Manual for the use of the clock analogy

CONTENT

Introduction

The operation of this simulator for the clock analogy and the interpretation of its results are simple tasks once you have studied the basic concepts of the clock analogy; however, it has been considered useful to write this small manual.

This manual will include comments that, while not corresponding to the operation of the simulator, will show that it is a valuable aid in visualizing key concepts of harmony in music theory: intervals, scales, and chords.
The start window of this application consists of two main areas. The upper part has is a set of buttons that allow the selection of the task to be executed, and the lower part has a clock face that shows the results of the execution.

Initially, the buttons are preselected as follows:

For this initial condition, the lower part of the window only shows the location of the twelve notes used in Western music on the clock face:
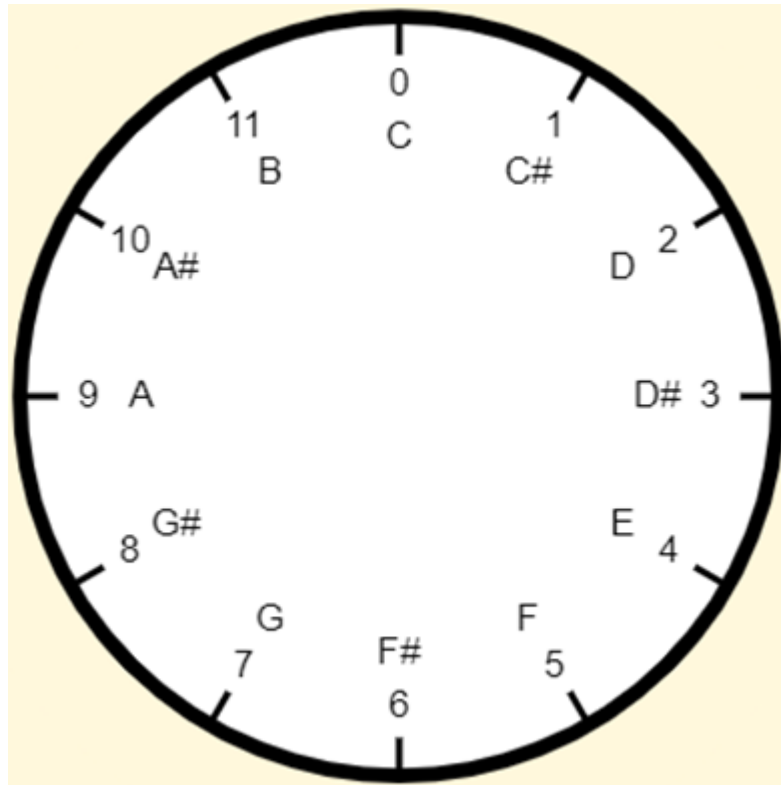
*These notes will remain fixed throughout the simulation.*

Displaying intervals

To display the intervals, click on the second button in the Theme column:

