

Music Reference and Exercises



Christian Gimenez

0.1 Version



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Book version:

This book were compiled using Lua^AT_EX and Lilypond programs on '2024-06-04 at 11:16'.
Source code used are available at <https://gitlab.com/cnngimenez/music-exercises>.

Git were used as distributed version control system. Source code revision used were
"fa64bb3b76d3616af50f2912d6f835973b5cc320" on branch "main".

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Part I

About This Book

This chapter describes writing and format conventions used on this book. This book kind of contents and languages are also discussed, as well as their written representation.

This book homepage can be visited by the URL: <https://gitlab.com/cnngimenez/music-exercises>

Chapter 1

Font, text size, and line spacing

The font, size, and line spacing were specifically selected for easy and better readability. Sans serif font (in particular, Latin Modern Sans), 14 pt size, and 1.25 line spacing were used to help people with reading difficulties, such as dyslexia. See <https://webaim.org/techniques/fonts/> for more information.

There is no perfect font, or size, nor a perfect decision regarding the type of format and text. However, this book source code is free and open source (see Part VII), the authors allow to modify and to create new editions to fit other needs, as long as the license and authors are respected. Therefore, it is possible to create new versions of this book with other styles and formatting, to suit the needs for other audiences.

Chapter 2

Format and Writing Conventions

This sections describes the format and structure conventions used in this book. This conventions may not be strict, but are the prefered way used to write this work.

Titles are written with initial uppercases.

Relevant concepts are in **bold** to help the reader to find them (*emphasis* are not encouraged). One or several index entries are used when this important concepts are mentioned. Then, the reader can search a concept or term on the Index (see Index at page 85), go to the indicated page and find it easily.

Musics scores are written inline and centered when they are short and do not disturb the flow of - the reading. More than two lines of staves, are used in a "floating box" environments which position itself on the top or bottom page whenever it is near and there is space, or in another page. For example, a large code such as Fig. 2.1 is a floating box, but a simpler stave with a scale like this one:



This inline stave can be found inline, expecting not to disturb the reader too much. The eye movement should be continuous, and the understanding of the paragraphs were not to be disturbed.

Moreover, to refer to a particular score in this book, such as the previous one, the "Figure NUMBER" format are used (for PDF or \LaTeX generated resources), in a similar way as the figures, chapters or any object of this book.



Figure 2.1: An example score.

Chapter 3

Content Conventions

All content are synthesis from other formal resources. Academic and technical resources are preferred, such as journal or congress papers, books, and any material that were under some peer-review process. The paragraphs and texts that refers to these contents are cited and references. See the Reference section of this book

This book may have reference content, as well as curiosities or anything about music theory and singing. Other instruments may be included as well in their respective chapters.

Part II

Intervals

Table 3.1: Interval names and their tones and semitones.

Interval name	Abrev.	Semitones	Tones
Perfect unison	P1	0	0
Minor second	m2	1	$\frac{1}{2}$
Major second	M2	2	1
Minor third	m3	3	$1\frac{1}{2}$
Major third	M3	4	2
Perfect fourth	P4	5	$2\frac{1}{2}$
-	-	6	3
Perfect fifth	P5	7	$3\frac{1}{2}$
Minor sixth	m6	8	4
Major sixth	M6	9	$4\frac{1}{2}$
Minor seventh	m7	10	5
Major seventh	M7	11	$5\frac{1}{2}$
Perfect octave	P8	12	6

Interval is the difference in pitch between two sounds. Interval names refers to the difference in notes in a scale: C and D is a second; C and E is a third because C, D and E counts three notes; and so on. Major and minor intervals indicate a difference in one more semitone or one less semitone respectively. For example, C and E is a minor third (3 notes, but $1\frac{1}{2}$ tones) C and E \sharp is major third (3 notes, but 2 tones) .

The Table 3.1 describe the interval names, their usual abbreviations, and their semitones and tones distance from the first note.

Part III

Scales

This chapter list all major and minor scales. Some information for each scale is provided.

Chapter 4

Key Signatures

The key signature is a notation to avoid repeating the flat (♭) or sharp (♯) or any other alteration to specific notes. For instance, to state that all Fs should be sharped.

There are conventions to construct key signatures: The order in which the amount of flats or sharps appears in the different major scales. The major scale with 1 sharp is G major, which is F♯ the first; then the scale with 2 sharps is D major, which is F♯ and then C♯; and so on. Similarly, with flat signatures: the major scale with 1 flat is F major, which is B♭; then the scale with 2 flats is B♭ major, which is B♭ and then E♭; and so on [1].

Chapter 5

Sharp (#) Key Signatures

The Fig. 5.1 and Fig. 5.3 shows the key signatures written in conventional way. The first score shows the key signatures ordered by the sharp (#) appearance in the major scales. The second one shows the signatures ordered by the scale name.



Tips

To recognise the key signature name faster on Fig. 5.1, look for the last # on the key signature and add $\frac{1}{2}$ T to obtain it.

For example, the third key signature on the figure has the # on C#, adding $\frac{1}{2}$ T is D which is the name of the key signature. The next one has the last # on G#, adding $\frac{1}{2}$ T is A.

5.1 Flat (b) Key Signatures

The Fig. 5.4 and Fig. 5.5 shows the key signatures written in conventional way. The first score shows the key signatures ordered by the flat (b) appearance in the major scales. The second one shows the signatures ordered by the scale name.



Figure 5.1: Sharp key signatures ordered by the major scale appearance.



Figure 5.2: Double sharp key signatures.

