

Swaranjali Music School
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Visharad Poorna Theory

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Theory: Written Exam Paper # 1:

Chapter 6: Swar Placement in Medieval and Modern Times

So far we have obtained general knowledge of definitions of Shruti and Swar and distribution of 22 shrutis in seven swar. In this chapter we will study placement of Swar on Shrutis, Saaranaa Chatushtayee and length of string.

Music time periods:

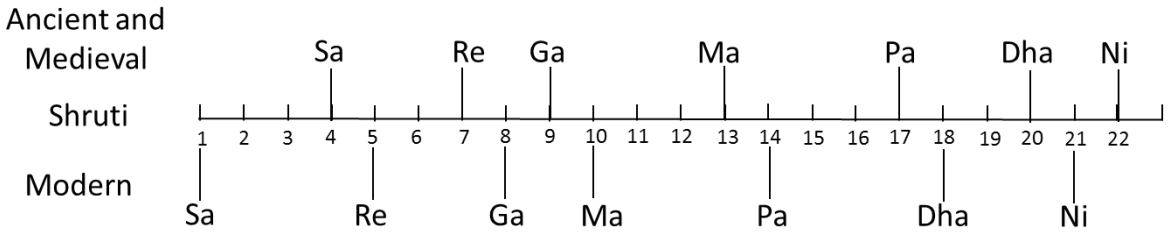
1. Ancient Time Period: (a) Time of Veda (Saamaved Music) and (b) From Bharat's (author of 'Naatyashaastra') time (200-300 AD) to writer of 'Sangeet Rarnaakar' – Shaarngadeva's time (1300 AD).
2. Medieval Time: After 'Sangeet Ratnaakar' i.e. after 1300 AD

   This time period includes works of writers Raamaamaatya (author of 'SwarMelKalaaNidhi'), Somnaath (Author of 'Raagbibodh'), Vyankatmakhee (author of 'Chaturdindiprakaashikaa'), Ahobal (author of 'Sangeet Paarijaat'), Shreenivaas (author of 'Raagtatvavibodh'), Lochan (author of 'Raagtarangini') etc.
3. Modern time: (a) Time of British occupancy of India – before independence and (b) Time after independence (after August 15, 1947).

Main points about Shruti-Swar to remember from these periods are:

1. Vedic music had descending octave.
2. From Bharat' time there are octaves that start from lower Sa like we have now. In Bharat's book 'Naatyashaastra', he has also written names of Swar.
3. From Bharat's time to medieval time, basic octave was considered to be of Kaafee thaat, that is, it had Ga-Ni komal or soft.
4. In Modern times, basic octave is thought to be of Bilaaval Thaat. This was first indicated by Patanaa's navaab (ruler) Muhammad Rajaa Saahab in a book 'Nagamaate-Aasafee'. (If you assume komal Ni from Mandra saptak of Kaafee Thaat to be Sa, you get today's Bilaaval Thaat).

Everyone from ancient to modern times agrees that there are 22 shruti. However, they disagree on which swar should be placed on which shruti. Each swar has fixed number of shruti assigned to it. Sa-Ma-Pa have four shruti each, Ga-Ni have two shruti and Re-Dha have three shruti each. In ancient and medieval times, swar was placed on last shruti of the interval, and in modern times, swar is placed on the first shruti of the interval.



From the above illustration it becomes clear that in ancient and medieval times, seven shuddha (basic) swar – Sa-Re-Ga-Ma-Pa-Dha-Ni, are respectively on 4-7-9-13-17-20-22 shruti. In modern (current) times, these same shuddha swar are on 1-5-8-10-14-18-21 shruti respectively. We can observe that in medieval times, distance between Ni-Sa, Ga-Ma and Ma-Pa was bigger or of four shruti. In modern times, Sa-Re, Ma-Pa and Pa-Dha pairs of swar have distance of four shruti between them. Hence, apparently, ancient Ga-Ni swar are different than modern Ga-Ni.

There are 22 shruti in a Saptak. However, scholars disagree on whether the distance between the shrutis is identical or varied. Scholars like Pandit Bhatkhande believed all shruti are equidistant (same distance or frequencies between all shruti). Other scholars like Bharat, Matanga, Shaarngadeva believed shrutis to be currently equidistant, but they were varied in ancient times. These differences of opinion exist even today.

Great teacher Bharat described 22 shrutis, but he did not name them. In 11th century, king Naanyabhoopaal (or Naanyadev) of Mithilaa wrote a book called 'Bharat Bhaashya' and listed the names of shrutis. The names are:
1. Teevra, 2. Kumudvatee, 3. Mandaa, 4. Chhandovatee, 5. Dayaavatee, 6. Ranjanee, 7. Raktikaa, 8. Roudree, 9. Krodhaa, 10. Vajrikaa, 11. Prasaarini, 12. Preetee, 13. Maarjanee, 14. Kshiti, 15. Raktaa, 16. Sandeepanee, 17. Aalaapini, 18. Madantee, 19. Rohini, 20. Ramyaa, 21. Ugraa, 22. Kshobhini

Shruti and Swar are essentially the same. There can be many shruti in one saptak. It is meaningless from the point of view of music as an art form. When shruti is used in a raag, it is called a swar. You can also think about shruti at other places. For example, quality (or grade) of swar Re (Rishabh) is different in raag Puriyaa Dhanaashree and raag Maarvaa. One can find differences in shruti for Rishabh in these two raag.

