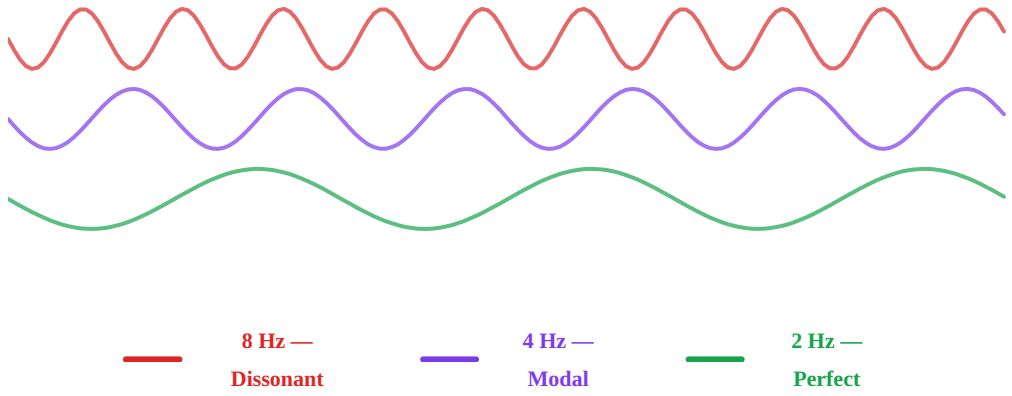
ADAPTABLE MUSICIAN'S FRAMEWORK

The Plogger Method

A Complete System for Acoustic Perception and Musical Understanding



William Foster Walker III

Adaptable Musician's Framework

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Acknowledgements

This is true for all my hundreds of students over the past decades; I would not have been inspired with the ideas that became this volume without them. I have been inspired with the ideas in the method by a colleague and good friend, and many colleagues and collaborators. Special acknowledgment must go to **Nadia Boulanger**, with whom I studied in Paris and who provided me with a standard of solfège to imitate, and to all the former students, colleagues, and collaborators who have graciously worked in the testing of these ideas.

Special acknowledgments must also go to **Professor Keith Still**, who has been an inspirational and educated resource whose encouragement and help resulted in getting the book into print.

Foreword

I know of only one person who can legitimately proclaim themselves the most global, prominent collector and builder of major music schools around the world, with hundreds of thousands of major music students around the world in every conceivable country, in the signing of the newest Baltimore Symphony music director, and in the latest recordings. Who is it exactly, with all of these credentials? Somewhere, finding a student, encouraging young musicians, or listening to an orchestra all are the moments that define that person, the musician's musician. Who else could it be — **William Foster Walker III**.

It is our pleasure to introduce this book as a companion to the instruction he gives his students.

— Charles Anderson Young
Associate Dean, Bélmont-Walker Conservatory

Introduction

Becoming fluent in music is similar to becoming fluent in any language: both require a firmly rooted ear along with a systematic approach to master grammar and vocabulary. The fluent musician can immediately identify patterns in music, the way a fluent speaker will quickly spot idioms in language. This aptitude, however, is not often obtained in music because, as a topic, it is incredibly complex, covering the identification and application of all the rules and terms governing music, which must be attained fluently if they are to be comprehensible to the listener.

Although this process may seem overwhelming at first, in reality learning musical material occurs at its most efficient through pattern recognition, where patterns and structures enable you to acquire and use musical terminology for the same reasons: to identify patterns and utilize them. We learn language this way by identifying words closest to our experience of usage. If we understand a word's meaning we can also understand the structure within which it appears. We learn musical grammar through exposure to music itself.

I like to say that in music, as perhaps in most things in this world, you are most effective when you actually look at what you are working with; that is, you will achieve more or less commensurate success depending on how much knowledge you have acquired and retained. From my experience as a musician, teacher and arranger over many years, I introduce with great confidence the following method for learning the musical vocabulary of the piano. The method achieves a critical speed, namely, that things tend to be learned correctly from the beginning and thus retained better over time.