However, since the button corresponding to the First interval and the button corresponding to the Augmented species are preselected in the Intervals column, and in addition, although it is indicated, the simulator starts with the preselected note C, the first interval from note C to note C# will be displayed:
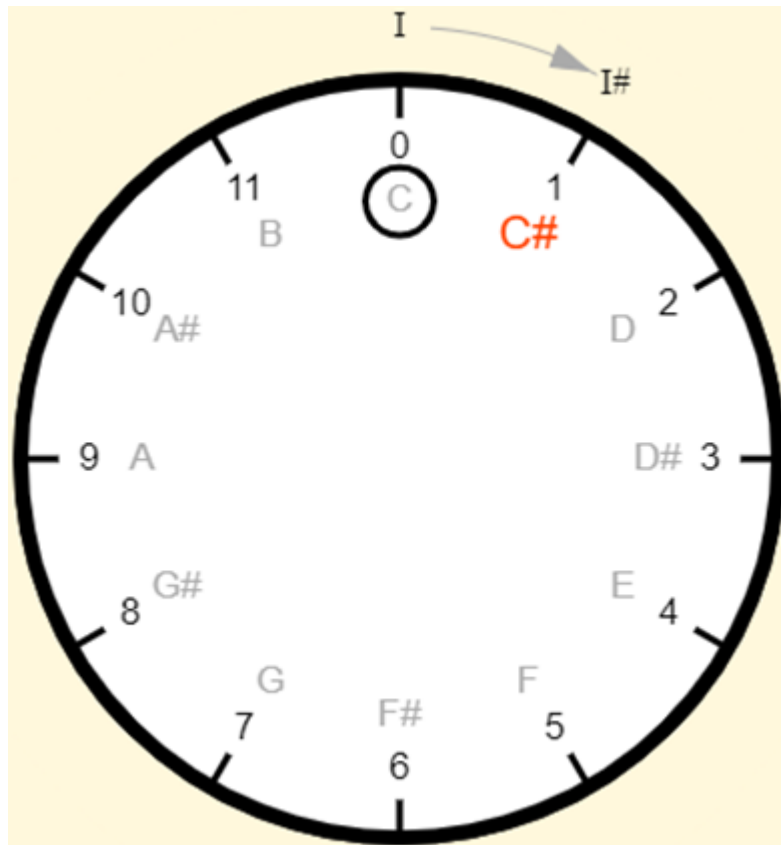
Although it is straightforward to predict, so there is no need to use this application to visualize it, if we want to see the first interval that starts in the note G we click on this note (corresponding to the hour 7), with what we obtain:
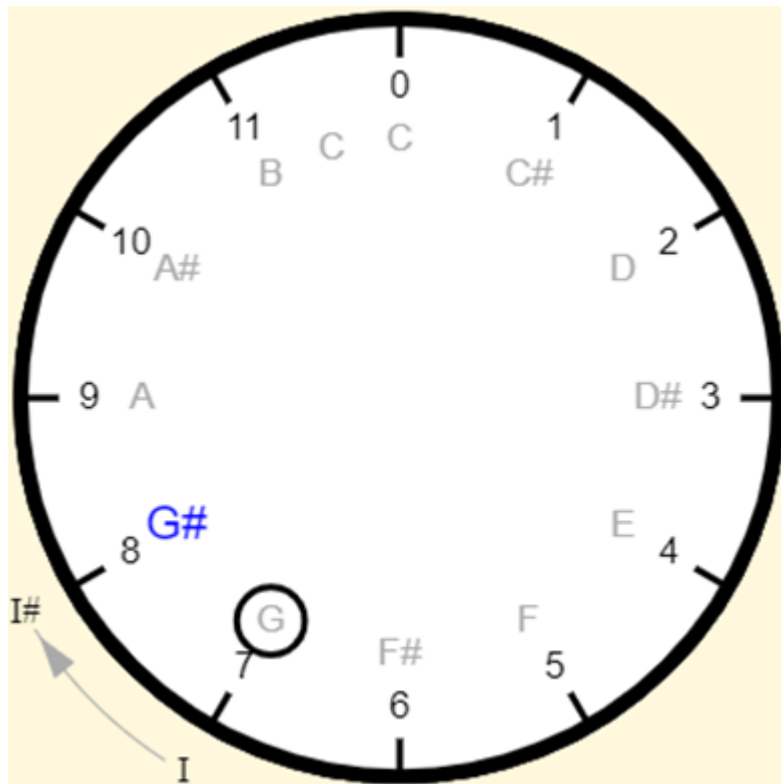
NOTE: Clicking on a note on the clock face is the general tonic selection mechanism for intervals, scales, and chords.

You will have noticed that for the First intervals the only Species option is the Augmented one. If we click on the Second interval selection button we will have the Minor, Major, and Augmented options:

Theme
- ( ) Notes
- (●) Intervals
- ( ) Scales
- ( ) Chords

Intervals

Name
- (●) First
- ( ) Second
- ( ) Third
- ( ) Fourth
- ( ) Fifth

Specie
- ( ) Diminished
- ( ) Minor
- ( ) Perfect
- ( ) Major
- (●) Augmented

and the default (Major) option for the same G tonic that we selected in the last action will appear:

