7=[0, 3, 6, 9, 12, 15] de structure [3, 3, 3, 3, 3, 3]
m8=[0, 2, 5, 9, 11, 14] de structure [2, 3, 4, 2, 3, 4]
m9=[0, 2, 6, 9, 11, 15] de structure [2, 4, 3, 2, 4, 3]
m10=[0, 1, 5, 9, 10, 14] de structure [1, 4, 4, 1, 4, 4]
m11=[0, 2, 4, 9, 11, 13] de structure [2, 2, 5, 2, 2, 5]
m12=[0, 1, 4, 9, 10, 13] de structure [1, 3, 5, 1, 3, 5]
m13=[0, 1, 6, 9, 10, 15] de structure [1, 5, 3, 1, 5, 3]
m14=[0, 1, 3, 9, 10, 12] de structure [1, 2, 6, 1, 2, 6]
m15=[0, 1, 7, 9, 10, 16] de structure [1, 6, 2, 1, 6, 2]
m16=[0, 1, 2, 9, 10, 11] de structure [1, 1, 7, 1, 1, 7]
m17=[0, 2, 6, 8, 12, 14] de structure [2, 4, 2, 4, 2, 4]
m18=[0, 1, 6, 7, 12, 13] de structure [1, 5, 1, 5, 1, 5]

Modes de 8 notes.
m19=[0, 2, 4, 6, 9, 11, 13, 15] de structure [2, 2, 2, 3, 2, 2, 2, 3]
m20=[0, 1, 3, 6, 9, 10, 12, 15] de structure [1, 2, 3, 3, 1, 2, 3, 3]
m21=[0, 1, 4, 6, 9, 10, 13, 15] de structure [1, 3, 2, 3, 1, 3, 2, 3]
m22=[0, 1, 4, 7, 9, 10, 13, 16] de structure [1, 3, 3, 2, 1, 3, 3, 2]
m23=[0, 1, 3, 5, 9, 10, 12, 14] de structure [1, 2, 2, 4, 1, 2, 2, 4]
m24=[0, 1, 3, 7, 9, 10, 12, 16] de structure [1, 2, 4, 2, 1, 2, 4, 2]
m25=[0, 1, 5, 7, 9, 10, 14, 16] de structure [1, 4, 2, 2, 1, 4, 2, 2]
m26=[0, 1, 2, 5, 9, 10, 11, 14] de structure [1, 1, 3, 4, 1, 1, 3, 4]
m27=[0, 1, 2, 6, 9, 10, 11, 15] de structure [1, 1, 4, 3, 1, 1, 4, 3]
m28=[0, 1, 4, 5, 9, 10, 13, 14] de structure [1, 3, 1, 4, 1, 3, 1, 4]
m29=[0, 1, 2, 4, 9, 10, 11, 13] de structure [1, 1, 2, 5, 1, 1, 2, 5]
m30=[0, 1, 2, 7, 9, 10, 11, 16] de structure [1, 1, 5, 2, 1, 1, 5, 2]
m31=[0, 1, 3, 4, 9, 10, 12, 13] de structure [1, 2, 1, 5, 1, 2, 1, 5]
m32=[0, 1, 2, 3, 9, 10, 11, 12] de structure [1, 1, 1, 6, 1, 1, 1, 6]

Modes de 9 notes.
m33=[0, 2, 4, 6, 8, 10, 12, 14, 16] de structure [2, 2, 2, 2, 2, 2, 2, 2, 2]
m34=[0, 1, 3, 6, 7, 9, 12, 13, 15] de structure [1, 2, 3, 1, 2, 3, 1, 2, 3]
m35=[0, 1, 4, 6, 7, 10, 12, 13, 16] de structure [1, 3, 2, 1, 3, 2, 1, 3, 2]
m36=[0, 1, 2, 6, 7, 8, 12, 13, 14] de structure [1, 1, 4, 1, 1, 4, 1, 1, 4]

Modes de 10 notes.
m37=[0, 1, 3, 5, 7, 9, 10, 12, 14, 16] de structure [1, 2, 2, 2, 2, 1, 2, 2, 2, 2]

m38=[0, 1, 2, 4, 6, 9, 10, 11, 13, 15] de structure [1, 1, 2, 2, 3, 1, 1, 2, 2, 3]
m39=[0, 1, 2, 4, 7, 9, 10, 11, 13, 16] de structure [1, 1, 2, 3, 2, 1, 1, 2, 3, 2]
m40=[0, 1, 2, 5, 7, 9, 10, 11, 14, 16] de structure [1, 1, 3, 2, 2, 1, 1, 3, 2, 2]
m41=[0, 1, 3, 4, 6, 9, 10, 12, 13, 15] de structure [1, 2, 1, 2, 3, 1, 2, 1, 2, 3]
m42=[0, 1, 3, 4, 7, 9, 10, 12, 13, 16] de structure [1, 2, 1, 3, 2, 1, 2, 1, 3, 2]
m43=[0, 1, 3, 5, 6, 9, 10, 12, 14, 15] de structure [1, 2, 2, 1, 3, 1, 2, 2, 1, 3]
m44=[0, 1, 2, 3, 6, 9, 10, 11, 12, 15] de structure [1, 1, 1, 3, 3, 1, 1, 1, 3, 3]
m45=[0, 1, 2, 5, 6, 9, 10, 11, 14, 15] de structure [1, 1, 3, 1, 3, 1, 1, 3, 1, 3]
m46=[0, 1, 2, 3, 5, 9, 10, 11, 12, 14] de structure [1, 1, 1, 2, 4, 1, 1, 1, 2, 4]
m47=[0, 1, 2, 3, 7, 9, 10, 11, 12, 16] de structure [1, 1, 1, 4, 2, 1, 1, 1, 4, 2]
m48=[0, 1, 2, 4, 5, 9, 10, 11, 13, 14] de structure [1, 1, 2, 1, 4, 1, 1, 2, 1, 4]
m49=[0, 1, 2, 6, 7, 9, 10, 11, 15, 16] de structure [1, 1, 4, 1, 2, 1, 1, 4, 1, 2]
m50=[0, 1, 2, 3, 4, 9, 10, 11, 12, 13] de structure [1, 1, 1, 1, 5, 1, 1, 1, 1, 5]

Modes de 12 notes.
m51=[0, 1, 2, 3, 5, 7, 9, 10, 11, 12, 14, 16] de structure [1, 1, 1, 2, 2, 2, 1, 1, 1, 2, 2, 2]
m52=[0, 1, 2, 4, 5, 7, 9, 10, 11, 13, 14, 16] de structure [1, 1, 2, 1, 2, 2, 1, 1, 2, 1, 2, 2]
m53=[0, 1, 2, 4, 6, 7, 9, 10, 11, 13, 15, 16] de structure [1, 1, 2, 2, 1, 2, 1, 1, 2, 2, 1, 2]
m54=[0, 1, 3, 4, 6, 7, 9, 10, 12, 13, 15, 16] de structure [1, 2, 1, 2, 1, 2, 1, 2, 1, 2, 1, 2]
m55=[0, 1, 2, 3, 4, 6, 9, 10, 11, 12, 13, 15] de structure [1, 1, 1, 1, 2, 3, 1, 1, 1, 1, 2, 3]
m56=[0, 1, 2, 3, 4, 7, 9, 10, 11, 12, 13, 16] de structure [1, 1, 1, 1, 3, 2, 1, 1, 1, 1, 3, 2]
m57=[0, 1, 2, 3, 5, 6, 9, 10, 11, 12, 14, 15] de structure [1, 1, 1, 2, 1, 3, 1, 1, 1, 2, 1, 3]
m58=[0, 1, 2, 3, 6, 7, 9, 10, 11, 12, 15, 16] de structure [1, 1, 1, 3, 1, 2, 1, 1, 1, 3, 1, 2]
m59=[0, 1, 2, 4, 5, 6, 9, 10, 11, 13, 14, 15] de structure [1, 1, 2, 1, 1, 3, 1, 1, 2, 1, 1, 3]
m60=[0, 1, 2, 3, 4, 5, 9, 10, 11, 12, 13, 14] de structure [1, 1, 1, 1, 1, 4, 1, 1, 1, 1, 1, 4]
m61=[0, 1, 2, 4, 6, 7, 8, 10, 12, 13, 14, 16] de structure [1, 1, 2, 2, 1, 1, 2, 2, 1, 1, 2, 2]
m62=[0, 1, 2, 3, 6, 7, 8, 9, 12, 13, 14, 15] de structure [1, 1, 1, 3, 1, 1, 1, 3, 1, 1, 1, 3]

Modes de 14 notes.
m63=[0, 1, 2, 3, 4, 5, 7, 9, 10, 11, 12, 13, 14, 16] de structure [1, 1, 1, 1, 1, 2, 2, 1, 1, 1, 1, 1, 2, 2]
m64=[0, 1, 2, 3, 4, 6, 7, 9, 10, 11, 12, 13, 15, 16] de structure [1, 1, 1, 1, 2, 1, 2, 1, 1, 1, 1, 2, 1, 2]
m65=[0, 1, 2, 3, 5, 6, 7, 9, 10, 11, 12, 14, 15, 16] de structure [1, 1, 1, 2, 1, 1, 2, 1, 1, 1, 2, 1, 1, 2]
m66=[0, 1, 2, 3, 4, 5, 6, 9, 10, 11, 12, 13, 14, 15] de structure [1, 1, 1, 1, 1, 1, 3, 1, 1, 1, 1, 1, 1, 3]

Modes de 15 notes.
m67=[0, 1, 2, 3, 4, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16] de structure [1, 1, 1, 1, 2, 1, 1, 1, 1, 2, 1, 1, 1, 1, 2]

Modes de 16 notes.
m68=[0, 1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16] de structure [1, 1, 1, 1, 1, 1, 1, 2, 1, 1, 1, 1, 1, 1, 1, 2]

Modes de 18 notes.
m69=[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17] de structure [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1]

17. Modes de $\mathbb{Z}_{19}$

Pour $n = 19$, il y a un seul mode à transpositions limitées.

Notes	ECH	ATL	Détails
19	1	1	1 à 1 transp.
1, 18	1	0	0
2, 17	9	0	0
3, 16	51	0	0
4, 15	204	0	0
5, 14	612	0	0
6, 13	1428	0	0
7, 12	2652	0	0
8, 11	3978	0	0
9, 10	4862	0	0
Total	27595	1	1

18. Modes de $\mathbb{Z}_{20}$

Pour $n = 20$, il y a 110 modes à transpositions limitées, avec la répartition suivante.
Pour $k = 4$, l'équation

$$3x_{4,5} + 2x_{4,10} = 11$$

a pour solution

$$\begin{cases} x_{4,5} = 1 + 2n_1 \\ x_{4,10} = 4 - 3n_1 \end{cases}$$

La seule solution entière positive est $n_1 = 0$, d'où $x_{4,5} = 1$ et $x_{4,10} = 4$. Pour $k = 8$, l'équation

$$3x_{8,5} + 2x_{8,10} = 46$$

a pour solution

$$\begin{cases} x_{8,5} = 2n_1 \\ x_{8,10} = 23 - 3n_1 \end{cases}$$

La seule solution entière positive est $n_1 = 1$, d'où $x_{8,5} = 2$ et $x_{8,10} = 20$. Pour $k = 10$, l'équation

$$9x_{10,2} + 8x_{10,4} + 5x_{10,10} = 142$$

a pour solution

$$\begin{cases} x_{10,2} = n_1 \\ x_{10,4} = 4 + 2n_1 + 5n_2 \\ x_{10,10} = 22 - 5n_1 - 8n_2 \end{cases}$$

avec $n_1, n_2 \in \mathbb{Z}$. Comme $x_{10,2} = 1$, on a $n_1 = 1$. Or, on peut montrer que $n_2 = -1$, on en déduit les solutions $x_{10,2} = 1$, $x_{10,4} = 1$, $x_{10,10} = 25$.

Notes	ECH	ATL	Détails
20	1	1	1 à 1 transp.
1, 19	1	0	0
2, 18	10	1	1 à 10 transp.
3, 17	57	0	0
4, 16	245	5	1 (4) 4 (10)
5, 15	776	1	1 à 4 transp.
6, 14	1944	12	12 à 10 transp.
7, 13	3876	0	0
8, 12	6310	22	2 (5), 20 (10)
9, 11	8398	0	0
10	9252	27	1 (2), 1 (4), 25 (10)
Total	52487	110	110

Modes de 2 notes.
m1=[0, 10] de structure [10, 10]

Modes de 4 notes.
m2=[0, 5, 10, 15] de structure [5, 5, 5, 5]
m3=[0, 4, 10, 14] de structure [4, 6, 4, 6]
m4=[0, 3, 10, 13] de structure [3, 7, 3, 7]
m5=[0, 2, 10, 12] de structure [2, 8, 2, 8]
m6=[0, 1, 10, 11] de structure [1, 9, 1, 9]

Modes de 5 notes.
m7=[0, 4, 8, 12, 16] de structure [4, 4, 4, 4, 4]

Modes de 6 notes.
m8=[0, 3, 6, 10, 13, 16] de structure [3, 3, 4, 3, 3, 4]
m9=[0, 2, 6, 10, 12, 16] de structure [2, 4, 4, 2, 4, 4]
m10=[0, 2, 5, 10, 12, 15] de structure [2, 3, 5, 2, 3, 5]
m11=[0, 2, 7, 10, 12, 17] de structure [2, 5, 3, 2, 5, 3]
m12=[0, 1, 5, 10, 11, 15] de structure [1, 4, 5, 1, 4, 5]
m13=[0, 1, 6, 10, 11, 16] de structure [1, 5, 4, 1, 5, 4]
m14=[0, 2, 4, 10, 12, 14] de structure [2, 2, 6, 2, 2, 6]
m15=[0, 1, 4, 10, 11, 14] de structure [1, 3, 6, 1, 3, 6]
m16=[0, 1, 7, 10, 11, 17] de structure [1, 6, 3, 1, 6, 3]
m17=[0, 1, 3, 10, 11, 13] de structure [1, 2, 7, 1, 2, 7]
m18=[0, 1, 8, 10, 11, 18] de structure [1, 7, 2, 1, 7, 2]
m19=[0, 1, 2, 10, 11, 12] de structure [1, 1, 8, 1, 1, 8]

Modes de 8 notes.
m20=[0, 2, 4, 7, 10, 12, 14, 17] de structure [2, 2, 3, 3, 2, 2, 3, 3]
m21=[0, 2, 5, 7, 10, 12, 15, 17] de structure [2, 3, 2, 3, 2, 3, 2, 3]
m22=[0, 1, 4, 7, 10, 11, 14, 17] de structure [1, 3, 3, 3, 1, 3, 3, 3]
m23=[0, 2, 4, 6, 10, 12, 14, 16] de structure [2, 2, 2, 4, 2, 2, 2, 4]

m24=[0, 1, 3, 6, 10, 11, 13, 16] de structure [1, 2, 3, 4, 1, 2, 3, 4]
m25=[0, 1, 3, 7, 10, 11, 13, 17] de structure [1, 2, 4, 3, 1, 2, 4, 3]
m26=[0, 1, 4, 6, 10, 11, 14, 16] de structure [1, 3, 2, 4, 1, 3, 2, 4]
m27=[0, 1, 4, 8, 10, 11, 14, 18] de structure [1, 3, 4, 2, 1, 3, 4, 2]
m28=[0, 1, 5, 7, 10, 11, 15, 17] de structure [1, 4, 2, 3, 1, 4, 2, 3]
m29=[0, 1, 5, 8, 10, 11, 15, 18] de structure [1, 4, 3, 2, 1, 4, 3, 2]
m30=[0, 1, 2, 6, 10, 11, 12, 16] de structure [1, 1, 4, 4, 1, 1, 4, 4]
m31=[0, 1, 5, 6, 10, 11, 15, 16] de structure [1, 4, 1, 4, 1, 4, 1, 4]
m32=[0, 1, 3, 5, 10, 11, 13, 15] de structure [1, 2, 2, 5, 1, 2, 2, 5]
m33=[0, 1, 3, 8, 10, 11, 13, 18] de structure [1, 2, 5, 2, 1, 2, 5, 2]
m34=[0, 1, 6, 8, 10, 11, 16, 18] de structure [1, 5, 2, 2, 1, 5, 2, 2]
m35=[0, 1, 2, 5, 10, 11, 12, 15] de structure [1, 1, 3, 5, 1, 1, 3, 5]
m36=[0, 1, 2, 7, 10, 11, 12, 17] de structure [1, 1, 5, 3, 1, 1, 5, 3]
m37=[0, 1, 4, 5, 10, 11, 14, 15] de structure [1, 3, 1, 5, 1, 3, 1, 5]
m38=[0, 1, 2, 4, 10, 11, 12, 14] de structure [1, 1, 2, 6, 1, 1, 2, 6]
m39=[0, 1, 2, 8, 10, 11, 12, 18] de structure [1, 1, 6, 2, 1, 1, 6, 2]
m40=[0, 1, 3, 4, 10, 11, 13, 14] de structure [1, 2, 1, 6, 1, 2, 1, 6]
m41=[0, 1, 2, 3, 10, 11, 12, 13] de structure [1, 1, 1, 7, 1, 1, 1, 7]