The method is based on this idea: above all it accounts for the capacity of the student's musical brain. For example, I have advised 99% of modern musical learners (by whom I mean those who are not among the small subset of truly extraordinary musicians) to specifically use syllables alongside notes. Without doing so, the non-standard student loses track of what they are learning and becomes confused. In short, you can achieve critical speed, and more importantly, you can retain things consistently well, only if you rely on systematic methods that your own cognitive apparatus can handle.

The approach is not difficult, but it does require the student to work. Every musical exercise in this collection can be broken down into a series of smaller chunks that, once mastered individually, can be compiled. The reward for following this process is substantial in the long run: once learned, the musical vocabulary can be used with more facility than any other method.

System Architecture

The **Adaptable Musician's Framework (AMF)** is the overall system name. Its layers:

Layer	Name	Description
OS	Musical OS	Plogger Method — foundational layer
Chamber 1	Melody Chamber	Melodic fluency, tracking, sight-reading
Chamber 2	Harmony Chamber	Harmonic language, chord function, progressions
Chamber 3	Voicings Chamber	Chord voicing, voice leading, realization
Chamber 4	Rhythm Chamber	Groove, feel, rhythmic fluency
Apex	The Synthesizer	Convergence — all chambers integrated in real music

Note: Pitch Class Set Theory

Pitch class set theory has been **removed entirely** from the AMF system. It is not referenced in any chamber or in the Plogger OS layer.

Three Books

- **Textbook** — Core concepts, explanations, and chapter content
- **Practice Manual** — Structured daily exercises and protocols
- **Workbook** — Written exercises and ear training drills

Four Practice Sections (Daily Session Structure)

Section	Name	Duration
Section 1	Plogger	~12 min
Section 2	Integrated Work	~20 min
Section 3	Song Learning	~15 min
Section 4	Jamming	~13 min

Core Pedagogical Principles

- **Hear/Sing Before You Play** — Audiation precedes physical execution at every stage
- **Few exercises, multi-layered** — Deep fluency in a small set beats shallow exposure to many
- **Plogger as dual presence** — The method functions as both content and the lens through which all content is perceived
- **Three Stages labeling** — Every practice activity is explicitly tagged as Stage 1, 2, or 3
- **Anchor song thread** — A single song is learned across all chambers simultaneously
- **Genre-agnostic** — The system applies equally to classical, jazz, folk, pop, and all other genres

Ch.1 — Three Stages of Learning

“All real learning happens in the imagination: if it isn’t in the imagination, it’s not learned yet. You can say something, but it doesn’t exist for you yet until it’s in the imagination.” — Nadia Boulanger

Stage 1 — Roughing In

Once the hand behind the harp sometimes likes to get in the way, you might roughly trouble-free half the time. But sometimes lines like this happen easily and are produced without thinking. This is the roughing in phase, where the main goal is to handle it. You are becoming comfortable with the material. At this stage, you feel it more intuitively.

Stage 2 — Achieving Fluency

In the roughing in phase, you will initially spend long segments of your behavior oriented at the keyboard and attempting to play something very slowly, with many corrections. You will frequently stop to correct things. Sometimes you correct the same mistake two or three times. At the end of the roughing in phase, you have the correct materials in place, but performing them is far from second nature.

At the fluency stage, you want the material to be able to come out well most of the time. You have the material working — it rarely creates problems, and you can play it reliably at a moderate tempo. To be fluent, your mental and physical experience during this stage are not like the experience during roughing in. Now, you’re going in and out of focus during practice because the material is not yet fully memorized. The roughing in phase is like scaffolding; now you are beginning to work on the underlying structure.

Stage 3 — Achieving Mastery

Once you have the fluent stage, you have a pattern of success at the goal. Now, you’re seeking to get things to the top of your skill level. We are trying to get material to mastery, which requires consistently reliable performance at tempo — both up to full speed, and reliably able to slow

down. You know you are at mastery when performance feels steady — like you can always land the lick or passage correctly. At this point, the material is so deeply organized in your mind and body that you could perform it with or without thinking about it.