In ancient times, musicians did not know about the frequency of each sound or swar. Hence based upon relative distances between swar, or basic knowledge acquired by listening to all swar, all swar were placed in a saptak. Even though modern knowledge from Physics about frequency of sounds was not available to ancient musicians, they very well knew the relation between the length of the string on Veena and the higher or lower pitch of the swar. Based upon the length of strings on Veena, Pandit Ahobal and Pandit Shreenivaas explained the division between shruti-swar. In modern physics, with sophisticated instruments, frequency of a sound or swar is accurately measured. Modenr music scholars like Bhatkhande made use of the measurement of frequencies. Based on these observations, following table can be created.

	Name of Shruti	Ancient Bharat	Ancient Shaarngadev	Medieval Ahobal	Modern Pandit Bhatkhande
1	Teevra		Kaishik	Teevra Ni	Shadja (Sa)
2	Kumudvatee	Kaakli	Kaakli	Teevratar Ni	
3	Mandaa		Chyuta Shadja	Teevratam Ni	
4	Chhandovatee – Sa		Achyuta Shadja		
5	Dayaavatee			Poorva Re	Rishabh (Re)
6	Ranjanee			Komal Re	
7	Raktikaa- Re			Poorva Ga	
8	Roudree			Komal Ga (Teevra Re)	Gandhar (Ga)
9	Krodhaa – Ga			Teevratar Re	
10	Vajrikaa		Saadhaaran	Teevra Ga	Madhyam (Ma)
11	Prasaarini	Antar	Antar	Teevratar Ga	
12	Preetee		Chyuta Ma	Teevratam Ga	
13	Maarjanee – Ma		Achyuta Ma	Atiteevratam Ga	Pancham (Pa)
14	Kshiti			Teevra Ma	
15	Raktaa			Teevratar Ma	
16	Sandeepanee		Kaishik Pa	Teevratam Ma	
17	Aalaapini – Pa				Dhaivat (Dha)
18	Madantee			Poorva Dha	
19	Rohini			Komal Dha	
20	Ramyaa – Dha		Vikrut Dha	Poorva Ni	Nishaad (Ni)
21	Ugraa			Komal Ni (Teevra Dha)	
22	Kshobhini - Ni			Teevratar Dha	
1	Teevra				Taar Shadja (Sa)

		Medieval			Modern						
		Swar by Pandit Shreenivaas			Pandit Bhatkhande's swar			Western Swar		Karnatak (South Indian) Classical Music swar	
	Swar	Komal Shuddha	Length of String Inches	Frequency Hz (CPS – Cycles Per Second)	Komal Shuddha	Length of String Inches	Frequency	Swar Name	Frequency	Swar Name	Frequency
1	Sa		36	240	-	36	240	C	240	Sa	240
2	Re	Komal	33.33	259.20	Komal	34	254.12		256	Shuddha Re	256
3	Re	Shuddha	32	270	Shuddha	32	270	D	270	Shuddha Ga	270
4	Ga	Shuddha	30	288	Komal	30	288		288	Saadhaaran Ga	288
5	Ga	Teevra	28.66	301.4	Shuddha	28.66	301.4	E	300	Antar Ga	300
6	Ma	Shuddha	27	320	Shuddha	27	320	F	320	Shuddha Ma	320
7	Ma'	Teevratar	25.11	344.071	Teevra	25.5	338.82		337.5	Prati Ma	337.5
8	Pa	-	24	360	-	24	360	G	360	Pa	360
9	Dha	Komal	22.22	388.8	Komal	22.66	381.18		384	Shuddha Dha	384
10	Dha	Shuddha	21.33	405	Shuddha	21.33	405	A	400	Shuddha Ni	405
11	Ni	Shuddha	20	432	Komal	20	432		432	Kaishik Ni	426.44
12	Ni	Teevra	19.11	452.093	Shuddha	19.11	452.093	B	450	Kaakli Ni	450
	Sa'	Taar	18	480	Taar	18	480	C	480	Taar Sa'	480

In this table, Frequency of western Swar 'Middle C' is shown to be 240 for convenience (From a book 'Raag Taal Darshan' – Visharad Pratham, Visharad Poorna, published by Akhil Bharatiya Gandharva Mahaidyalaya Mandal). (In reality, Middle C is 261.63 Hz)

Determine length of string and frequency with Mathematical calculations:

It is necessary to remember some physics theories to understand this topic. Pitch of a sound, frequency of a naad, and length of a string are all related to each other. Pitch and frequency are directly proportional to each other. That is, when frequency goes up, pitch of a sound goes up too. For example, if you assume frequency of 'Sa' to be 240 Hz, any swar that has higher pitch, say 'Ma', will have higher frequency (Ma's frequency is 320 Hz).
Length of string and frequency are inversely proportional to each other. For example: Sa has frequency 240 Hz and length of string 36 inches. Pa has frequency 360 and length of string 24 inches.

Following equation is established:
Frequency (Hz) X Length of string (Inches) = Constant
240 X 36 = 8640 (The number 8640 will never change. It will be same for all swar.

If you multiply frequency (in Hz) and length of string (in inches) for any swar, you will get number 8640. Hence if you know either frequency or length of string, you can find the other with this equation.
You can also find length of strings with ratios. Sa/Pa ratio is 3/2 (360/240 or 36/24).