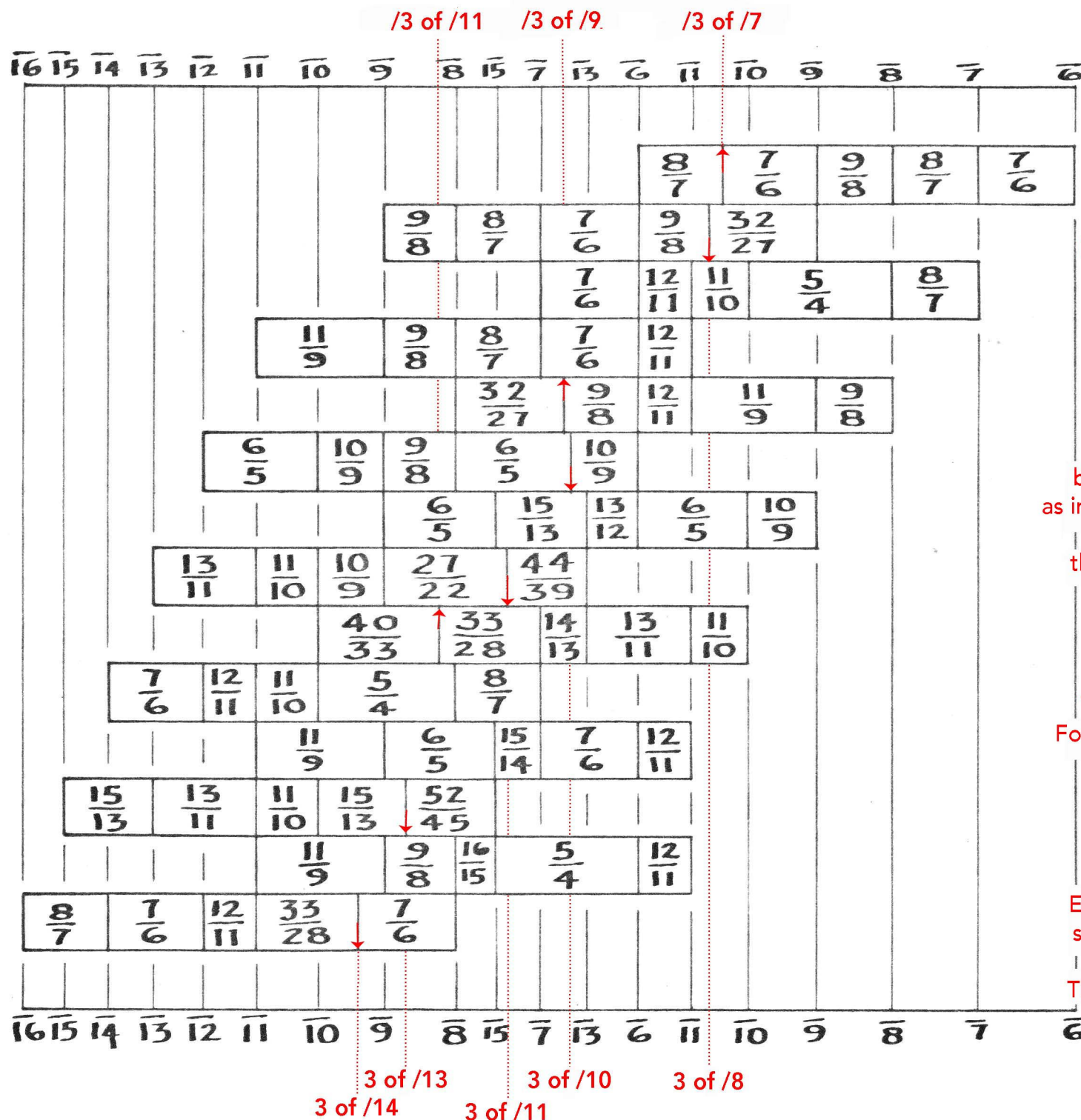


2004/03/24

[illegible]

Some Pentatonic Flute Scales
© 1984 by Eric Wilson



Wilson had a large collection of South American flutes with equally-spaced finger holes that produced subharmonic scales. In many cases, the exit hole (where the air exits the extreme end of the flute body) was also tuned to be either a fifth above ("3", as in the 3rd harmonic) or a fifth below (" $\frac{1}{3}$ " or "sub 3", as in the 3rd subharmonic) particular pitches in the subharmonic series.

These extra pitches have been labeled in red above and below Wilson's original chart. For example, the dotted line labelled "3 of /8" represents the note a fifth above /8 (which is equivalent to a fourth below /8). Eight of the pentatonic scales here are a result of tuned exit holes. These scales are shown with red arrows that point to the exit hole notes.

exit 1 2 3 4 5



$\frac{3}{44}$ or $\overline{15}$ $\overline{13}$ $\overline{12}$ $\overline{11}$ $\overline{10}$ $\overline{9}$

28, or 27. $\frac{0}{34}$, 4, 8, 13, 18,

7 4 4 5 5

Hole Hole Hole Hole Hole

exit 1 2 3 4 5



$\overline{12}$ $\overline{11}$ $\overline{10}$ $\overline{9}$ $\overline{8}$ $\overline{7}$

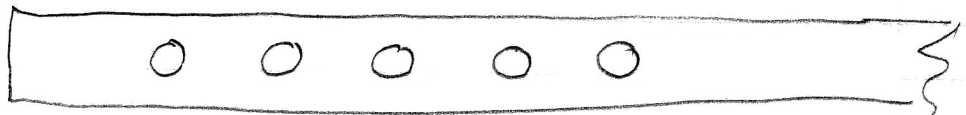
27, $\frac{0}{31}$, 4, 9, 14, 20.



$\frac{3}{40}$ or $\frac{2}{27}$ $\overline{12}$ $\overline{11}$ $\overline{10}$ $\overline{9}$ $\overline{8}$

(26) or (26) $\frac{0}{31}$ 4, (8), (13), (18).

29, 28, $\frac{0}{34}$, 4, 9, 14, 20.



$\frac{3}{44}$ or $\overline{15}$ $\overline{13}$ $\overline{12}$ $\overline{11}$ $\overline{10}$ $\overline{9}$

