The Parallel Murchanas of Kafi

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1. Kafi

1/1	10/9	32/27	4/3	3/2	5/3	16/9	2/1
10/9	16/15	9/8	(9/8)	10/9	16/15	9/8	
S	R-	G	M	P	D-	N	S

2.

1/1	9/8	5/4	4/3	3/2	27/16	15/8	2/1
9/8	10/9	16/15	9/8	(9/8)	10/9	16/15	
S	R	G	M	P	D	N	S

3.

1/1	16/15	6/5	4/3	64/45	8/5	9/5	2/1
16/15	9/8	10/9	16/15	9/8	(9/8)	10/9	
S	R+	G+	M	P+	D+	N+	S

4.

1/1	10/9	32/27	4/3	40/27	128/81	16/9	2/1
10/9	16/15	9/8	10/9	16/15	9/8	(9/8)	
S	R-	G	M	P-	D	N	S

5.

1/1	9/8	5/4	4/3	3/2	5/3	16/9	2/1
(9/8)	10/9	16/15	9/8	10/9	16/15	9/8	
S	R	G	M	P	D-	N	S

6.

1/1	9/8	81/64	45/32	3/2	27/16	15/8	2/1
9/8	(9/8)	10/9	16/15	9/8	10/9	16/15	
S	R	G+	Ḿ	P	D	N	S

7.

1/1	16/15	6/5	27/20	3/2	8/5	9/5	2/1
16/15	9/8	(9/8)	10/9	16/15	9/8	10/9	
S	R+	G+	M+	P	D+	N+	S

S R+ R G+ G+ M+ Ḿ+ P D+ D N+ N+ S

1/1	16/15	9/8	6/5	81/64	27/20	729/512	3/2	8/5	27/16	9/5	243/128	2/1
	16/15	135/128	16/15	135/128	16/15	135/128	256/243	16/15	135/128	16/15	135/128	256/243
	256/243	S 25/24	S 256/243	S 25/24	S 256/243	S 25/24	S 256/243	256/243	S 25/24	S 256/243	S 25/24	S 256/243
	256/243	135/128	16/15	135/128	16/15	135/128	16/15	256/243	135/128	16/15	135/128	16/15

upper inflection

S = 81/80

variable inflection of basic 12-tone scale = the 22-tone scale.

lower inflection

1/1	256/243	10/9	32/27	5/4	4/3	45/32	3/2	128/81	5/3	16/9	15/8	2/1
S	R	R-	G	G	M	Ḿ	P	D	D-	N	N	S

The Relative Murchanas of Kafi

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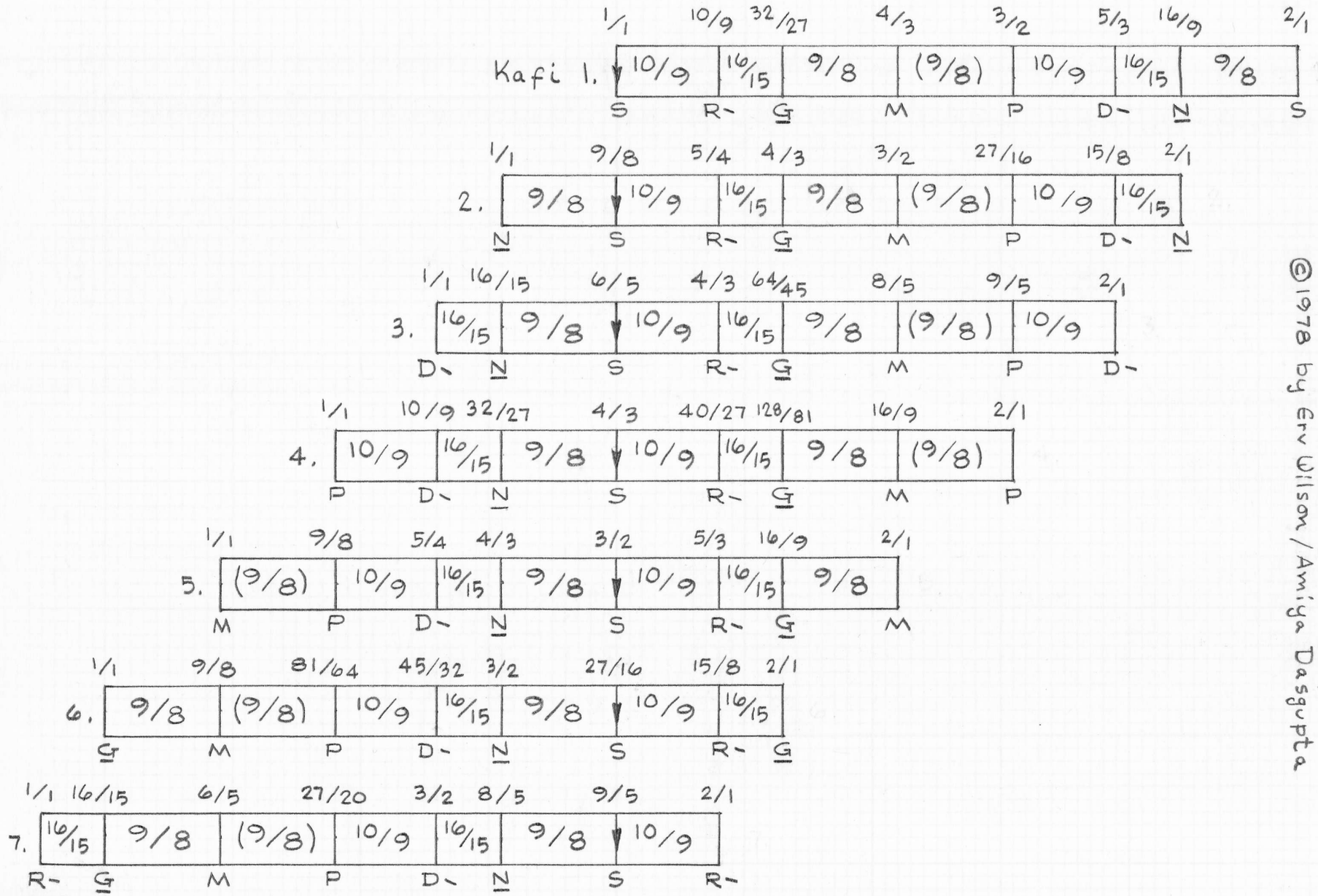


0 1 2 3 4 5 6 7 8 9 10 11 12/0 1 2 3 4 5 6 7 8 9 10 11 12

S R G ḾP D N S R G ḾP D N S

S R G ḾP D N S R G ḾP D N S

P D N S R G ḾP

R G ḾP D N S R

D N S R G ḾP D

R G ḾP D N S R

G ḾP D N S R G

D N S R G ḾP D

G ḾP D N S R G

N S R G ḾP D N

ḾP D N S R G Ḿ

ḾP D N S R G Ḿ

N S R G ḾP D N

G ḾP D N S R G

D N S R G ḾP D

R G ḾP D N S R

P D N S R G ḾP

S R G ḾP D N S

ḾP D N S R G ḾP D N S R G ḾP D N S R G ḾP D N S

S R G ḾP D N S

S R G ḾP D N S

S R G M M P D N S

S R G M P D N S

S R G M P D N S

S R G

Kalyan Variations

	S	P	R	D	G	N	Ḿ	Sa as Sa	Pa as Sa	Re as Sa	Dha a Sa
1.	S	P	R	D	G	N	Ḿ	Marwa			
2.	S	P	R	D	G	N	Ḿ	Purvi	Lalit 2		
3.	S	P	R	D	G	N	Ḿ	Todi	Lalit		
4.	S	P	R	D	G	N	Ḿ				
5.	S	P	R	D	G	N	Ḿ		Anand Bhairav		
6.	S	P	R	D	G	N	Ḿ		Bhairav		
7.	S	P	R	D	G	N	Ḿ		Jogiya Todi		
8.	S	P	R	D	G	N	Ḿ	Madhubanti	Nat Bhairav	Ahir Bhairav	
9.	S	P	R	D	G	N	Ḿ		Chandra Kanada	Ramekeli	
10.	S	P	R	D	G	N	Ḿ	Champakali	Pat Deep	Mohan Kauns	Para-meswari

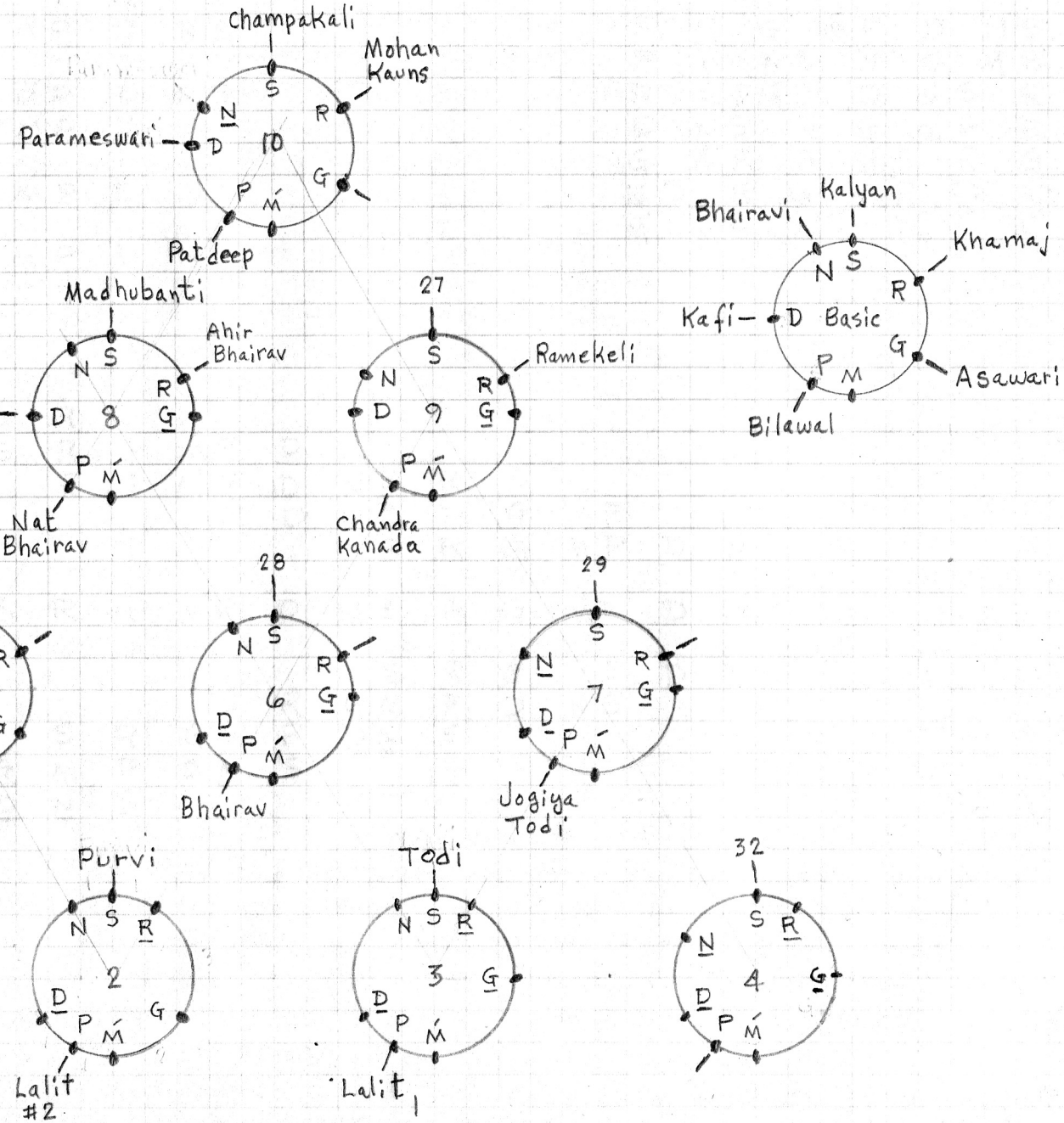
Transposed by Taking Pa as the Sa to Bilawal Variations

	M	S	P	R	D	G	N
1.	M	S	P	R	D	G	N
2.	M	S	P	R	D	G	N
3.	M	S	P	R	D	G	N
4.	M	S	P	R	D	G	N
5.	M	S	P	R	D	G	N
6.	M	S	P	R	D	G	N
7.	M	S	P	R	D	G	N
8.	M	S	P	R	D	G	N
9.	M	S	P	R	D	G	N
10.	M	S	P	R	D	G	N

Chain of Fifths

Basic	S	P	R	D	G	N	Ḿ
1	S	P	R	D	G	N	Ḿ
2	S	P	R	D	G	N	Ḿ
3	S	P	R	D	G	N	Ḿ
4	S	P	R	D	G	N	Ḿ
5	S	P	R	D	G	N	Ḿ
6	S	P	R	D	G	N	Ḿ
7	S	P	R	D	G	N	Ḿ
8	S	P	R	D	G	N	Ḿ
9	S	P	R	D	G	N	Ḿ
10	S	P	R	D	G	N	Ḿ

(The 10 variations where the Komal values are associated by Fifths)



Basic	S	P	R	D	G	N	Ḿ
1.	S	P	R	D	G	N	Ḿ
2.	S	P	R	D	G	N	Ḿ
3.	S	P	R	D	G	N	Ḿ
4.	S	P	R	D	G	N	Ḿ
5.	S	P	R	D	G	N	Ḿ
6.	S	P	R	D	G	N	Ḿ
7.	S	P	R	D	G	N	Ḿ
8.	S	P	R	D	G	N	Ḿ
9.	S	P	R	D	G	N	Ḿ
10.	S	P	R	D	G	N	Ḿ

KEY TO RAGA SCALES

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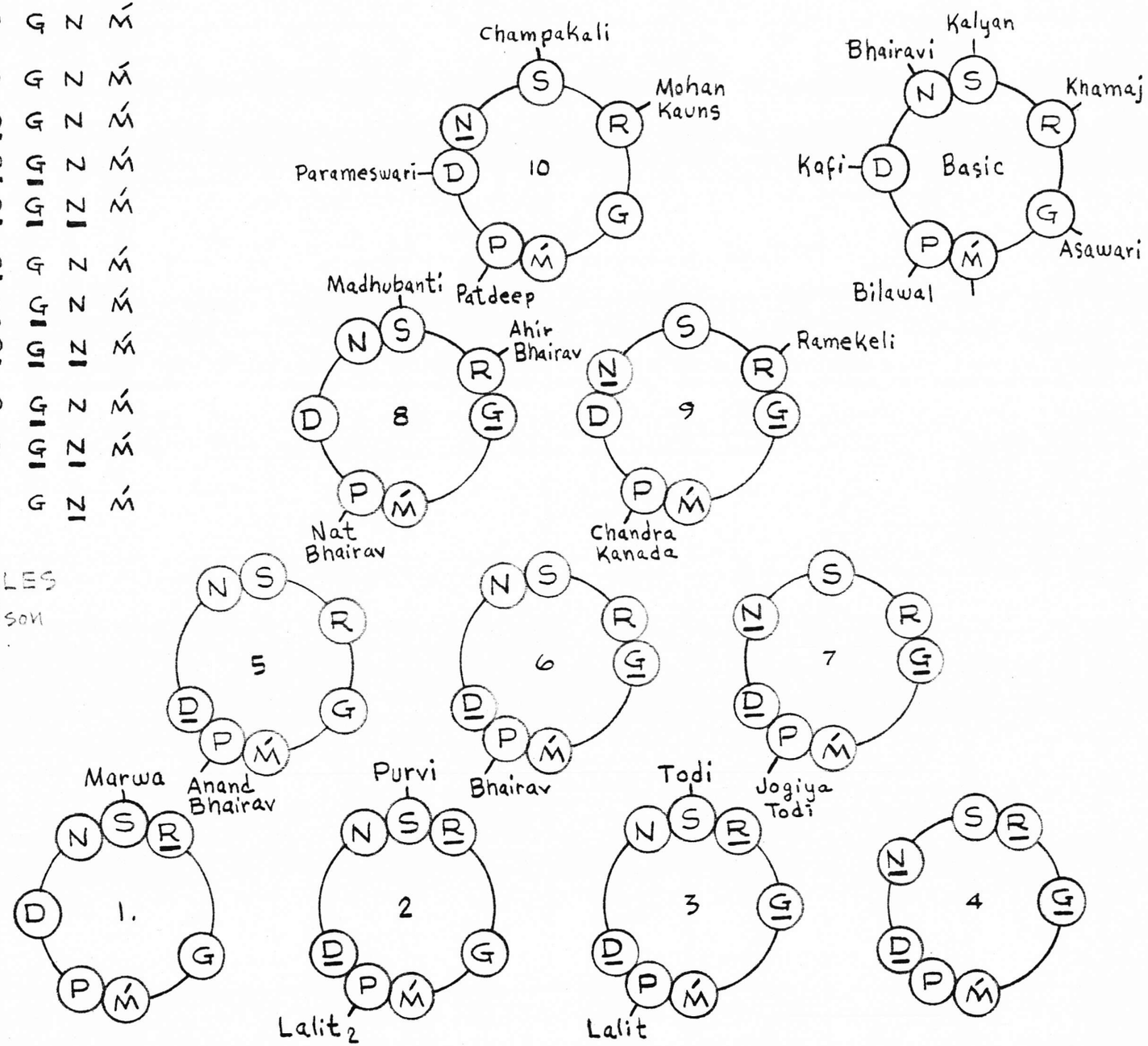
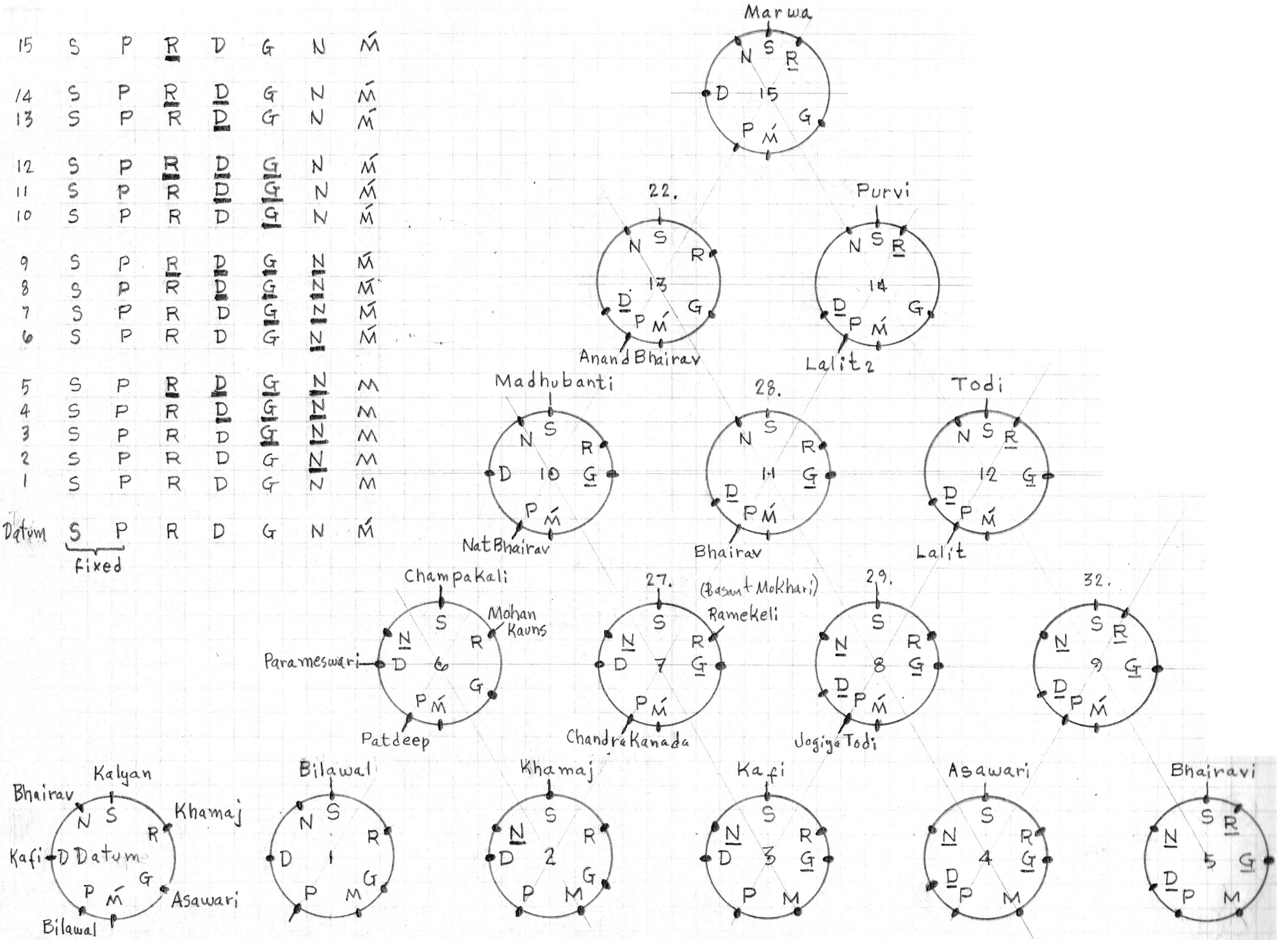