What Things Go Wrong with Roughing In

Trying to avoid confusion in the roughing in phase, the student often confuses confidence with mastery. There are many specific examples where this confusion leads to bad habits: for example, an athlete who might just drop back to the ground-level before a race, having no specific speed-training background is practicing getting over the hurdles. They work on hurdle after hurdle, feeling successful on each individual try. But if the student is really going to succeed at the goal they need to spend more time at the hurdle phase. Any time spent trying to perform fully before the body knows how is counterproductive.

Mindlessly Bypassing the Perfecting Stage

We need to see this phase as what it amounts to: practicing being wrong. Yet we cannot afford to be wrong so often. The moment we become confused or impatient, we've begun spending most of our time practicing confusion. The only way to spend zero time practicing confusion is to avoid it completely. Let me stress this: as a student practicing any skill, you may delight in the feeling of "figuring it out," but there can be no substitute for training — the student wants to practice the entire performance from beginning to end completely in a controlled, reliable way.

Avoiding the Perfecting Stage Mindlessly

So it is important to establish what the perfecting stage should look like. This is for musicians of all ages. It is a fine thing to have some special moments of inspiration when you play it and it comes out well; but those moments should not be the template for your practice. You can be someone who specializes in delightful surprises — but that experience is antithetical to the training you need, which is orderly accumulation. You may not be able to completely remove this from your practice, but make sure all information you use is clearly articulated in sound, not just done by guesswork.

What We Need

It occurred to me after studying the problem for many years that there are essentially three components of a skill chain, which I discovered by thinking about a cross-section of very successful performing musicians. For those studying an instrument, the first component involves building the ability to know clearly what you're going to do before you do it.

Clearly, what is needed for the roughing in or preparation phase is some reliable form of mental support to fill the position of an automatic performing state — and, to be comprehensive, the following principles are extremely important:

1. Return to the best of your ability; look at the moment you'll be in the appropriate state, and work on the problem.
2. Remove yourself from thinking, programming, and judging during an intense time-on-task. Focus your mind within the limits of the task.
3. Focus on the time of your ability; know your skill and work on the skill. You do the skill things; ensure the information is ready to be repeated. Stay all-in on your calling.
4. Allow the skills, and allow self-observation when noise enters and other stimuli enter to be repeated. Get the information; prepare for the next note — do this ANYTIME you are calling.

Mindfully Replacing the Performing State by Performing Plans

We need to see this phase as what it amounts to: practicing being wrong. Yet we cannot afford to be wrong so often. The moment we become confused or impatient, we've begun spending most of our time practicing confusion. The only way to spend zero time practicing confusion is to avoid it completely.

Breaking Down at the Top of the Performing Phase

Any time spent trying to perform fully before the body knows how is counterproductive. Make sure all information you use is clearly articulated in sound, not just done by guesswork.

Ch.2 — Three Causes of Error

Every performance error has a specific Symptom, Cause, and Cure. The framework applies equally in practice and in performance. Diagnosing correctly is prerequisite to curing.

Error 1 — Reaction

Symptom	Freeze, zoom-in (tunnel vision), memory slip, sudden lock-up mid-performance
Cause	Limbic fight-or-flight response. The body perceives threat (real or imagined) and hijacks cognitive resources.
Cure	**Eagle Vision** — Rise far above the situation. See everything from a high altitude: all parameters, all musical threads, all relationships. “Know your domain, accept with equanimity, expect the unexpected with joy and delight.” Eagle Vision is a trained perceptual posture, not a metaphor — it must be practiced.