Modes de 10 notes.
m42=[0, 2, 4, 6, 8, 10, 12, 14, 16, 18] de structure [2, 2, 2, 2, 2, 2, 2, 2, 2, 2]
m43=[0, 1, 3, 5, 7, 10, 11, 13, 15, 17] de structure [1, 2, 2, 2, 3, 1, 2, 2, 2, 3]
m44=[0, 1, 3, 5, 8, 10, 11, 13, 15, 18] de structure [1, 2, 2, 3, 2, 1, 2, 2, 3, 2]
m45=[0, 1, 3, 6, 8, 10, 11, 13, 16, 18] de structure [1, 2, 3, 2, 2, 1, 2, 3, 2, 2]
m46=[0, 1, 4, 6, 8, 10, 11, 14, 16, 18] de structure [1, 3, 2, 2, 2, 1, 3, 2, 2, 2]
m47=[0, 1, 2, 4, 7, 10, 11, 12, 14, 17] de structure [1, 1, 2, 3, 3, 1, 1, 2, 3, 3]
m48=[0, 1, 2, 5, 7, 10, 11, 12, 15, 17] de structure [1, 1, 3, 2, 3, 1, 1, 3, 2, 3]
m49=[0, 1, 2, 5, 8, 10, 11, 12, 15, 18] de structure [1, 1, 3, 3, 2, 1, 1, 3, 3, 2]
m50=[0, 1, 3, 4, 7, 10, 11, 13, 14, 17] de structure [1, 2, 1, 3, 3, 1, 2, 1, 3, 3]
m51=[0, 1, 3, 6, 7, 10, 11, 13, 16, 17] de structure [1, 2, 3, 1, 3, 1, 2, 3, 1, 3]
m52=[0, 1, 4, 5, 8, 10, 11, 14, 15, 18] de structure [1, 3, 1, 3, 2, 1, 3, 1, 3, 2]
m53=[0, 1, 2, 4, 6, 10, 11, 12, 14, 16] de structure [1, 1, 2, 2, 4, 1, 1, 2, 2, 4]
m54=[0, 1, 2, 4, 8, 10, 11, 12, 14, 18] de structure [1, 1, 2, 4, 2, 1, 1, 2, 4, 2]
m55=[0, 1, 2, 6, 8, 10, 11, 12, 16, 18] de structure [1, 1, 4, 2, 2, 1, 1, 4, 2, 2]
m56=[0, 1, 3, 4, 6, 10, 11, 13, 14, 16] de structure [1, 2, 1, 2, 4, 1, 2, 1, 2, 4]
m57=[0, 1, 3, 4, 8, 10, 11, 13, 14, 18] de structure [1, 2, 1, 4, 2, 1, 2, 1, 4, 2]
m58=[0, 1, 3, 5, 6, 10, 11, 13, 15, 16] de structure [1, 2, 2, 1, 4, 1, 2, 2, 1, 4]
m59=[0, 1, 2, 3, 6, 10, 11, 12, 13, 16] de structure [1, 1, 1, 3, 4, 1, 1, 1, 3, 4]
m60=[0, 1, 2, 3, 7, 10, 11, 12, 13, 17] de structure [1, 1, 1, 4, 3, 1, 1, 1, 4, 3]
m61=[0, 1, 2, 5, 6, 10, 11, 12, 15, 16] de structure [1, 1, 3, 1, 4, 1, 1, 3, 1, 4]
m62=[0, 1, 2, 6, 7, 10, 11, 12, 16, 17] de structure [1, 1, 4, 1, 3, 1, 1, 4, 1, 3]
m63=[0, 1, 2, 3, 5, 10, 11, 12, 13, 15] de structure [1, 1, 1, 2, 5, 1, 1, 1, 2, 5]
m64=[0, 1, 2, 3, 8, 10, 11, 12, 13, 18] de structure [1, 1, 1, 5, 2, 1, 1, 1, 5, 2]
m65=[0, 1, 2, 4, 5, 10, 11, 12, 14, 15] de structure [1, 1, 2, 1, 5, 1, 1, 2, 1, 5]
m66=[0, 1, 2, 7, 8, 10, 11, 12, 17, 18] de structure [1, 1, 5, 1, 2, 1, 1, 5, 1, 2]
m67=[0, 1, 2, 3, 4, 10, 11, 12, 13, 14] de structure [1, 1, 1, 1, 6, 1, 1, 1, 1, 6]
m68=[0, 1, 4, 5, 8, 9, 12, 13, 16, 17] de structure [1, 3, 1, 3, 1, 3, 1, 3, 1, 3]

Modes de 12 notes.

m69=[0, 1, 2, 4, 6, 8, 10, 11, 12, 14, 16, 18] de structure [1, 1, 2, 2, 2, 2, 1, 1, 2, 2, 2, 2]
m70=[0, 1, 3, 4, 6, 8, 10, 11, 13, 14, 16, 18] de structure [1, 2, 1, 2, 2, 2, 1, 2, 1, 2, 2, 2]
m71=[0, 1, 3, 5, 6, 8, 10, 11, 13, 15, 16, 18] de structure [1, 2, 2, 1, 2, 2, 1, 2, 2, 1, 2, 2]
m72=[0, 1, 2, 3, 5, 7, 10, 11, 12, 13, 15, 17] de structure [1, 1, 1, 2, 2, 3, 1, 1, 1, 2, 2, 3]
m73=[0, 1, 2, 3, 5, 8, 10, 11, 12, 13, 15, 18] de structure [1, 1, 1, 2, 3, 2, 1, 1, 1, 2, 3, 2]
m74=[0, 1, 2, 3, 6, 8, 10, 11, 12, 13, 16, 18] de structure [1, 1, 1, 3, 2, 2, 1, 1, 1, 3, 2, 2]
m75=[0, 1, 2, 4, 5, 7, 10, 11, 12, 14, 15, 17] de structure [1, 1, 2, 1, 2, 3, 1, 1, 2, 1, 2, 3]
m76=[0, 1, 2, 4, 5, 8, 10, 11, 12, 14, 15, 18] de structure [1, 1, 2, 1, 3, 2, 1, 1, 2, 1, 3, 2]
m77=[0, 1, 2, 4, 6, 7, 10, 11, 12, 14, 16, 17] de structure [1, 1, 2, 2, 1, 3, 1, 1, 2, 2, 1, 3]
m78=[0, 1, 2, 4, 7, 8, 10, 11, 12, 14, 17, 18] de structure [1, 1, 2, 3, 1, 2, 1, 1, 2, 3, 1, 2]
m79=[0, 1, 2, 5, 6, 8, 10, 11, 12, 15, 16, 18] de structure [1, 1, 3, 1, 2, 2, 1, 1, 3, 1, 2, 2]
m80=[0, 1, 2, 5, 7, 8, 10, 11, 12, 15, 17, 18] de structure [1, 1, 3, 2, 1, 2, 1, 1, 3, 2, 1, 2]
m81=[0, 1, 3, 4, 6, 7, 10, 11, 13, 14, 16, 17] de structure [1, 2, 1, 2, 1, 3, 1, 2, 1, 2, 1, 3]
m82=[0, 1, 2, 3, 4, 7, 10, 11, 12, 13, 14, 17] de structure [1, 1, 1, 1, 3, 3, 1, 1, 1, 1, 3, 3]
m83=[0, 1, 2, 3, 6, 7, 10, 11, 12, 13, 16, 17] de structure [1, 1, 1, 3, 1, 3, 1, 1, 1, 3, 1, 3]
m84=[0, 1, 2, 5, 6, 7, 10, 11, 12, 15, 16, 17] de structure [1, 1, 3, 1, 1, 3, 1, 1, 3, 1, 1, 3]
m85=[0, 1, 2, 3, 4, 6, 10, 11, 12, 13, 14, 16] de structure [1, 1, 1, 1, 2, 4, 1, 1, 1, 1, 2, 4]
m86=[0, 1, 2, 3, 4, 8, 10, 11, 12, 13, 14, 18] de structure [1, 1, 1, 1, 4, 2, 1, 1, 1, 1, 4, 2]
m87=[0, 1, 2, 3, 5, 6, 10, 11, 12, 13, 15, 16] de structure [1, 1, 1, 2, 1, 4, 1, 1, 1, 2, 1, 4]
m88=[0, 1, 2, 3, 7, 8, 10, 11, 12, 13, 17, 18] de structure [1, 1, 1, 4, 1, 2, 1, 1, 1, 4, 1, 2]
m89=[0, 1, 2, 4, 5, 6, 10, 11, 12, 14, 15, 16] de structure [1, 1, 2, 1, 1, 4, 1, 1, 2, 1, 1, 4]
m90=[0, 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 15] de structure [1, 1, 1, 1, 1, 5, 1, 1, 1, 1, 1, 5]

Modes de 14 notes.
m91=[0, 1, 2, 3, 4, 6, 8, 10, 11, 12, 13, 14, 16, 18] de structure [1, 1, 1, 1, 2, 2, 2, 1, 1, 1, 1, 2, 2, 2]

m92=[0, 1, 2, 3, 5, 6, 8, 10, 11, 12, 13, 15, 16, 18] de structure [1, 1, 1, 2, 1, 2, 2, 1, 1, 1, 2, 1, 2, 2]
m93=[0, 1, 2, 3, 5, 7, 8, 10, 11, 12, 13, 15, 17, 18] de structure [1, 1, 1, 2, 2, 1, 2, 1, 1, 1, 2, 2, 1, 2]
m94=[0, 1, 2, 4, 5, 6, 8, 10, 11, 12, 14, 15, 16, 18] de structure [1, 1, 2, 1, 1, 2, 2, 1, 1, 2, 1, 1, 2, 2]
m95=[0, 1, 2, 4, 5, 7, 8, 10, 11, 12, 14, 15, 17, 18] de structure [1, 1, 2, 1, 2, 1, 2, 1, 1, 2, 1, 2, 1, 2]
m96=[0, 1, 2, 3, 4, 5, 7, 10, 11, 12, 13, 14, 15, 17] de structure [1, 1, 1, 1, 1, 2, 3, 1, 1, 1, 1, 1, 2, 3]
m97=[0, 1, 2, 3, 4, 5, 8, 10, 11, 12, 13, 14, 15, 18] de structure [1, 1, 1, 1, 1, 3, 2, 1, 1, 1, 1, 1, 3, 2]
m98=[0, 1, 2, 3, 4, 6, 7, 10, 11, 12, 13, 14, 16, 17] de structure [1, 1, 1, 1, 2, 1, 3, 1, 1, 1, 1, 2, 1, 3]
m99=[0, 1, 2, 3, 4, 7, 8, 10, 11, 12, 13, 14, 17, 18] de structure [1, 1, 1, 1, 3, 1, 2, 1, 1, 1, 1, 3, 1, 2]
m100=[0, 1, 2, 3, 5, 6, 7, 10, 11, 12, 13, 15, 16, 17] de structure [1, 1, 1, 2, 1, 1, 3, 1, 1, 1, 2, 1, 1, 3]
m101=[0, 1, 2, 3, 6, 7, 8, 10, 11, 12, 13, 16, 17, 18] de structure [1, 1, 1, 3, 1, 1, 2, 1, 1, 1, 3, 1, 1, 2]
m102=[0, 1, 2, 3, 4, 5, 6, 10, 11, 12, 13, 14, 15, 16] de structure [1, 1, 1, 1, 1, 1, 4, 1, 1, 1, 1, 1, 1, 4]

Modes de 15 notes.
m103=[0, 1, 2, 4, 5, 6, 8, 9, 10, 12, 13, 14, 16, 17, 18] de structure [1, 1, 2, 1, 1, 2, 1, 1, 2, 1, 1, 2, 1, 1, 2]

Modes de 16 notes.
m104=[0, 1, 2, 3, 4, 5, 6, 8, 10, 11, 12, 13, 14, 15, 16, 18] de structure [1, 1, 1, 1, 1, 1, 2, 2, 1, 1, 1, 1, 1, 1, 2, 2]
m105=[0, 1, 2, 3, 4, 5, 7, 8, 10, 11, 12, 13, 14, 15, 17, 18] de structure [1, 1, 1, 1, 1, 2, 1, 2, 1, 1, 1, 1, 1, 2, 1, 2]
m106=[0, 1, 2, 3, 4, 6, 7, 8, 10, 11, 12, 13, 14, 16, 17, 18] de structure [1, 1, 1, 1, 2, 1, 1, 2, 1, 1, 1, 1, 2, 1, 1, 2]
m107=[0, 1, 2, 3, 5, 6, 7, 8, 10, 11, 12, 13, 15, 16, 17, 18] de structure [1, 1, 1, 2, 1, 1, 1, 2, 1, 1, 1, 2, 1, 1, 1, 2]
m108=[0, 1, 2, 3, 4, 5, 6, 7, 10, 11, 12, 13, 14, 15, 16, 17] de structure [1, 1, 1, 1, 1, 1, 1, 3, 1, 1, 1, 1, 1, 1, 1, 3]

Modes de 18 notes.
m109=[0, 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18] de structure [1, 1, 1, 1, 1, 1, 1, 1, 2, 1, 1, 1, 1, 1, 1, 1, 1, 2]

Modes de 20 notes.
m110=[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19] de structure [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1]

19. Modes de $\mathbb{Z}_{21}$

Pour $n = 21$, il y a 21 modes à transpositions limitées, avec la répartition suivante.

Notes	ECH	ATL	Détails
21	1	1	1 à 1 transp.
1, 20	1	0	0
2, 19	10	0	0
3, 18	64	1	1 à 7 transp.
4, 17	285	0	0
5, 16	969	0	0
6, 15	2586	3	3 à 7 transp.
7, 14	5538	1	1 à 3 transp.
8, 13	9690	0	0
9, 12	14000	5	5 à 7 transp.
10, 11	16796	0	0
Total	99879	21	21

Modes de 3 notes.
m1=[0, 7, 14] de structure [7, 7, 7]

Modes de 6 notes.
m2=[0, 3, 7, 10, 14, 17] de structure [3, 4, 3, 4, 3, 4]
m3=[0, 2, 7, 9, 14, 16] de structure [2, 5, 2, 5, 2, 5]
m4=[0, 1, 7, 8, 14, 15] de structure [1, 6, 1, 6, 1, 6]

Modes de 7 notes.
m5=[0, 3, 6, 9, 12, 15, 18] de structure [3, 3, 3, 3, 3, 3, 3]

Modes de 9 notes.
m6=[0, 2, 4, 7, 9, 11, 14, 16, 18] de structure [2, 2, 3, 2, 2, 3, 2, 2, 3]
m7=[0, 1, 4, 7, 8, 11, 14, 15, 18] de structure [1, 3, 3, 1, 3, 3, 1, 3, 3]
m8=[0, 1, 3, 7, 8, 10, 14, 15, 17] de structure [1, 2, 4, 1, 2, 4, 1, 2, 4]
m9=[0, 1, 5, 7, 8, 12, 14, 15, 19] de structure [1, 4, 2, 1, 4, 2, 1, 4, 2]
m10=[0, 1, 2, 7, 8, 9, 14, 15, 16] de structure [1, 1, 5, 1, 1, 5, 1, 1, 5]

Modes de 12 notes.
m11=[0, 1, 3, 5, 7, 8, 10, 12, 14, 15, 17, 19] de structure [1, 2, 2, 2, 1, 2, 2, 2, 1, 2, 2, 2]
m12=[0, 1, 2, 4, 7, 8, 9, 11, 14, 15, 16, 18] de structure [1, 1, 2, 3, 1, 1, 2, 3, 1, 1, 2, 3]
m13=[0, 1, 2, 5, 7, 8, 9, 12, 14, 15, 16, 19] de structure [1, 1, 3, 2, 1, 1, 3, 2, 1, 1, 3, 2]
m14=[0, 1, 3, 4, 7, 8, 10, 11, 14, 15, 17, 18] de structure [1, 2, 1, 3, 1, 2, 1, 3, 1, 2, 1, 3]
m15=[0, 1, 2, 3, 7, 8, 9, 10, 14, 15, 16, 17] de structure [1, 1, 1, 4, 1, 1, 1, 4, 1, 1, 1, 4]

Modes de 14 notes.

m16=[0, 1, 3, 4, 6, 7, 9, 10, 12, 13, 15, 16, 18, 19] de structure [1, 2, 1, 2, 1, 2, 1, 2, 1, 2, 1, 2, 1, 2]

Modes de 15 notes.
m17=[0, 1, 2, 3, 5, 7, 8, 9, 10, 12, 14, 15, 16, 17, 19] de structure [1, 1, 1, 2, 2, 1, 1, 1, 2, 2, 1, 1, 1, 2, 2]
m18=[0, 1, 2, 4, 5, 7, 8, 9, 11, 12, 14, 15, 16, 18, 19] de structure [1, 1, 2, 1, 2, 1, 1, 2, 1, 2, 1, 1, 2, 1, 2]
m19=[0, 1, 2, 3, 4, 7, 8, 9, 10, 11, 14, 15, 16, 17, 18] de structure [1, 1, 1, 1, 3, 1, 1, 1, 1, 3, 1, 1, 1, 1, 3]

Modes de 18 notes.
m20=[0, 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19] de structure [1, 1, 1, 1, 1, 2, 1, 1, 1, 1, 1, 2, 1, 1, 1, 1, 1, 2]

Modes de 21 notes.
m21=[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20] de structure [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1]

20. Modes de $\mathbb{Z}_{22}$

Pour $n = 22$, il y a 188 modes à transpositions limitées avec la répartition suivante.

Notes	ECH	ATL	Détails
22	1	1	1 à 1 transp.
1, 21	1	0	0
2, 20	11	1	1 à 11 transp.
3, 19	70	0	0
4, 18	335	5	5 à 11 transp.
5, 17	1197	0	0
6, 16	3399	15	15 à 11 transp.
7, 15	7752	0	0
8, 14	14550	30	30 à 11 transp.
9, 13	22610	0	0
10, 12	29414	42	42 à 11 transp.
11	32066	1	1 à 2 transp.
Total	190745	188	188

Modes de 2 notes.
m1=[0, 11] de structure [11, 11]

Modes de 4 notes.
m2=[0, 5, 11, 16] de structure [5, 6, 5, 6]
m3=[0, 4, 11, 15] de structure [4, 7, 4, 7]
m4=[0, 3, 11, 14] de structure [3, 8, 3, 8]
m5=[0, 2, 11, 13] de structure [2, 9, 2, 9]
m6=[0, 1, 11, 12] de structure [1, 10, 1, 10]

Modes de 6 notes.
m7=[0, 3, 7, 11, 14, 18] de structure [3, 4, 4, 3, 4, 4]
m8=[0, 3, 6, 11, 14, 17] de structure [3, 3, 5, 3, 3, 5]

m9=[0, 2, 6, 11, 13, 17] de structure [2, 4, 5, 2, 4, 5]
m10=[0, 2, 7, 11, 13, 18] de structure [2, 5, 4, 2, 5, 4]
m11=[0, 1, 6, 11, 12, 17] de structure [1, 5, 5, 1, 5, 5]
m12=[0, 2, 5, 11, 13, 16] de structure [2, 3, 6, 2, 3, 6]
m13=[0, 2, 8, 11, 13, 19] de structure [2, 6, 3, 2, 6, 3]
m14=[0, 1, 5, 11, 12, 16] de structure [1, 4, 6, 1, 4, 6]
m15=[0, 1, 7, 11, 12, 18] de structure [1, 6, 4, 1, 6, 4]
m16=[0, 2, 4, 11, 13, 15] de structure [2, 2, 7, 2, 2, 7]
m17=[0, 1, 4, 11, 12, 15] de structure [1, 3, 7, 1, 3, 7]
m18=[0, 1, 8, 11, 12, 19] de structure [1, 7, 3, 1, 7, 3]
m19=[0, 1, 3, 11, 12, 14] de structure [1, 2, 8, 1, 2, 8]
m20=[0, 1, 9, 11, 12, 20] de structure [1, 8, 2, 1, 8, 2]
m21=[0, 1, 2, 11, 12, 13] de structure [1, 1, 9, 1, 1, 9]