26, or 25, $\frac{0}{31}$, 4, 8, 12, 17,

28, or 27, $\frac{0}{34}$, 4, 8, 13, 18,



Aliquot Flute - Five Holes & Tuned Exit

© 14 Jan 07. EW

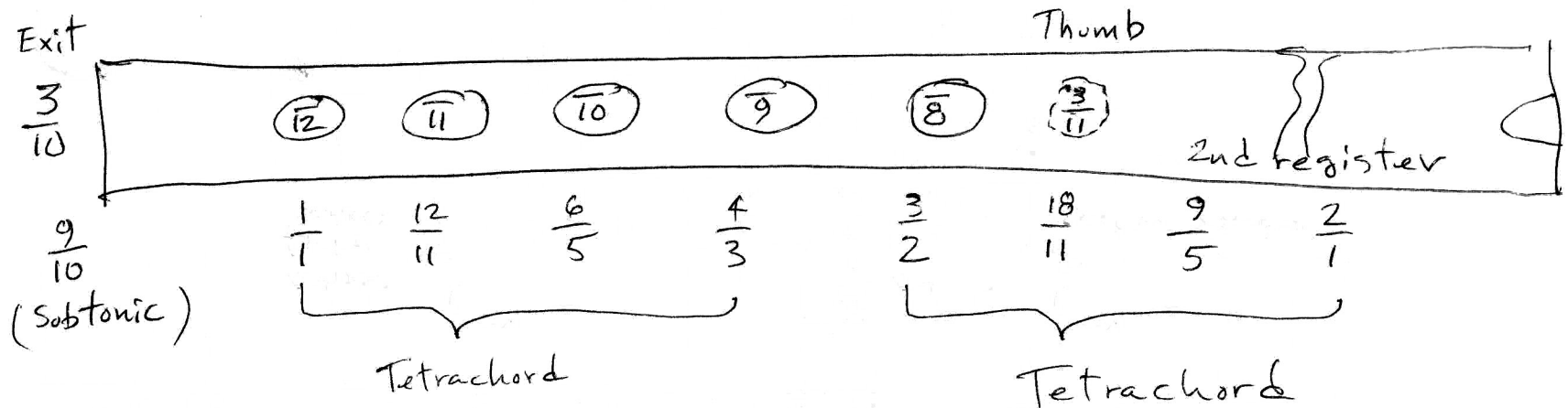
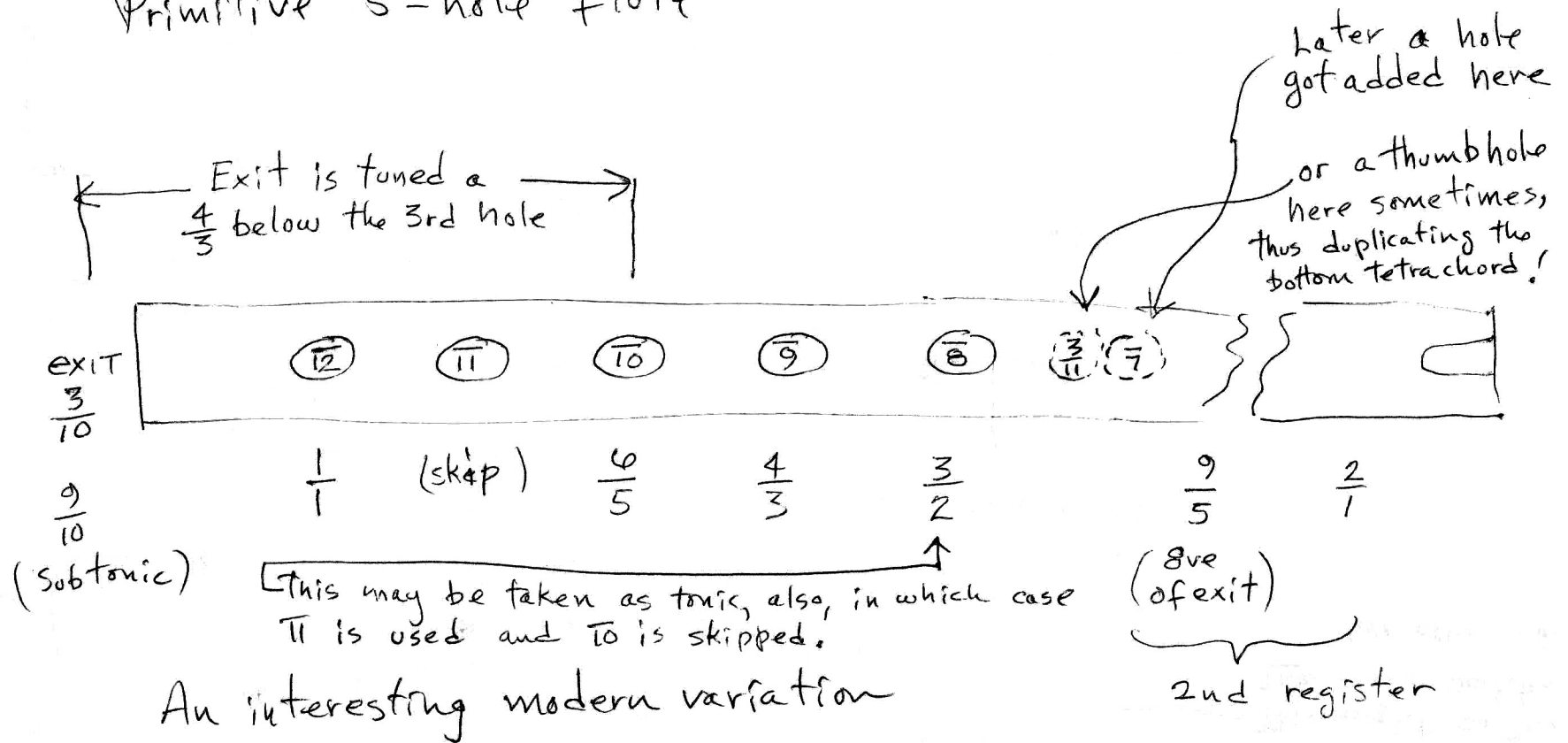
P
 14,5 13 12 11 10 9
 13,5 12 11 10 9 8
 12,5 11 10 9 8 7

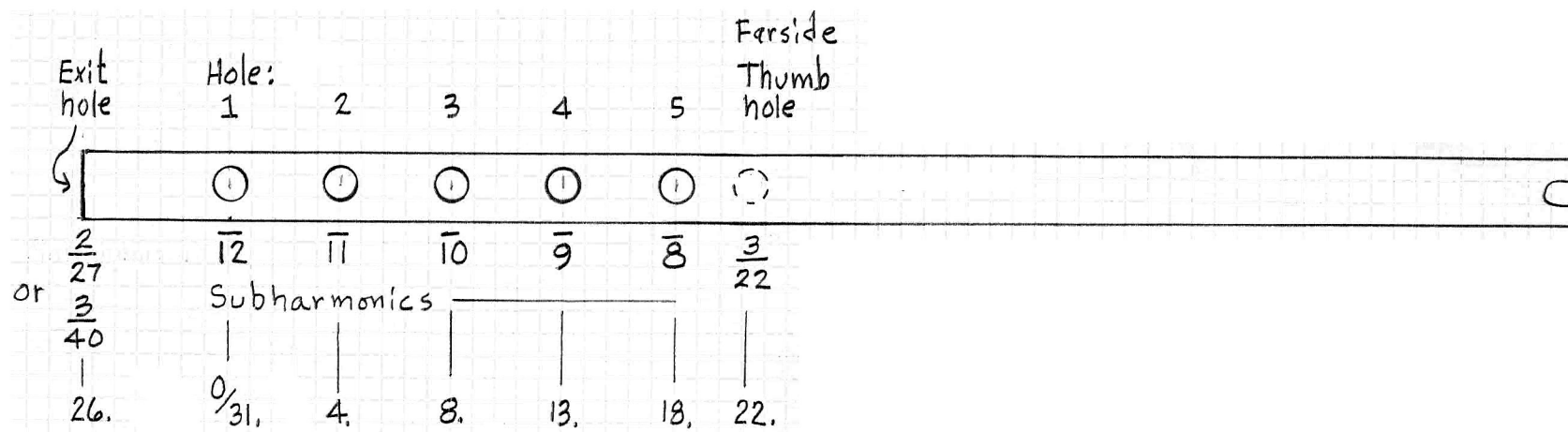
	7	5	4	8	5	
	36	29	26	24	22	20 18
	<u>34</u>	<u>29</u>	<u>26</u>	<u>24</u>	<u>20</u>	<u>18</u>
→	<u>32</u>	<u>27</u>	<u>24</u>	<u>22</u>	20	<u>18</u> <u>16</u>
	1	1		↑		
	28	25	22	20	18	16 14
	<u>30</u>	<u>25</u>	<u>22</u>	<u>20</u>	18	<u>16</u> <u>14</u>