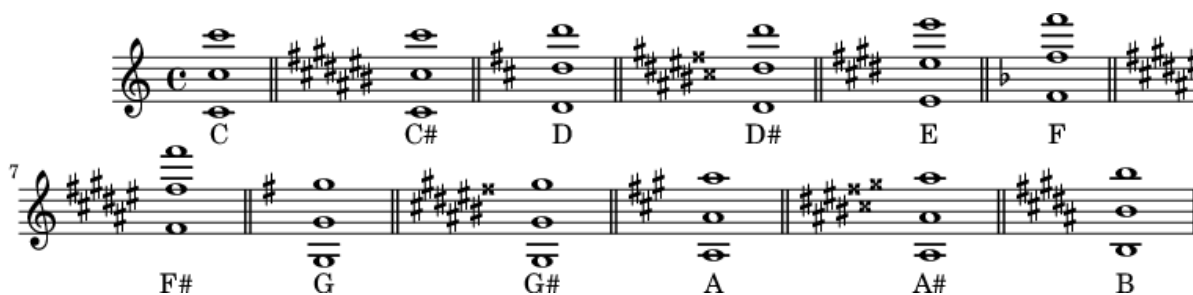


Figure 5.3: Sharp key signatures ordered by scale note.

To recognise the key signature name faster, on Fig. 5.4 after two flats on the key (from B \flat key signature), the penultimate \flat in the key indicates the scale note. For instance, B \flat key signatures have the last \flat in E \flat , and the penultimate is B \flat ; also E \flat key signature have the last \flat in A \flat , and the penultimate in E \flat ; and so on.


Tips



Figure 5.4: Flat key signatures ordered by the major scale appearance.



Figure 5.5: Flat key signatures ordered by scale note.

Chapter 6

Scale Degrees and Functional Names

Scale degrees is a nomenclature used to provide a conventional number to each pitch within a scale. Degrees are provided in numbers, which the first degree (1°) is the first pitch of the scale.

Each degree has a functional name. The Table 6.1 display each degree and their corresponding functional name. The prefix "sub-" and "super-" is used to indicate below and above respectively [1].

When reproducing a scale on an instrument, and stopping at the 7° degree, it usually provides an unfinished sensation. A needed tendency to end playing the scale by using the next note, the tonic. This is the reason of the name "leading tone" for this degree.

Table 6.1: Scale degrees and their names.

Degree	Functional name
1°	Tonic
2°	Supertonic
3°	Mediant
4°	Subdominant
5°	Dominant
6°	Submediant
7° ^{nil}	Leading tone

Chapter 7

Major Scales

The major scale tones and semitones are shown on Table 7.1 [1]. The most representative major scale is the C major, which is the first row on the table. The second row describes the tones and semitones distance between each note. The third row describes the interval name between the notes, which M2 is major seconds (1T distance) and m2 is minor second ($\frac{1}{2}$ T distance). The fourth row is the interval between the first note of the scale and the current note.

Later, in Chapter 9, the relative major and minor scale concept is introduced. This introduces a relation between these two types of scales: despite the different structure of the minor scale, the same notes are used to create a it from a major scale. For instance, the notes from C major scale are also the same notes from the A minor scale.

To obtain the relative minor scale of a specific major scale, the rule is:

- Major scale \rightarrow minor scale : augment $1\frac{1}{2}$ to the scale note.
- Minor scale \rightarrow major scale : diminish $1\frac{1}{2}$ to the scale note.

Table 7.1: Tones and semitones used on the major scale.

Notes:	C	D	E	F	G	A	B	C
Tones:	1T	1T	$\frac{1}{2}$ T	1T	1T	1T	$\frac{1}{2}$ T	
Intervals:	M2	M2	2m	M2	M2	2M	m2	
Intervals:	M2	M3	P4	P5	M6	M7	P8	

7.1 C Major Scale



The relative minor scale is: A minor (see Section 8.7).

Relative minor scale: A minor.

Equivalent scale: C major, B \sharp major

Equivalent scale most used: C

Tonic: C

Mediant: E

Dominant: G

Chord: C - E - G

7.2 D Major Scale



The relative minor scale is: B and C \flat minor (see Section 8.8).

Relative minor scale: B and C \flat minor.

Tonic: D

Mediant: F \sharp

Dominant: A

Chord: D - F \sharp - A

7.3 E Major Scale



The relative minor scale is: C \sharp and D \flat minor (see Section 7.8).

Relative minor scale: C \sharp and D \flat minor.

Equivalent scale: E major, F \flat major

Equivalent scale most used: E

Tonic: E

Mediant: G \sharp

Dominant: B

Chord: E - G \sharp - B

7.4 F Major Scale



The relative minor scale is: D minor (see Section 8.3).

Relative minor scale: D minor.

Equivalent scale: F major, E \sharp major

Equivalent scale most used: F

Tonic: F

Mediant: A

Dominant: C

Chord: F - A - C

7.5 G Major Scale



The relative minor scale is: E and F \flat minor (see Section 8.4).

Relative minor scale: E and F \flat minor.

Tonic: G

Mediant: B

Dominant: D

Chord: G - B - D

7.6 A Major Scale



The relative minor scale is: F \sharp and G \flat minor (see Section 8.11).

Relative minor scale: F \sharp and G \flat minor.

Tonic: A

Mediant: C \sharp

Dominant: E

Chord: A - C \sharp - E

7.7 B Major Scale



The relative minor scale is: G \sharp and A \flat minor (see Section 8.12).

Relative minor scale: G \sharp and A \flat minor.

Equivalent scale: B major, C \flat major

Equivalent scale most used: B

Tonic: B

Mediant: D \sharp

Dominant: F \sharp

Chord: B - D \sharp - F \sharp

7.8 C \sharp /D \flat Major Scale



The relative minor scale is: A \sharp and B \flat minor (see Section 8.13).