Modes de 8 notes.
m22=[0, 2, 5, 8, 11, 13, 16, 19] de structure [2, 3, 3, 3, 2, 3, 3, 3]
m23=[0, 2, 4, 7, 11, 13, 15, 18] de structure [2, 2, 3, 4, 2, 2, 3, 4]
m24=[0, 2, 4, 8, 11, 13, 15, 19] de structure [2, 2, 4, 3, 2, 2, 4, 3]
m25=[0, 2, 5, 7, 11, 13, 16, 18] de structure [2, 3, 2, 4, 2, 3, 2, 4]
m26=[0, 1, 4, 7, 11, 12, 15, 18] de structure [1, 3, 3, 4, 1, 3, 3, 4]
m27=[0, 1, 4, 8, 11, 12, 15, 19] de structure [1, 3, 4, 3, 1, 3, 4, 3]
m28=[0, 1, 5, 8, 11, 12, 16, 19] de structure [1, 4, 3, 3, 1, 4, 3, 3]
m29=[0, 1, 3, 7, 11, 12, 14, 18] de structure [1, 2, 4, 4, 1, 2, 4, 4]
m30=[0, 1, 5, 7, 11, 12, 16, 18] de structure [1, 4, 2, 4, 1, 4, 2, 4]
m31=[0, 1, 5, 9, 11, 12, 16, 20] de structure [1, 4, 4, 2, 1, 4, 4, 2]
m32=[0, 2, 4, 6, 11, 13, 15, 17] de structure [2, 2, 2, 5, 2, 2, 2, 5]
m33=[0, 1, 3, 6, 11, 12, 14, 17] de structure [1, 2, 3, 5, 1, 2, 3, 5]
m34=[0, 1, 3, 8, 11, 12, 14, 19] de structure [1, 2, 5, 3, 1, 2, 5, 3]
m35=[0, 1, 4, 6, 11, 12, 15, 17] de structure [1, 3, 2, 5, 1, 3, 2, 5]
m36=[0, 1, 4, 9, 11, 12, 15, 20] de structure [1, 3, 5, 2, 1, 3, 5, 2]
m37=[0, 1, 6, 8, 11, 12, 17, 19] de structure [1, 5, 2, 3, 1, 5, 2, 3]
m38=[0, 1, 6, 9, 11, 12, 17, 20] de structure [1, 5, 3, 2, 1, 5, 3, 2]
m39=[0, 1, 2, 6, 11, 12, 13, 17] de structure [1, 1, 4, 5, 1, 1, 4, 5]
m40=[0, 1, 2, 7, 11, 12, 13, 18] de structure [1, 1, 5, 4, 1, 1, 5, 4]
m41=[0, 1, 5, 6, 11, 12, 16, 17] de structure [1, 4, 1, 5, 1, 4, 1, 5]
m42=[0, 1, 3, 5, 11, 12, 14, 16] de structure [1, 2, 2, 6, 1, 2, 2, 6]
m43=[0, 1, 3, 9, 11, 12, 14, 20] de structure [1, 2, 6, 2, 1, 2, 6, 2]
m44=[0, 1, 7, 9, 11, 12, 18, 20] de structure [1, 6, 2, 2, 1, 6, 2, 2]
m45=[0, 1, 2, 5, 11, 12, 13, 16] de structure [1, 1, 3, 6, 1, 1, 3, 6]
m46=[0, 1, 2, 8, 11, 12, 13, 19] de structure [1, 1, 6, 3, 1, 1, 6, 3]
m47=[0, 1, 4, 5, 11, 12, 15, 16] de structure [1, 3, 1, 6, 1, 3, 1, 6]
m48=[0, 1, 2, 4, 11, 12, 13, 15] de structure [1, 1, 2, 7, 1, 1, 2, 7]
m49=[0, 1, 2, 9, 11, 12, 13, 20] de structure [1, 1, 7, 2, 1, 1, 7, 2]
m50=[0, 1, 3, 4, 11, 12, 14, 15] de structure [1, 2, 1, 7, 1, 2, 1, 7]
m51=[0, 1, 2, 3, 11, 12, 13, 14] de structure [1, 1, 1, 8, 1, 1, 1, 8]

Modes de 10 notes.
m52=[0, 2, 4, 6, 8, 11, 13, 15, 17, 19] de structure [2, 2, 2, 2, 3, 2, 2, 2, 2, 3]
m53=[0, 1, 3, 5, 8, 11, 12, 14, 16, 19] de structure [1, 2, 2, 3, 3, 1, 2, 2, 3, 3]

m54=[0, 1, 3, 6, 8, 11, 12, 14, 17, 19] de structure [1, 2, 3, 2, 3, 1, 2, 3, 2, 3]
m55=[0, 1, 3, 6, 9, 11, 12, 14, 17, 20] de structure [1, 2, 3, 3, 2, 1, 2, 3, 3, 2]
m56=[0, 1, 4, 6, 8, 11, 12, 15, 17, 19] de structure [1, 3, 2, 2, 3, 1, 3, 2, 2, 3]
m57=[0, 1, 4, 6, 9, 11, 12, 15, 17, 20] de structure [1, 3, 2, 3, 2, 1, 3, 2, 3, 2]
m58=[0, 1, 4, 7, 9, 11, 12, 15, 18, 20] de structure [1, 3, 3, 2, 2, 1, 3, 3, 2, 2]
m59=[0, 1, 2, 5, 8, 11, 12, 13, 16, 19] de structure [1, 1, 3, 3, 3, 1, 1, 3, 3, 3]
m60=[0, 1, 4, 5, 8, 11, 12, 15, 16, 19] de structure [1, 3, 1, 3, 3, 1, 3, 1, 3, 3]
m61=[0, 1, 3, 5, 7, 11, 12, 14, 16, 18] de structure [1, 2, 2, 2, 4, 1, 2, 2, 2, 4]
m62=[0, 1, 3, 5, 9, 11, 12, 14, 16, 20] de structure [1, 2, 2, 4, 2, 1, 2, 2, 4, 2]
m63=[0, 1, 3, 7, 9, 11, 12, 14, 18, 20] de structure [1, 2, 4, 2, 2, 1, 2, 4, 2, 2]
m64=[0, 1, 5, 7, 9, 11, 12, 16, 18, 20] de structure [1, 4, 2, 2, 2, 1, 4, 2, 2, 2]
m65=[0, 1, 2, 4, 7, 11, 12, 13, 15, 18] de structure [1, 1, 2, 3, 4, 1, 1, 2, 3, 4]
m66=[0, 1, 2, 4, 8, 11, 12, 13, 15, 19] de structure [1, 1, 2, 4, 3, 1, 1, 2, 4, 3]
m67=[0, 1, 2, 5, 7, 11, 12, 13, 16, 18] de structure [1, 1, 3, 2, 4, 1, 1, 3, 2, 4]
m68=[0, 1, 2, 5, 9, 11, 12, 13, 16, 20] de structure [1, 1, 3, 4, 2, 1, 1, 3, 4, 2]
m69=[0, 1, 2, 6, 8, 11, 12, 13, 17, 19] de structure [1, 1, 4, 2, 3, 1, 1, 4, 2, 3]
m70=[0, 1, 2, 6, 9, 11, 12, 13, 17, 20] de structure [1, 1, 4, 3, 2, 1, 1, 4, 3, 2]
m71=[0, 1, 3, 4, 7, 11, 12, 14, 15, 18] de structure [1, 2, 1, 3, 4, 1, 2, 1, 3, 4]
m72=[0, 1, 3, 4, 8, 11, 12, 14, 15, 19] de structure [1, 2, 1, 4, 3, 1, 2, 1, 4, 3]
m73=[0, 1, 3, 6, 7, 11, 12, 14, 17, 18] de structure [1, 2, 3, 1, 4, 1, 2, 3, 1, 4]
m74=[0, 1, 3, 7, 8, 11, 12, 14, 18, 19] de structure [1, 2, 4, 1, 3, 1, 2, 4, 1, 3]
m75=[0, 1, 4, 5, 9, 11, 12, 15, 16, 20] de structure [1, 3, 1, 4, 2, 1, 3, 1, 4, 2]
m76=[0, 1, 4, 6, 7, 11, 12, 15, 17, 18] de structure [1, 3, 2, 1, 4, 1, 3, 2, 1, 4]
m77=[0, 1, 2, 3, 7, 11, 12, 13, 14, 18] de structure [1, 1, 1, 4, 4, 1, 1, 1, 4, 4]
m78=[0, 1, 2, 6, 7, 11, 12, 13, 17, 18] de structure [1, 1, 4, 1, 4, 1, 1, 4, 1, 4]
m79=[0, 1, 2, 4, 6, 11, 12, 13, 15, 17] de structure [1, 1, 2, 2, 5, 1, 1, 2, 2, 5]
m80=[0, 1, 2, 4, 9, 11, 12, 13, 15, 20] de structure [1, 1, 2, 5, 2, 1, 1, 2, 5, 2]
m81=[0, 1, 2, 7, 9, 11, 12, 13, 18, 20] de structure [1, 1, 5, 2, 2, 1, 1, 5, 2, 2]
m82=[0, 1, 3, 4, 6, 11, 12, 14, 15, 17] de structure [1, 2, 1, 2, 5, 1, 2, 1, 2, 5]
m83=[0, 1, 3, 4, 9, 11, 12, 14, 15, 20] de structure [1, 2, 1, 5, 2, 1, 2, 1, 5, 2]
m84=[0, 1, 3, 5, 6, 11, 12, 14, 16, 17] de structure [1, 2, 2, 1, 5, 1, 2, 2, 1, 5]
m85=[0, 1, 2, 3, 6, 11, 12, 13, 14, 17] de structure [1, 1, 1, 3, 5, 1, 1, 1, 3, 5]
m86=[0, 1, 2, 3, 8, 11, 12, 13, 14, 19] de structure [1, 1, 1, 5, 3, 1, 1, 1, 5, 3]
m87=[0, 1, 2, 5, 6, 11, 12, 13, 16, 17] de structure [1, 1, 3, 1, 5, 1, 1, 3, 1, 5]
m88=[0, 1, 2, 7, 8, 11, 12, 13, 18, 19] de structure [1, 1, 5, 1, 3, 1, 1, 5, 1, 3]
m89=[0, 1, 2, 3, 5, 11, 12, 13, 14, 16] de structure [1, 1, 1, 2, 6, 1, 1, 1, 2, 6]
m90=[0, 1, 2, 3, 9, 11, 12, 13, 14, 20] de structure [1, 1, 1, 6, 2, 1, 1, 1, 6, 2]
m91=[0, 1, 2, 4, 5, 11, 12, 13, 15, 16] de structure [1, 1, 2, 1, 6, 1, 1, 2, 1, 6]
m92=[0, 1, 2, 8, 9, 11, 12, 13, 19, 20] de structure [1, 1, 6, 1, 2, 1, 1, 6, 1, 2]
m93=[0, 1, 2, 3, 4, 11, 12, 13, 14, 15] de structure [1, 1, 1, 1, 7, 1, 1, 1, 1, 7]

Modes de 11 notes.
m94=[0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20] de structure [2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2]

Modes de 12 notes.
m95=[0, 1, 3, 5, 7, 9, 11, 12, 14, 16, 18, 20] de structure [1, 2, 2, 2, 2, 2, 1, 2, 2, 2, 2, 2]
m96=[0, 1, 2, 4, 6, 8, 11, 12, 13, 15, 17, 19] de structure [1, 1, 2, 2, 2, 3, 1, 1, 2, 2, 2, 3]

m97=[0, 1, 2, 4, 6, 9, 11, 12, 13, 15, 17, 20] de structure [1, 1, 2, 2, 3, 2, 1, 1, 2, 2, 3, 2]
m98=[0, 1, 2, 4, 7, 9, 11, 12, 13, 15, 18, 20] de structure [1, 1, 2, 3, 2, 2, 1, 1, 2, 3, 2, 2]
m99=[0, 1, 2, 5, 7, 9, 11, 12, 13, 16, 18, 20] de structure [1, 1, 3, 2, 2, 2, 1, 1, 3, 2, 2, 2]
m100=[0, 1, 3, 4, 6, 8, 11, 12, 14, 15, 17, 19] de structure [1, 2, 1, 2, 2, 3, 1, 2, 1, 2, 2, 3]
m101=[0, 1, 3, 4, 6, 9, 11, 12, 14, 15, 17, 20] de structure [1, 2, 1, 2, 3, 2, 1, 2, 1, 2, 3, 2]
m102=[0, 1, 3, 4, 7, 9, 11, 12, 14, 15, 18, 20] de structure [1, 2, 1, 3, 2, 2, 1, 2, 1, 3, 2, 2]
m103=[0, 1, 3, 5, 6, 8, 11, 12, 14, 16, 17, 19] de structure [1, 2, 2, 1, 2, 3, 1, 2, 2, 1, 2, 3]
m104=[0, 1, 3, 5, 6, 9, 11, 12, 14, 16, 17, 20] de structure [1, 2, 2, 1, 3, 2, 1, 2, 2, 1, 3, 2]
m105=[0, 1, 3, 5, 7, 8, 11, 12, 14, 16, 18, 19] de structure [1, 2, 2, 2, 1, 3, 1, 2, 2, 2, 1, 3]
m106=[0, 1, 2, 3, 5, 8, 11, 12, 13, 14, 16, 19] de structure [1, 1, 1, 2, 3, 3, 1, 1, 1, 2, 3, 3]
m107=[0, 1, 2, 3, 6, 8, 11, 12, 13, 14, 17, 19] de structure [1, 1, 1, 3, 2, 3, 1, 1, 1, 3, 2, 3]
m108=[0, 1, 2, 3, 6, 9, 11, 12, 13, 14, 17, 20] de structure [1, 1, 1, 3, 3, 2, 1, 1, 1, 3, 3, 2]
m109=[0, 1, 2, 4, 5, 8, 11, 12, 13, 15, 16, 19] de structure [1, 1, 2, 1, 3, 3, 1, 1, 2, 1, 3, 3]
m110=[0, 1, 2, 4, 7, 8, 11, 12, 13, 15, 18, 19] de structure [1, 1, 2, 3, 1, 3, 1, 1, 2, 3, 1, 3]
m111=[0, 1, 2, 5, 6, 8, 11, 12, 13, 16, 17, 19] de structure [1, 1, 3, 1, 2, 3, 1, 1, 3, 1, 2, 3]
m112=[0, 1, 2, 5, 6, 9, 11, 12, 13, 16, 17, 20] de structure [1, 1, 3, 1, 3, 2, 1, 1, 3, 1, 3, 2]
m113=[0, 1, 2, 5, 7, 8, 11, 12, 13, 16, 18, 19] de structure [1, 1, 3, 2, 1, 3, 1, 1, 3, 2, 1, 3]
m114=[0, 1, 2, 5, 8, 9, 11, 12, 13, 16, 19, 20] de structure [1, 1, 3, 3, 1, 2, 1, 1, 3, 3, 1, 2]
m115=[0, 1, 3, 4, 7, 8, 11, 12, 14, 15, 18, 19] de structure [1, 2, 1, 3, 1, 3, 1, 2, 1, 3, 1, 3]
m116=[0, 1, 2, 3, 5, 7, 11, 12, 13, 14, 16, 18] de structure [1, 1, 1, 2, 2, 4, 1, 1, 1, 2, 2, 4]
m117=[0, 1, 2, 3, 5, 9, 11, 12, 13, 14, 16, 20] de structure [1, 1, 1, 2, 4, 2, 1, 1, 1, 2, 4, 2]
m118=[0, 1, 2, 3, 7, 9, 11, 12, 13, 14, 18, 20] de structure [1, 1, 1, 4, 2, 2, 1, 1, 1, 4, 2, 2]
m119=[0, 1, 2, 4, 5, 7, 11, 12, 13, 15, 16, 18] de structure [1, 1, 2, 1, 2, 4, 1, 1, 2, 1, 2, 4]
m120=[0, 1, 2, 4, 5, 9, 11, 12, 13, 15, 16, 20] de structure [1, 1, 2, 1, 4, 2, 1, 1, 2, 1, 4, 2]

m121=[0, 1, 2, 4, 6, 7, 11, 12, 13, 15, 17, 18] de structure [1, 1, 2, 2, 1, 4, 1, 1, 2, 2, 1, 4]
m122=[0, 1, 2, 4, 8, 9, 11, 12, 13, 15, 19, 20] de structure [1, 1, 2, 4, 1, 2, 1, 1, 2, 4, 1, 2]
m123=[0, 1, 2, 6, 7, 9, 11, 12, 13, 17, 18, 20] de structure [1, 1, 4, 1, 2, 2, 1, 1, 4, 1, 2, 2]
m124=[0, 1, 2, 6, 8, 9, 11, 12, 13, 17, 19, 20] de structure [1, 1, 4, 2, 1, 2, 1, 1, 4, 2, 1, 2]
m125=[0, 1, 3, 4, 6, 7, 11, 12, 14, 15, 17, 18] de structure [1, 2, 1, 2, 1, 4, 1, 2, 1, 2, 1, 4]
m126=[0, 1, 2, 3, 4, 7, 11, 12, 13, 14, 15, 18] de structure [1, 1, 1, 1, 3, 4, 1, 1, 1, 1, 3, 4]
m127=[0, 1, 2, 3, 4, 8, 11, 12, 13, 14, 15, 19] de structure [1, 1, 1, 1, 4, 3, 1, 1, 1, 1, 4, 3]
m128=[0, 1, 2, 3, 6, 7, 11, 12, 13, 14, 17, 18] de structure [1, 1, 1, 3, 1, 4, 1, 1, 1, 3, 1, 4]
m129=[0, 1, 2, 3, 7, 8, 11, 12, 13, 14, 18, 19] de structure [1, 1, 1, 4, 1, 3, 1, 1, 1, 4, 1, 3]
m130=[0, 1, 2, 5, 6, 7, 11, 12, 13, 16, 17, 18] de structure [1, 1, 3, 1, 1, 4, 1, 1, 3, 1, 1, 4]
m131=[0, 1, 2, 3, 4, 6, 11, 12, 13, 14, 15, 17] de structure [1, 1, 1, 1, 2, 5, 1, 1, 1, 1, 2, 5]
m132=[0, 1, 2, 3, 4, 9, 11, 12, 13, 14, 15, 20] de structure [1, 1, 1, 1, 5, 2, 1, 1, 1, 1, 5, 2]
m133=[0, 1, 2, 3, 5, 6, 11, 12, 13, 14, 16, 17] de structure [1, 1, 1, 2, 1, 5, 1, 1, 1, 2, 1, 5]
m134=[0, 1, 2, 3, 8, 9, 11, 12, 13, 14, 19, 20] de structure [1, 1, 1, 5, 1, 2, 1, 1, 1, 5, 1, 2]
m135=[0, 1, 2, 4, 5, 6, 11, 12, 13, 15, 16, 17] de structure [1, 1, 2, 1, 1, 5, 1, 1, 2, 1, 1, 5]
m136=[0, 1, 2, 3, 4, 5, 11, 12, 13, 14, 15, 16] de structure [1, 1, 1, 1, 1, 6, 1, 1, 1, 1, 1, 6]