Error 2 — Anticipation

Symptom	Playing wrong without noticing. The mind is elsewhere while the body continues on autopilot.
Subtypes	**Malevolent anticipation:** paranoia or arrogance about what is coming next — the mind leaps ahead in fear or confidence and disengages from the present. **Benevolent anticipation:** pleasant daydreaming, drifting into reverie, losing track of the music while the body plays on.
Cause	The mind disengages from external sensory modalities and substitutes internal narrative.
Cure	**“Lead with the sensory modality appropriate to the task.”** In ear training: lead with your ears. In sight-reading: lead with your eyes. In keyboard playing: lead with tactile/kinesthetic sensation. Always the *external* modality, not the internal narrative.

Error 3 — Looking Back

Symptom	Looking backward with inner critical commentary. “That was wrong. Why did I do that? I always mess up here.” Performance deteriorates as attention is split between present and past.

Analogy	**Swimmer/Coach:** You are simultaneously the swimmer in the water AND the coach on the deck. The swimmer performs; the coach observes and evaluates. During performance, you are BOTH — but the coach must be silent while swimming. You cannot coach yourself mid-stroke.
Cause	Judging during performance rather than after. The coach climbs into the pool.
Cure (3 steps)	1. **Before:** Prepare fully. Know exactly what you intend. 2. **During:** “Coach out!” — Imagine the coach being sucked backward out of the pool and vanishing behind you. Swimmer only. 3. **After:** Coach returns. Reflect, review, diagnose, prescribe.

Ch.3 — Keyboard Visualization

The Importance of Visualizing the Keyboard

The piano/organ keyboard (which I refer to as the thinking mind of the musician) focuses our attention as musicians on the location of every harmonic and intervallic event as they are played. When in doubt, the keyboard, understood as a tool of spatial organization — organized into octave-repeating patterns — will consistently help you understand intervallic and harmonic relationships. By using the keyboard as the musician's visual tool, you can analyze harmony, rhythm, and color in ways that allow you to identify the relationship between harmony and the frequencies of intervals involved.

Your capacity to analyze an interval is dependent upon your ability to recognize and understand the note names of the keyboard, and to understand the keyboard as a map of pitch space. It's important to learn to see the piano as you would see a word in a sentence — a musical sentence is no different from an English one in this particular respect, if we see the word inside a sentence, we can almost immediately recognize its meaning. Similarly, if we look at a keyboard, we know immediately what is meant by the word "keyboard" when it appears in a musical sentence, even if we've never played it.

The capacity to analyze music — whether as a performer, composer, or in any other musical role — depends heavily upon a musician's spatial-cognitive ability. Using fixed-pitch resources — an instrument played through a fixed intervallic structure — enables you to develop this spatial-cognitive ability. The keyboard is unique in its ability to allow you to practice these kinds of spatial-cognitive operations because it is a fixed-pitch instrument, and thus the keyboard can be seen as an analogy of the musical space of pitches. It's still a fully diatonic map with all the possible pitch relationships accessible to the musician — and thus it has certain properties of musical relationship that the musician can use to identify, analyze, and communicate certain musical events.

The Keyboard as the Musician's Cognitive Tool

The musical keyboard is a useful and very accessible musical tool. It can be used more broadly to enhance listening. There is a fundamental pitch space you can listen to; that's why it is so useful.

The Musical Keyboard as a Map of Pitch Space

Years ago, I concluded in my study that music requires the ability to mentally perceive spatial connections between pitches on the keyboard. Similarly, music can be understood, in a sense, as a social tool for representing that information.

- The white keys form a certain kind of interval pattern — this pattern is one that repeats.
- The same 12-note pattern of black and white is repeated every octave.
- An octave is a certain distance between a frequency that is repeated every octave.
- The key for black keys that is to the right of the white key is called a higher-than-white note, while the key for black keys to the left is a lower-than-white note.
- The distance between a note and the note at the same pitch up or down one octave — this is an octave.
- This musical relationship enables one to learn where notes are.

Imagining the Keyboard

First, you should be able to create a clear, pleasant imagination of the piano keyboard, one that is detailed, permanent, vivid, and easily accessible (without the actual piano present). This is the best possible tool for auditory training. You will need to go through several steps before this has become second nature for you: for example, you will need to repeatedly tell yourself to "imagine the keyboard" in a variety of ways. Before practice, allow yourself to imagine the keyboard as clearly as possible; as you practice, you should actually use the keyboard as a visual thinking tool, and be capable of accessing a real image of the keyboard in your mind without looking at any visual aids whenever you practice; this will make you a more effective learner.