7.9 D \sharp /E \flat Major Scale





The relative minor scale is: C and B \sharp minor (see Section 8.2).

7.10 F \sharp /G \flat Major Scale



The relative minor scale is: D \sharp and E \flat minor (see Section 8.10).

7.11 G \sharp /A \flat Major Scale}



The relative minor scale is: F and E \sharp minor (see Section 8.11).

7.12 A \sharp /B \flat Major Scale





The relative minor scale is: G minor (see Section 8.6).

Chapter 8

Minor Scales

The structure of the minor scale is shown on Table 8.1 [1].

The relative major scale of a minor scale is calculated by $1\frac{1}{2}T$ above. For example: $1\frac{1}{2}T$ above A is C, then corresponding major scale of the A Minor Scale is the C Major Scale.

Therefore, the rule is:

- Major scale \rightarrow minor scale : augment $1\frac{1}{2}$ to the scale note.
- Minor scale \rightarrow major scale : diminish $1\frac{1}{2}$ to the scale note.

8.1 Minor Scale Key Signatures

3

8.2 C Minor Scale



Table 8.1: Tones and semitones used on the minor scale.

A	B	C	D	E	F	G	A
1T	$\frac{1}{2}T$	1T	1T	$\frac{1}{2}T$	1T	1T	

The relative major scale is: D \sharp and E \flat major (see Section 8.10).

8.3 D Minor Scale



The relative major scale is: F and E \sharp major (see Section 7.4).

8.4 E Minor Scale



The relative major scale is: G major (see Section 7.5).

8.5 F Minor Scale



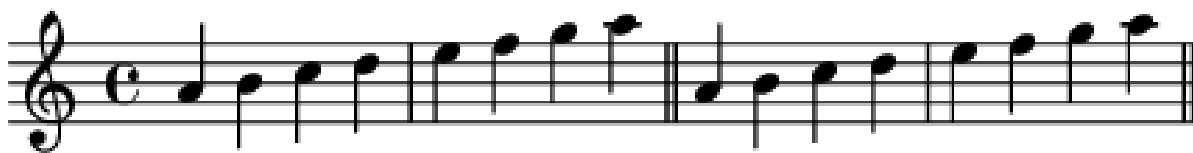
The relative major scale is: G \sharp and A \flat major (see Section 7.11).

8.6 G Minor Scale



The relative major scale is: A \sharp and B \flat major (see Section 7.12).

8.7 A Minor Scale



The relative major scale is: C and B \sharp major (see Section 7.1).

8.8 B Minor Scale



The relative major scale is: D major (see Section 7.2).

8.9 C \sharp /D \flat Minor Scale



The relative major scale is: E major (see Section 7.3).

8.10 D \sharp /E \flat Minor Scale



The relative major scale is: F \sharp and G \flat major (see Section 7.10).

8.11 F[#]/G^b Minor Scale



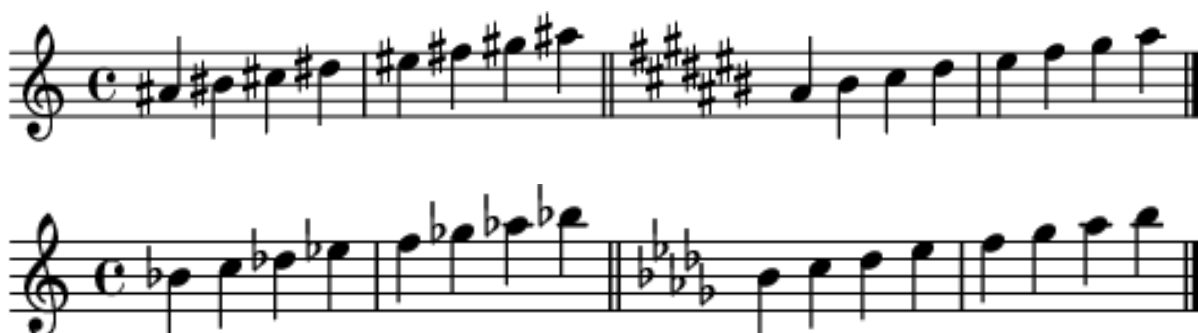
The relative major scale is: A major (see Section 7.6).

8.12 G[#]/A^b Minor Scale



The relative major scale is: B major (see Section 7.7).

8.13 A[#]/B^b Minor Scale



The relative major scale is: C[♯] and D^b major (see Section 7.8).

Chapter 9

Relative Major and Minor Scales

Same key signatures in scales are called **relative** scales or relative keys [1]. The relative minor scale of a major scale is calculated by $1\frac{1}{2}T$ below. For example: $1\frac{1}{2}T$ below of C is A, then corresponding minor scale of the C Major Scale is the A Minor Scale. Table 9.1 shows all the major scales and their relative minor scales.

Therefore, the rule is:

- Major scale \rightarrow minor scale : augment $1\frac{1}{2}$ to the scale note.
- Minor scale \rightarrow major scale : diminish $1\frac{1}{2}$ to the scale note.

Table 9.1: Major and minor relative scales.

Major Scale:	C	C \sharp	D	D \sharp	E	F	F \sharp	G	G \sharp	A	A \sharp	B
Minor Scale:	A	A \sharp	B	C	C \sharp	D	D \sharp	E	F	F \sharp	G	G \sharp

Chapter 10

Chromatic Scale

10.1 Chromatic Scale in a Treble Clef

The Fig. 10.1 shows the chromatic scale in a treble (G) clef. For each note, the note name and scale is displayed with the frequency below. For example, the first note is C at the fourth scale, which in frequency is 261.63 Hz.