Modes de 14 notes.
m137=[0, 1, 2, 3, 5, 7, 9, 11, 12, 13, 14, 16, 18, 20] de structure [1, 1, 1, 2, 2, 2, 2, 1, 1, 1, 2, 2, 2, 2]
m138=[0, 1, 2, 4, 5, 7, 9, 11, 12, 13, 15, 16, 18, 20] de structure [1, 1, 2, 1, 2, 2, 2, 1, 1, 2, 1, 2, 2, 2]
m139=[0, 1, 2, 4, 6, 7, 9, 11, 12, 13, 15, 17, 18, 20] de structure [1, 1, 2, 2, 1, 2, 2, 1, 1, 2, 2, 1, 2, 2]
m140=[0, 1, 2, 4, 6, 8, 9, 11, 12, 13, 15, 17, 19, 20] de structure [1, 1, 2, 2, 2, 1, 2, 1, 1, 2, 2, 2, 1, 2]
m141=[0, 1, 3, 4, 6, 7, 9, 11, 12, 14, 15, 17, 18, 20] de structure [1, 2, 1, 2, 1, 2, 2, 1, 2, 1, 2, 1, 2, 2]
m142=[0, 1, 2, 3, 4, 6, 8, 11, 12, 13, 14, 15, 17, 19] de structure [1, 1, 1, 1, 2, 2, 3, 1, 1, 1, 1, 2, 2, 3]
m143=[0, 1, 2, 3, 4, 6, 9, 11, 12, 13, 14, 15, 17, 20] de structure [1, 1, 1, 1, 2, 3, 2, 1, 1, 1, 1, 2, 3, 2]

m144=[0, 1, 2, 3, 4, 7, 9, 11, 12, 13, 14, 15, 18, 20] de structure [1, 1, 1, 1, 3, 2, 2, 1, 1, 1, 1, 3, 2, 2]
m145=[0, 1, 2, 3, 5, 6, 8, 11, 12, 13, 14, 16, 17, 19] de structure [1, 1, 1, 2, 1, 2, 3, 1, 1, 1, 2, 1, 2, 3]
m146=[0, 1, 2, 3, 5, 6, 9, 11, 12, 13, 14, 16, 17, 20] de structure [1, 1, 1, 2, 1, 3, 2, 1, 1, 1, 2, 1, 3, 2]
m147=[0, 1, 2, 3, 5, 7, 8, 11, 12, 13, 14, 16, 18, 19] de structure [1, 1, 1, 2, 2, 1, 3, 1, 1, 1, 2, 2, 1, 3]
m148=[0, 1, 2, 3, 5, 8, 9, 11, 12, 13, 14, 16, 19, 20] de structure [1, 1, 1, 2, 3, 1, 2, 1, 1, 1, 2, 3, 1, 2]
m149=[0, 1, 2, 3, 6, 7, 9, 11, 12, 13, 14, 17, 18, 20] de structure [1, 1, 1, 3, 1, 2, 2, 1, 1, 1, 3, 1, 2, 2]
m150=[0, 1, 2, 3, 6, 8, 9, 11, 12, 13, 14, 17, 19, 20] de structure [1, 1, 1, 3, 2, 1, 2, 1, 1, 1, 3, 2, 1, 2]
m151=[0, 1, 2, 4, 5, 6, 8, 11, 12, 13, 15, 16, 17, 19] de structure [1, 1, 2, 1, 1, 2, 3, 1, 1, 2, 1, 1, 2, 3]
m152=[0, 1, 2, 4, 5, 6, 9, 11, 12, 13, 15, 16, 17, 20] de structure [1, 1, 2, 1, 1, 3, 2, 1, 1, 2, 1, 1, 3, 2]
m153=[0, 1, 2, 4, 5, 7, 8, 11, 12, 13, 15, 16, 18, 19] de structure [1, 1, 2, 1, 2, 1, 3, 1, 1, 2, 1, 2, 1, 3]
m154=[0, 1, 2, 4, 5, 8, 9, 11, 12, 13, 15, 16, 19, 20] de structure [1, 1, 2, 1, 3, 1, 2, 1, 1, 2, 1, 3, 1, 2]
m155=[0, 1, 2, 4, 6, 7, 8, 11, 12, 13, 15, 17, 18, 19] de structure [1, 1, 2, 2, 1, 1, 3, 1, 1, 2, 2, 1, 1, 3]
m156=[0, 1, 2, 5, 6, 8, 9, 11, 12, 13, 16, 17, 19, 20] de structure [1, 1, 3, 1, 2, 1, 2, 1, 1, 3, 1, 2, 1, 2]
m157=[0, 1, 2, 3, 4, 5, 8, 11, 12, 13, 14, 15, 16, 19] de structure [1, 1, 1, 1, 1, 3, 3, 1, 1, 1, 1, 1, 3, 3]
m158=[0, 1, 2, 3, 4, 7, 8, 11, 12, 13, 14, 15, 18, 19] de structure [1, 1, 1, 1, 3, 1, 3, 1, 1, 1, 1, 3, 1, 3]
m159=[0, 1, 2, 3, 6, 7, 8, 11, 12, 13, 14, 17, 18, 19] de structure [1, 1, 1, 3, 1, 1, 3, 1, 1, 1, 3, 1, 1, 3]
m160=[0, 1, 2, 3, 4, 5, 7, 11, 12, 13, 14, 15, 16, 18] de structure [1, 1, 1, 1, 1, 2, 4, 1, 1, 1, 1, 1, 2, 4]
m161=[0, 1, 2, 3, 4, 5, 9, 11, 12, 13, 14, 15, 16, 20] de structure [1, 1, 1, 1, 1, 4, 2, 1, 1, 1, 1, 1, 4, 2]
m162=[0, 1, 2, 3, 4, 6, 7, 11, 12, 13, 14, 15, 17, 18] de structure [1, 1, 1, 1, 2, 1, 4, 1, 1, 1, 1, 2, 1, 4]
m163=[0, 1, 2, 3, 4, 8, 9, 11, 12, 13, 14, 15, 19, 20] de structure [1, 1, 1, 1, 4, 1, 2, 1, 1, 1, 1, 4, 1, 2]
m164=[0, 1, 2, 3, 5, 6, 7, 11, 12, 13, 14, 16, 17, 18] de structure [1, 1, 1, 2, 1, 1, 4, 1, 1, 1, 2, 1, 1, 4]
m165=[0, 1, 2, 3, 7, 8, 9, 11, 12, 13, 14, 18, 19, 20] de structure [1, 1, 1, 4, 1, 1, 2, 1, 1, 1, 4, 1, 1, 2]
m166=[0, 1, 2, 3, 4, 5, 6, 11, 12, 13, 14, 15, 16, 17] de structure [1, 1, 1, 1, 1, 1, 5, 1, 1, 1, 1, 1, 1, 5]

Modes de 16 notes.

m167=[0, 1, 2, 3, 4, 5, 7, 9, 11, 12, 13, 14, 15, 16, 18, 20] de structure [1, 1, 1, 1, 1, 2, 2, 2, 1, 1, 1, 1, 1, 2, 2, 2]
m168=[0, 1, 2, 3, 4, 6, 7, 9, 11, 12, 13, 14, 15, 17, 18, 20] de structure [1, 1, 1, 1, 2, 1, 2, 2, 1, 1, 1, 1, 2, 1, 2, 2]
m169=[0, 1, 2, 3, 4, 6, 8, 9, 11, 12, 13, 14, 15, 17, 19, 20] de structure [1, 1, 1, 1, 2, 2, 1, 2, 1, 1, 1, 1, 2, 2, 1, 2]
m170=[0, 1, 2, 3, 5, 6, 7, 9, 11, 12, 13, 14, 16, 17, 18, 20] de structure [1, 1, 1, 2, 1, 1, 2, 2, 1, 1, 1, 2, 1, 1, 2, 2]
m171=[0, 1, 2, 3, 5, 6, 8, 9, 11, 12, 13, 14, 16, 17, 19, 20] de structure [1, 1, 1, 2, 1, 2, 1, 2, 1, 1, 1, 2, 1, 2, 1, 2]
m172=[0, 1, 2, 3, 5, 7, 8, 9, 11, 12, 13, 14, 16, 18, 19, 20] de structure [1, 1, 1, 2, 2, 1, 1, 2, 1, 1, 1, 2, 2, 1, 1, 2]
m173=[0, 1, 2, 4, 5, 6, 8, 9, 11, 12, 13, 15, 16, 17, 19, 20] de structure [1, 1, 2, 1, 1, 2, 1, 2, 1, 1, 2, 1, 1, 2, 1, 2]
m174=[0, 1, 2, 3, 4, 5, 6, 8, 11, 12, 13, 14, 15, 16, 17, 19] de structure [1, 1, 1, 1, 1, 1, 2, 3, 1, 1, 1, 1, 1, 1, 2, 3]
m175=[0, 1, 2, 3, 4, 5, 6, 9, 11, 12, 13, 14, 15, 16, 17, 20] de structure [1, 1, 1, 1, 1, 1, 3, 2, 1, 1, 1, 1, 1, 1, 3, 2]
m176=[0, 1, 2, 3, 4, 5, 7, 8, 11, 12, 13, 14, 15, 16, 18, 19] de structure [1, 1, 1, 1, 1, 2, 1, 3, 1, 1, 1, 1, 1, 2, 1, 3]
m177=[0, 1, 2, 3, 4, 5, 8, 9, 11, 12, 13, 14, 15, 16, 19, 20] de structure [1, 1, 1, 1, 1, 3, 1, 2, 1, 1, 1, 1, 1, 3, 1, 2]
m178=[0, 1, 2, 3, 4, 6, 7, 8, 11, 12, 13, 14, 15, 17, 18, 19] de structure [1, 1, 1, 1, 2, 1, 1, 3, 1, 1, 1, 1, 2, 1, 1, 3]
m179=[0, 1, 2, 3, 4, 7, 8, 9, 11, 12, 13, 14, 15, 18, 19, 20] de structure [1, 1, 1, 1, 3, 1, 1, 2, 1, 1, 1, 1, 3, 1, 1, 2]
m180=[0, 1, 2, 3, 5, 6, 7, 8, 11, 12, 13, 14, 16, 17, 18, 19] de structure [1, 1, 1, 2, 1, 1, 1, 3, 1, 1, 1, 2, 1, 1, 1, 3]
m181=[0, 1, 2, 3, 4, 5, 6, 7, 11, 12, 13, 14, 15, 16, 17, 18] de structure [1, 1, 1, 1, 1, 1, 1, 4, 1, 1, 1, 1, 1, 1, 1, 4]

Modes de 18 notes.
m182=[0, 1, 2, 3, 4, 5, 6, 7, 9, 11, 12, 13, 14, 15, 16, 17, 18, 20] de structure [1, 1, 1, 1, 1, 1, 1, 2, 2, 1, 1, 1, 1, 1, 1, 1, 2, 2]
m183=[0, 1, 2, 3, 4, 5, 6, 8, 9, 11, 12, 13, 14, 15, 16, 17, 19, 20] de structure [1, 1, 1, 1, 1, 1, 2, 1, 2, 1, 1, 1, 1, 1, 1, 2, 1, 2]
m184=[0, 1, 2, 3, 4, 5, 7, 8, 9, 11, 12, 13, 14, 15, 16, 18, 19, 20] de structure [1, 1, 1, 1, 1, 2, 1, 1, 2, 1, 1, 1, 1, 1, 2, 1, 1, 2]
m185=[0, 1, 2, 3, 4, 6, 7, 8, 9, 11, 12, 13, 14, 15, 17, 18, 19, 20] de structure [1, 1, 1, 1, 2, 1, 1, 1, 2, 1, 1, 1, 1, 2, 1, 1, 1, 2]
m186=[0, 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 14, 15, 16, 17, 18, 19] de structure [1, 1, 1, 1, 1, 1, 1, 1, 3, 1, 1, 1, 1, 1, 1, 1, 1, 3]

Modes de 20 notes.
m187=[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20] de structure [1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 1, 1, 1, 1, 1, 1, 1, 1, 1, 2]

Modes de 22 notes.

m188=[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21] de structure [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1]

21. Modes de $\mathbb{Z}_{23}$

Pour $n = 23$, il y a un seul mode à transpositions limitées. C'est le total chromatique.

Notes	ECH	ATL	Détails
23	1	1	1 à 1 transp.
1, 22	1	0	0
2, 21	11	0	0
3, 20	77	0	0
4, 19	385	0	0
5, 18	1463	0	0
6, 17	4389	0	0
7, 16	10659	0	0
8, 15	21318	0	0
9, 14	35530	0	0
10, 13	49742	0	0
11, 12	58786	0	0
Total	364723	1	1

22. Modes de $\mathbb{Z}_{24}$

Pour $n = 24$ (Système des quarts de ton), il y a trois équations à résoudre. Pour $k = 6$, l'équation

$$5x_{6,4} + 4x_{6,8} + 3x_{6,12} = 71$$

a pour solution

$$\begin{cases} x_{6,4} = n_1 \\ x_{6,8} = 2 + n_1 + 3n_2 \\ x_{6,12} = 21 - 3n_1 - 4n_2 \end{cases}$$

Comme $x_{6,4} = 1$, on a $n_1 = 1$. Les seules valeurs entières non nulles possibles sont obtenues pour $n_2 = 0$. D'où les solutions $x_{6,4} = 1$, $x_{6,8} = 3$, $x_{6,12} = 18$. Pour $k = 8$, l'équation

$$7x_{8,3} + 6x_{8,6} + 4x_{8,12} = 179$$

a pour solution

$$\begin{cases} x_{8,3} = 1 + 2n_1 \\ x_{8,6} = n_1 + 2n_2 \\ x_{8,12} = 43 - 5n_1 - 3n_2 \end{cases}$$

Les modes de 8 notes à 3 transpositions sont issus de la superposition de l'unique mode $\{0, 3, 6, 9\}$ de 4 notes à 3 transpositions de $\mathbb{Z}/12\mathbb{Z}$. Comme il n'y a qu'une seule manière de réaliser cette superposition, on a nécessairement $n_1 = 0$. De la même manière, les modes 6 fois transposables dérivent des modes à transpositions limitées de $\mathbb{Z}/12\mathbb{Z}$. On a donc $n_2 = 1$. D'où les solutions $x_{8,3} = 1$, $x_{8,6} = 2$, $x_{8,12} = 40$. Pour $k = 12$, l'équation

$$11x_{12,2} + 10x_{12,4} + 9x_{12,6} + 8x_{12,8} + 6x_{12,12} = 562$$

a pour solution

$$\begin{cases} x_{12,2} = n_1 \\ x_{12,4} = n_2 \\ x_{12,6} = n_1 + 2n_3 \\ x_{12,8} = 2 + 2n_1 + n_2 + 3n_4 \\ x_{12,12} = 91 - 6n_1 - 3n_2 - 3n_3 - 4n_4 \end{cases}$$

Les valeurs n_1, n_2 et n_3 sont imposées par les modes de $\mathbb{Z}/12\mathbb{Z}$. On a donc $x_{12,2} = 1$, $x_{12,4} = 1$, $x_{12,6} = 3$. Reste alors à résoudre le système

$$\begin{cases} x_{12,8} = 5 + 3n_4 \\ x_{12,12} = 79 - 4n_4 \end{cases}$$

Comme les modes de 12 notes à 8 transpositions sont issus de la superposition des modes de $\mathbb{Z}/12\mathbb{Z}$, on élimine facilement les superpositions qui n'ont pas le bon nombre de transpositions (inférieure à 4). On ne peut donc avoir que superposition soit d'un mode de 6 notes à un mode de 6 notes, soit superposition d'un mode de 9 notes à un mode de 3 notes. On a donc une inégalité de la forme $6 < 5 + 3n_4 < 12$. D'où on tire que $n_4 = 1$. Les valeurs sont donc $x_{12,8} = 8$ et $x_{12,12} = 75$.

Notes	ECH	ATL	Détails
24	1	1	1 à 1 transp.
1, 23	1	0	0
2, 22	12	1	1 à 12 transp.
3, 21	85	1	1 à 8 transp.
4, 20	446	6	1 (6 tr.), 5 (12 tr.)
5, 19	1771	0	0
6, 18	5620	22	1 (4 tr.), 3 (8 tr.), 18 (12 tr.)
7, 17	14 421	0	0
8, 16	30 667	43	1 (3), 2 (6), 40 (12)
9, 15	54 484	7	7 à 8 transp.
10, 14	81 752	66	66 à 12 transp.
11, 13	104 066	0	0
12	112 720	88	1 (2), 2 (4), 8 (8), 75 (12)
Total	699 251	381	381

Modes de 2 notes.
m1=[0, 12] de structure [12, 12]

Modes de 3 notes.
m2=[0, 8, 16] de structure [8, 8, 8]

Modes de 4 notes.
m3=[0, 6, 12, 18] de structure [6, 6, 6, 6]
m4=[0, 5, 12, 17] de structure [5, 7, 5, 7]
m5=[0, 4, 12, 16] de structure [4, 8, 4, 8]
m6=[0, 3, 12, 15] de structure [3, 9, 3, 9]
m7=[0, 2, 12, 14] de structure [2, 10, 2, 10]
m8=[0, 1, 12, 13] de structure [1, 11, 1, 11]

Modes de 6 notes.
m9=[0, 4, 8, 12, 16, 20] de structure [4, 4, 4, 4, 4, 4]

m10=[0, 3, 7, 12, 15, 19] de structure [3, 4, 5, 3, 4, 5]
m11=[0, 3, 8, 12, 15, 20] de structure [3, 5, 4, 3, 5, 4]
m12=[0, 2, 7, 12, 14, 19] de structure [2, 5, 5, 2, 5, 5]
m13=[0, 3, 6, 12, 15, 18] de structure [3, 3, 6, 3, 3, 6]
m14=[0, 2, 6, 12, 14, 18] de structure [2, 4, 6, 2, 4, 6]
m15=[0, 2, 8, 12, 14, 20] de structure [2, 6, 4, 2, 6, 4]
m16=[0, 1, 6, 12, 13, 18] de structure [1, 5, 6, 1, 5, 6]
m17=[0, 1, 7, 12, 13, 19] de structure [1, 6, 5, 1, 6, 5]
m18=[0, 2, 5, 12, 14, 17] de structure [2, 3, 7, 2, 3, 7]
m19=[0, 2, 9, 12, 14, 21] de structure [2, 7, 3, 2, 7, 3]
m20=[0, 1, 5, 12, 13, 17] de structure [1, 4, 7, 1, 4, 7]
m21=[0, 1, 8, 12, 13, 20] de structure [1, 7, 4, 1, 7, 4]
m22=[0, 2, 4, 12, 14, 16] de structure [2, 2, 8, 2, 2, 8]
m23=[0, 1, 4, 12, 13, 16] de structure [1, 3, 8, 1, 3, 8]
m24=[0, 1, 9, 12, 13, 21] de structure [1, 8, 3, 1, 8, 3]
m25=[0, 1, 3, 12, 13, 15] de structure [1, 2, 9, 1, 2, 9]
m26=[0, 1, 10, 12, 13, 22] de structure [1, 9, 2, 1, 9, 2]
m27=[0, 1, 2, 12, 13, 14] de structure [1, 1, 10, 1, 1, 10]
m28=[0, 3, 8, 11, 16, 19] de structure [3, 5, 3, 5, 3, 5]
m29=[0, 2, 8, 10, 16, 18] de structure [2, 6, 2, 6, 2, 6]
m30=[0, 1, 8, 9, 16, 17] de structure [1, 7, 1, 7, 1, 7]