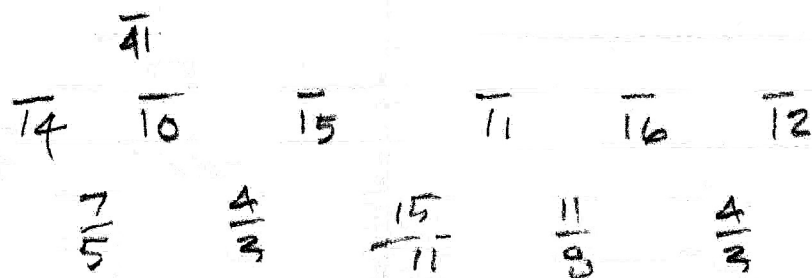
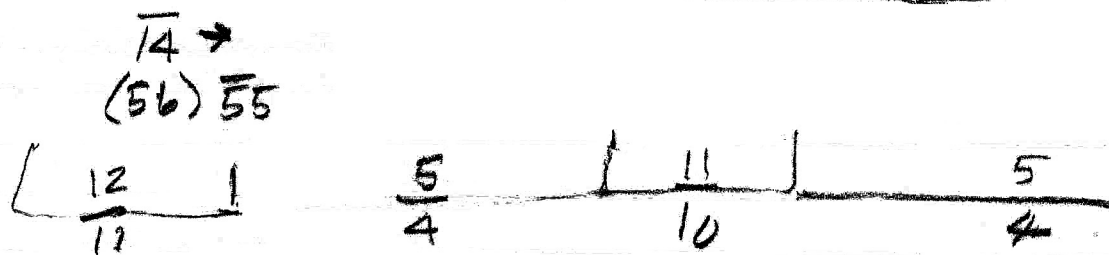
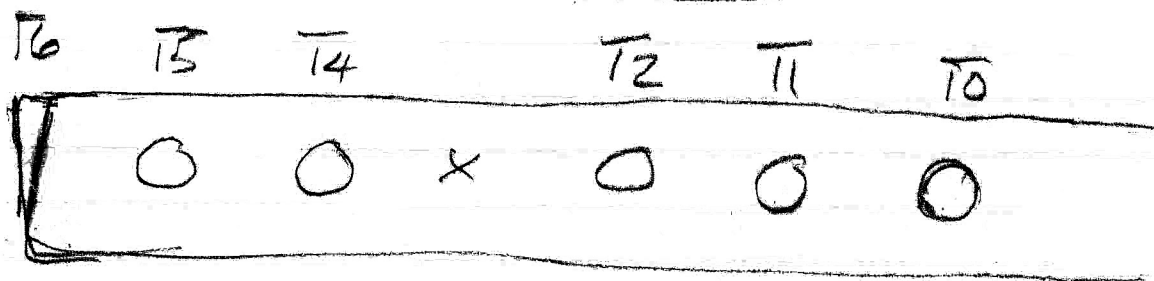
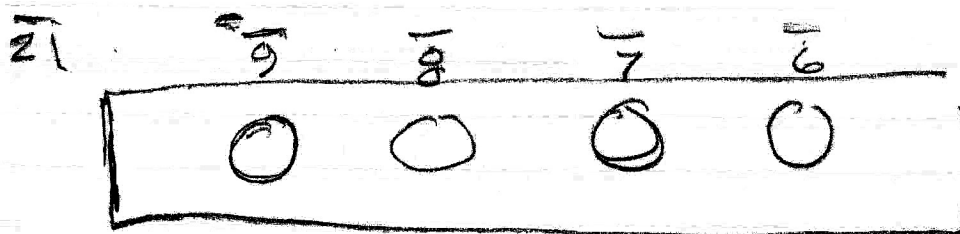
unique coincidence

© 14 Jan 07. EW

Primitive 5-hole flute

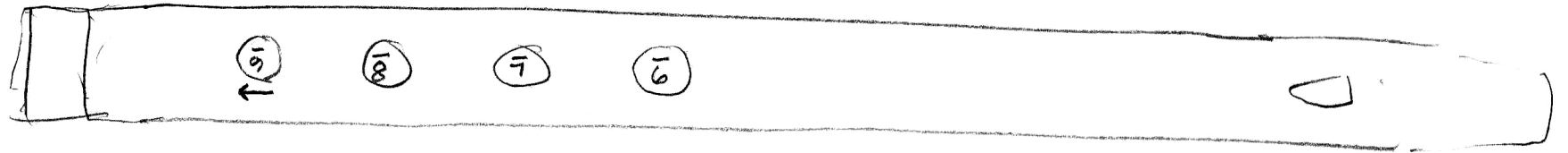






exit $\bar{21}$

$\bar{21}$



$\frac{7}{6}$
 $\frac{8}{9}$

$\frac{9}{8}$
 $\frac{8}{9}$

$\frac{8}{7}$

$\frac{7}{6}$

$\frac{8}{7}$

$\bar{64}$

$\bar{60}$

$\bar{56}$ ($\bar{55}$)

$\bar{48}$

$\bar{44}$

$\bar{40}$

$\bar{16}$

$\bar{15}$

$\bar{14}$

$\bar{12}$

$\bar{11}$

$\bar{10}$



-3

-1

+1

-4

$\bar{2}$

0

-4 -2 0 +2 -5 -3 -1 +1 6 -4
 $\bar{16}$ $\bar{15}$ $\bar{14}$ $\frac{7}{5}$ $\bar{11}$ $\bar{10}$ $\frac{128}{77}$ $\frac{28}{15}$ $\bar{8}$

$\frac{128}{105}$ $\frac{128}{77}$ $\frac{8}{7}$ $\frac{8}{5}$ $\frac{16}{15}$ $\frac{16}{11}$ $\frac{1}{1}$ $\frac{7}{5}$ $\frac{28}{15}$
+2 +1 0 -1 -2 -3 -4 -5 -6
 $\frac{15}{11}$ $\frac{11}{8}$ $\frac{7}{5}$ $\frac{4}{3}$ $\frac{15}{11}$ $\frac{11}{8}$ ($\frac{7}{5}$) ($\frac{4}{3}$)

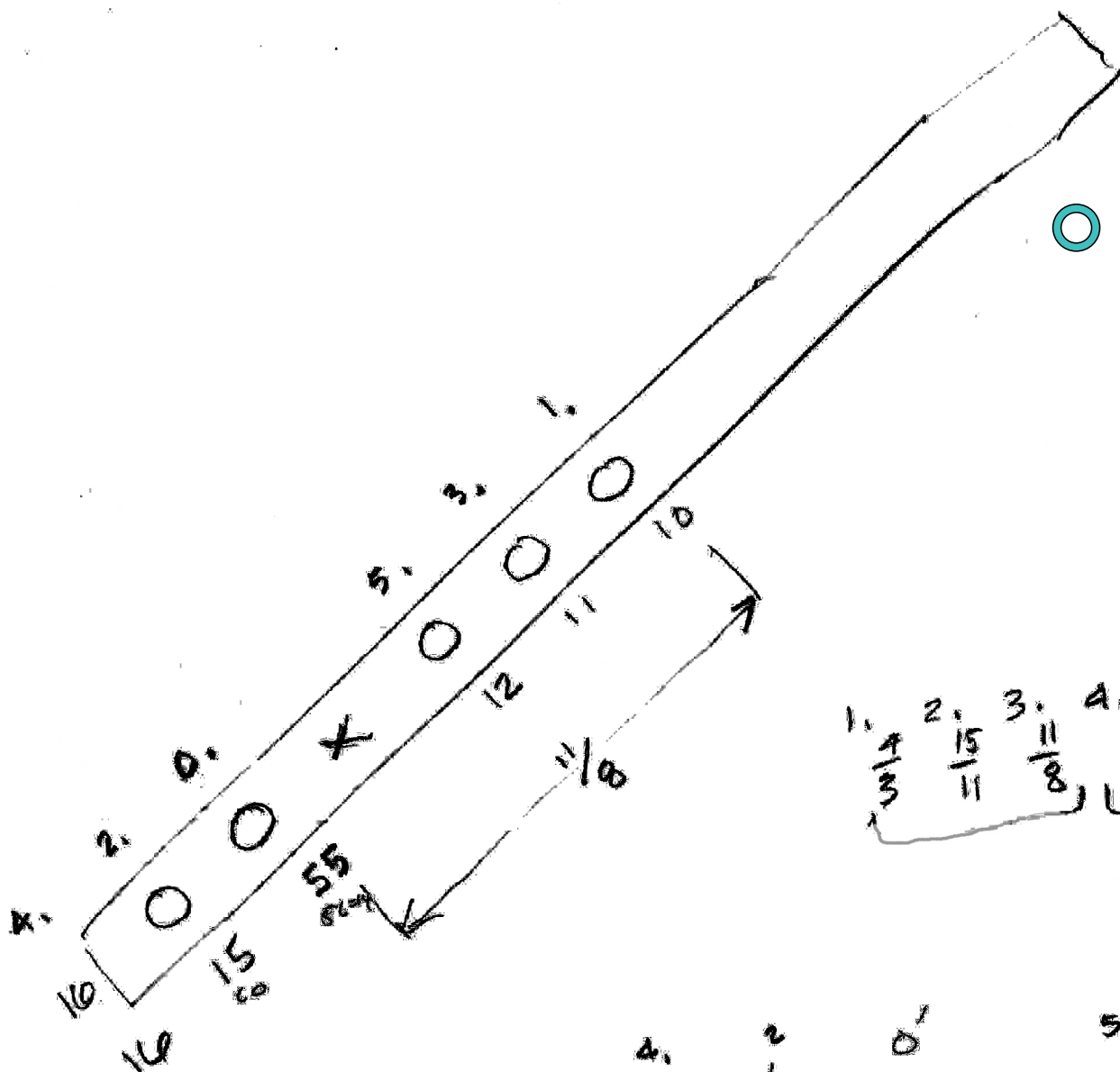
+1 0 -1 -2 -3 -4
 $\frac{11}{8}$ $\frac{4}{3}$ $\frac{15}{11}$ $\frac{11}{8}$ $\frac{4}{3}$

$$\frac{7}{5} \times \frac{4}{3} = \frac{28}{15}$$

$$\frac{16}{11} \times \frac{8}{7} = \frac{128}{77}$$

$$\frac{16}{15} \times \frac{8}{7} = \frac{128}{105}$$

059375-1



1. $\frac{4}{3}$
2. $\frac{15}{11}$
3. $\frac{11}{8}$
4. $\frac{4}{3}$
5. $\frac{15}{11}$