10.2 Chromatic Scale in a Suboctave Treble Clef

The Fig. 10.2 ...

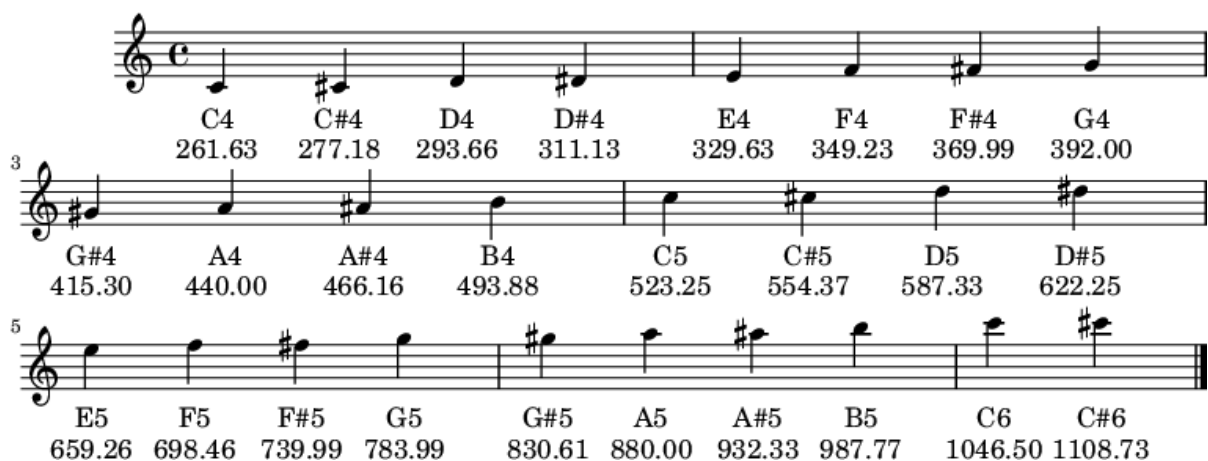


Figure 10.1: Chromatic scale with note and frequency (in Hz) reference.

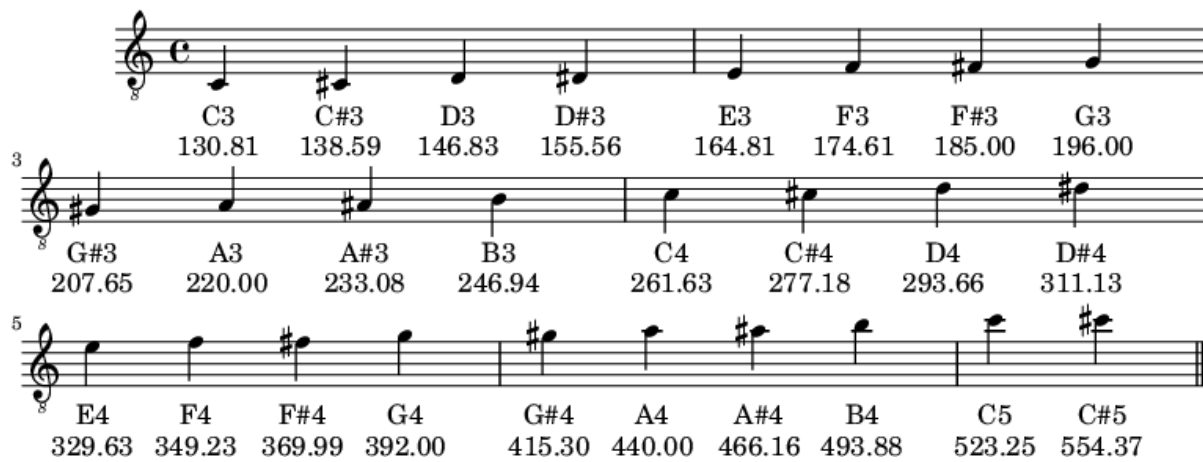


Figure 10.2: Chromatic scale references using treble suboctave clef.

10.3 Chromatic Scale in a Bass and Treble Clef

The Fig. 10.3 ...



Figure 10.3: Chromatic scale references using treble and bass clefs.

Chapter 11

The Blues Scale

This scale can also be formed by diminishing three notes from the major scale: the third, fifth, and seventh tones. These notes are called **blues notes** [3, 4].

From a minor scale, a blues scale can be formed by omitting the second and sixth tones. Then, new tones are added between the fourth and fifth. For example, to form the A blues scale from A minor scale, the B (second) and F (sixth) notes must be removed. The Fig. 11.1 shows the A minor scale above and A Blues scale below. The red notes are the one to be removed to create the Blues scale.

The Table 11.1 shows the tones and semitones used for the blues scale. The notes in the first row are from the C blues scale.