Modes de 8 notes.
m31=[0, 3, 6, 9, 12, 15, 18, 21] de structure [3, 3, 3, 3, 3, 3, 3, 3]
m32=[0, 2, 6, 8, 12, 14, 18, 20] de structure [2, 4, 2, 4, 2, 4, 2, 4]
m33=[0, 1, 6, 7, 12, 13, 18, 19] de structure [1, 5, 1, 5, 1, 5, 1, 5]
m34=[0, 2, 5, 8, 12, 14, 17, 20] de structure [2, 3, 3, 4, 2, 3, 3, 4]
m35=[0, 2, 5, 9, 12, 14, 17, 21] de structure [2, 3, 4, 3, 2, 3, 4, 3]
m36=[0, 2, 6, 9, 12, 14, 18, 21] de structure [2, 4, 3, 3, 2, 4, 3, 3]
m37=[0, 2, 4, 8, 12, 14, 16, 20] de structure [2, 2, 4, 4, 2, 2, 4, 4]
m38=[0, 1, 4, 8, 12, 13, 16, 20] de structure [1, 3, 4, 4, 1, 3, 4, 4]
m39=[0, 1, 5, 8, 12, 13, 17, 20] de structure [1, 4, 3, 4, 1, 4, 3, 4]
m40=[0, 1, 5, 9, 12, 13, 17, 21] de structure [1, 4, 4, 3, 1, 4, 4, 3]
m41=[0, 2, 4, 7, 12, 14, 16, 19] de structure [2, 2, 3, 5, 2, 2, 3, 5]
m42=[0, 2, 4, 9, 12, 14, 16, 21] de structure [2, 2, 5, 3, 2, 2, 5, 3]
m43=[0, 2, 5, 7, 12, 14, 17, 19] de structure [2, 3, 2, 5, 2, 3, 2, 5]
m44=[0, 1, 4, 7, 12, 13, 16, 19] de structure [1, 3, 3, 5, 1, 3, 3, 5]
m45=[0, 1, 4, 9, 12, 13, 16, 21] de structure [1, 3, 5, 3, 1, 3, 5, 3]
m46=[0, 1, 6, 9, 12, 13, 18, 21] de structure [1, 5, 3, 3, 1, 5, 3, 3]
m47=[0, 1, 3, 7, 12, 13, 15, 19] de structure [1, 2, 4, 5, 1, 2, 4, 5]
m48=[0, 1, 3, 8, 12, 13, 15, 20] de structure [1, 2, 5, 4, 1, 2, 5, 4]
m49=[0, 1, 5, 7, 12, 13, 17, 19] de structure [1, 4, 2, 5, 1, 4, 2, 5]
m50=[0, 1, 5, 10, 12, 13, 17, 22] de structure [1, 4, 5, 2, 1, 4, 5, 2]
m51=[0, 1, 6, 8, 12, 13, 18, 20] de structure [1, 5, 2, 4, 1, 5, 2, 4]
m52=[0, 1, 6, 10, 12, 13, 18, 22] de structure [1, 5, 4, 2, 1, 5, 4, 2]
m53=[0, 1, 2, 7, 12, 13, 14, 19] de structure [1, 1, 5, 5, 1, 1, 5, 5]
m54=[0, 2, 4, 6, 12, 14, 16, 18] de structure [2, 2, 2, 6, 2, 2, 2, 6]
m55=[0, 1, 3, 6, 12, 13, 15, 18] de structure [1, 2, 3, 6, 1, 2, 3, 6]
m56=[0, 1, 3, 9, 12, 13, 15, 21] de structure [1, 2, 6, 3, 1, 2, 6, 3]

m57=[0, 1, 4, 6, 12, 13, 16, 18] de structure [1, 3, 2, 6, 1, 3, 2, 6]
m58=[0, 1, 4, 10, 12, 13, 16, 22] de structure [1, 3, 6, 2, 1, 3, 6, 2]
m59=[0, 1, 7, 9, 12, 13, 19, 21] de structure [1, 6, 2, 3, 1, 6, 2, 3]
m60=[0, 1, 7, 10, 12, 13, 19, 22] de structure [1, 6, 3, 2, 1, 6, 3, 2]
m61=[0, 1, 2, 6, 12, 13, 14, 18] de structure [1, 1, 4, 6, 1, 1, 4, 6]
m62=[0, 1, 2, 8, 12, 13, 14, 20] de structure [1, 1, 6, 4, 1, 1, 6, 4]
m63=[0, 1, 5, 6, 12, 13, 17, 18] de structure [1, 4, 1, 6, 1, 4, 1, 6]
m64=[0, 1, 3, 5, 12, 13, 15, 17] de structure [1, 2, 2, 7, 1, 2, 2, 7]
m65=[0, 1, 3, 10, 12, 13, 15, 22] de structure [1, 2, 7, 2, 1, 2, 7, 2]
m66=[0, 1, 8, 10, 12, 13, 20, 22] de structure [1, 7, 2, 2, 1, 7, 2, 2]
m67=[0, 1, 2, 5, 12, 13, 14, 17] de structure [1, 1, 3, 7, 1, 1, 3, 7]
m68=[0, 1, 2, 9, 12, 13, 14, 21] de structure [1, 1, 7, 3, 1, 1, 7, 3]
m69=[0, 1, 4, 5, 12, 13, 16, 17] de structure [1, 3, 1, 7, 1, 3, 1, 7]
m70=[0, 1, 2, 4, 12, 13, 14, 16] de structure [1, 1, 2, 8, 1, 1, 2, 8]
m71=[0, 1, 2, 10, 12, 13, 14, 22] de structure [1, 1, 8, 2, 1, 1, 8, 2]
m72=[0, 1, 3, 4, 12, 13, 15, 16] de structure [1, 2, 1, 8, 1, 2, 1, 8]
m73=[0, 1, 2, 3, 12, 13, 14, 15] de structure [1, 1, 1, 9, 1, 1, 1, 9]

Modes de 9 notes.
m74=[0, 2, 5, 8, 10, 13, 16, 18, 21] de structure [2, 3, 3, 2, 3, 3, 2, 3, 3]
m75=[0, 2, 4, 8, 10, 12, 16, 18, 20] de structure [2, 2, 4, 2, 2, 4, 2, 2, 4]
m76=[0, 1, 4, 8, 9, 12, 16, 17, 20] de structure [1, 3, 4, 1, 3, 4, 1, 3, 4]
m77=[0, 1, 5, 8, 9, 13, 16, 17, 21] de structure [1, 4, 3, 1, 4, 3, 1, 4, 3]
m78=[0, 1, 3, 8, 9, 11, 16, 17, 19] de structure [1, 2, 5, 1, 2, 5, 1, 2, 5]
m79=[0, 1, 6, 8, 9, 14, 16, 17, 22] de structure [1, 5, 2, 1, 5, 2, 1, 5, 2]
m80=[0, 1, 2, 8, 9, 10, 16, 17, 18] de structure [1, 1, 6, 1, 1, 6, 1, 1, 6]

Modes de 10 notes.
m81=[0, 2, 4, 6, 9, 12, 14, 16, 18, 21] de structure [2, 2, 2, 3, 3, 2, 2, 2, 3, 3]
m82=[0, 2, 4, 7, 9, 12, 14, 16, 19, 21] de structure [2, 2, 3, 2, 3, 2, 2, 3, 2, 3]
m83=[0, 1, 3, 6, 9, 12, 13, 15, 18, 21] de structure [1, 2, 3, 3, 3, 1, 2, 3, 3, 3]
m84=[0, 1, 4, 6, 9, 12, 13, 16, 18, 21] de structure [1, 3, 2, 3, 3, 1, 3, 2, 3, 3]
m85=[0, 1, 4, 7, 9, 12, 13, 16, 19, 21] de structure [1, 3, 3, 2, 3, 1, 3, 3, 2, 3]
m86=[0, 1, 4, 7, 10, 12, 13, 16, 19, 22] de structure [1, 3, 3, 3, 2, 1, 3, 3, 3, 2]
m87=[0, 2, 4, 6, 8, 12, 14, 16, 18, 20] de structure [2, 2, 2, 2, 4, 2, 2, 2, 2, 4]
m88=[0, 1, 3, 5, 8, 12, 13, 15, 17, 20] de structure [1, 2, 2, 3, 4, 1, 2, 2, 3, 4]
m89=[0, 1, 3, 5, 9, 12, 13, 15, 17, 21] de structure [1, 2, 2, 4, 3, 1, 2, 2, 4, 3]
m90=[0, 1, 3, 6, 8, 12, 13, 15, 18, 20] de structure [1, 2, 3, 2, 4, 1, 2, 3, 2, 4]
m91=[0, 1, 3, 6, 10, 12, 13, 15, 18, 22] de structure [1, 2, 3, 4, 2, 1, 2, 3, 4, 2]
m92=[0, 1, 3, 7, 9, 12, 13, 15, 19, 21] de structure [1, 2, 4, 2, 3, 1, 2, 4, 2, 3]
m93=[0, 1, 3, 7, 10, 12, 13, 15, 19, 22] de structure [1, 2, 4, 3, 2, 1, 2, 4, 3, 2]
m94=[0, 1, 4, 6, 8, 12, 13, 16, 18, 20] de structure [1, 3, 2, 2, 4, 1, 3, 2, 2, 4]
m95=[0, 1, 4, 6, 10, 12, 13, 16, 18, 22] de structure [1, 3, 2, 4, 2, 1, 3, 2, 4, 2]
m96=[0, 1, 4, 8, 10, 12, 13, 16, 20, 22] de structure [1, 3, 4, 2, 2, 1, 3, 4, 2, 2]
m97=[0, 1, 5, 7, 9, 12, 13, 17, 19, 21] de structure [1, 4, 2, 2, 3, 1, 4, 2, 2, 3]
m98=[0, 1, 5, 7, 10, 12, 13, 17, 19, 22] de structure [1, 4, 2, 3, 2, 1, 4, 2, 3, 2]
m99=[0, 1, 5, 8, 10, 12, 13, 17, 20, 22] de structure [1, 4, 3, 2, 2, 1, 4, 3, 2, 2]
m100=[0, 1, 2, 5, 8, 12, 13, 14, 17, 20] de structure [1, 1, 3, 3, 4, 1, 1, 3, 3, 4]
m101=[0, 1, 2, 5, 9, 12, 13, 14, 17, 21] de structure [1, 1, 3, 4, 3, 1, 1, 3, 4, 3]

m102=[0, 1, 2, 6, 9, 12, 13, 14, 18, 21] de structure [1, 1, 4, 3, 3, 1, 1, 4, 3, 3]
m103=[0, 1, 4, 5, 8, 12, 13, 16, 17, 20] de structure [1, 3, 1, 3, 4, 1, 3, 1, 3, 4]
m104=[0, 1, 4, 5, 9, 12, 13, 16, 17, 21] de structure [1, 3, 1, 4, 3, 1, 3, 1, 4, 3]
m105=[0, 1, 4, 7, 8, 12, 13, 16, 19, 20] de structure [1, 3, 3, 1, 4, 1, 3, 3, 1, 4]
m106=[0, 1, 2, 4, 8, 12, 13, 14, 16, 20] de structure [1, 1, 2, 4, 4, 1, 1, 2, 4, 4]
m107=[0, 1, 2, 6, 8, 12, 13, 14, 18, 20] de structure [1, 1, 4, 2, 4, 1, 1, 4, 2, 4]
m108=[0, 1, 2, 6, 10, 12, 13, 14, 18, 22] de structure [1, 1, 4, 4, 2, 1, 1, 4, 4, 2]
m109=[0, 1, 3, 4, 8, 12, 13, 15, 16, 20] de structure [1, 2, 1, 4, 4, 1, 2, 1, 4, 4]
m110=[0, 1, 3, 7, 8, 12, 13, 15, 19, 20] de structure [1, 2, 4, 1, 4, 1, 2, 4, 1, 4]
m111=[0, 1, 5, 6, 10, 12, 13, 17, 18, 22] de structure [1, 4, 1, 4, 2, 1, 4, 1, 4, 2]
m112=[0, 1, 3, 5, 7, 12, 13, 15, 17, 19] de structure [1, 2, 2, 2, 5, 1, 2, 2, 2, 5]
m113=[0, 1, 3, 5, 10, 12, 13, 15, 17, 22] de structure [1, 2, 2, 5, 2, 1, 2, 2, 5, 2]
m114=[0, 1, 3, 8, 10, 12, 13, 15, 20, 22] de structure [1, 2, 5, 2, 2, 1, 2, 5, 2, 2]
m115=[0, 1, 6, 8, 10, 12, 13, 18, 20, 22] de structure [1, 5, 2, 2, 2, 1, 5, 2, 2, 2]
m116=[0, 1, 2, 4, 7, 12, 13, 14, 16, 19] de structure [1, 1, 2, 3, 5, 1, 1, 2, 3, 5]
m117=[0, 1, 2, 4, 9, 12, 13, 14, 16, 21] de structure [1, 1, 2, 5, 3, 1, 1, 2, 5, 3]
m118=[0, 1, 2, 5, 7, 12, 13, 14, 17, 19] de structure [1, 1, 3, 2, 5, 1, 1, 3, 2, 5]
m119=[0, 1, 2, 5, 10, 12, 13, 14, 17, 22] de structure [1, 1, 3, 5, 2, 1, 1, 3, 5, 2]
m120=[0, 1, 2, 7, 9, 12, 13, 14, 19, 21] de structure [1, 1, 5, 2, 3, 1, 1, 5, 2, 3]
m121=[0, 1, 2, 7, 10, 12, 13, 14, 19, 22] de structure [1, 1, 5, 3, 2, 1, 1, 5, 3, 2]
m122=[0, 1, 3, 4, 7, 12, 13, 15, 16, 19] de structure [1, 2, 1, 3, 5, 1, 2, 1, 3, 5]
m123=[0, 1, 3, 4, 9, 12, 13, 15, 16, 21] de structure [1, 2, 1, 5, 3, 1, 2, 1, 5, 3]
m124=[0, 1, 3, 6, 7, 12, 13, 15, 18, 19] de structure [1, 2, 3, 1, 5, 1, 2, 3, 1, 5]
m125=[0, 1, 3, 8, 9, 12, 13, 15, 20, 21] de structure [1, 2, 5, 1, 3, 1, 2, 5, 1, 3]
m126=[0, 1, 4, 5, 10, 12, 13, 16, 17, 22] de structure [1, 3, 1, 5, 2, 1, 3, 1, 5, 2]
m127=[0, 1, 4, 6, 7, 12, 13, 16, 18, 19] de structure [1, 3, 2, 1, 5, 1, 3, 2, 1, 5]
m128=[0, 1, 2, 3, 7, 12, 13, 14, 15, 19] de structure [1, 1, 1, 4, 5, 1, 1, 1, 4, 5]
m129=[0, 1, 2, 3, 8, 12, 13, 14, 15, 20] de structure [1, 1, 1, 5, 4, 1, 1, 1, 5, 4]
m130=[0, 1, 2, 6, 7, 12, 13, 14, 18, 19] de structure [1, 1, 4, 1, 5, 1, 1, 4, 1, 5]
m131=[0, 1, 2, 7, 8, 12, 13, 14, 19, 20] de structure [1, 1, 5, 1, 4, 1, 1, 5, 1, 4]
m132=[0, 1, 2, 4, 6, 12, 13, 14, 16, 18] de structure [1, 1, 2, 2, 6, 1, 1, 2, 2, 6]
m133=[0, 1, 2, 4, 10, 12, 13, 14, 16, 22] de structure [1, 1, 2, 6, 2, 1, 1, 2, 6, 2]
m134=[0, 1, 2, 8, 10, 12, 13, 14, 20, 22] de structure [1, 1, 6, 2, 2, 1, 1, 6, 2, 2]
m135=[0, 1, 3, 4, 6, 12, 13, 15, 16, 18] de structure [1, 2, 1, 2, 6, 1, 2, 1, 2, 6]
m136=[0, 1, 3, 4, 10, 12, 13, 15, 16, 22] de structure [1, 2, 1, 6, 2, 1, 2, 1, 6, 2]
m137=[0, 1, 3, 5, 6, 12, 13, 15, 17, 18] de structure [1, 2, 2, 1, 6, 1, 2, 2, 1, 6]
m138=[0, 1, 2, 3, 6, 12, 13, 14, 15, 18] de structure [1, 1, 1, 3, 6, 1, 1, 1, 3, 6]
m139=[0, 1, 2, 3, 9, 12, 13, 14, 15, 21] de structure [1, 1, 1, 6, 3, 1, 1, 1, 6, 3]
m140=[0, 1, 2, 5, 6, 12, 13, 14, 17, 18] de structure [1, 1, 3, 1, 6, 1, 1, 3, 1, 6]
m141=[0, 1, 2, 8, 9, 12, 13, 14, 20, 21] de structure [1, 1, 6, 1, 3, 1, 1, 6, 1, 3]
m142=[0, 1, 2, 3, 5, 12, 13, 14, 15, 17] de structure [1, 1, 1, 2, 7, 1, 1, 1, 2, 7]
m143=[0, 1, 2, 3, 10, 12, 13, 14, 15, 22] de structure [1, 1, 1, 7, 2, 1, 1, 1, 7, 2]
m144=[0, 1, 2, 4, 5, 12, 13, 14, 16, 17] de structure [1, 1, 2, 1, 7, 1, 1, 2, 1, 7]
m145=[0, 1, 2, 9, 10, 12, 13, 14, 21, 22] de structure [1, 1, 7, 1, 2, 1, 1, 7, 1, 2]
m146=[0, 1, 2, 3, 4, 12, 13, 14, 15, 16] de structure [1, 1, 1, 1, 8, 1, 1, 1, 1, 8]