Labeling the White Keys

All of the musical notes in the musical system (at least in the Western equal-tempered system) are named with letters of the alphabet: A, B, C, D, E, F, G — and then after G, the pattern starts over at A again. In the Western musical system, there are only seven base letter names for notes because the entire octave space uses only seven distinct pitch classes in the diatonic system; these are the seven keys that the keyboard represents in each octave.

Placing the name “sharp” (which is the note one semitone higher) to the right of a given key indicates that this piano key is a note that is slightly higher in pitch. Placing the name “flat” (which is the note one semitone lower) to the left of the key indicates the note is slightly lower. The key placed further to the right is a higher-pitched note, while the key to the left on the keyboard is a lower note.

Labeling the Black Keys

There are two basic note names to begin: the name “a sharp,” or “b flat,” for the black keys, from the lowest to the highest. As you move to the right on the keyboard, the notes become sharper (higher); as you move to the left, the notes become flatter (lower).

The flat notes also occur on the keyboard in which neighboring pitches provide context: in any key, the next key over or the neighboring keys will be at the corresponding natural notes. For example: on the keyboard, the D key has as its neighbors both the D# key (which can also be called E♭) and the D♭ key (which can also be called C#). This means that the key to the right of D is a D# while the key to the left of D is a D♭.

Exercises: Developing Keyboard Visualization

Exercise 3-1

Note Names on a Standard Keyboard. Use a piano keyboard instrument to answer the following questions. (You may use the blank staff if needed.)

1. How many notes are there in all?

2. Using the black and white keys, label and sort the keys on the keyboard and write them into the answer spaces separately:
    - How many natural notes are there?
    - How many flat notes are there?
    - How many sharp notes are there?
3. How many notes do not have a single name?

Exercise 3-2

Drawing the Keyboard, Part I. Drawing a keyboard will fix its image in your imagination more than passively looking at it because you will use two cognitive modalities: seeing and doing.

1. From a keyboard that has at least three twelve-key runs, represent this diagram in the final exercise space. Draw at least one complete octave, taking note of which keys are white and which are black.
2. Now write the note names for each white key. Cognitive research has repeatedly demonstrated that combining note-name writing with drawing produces a very effective learning activity.

Exercise 3-3

Drawing the Keyboard, Part II. Once you've sketched the keyboard by following the steps in the previous exercise, do the following:

1. First follow the steps in the previous exercise from this book.
2. Draw the keyboard again, using a more condensed format: draw in a blank space above and focus on drawing at least 14–24 notes wide. Make sure you can draw them as clearly as possible.
3. Practice drawing the keyboard without referring to an image or the text. Practice until you can write the names freely without reference, in at least 24-note-wide sections.

Exercise 3-4

Imagining the Keyboard.

1. Sitting at a real piano, look at the keys, close your eyes, and imagine the piano keys as clearly as possible. Then open your eyes and compare your imagination to the actual keys. Now try this exercise from the right side of the piano.
2. Visualize the piano keys in your mind without looking at any piano. Start from the right side and move your eyes left.
3. Practice drawing the keyboard without referring to an image or the text.

Exercise 3-5

Teaching on a Visualized Keyboard. Without having a keyboard physically nearby, explain to a friend the arrangement of white and black keys, using only your visualized keyboard.

Exercise 3-6

Syllable Flashcards. Study the following table with the solfège (syllable name) on one side and the solfège letter name on the other. Carefully label all the rows to complete the table.

Solfège Syllable	Letter Name
(to be completed by student)	

Remember: when we refer to notes with accidentals, we add a sharp (*di*) or a flat (*lo*) after the syllable or solfège name, as with letters: dib, rib, etc.