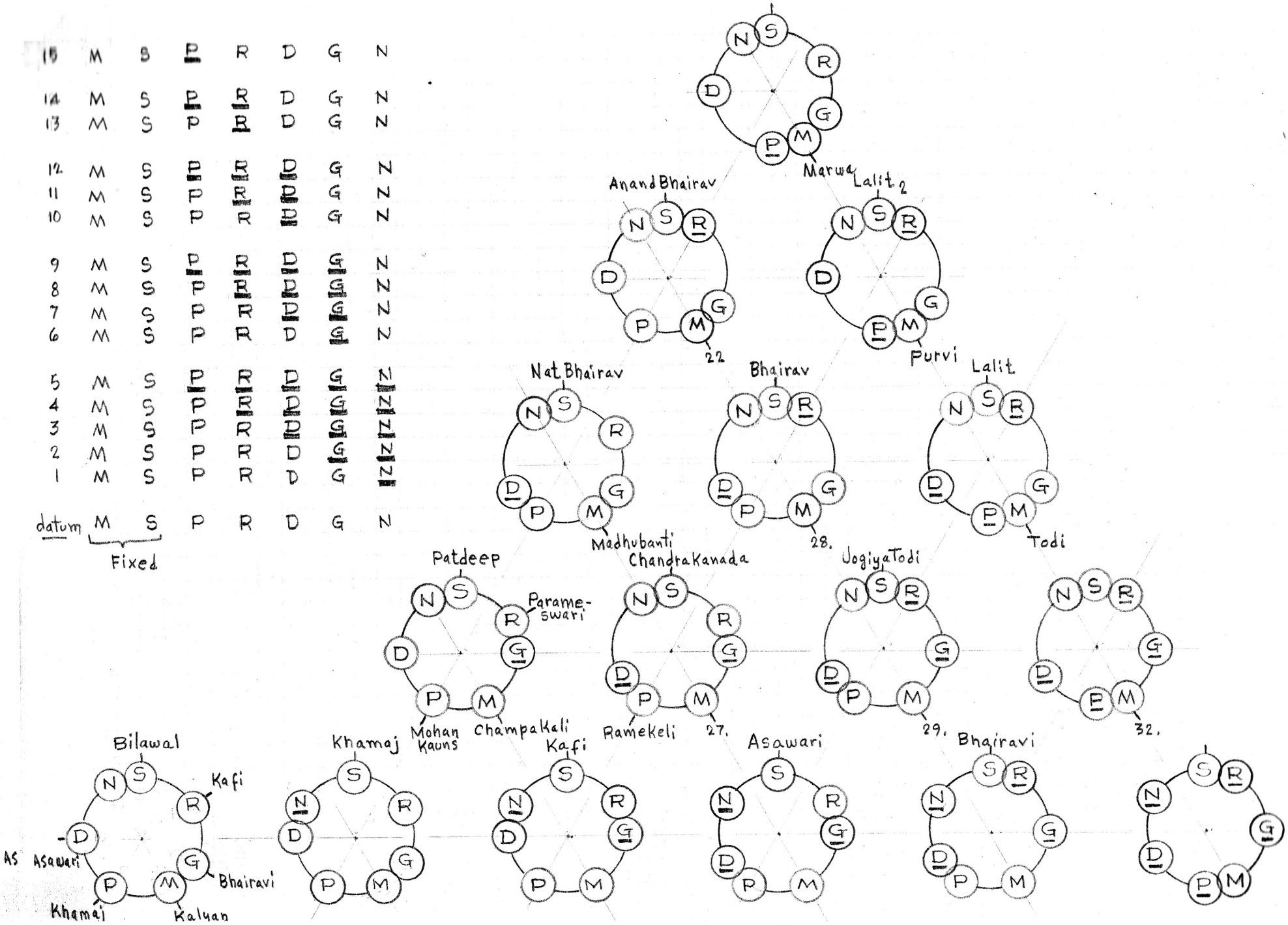
E.W.

15	S	P	R	D	G	N	Ḿ
14	S	P	R	D	G	N	Ḿ
13	S	P	R	D	G	N	Ḿ
12	S	P	R	D	G	N	Ḿ
11	S	P	R	D	G	N	Ḿ
10	S	P	R	D	G	N	Ḿ
9	S	P	R	D	G	N	Ḿ
8	S	P	R	D	G	N	Ḿ
7	S	P	R	D	G	N	Ḿ
6	S	P	R	D	G	N	Ḿ
5	S	P	R	D	G	N	M
4	S	P	R	D	G	N	M
3	S	P	R	D	G	N	M
2	S	P	R	D	G	N	M
1	S	P	R	D	G	N	M
Datum	S	P	R	D	G	N	Ḿ
	fixed						

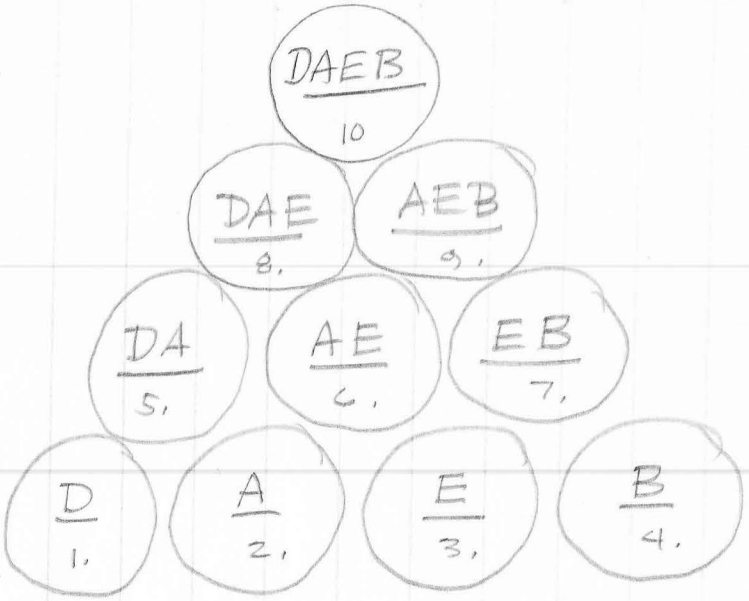


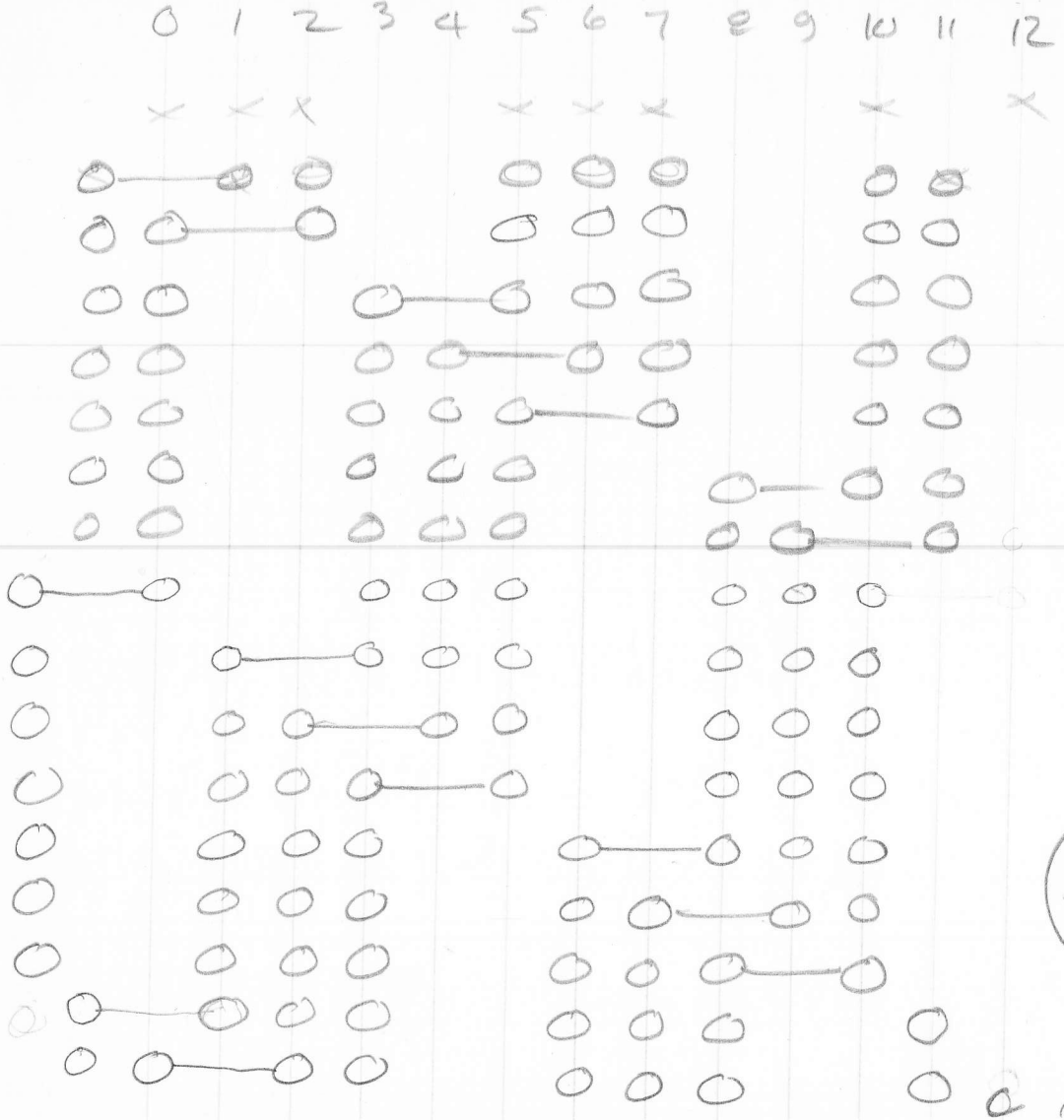
15	M	S	P	R	D	G	N
14	M	S	P	R	D	G	N
13	M	S	P	R	D	G	N
12	M	S	P	R	D	G	N
11	M	S	P	R	D	G	N
10	M	S	P	R	D	G	N
9	M	S	P	R	D	G	N
8	M	S	P	R	D	G	N
7	M	S	P	R	D	G	N
6	M	S	P	R	D	G	N
5	M	S	P	R	D	G	N
4	M	S	P	R	D	G	N
3	M	S	P	R	D	G	N
2	M	S	P	R	D	G	N
1	M	S	P	R	D	G	N
datum	M	S	P	R	D	G	N

Fixed



	0	1	2	3	4	5	6	7	8	9	10	11	12	
	C		D		E		F#	G		A		B	C	BASIC
1.	C	Db			E		F#	G		A		B	C	
2.	C		D		E		F#	G	Ab			B	C	
3.	C		D	Eb			F#	G		A		B	C	
4	C		D		E		F#	G		A	Bb		C	
5.	C	Db			E		F#	G	Ab			B	C	
6.	C		D	Eb			F#	G	Ab			B	C	
7.	C		D	Eb			F#	G		A	Bb		C	
8.	C	Db		Eb			F#	G	Ab			B	C	
9.	C		D	Eb			F#	G	Ab		Bb		C	
10.	C	Db		Eb			F#	G	Ab		Bb		C	

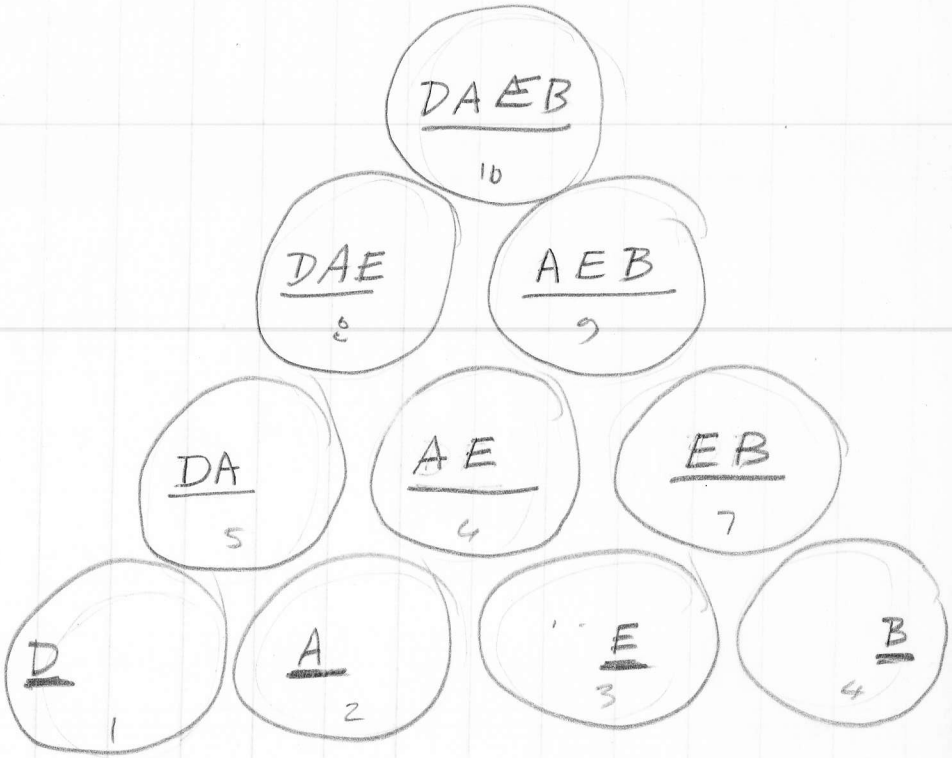




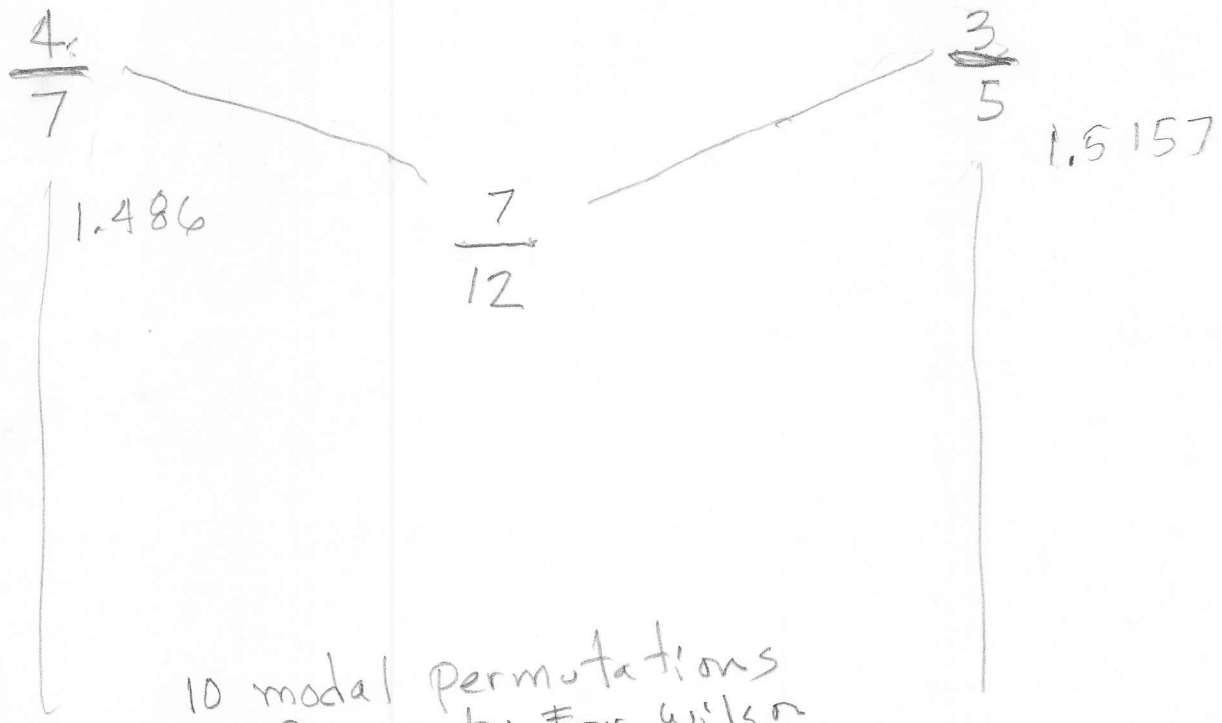
C D E F# G A B C Basic Scale

D E A B Flatable Tones

1 3 2 4



C	1	D	3	E	F#	G		A	B	C
C	D			E	F#	G		A	B	C
C		D		E	F#	G	A		B	C
C		D	E		F#	G		A	B	C
C		D		E	F#	G		A	Bb	C
C	D			E	F#	G	A		B	C
C		D	E		F#	G	A		B	C
C		D	E		F#	G		A	B	C
C	D	D	E		F#	G	A		B	C
C	D		E		F#	G	A		B	C