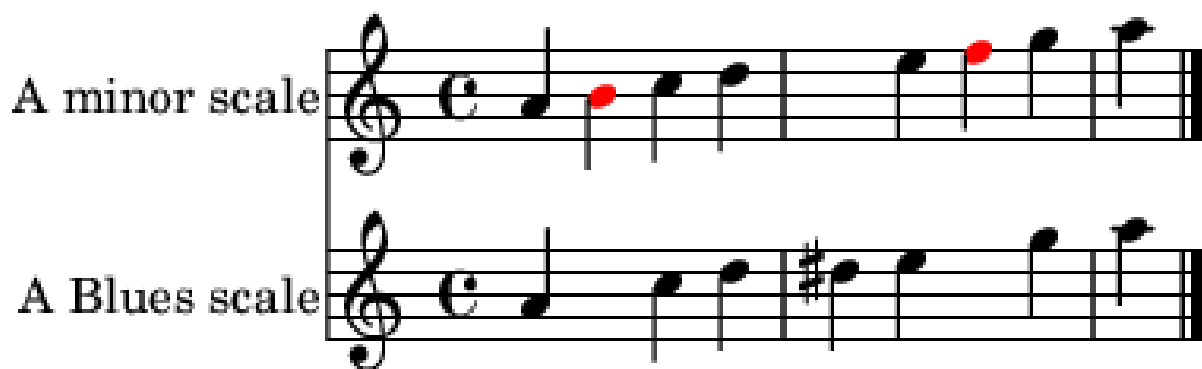


Figure 11.1: Creating the A Blues scale from the A minor scale.

Table 11.1: Tones and semitones used on the pentatonic blues minor scale.

Notes:	C	E \flat	F	G \flat	G	B \flat	C
Distance:		1½T	1T	½T	½T	1½T	1T
Intervals:	1	3 \flat	4	5 \flat	5	7 \flat	8
Intervals:	T	m3	P4	A4	P5	m7	T
Blue note:		B		B		B	

11.1 C Blues Scale



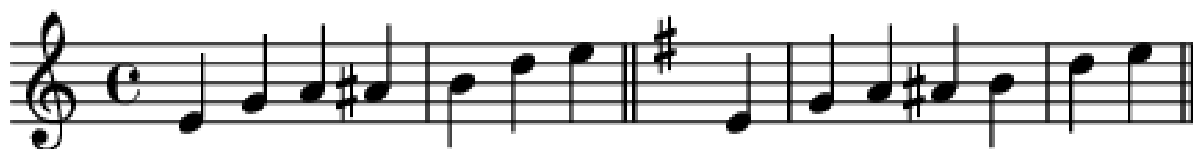
This scale can be formed from C minor scale (see Section 8.2), and D \sharp (E \flat) major scale (see Section 7.9).

11.2 D Blues Scale



This scale can be formed from D minor scale (see Section 8.3), and F major scale (see Section 7.4).

11.3 E Blues Scale



This scale can be formed from E minor scale (see Section 8.4), and G major scale (see Section 7.5).

11.4 F Blues Scale



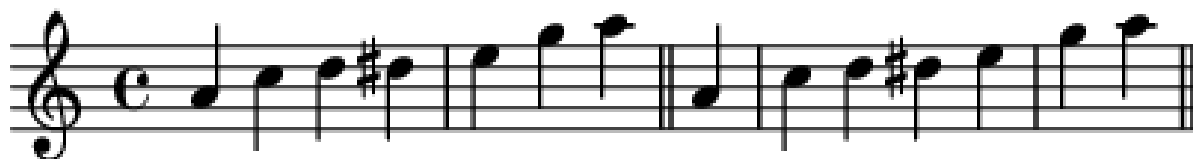
This scale can be formed from F minor scale (see Section 8.5), and G \sharp (A \flat) major scale (see Section 7.11).

11.5 G Blues Scale



This scale can be formed from G minor scale (see Section 8.6), and A \sharp (B \flat) major scale (see Section 7.12).

11.6 A Blues Scale



This scale can be formed from A minor scale (see Section 8.7), and C major scale (see Section 7.1).

11.7 B Blues Scale



This scale can be formed from B minor scale (see Section 8.8), and D major scale (see Section 7.2).

11.8 C# Blues Scale



This scale can be formed from C# minor scale (see Section 8.9), and E major scale (see Section 7.3).

11.9 D# Blues Scale



This scale can be formed from D# minor scale (see Section 8.10), and F# (Gb) major scale (see Section 7.10).

11.10 F# Blues Scale



This scale can be formed from F# minor scale (see Section 8.11), and A major scale (see Section 7.6).

11.11 G# Blues Scale



This scale can be formed from G# minor scale (see Section 8.12), and B major scale (see Section 7.7).

11.12 A# Blues Scale



This scale can be formed from A# minor scale (see Section 8.13), and C# (D \flat) major scale (see Section 7.8).

Part IV

Voice Classification



Figure 11.2: Vocal types and their ranges.

It is important to not to hurry to classify the voice. This section is provided as a reference and not to provide any means to determine which kind of voice we possess. Therefore, avoid any premature diagnoses about the tessitura of any voice to prevent any harm to the student. Just begin with any comfortable (middle) part of the voice and work upwards and downwards [2].

! It is important to not to hurry to classify the voice!

Work your voice from a comfortable range, and work it upwards and downwards.

The Fig. 11.2 shows three intervals, which establish the **range** of the different type of voices. The first interval is the twelfth range which that particular singer can handle, the two octaves that a professional singer should have, and the extreme ranges sometimes demanded. It is important to note, that the range may vary between individuals, and therefore may not be precise.

From the mentioned notes, the Table 11.2 can be deduced. This table mention the different voice types and their ranges in the same way.

Range is not the same as tessitura. **Tessitura** is not the total range, it is the part of the range comfortable or most used by the singer. Some singer may sing a song comfortably, others with the same range may feel the tune more demanding if some of the notes are very high.

Table 11.2: Voice types and their ranges.

Voice type	"practical"	"ideal"	"extreme"
<>	<>	<>	<>
Bass	A2 to E4	F2 to F4	C2 to G4
Baritone	B2 to F \sharp 4	A \flat 2 to A \flat 4	G2 to B \flat 4
Tenor	D3 to A4	C3 to C5	B \flat 2 to E \flat 5
Contralto	A3 to E5	G3 to G5	E3 to B \flat 5
Mezzo	C4 to G5	A3 to A5	G3 to C6
Soprano	D4 to A5	C4 to C6	A3 to F6

Part V

Chords

Table 11.3: Triads from C scale, their structures and names.