and the default (Major) option for the same G tonic that we selected in the last action will appear:
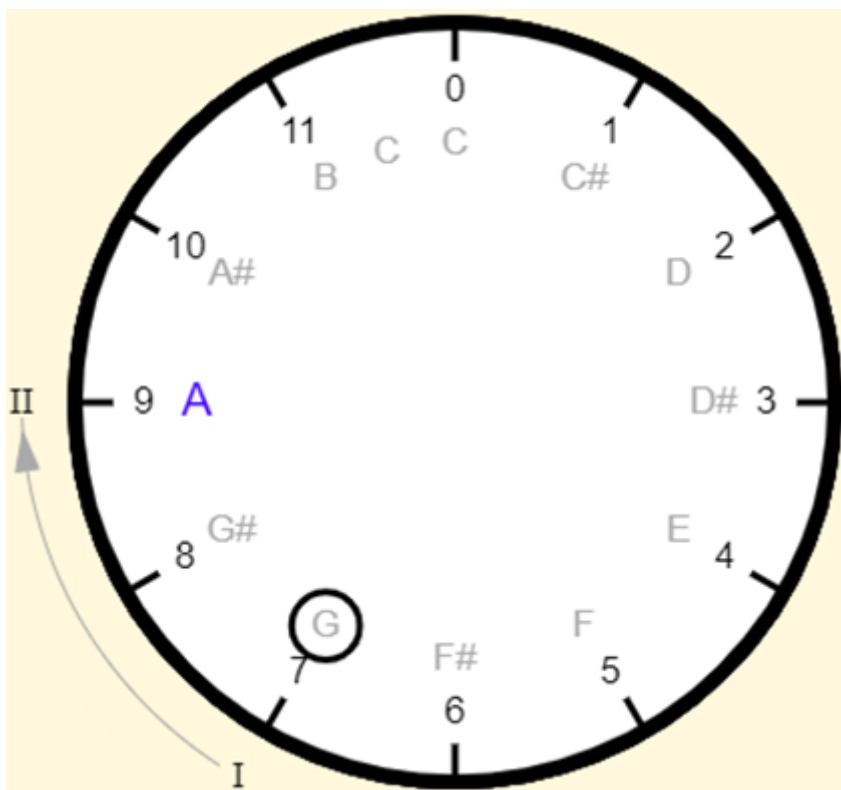
The operation of this simulator is that simple, but its usefulness becomes evident when considering its application to the study of chords and scales.

Display of scales composition

To display the composition of the scales, click on the third button in the Theme column:

Theme	Intervals		Scales
○ Notes	**Name**	**Specie**	● Majors
○ Intervals	○ First	○ Diminished	○ Natural minors
● Scales	● Second	○ Minor	○ Harmonic minors
○ Chords	○ Third	○ Perfect	