Modes de 12 notes.
m147=[0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22] de structure [2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2]

m148=[0, 1, 3, 6, 7, 9, 12, 13, 15, 18, 19, 21] de structure [1, 2, 3, 1, 2, 3, 1, 2, 3, 1, 2, 3]
m149=[0, 1, 4, 6, 7, 10, 12, 13, 16, 18, 19, 22] de structure [1, 3, 2, 1, 3, 2, 1, 3, 2, 1, 3, 2]
m150=[0, 1, 2, 6, 7, 8, 12, 13, 14, 18, 19, 20] de structure [1, 1, 4, 1, 1, 4, 1, 1, 4, 1, 1, 4]
m151=[0, 1, 4, 5, 8, 9, 12, 13, 16, 17, 20, 21] de structure [1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3]
m152=[0, 1, 3, 5, 7, 9, 12, 13, 15, 17, 19, 21] de structure [1, 2, 2, 2, 2, 3, 1, 2, 2, 2, 2, 3]
m153=[0, 1, 3, 5, 7, 10, 12, 13, 15, 17, 19, 22] de structure [1, 2, 2, 2, 3, 2, 1, 2, 2, 2, 3, 2]
m154=[0, 1, 3, 5, 8, 10, 12, 13, 15, 17, 20, 22] de structure [1, 2, 2, 3, 2, 2, 1, 2, 2, 3, 2, 2]
m155=[0, 1, 3, 6, 8, 10, 12, 13, 15, 18, 20, 22] de structure [1, 2, 3, 2, 2, 2, 1, 2, 3, 2, 2, 2]
m156=[0, 1, 4, 6, 8, 10, 12, 13, 16, 18, 20, 22] de structure [1, 3, 2, 2, 2, 2, 1, 3, 2, 2, 2, 2]
m157=[0, 1, 2, 4, 6, 9, 12, 13, 14, 16, 18, 21] de structure [1, 1, 2, 2, 3, 3, 1, 1, 2, 2, 3, 3]
m158=[0, 1, 2, 4, 7, 9, 12, 13, 14, 16, 19, 21] de structure [1, 1, 2, 3, 2, 3, 1, 1, 2, 3, 2, 3]
m159=[0, 1, 2, 4, 7, 10, 12, 13, 14, 16, 19, 22] de structure [1, 1, 2, 3, 3, 2, 1, 1, 2, 3, 3, 2]
m160=[0, 1, 2, 5, 7, 9, 12, 13, 14, 17, 19, 21] de structure [1, 1, 3, 2, 2, 3, 1, 1, 3, 2, 2, 3]
m161=[0, 1, 2, 5, 7, 10, 12, 13, 14, 17, 19, 22] de structure [1, 1, 3, 2, 3, 2, 1, 1, 3, 2, 3, 2]
m162=[0, 1, 2, 5, 8, 10, 12, 13, 14, 17, 20, 22] de structure [1, 1, 3, 3, 2, 2, 1, 1, 3, 3, 2, 2]
m163=[0, 1, 3, 4, 6, 9, 12, 13, 15, 16, 18, 21] de structure [1, 2, 1, 2, 3, 3, 1, 2, 1, 2, 3, 3]
m164=[0, 1, 3, 4, 7, 9, 12, 13, 15, 16, 19, 21] de structure [1, 2, 1, 3, 2, 3, 1, 2, 1, 3, 2, 3]
m165=[0, 1, 3, 4, 7, 10, 12, 13, 15, 16, 19, 22] de structure [1, 2, 1, 3, 3, 2, 1, 2, 1, 3, 3, 2]
m166=[0, 1, 3, 5, 6, 9, 12, 13, 15, 17, 18, 21] de structure [1, 2, 2, 1, 3, 3, 1, 2, 2, 1, 3, 3]
m167=[0, 1, 3, 5, 8, 9, 12, 13, 15, 17, 20, 21] de structure [1, 2, 2, 3, 1, 3, 1, 2, 2, 3, 1, 3]
m168=[0, 1, 3, 6, 7, 10, 12, 13, 15, 18, 19, 22] de structure [1, 2, 3, 1, 3, 2, 1, 2, 3, 1, 3, 2]
m169=[0, 1, 3, 6, 8, 9, 12, 13, 15, 18, 20, 21] de structure [1, 2, 3, 2, 1, 3, 1, 2, 3, 2, 1, 3]
m170=[0, 1, 4, 5, 8, 10, 12, 13, 16, 17, 20, 22] de structure [1, 3, 1, 3, 2, 2, 1, 3, 1, 3, 2, 2]
m171=[0, 1, 2, 3, 6, 9, 12, 13, 14, 15, 18, 21] de structure [1, 1, 1, 3, 3, 3, 1, 1, 1, 3, 3, 3]

m172=[0, 1, 2, 5, 6, 9, 12, 13, 14, 17, 18, 21] de structure [1, 1, 3, 1, 3, 3, 1, 1, 3, 1, 3, 3]
m173=[0, 1, 2, 5, 8, 9, 12, 13, 14, 17, 20, 21] de structure [1, 1, 3, 3, 1, 3, 1, 1, 3, 3, 1, 3]
m174=[0, 1, 2, 4, 6, 8, 12, 13, 14, 16, 18, 20] de structure [1, 1, 2, 2, 2, 4, 1, 1, 2, 2, 2, 4]
m175=[0, 1, 2, 4, 6, 10, 12, 13, 14, 16, 18, 22] de structure [1, 1, 2, 2, 4, 2, 1, 1, 2, 2, 4, 2]
m176=[0, 1, 2, 4, 8, 10, 12, 13, 14, 16, 20, 22] de structure [1, 1, 2, 4, 2, 2, 1, 1, 2, 4, 2, 2]
m177=[0, 1, 2, 6, 8, 10, 12, 13, 14, 18, 20, 22] de structure [1, 1, 4, 2, 2, 2, 1, 1, 4, 2, 2, 2]
m178=[0, 1, 3, 4, 6, 8, 12, 13, 15, 16, 18, 20] de structure [1, 2, 1, 2, 2, 4, 1, 2, 1, 2, 2, 4]
m179=[0, 1, 3, 4, 6, 10, 12, 13, 15, 16, 18, 22] de structure [1, 2, 1, 2, 4, 2, 1, 2, 1, 2, 4, 2]
m180=[0, 1, 3, 4, 8, 10, 12, 13, 15, 16, 20, 22] de structure [1, 2, 1, 4, 2, 2, 1, 2, 1, 4, 2, 2]
m181=[0, 1, 3, 5, 6, 8, 12, 13, 15, 17, 18, 20] de structure [1, 2, 2, 1, 2, 4, 1, 2, 2, 1, 2, 4]
m182=[0, 1, 3, 5, 6, 10, 12, 13, 15, 17, 18, 22] de structure [1, 2, 2, 1, 4, 2, 1, 2, 2, 1, 4, 2]
m183=[0, 1, 3, 5, 7, 8, 12, 13, 15, 17, 19, 20] de structure [1, 2, 2, 2, 1, 4, 1, 2, 2, 2, 1, 4]
m184=[0, 1, 2, 3, 5, 8, 12, 13, 14, 15, 17, 20] de structure [1, 1, 1, 2, 3, 4, 1, 1, 1, 2, 3, 4]
m185=[0, 1, 2, 3, 5, 9, 12, 13, 14, 15, 17, 21] de structure [1, 1, 1, 2, 4, 3, 1, 1, 1, 2, 4, 3]
m186=[0, 1, 2, 3, 6, 8, 12, 13, 14, 15, 18, 20] de structure [1, 1, 1, 3, 2, 4, 1, 1, 1, 3, 2, 4]
m187=[0, 1, 2, 3, 6, 10, 12, 13, 14, 15, 18, 22] de structure [1, 1, 1, 3, 4, 2, 1, 1, 1, 3, 4, 2]
m188=[0, 1, 2, 3, 7, 9, 12, 13, 14, 15, 19, 21] de structure [1, 1, 1, 4, 2, 3, 1, 1, 1, 4, 2, 3]
m189=[0, 1, 2, 3, 7, 10, 12, 13, 14, 15, 19, 22] de structure [1, 1, 1, 4, 3, 2, 1, 1, 1, 4, 3, 2]
m190=[0, 1, 2, 4, 5, 8, 12, 13, 14, 16, 17, 20] de structure [1, 1, 2, 1, 3, 4, 1, 1, 2, 1, 3, 4]
m191=[0, 1, 2, 4, 5, 9, 12, 13, 14, 16, 17, 21] de structure [1, 1, 2, 1, 4, 3, 1, 1, 2, 1, 4, 3]
m192=[0, 1, 2, 4, 7, 8, 12, 13, 14, 16, 19, 20] de structure [1, 1, 2, 3, 1, 4, 1, 1, 2, 3, 1, 4]
m193=[0, 1, 2, 4, 8, 9, 12, 13, 14, 16, 20, 21] de structure [1, 1, 2, 4, 1, 3, 1, 1, 2, 4, 1, 3]
m194=[0, 1, 2, 5, 6, 8, 12, 13, 14, 17, 18, 20] de structure [1, 1, 3, 1, 2, 4, 1, 1, 3, 1, 2, 4]
m195=[0, 1, 2, 5, 6, 10, 12, 13, 14, 17, 18, 22] de structure [1, 1, 3, 1, 4, 2, 1, 1, 3, 1, 4, 2]

m196=[0, 1, 2, 5, 7, 8, 12, 13, 14, 17, 19, 20] de structure [1, 1, 3, 2, 1, 4, 1, 1, 3, 2, 1, 4]
m197=[0, 1, 2, 5, 9, 10, 12, 13, 14, 17, 21, 22] de structure [1, 1, 3, 4, 1, 2, 1, 1, 3, 4, 1, 2]
m198=[0, 1, 2, 6, 7, 9, 12, 13, 14, 18, 19, 21] de structure [1, 1, 4, 1, 2, 3, 1, 1, 4, 1, 2, 3]
m199=[0, 1, 2, 6, 7, 10, 12, 13, 14, 18, 19, 22] de structure [1, 1, 4, 1, 3, 2, 1, 1, 4, 1, 3, 2]
m200=[0, 1, 2, 6, 8, 9, 12, 13, 14, 18, 20, 21] de structure [1, 1, 4, 2, 1, 3, 1, 1, 4, 2, 1, 3]
m201=[0, 1, 2, 6, 9, 10, 12, 13, 14, 18, 21, 22] de structure [1, 1, 4, 3, 1, 2, 1, 1, 4, 3, 1, 2]
m202=[0, 1, 3, 4, 7, 8, 12, 13, 15, 16, 19, 20] de structure [1, 2, 1, 3, 1, 4, 1, 2, 1, 3, 1, 4]
m203=[0, 1, 3, 4, 8, 9, 12, 13, 15, 16, 20, 21] de structure [1, 2, 1, 4, 1, 3, 1, 2, 1, 4, 1, 3]
m204=[0, 1, 2, 3, 4, 8, 12, 13, 14, 15, 16, 20] de structure [1, 1, 1, 1, 4, 4, 1, 1, 1, 1, 4, 4]
m205=[0, 1, 2, 3, 7, 8, 12, 13, 14, 15, 19, 20] de structure [1, 1, 1, 4, 1, 4, 1, 1, 1, 4, 1, 4]
m206=[0, 1, 2, 3, 5, 7, 12, 13, 14, 15, 17, 19] de structure [1, 1, 1, 2, 2, 5, 1, 1, 1, 2, 2, 5]
m207=[0, 1, 2, 3, 5, 10, 12, 13, 14, 15, 17, 22] de structure [1, 1, 1, 2, 5, 2, 1, 1, 1, 2, 5, 2]
m208=[0, 1, 2, 3, 8, 10, 12, 13, 14, 15, 20, 22] de structure [1, 1, 1, 5, 2, 2, 1, 1, 1, 5, 2, 2]
m209=[0, 1, 2, 4, 5, 7, 12, 13, 14, 16, 17, 19] de structure [1, 1, 2, 1, 2, 5, 1, 1, 2, 1, 2, 5]
m210=[0, 1, 2, 4, 5, 10, 12, 13, 14, 16, 17, 22] de structure [1, 1, 2, 1, 5, 2, 1, 1, 2, 1, 5, 2]
m211=[0, 1, 2, 4, 6, 7, 12, 13, 14, 16, 18, 19] de structure [1, 1, 2, 2, 1, 5, 1, 1, 2, 2, 1, 5]
m212=[0, 1, 2, 4, 9, 10, 12, 13, 14, 16, 21, 22] de structure [1, 1, 2, 5, 1, 2, 1, 1, 2, 5, 1, 2]
m213=[0, 1, 2, 7, 8, 10, 12, 13, 14, 19, 20, 22] de structure [1, 1, 5, 1, 2, 2, 1, 1, 5, 1, 2, 2]
m214=[0, 1, 2, 7, 9, 10, 12, 13, 14, 19, 21, 22] de structure [1, 1, 5, 2, 1, 2, 1, 1, 5, 2, 1, 2]
m215=[0, 1, 3, 4, 6, 7, 12, 13, 15, 16, 18, 19] de structure [1, 2, 1, 2, 1, 5, 1, 2, 1, 2, 1, 5]
m216=[0, 1, 2, 3, 4, 7, 12, 13, 14, 15, 16, 19] de structure [1, 1, 1, 1, 3, 5, 1, 1, 1, 1, 3, 5]
m217=[0, 1, 2, 3, 4, 9, 12, 13, 14, 15, 16, 21] de structure [1, 1, 1, 1, 5, 3, 1, 1, 1, 1, 5, 3]
m218=[0, 1, 2, 3, 6, 7, 12, 13, 14, 15, 18, 19] de structure [1, 1, 1, 3, 1, 5, 1, 1, 1, 3, 1, 5]
m219=[0, 1, 2, 3, 8, 9, 12, 13, 14, 15, 20, 21] de structure [1, 1, 1, 5, 1, 3, 1, 1, 1, 5, 1, 3]

m220=[0, 1, 2, 5, 6, 7, 12, 13, 14, 17, 18, 19] de structure [1, 1, 3, 1, 1, 5, 1, 1, 3, 1, 1, 5]
m221=[0, 1, 2, 3, 4, 6, 12, 13, 14, 15, 16, 18] de structure [1, 1, 1, 1, 2, 6, 1, 1, 1, 1, 2, 6]
m222=[0, 1, 2, 3, 4, 10, 12, 13, 14, 15, 16, 22] de structure [1, 1, 1, 1, 6, 2, 1, 1, 1, 1, 6, 2]
m223=[0, 1, 2, 3, 5, 6, 12, 13, 14, 15, 17, 18] de structure [1, 1, 1, 2, 1, 6, 1, 1, 1, 2, 1, 6]
m224=[0, 1, 2, 3, 9, 10, 12, 13, 14, 15, 21, 22] de structure [1, 1, 1, 6, 1, 2, 1, 1, 1, 6, 1, 2]
m225=[0, 1, 2, 4, 5, 6, 12, 13, 14, 16, 17, 18] de structure [1, 1, 2, 1, 1, 6, 1, 1, 2, 1, 1, 6]
m226=[0, 1, 2, 3, 4, 5, 12, 13, 14, 15, 16, 17] de structure [1, 1, 1, 1, 1, 7, 1, 1, 1, 1, 1, 7]
m227=[0, 1, 3, 5, 8, 9, 11, 13, 16, 17, 19, 21] de structure [1, 2, 2, 3, 1, 2, 2, 3, 1, 2, 2, 3]
m228=[0, 1, 3, 6, 8, 9, 11, 14, 16, 17, 19, 22] de structure [1, 2, 3, 2, 1, 2, 3, 2, 1, 2, 3, 2]
m229=[0, 1, 4, 6, 8, 9, 12, 14, 16, 17, 20, 22] de structure [1, 3, 2, 2, 1, 3, 2, 2, 1, 3, 2, 2]
m230=[0, 1, 2, 5, 8, 9, 10, 13, 16, 17, 18, 21] de structure [1, 1, 3, 3, 1, 1, 3, 3, 1, 1, 3, 3]
m231=[0, 1, 2, 4, 8, 9, 10, 12, 16, 17, 18, 20] de structure [1, 1, 2, 4, 1, 1, 2, 4, 1, 1, 2, 4]
m232=[0, 1, 2, 6, 8, 9, 10, 14, 16, 17, 18, 22] de structure [1, 1, 4, 2, 1, 1, 4, 2, 1, 1, 4, 2]
m233=[0, 1, 3, 4, 8, 9, 11, 12, 16, 17, 19, 20] de structure [1, 2, 1, 4, 1, 2, 1, 4, 1, 2, 1, 4]
m234=[0, 1, 2, 3, 8, 9, 10, 11, 16, 17, 18, 19] de structure [1, 1, 1, 5, 1, 1, 1, 5, 1, 1, 1, 5]

Modes de 14 notes.
m235=[0, 1, 2, 4, 6, 8, 10, 12, 13, 14, 16, 18, 20, 22] de structure [1, 1, 2, 2, 2, 2, 2, 1, 1, 2, 2, 2, 2, 2]
m236=[0, 1, 3, 4, 6, 8, 10, 12, 13, 15, 16, 18, 20, 22] de structure [1, 2, 1, 2, 2, 2, 2, 1, 2, 1, 2, 2, 2, 2]
m237=[0, 1, 3, 5, 6, 8, 10, 12, 13, 15, 17, 18, 20, 22] de structure [1, 2, 2, 1, 2, 2, 2, 1, 2, 2, 1, 2, 2, 2]
m238=[0, 1, 2, 3, 5, 7, 9, 12, 13, 14, 15, 17, 19, 21] de structure [1, 1, 1, 2, 2, 2, 3, 1, 1, 1, 2, 2, 2, 3]
m239=[0, 1, 2, 3, 5, 7, 10, 12, 13, 14, 15, 17, 19, 22] de structure [1, 1, 1, 2, 2, 3, 2, 1, 1, 1, 2, 2, 3, 2]
m240=[0, 1, 2, 3, 5, 8, 10, 12, 13, 14, 15, 17, 20, 22] de structure [1, 1, 1, 2, 3, 2, 2, 1, 1, 1, 2, 3, 2, 2]
m241=[0, 1, 2, 3, 6, 8, 10, 12, 13, 14, 15, 18, 20, 22] de structure [1, 1, 1, 3, 2, 2, 2, 1, 1, 1, 3, 2, 2, 2]
m242=[0, 1, 2, 4, 5, 7, 9, 12, 13, 14, 16, 17, 19, 21] de structure [1, 1, 2, 1, 2, 2, 3, 1, 1, 2, 1, 2, 2, 3]