10 modal permutations
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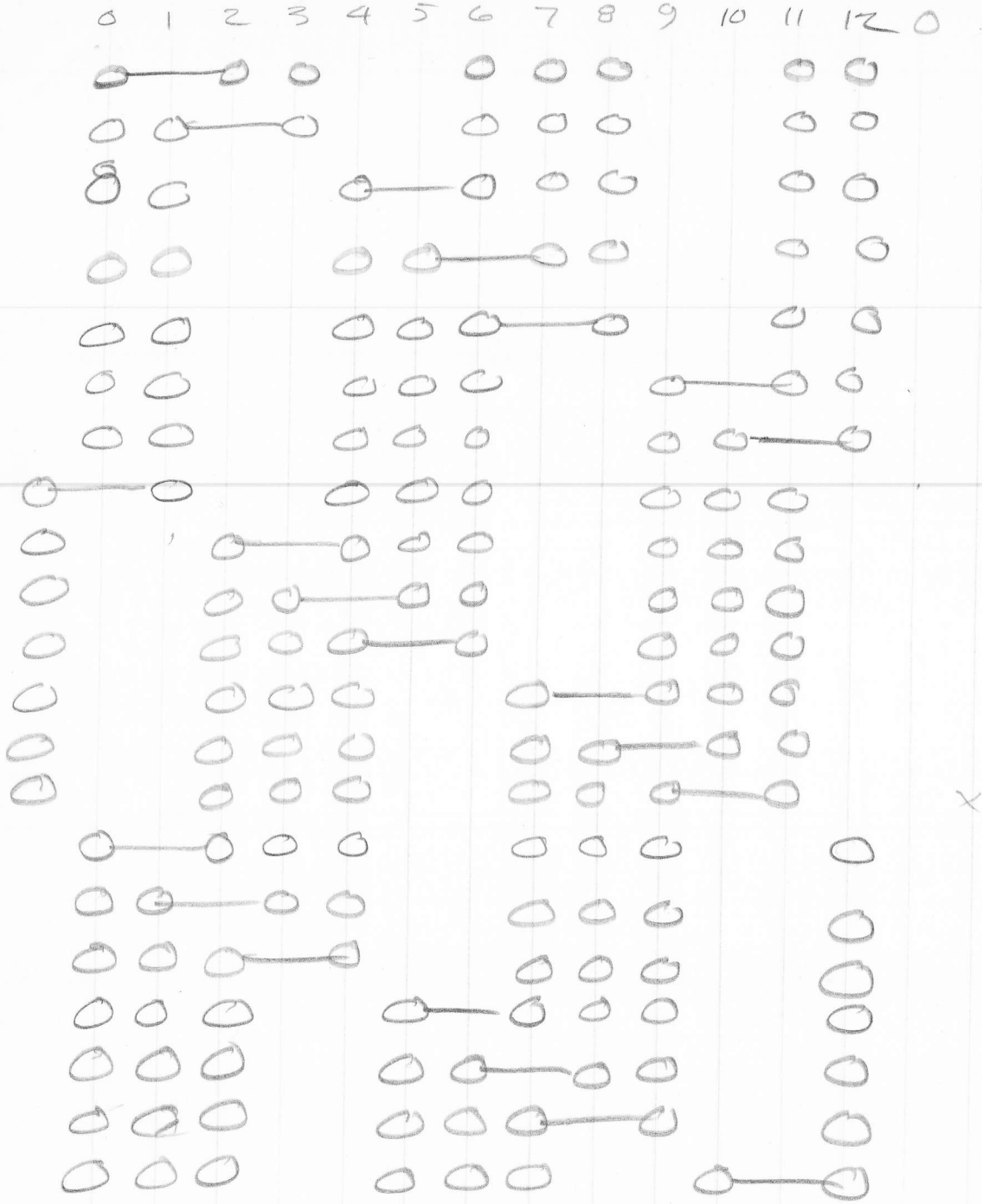
	0	1	2	3	4	5	6	7	8	9	10	11	12/0
	O		O		O		O	O		O		O	O
master	C		D		E		F#	G		A		B	C
	C		D		E		F#	G		A	Bb		C
	C		D	Eb			F#	G		A	Bb		C
4	C		D	Eb			F#	G	Ab		Bb		C
	C	Db		Eb			F#	G	Ab		Bb		C
	C		D	Eb			F#	G		A		B	C
3	C		D	Eb			F#	G	Ab			B	C
	C		D	Eb			F#	G	Ab			B	C
	C	Db		Eb			F#	G	Ab			B	C
2	C		D		E		F#	G	Ab			B	C
	C	Db			E		F#	G	Ab			B	C
1	C	Db			E		F#	G		A		B	C


0 1 2 3 4 5 6 7 8 9 10 11 12 0

10 Most important "Thāts"

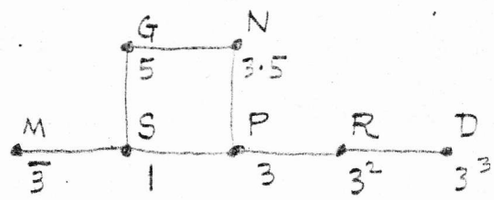
Reference, unpublished notes by Amiya Dasgupta

These are:

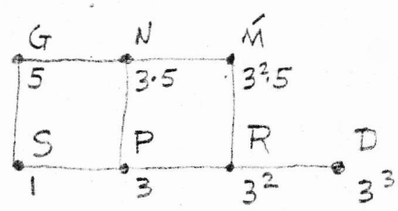
S	R	G	M	P	D	N	Ṡ	1. Bilawal
S	R	G	Ḿ	P	D	N	Ṡ	2. Kalyan
S	R	G	M	P	D	N	Ṡ	3. Khamaj
S	R	G	M	P	D	N	Ṡ	4. Kafi
S	R	G	M	P	D	N	Ṡ	5. Asawari
S	R	G	M	P	D	N	Ṡ	6. Bhairavi
S	R	G	Ḿ	P	D	N	Ṡ	7. Todi
S	R	G	Ḿ	P	D	N	Ṡ	8. Purvi
S	R	G	Ḿ	P	D	N	Ṡ	9. Marva
S	R	G	M	P	D	N	Ṡ	10. Bhairav

In keeping with stated intonational preferences, the following ratios and factorad values may be assigned:

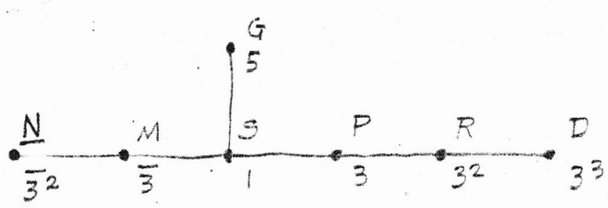
1. Bilawal



2. Kalyan

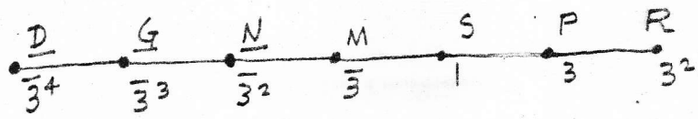


3. Khamaj

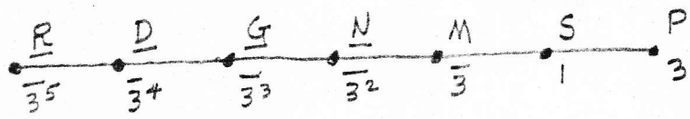


4. Kafi

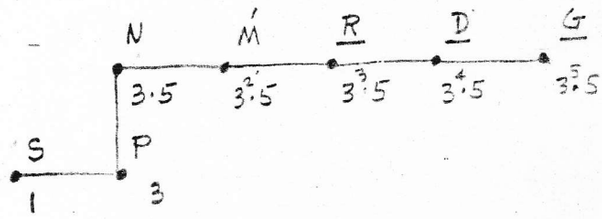
5. Asawri



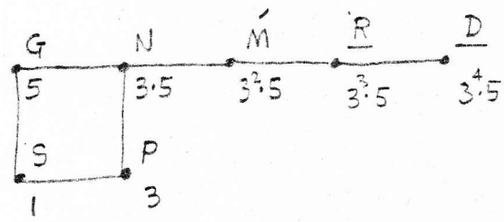
6. Bhairavi



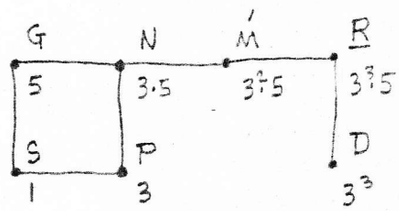
7. Todi



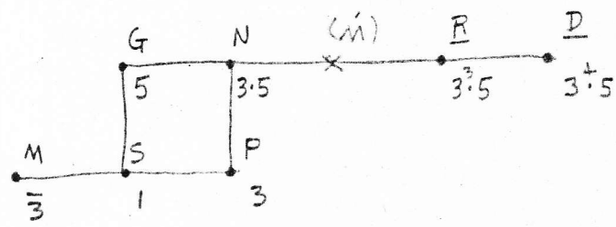
8. Purvi



9. Marwa



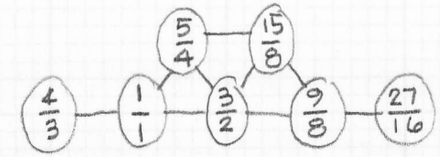
10. Bhairav



0 · · · · · · · 9 · · · 14 · · · · · · 22 · · · · · · · 31 · · · · · · · · 40 · · 44 · · · · · · 53

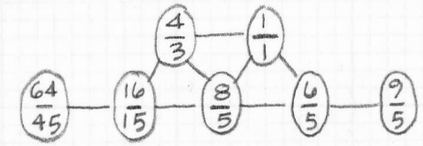
1/1 9/8 5/4 4/3 3/2 27/16 15/8 2/1

1 | 9/8 | 10/9 | 16/15 | (9/8) | 9/8 | 10/9 | 16/15 |



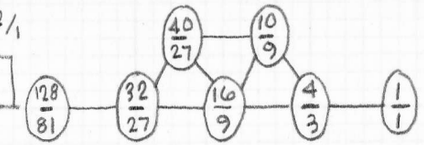
1/1 16/15 6/5 4/3 64/45 8/5 9/5 2/1

2 | 16/15 | 9/8 | 10/9 | 16/15 | (9/8) | (9/8) | 10/9 |



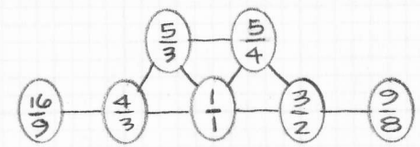
1/1 10/9 32/27 4/3 40/27 128/81 16/9 2/1

3 | 10/9 | 16/15 | 9/8 | 10/9 | 16/15 | (9/8) | 9/8 |



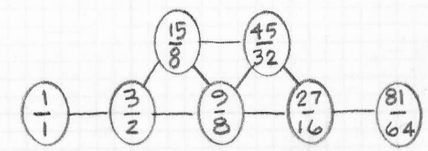
1/1 9/8 5/4 4/3 3/2 5/3 16/9 2/1

4 | 9/8 | 10/9 | 16/15 | 9/8 | 10/9 | 16/15 | 9/8 |



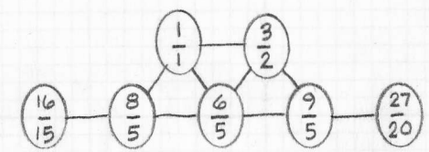
1/1 9/8 81/64 45/32 3/2 27/16 15/8 2/1

5 | 9/8 | 9/8 | 10/9 | 16/15 | 9/8 | 10/9 | 16/15 |



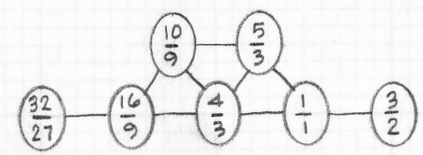
1/1 16/15 6/5 27/20 3/2 8/5 9/5 2/1

6 | 16/15 | 9/8 | 9/8 | 10/9 | 16/15 | 9/8 | 10/9 |



1/1 10/9 32/27 4/3 3/2 5/3 16/9 2/1

7 | 10/9 | 16/15 | 9/8 | 9/8 | 10/9 | 16/15 | 9/8 |



The Murchanas of Basic 12 (Skhisma neglected)

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	1/1	256/243	10/9	32/27	5/4	4/3	45/32	40/27	128/81	5/3	16/9	15/8	2/1
1.	D		N	S		R		G	M		P		D
2.	R		G	M		P		D		N	S		R
3.	P		D		N	S		R		G	M		P
4.	S		R		G	M		P		D		N	S
5.	M		P		D		N	S		R		G	M
6.		N	S		R		G	M		P		D	
7.		G	M		P		D		N	S		R	
8.		D		N	S		R		G	M		P	
9.		R		G	M		P		D		N	S	
10.		P		D		N	S		R		G	M	
11.	N	S		R		G	M		P		D		N
12.	G	M		P		D		N	S		R		G
	1/1	16/15	9/8	6/5	81/64	27/20	729/512	3/2	8/5	27/16	9/5	243/128	2/1

Bilawal Matrix

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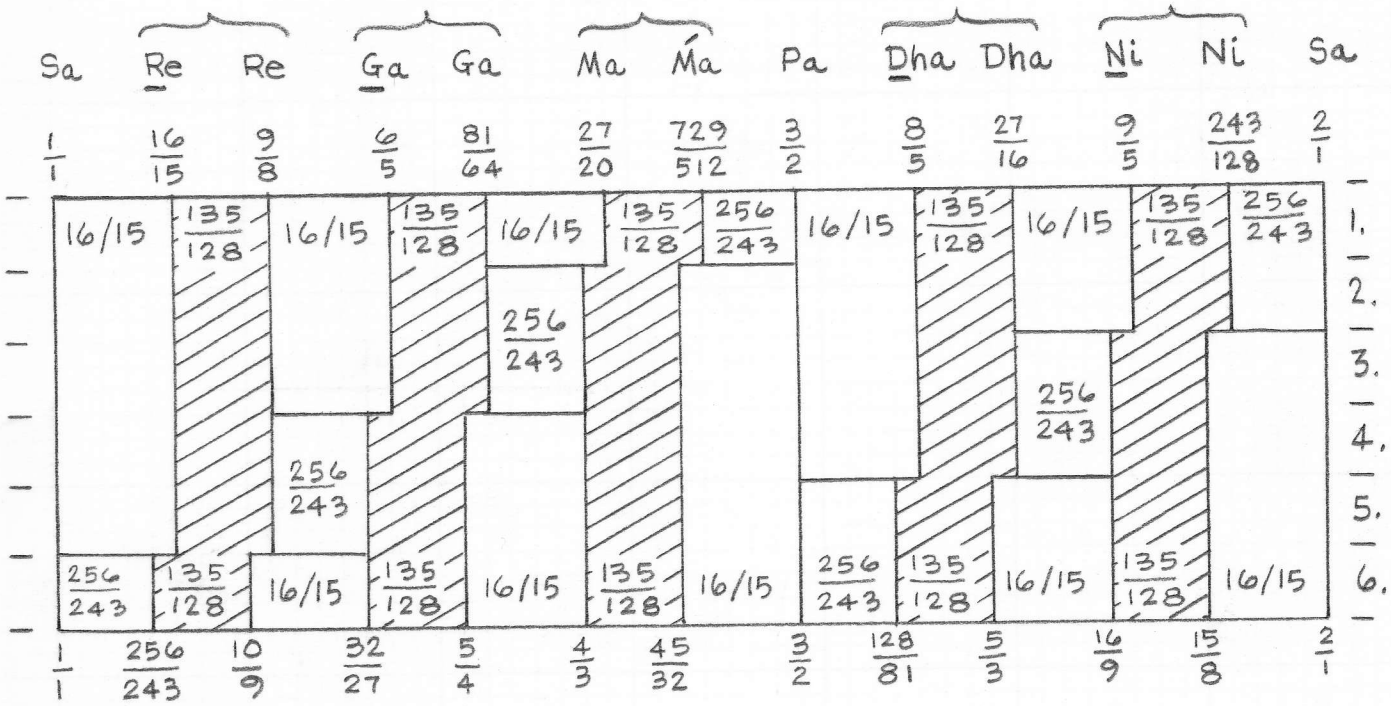

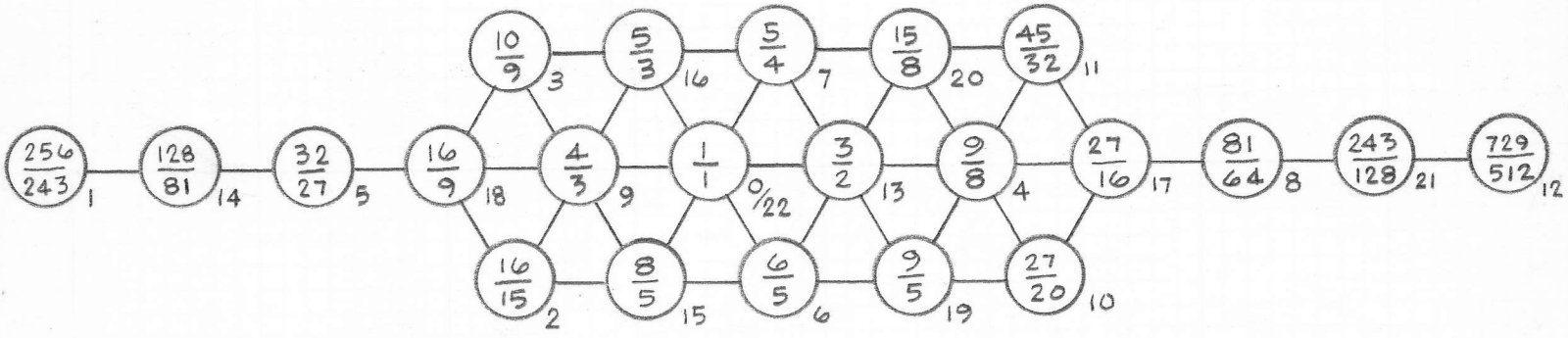

Multani Matrix

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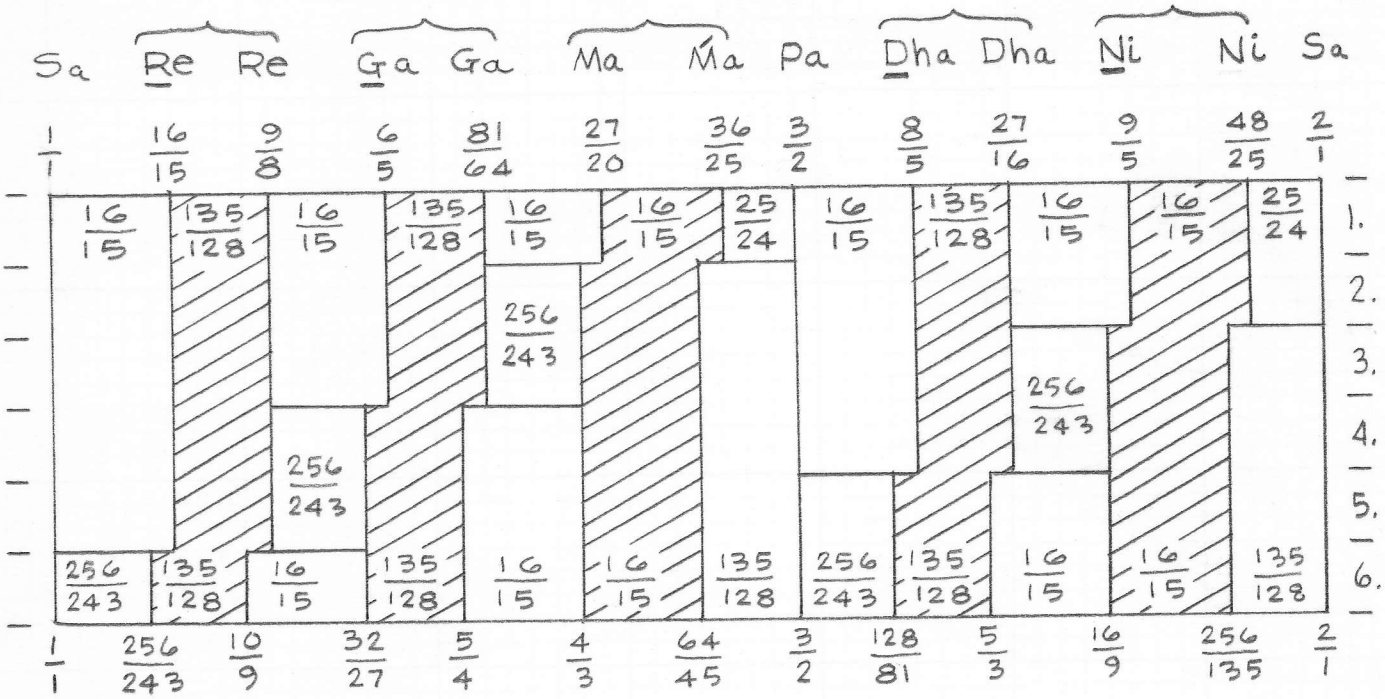