However, since the Scales column has preselected the button corresponding to the major scales, the major scale corresponding to the selected note will be displayed (note C at the beginning of the simulation). In the previous simulation, the note G was selected to show the interval of the second lowest note that starts there; therefore, if no other note is selected, the G major scale will be displayed:
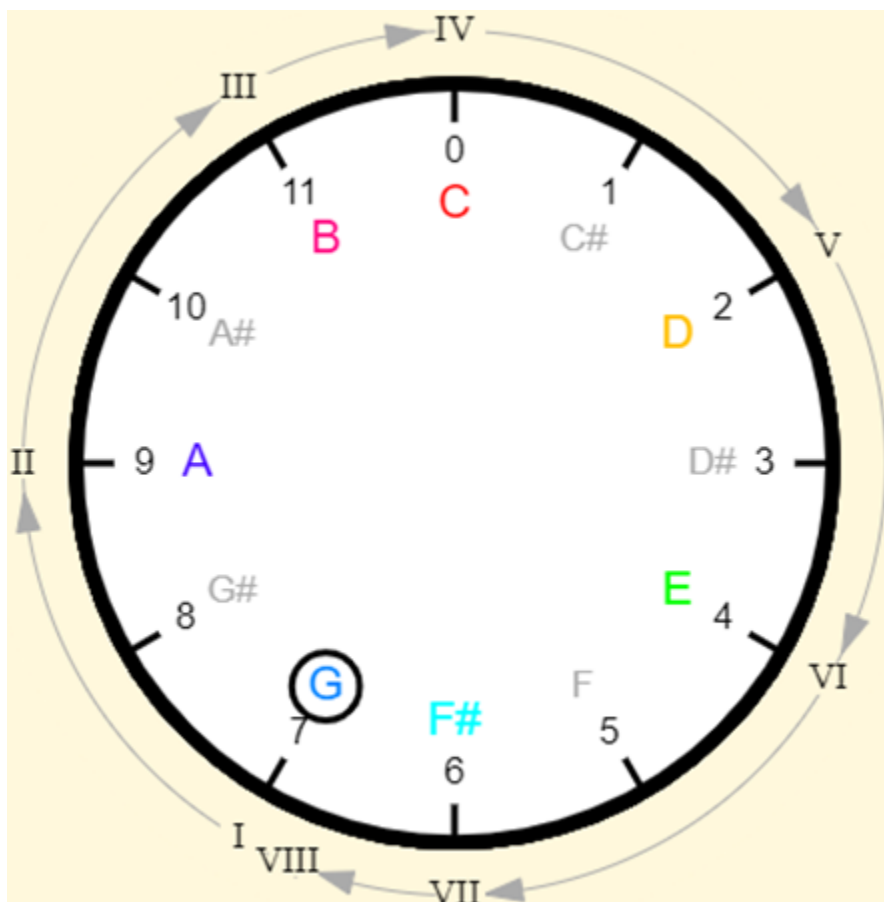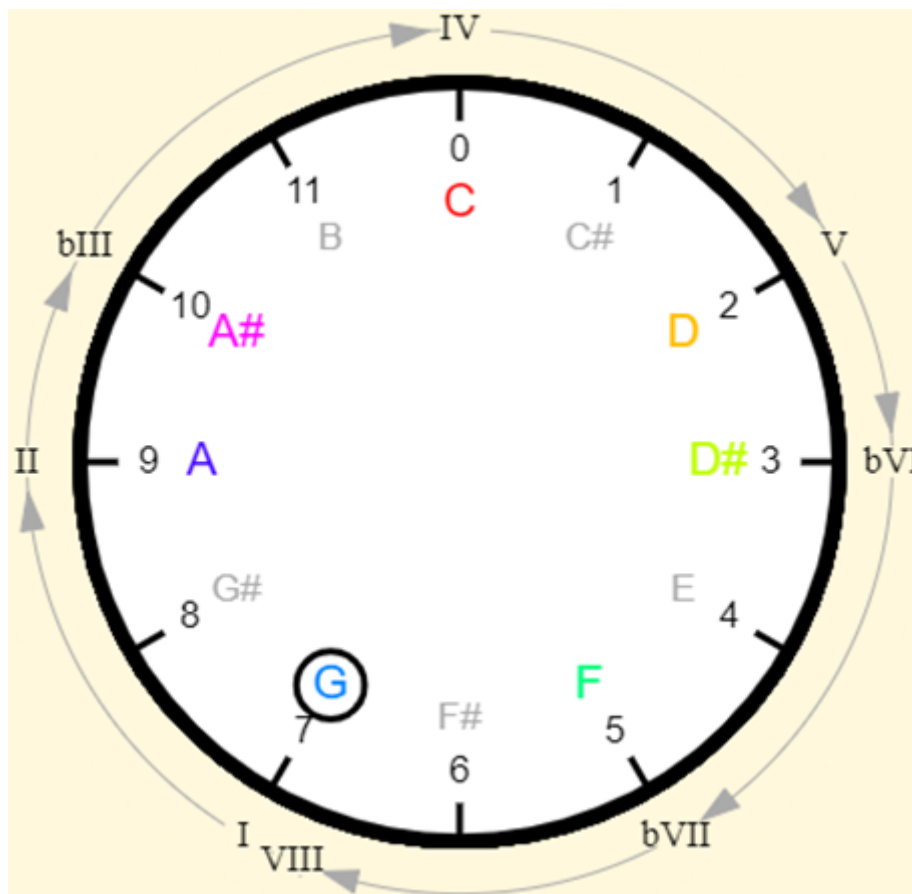
Apart from the fact that each note is associated with its corresponding degree within the scale, they have been highlighted in color; notes not belonging to the scale, including the natural note F, are shown in light gray.

Let's keep the note G as the tonic and now adjust the simulator to show the natural minor scale of G:

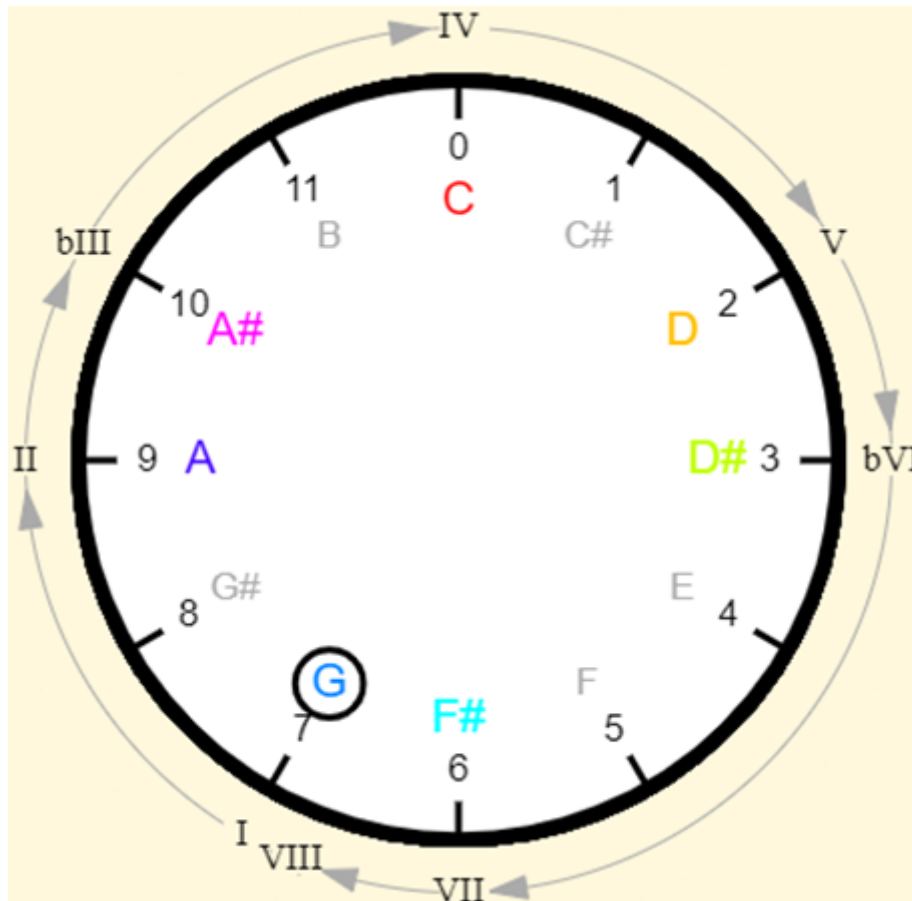| Theme	Intervals		Scales
⊙ Notes	**Name**	**Specie**	⊙ Majors
⊙ Intervals	● First	⊙ Diminished	● Natural minors
● Scales	⊙ Second	⊙ Minor	⊙ Harmonic minors
⊙ Chords	⊙ Third	⊙ Perfect	

The result is as follows:

A reduction of a semitone is observed for grades III, VI, and VII. The reduction of the third degrade is common to all minor scales. Let's check this fact by adjusting the simulator to produce the harmonic minor scale for G:

The result is as follows:

The only difference between this scale and the natural minor scale is that the degrade corresponding to grade VII has not been reduced by one semitone.

Display of chords composition

To visualize the composition of the chords, click on the fourth button in the Theme column:

Theme	Intervals		Scales	Chords
○ Notes	Name	Specie	○ Majors	● Majors
○ Intervals	● First	○ Diminished	○ Natural minors	○ Minors
○ Scales	○ Second	○ Minor	● Harmonic minors	○ Dominant seventh
● Chords	○ Third	○ Perfect		

Since the note G is still preset and major chords are the default option, the G major chord will appear. If we also click on the note C, the C major chord will be displayed:
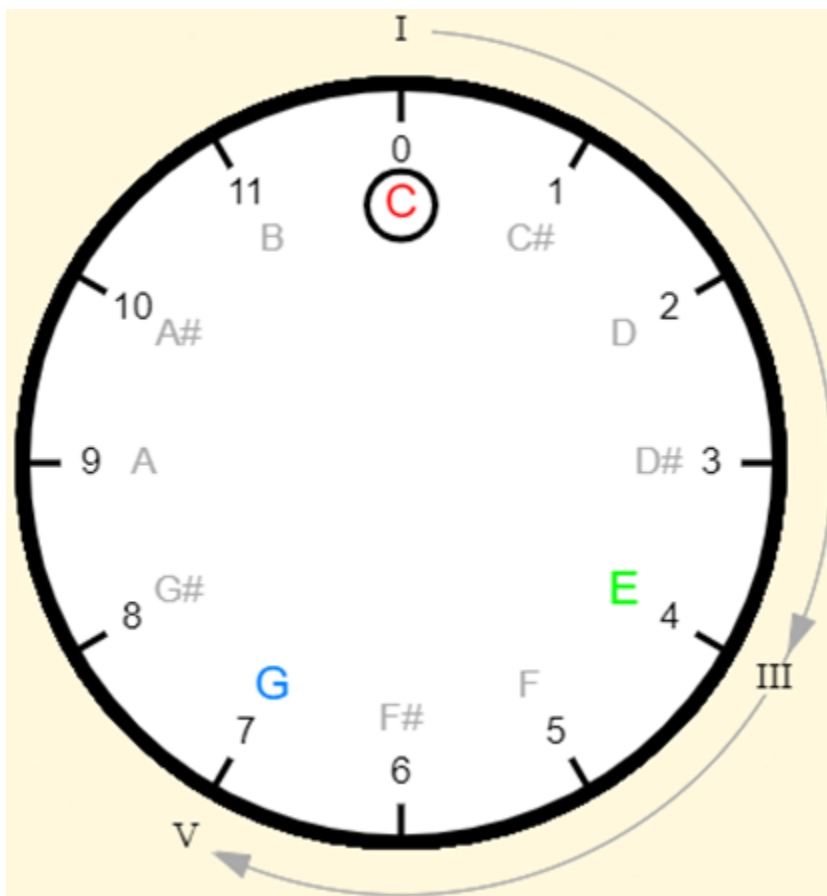
This shows that the major chords are built with the notes corresponding to grades I, III, and V of the C major scale. You can click on the Theme column to verify that these chords are made up of the interval sequence