5.	3.	1.	4.	2.	0.	5.
$\frac{1}{1}$	$\frac{13}{11}$	$\frac{6}{5}$	$\frac{3}{2}$	$\frac{8}{5}$		$\frac{2}{1}$
$\frac{12}{11}$	$\frac{11}{10}$	$\frac{5}{4}$	$\frac{16}{15}$	$\frac{5}{4}$		$\frac{5}{4}$
	$\frac{11}{10}$	$\frac{5}{4}$	$\frac{16}{15}$	$\frac{12}{11}$		$\frac{5}{4}$

exit 20

1

Abstract

1

○
—
16

0-15

14

11

10

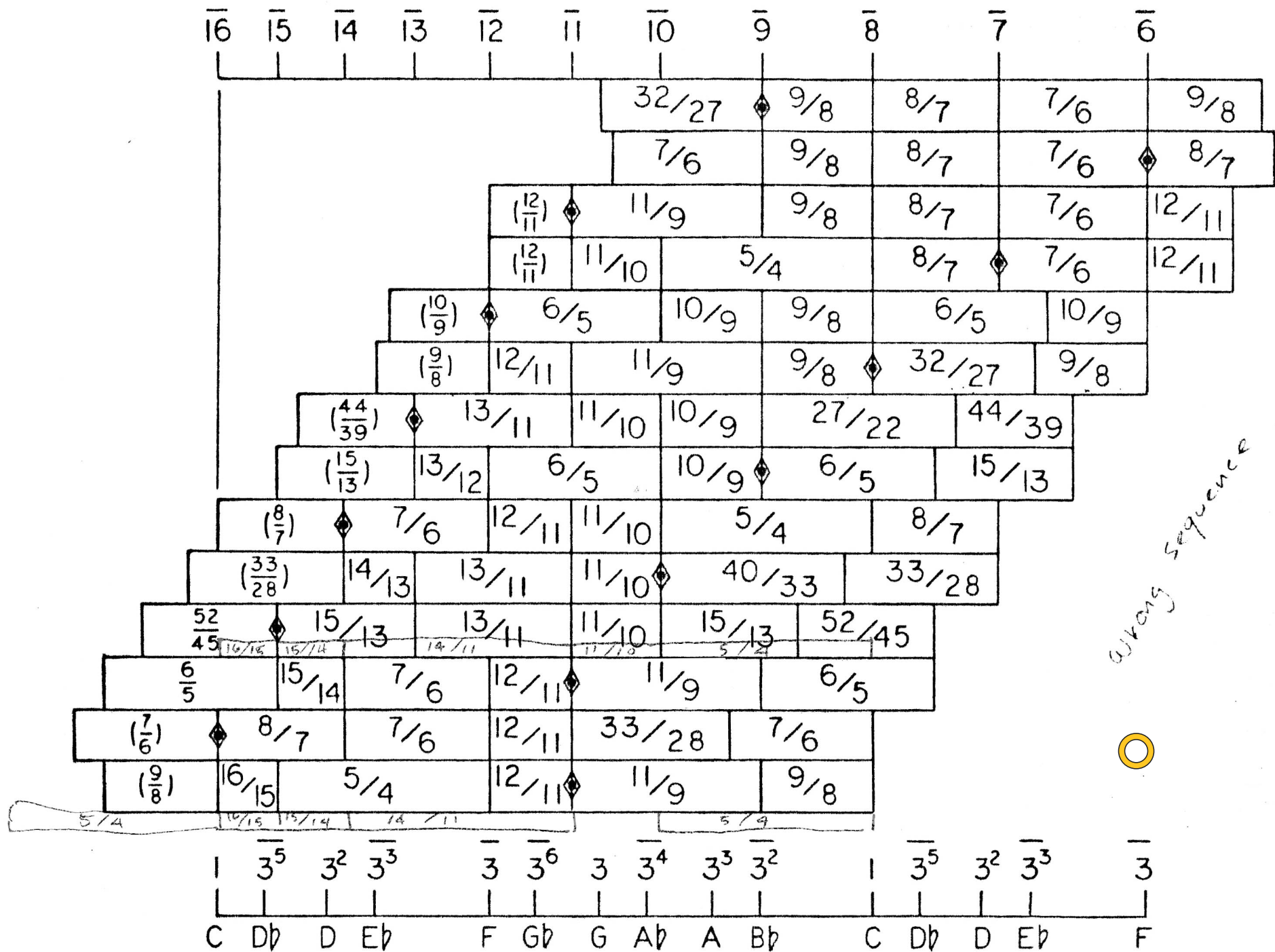
3



$\overline{11}$	$\overline{10}$	$\overline{9}$	$\overline{8}$	$\overline{7}$	$\overline{3 \cdot 9}$ Exit	$\overline{12}$	$\overline{11}$
$\frac{11}{9}$		$\frac{9}{8}$	$\frac{8}{7}$	$\frac{7}{6}$		$\frac{12}{11}$	
$\frac{11}{10}$	$\frac{10}{9}$			$\frac{28}{27}$	$\frac{9}{8}$		
$\frac{33}{32}$	$\frac{81}{80}$			$\frac{64}{63}$		$\frac{33}{32}$	
$\frac{32}{27}$		$\frac{9}{8}$	$\frac{9}{8}$	$\frac{32}{27}$		$\frac{9}{8}$	
$\frac{256}{243}$	$\frac{9}{8}$			$\frac{256}{243}$	$\frac{9}{8}$		
1	$\overline{3^5}$	$\overline{3^3}$	$\overline{3}$	3	$\overline{3^4}$	$\overline{3^2}$	1

$\overline{12}$	$\overline{11}$	$\overline{10}$	$\overline{9}$	$\overline{8}$	$\overline{7}$	$\overline{3/10}$ Exit	$\overline{12}$
$\frac{6}{5}$		$\frac{10}{9}$	$\frac{9}{8}$	$\frac{6}{5}$		$\frac{10}{9}$	
$\frac{12}{11}$	$\frac{11}{10}$			$\frac{8}{7}$	$\frac{21}{20}$		
$\frac{33}{32}$	$\frac{81}{80}$			$\frac{64}{63}$	$\frac{81}{80}$		
$\frac{32}{27}$		$\frac{9}{8}$	$\frac{9}{8}$	$\frac{32}{27}$		$\frac{9}{8}$	
$\frac{9}{8}$	$\frac{256}{243}$			$\frac{9}{8}$	$\frac{256}{243}$		
1	$\overline{3^2}$	$\overline{3^3}$	$\overline{3}$	3	$\overline{3^3}$	$\overline{3^2}$	1

$\overline{13}$	$\overline{12}$	$\overline{11}$	$\overline{10}$	$\overline{9}$	$\overline{8}$	$\overline{3/11}$ Exit	$\overline{13}$		
$\frac{13}{11}$		$\frac{11}{10}$	$\frac{10}{9}$	$\frac{27}{22}$		$\frac{44}{39}$			
$\frac{13}{12}$	$\frac{12}{11}$			$\frac{9}{8}$	$\frac{12}{11}$				
$\frac{27}{26}$	$\frac{729}{704}$	$\frac{81}{80}$		$\frac{729}{704}$	$\frac{27}{26}$				
$\frac{32}{27}$		$\frac{9}{8}$	$\frac{9}{8}$	$\frac{32}{27}$		$\frac{9}{8}$			
$\frac{9}{8}$	$\frac{256}{243}$			$\frac{9}{8}$	$\frac{256}{243}$				
1	3^2	$\overline{3^3}$	$\overline{3}$	3	3^3	$\overline{3^2}$	1		
C	D \flat	D	E \flat	F	G	A \flat	A	B \flat	C