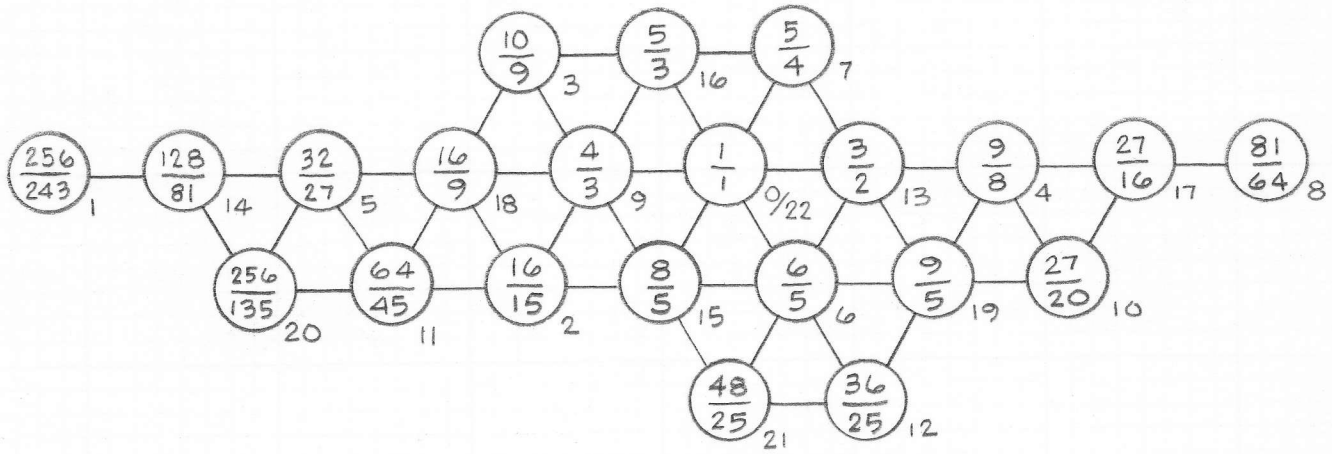

Todi Matrix

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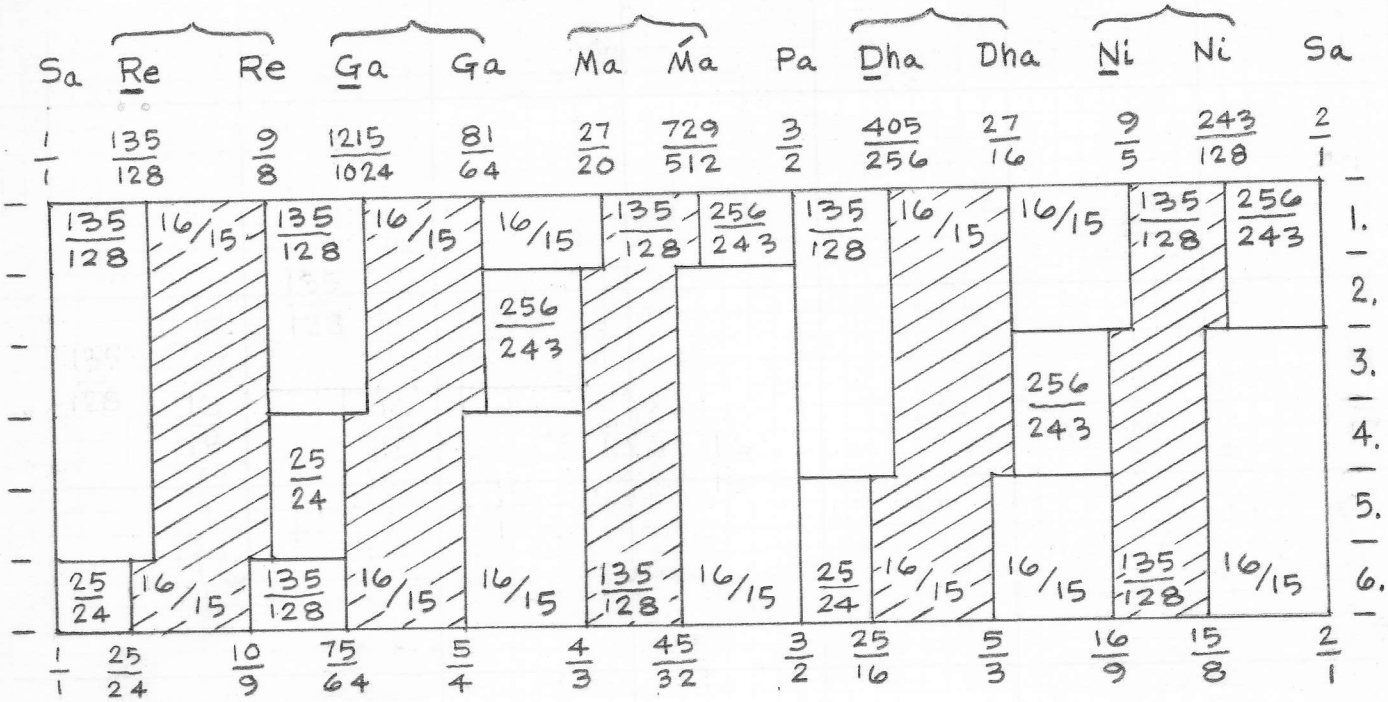
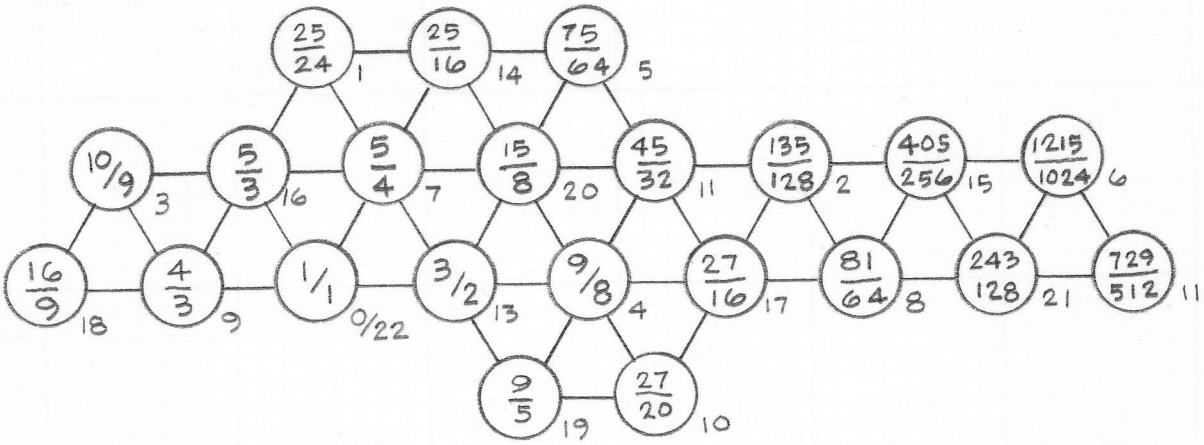
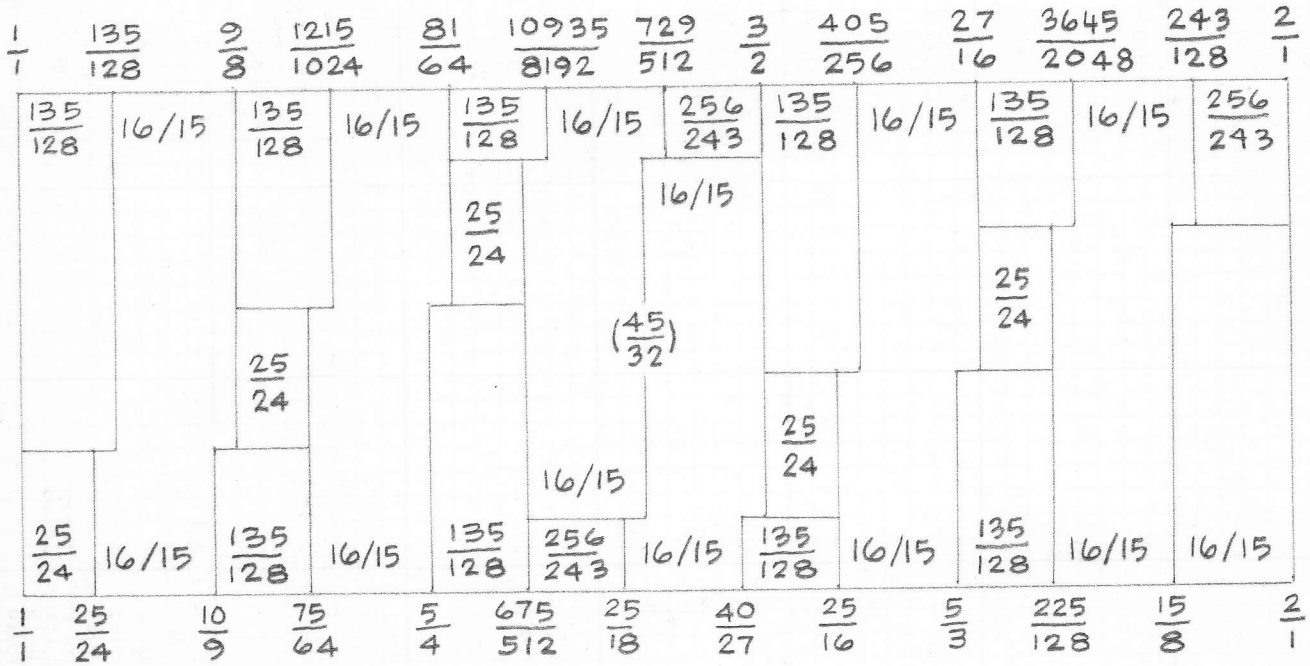
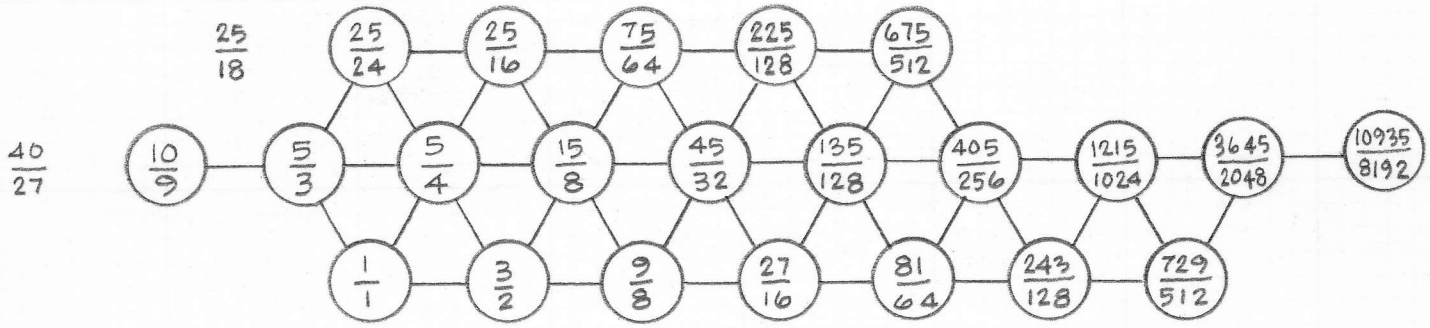
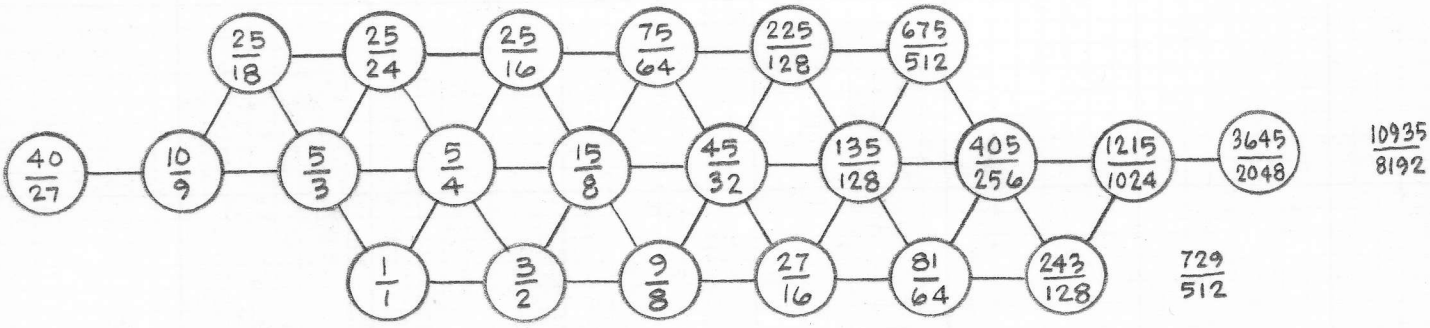


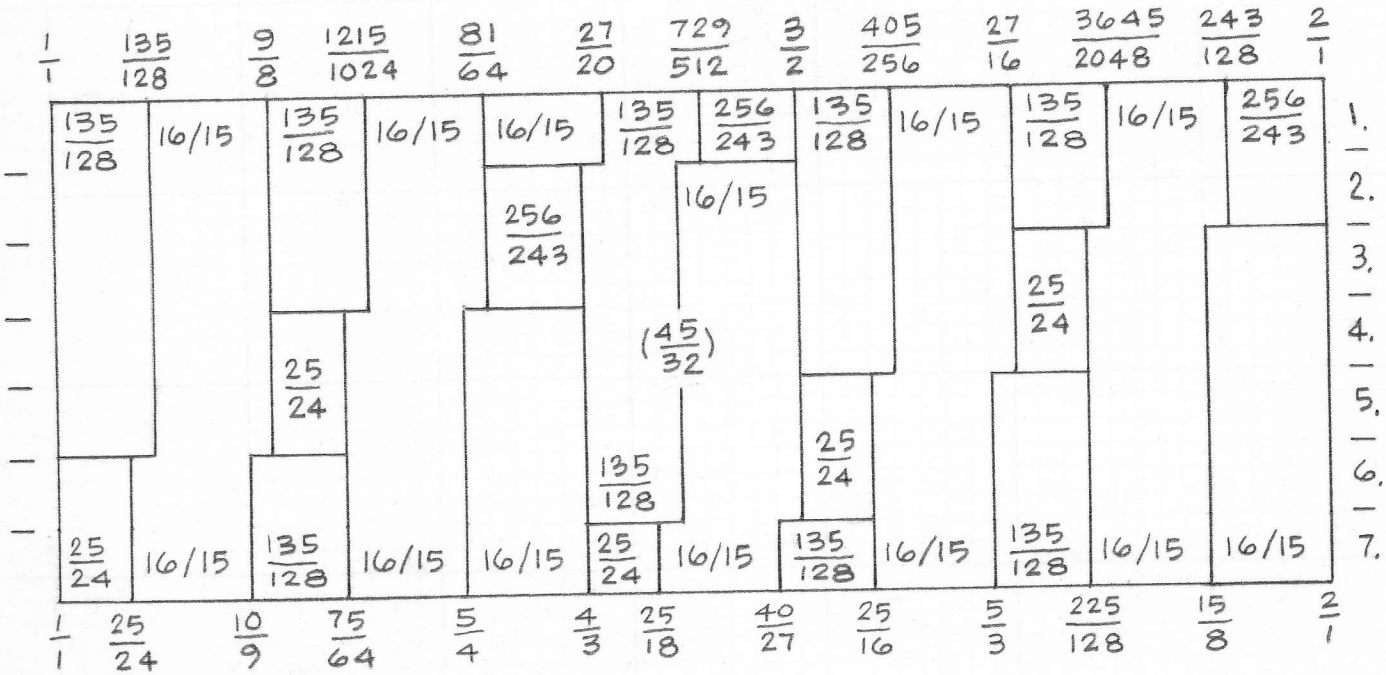


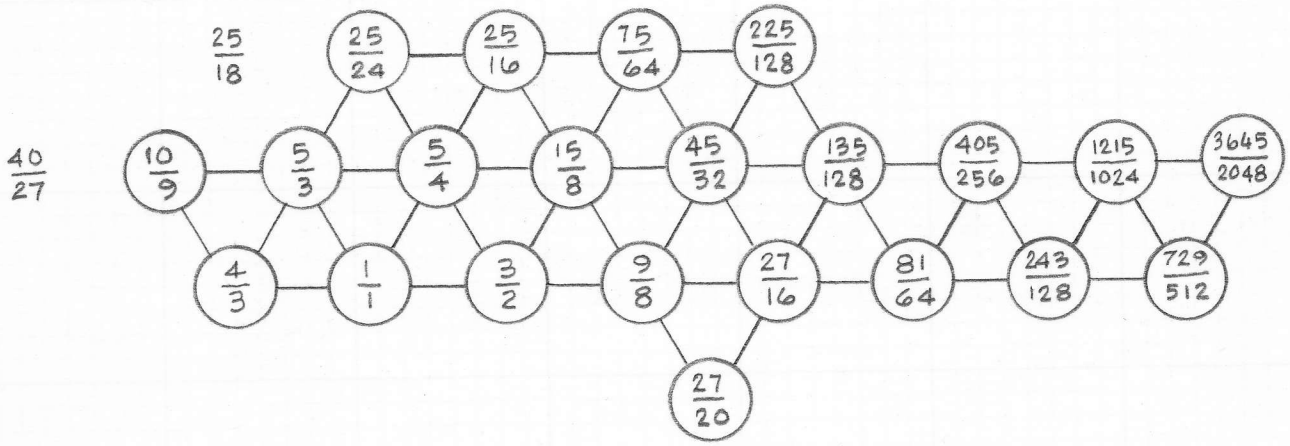
Para "0"

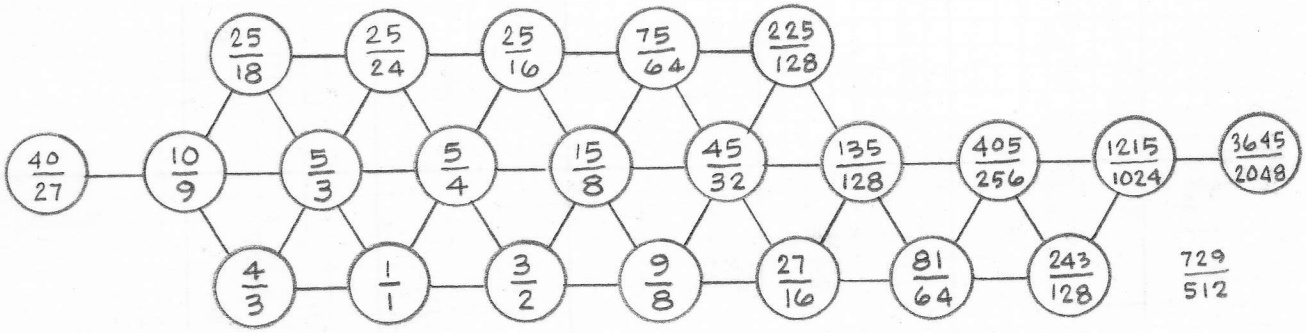

1/1 135/128 9/8 1215/1024 81/64 10935/8192 729/512 3/2 405/256 27/16 3645/2048 243/128 2/1
135/128 16/15 135/128 16/15 135/128 16/15 256/243 135/128 16/15 135/128 16/15 256/243
25/24
16/15
(45/32)
25/24
25/24
16/15
25/24 16/15 135/128 16/15 135/128 256/243 16/15 135/128 16/15 135/128 16/15 16/15
1/1 25/24 10/9 75/64 5/4 675/512 25/18 40/27 25/16 5/3 225/128 15/8 2/1