G	A	B	C	D	E	F	G
E	F	G	A	B	C	D	E
C	D	E	F	G	A	B	C
M3-m3	m3-M3	m3-M3	M3-m3	M3-m3	m3-M3	m3-m3	M3-m3
Major	Minor	Minor	Major	Major	Minor	Dim.	Major
1	2	3	4	5	6	7	8/1



Figure 11.3: Triads constructed with C scale pitches.

A **triad** is a three simultaneous notes. It is a chord which each pitch are related by a specific intervals. Usually, the name is used to refer to the **tertian** triad, which each note on the chord are distanced in interval of a third. For example, using the C scale pitches, their triads are as shown on Fig. 11.3.

The structure of each triad constructed in the scale differs between major and minor thirds on each interval. For instance, the triad constructed on 1° degree uses one M3 and then one m3, the triad on 2° uses m3 and then M3, and the triad on 7° degree uses m3 and m3 intervals. Following this analysis, three types of triads are found on the scale. They are named "major triads" for triads with M3 and m3 intervals, "minor triads" for m3 and M3 intervals, and "diminished triad" for m3 and m3. The Fig. 11.4 shows the same triads as Fig. 11.3 but ordered by their type [1].

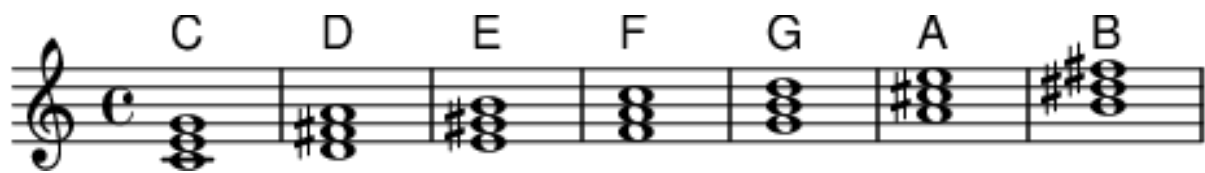
Also, Table 11.3 shows the triads notes formed from the C scale, their structure, name, and grades. The distribution of major, minor and diminished through the grades of the scale can be appreciated.



Figure 11.4: C scale triads orderer by type.