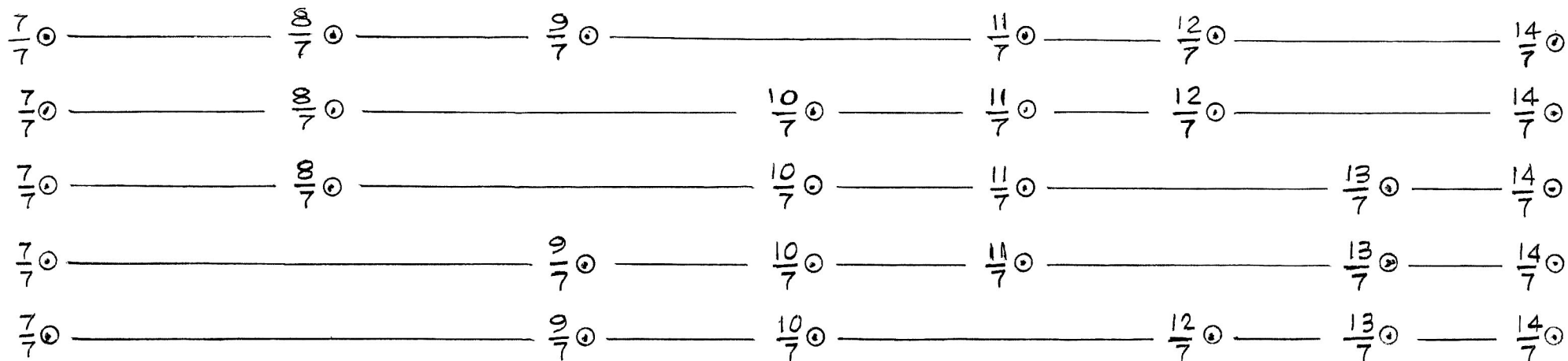


RĀG MĀLKOS Revisited

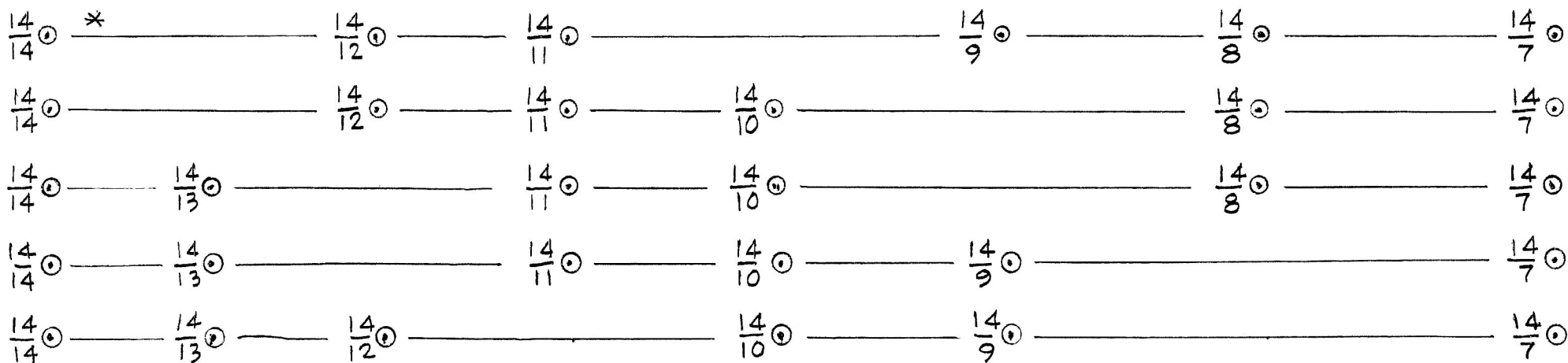
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harmonic flute;



aliquot flute;

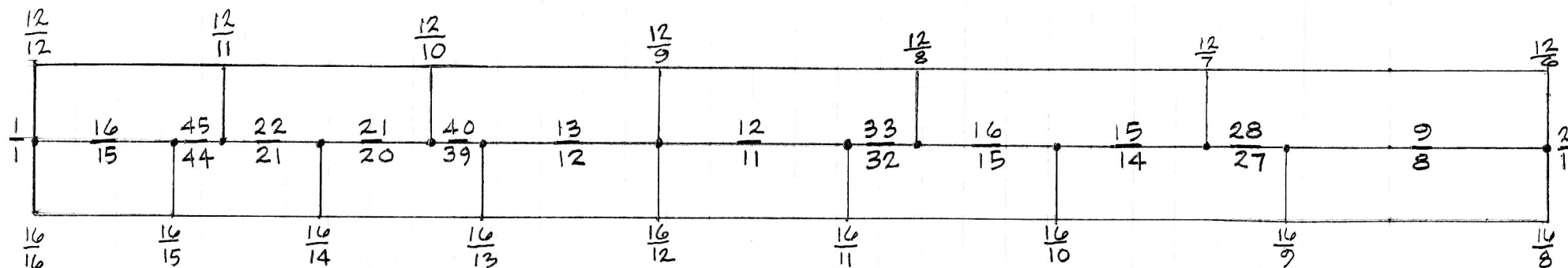


23Sep05·EW

* see Kathleen Schlesinger, The Greek Aulos, p399-401

MODES $\bar{1}2$ and $\bar{1}6$ Shown on the Logarithmic₂ Slide-Rule

9MAR2005-EW
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12	11	10	9	8	7	6	5	(9)	4	(7)
16	15	14	13	12	11	10	9	8	7	6

(16)		(14)		(12)	Exit: 10:66	9	8	7	6	
------	--	------	--	------	-------------	---	---	---	---	--

(12)	Exit: 10:5	9	8	7	6	(10.5)	(9)	(8)	(7)	(6)
------	------------	---	---	---	---	--------	-----	-----	-----	-----

exit: (12)	10	9	8	7
------------	----	---	---	---



A	B \flat	B	\downarrow C	D \flat	D	E \flat E	F	G \flat \downarrow G	A \flat	A	B \flat B	C	
14	18	13	D 12	E \flat 11	14	F 10	G 9	A 8	(15) 10	7	(13) 9	6 8	(11) 7
-----			(8)	Exit: 13.33			12	()	10	9	8		
exit			13.5	12	11	()	9	8	(13.5)		(12) (11)		
-----			(18)	exit 14.66			13	()	11	10	9		
-----			13	12	()	10	9	exit (15)		(13)			
-----			exit: 16			14	()	12	11	10	(8) (7)		
14	13	()	11	10	exit: (16.5)			(14) (13)					



Some Flute notes
 © by Eric Wilson 1993

22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
 (14) (13) (12) (11) (10) (9) (8) (7) (6) (5) (4)

(7) 9 8 7 6

16 (9) (8) (7) (6)

12 10 9 8 7

18 (10) (9) (8) (7)

12 11 10 - 8 7

18 (11) - (9) (8) (7)

(9) 12 11 - 9 8

20 (12) - (10) (9) (8)

(10) 13 12 - 10 9

22 (13) - (11) (10) (9)

25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9
	(16)	(15)		(14)	(13)		(12)	(33)	(11)	(30)	(27)	(24)	(8)	(21)	(7)	(18)