Major third (4h) → Minor third (3h)

In terms of hours and intervals, the formula for the generation of this chord, and of all major chords, is as follows:

Major chord = 0h → 4h → 3h

Or in terms of notes:

Major chord = Note(T+0h) + Note (T+4h)+ Note (T+7h)

Where Note(T+nh) represents the note located n hours from the tonic.

A great advantage of the watch analogy is that, due to our familiarity with clock faces, it is effortless to visualize these relationships. Taking into account that the note G is always associated with the hour 9, you will most probably have no difficulty in visualizing, without the help of the simulator, that the G chord is made up of the notes G, B, and D; but you can use it to verify your answer:
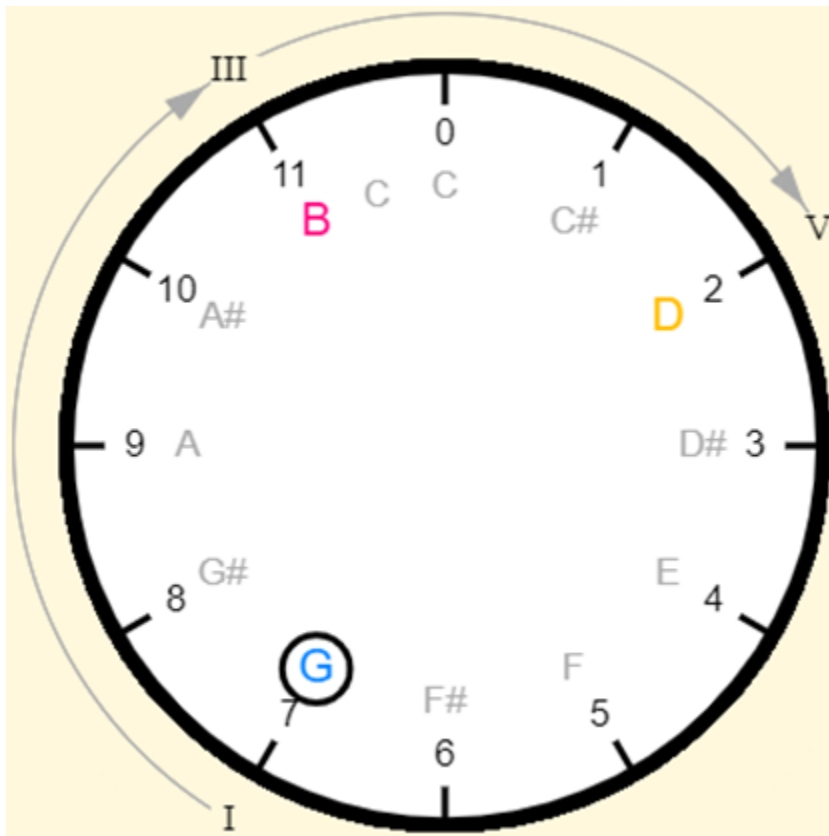

By performing exercises like this with the help of the simulator, you can achieve mastery to mentally perform the type of calculations involved in the clock analogy.