Chapter 12

Natural Major Chords



12.1 C Major Triads



Table 12.1: Tones and semitones of the natural major chords

C	E	G	C
<>	<>	<>	<>
2T	1½T	2½T	
M3	m3	P4	

12.2 D Major Triads



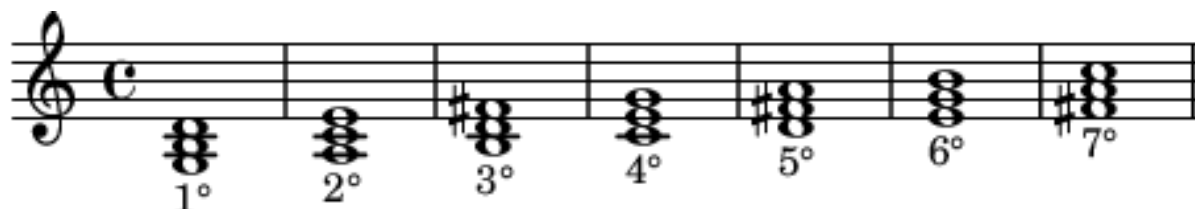
12.3 E Major Triads



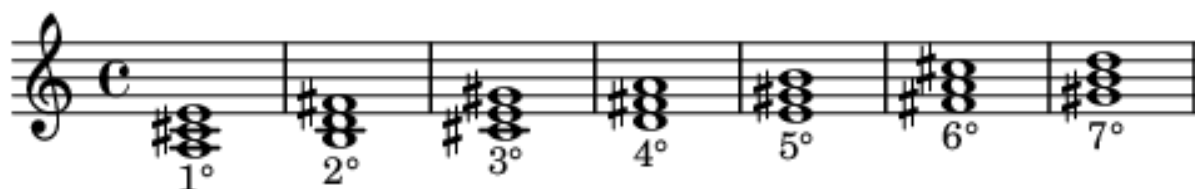
12.4 F Major Triads



12.5 G Major Triads



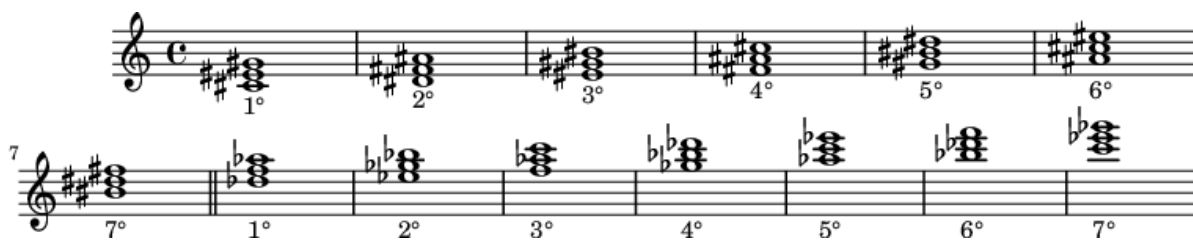
12.6 A Major Triads



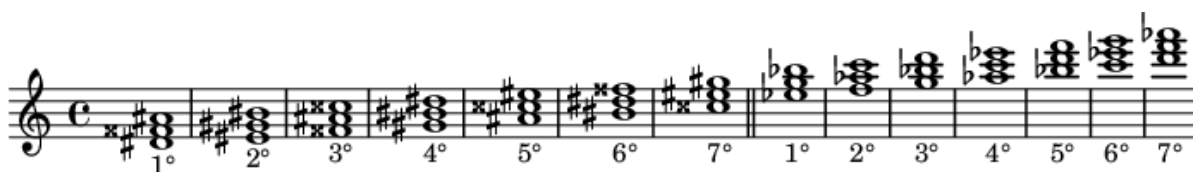
12.7 B Major Triads



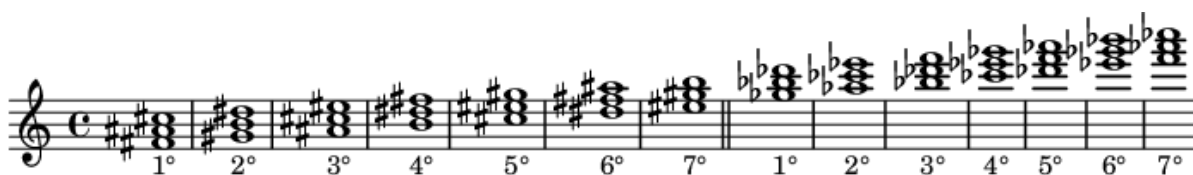
12.8 C#/Db Major Triads



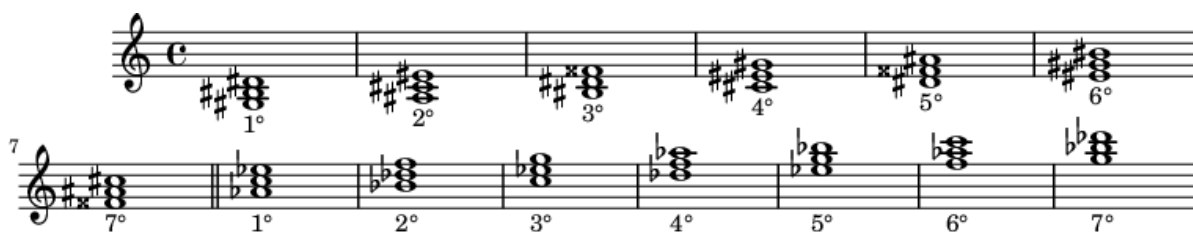
12.9 D#/Eb Major Triads



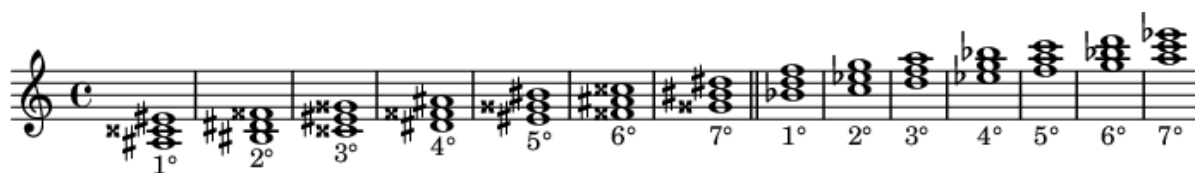
12.10 F#/Gb Major Triads



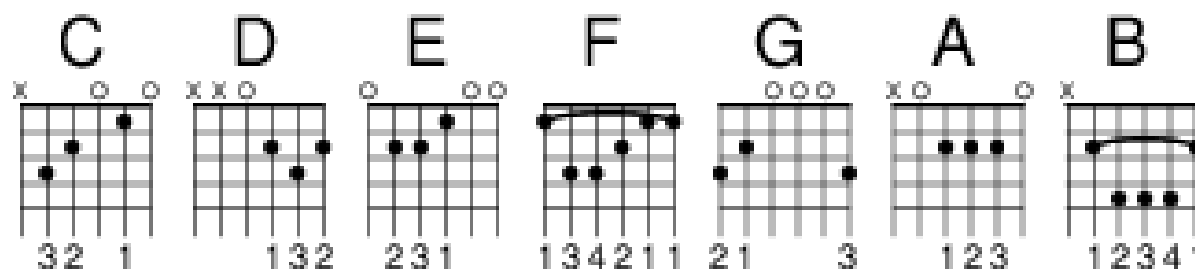
12.11 G#/Ab Major Triads



12.12 A[#]/B^b Major Triads

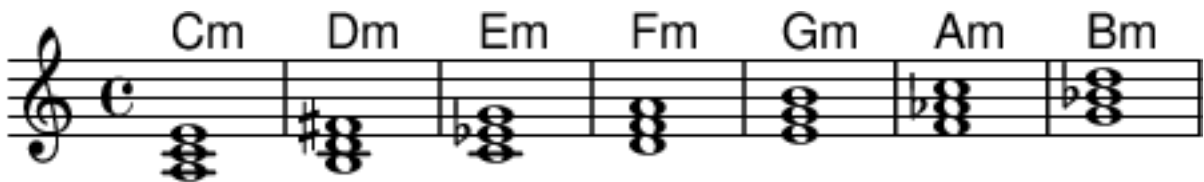


12.13 Guitar Natural Major Chords



Chapter 13

Natural Minor Chords



13.1 Guitar Minor Chords

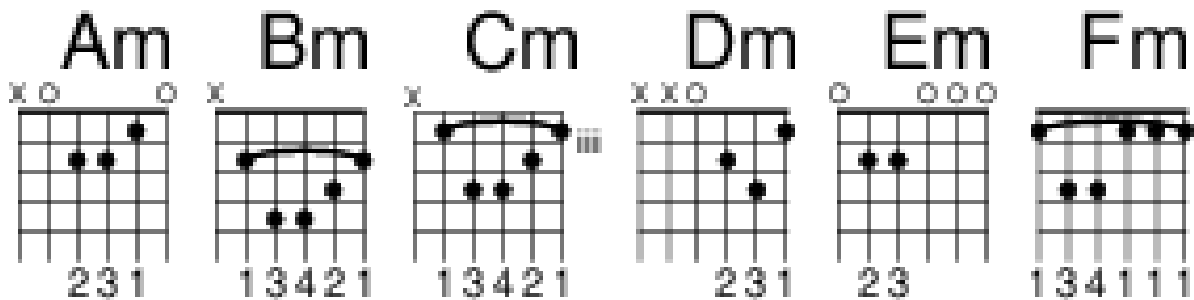
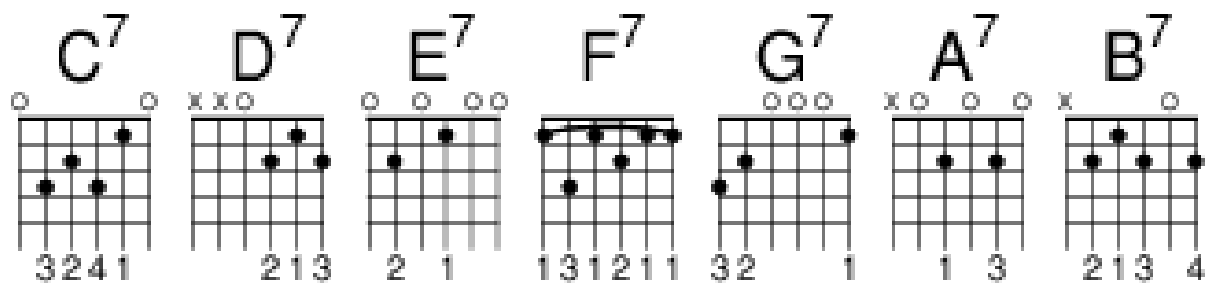


Table 13.1: Tones and semitones of the natural minor chords.

A	C	E	A
<>	<>	<>	<>
1½T	2T	2½T	
m3	M3	P4	

13.2 Guitar 7th Minor Chords



Part VI

How This Book were Developed

This chapter describes how this book were developed, the compilation process, and conventions used in code. Writing style and conventions are not described here, refer to about-this-book.org instead.

The project homepage is:

<https://gitlab.com/cnngimenez/music-exercises>

The source code can be downloaded, red, and studied from that Web page.

Chapter 14

Org-mode

Org-mode is an Emacs major mode created to provide notes and document editing. The purpose is to use plain text syntax to create links, bold, italic, and several formats, allowing to use Emacs or any other editor.

Also, Emacs provide Babel library to execute source code written inside specific syntax in Org-mode. This allows code in other programming and markup languages to be executed and use its results inside an Org-mode file.

Moreover, several export mechanism can be used to generate, from a single Org-mode file, into other well-known file formats. These output formats are:

- $\text{Lua}\text{\LaTeX}$, and its PDF generation.
- HTML and Web technology.
- Epub for E-Book support.
- Possibly others.

This particular syntax were chosen for this book. It support Lilypond execution through the ob-lilypond (Org Babel Lilypond), and the export methods to generate PDF, Web pages, and Epub.

Chapter 15

Implementing Conventions