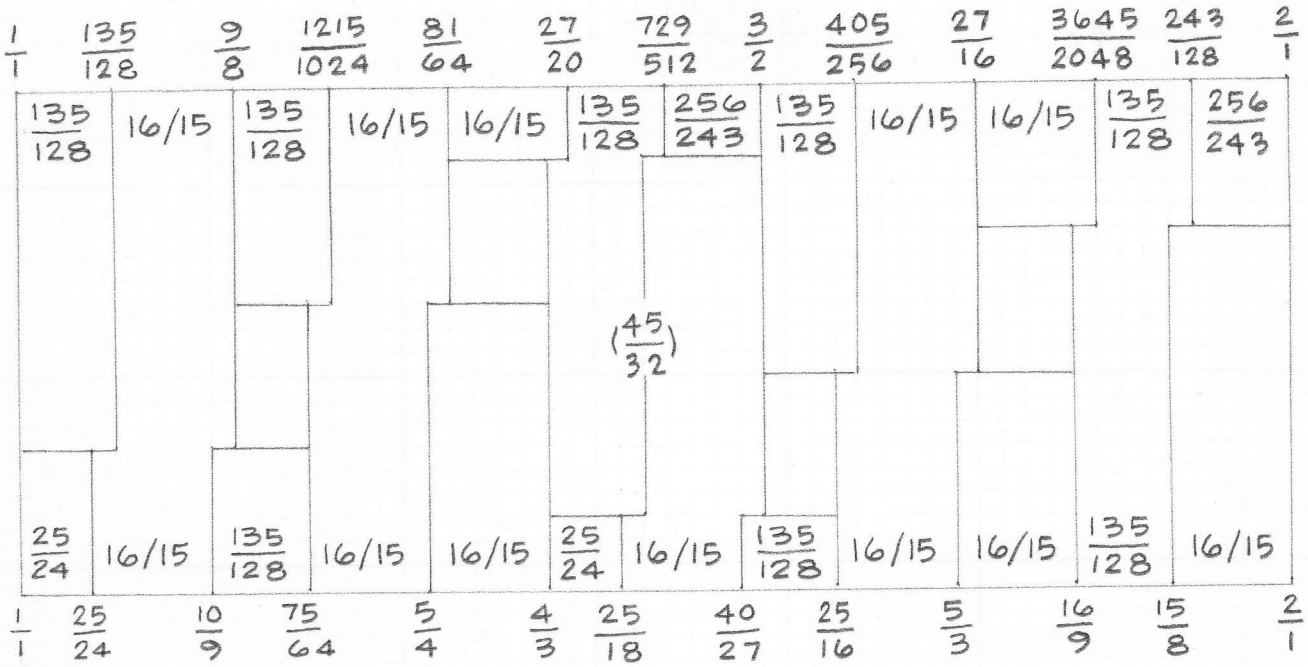

25/18
25/24 25/16 75/64 225/128 675/512
40/27
10/9 5/3 5/4 15/8 45/32 135/128 405/256 1215/1024 3645/2048 10935/8192
1/1 3/2 9/8 27/16 81/64 243/128 729/512

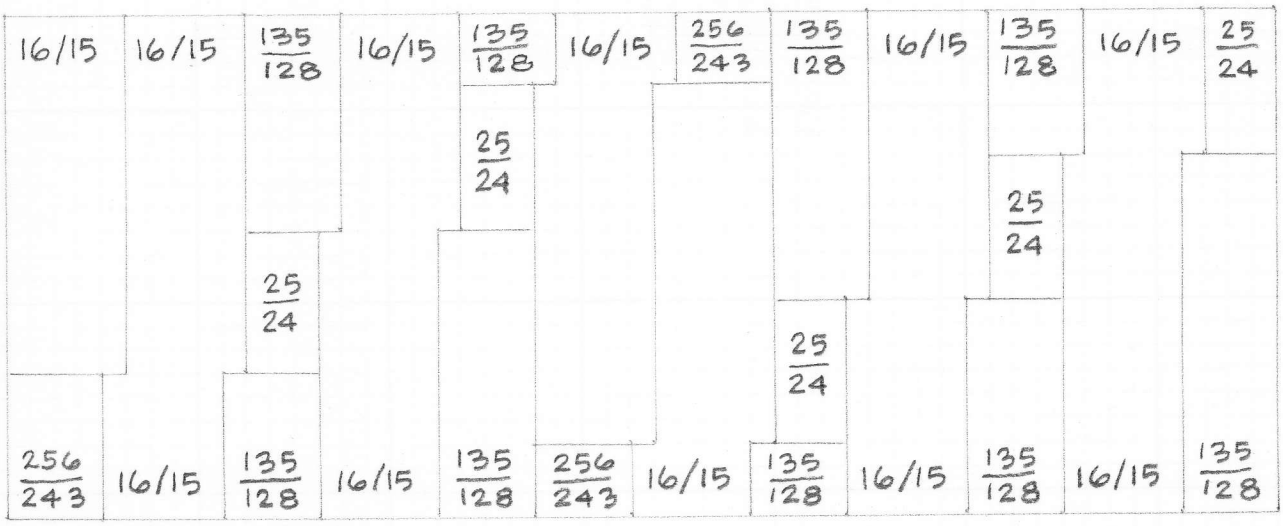

25/18 25/24 25/16 75/64 225/128 675/512
40/27
10/9 5/3 5/4 15/8 45/32 135/128 405/256 1215/1024 3645/2048
10935/8192
1/1 3/2 9/8 27/16 81/64 243/128
729/512


1/1 135/128 9/8 1215/1024 81/64 27/20 729/512 3/2 405/256 27/16 3645/2048 243/128 2/1
135/128 16/15 135/128 16/15 16/15 135/128 256/243 135/128 16/15 135/128 16/15 256/243
256/243 16/15
25/24
(45/32)
25/24
135/128
25/24
25/24 16/15 135/128 16/15 16/15 25/24 16/15 135/128 16/15 135/128 16/15 16/15
1. 2. 3. 4. 5. 6. 7.
1/1 25/24 10/9 75/64 5/4 4/3 25/18 40/27 25/16 5/3 225/128 15/8 2/1


25/18
40/27
25/24 25/16 75/64 225/128
10/9 5/3 5/4 15/8 45/32 135/128 405/256 1215/1024 3645/2048
4/3 1/1 3/2 9/8 27/16 81/64 243/128 729/512
27/20


25/18 25/24 25/16 75/64 225/128
40/27 10/9 5/3 5/4 15/8 45/32 135/128 405/256 1215/1024 3645/2048
4/3 1/1 3/2 9/8 27/16 81/64 243/128
729/512
27/20


1/1
135/128
9/8
1215/1024
81/64
27/20
729/512
3/2
405/256
27/16
3645/2048
243/128
2/1
135/128
16/15
135/128
16/15
16/15
135/128
256/243
135/128
16/15
16/15
135/128
256/243
(45/32)
25/24
16/15
135/128
16/15
16/15
25/24
16/15
135/128
16/15
16/15
135/128
16/15
1/1
25/24
10/9
75/64
5/4
4/3
25/18
40/27
25/16
5/3
16/9
15/8
2/1


16/15
16/15
135/128
16/15
135/128
16/15
256/243
135/128
16/15
135/128
16/15
25/24
25/24
25/24
25/24
25/24
256/243
16/15
135/128
16/15
135/128
256/243
16/15
135/128
16/15
135/128
16/15
135/128

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53

1/1 16/15 9/8 6/5 81/64 27/20 81/56 3/2 8/5 27/16 9/5 243/128 2/1

| | | |

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53

1/1 16/15 9/8 6/5 81/64 27/20 36/25 3/2 8/5 27/16 9/5 243/128 2/1

| | | |

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 51 51 52 53

1/1 135/128 9/8 1215/1024 81/64 10935/8192 729/512 3/2 405/256 27/16 3645/2048 243/128 2/1

25/24	81/80	256/253	81/80	25/24	81/80	256/243	81/80	25/24	81/80	256/243	81/80	256/243	25/24	81/80	256/243	81/80	25/24	81/80	256/243	81/80	256/243	1

1/1 25/24 10/9 75/64 5/4 675/512 45/32 3/2 25/16 5/3 225/128 15/8 2/1

1/1 135/128 9/8 1215/1024 81/64 27/20 729/512 3/2 405/256 27/16 3645/2048 243/128 2/1

25/24	81/80	256/243	81/80	25/24	81/80	256/243	81/80	256/243	81/80	25/24	81/80	256/243	25/24	81/80	256/243	81/80	25/24	81/80	256/243	81/80	256/243	2

1/1 25/24 10/9 75/64 5/4 4/3 45/32 3/2 25/16 5/3 225/128 15/8 2/1

1/1 135/128 9/8 1215/1024 81/64 27/20 729/512 3/2 405/256 27/16 9/5 243/128 2/1

25/24	81/80	256/243	81/80	25/24	81/80	256/243	81/80	256/243	81/80	25/24	81/80	256/243	25/24	81/80	256/243	81/80	256/243	81/80	25/24	81/80	256/243	3

1/1 25/24 10/9 75/64 5/4 4/3 45/32 3/2 25/16 5/3 16/9 15/8 2/1

1/1 135/128 9/8 6/5 81/64 27/20 729/512 3/2 405/256 27/16 9/5 243/128 2/1

25/24	81/80	256/243	81/80	256/243	81/80	25/24	81/80	256/243	81/80	25/24	81/80	256/243	25/24	81/80	256/243	81/80	256/243	81/80	25/24	81/80	256/	4

1/1 25/24 10/9 32/27 5/4 4/3 45/32 3/2 25/16 5/3 16/9 15/8 2

1/1 135/128 9/8 6/5 81/64 27/20 729/512 3/2 8/5 27/16 9/5 243/128 2/1

25/24	81/80	256/243	81/80	256/243	81/80	25/24	81/80	256/243	81/80	25/24	81/80	256/243	256/243	81/80	25/24	81/80	256/243	81/80	25/24	81/80	256/243	5

1/1 25/24 10/9 32/27 5/4 4/3 45/32 3/2 128/81 5/3 16/9 15/8 2/1

1/1 16/15 9/8 6/5 81/64 27/20 729/512 3/2 8/5 27/16 9/5 243/128 2/1

256/243	81/80	25/24	81/80	256/243	81/80	25/24	81/80	256/243	81/80	25/24	81/80	256/243	256/243	81/80	25/24	81/80	256/243	81/80	25/24	81/80	256/243	6

1/1 256/243 10/9 32/27 5/4 4/3 45/32 3/2 128/81 5/3 16/9 15/8 2/1

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53

1/1 21/20 9/8 189/160 81/64 1701/1280 729/512 3/2 63/40 27/16 567/320 243/128 2/1

28/27	81/80	200/189	81/80	28/27	81/80	200/189	81/80	28/27	81/80	200/189	81/80	256/243	28/27	81/80	200/189	81/80	28/27	81/80	200/189	81/80	256/243	1

1/1 28/27 10/9 7/6 5/4 21/16 × 45/32 3/2 14/9 5/3 7/4 15/8 2/1

1/1 21/20 9/8 189/160 81/64 27/20 729/512 3/2 63/40 27/16 567/320 243/128 2/1

28/27	81/80	200/189	81/80	28/27	81/80	200/189	81/80	256/243	81/80	25/24	81/80	256/243	28/27	81/80	200/189	81/80	28/27	81/80	200/189	81/80	256/243	2

1/1 28/27 10/9 7/6 5/4 4/3 45/32 3/2 14/9 5/3 7/4 × 9/5 15/8 2/1

1/1 21/20 9/8 189/160 81/64 27/20 729/512 3/2 63/40 27/16 9/5 243/128 2/1

28/27	81/80	200/189	81/80	28/27	81/80	200/189	81/80	246/243	81/80	25/24	81/80	256/243	28/27	81/80	200/189	81/80	256/243	81/80	25/24	81/80	256/243	3

1/1 28/27 10/9 7/6 5/4 4/3 45/32 3/2 14/9 5/3 16/9 15/8 2/1

1/1 21/20 9/8 × 6/5 81/64 27/20 729/512 3/2 63/40 27/16 9/5 243/128 2/1

28/27	81/80	200/189	81/80	256/243	81/80	25/24	81/80	256/243	81/80	25/24	81/80	256/243	28/27	81/80	200/189	81/80	256/243	81/80	25/24	81/80	256/243	4

1/1 28/27 10/9 32/27 5/4 4/3 45/32 3/2 14/9 × 8/5 16/9 15/8 2/1

1/1 21/20 9/8 6/5 81/64 27/20 729/512 3/2 27/16 9/5 243/128 2/1

28/27	81/80	200/189	81/80	256/243	81/80	25/24	81/80	256/243	81/80	25/24	81/80	256/243	256/243	81/80	25/24	81/80	256/243	81/80	25/24	81/80	256/243	

1/1 28/27 × 16/15 10/9 32/27 5/4 4/3 45/32 3/2 128/81 5/3 16/9 15/8 2/1

1/1 9/8 6/5 81/64 27/20 729/512 3/2 8/5 27/16 9/5 243/128 2/1

256/243	81/80	25/24	81/80	256/243	81/80	25/24	81/80	256/243	81/80	25/24	81/80	256/243	256/243	81/80	25/24	81/80	256/243	81/80	25/24	81/80	256/243	

1/1 256/243 10/9 32/27 5/4 4/3 45/32 × 3/2 128/81 5/3 16/9 15/8 2/1

0 9 13 22 31 40 44 52

1/1 135/128 Bhairav 5/4 4/3 3/2 405/256 15/8 2/1

135/128	32/27	16/15	9/8	135/128	32/27	16/15
2	5	2	4	2	5	2

Shree

1/1 256/243 5/4 36/25 3/2 128/81 48/25 2/1

256/243	1215/1024	144/125	25/24	256/243	243/200	25/24
1	6	5	1	1	7	1

1/1 Darbari Kanada 9/8 7/6 4/3 3/2 14/9 7/4 2/1

9/8	28/27	8/7	9/8	28/27	9/8	8/7
4	1	4	4	1	4	4

Scale has all harmonics of Sa thru the 10th harmonic

1/1 Jhinjoti 9/8 5/4 4/3 3/2 5/3 7/4 2/1

9/8	10/9	16/15	9/8	10/9	21/20	8/7
4	3	2	4	3	2 or	4
					16/15	9/8
					2	4

Ahir Bhairav

1/1 135/128 5/4 4/3 3/2 5/3 7/4 16/9 2/1

135/128	32/27	16/15	9/8	10/9	21/20	8/7
2	5	2	4	3	2	4

21/20 25/21

Multani } Todi }

1/1 256/243 32/27 murchana of Dha 64/45 3/2 128/81 256/135 2/1

256/243	9/8	6/5	135/128	256/243	6/5	135/128
1	4	6	2	1	6	2

not used

0 1 9 13 22 31 40 44 53

1/1 Khamaj 9/8 5/4 4/3 3/2 27/16 16/9 2/1

9/8	10/9	16/15	9/8	9/8	256/243	9/8
					9/8	256/243

~~246/128~~ 243/128

1/1 Rageshree 9/8 5/4 4/3 ~~3/2~~ 5/3 16/9 2/1

9/8	10/9	16/15	9/8	~~10/9~~	16/15	9/8

5/4

1/1 Bhimpalasi 10/9 32/27 4/3 3/2 5/3 16/9 2/1

10/9	16/15	9/8	9/8	10/9	16/15	9/8

1/1 Bageshree 10/9 32/27 4/3 3/2 5/3 16/9 2/1

10/9	16/15	9/8	9/8	10/9	16/15	9/8

1/1 Malkauns 32/27 4/3 128/81 16/9 2/1

32/27	9/8	32/27	9/8	9/8

1/1 Miya-ki-malhar 9/8 32/27 4/3 3/2 5/3 16/9 2/1

9/8	256/243	9/8	9/8	10/9	16/15	9/8
					9/8	16/15

15/8

1/1 Basant Mukhari 135/128 5/4 4/3 3/2 128/81 16/9 2/1

135/128	32/27	16/15	9/8	256/243	9/8	9/8

(256/243) (1215/1024)

This tone functions in 2 senses, 2 cents apart!

