

## 'Music': What it means?

### Introduction:

Read following conversation between Rahi and her music teacher.

Teacher: For the annual programme, I need one person from your class to sing national anthem from the stage.

Rahi: All of us like our national anthem. So you can select anyone of us.

Teacher: True. But I will take an audition and select the student who can sing it 'properly'.

Rahi: What you mean by properly? All of us know the exact words of anthem.

Teacher: Yes. But you don't have to just 'recite' it, you should be able to 'sing' it.

Rahi: But all of us also know the tune of the national anthem. So all of us can sing it.

Teacher: Singing is not just knowing the tune. You should sing with exact 'सुर'.

Rahi: I know the seven सुर. They are सा, रे, ग, म, प, ध, नी.

Teacher: Correct. Singing properly means each sound from your vocal chord should hit correct position of the respective सुर.

Rahi: Correct position? What is that? Are they standing somewhere?

What do you think the teacher is trying to say? Do you understand what she means by 'correct position'?

Let us take the example of a harmonium.

For the following tasks, we will need a smartphone. There are many smartphone apps which show you frequency of sound played in the vicinity of the phone. We will use one of those apps.

### Session-1

#### Task 0 : Familiarization with the 'Tuner - DaTuner' app

1) We will be using 'DaTuner Lite' app throughout this LU to measure the frequency of different musical notes. When you open the app, the frequency is shown on the bottom left side of the screen. The scale along the left edge shows volume level. Note units of both the quantities.



2) Just to test the app, we will need some volunteers. Take the phone from the teacher. One of you can try saying the vowel 'आ' in an extended way and see what frequency gets displayed. Tell the frequency to the entire class and then pass the phone to the next group.

Da Tuner App

#### Task 1: Understanding the relation between different notes on a harmonium

Teacher will play different keys on Harmonium.

For convenience, let us agree to a convention. On the harmonium, you will see a pair of black keys and then a set of three black keys. The white key just before the black pair (first key in the figure) will be called White 1 (W1). As you proceed rightwards from this key, next key will be called Black 1 (B1), the next one is W2 and so on. Note that B3 comes after W4.

Now, note the frequency of the keys in the table on next page.

Key	Freq		Key	Freq		Key	Freq	
W1		-----	W8			W15		
B1			B6			B11		
W2			W9			W16		
B2			B7			B12		
W3			W10			W17		
W4			W11			W18		
B3			B8			B13		
W5			W12			W19		
B4			B9			B14		
W6			W13			W20		
B5			B10			B15		
W7			W14			W21		

What patterns do you observe in these frequencies? Write your observations below.

## Session 2

### Task 2 :Understanding the seven सुर for any given scale

In the beginning, Rahi spoke about seven सुर in Indian music. Let us find the relation between सुर and harmonium keys (in a particular scale). Refer to the table above (in Task 1) and note down frequencies of the keys given in table below (in the second row). In the third row of the table, write the ratio of frequency of each key to the frequency of the key W1.

Sur	सा	रे	ग	म	प	ध	नी	सा
Key	W1	W2	W3	W4	W5	W6	W7	W8
Freq.								
Ratio	----							

Harmonium or piano uses pre-defined frequencies which are set to a fixed frequency ratio. This is called 'equi-tempered scale'. However, one may note that there are other ways of defining scale, which give almost same frequencies. Looking at the decimal ratios in Task 2, one may notice that these ratios can also be expressed as fractions where both numerator and denominator are both integers less than 20. Write the ratios in that form.

The sequence of ratio you get is known as 'Ptolemaic Sequence'.

**Task 3 : Finding the frequency of seven सुर in any scale**

Different scales in music just mean starting your first सुर at another key. Now suppose your first सुर (i.e. सा) is starting with B1 instead of W1. Use the Ptolemaic sequence you found above and the table on the previous page to decide which keys will correspond to other सुर. Here B1 is taken just as an example and you can choose any other key instead of B1,

Sur	सा	रे	ग	म	प	ध	नी	सा
Ratio								
Fre.								
Key								

Play this sequence on harmonium to see if you get similar sequence of sounds as playing W1-W7.

**Session 3**

**Task 4: Understanding the Working of Jaltarang**

Take ceramic bowls / metallic bowls / beakers of different kinds and a measuring cylinder.



Place the 3 bowls / beakers side by side and tap them with a pencil and note down the frequency in each case. Which bowl has the highest frequency?

Description (size and material) of the beaker	Frequency observed

Take the largest beaker, keep adding a fixed amount to water to it (say 25 ml each time) and note the frequency.

Volume of water added	Frequency observed

Is it possible to change the frequency of this bowl/beaker to match that of the smallest bowl/beaker and at what water level will that occur?

What all parameters are important in deciding vibrating frequency of the beaker?