If we now change the type of chord to minor chords

Theme	Intervals		Scales	Chords
◯ Notes	Name	Specie	◯ Majors	◯ Majors
◯ Intervals	● First	◯ Diminished	◯ Natural minors	● Minors
◯ Scales	◯ Second	◯ Minor	● Harmonic minors	◯ Dominant seventh
● Chords	◯ Third	◯ Perfect		

The application will display in G minor chord:
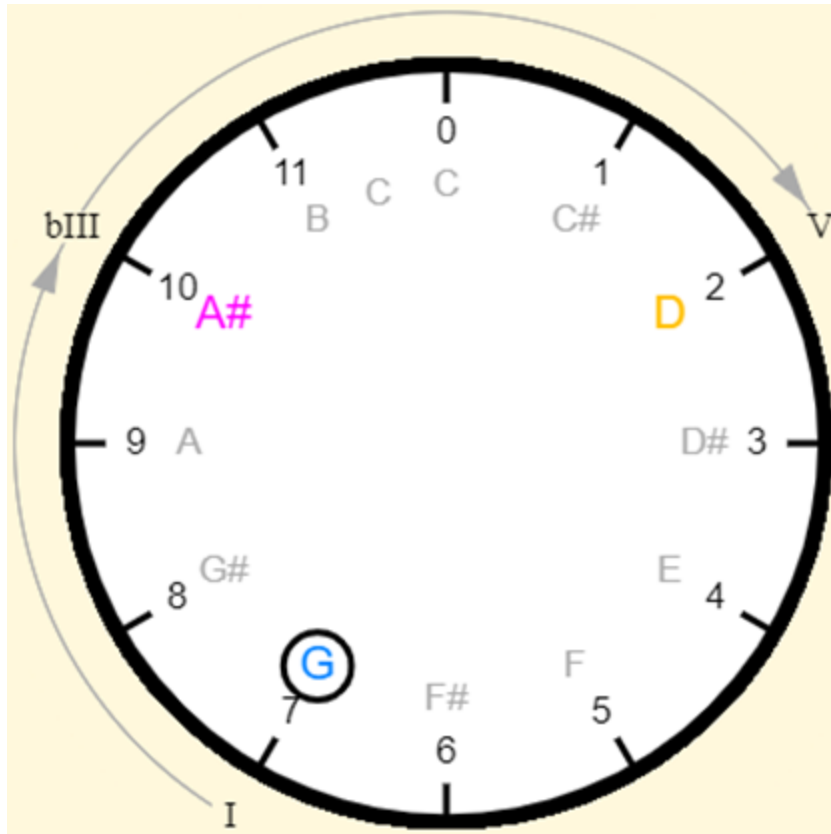
If you compare the conformation of this chord with its corresponding major, you will see that it differs only in the second note is the note A# corresponding to grade bIII instead of the note B corresponding to grade III. This is consistent with what happened in the comparison of major and minor scales. In terms of intervals, the formula for minor chords is as follows:

Minor third (4h) $\rightarrow$ Major third (3h)

In terms of hours and intervals, it is:
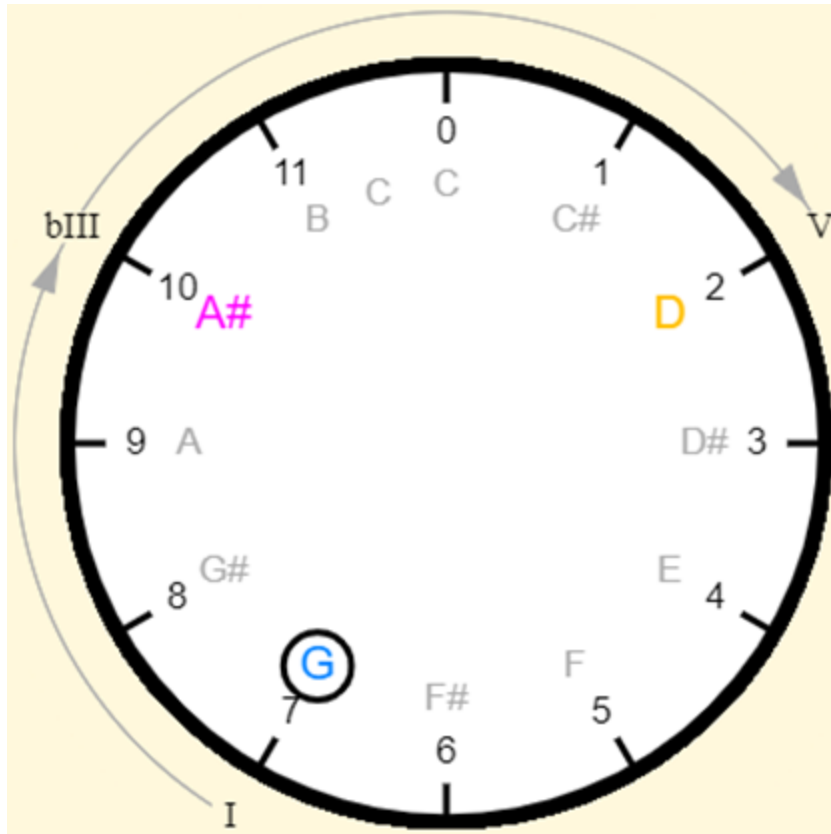
Major chord = 0h $\rightarrow$ 3h $\rightarrow$4h