0 9 13 22 31 40 44 53

1/1 Kalyan (Hindol) 9/8 5/4 10/7 3/2 5/3 40/21 2/1

9/8	10/9	8/7	21/20	10/9	8/7	21/20
4	3	4	2	3	4	2

1/1 Kalyan (Basic) 9/8 5/4 45/32 3/2 5/3 15/8 2/1

9/8	10/9	9/8	16/15	10/9	9/8	16/15
4	3	4	2	3	4	2

old & present

1/1 Kafi 10/9 32/27 4/3 3/2 5/3 16/9 2/1

10/9	16/15	9/8	9/8	10/9	16/15	9/8

1/1 135/128 Purvi 5/4 45/32 3/2 405/256 15/8 2/1

135/128	32/27	9/8	16/15	135/128	32/27	16/15

1/1 135/128 Marwa 5/4 45/32 3/2 5/3 15/8 2/1

135/128	32/27	9/8	16/15	10/9	9/8	16/15

32/27

1/1 135/128 Lalit 1 (Todi Ma) 5/4 4/3 45/32 405/256 15/8 2/1

135/128	32/27	16/15	135/128	9/8	32/27	16/15

1/1 Lalit 2 (Purvi ma) 5/3 2/1

135/128	32/27	16/15	135/128	32/27	9/8	16/15

0 9 13 22 31 40 44 53

Nat Bhairav

1/1 9/8 5/4 4/3 3/2 405/256 243/128 2/1

9/8	10/9	16/15	9/8	135/128	6/5	256/243

Pat Deep

1/1 9/8 32/27 4/3 3/2 27/16 243/128 2/1

9/8	256/243	9/8	9/8	9/8	9/8	256/243

Sudh Sarang

1/1 9/8 729/512 3/2 243/128 2/1

9/8	81/64	256/243	81/64	256/243		
	32/27	9/8	9/8	9/8		

4/3 27/16

Puriya Dhanashree

1/1 135/128 5/4 45/32 3/2 405/256 243/128 2/1

135/128	32/27	9/8	16/15	135/128	6/5	256/243

Puriya Kalyan

1/1 135/128 5/4 45/32 3/2 27/16 243/128 2/1

135/128	32/27	9/8	16/15	9/8	9/8	256/243

Puriya

1/1 135/128 5/4 45/32 27/16 243/128 2/1

135/128	32/27	9/8	6/5	9/8	256/243

Megh

1/1 9/8 4/3 3/2 16/9 2/1

9/8	32/27	9/8	32/27	9/8

0 9 13 22 31 40 44 53

1/1 Murchana of Bhairav 9/8 1215/1024 45/32 3/2 405/256 15/8 2/1

9/8	135/128	32/27	16/15	135/128	32/27	16/15

1/1 135/128 Proto-Todi 1215/1024 45/32 3/2 405/256 15/8 2/1

135/128	9/8	32/27	16/15	135/128	32/27	16/15

Purvi 5/4

135/128	32/27	9/8	16/15	135/128	32/27	16/15

Bhairav 4/3

135/128	32/27	16/15	9/8	135/128	32/27	16/15

25/24 25/24

Lalit1 45/32

135/128	32/27	16/15	135/128	9/8	32/27	16/15

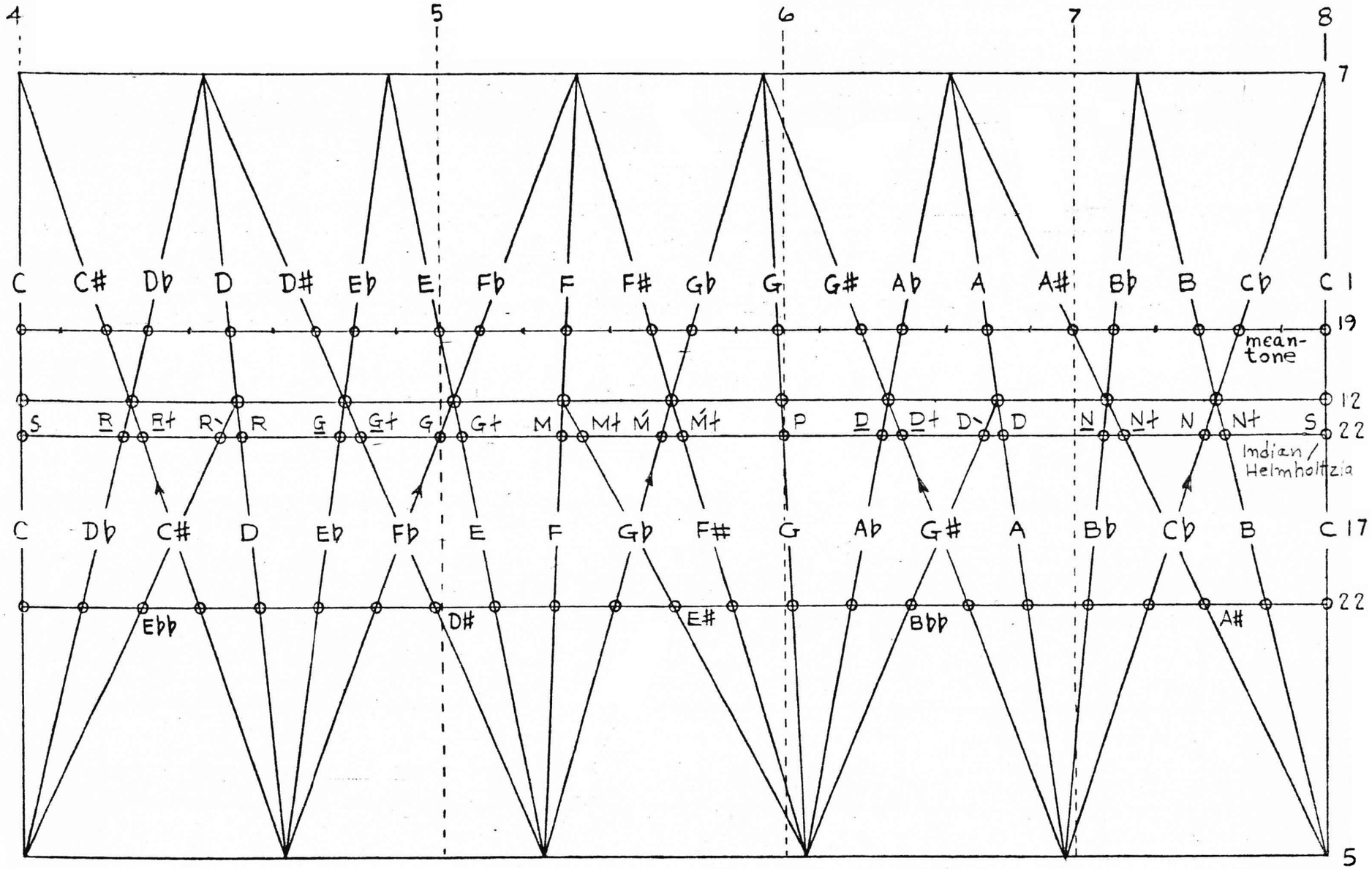
Lalit2 5/3

135/128	32/27	16/15	135/128	32/27	9/8	16/15

Murchana Bhairav 16/9

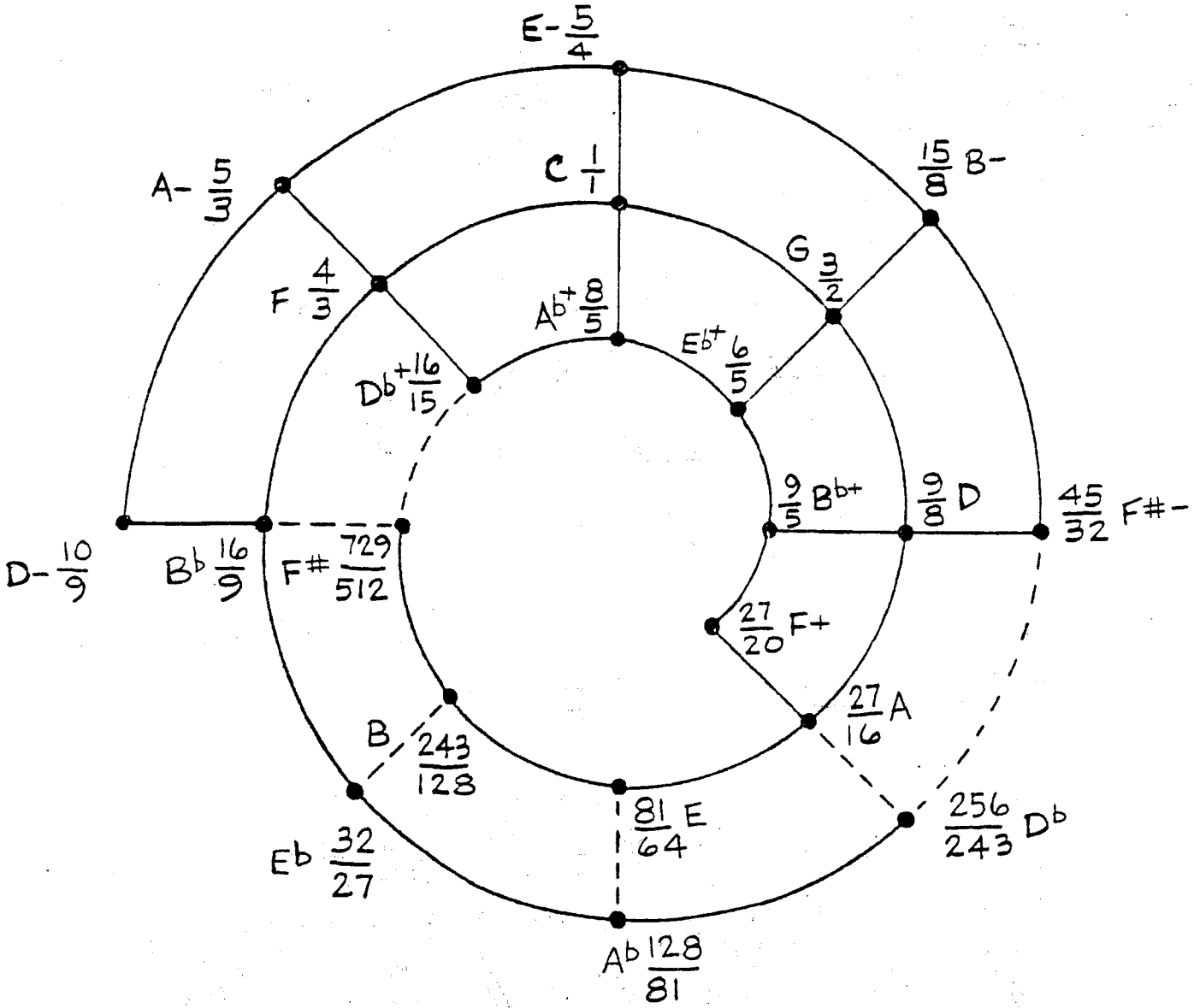
135/128	32/27	16/15	135/128	32/27	16/15	9/8

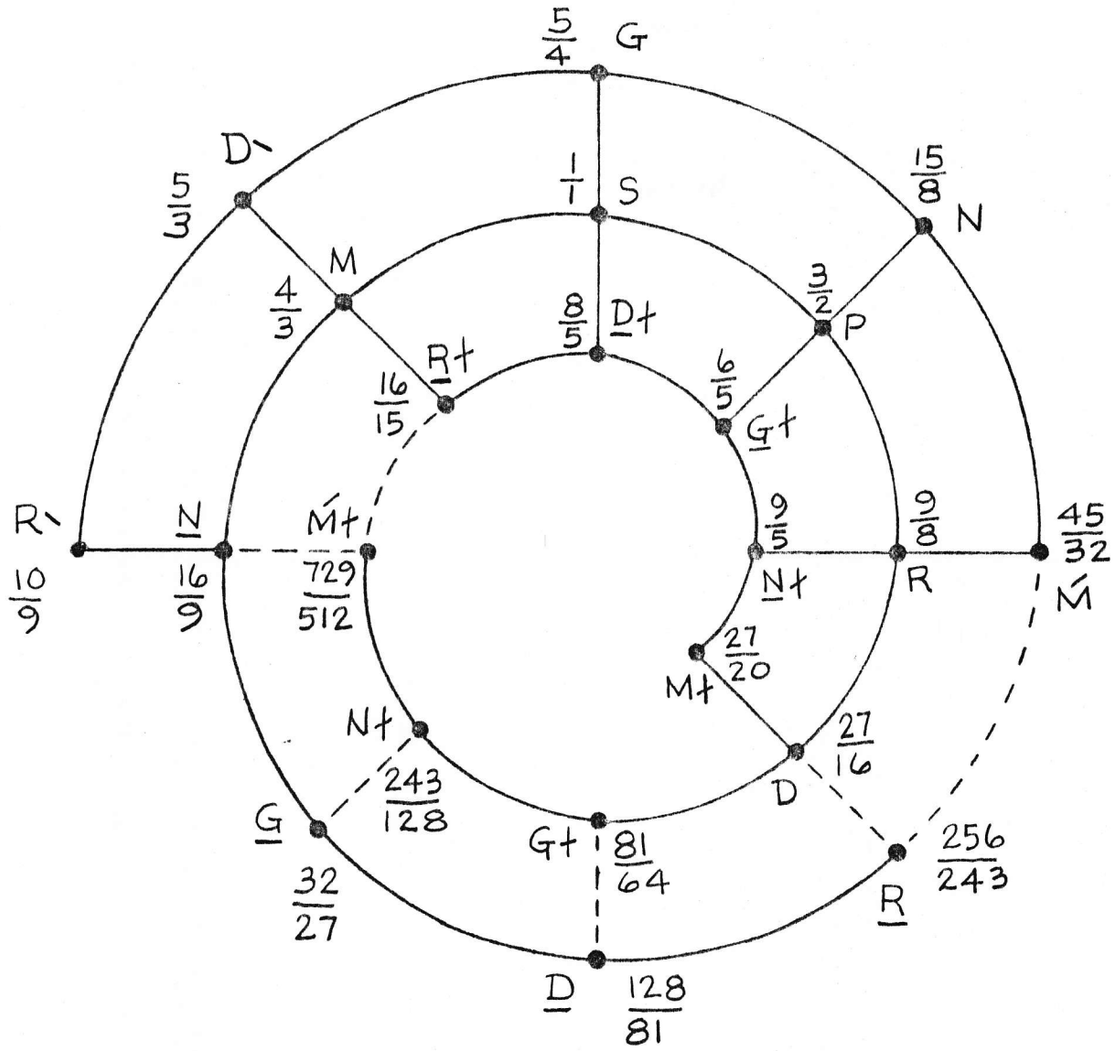
240 24 24 27


4
5
6
7
8
7
C C# D♭ D D# E♭ E F♭ F F# G♭ G G# A♭ A A# B♭ B C♭ C 1
19
mean-tone
12
S R R+ R` R G G+ G G+ M M+ Ḿ Ḿ+ P D D+ D` D N N+ N N+ S
22
Indian / Helmholtzia
C D♭ C# D E♭ F♭ E F G♭ F# G A♭ G# A B♭ C♭ B C 17
22
E♭♭
D#
E#
B♭♭
A#
5

22-tone Spiral lattice

© Erv Wilson 1985




5/4 G
D`
5/3
1/1 S
15/8 N
M
4/3
8/5 Dt
3/2 P
Rt
16/15
6/5 Gt
R`
10/9
N
16/9
Mt
729/512
9/5
9/8
45/32
Nt
R
M`
27/20
Mt
Nt
243/128
27/16
D
G
32/27
Gt
81/64
256/243
R
D
128/81

11 June 2003, Wednesday

Kraig,

This juxtaposes a Bosanquet generalized keyboard over an 8×8 Lambdoma Grid, And shows the confluence of 22, 41, (and 46, which has 5 243/242 epimoria).

Obviously this multiplies the applications of the Lambdoma Keyboard – If the ratios are retuneable at will by the user?

This may be posted on Anaphoria If you choose. Erv Wilson

The 22-Tone Scale of India*, Shown on 8×8 Lambdoma Grid, Modulo 41

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22-Tone Scale

+25 81/52 26.	+20 18/11 29.	+15 12/7 32.	+10 9/5 35.	+5 243/128 38.	+0 1/1 0/41.	-5 256/243 3.	-10 10/9 6.
+23 243/176 19.	+18 81/56 22.	+13 32/21 25.	+8 8/5 28.	+3 27/16 31.	-2 16/9 34.	-7 15/8 37.	-12 63/32 40.
+21 27/22 12.	+16 9/7 15.	+11 27/20 18.	+6 729/512 21.	+1 3/2 24.	-4 128/81 27.	-9 5/3 30.	-14 7/4 33.
+19 12/11 5.	+14 8/7 8.	+9 6/5 11.	+4 81/64 14.	-1 4/3 17.	-6 45/32 20.	-11 189/128 23.	-16 14/9 26.
+17 27/14 39.	+12 64/63 1.	+7 16/15 4.	+2 9/8 7.	-3 32/27 10.	-8 5/4 13.	-13 21/16 16.	-18 11/8 19.
+15 12/7 32.	+10 9/5 35.	+5 243/128 38.	+0 1/1 41/0.	-5 256/243 3.	-10 10/9 6.	-15 7/6 9.	-20 11/9 12.
+13 32/21 25.	+8 8/5 28.	+3 27/16 31.	-2 16/9 34.	-7 15/8 37.	-12 63/32 40.	-17 28/27 2.	-22 88/81 5.
+11 27/20 18.	+6 729/512 21.	+1 3/2 24.	-4 128/81 27.	-9 5/3 30.	-14 7/4 33.	-19 11/6 36.	-24 52/27 39.

Ref.* South Indian Music, Book IV p95-97, P. Sambamoorthy, University of Madras 1954

X

11Jun03·EW

41-tone 0/41 3. 7. 10. 14. 17. 21. 24.

22-Tone ① ① ① (88/81) ① ① ① (11/9) ① ① ① (243/176) ① ① ①

Ratio 1/1 64/63 28/27 256/243 16/15 12/11 10/9 9/8 8/7 7/6 32/27 6/5 27/22 5/4 81/64 9/7 21/16 4/3 27/20 11/8 45/32 729/512 81/56 189/128 3/2 → continued

24. 27. 31. 34. 38. 41/0. ← 41-Tone Scale

① ① ① ① ① ① ① ① ① ① ← 22-Tone Scale ①

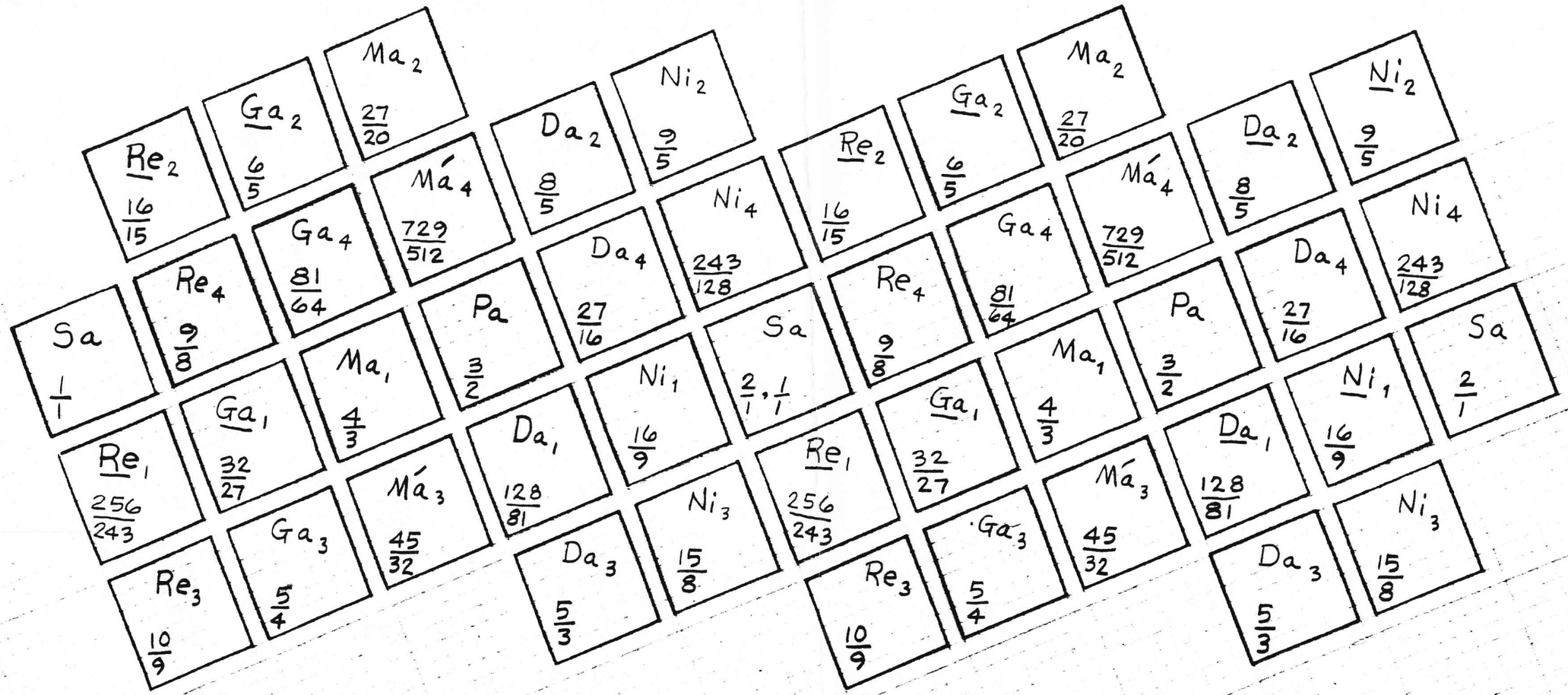
Continue → 3/2 32/21 14/9 128/81 8/5 18/11 5/3 27/16 12/7 7/4 16/9 9/5 11/6 15/8 243/128 27/14 63/32 2/1

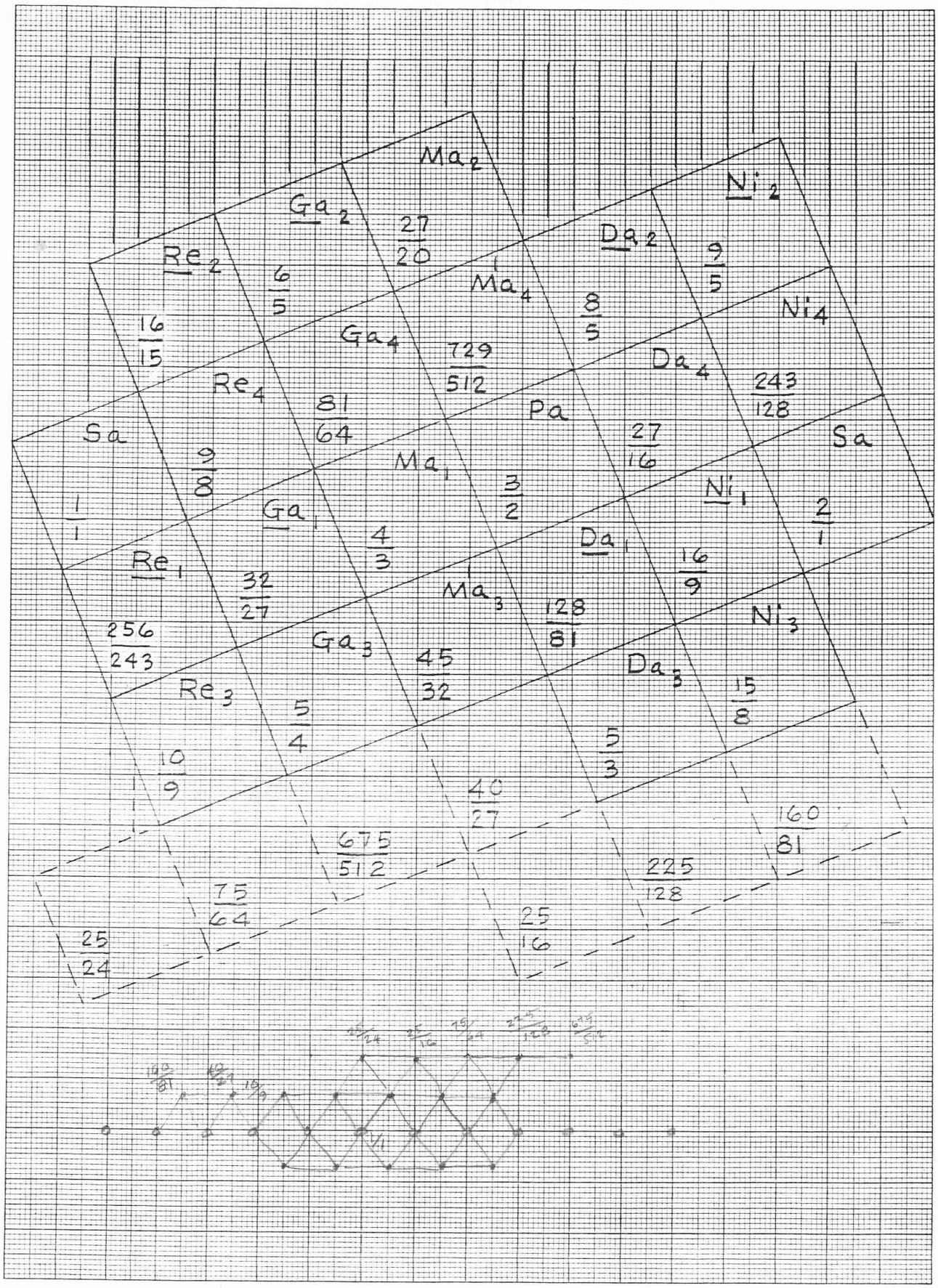
Note:
The epimore 243/242 results 5 times with the alternate ratios in ( ) → (44/27) X (81/44) ← alternate ratios, 5 places.