m243=[0, 1, 2, 4, 5, 7, 10, 12, 13, 14, 16, 17, 19, 22] de structure [1, 1, 2, 1, 2, 3, 2, 1, 1, 2, 1, 2, 3, 2]
m244=[0, 1, 2, 4, 5, 8, 10, 12, 13, 14, 16, 17, 20, 22] de structure [1, 1, 2, 1, 3, 2, 2, 1, 1, 2, 1, 3, 2, 2]
m245=[0, 1, 2, 4, 6, 7, 9, 12, 13, 14, 16, 18, 19, 21] de structure [1, 1, 2, 2, 1, 2, 3, 1, 1, 2, 2, 1, 2, 3]
m246=[0, 1, 2, 4, 6, 7, 10, 12, 13, 14, 16, 18, 19, 22] de structure [1, 1, 2, 2, 1, 3, 2, 1, 1, 2, 2, 1, 3, 2]
m247=[0, 1, 2, 4, 6, 8, 9, 12, 13, 14, 16, 18, 20, 21] de structure [1, 1, 2, 2, 2, 1, 3, 1, 1, 2, 2, 2, 1, 3]
m248=[0, 1, 2, 4, 6, 9, 10, 12, 13, 14, 16, 18, 21, 22] de structure [1, 1, 2, 2, 3, 1, 2, 1, 1, 2, 2, 3, 1, 2]
m249=[0, 1, 2, 4, 7, 8, 10, 12, 13, 14, 16, 19, 20, 22] de structure [1, 1, 2, 3, 1, 2, 2, 1, 1, 2, 3, 1, 2, 2]
m250=[0, 1, 2, 4, 7, 9, 10, 12, 13, 14, 16, 19, 21, 22] de structure [1, 1, 2, 3, 2, 1, 2, 1, 1, 2, 3, 2, 1, 2]
m251=[0, 1, 2, 5, 6, 8, 10, 12, 13, 14, 17, 18, 20, 22] de structure [1, 1, 3, 1, 2, 2, 2, 1, 1, 3, 1, 2, 2, 2]
m252=[0, 1, 2, 5, 7, 8, 10, 12, 13, 14, 17, 19, 20, 22] de structure [1, 1, 3, 2, 1, 2, 2, 1, 1, 3, 2, 1, 2, 2]
m253=[0, 1, 2, 5, 7, 9, 10, 12, 13, 14, 17, 19, 21, 22] de structure [1, 1, 3, 2, 2, 1, 2, 1, 1, 3, 2, 2, 1, 2]
m254=[0, 1, 3, 4, 6, 7, 9, 12, 13, 15, 16, 18, 19, 21] de structure [1, 2, 1, 2, 1, 2, 3, 1, 2, 1, 2, 1, 2, 3]
m255=[0, 1, 3, 4, 6, 7, 10, 12, 13, 15, 16, 18, 19, 22] de structure [1, 2, 1, 2, 1, 3, 2, 1, 2, 1, 2, 1, 3, 2]
m256=[0, 1, 3, 4, 6, 8, 9, 12, 13, 15, 16, 18, 20, 21] de structure [1, 2, 1, 2, 2, 1, 3, 1, 2, 1, 2, 2, 1, 3]
m257=[0, 1, 3, 4, 7, 8, 10, 12, 13, 15, 16, 19, 20, 22] de structure [1, 2, 1, 3, 1, 2, 2, 1, 2, 1, 3, 1, 2, 2]
m258=[0, 1, 2, 3, 4, 6, 9, 12, 13, 14, 15, 16, 18, 21] de structure [1, 1, 1, 1, 2, 3, 3, 1, 1, 1, 1, 2, 3, 3]
m259=[0, 1, 2, 3, 4, 7, 9, 12, 13, 14, 15, 16, 19, 21] de structure [1, 1, 1, 1, 3, 2, 3, 1, 1, 1, 1, 3, 2, 3]
m260=[0, 1, 2, 3, 4, 7, 10, 12, 13, 14, 15, 16, 19, 22] de structure [1, 1, 1, 1, 3, 3, 2, 1, 1, 1, 1, 3, 3, 2]
m261=[0, 1, 2, 3, 5, 6, 9, 12, 13, 14, 15, 17, 18, 21] de structure [1, 1, 1, 2, 1, 3, 3, 1, 1, 1, 2, 1, 3, 3]
m262=[0, 1, 2, 3, 5, 8, 9, 12, 13, 14, 15, 17, 20, 21] de structure [1, 1, 1, 2, 3, 1, 3, 1, 1, 1, 2, 3, 1, 3]
m263=[0, 1, 2, 3, 6, 7, 9, 12, 13, 14, 15, 18, 19, 21] de structure [1, 1, 1, 3, 1, 2, 3, 1, 1, 1, 3, 1, 2, 3]
m264=[0, 1, 2, 3, 6, 7, 10, 12, 13, 14, 15, 18, 19, 22] de structure [1, 1, 1, 3, 1, 3, 2, 1, 1, 1, 3, 1, 3, 2]
m265=[0, 1, 2, 3, 6, 8, 9, 12, 13, 14, 15, 18, 20, 21] de structure [1, 1, 1, 3, 2, 1, 3, 1, 1, 1, 3, 2, 1, 3]
m266=[0, 1, 2, 3, 6, 9, 10, 12, 13, 14, 15, 18, 21, 22] de structure [1, 1, 1, 3, 3, 1, 2, 1, 1, 1, 3, 3, 1, 2]

m267=[0, 1, 2, 4, 5, 6, 9, 12, 13, 14, 16, 17, 18, 21] de structure [1, 1, 2, 1, 1, 3, 3, 1, 1, 2, 1, 1, 3, 3]
m268=[0, 1, 2, 4, 5, 8, 9, 12, 13, 14, 16, 17, 20, 21] de structure [1, 1, 2, 1, 3, 1, 3, 1, 1, 2, 1, 3, 1, 3]
m269=[0, 1, 2, 4, 7, 8, 9, 12, 13, 14, 16, 19, 20, 21] de structure [1, 1, 2, 3, 1, 1, 3, 1, 1, 2, 3, 1, 1, 3]
m270=[0, 1, 2, 5, 6, 7, 10, 12, 13, 14, 17, 18, 19, 22] de structure [1, 1, 3, 1, 1, 3, 2, 1, 1, 3, 1, 1, 3, 2]
m271=[0, 1, 2, 5, 6, 8, 9, 12, 13, 14, 17, 18, 20, 21] de structure [1, 1, 3, 1, 2, 1, 3, 1, 1, 3, 1, 2, 1, 3]
m272=[0, 1, 2, 5, 6, 9, 10, 12, 13, 14, 17, 18, 21, 22] de structure [1, 1, 3, 1, 3, 1, 2, 1, 1, 3, 1, 3, 1, 2]
m273=[0, 1, 2, 3, 4, 6, 8, 12, 13, 14, 15, 16, 18, 20] de structure [1, 1, 1, 1, 2, 2, 4, 1, 1, 1, 1, 2, 2, 4]
m274=[0, 1, 2, 3, 4, 6, 10, 12, 13, 14, 15, 16, 18, 22] de structure [1, 1, 1, 1, 2, 4, 2, 1, 1, 1, 1, 2, 4, 2]
m275=[0, 1, 2, 3, 4, 8, 10, 12, 13, 14, 15, 16, 20, 22] de structure [1, 1, 1, 1, 4, 2, 2, 1, 1, 1, 1, 4, 2, 2]
m276=[0, 1, 2, 3, 5, 6, 8, 12, 13, 14, 15, 17, 18, 20] de structure [1, 1, 1, 2, 1, 2, 4, 1, 1, 1, 2, 1, 2, 4]
m277=[0, 1, 2, 3, 5, 6, 10, 12, 13, 14, 15, 17, 18, 22] de structure [1, 1, 1, 2, 1, 4, 2, 1, 1, 1, 2, 1, 4, 2]
m278=[0, 1, 2, 3, 5, 7, 8, 12, 13, 14, 15, 17, 19, 20] de structure [1, 1, 1, 2, 2, 1, 4, 1, 1, 1, 2, 2, 1, 4]
m279=[0, 1, 2, 3, 5, 9, 10, 12, 13, 14, 15, 17, 21, 22] de structure [1, 1, 1, 2, 4, 1, 2, 1, 1, 1, 2, 4, 1, 2]
m280=[0, 1, 2, 3, 7, 8, 10, 12, 13, 14, 15, 19, 20, 22] de structure [1, 1, 1, 4, 1, 2, 2, 1, 1, 1, 4, 1, 2, 2]
m281=[0, 1, 2, 3, 7, 9, 10, 12, 13, 14, 15, 19, 21, 22] de structure [1, 1, 1, 4, 2, 1, 2, 1, 1, 1, 4, 2, 1, 2]
m282=[0, 1, 2, 4, 5, 6, 8, 12, 13, 14, 16, 17, 18, 20] de structure [1, 1, 2, 1, 1, 2, 4, 1, 1, 2, 1, 1, 2, 4]
m283=[0, 1, 2, 4, 5, 6, 10, 12, 13, 14, 16, 17, 18, 22] de structure [1, 1, 2, 1, 1, 4, 2, 1, 1, 2, 1, 1, 4, 2]
m284=[0, 1, 2, 4, 5, 7, 8, 12, 13, 14, 16, 17, 19, 20] de structure [1, 1, 2, 1, 2, 1, 4, 1, 1, 2, 1, 2, 1, 4]
m285=[0, 1, 2, 4, 5, 9, 10, 12, 13, 14, 16, 17, 21, 22] de structure [1, 1, 2, 1, 4, 1, 2, 1, 1, 2, 1, 4, 1, 2]
m286=[0, 1, 2, 4, 6, 7, 8, 12, 13, 14, 16, 18, 19, 20] de structure [1, 1, 2, 2, 1, 1, 4, 1, 1, 2, 2, 1, 1, 4]
m287=[0, 1, 2, 6, 7, 9, 10, 12, 13, 14, 18, 19, 21, 22] de structure [1, 1, 4, 1, 2, 1, 2, 1, 1, 4, 1, 2, 1, 2]
m288=[0, 1, 2, 3, 4, 5, 8, 12, 13, 14, 15, 16, 17, 20] de structure [1, 1, 1, 1, 1, 3, 4, 1, 1, 1, 1, 1, 3, 4]
m289=[0, 1, 2, 3, 4, 5, 9, 12, 13, 14, 15, 16, 17, 21] de structure [1, 1, 1, 1, 1, 4, 3, 1, 1, 1, 1, 1, 4, 3]
m290=[0, 1, 2, 3, 4, 7, 8, 12, 13, 14, 15, 16, 19, 20] de structure [1, 1, 1, 1, 3, 1, 4, 1, 1, 1, 1, 3, 1, 4]

m291=[0, 1, 2, 3, 4, 8, 9, 12, 13, 14, 15, 16, 20, 21] de structure [1, 1, 1, 1, 4, 1, 3, 1, 1, 1, 1, 4, 1, 3]
m292=[0, 1, 2, 3, 6, 7, 8, 12, 13, 14, 15, 18, 19, 20] de structure [1, 1, 1, 3, 1, 1, 4, 1, 1, 1, 3, 1, 1, 4]
m293=[0, 1, 2, 3, 7, 8, 9, 12, 13, 14, 15, 19, 20, 21] de structure [1, 1, 1, 4, 1, 1, 3, 1, 1, 1, 4, 1, 1, 3]
m294=[0, 1, 2, 3, 4, 5, 7, 12, 13, 14, 15, 16, 17, 19] de structure [1, 1, 1, 1, 1, 2, 5, 1, 1, 1, 1, 1, 2, 5]
m295=[0, 1, 2, 3, 4, 5, 10, 12, 13, 14, 15, 16, 17, 22] de structure [1, 1, 1, 1, 1, 5, 2, 1, 1, 1, 1, 1, 5, 2]
m296=[0, 1, 2, 3, 4, 6, 7, 12, 13, 14, 15, 16, 18, 19] de structure [1, 1, 1, 1, 2, 1, 5, 1, 1, 1, 1, 2, 1, 5]
m297=[0, 1, 2, 3, 4, 9, 10, 12, 13, 14, 15, 16, 21, 22] de structure [1, 1, 1, 1, 5, 1, 2, 1, 1, 1, 1, 5, 1, 2]
m298=[0, 1, 2, 3, 5, 6, 7, 12, 13, 14, 15, 17, 18, 19] de structure [1, 1, 1, 2, 1, 1, 5, 1, 1, 1, 2, 1, 1, 5]
m299=[0, 1, 2, 3, 8, 9, 10, 12, 13, 14, 15, 20, 21, 22] de structure [1, 1, 1, 5, 1, 1, 2, 1, 1, 1, 5, 1, 1, 2]
m300=[0, 1, 2, 3, 4, 5, 6, 12, 13, 14, 15, 16, 17, 18] de structure [1, 1, 1, 1, 1, 1, 6, 1, 1, 1, 1, 1, 1, 6]

Modes de 15 notes.
m301=[0, 1, 2, 4, 6, 8, 9, 10, 12, 14, 16, 17, 18, 20, 22] de structure [1, 1, 2, 2, 2, 1, 1, 2, 2, 2, 1, 1, 2, 2, 2]
m302=[0, 1, 3, 4, 6, 8, 9, 11, 12, 14, 16, 17, 19, 20, 22] de structure [1, 2, 1, 2, 2, 1, 2, 1, 2, 2, 1, 2, 1, 2, 2]
m303=[0, 1, 2, 3, 5, 8, 9, 10, 11, 13, 16, 17, 18, 19, 21] de structure [1, 1, 1, 2, 3, 1, 1, 1, 2, 3, 1, 1, 1, 2, 3]
m304=[0, 1, 2, 3, 6, 8, 9, 10, 11, 14, 16, 17, 18, 19, 22] de structure [1, 1, 1, 3, 2, 1, 1, 1, 3, 2, 1, 1, 1, 3, 2]
m305=[0, 1, 2, 4, 5, 8, 9, 10, 12, 13, 16, 17, 18, 20, 21] de structure [1, 1, 2, 1, 3, 1, 1, 2, 1, 3, 1, 1, 2, 1, 3]
m306=[0, 1, 2, 5, 6, 8, 9, 10, 13, 14, 16, 17, 18, 21, 22] de structure [1, 1, 3, 1, 2, 1, 1, 3, 1, 2, 1, 1, 3, 1, 2]
m307=[0, 1, 2, 3, 4, 8, 9, 10, 11, 12, 16, 17, 18, 19, 20] de structure [1, 1, 1, 1, 4, 1, 1, 1, 1, 4, 1, 1, 1, 1, 4]

Modes de 16 notes.
m308=[0, 1, 2, 4, 6, 7, 8, 10, 12, 13, 14, 16, 18, 19, 20, 22] de structure [1, 1, 2, 2, 1, 1, 2, 2, 1, 1, 2, 2, 1, 1, 2, 2]
m309=[0, 1, 3, 4, 6, 7, 9, 10, 12, 13, 15, 16, 18, 19, 21, 22] de structure [1, 2, 1, 2, 1, 2, 1, 2, 1, 2, 1, 2, 1, 2, 1, 2]
m310=[0, 1, 2, 3, 6, 7, 8, 9, 12, 13, 14, 15, 18, 19, 20, 21] de structure [1, 1, 1, 3, 1, 1, 1, 3, 1, 1, 1, 3, 1, 1, 1, 3]
m311=[0, 1, 2, 3, 4, 6, 8, 10, 12, 13, 14, 15, 16, 18, 20, 22] de structure [1, 1, 1, 1, 2, 2, 2, 2, 1, 1, 1, 1, 2, 2, 2, 2]
m312=[0, 1, 2, 3, 5, 6, 8, 10, 12, 13, 14, 15, 17, 18, 20, 22] de structure [1, 1, 1, 2, 1, 2, 2, 2, 1, 1, 1, 2, 1, 2, 2, 2]

m313=[0, 1, 2, 3, 5, 7, 8, 10, 12, 13, 14, 15, 17, 19, 20, 22] de structure [1, 1, 1, 2, 2, 1, 2, 2, 1, 1, 1, 2, 2, 1, 2, 2]
m314=[0, 1, 2, 3, 5, 7, 9, 10, 12, 13, 14, 15, 17, 19, 21, 22] de structure [1, 1, 1, 2, 2, 2, 1, 2, 1, 1, 1, 2, 2, 2, 1, 2]
m315=[0, 1, 2, 4, 5, 6, 8, 10, 12, 13, 14, 16, 17, 18, 20, 22] de structure [1, 1, 2, 1, 1, 2, 2, 2, 1, 1, 2, 1, 1, 2, 2, 2]
m316=[0, 1, 2, 4, 5, 7, 8, 10, 12, 13, 14, 16, 17, 19, 20, 22] de structure [1, 1, 2, 1, 2, 1, 2, 2, 1, 1, 2, 1, 2, 1, 2, 2]
m317=[0, 1, 2, 4, 5, 7, 9, 10, 12, 13, 14, 16, 17, 19, 21, 22] de structure [1, 1, 2, 1, 2, 2, 1, 2, 1, 1, 2, 1, 2, 2, 1, 2]
m318=[0, 1, 2, 4, 6, 7, 9, 10, 12, 13, 14, 16, 18, 19, 21, 22] de structure [1, 1, 2, 2, 1, 2, 1, 2, 1, 1, 2, 2, 1, 2, 1, 2]
m319=[0, 1, 2, 3, 4, 5, 7, 9, 12, 13, 14, 15, 16, 17, 19, 21] de structure [1, 1, 1, 1, 1, 2, 2, 3, 1, 1, 1, 1, 1, 2, 2, 3]
m320=[0, 1, 2, 3, 4, 5, 7, 10, 12, 13, 14, 15, 16, 17, 19, 22] de structure [1, 1, 1, 1, 1, 2, 3, 2, 1, 1, 1, 1, 1, 2, 3, 2]
m321=[0, 1, 2, 3, 4, 5, 8, 10, 12, 13, 14, 15, 16, 17, 20, 22] de structure [1, 1, 1, 1, 1, 3, 2, 2, 1, 1, 1, 1, 1, 3, 2, 2]
m322=[0, 1, 2, 3, 4, 6, 7, 9, 12, 13, 14, 15, 16, 18, 19, 21] de structure [1, 1, 1, 1, 2, 1, 2, 3, 1, 1, 1, 1, 2, 1, 2, 3]
m323=[0, 1, 2, 3, 4, 6, 7, 10, 12, 13, 14, 15, 16, 18, 19, 22] de structure [1, 1, 1, 1, 2, 1, 3, 2, 1, 1, 1, 1, 2, 1, 3, 2]
m324=[0, 1, 2, 3, 4, 6, 8, 9, 12, 13, 14, 15, 16, 18, 20, 21] de structure [1, 1, 1, 1, 2, 2, 1, 3, 1, 1, 1, 1, 2, 2, 1, 3]
m325=[0, 1, 2, 3, 4, 6, 9, 10, 12, 13, 14, 15, 16, 18, 21, 22] de structure [1, 1, 1, 1, 2, 3, 1, 2, 1, 1, 1, 1, 2, 3, 1, 2]
m326=[0, 1, 2, 3, 4, 7, 8, 10, 12, 13, 14, 15, 16, 19, 20, 22] de structure [1, 1, 1, 1, 3, 1, 2, 2, 1, 1, 1, 1, 3, 1, 2, 2]
m327=[0, 1, 2, 3, 4, 7, 9, 10, 12, 13, 14, 15, 16, 19, 21, 22] de structure [1, 1, 1, 1, 3, 2, 1, 2, 1, 1, 1, 1, 3, 2, 1, 2]
m328=[0, 1, 2, 3, 5, 6, 7, 9, 12, 13, 14, 15, 17, 18, 19, 21] de structure [1, 1, 1, 2, 1, 1, 2, 3, 1, 1, 1, 2, 1, 1, 2, 3]
m329=[0, 1, 2, 3, 5, 6, 7, 10, 12, 13, 14, 15, 17, 18, 19, 22] de structure [1, 1, 1, 2, 1, 1, 3, 2, 1, 1, 1, 2, 1, 1, 3, 2]
m330=[0, 1, 2, 3, 5, 6, 8, 9, 12, 13, 14, 15, 17, 18, 20, 21] de structure [1, 1, 1, 2, 1, 2, 1, 3, 1, 1, 1, 2, 1, 2, 1, 3]
m331=[0, 1, 2, 3, 5, 6, 9, 10, 12, 13, 14, 15, 17, 18, 21, 22] de structure [1, 1, 1, 2, 1, 3, 1, 2, 1, 1, 1, 2, 1, 3, 1, 2]
m332=[0, 1, 2, 3, 5, 7, 8, 9, 12, 13, 14, 15, 17, 19, 20, 21] de structure [1, 1, 1, 2, 2, 1, 1, 3, 1, 1, 1, 2, 2, 1, 1, 3]
m333=[0, 1, 2, 3, 5, 8, 9, 10, 12, 13, 14, 15, 17, 20, 21, 22] de structure [1, 1, 1, 2, 3, 1, 1, 2, 1, 1, 1, 2, 3, 1, 1, 2]
m334=[0, 1, 2, 3, 6, 7, 8, 10, 12, 13, 14, 15, 18, 19, 20, 22] de structure [1, 1, 1, 3, 1, 1, 2, 2, 1, 1, 1, 3, 1, 1, 2, 2]
m335=[0, 1, 2, 3, 6, 7, 9, 10, 12, 13, 14, 15, 18, 19, 21, 22] de structure [1, 1, 1, 3, 1, 2, 1, 2, 1, 1, 1, 3, 1, 2, 1, 2]
m336=[0, 1, 2, 3, 6, 8, 9, 10, 12, 13, 14, 15, 18, 20, 21, 22] de structure [1, 1, 1, 3, 2, 1, 1, 2, 1, 1, 1, 3, 2, 1, 1, 2]