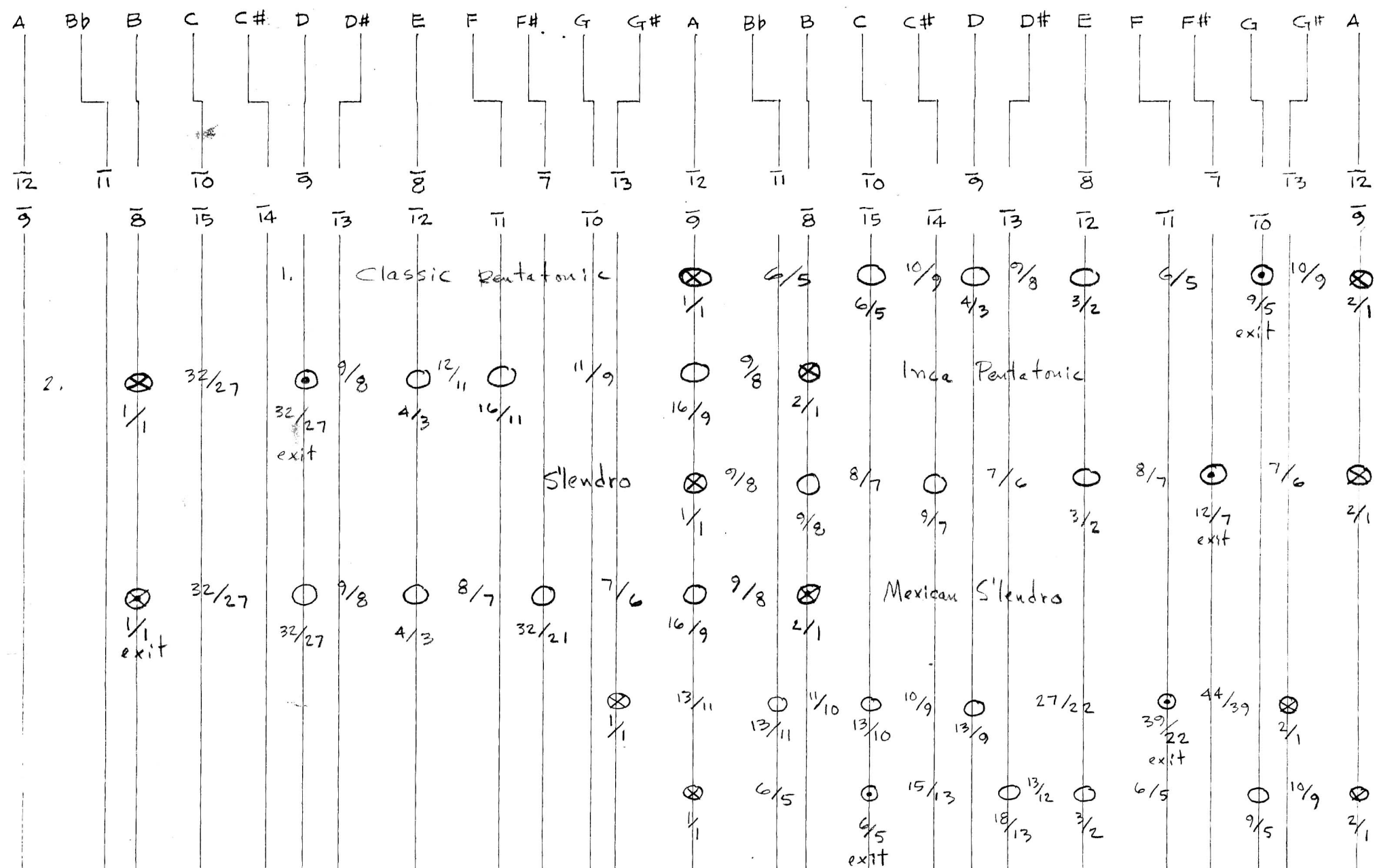
(33)		14	13	-	11	10
------	--	----	----	---	----	----

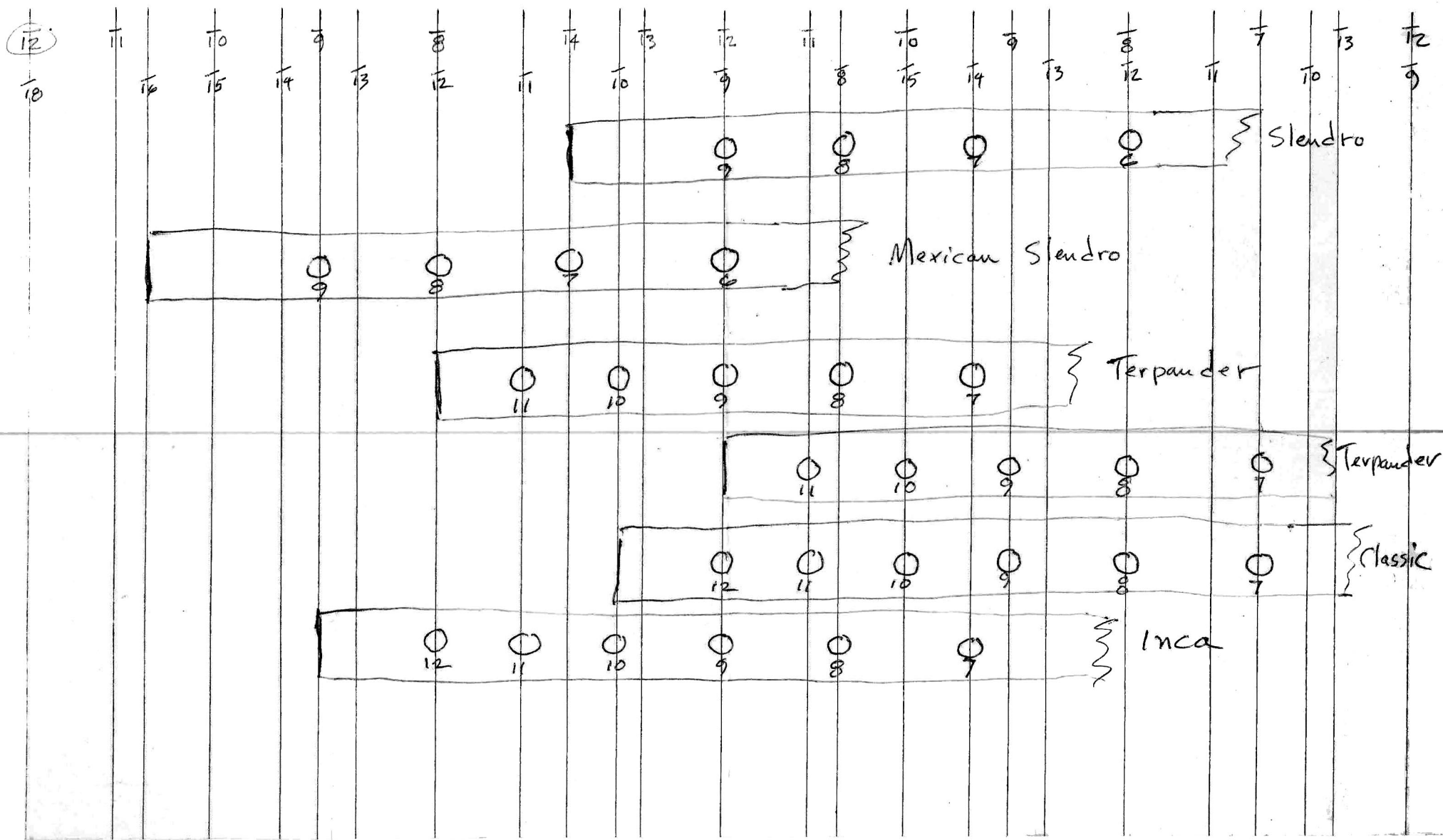
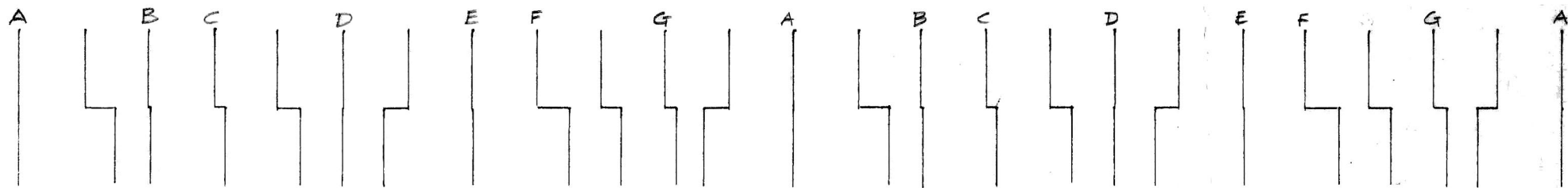
24		(14)	-	(12)	(11)	(10)
----	--	------	---	------	------	------