Harmonium Keyboard (#2) for 22-Tone Scale

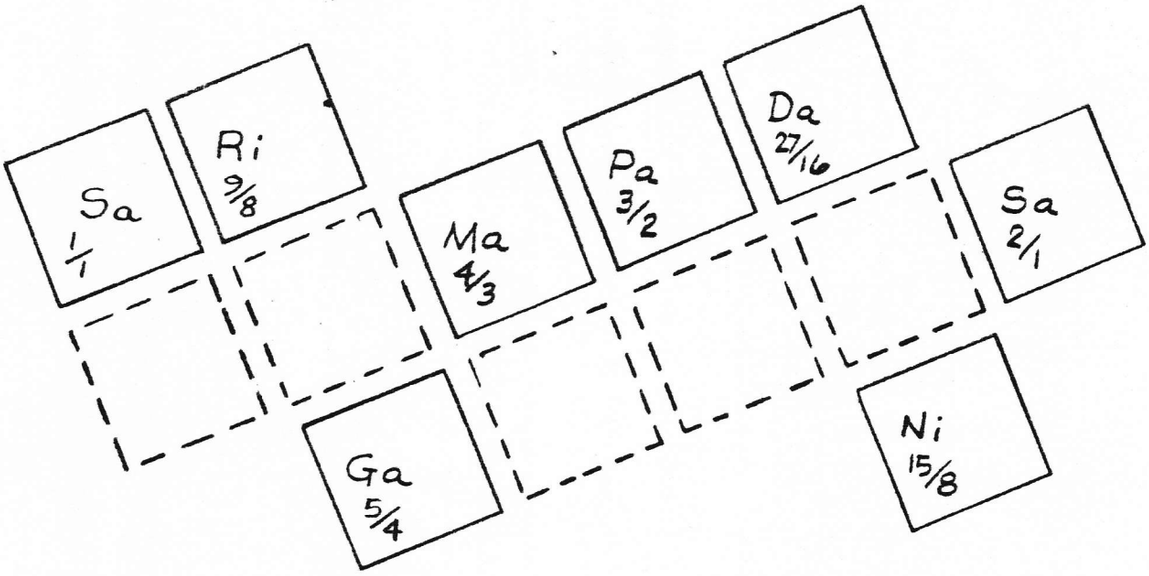
Design © by Erv Wilson 1985

(using the Bosanquet Generalized Pattern)



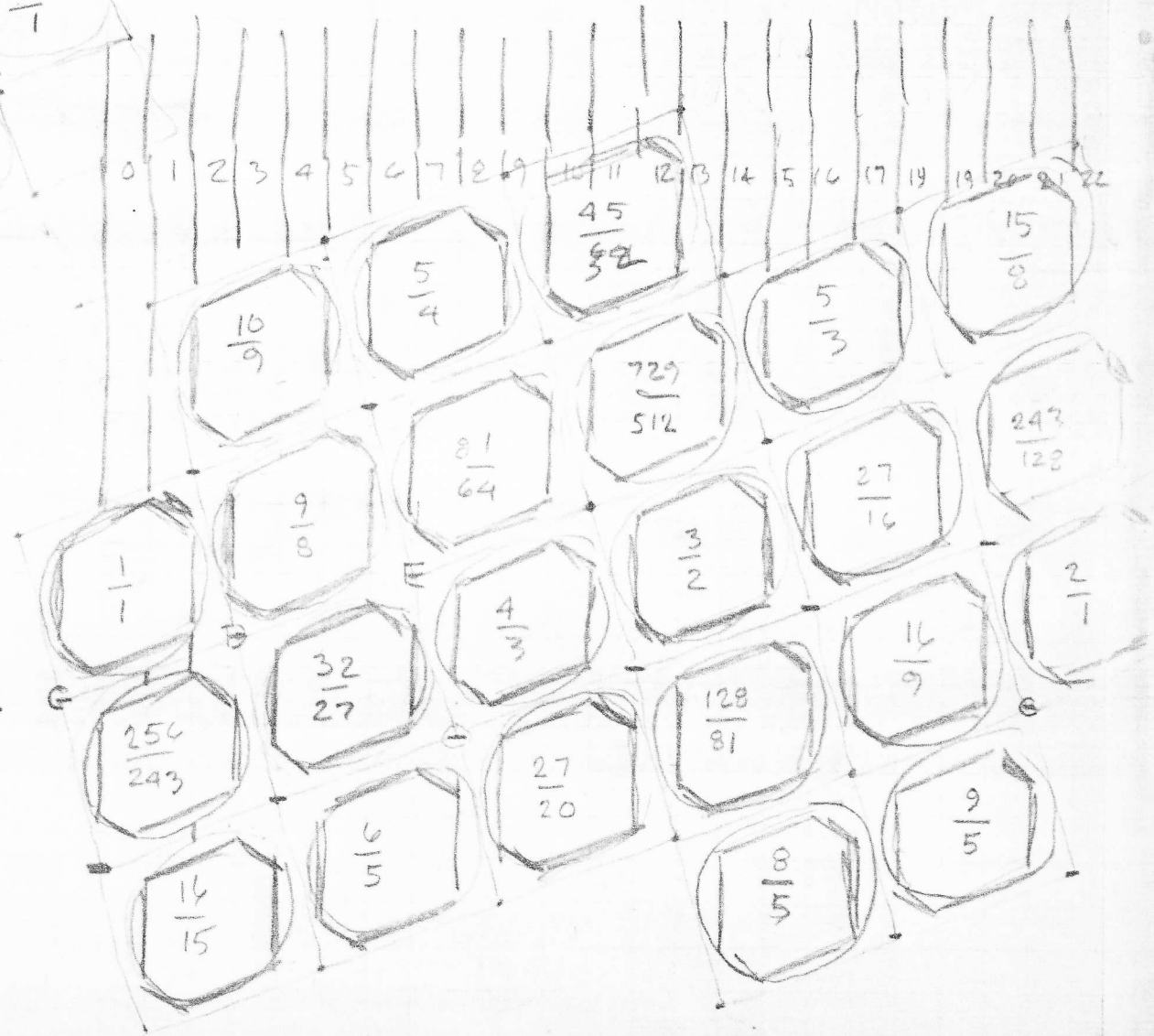


46 1513
K+E 10 X 10 TO THE CENTIMETER 18 X 25 CM.
KEUFFEL & ESSER CO. MADE IN U.S.A.


Sa
1/1
Ri
9/8
Ga
5/4
Ma
4/3
Pa
3/2
Da
27/16
Ni
15/8
Sa
2/1

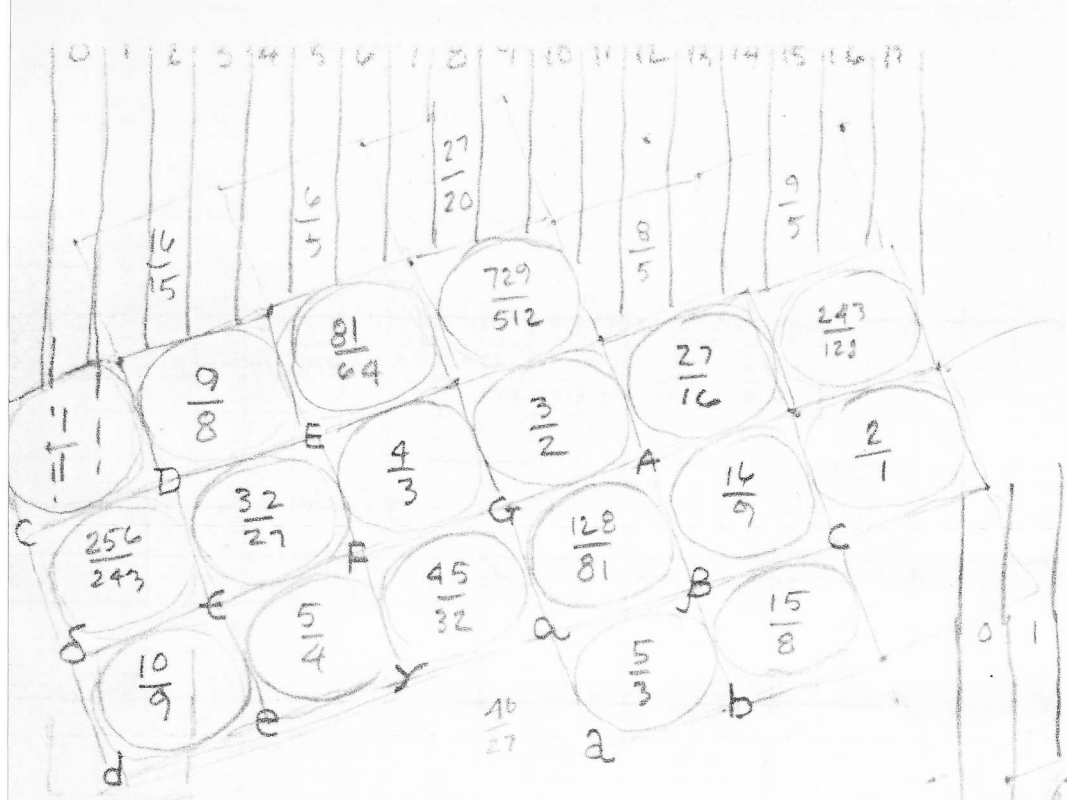
Design for a 22-levered Musical Instrument

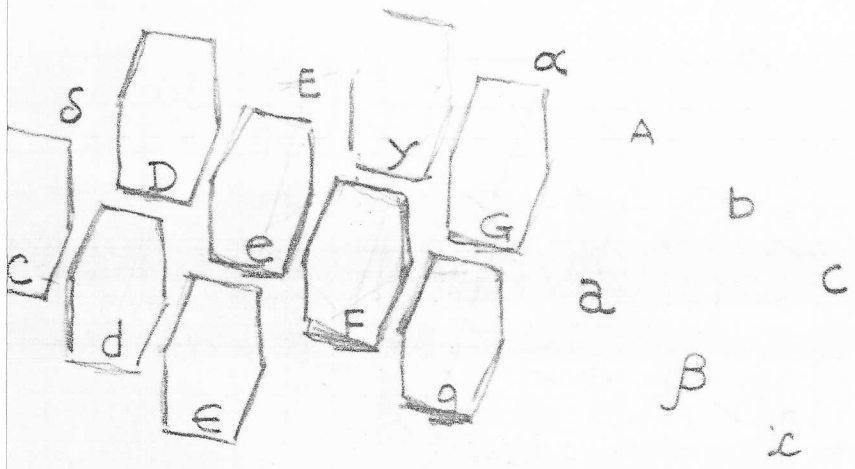
© 1980 by Erv Wilson



Design for a 17-Levered Musical Instrument

© 1980 by Erv Wilson

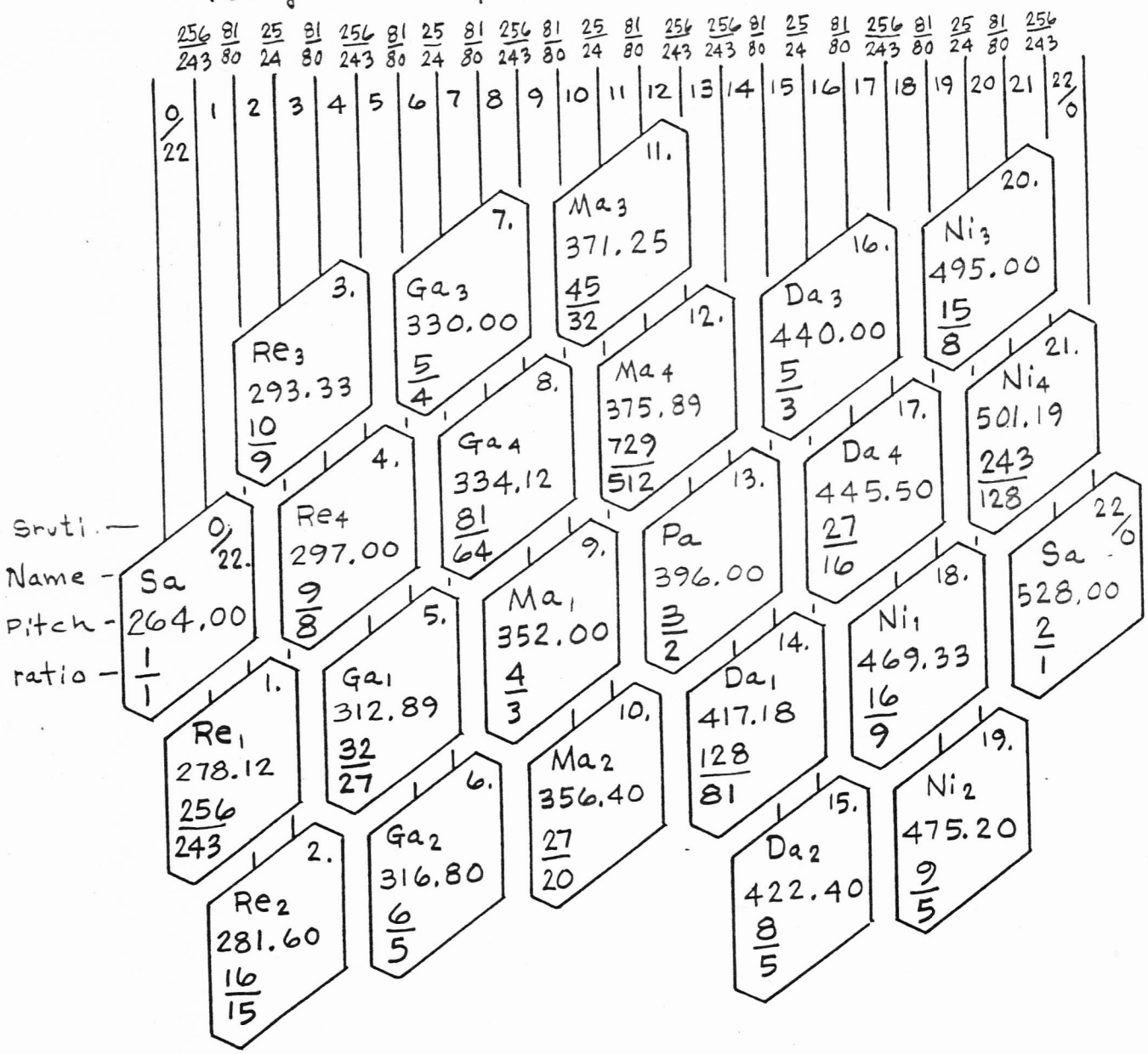




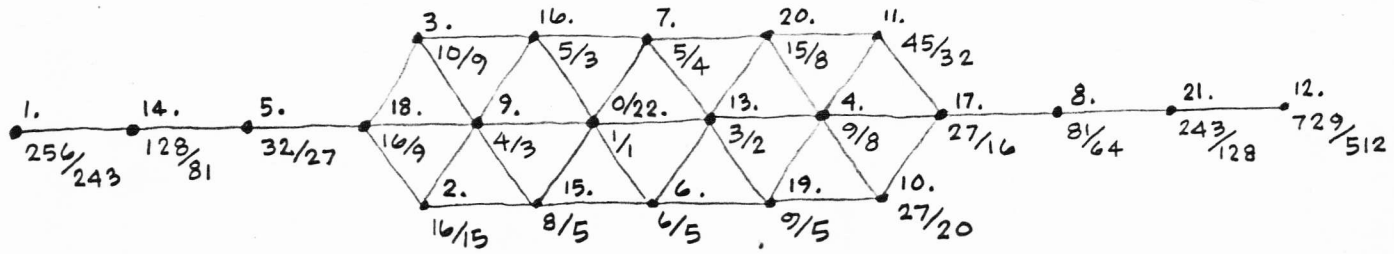
Harmonium Keyboard for 22-Tone Scale

Design © Erv Wilson 1985

(Using the Bosanquet Generalized Pattern)