Developer of this book should adhere to the Do not Repeat Yourself (DRY) principle. This means, any repeated code should be made modularised: create a macro, function, separated file, or similar ways to avoid copy-paste or repeated code or text. For example, the homepage is stored at the `homepage` macro, because it were repeated in this chapter, at the begining of the book, and at about-this-book.org. The results are always the same, and inconsistencies are avoided when changing its value by editing only once.

Index entries are defined near the bold concept. Most of the time, the concept is written in bold when mentioned, and at the end of the paragraph, one or several index entries are defined. For example, the index term is registered with `#+index: tessitura` in the same paragraph where the code `*tessitura*` appears.

Music scores are written within a Lilypond Source Block. The code at Fig. 15.1 illustrates how it is used, and the result is shown at Fig. 15.2 at about-this-book.org.

```
#+name: score:env-example
#+caption: This is an example score.
#+begin_src :file lilypond/chapter-development/env-example.png
\score {
  \new Staff \relative c' {
    \clef "treble"
    c8 d e f g a b c \bar "|."
    d, e fis g a b cis d |
    e, fis gis a b cis dis e |
  }
}
```

```

    f,   g   a   bes c   d   e   f |
    g,   a   b   c   d   e   fis g \bar "|."
  }
}
#+end_src

```

Figure 15.1: Lilypond source code to show a score.

```

\score {
  \new Staff \relative c' {
    \clef "treble"
    c8 d   e   f   g   a   b   c \bar "|."
    d,   e   fis g   a   b   cis d |
    e,   fis gis a   b   cis dis e |
    f,   g   a   bes c   d   e   f |
    g,   a   b   c   d   e   fis g \bar "|."
  }
}

```

Figure 15.2: This is an example score.

Chapter 16

Tools: Lilypond and L^AT_EX

This book was compiled using Lilypond and LuaL^AT_EX.

The Emacs editor were used with Org-mode.

Chapter 17

File structure

The file structure is as follows:

main.org The main file. It includes the rest of the org files, separated as chapters or topics.

Included files are:

- about-this-book.org
- scales.org
- chords.org
- etc.

lilypond/* Images generated by the Lilypond source blocks.

Part VII

License

This chapter describes the license of this work and all the resources used.

Chapter 18

This Work License

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Chapter 19

Images Licenses



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