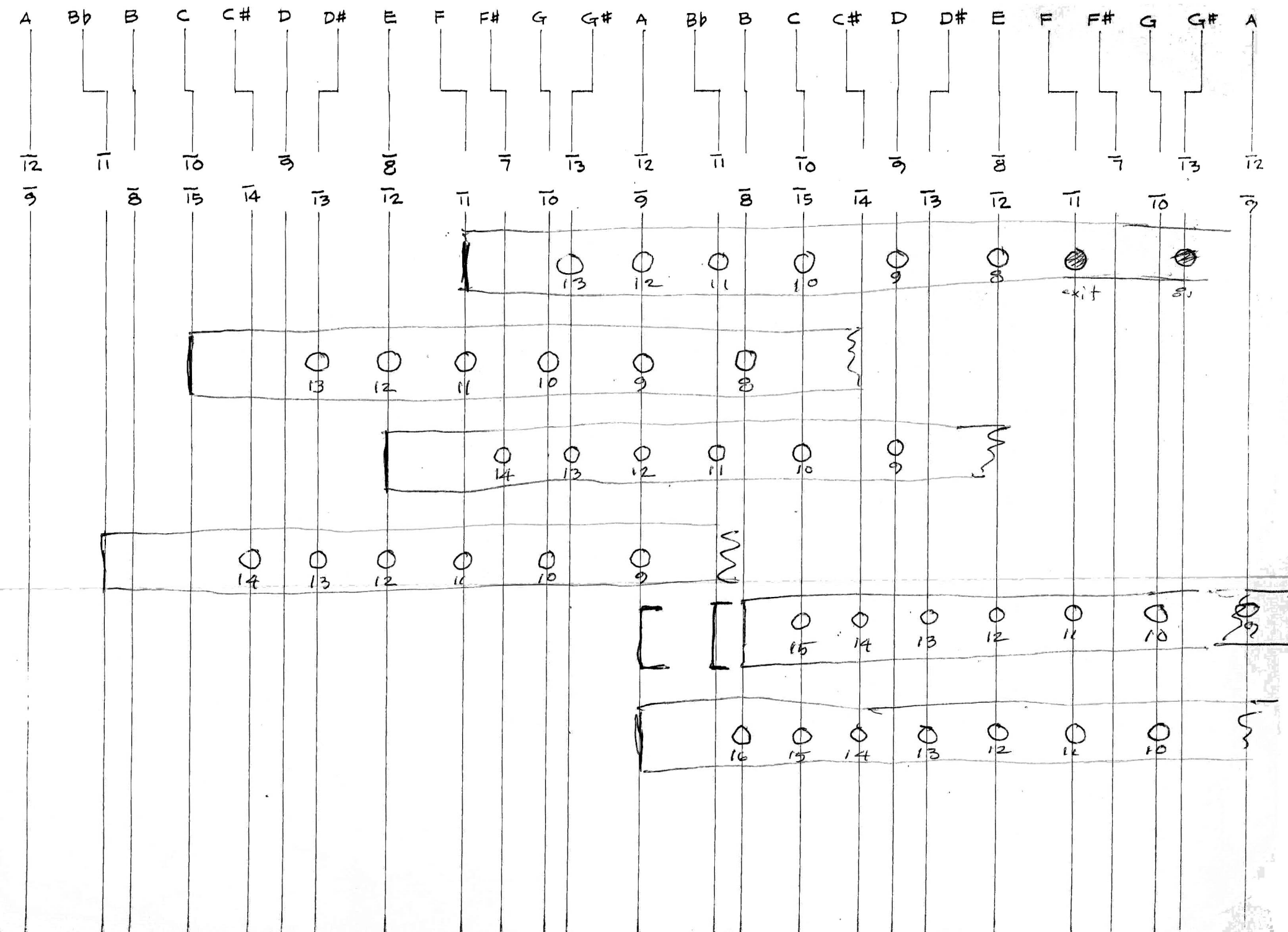
(33)	15	14	-	-	11	10
------	----	----	---	---	----	----

24	(15)	-	-	(12)	(11)	10
----	------	---	---	------	------	----









Some Scales for Flute Timbre

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	A	B	C	D	E	F	G	A					
	0/12	1	2	3	4	5	6	7	8	9	10	11	0/12
	12	11		10		9		8		7		13	12
	9	(33)	8	(15)	7	(27)	13	12	11	(21)	10	(39)	9
1	⊗			⊙		⊙		⊙			⊙		⊙
2.	⊙		⊗		⊙		⊙	⊙					⊙
			⊙	⊙	⊙				⊗		⊙		
	⊙	⊗	⊙			⊙		⊙	⊙	⊙			⊙
	⊙			⊗	⊙			⊙			⊙		⊙
			⊙		⊗	⊙	⊙		⊙	⊙	⊙		
			⊙	⊙	⊗		⊙		⊙	⊙	⊙		
3	⊙		⊙		⊙		⊙		⊙				⊙
	⊙		⊙		⊙	⊙		⊙		⊗	⊙		⊙
	⊙	⊙		⊙		⊙		⊙	⊙		⊙		⊙
	⊙		⊙		⊙		⊙	⊙		⊙		⊙	⊙
	⊗			⊙			⊙	⊙			⊙		⊗
		⊙		⊙		⊙		⊙				⊗	
	⊙	⊙					⊙		⊗				⊙
		⊙			⊙		⊙			⊗			
	⊙	⊙		⊙	⊙	×	⊙	⊙	⊙			×	⊙
		⊙		⊙	⊙		⊙		⊗			⊙	

	1/2	1	2	3	4	5	6	7	8	9	10	11	12
	1/2	1	2	3	4	5	6	7	8	9	10	11	12
	1	3/3	9	6	9	4	18	3	18	12	9	24	2
	1	33	8	5	7	3	13	2	11	7	5	13	1
Log ₂	.0000	.1255	.1699	.2630	.3626	.4150	.4695	.5850	.7105	.7776	.8480	.8845	1.0000
Cents	0.00	150.64	203.91	315.64	435.08	498.04	563.38	701.96	852.59	933.13	1017.60	1061.43	1200.00
Pitch 440	440.00	480.00	495.00	528.00	565.71	586.67	609.23	660.00	720.00	754.28	792.00	812.31	880.00
	(1.5.11)	(1.3.5)	(1.5.9.11)	(1.3.11)				(1.3.5.11)	(1.5.9)		(1.9.11)		