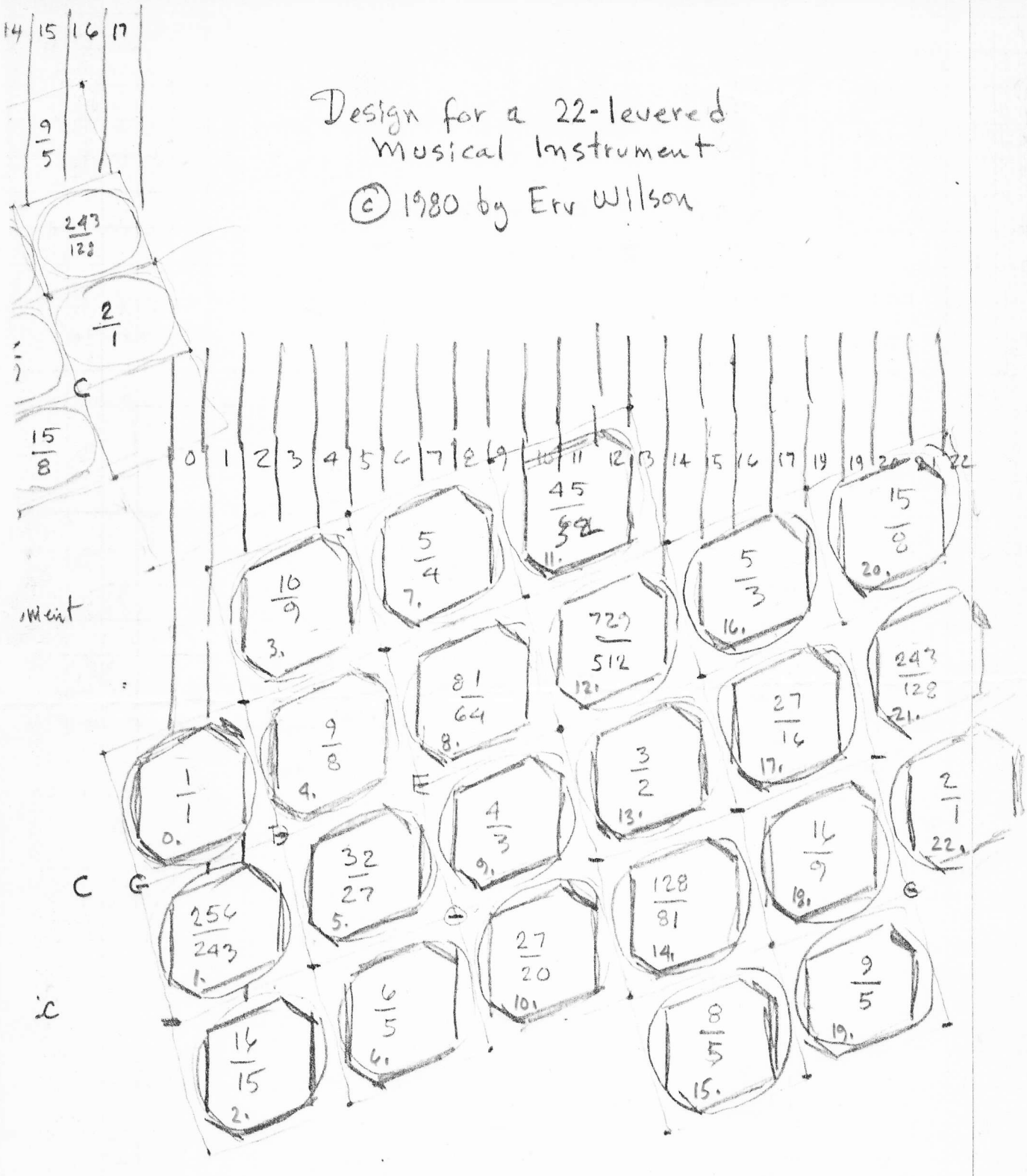


Tone Lattice of Scale

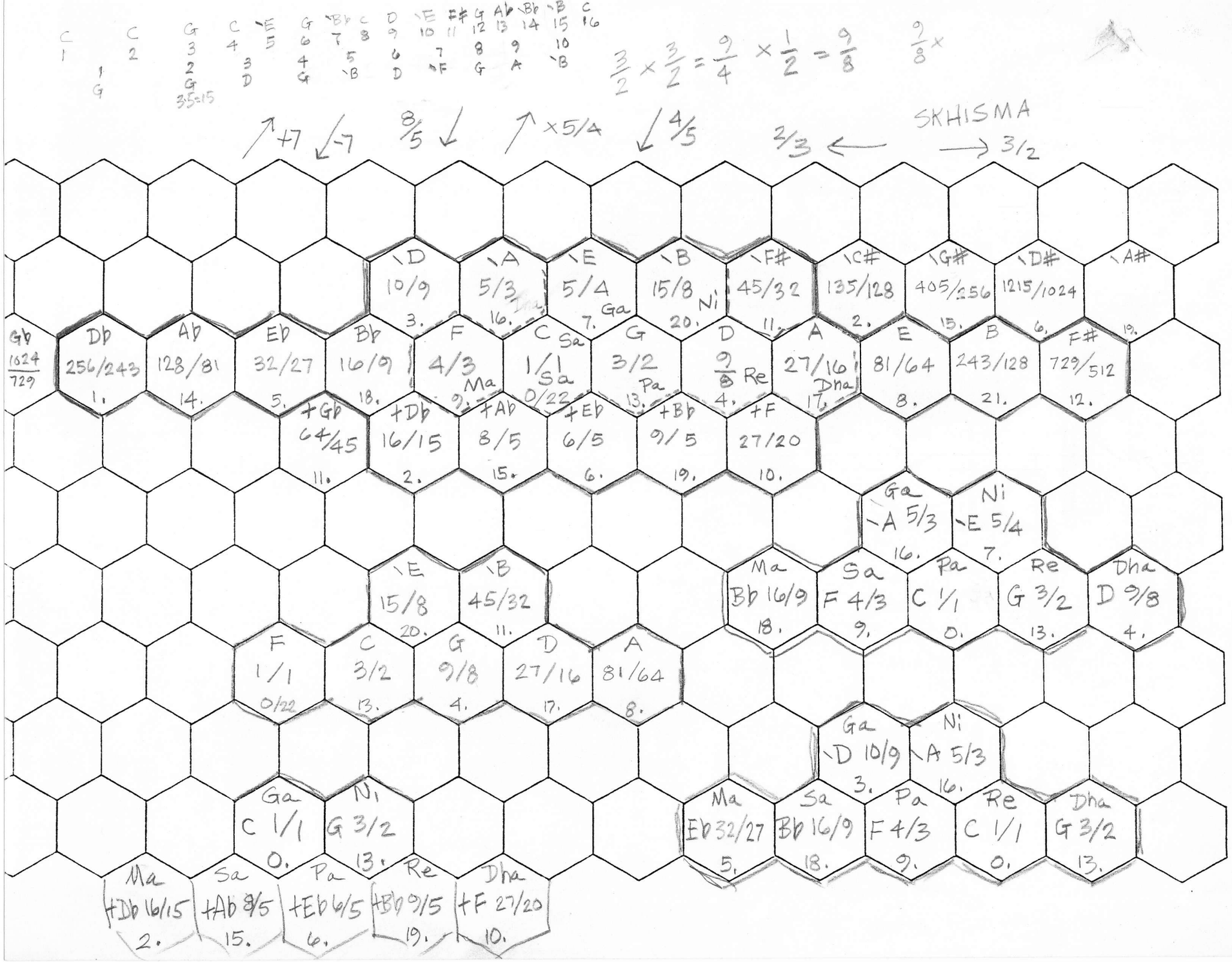


Design for a 22-levered Musical Instrument

© 1980 by Erv Wilson



31/53 Scale, 4/7 Kbd, Pythagorean Series (3/2)
© 2,001 by Ervin M. Wilson, all rights reserved.
Ref. Nazari, Ameli Türk Musikisi, Dr. Suphi Ezgi
etc.
+12 3^12 1.
+14 3^14 10.
+16 3^16 19.
+11 177147/131072 23.
+13 3^13 32.
+15 3^15 41.
+17 3^17 50.
+12 3^12 1.
+7 2187/2048 5.
+9 19683/16384 14.
+6 729/512 27.
+8 6561/4096 36.
+10 59049/32768 45.
+5 243/128 49.
0 1/1 0/53
+2 9/8 9.
+4 81/64 18.
+1 3/2 31.
+3 27/16 40.
0 2/1 53/0
-5 256/243 4.
-3 32/27 13.
-1 4/3 22.
-4 128/81 35.
-2 16/9 44.
-12 52.
-10 65536/59049 8.
-8 8192/6561 17.
-6 1024/729 26.
-11 262144/177147 30.
-9 32768/19683 39.
-7 4096/2187 48.
-12 1048576/531441 52.
-17 3^-17 3.
-15 3^-15 12.
-13 3^-13 21.
-18 3^-18 25.
-16 3^-16 34.
-14 3^-14 43.
-19 3^-19 47.
-24 3^-24 51.
-22 3^-22 7.
-20 3^-20 16.
-23 3^-23 29.
-21 3^-21 38.
-24 3^-24 51.
-29 3^-29 2.
-27 3^-27 11.
-25 3^-25 20.
-28 3^-28 33.
-26 3^-26 42.
-31 3^-31 46.
-34 3^-34 6.
-32 3^-32 15.
-30 3^-30 24.
-33 3^-33 37.
-36 3^-36 50.
-41 3^-41 1.
-39 3^-39 10.
-37 3^-37 19.
-35 3^-35 28.
-40 3^-40 32.
-38 3^-38 41.
-36 3^-36 50.
-46 3^-46 5.
-44 3^-44 14.
-42 3^-42 23.
-47 3^-47 27.
-45 3^-45 36.
-43 3^-43 45.
-48 3^-48 49.
-51 3^-51 9.
-49 3^-49 18.
etc.
-52 3^-52 31.
-50 3^-50 40.
-48 3^-48 49.
-53 3^-53 0/53
16JUL01 EW


C 1
C 2
G 3
C 4
\E 5
G 6
\Bb 7
C 8
D 9
\E 10
F# 11
G 12
Ab 13
\Bb 14
\B 15
C 16
1 G
2 G
3 D
4 G
5 \B
6 D
7 \F
8 G
9 A
10 \B
3.5=15
3/2 × 3/2 = 9/4 × 1/2 = 9/8
9/8 ×
↗ +7 ↙ -7
8/5 ↓
↗ ×5/4
↙ 4/5
2/3 ←
SKHISMA
→ 3/2
\D 10/9 3.
\A 5/3 16.
\E 5/4 7. Ga
\B 15/8 20. Ni
\F# 45/32 11.
\C# 135/128 2.
\G# 405/256 15.
\D# 1215/1024 6.
\A# 19.
Gb 1024/729
Db 256/243 1.
Ab 128/81 14.
Eb 32/27 5.
Bb 16/9 18.
F 4/3 9. Ma
C 1/1 Sa 0/22 Sa
G 3/2 13. Pa
D 9/8 4. Re
A 27/16 17. Dha
E 81/64 8.
B 243/128 21.
F# 729/512 12.
+Gb 64/45 11.
+Db 16/15 2.
+Ab 8/5 15.
+Eb 6/5 6.
+Bb 9/5 19.
+F 27/20 10.
Ga \A 5/3 16.
Ni \E 5/4 7.
\E 15/8 20.
\B 45/32 11.
Ma Bb 16/9 18.
Sa F 4/3 9.
Pa C 1/1 0.
Re G 3/2 13.
Dha D 9/8 4.
F 1/1 0/22
C 3/2 13.
G 9/8 4.
D 27/16 17.
A 81/64 8.
Ga \D 10/9 3.
Ni \A 5/3 16.
Ga C 1/1 0.
Ni G 3/2 13.
Ma Eb 32/27 5.
Sa Bb 16/9 18.
Pa F 4/3 9.
Re C 1/1 0.
Dha G 3/2 13.
Ma +Db 16/15 2.
Sa +Ab 8/5 15.
Pa +Eb 6/5 6.
Re +Bb 9/5 19.
Dha +F 27/20 10.

Ref: South Indian Music Book IV, P. Sambamoorthy, 1954, Madras

Table V

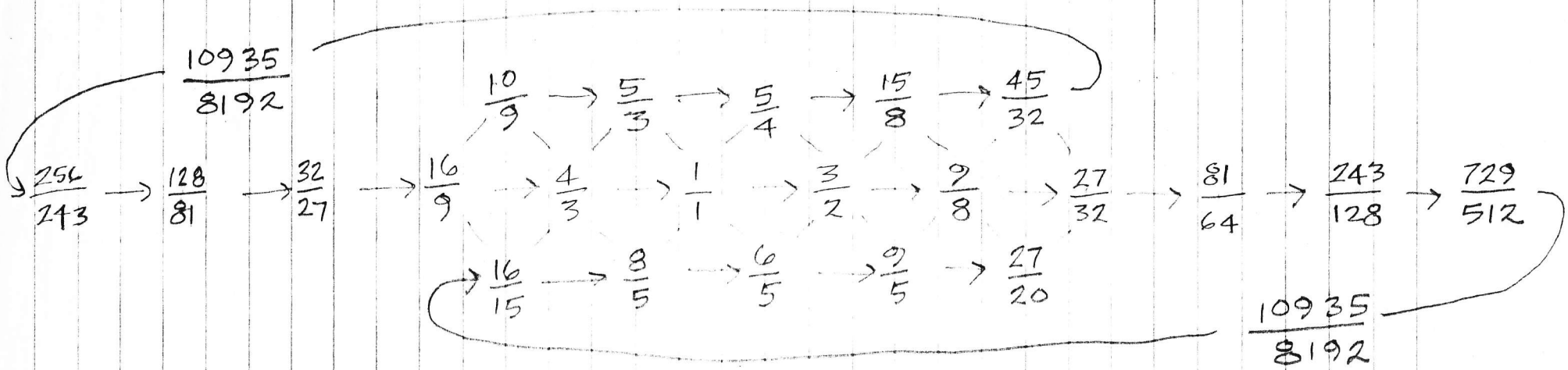


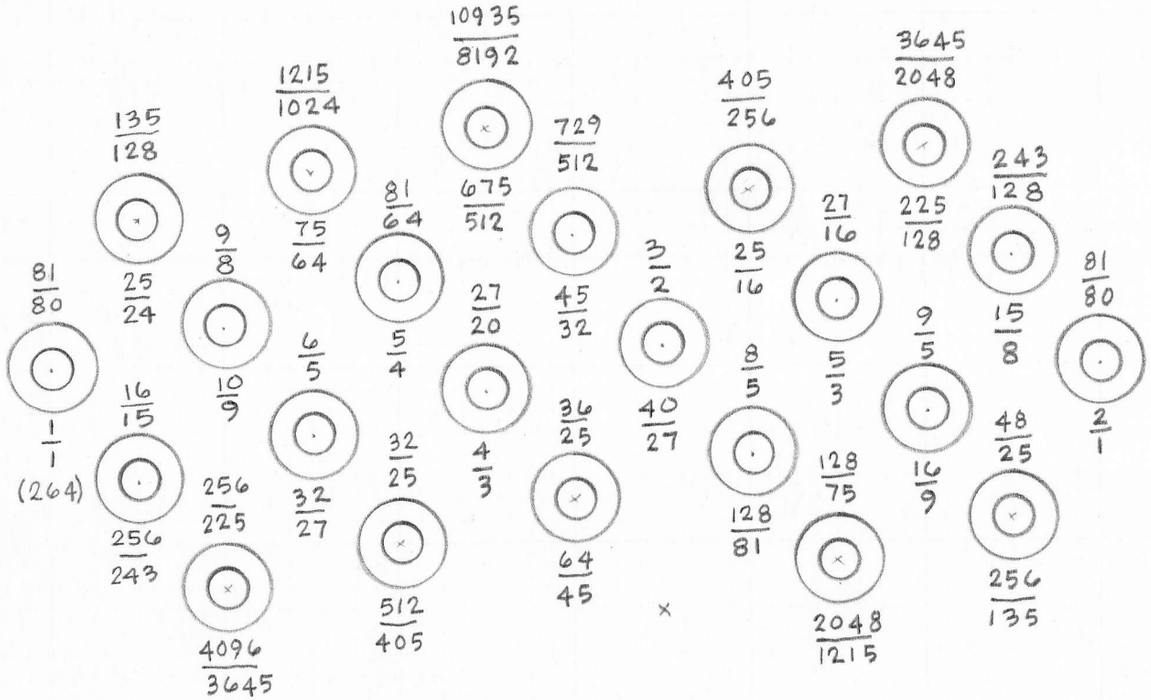
diagram by Erv Wilson, 1 Sep 1998

		(C1)	(G1)	D1	A1	E1	B1	F1#			
		-12	-11	-10	-9	-8	-7	-6			
Db	Ab	Eb	Bb	F	C	G	D	A	E	B	F#
-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6
				D'b	A'b	E'b	B'b	F'			
				+7	+8	+9	+10	+11			

																							G1x
																							+3
		F1	C1	G1	D1	A1	E1	B1	F1#	C1#	G1#	D1#	A1#	(E1#)	(B1#)	(F1x)	(C1x)						
		-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2						
(Db)	(Ab)	(Eb)	(Bb)	F	C	G	D	A	E	B	F#	C#	G#	D#	A#								
-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10								
E	B	F#	C#	G#	D#	A#	E#																
-4	5	6	7	8	9	10	11																

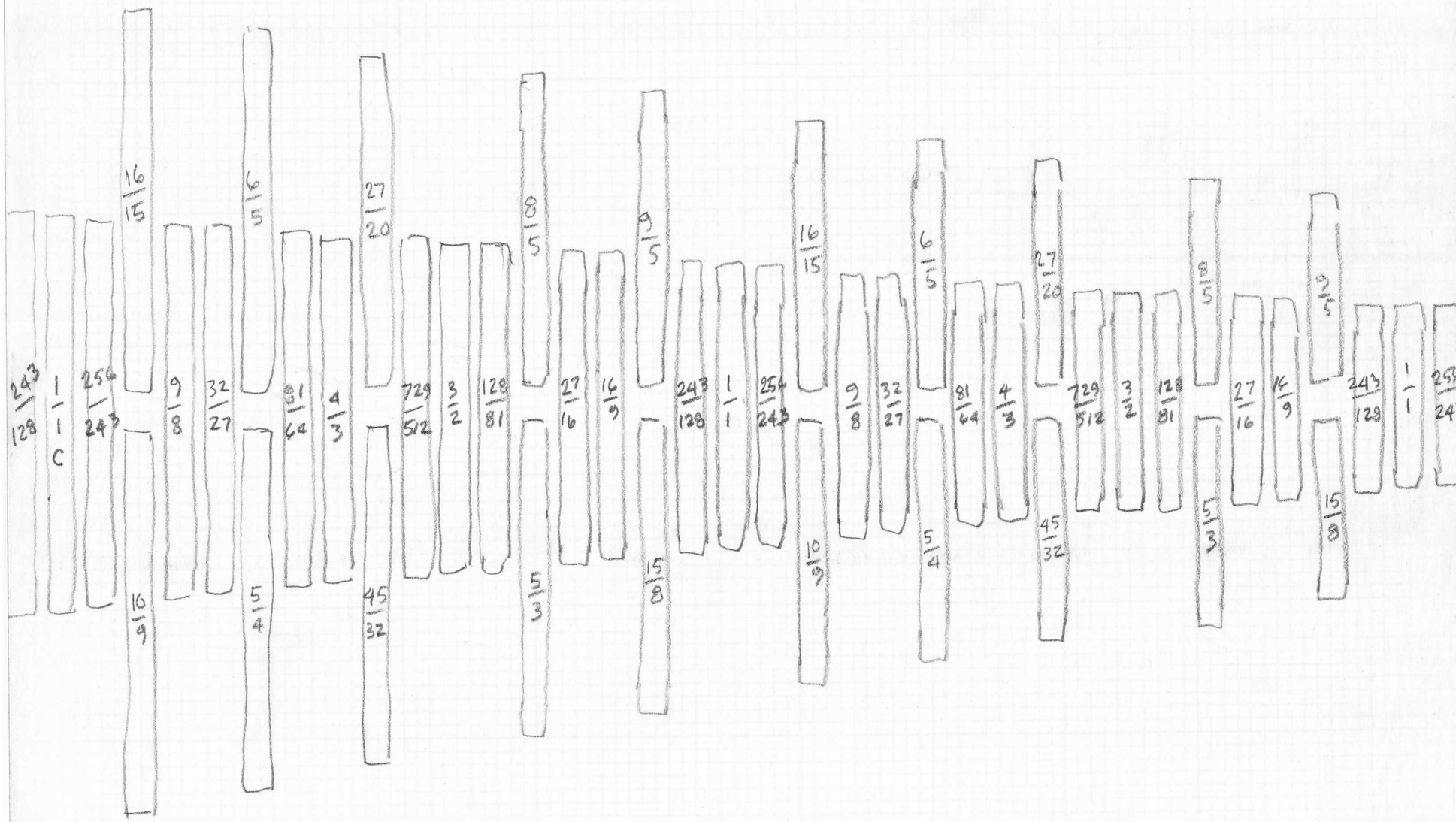
D Vanni
starts here

E#
+11


10935/8192
1215/1024
135/128
729/512
405/256
3645/2048
675/512
75/64
25/24
81/64
45/32
25/16
225/128
243/128
9/8
27/20
3/2
27/16
81/80
81/80
6/5
5/4
40/27
8/5
5/3
15/8
10/9
4/3
9/5
2/1
1/1
(264)
16/15
36/25
128/75
48/25
32/25
32/27
16/9
256/225
64/45
128/81
256/243
512/405
2048/1215
256/135
4096/3645

Design for 22-tubes, Classic Indian 22

© 1978 by Erv Wilson



Tuning Table for 22-tone Indian Scale
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22 Srutis	Indian Scale Note	Just Pitch	Equal name	Equal Pitch	Adjust Tuner
	1/1	C 264	C	261.6255	+ 15.6 cents
256/243 (L)					
81/80 (S)	256/243	Db 278.123	Db	277.183	+ 5.9
	16/15	+Db 281.6			+ 27.4
25/24 (m)					
81/80	10/9	\D 293.333	D	293.665	− 2
	9/8	D 297			+ 19.5
256/243					
81/80	32/27	Db 312.889	Eb	311.127	+ 9.8
	6/5	+Db 316.8			+ 31.3
25/24					
81/80	5/4	\E 330	E	329.628	+ 2
	81/64	E 334.125			+ 23.5
256/243					
81/80	4/3	F 352	F	349.228	+ 13.7
	27/20	+F 356.4			+ 35.2
25/24					
81/80	45/32	\F# 371.25	F#	369.994	+ 5.9
	729/512	F# 375.891			+ 27.4
256/243					
	3/2	G 396	G	391.995	+ 17.6
256/243					
81/80	128/81	Ab 417.185	Ab	415.305	+ 7.8
	8/5	+Ab 422.4			+ 29.3
25/24					
81/80	5/3	\A 440	A	440	± 0
	27/16	A 445.5			+ 21.5
256/243					
81/80	16/9	Bb 469.333	Bb	466.164	+ 11.7
	9/5	+Bb 475.2			+ 33.2
25/24					
81/80	15/8	\B 495	B	493.883	+ 3.9
	243/128	B 501.188			+ 25.4
256/243					
	2/1	C 528 (=2×264)	C	523.251	+ 15.6