And in terms of notes:

Minor chord = Nota(T+0h) + Nota(T+3h) + Nota (T+4h)

Finally, if we now change the type to dominant seventh chords

The application will show the G major chord with dominant seventh:

If you compare the conformation of this chord with its corresponding major, you will see that it differs only in the second note is the note A# corresponding to grade bIII instead of the note B corresponding to grade III. This is consistent with what happened in the comparison of major and minor scales. In terms of intervals, the formula for minor chords is as follows:
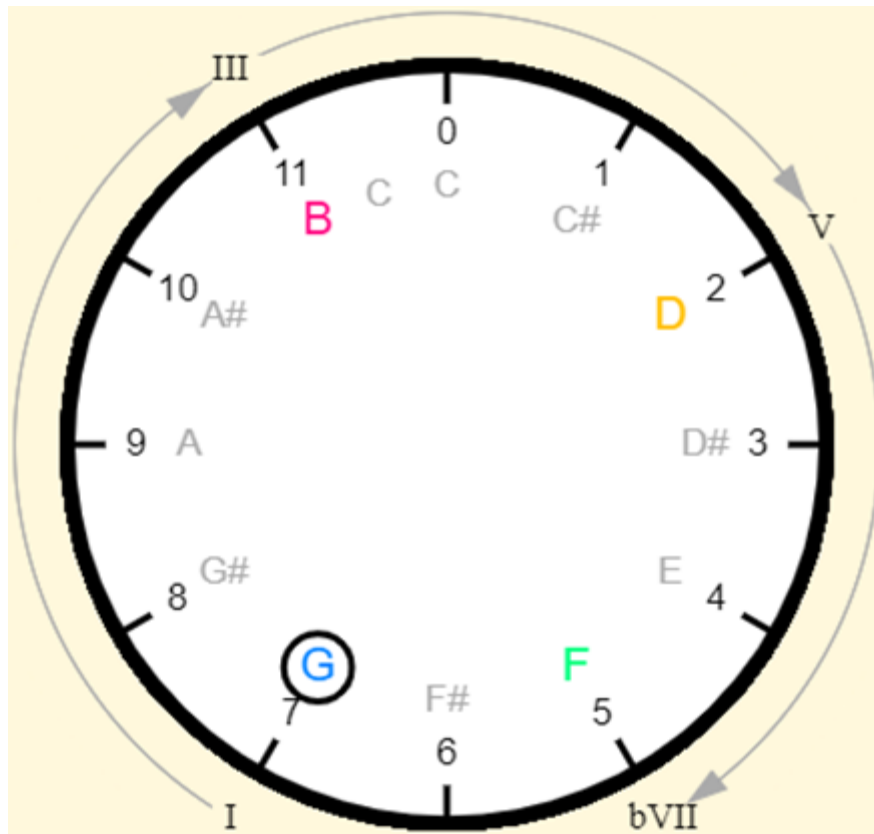
Minor third (4h) ➤ Major third (3h)

In terms of hours and intervals, it is:

Major chord = 0h ➤ 3h ➤ 4h

And in terms of notes:

Minor chord = Nota(T+0h) + Nota(T+3h)+ Nota (T+4h)

The comparison of this chord differs from the G major chord in that it is added to the note corresponding to grade bVII. In terms of intervals, the formula for minor chords is as follows:

Minor third (4h) → Major third (3h) → Minor third (3h)

In terms of hours intervals, it is:

Major chord = 0h → 3h → 4h → 3h

And in terms of notes:

Dominant seventh chords = Nota(T+0h) + Nota(T+7h) + Nota (T+7h) + Nota (T+10h)

Final consideration

There is considerable room for improvement in this simulator, especially with the inclusion of other commonly used chords in modern harmonization. However, the author will only address this task when other pending tasks on the iMusicMate website, in which it is embedded, are completed and if he considers that their degree of acceptance justifies it.