Kraig's choice

1.7.11

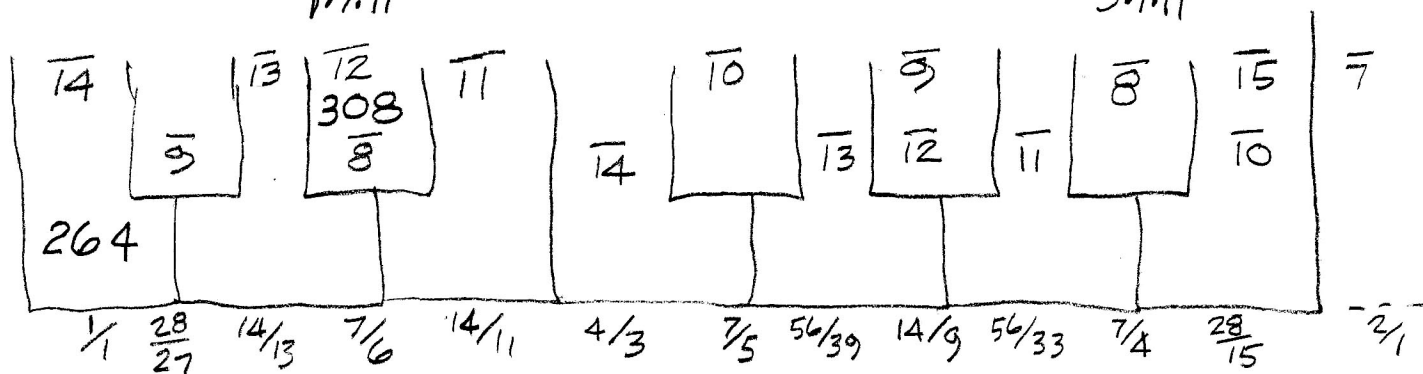
D#

1.7.11

3.7.11

A#

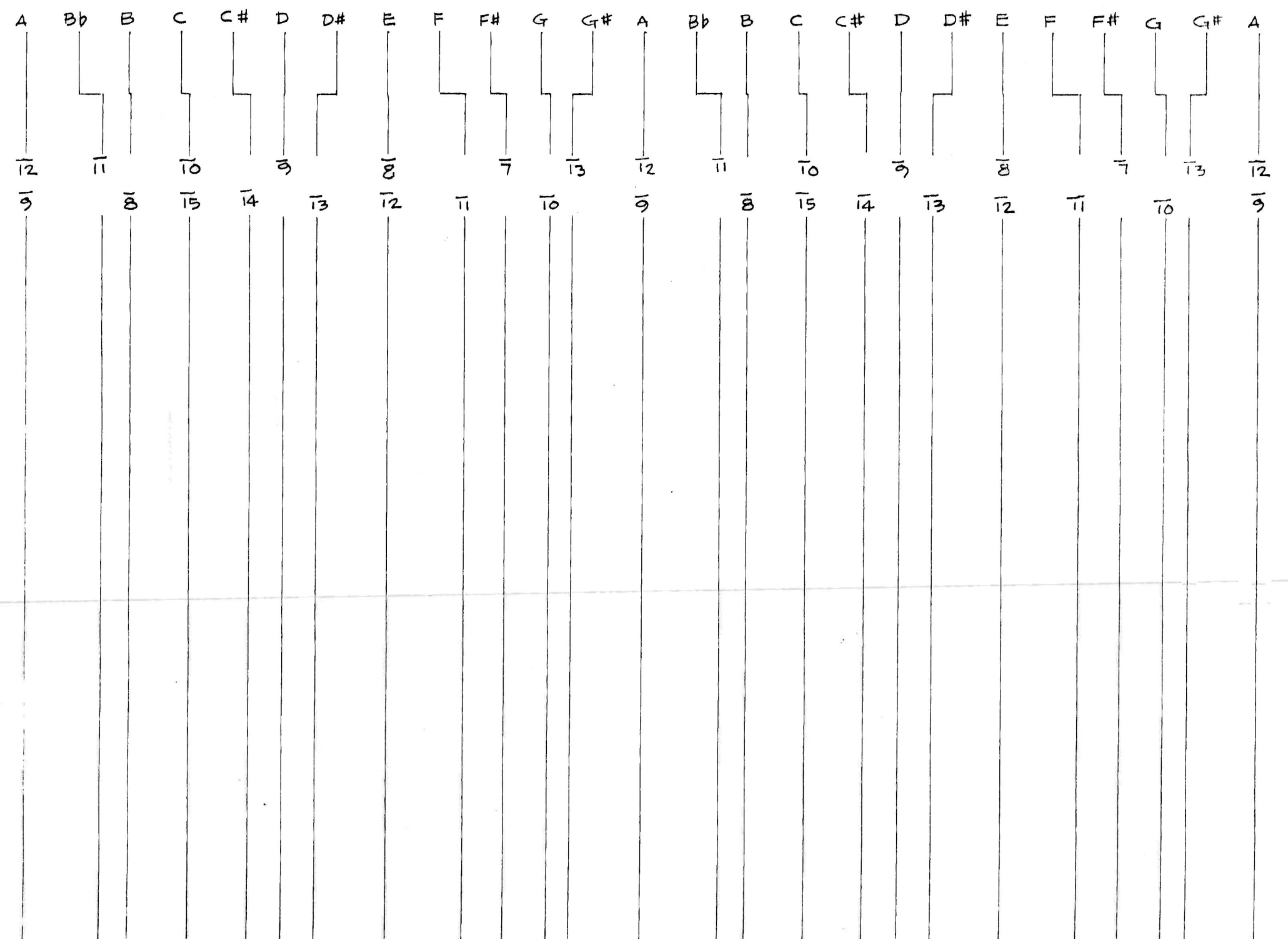
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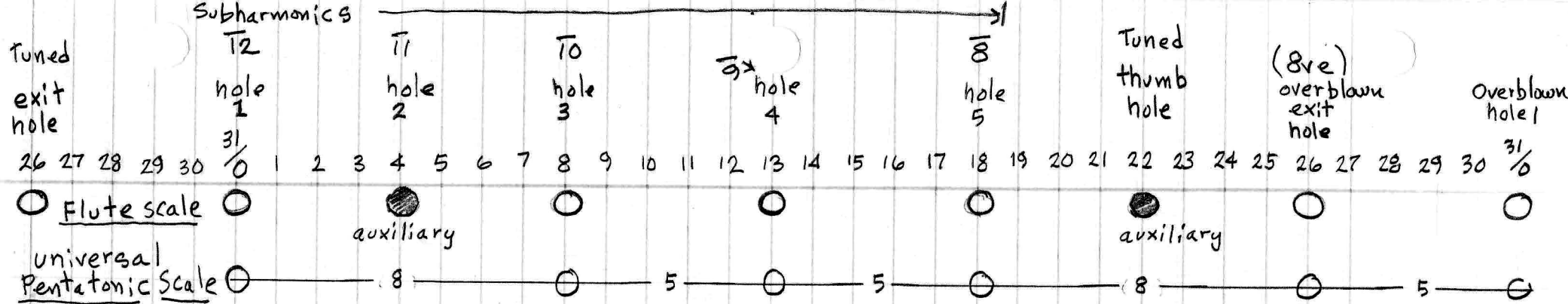


Scalatron
Setting

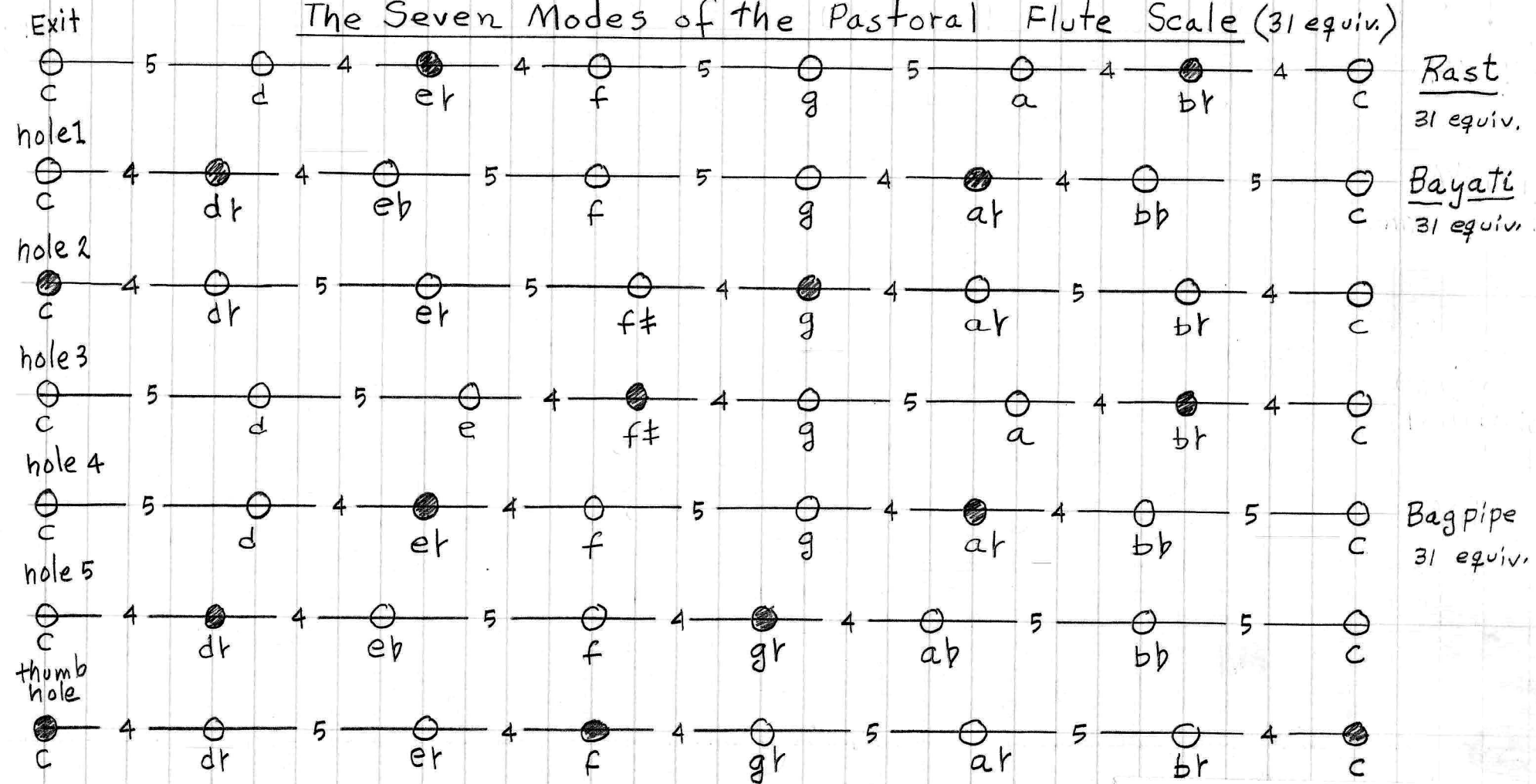
1/1	264	✓	6 7 9
28/27	273.78	✓	1 3 4 5 8 9
14/13	284.31	○	1 4 5 7 8 9
7/6	308.	✓	2 5 7 10
14/11	336	✓	3 4 7 8 10
4/3	352	✓	4 9 10
7/5	369.6	✓	1 3 7 9 10
56/39	379.08	○	1 2 6 7 9 10
14/9	410.67	✓	2 3 4 5 6 8 9 10
56/33	448	✓	1 5 6
7/4	462	✓	2 3 4 6 7
28/15	492.8	✓	1 2 3 6 7 8







The Seven Modes of the Pastoral Flute Scale (31 equiv.)



31-Tone Tuning of a Pastoral Flute Scale

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