m337=[0, 1, 2, 4, 5, 6, 8, 9, 12, 13, 14, 16, 17, 18, 20, 21] de structure [1, 1, 2, 1, 1, 2, 1, 3, 1, 1, 2, 1, 1, 2, 1, 3]
m338=[0, 1, 2, 4, 5, 6, 9, 10, 12, 13, 14, 16, 17, 18, 21, 22] de structure [1, 1, 2, 1, 1, 3, 1, 2, 1, 1, 2, 1, 1, 3, 1, 2]
m339=[0, 1, 2, 4, 5, 7, 8, 9, 12, 13, 14, 16, 17, 19, 20, 21] de structure [1, 1, 2, 1, 2, 1, 1, 3, 1, 1, 2, 1, 2, 1, 1, 3]
m340=[0, 1, 2, 3, 4, 5, 6, 9, 12, 13, 14, 15, 16, 17, 18, 21] de structure [1, 1, 1, 1, 1, 1, 3, 3, 1, 1, 1, 1, 1, 1, 3, 3]
m341=[0, 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16, 17, 20, 21] de structure [1, 1, 1, 1, 1, 3, 1, 3, 1, 1, 1, 1, 1, 3, 1, 3]
m342=[0, 1, 2, 3, 4, 7, 8, 9, 12, 13, 14, 15, 16, 19, 20, 21] de structure [1, 1, 1, 1, 3, 1, 1, 3, 1, 1, 1, 1, 3, 1, 1, 3]
m343=[0, 1, 2, 3, 4, 5, 6, 8, 12, 13, 14, 15, 16, 17, 18, 20] de structure [1, 1, 1, 1, 1, 1, 2, 4, 1, 1, 1, 1, 1, 1, 2, 4]
m344=[0, 1, 2, 3, 4, 5, 6, 10, 12, 13, 14, 15, 16, 17, 18, 22] de structure [1, 1, 1, 1, 1, 1, 4, 2, 1, 1, 1, 1, 1, 1, 4, 2]
m345=[0, 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 15, 16, 17, 19, 20] de structure [1, 1, 1, 1, 1, 2, 1, 4, 1, 1, 1, 1, 1, 2, 1, 4]
m346=[0, 1, 2, 3, 4, 5, 9, 10, 12, 13, 14, 15, 16, 17, 21, 22] de structure [1, 1, 1, 1, 1, 4, 1, 2, 1, 1, 1, 1, 1, 4, 1, 2]
m347=[0, 1, 2, 3, 4, 6, 7, 8, 12, 13, 14, 15, 16, 18, 19, 20] de structure [1, 1, 1, 1, 2, 1, 1, 4, 1, 1, 1, 1, 2, 1, 1, 4]
m348=[0, 1, 2, 3, 4, 8, 9, 10, 12, 13, 14, 15, 16, 20, 21, 22] de structure [1, 1, 1, 1, 4, 1, 1, 2, 1, 1, 1, 1, 4, 1, 1, 2]
m349=[0, 1, 2, 3, 5, 6, 7, 8, 12, 13, 14, 15, 17, 18, 19, 20] de structure [1, 1, 1, 2, 1, 1, 1, 4, 1, 1, 1, 2, 1, 1, 1, 4]
m350=[0, 1, 2, 3, 4, 5, 6, 7, 12, 13, 14, 15, 16, 17, 18, 19] de structure [1, 1, 1, 1, 1, 1, 1, 5, 1, 1, 1, 1, 1, 1, 1, 5]

Modes de 18 notes.
m351=[0, 1, 2, 4, 5, 6, 8, 9, 10, 12, 13, 14, 16, 17, 18, 20, 21, 22] de structure [1, 1, 2, 1, 1, 2, 1, 1, 2, 1, 1, 2, 1, 1, 2, 1, 1, 2]
m352=[0, 1, 2, 3, 4, 5, 6, 8, 10, 12, 13, 14, 15, 16, 17, 18, 20, 22] de structure [1, 1, 1, 1, 1, 1, 2, 2, 2, 1, 1, 1, 1, 1, 1, 2, 2, 2]
m353=[0, 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 15, 16, 17, 19, 20, 22] de structure [1, 1, 1, 1, 1, 2, 1, 2, 2, 1, 1, 1, 1, 1, 2, 1, 2, 2]
m354=[0, 1, 2, 3, 4, 5, 7, 9, 10, 12, 13, 14, 15, 16, 17, 19, 21, 22] de structure [1, 1, 1, 1, 1, 2, 2, 1, 2, 1, 1, 1, 1, 1, 2, 2, 1, 2]
m355=[0, 1, 2, 3, 4, 6, 7, 8, 10, 12, 13, 14, 15, 16, 18, 19, 20, 22] de structure [1, 1, 1, 1, 2, 1, 1, 2, 2, 1, 1, 1, 1, 2, 1, 1, 2, 2]
m356=[0, 1, 2, 3, 4, 6, 7, 9, 10, 12, 13, 14, 15, 16, 18, 19, 21, 22] de structure [1, 1, 1, 1, 2, 1, 2, 1, 2, 1, 1, 1, 1, 2, 1, 2, 1, 2]
m357=[0, 1, 2, 3, 4, 6, 8, 9, 10, 12, 13, 14, 15, 16, 18, 20, 21, 22] de structure [1, 1, 1, 1, 2, 2, 1, 1, 2, 1, 1, 1, 1, 2, 2, 1, 1, 2]
m358=[0, 1, 2, 3, 5, 6, 7, 8, 10, 12, 13, 14, 15, 17, 18, 19, 20, 22] de structure [1, 1, 1, 2, 1, 1, 1, 2, 2, 1, 1, 1, 2, 1, 1, 1, 2, 2]
m359=[0, 1, 2, 3, 5, 6, 7, 9, 10, 12, 13, 14, 15, 17, 18, 19, 21, 22] de structure [1, 1, 1, 2, 1, 1, 2, 1, 2, 1, 1, 1, 2, 1, 1, 2, 1, 2]

m360=[0, 1, 2, 3, 5, 6, 8, 9, 10, 12, 13, 14, 15, 17, 18, 20, 21, 22] de structure [1, 1, 1, 2, 1, 2, 1, 1, 2, 1, 1, 1, 2, 1, 2, 1, 1, 2]
m361=[0, 1, 2, 3, 4, 5, 6, 7, 9, 12, 13, 14, 15, 16, 17, 18, 19, 21] de structure [1, 1, 1, 1, 1, 1, 1, 2, 3, 1, 1, 1, 1, 1, 1, 1, 2, 3]
m362=[0, 1, 2, 3, 4, 5, 6, 7, 10, 12, 13, 14, 15, 16, 17, 18, 19, 22] de structure [1, 1, 1, 1, 1, 1, 1, 3, 2, 1, 1, 1, 1, 1, 1, 1, 3, 2]
m363=[0, 1, 2, 3, 4, 5, 6, 8, 9, 12, 13, 14, 15, 16, 17, 18, 20, 21] de structure [1, 1, 1, 1, 1, 1, 2, 1, 3, 1, 1, 1, 1, 1, 1, 2, 1, 3]
m364=[0, 1, 2, 3, 4, 5, 6, 9, 10, 12, 13, 14, 15, 16, 17, 18, 21, 22] de structure [1, 1, 1, 1, 1, 1, 3, 1, 2, 1, 1, 1, 1, 1, 1, 3, 1, 2]
m365=[0, 1, 2, 3, 4, 5, 7, 8, 9, 12, 13, 14, 15, 16, 17, 19, 20, 21] de structure [1, 1, 1, 1, 1, 2, 1, 1, 3, 1, 1, 1, 1, 1, 2, 1, 1, 3]
m366=[0, 1, 2, 3, 4, 5, 8, 9, 10, 12, 13, 14, 15, 16, 17, 20, 21, 22] de structure [1, 1, 1, 1, 1, 3, 1, 1, 2, 1, 1, 1, 1, 1, 3, 1, 1, 2]
m367=[0, 1, 2, 3, 4, 6, 7, 8, 9, 12, 13, 14, 15, 16, 18, 19, 20, 21] de structure [1, 1, 1, 1, 2, 1, 1, 1, 3, 1, 1, 1, 1, 2, 1, 1, 1, 3]
m368=[0, 1, 2, 3, 4, 7, 8, 9, 10, 12, 13, 14, 15, 16, 19, 20, 21, 22] de structure [1, 1, 1, 1, 3, 1, 1, 1, 2, 1, 1, 1, 1, 3, 1, 1, 1, 2]
m369=[0, 1, 2, 3, 4, 5, 6, 7, 8, 12, 13, 14, 15, 16, 17, 18, 19, 20] de structure [1, 1, 1, 1, 1, 1, 1, 1, 4, 1, 1, 1, 1, 1, 1, 1, 1, 4]
m370=[0, 1, 2, 3, 4, 6, 8, 9, 10, 11, 12, 14, 16, 17, 18, 19, 20, 22] de structure [1, 1, 1, 1, 2, 2, 1, 1, 1, 1, 2, 2, 1, 1, 1, 1, 2, 2]
m371=[0, 1, 2, 3, 5, 6, 8, 9, 10, 11, 13, 14, 16, 17, 18, 19, 21, 22] de structure [1, 1, 1, 2, 1, 2, 1, 1, 1, 2, 1, 2, 1, 1, 1, 2, 1, 2]
m372=[0, 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 13, 16, 17, 18, 19, 20, 21] de structure [1, 1, 1, 1, 1, 3, 1, 1, 1, 1, 1, 3, 1, 1, 1, 1, 1, 3]

Modes de 20 notes.
m373=[0, 1, 2, 3, 4, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22] de structure [1, 1, 1, 1, 2, 1, 1, 1, 1, 2, 1, 1, 1, 1, 2, 1, 1, 1, 1, 2]
m374=[0, 1, 2, 3, 4, 5, 6, 7, 8, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22] de structure [1, 1, 1, 1, 1, 1, 1, 1, 2, 2, 1, 1, 1, 1, 1, 1, 1, 1, 2, 2]
m375=[0, 1, 2, 3, 4, 5, 6, 7, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22] de structure [1, 1, 1, 1, 1, 1, 1, 2, 1, 2, 1, 1, 1, 1, 1, 1, 1, 2, 1, 2]
m376=[0, 1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22] de structure [1, 1, 1, 1, 1, 1, 2, 1, 1, 2, 1, 1, 1, 1, 1, 1, 2, 1, 1, 2]
m377=[0, 1, 2, 3, 4, 5, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 19, 20, 21, 22] de structure [1, 1, 1, 1, 1, 2, 1, 1, 1, 2, 1, 1, 1, 1, 1, 2, 1, 1, 1, 2]
m378=[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21] de structure [1, 1, 1, 1, 1, 1, 1, 1, 1, 3, 1, 1, 1, 1, 1, 1, 1, 1, 1, 3]

Modes de 21 notes.
m379=[0, 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22] de structure [1, 1, 1, 1, 1, 1, 2, 1, 1, 1, 1, 1, 1, 2, 1, 1, 1, 1, 1, 1, 2]

Modes de 22 notes.
m380=[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22] de structure [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 2]

Modes de 24 notes.

m381=[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23] de structure [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1]

23. Modes de $\mathbb{Z}_{30}$

Pour $n = 30$ (Système des cinquièmes de ton), on a la répartition suivante

Notes	ECH	ATL	Détails
30	1	1	1 à 1 transp.
1, 29	1	0	0
2, 28	15	1	1 à 15 transp.
3, 27	136	1	1 à 10 transp.
4, 26	917	7	7 à 15 transp.
5, 25	4 751	1	1 à 6 transp.
6, 24	19 811	35	1 (5), 4 (10), 30 (15)
7, 23	67 860	0	0
8, 22	195 143	91	91 à 15 transp.
9, 21	476 913	12	12 à 10 transp.
10, 20	1 001 603	203	1 (3), 2 (6), 200 (15)
11, 19	1 820 910	0	0
12, 18	2 883 289	355	2 (5), 20 (10), 333 (15)
13, 17	3 991 995	0	0
14, 16	4 847 637	429	429 à 15 transp.
15	5 170 604	29	1 (2), 3 (6), 25 (10)
Total	35 792 567	2300	2300

Pour $k = 6$, l'équation

$$5x_{6,5} + 4x_{6,10} + 3x_{6,15} = 111$$

admet pour solution

$$\begin{cases} x_{6,5} = n_1 \\ x_{6,10} = n_1 + 3n_2 \\ x_{6,15} = 37 - 3n_1 - 4n_2 \end{cases}$$

Pour $k = 10$, l'équation

$$9x_{10,3} + 8x_{10,6} + 5x_{10,15} = 1025$$

admet pour solution

$$\begin{cases} x_{10,3} = n_1 \\ x_{10,6} = 2n_1 + 5n_2 \\ x_{10,15} = 205 - 5n_1 - 8n_2 \end{cases}$$

Pour $k = 12$, l'équation

$$5x_{12,5} + 4x_{12,10} + 3x_{12,15} = 1089$$

admet pour solution

$$\begin{cases} x_{12,5} = n_1 \\ x_{12,10} = n_1 + 3n_2 \\ x_{12,15} = 363 - 3n_1 - 4n_2 \end{cases}$$

Pour $k = 15$, l'équation

$$7x_{15,2} + 6x_{15,6} + 5x_{15,10} = 150$$

admet pour solution

$$\begin{cases} x_{15,2} = n_1 \\ x_{15,6} = 3n_1 + 5n_2 \\ x_{15,10} = 30 - 5n_1 - 6n_2 \end{cases}$$

24. Modes de $\mathbb{Z}_{36}$

Pour $n = 36$ (Système des sixièmes de ton), on a la répartition suivante

Notes	ECH	ATL	Détails
36	1	1	1 à 1 transp.
1, 35	1	0	0
2, 34	18	1	1 à 18 transp.
3, 33	199	1	1 à 12 transp.
4, 32	1641	9	1 (9), 8 (18)
5, 31	10472	0	0
6, 30	54132	51	1 (6), 2 (12), 49 (18)
7, 29	231880	0	0
8, 28	840652	172	4 (9), 168 (18)
9, 27	2615104	19	1 (4), 18 (12)
10, 26	7060984	476	476 à 18 transp.
11, 25	16689036	0	0
12, 24	34769374	1078	1 (3), 2 (6), 9 (9), 28 (12), 1038 (18)
13, 23	64188600	0	0
14, 22	105453584	1768	1768 à 18 transp.
15, 21	154664004	66	66 à 12 transp.
16, 20	202997670	2438	14 (9), 2424 (18)
17, 19	238819350	0	0
18	252088496	2780	1 (2), 4 (4), 3 (6), 68 (12), 2704 (18)
Total	1 908 881 899	14939	14939

Pour $k = 4$, l'équation

$$3x_{4,9} + 2x_{4,18} = 19$$

admet pour solution

$$\begin{cases} x_{4,9} = 1 + 2n_1 \\ x_{4,18} = 8 - 3n_1 \end{cases}$$

Pour $k = 6$, l'équation

$$5x_{6,6} + 4x_{6,12} + 3x_{6,18} = 160$$

admet pour solution

$$\begin{cases} x_{6,6} = n_1 \\ x_{6,12} = 1 + n_1 + +3n_2 \\ x_{6,18} = 52 - 3n_1 - 4n_2 \end{cases}$$

Pour $k = 8$, l'équation

$$3x_{8,9} + 2x_{8,18} = 348$$

admet pour solution

$$\begin{cases} x_{8,9} = 2n_1 \\ x_{8,18} = 174 - 3n_1 \end{cases}$$

Pour $k = 9$, l'équation

$$4x_{9,4} + 3x_{9,12} = 58$$

admet pour solution

$$\begin{cases} x_{9,4} = 1 + 3n_1 \\ x_{9,12} = 18 - 4n_1 \end{cases}$$

Pour $k = 12$, l'équation

$$11x_{12,3} + 2x_{12,6} + 9x_{12,9} + 4x_{12,12} + 6x_{12,18} = 6588$$

admet pour solution

$$\begin{cases} x_{12,3} = n_1 \\ x_{12,6} = n_2 \\ x_{12,9} = n_1 + 2n_3 \\ x_{12,12} = 2n_1 + n_2 + 3n_4 \\ x_{12,18} = 1098 - 6n_1 - 3n_2 - 3n_3 - 4n_4 \end{cases}$$

Pour $k = 16$, l'équation

$$3x_{16,9} + 2x_{16,18} = 4890$$

admet pour solution

$$\begin{cases} x_{16,9} = 2n_1 \\ x_{16,18} = 2445 - -3n_1 \end{cases}$$

Pour $k = 18$, l'équation

$$17x_{18,2} + 12x_{18,12} + 15x_{18,6} + 16x_{18,4} + 9x_{18,18} = 25278$$

admet pour solution

$$\begin{cases} x_{18,2} = n_1 \\ x_{18,4} = n_1 + 3n_2 \\ x_{18,6} = n_3 \\ x_{18,12} = 2 + n_1 + 2n_2 + n_3 + 3n_4 \\ x_{18,18} = 2806 - 5n_1 - 8n_2 - 3n_3 - 4n_4 \end{cases}$$