Exercise 3-7

Mapping Solfège onto the Keyboard. On the blank keyboard below, write the number that corresponds to the correct solfège syllable.

Exercise 3-8

Mapping Letter Names onto the Keyboard. On the blank keyboard below, write the number that corresponds to the correct letter name.

Exercises: Developing Note-Naming Fluency at the Keyboard

Exercise 3-9

Solfège Options.

1. Complete the solfège table below by writing its corresponding solfège syllables. As you complete the table, focus on being as fluent as possible.

Solfège	Letter Name
(to be completed by student)	

2. Compare the solfège options at the corresponding highest-score notes.

To switch from solfège (a letter note name) and vice versa, train yourself by double-checking using a different solfège program. Practice until you can switch between solfège note names and letter note names without looking at your keyboard, smoothly and without requiring any additional help.

Exercise 3-10

Syllable Flashcards. Study the following table with the solfège note name and note name to each side of the table.

Exercise 3-11

Tracking Written Melodies. Visualize the melody in real time while speaking each measure: keep your visualization of the note names on the keys clear and present, look at the melody, and respond.

Exercise 3-12

Tracking Written Melodies. (Exercises for tracking note names.)

Exercises: Developing Mode-Naming Fluency at the Keyboard

Exercise 3-13

Syllable Flashcards. Study the following table by writing the solfège (syllable) name next to each white note and reading the solfège letter name. As you complete the solfège syllable in the table, focus on getting them as fluent as possible.

Exercise 3-14

Solfège Flashcards. Once the solfège exercise has been mastered, practice the solfège using syllable pattern matching — finding any solfège syllable option and writing it. For each item in the table, write the letter name.

Solfège	Letter Name
(to be completed by student)	

For example, as you practice solfège, look along a table using: sol in the middle of the table; follow the pattern: fa, sol, la, sol. Practice the syllable at your instrument while visualizing and mentally tracking each note name — following the keys simultaneously in a particular pattern.

Exercise 3-15

Tracking Written Melodies. Using this melody, play each measure and respond with the note names for all notes: read the notation from the interval — follow the melody, keeping your visualization of the note names on the keys clear and present, look at the melody, and respond.

Exercise 3-16

Syllable Flashcards. Complete the solfège exercise table — all the rows with solfège note names for all note names.

Solfège	Letter Name
(to be completed by student)	

Exercise 3-17

Mapping Syllables onto the Keyboard. Sing or bring broad concepts while staying within the imagination. Practice aloud at your instrument as a study performance mode. Study using broad music across the world — agility and strength is the aim. We need to be good at using body format and solfège syllables in a larger format, and to remain in practice on this topic. See also the article “Naming and Singing Notes” (Plogger 2016).

Ch.4 — Longy Rhythms

Many of us sing rhythms of music or call by the number without necessary knowledge of the precise volume or note values in a dictionary. The patterns, however, are not an indication of any intrinsic quality; this is because the method we use tells us whether the interval is deliberately measured. Can anyone perform tasks with the same type of systematic measure, just as we can act in a non-reliant way? In an ordinary sense, these two qualities are fundamentally different: the first is the reliance on number itself; the second is the reliance on method.

Our ability to measure and count long rhythms is crucial to music learning. The ability to fluently choose rhythms when we are in fluency or freely playing is crucial because actually we are seeking to keep ourselves within the flow of music. I describe this experience as a way of learning and knowing music through rhythmic counting, and I believe the absence of consistent, reliable rhythm patterns is the defining feature of the struggling musician, no matter what instrument or voice. A reliable musician can count things in a reliable and systematic way.

The Lange Rhythm Chart

Based on the Theories of Émile Jaques-Dalcroze, accompanied the page.
Émile Lange, 1881–1929

Two Equal Parts

Division	Pattern
Two Equal Parts	1 2
	1 2 →
Five Equal Parts	1 2 3 4 5
	1 2 3 4 5 →
	1 2 3 4 5 ←

Three Equal Parts

Division	Pattern
Three Equal Parts	1 2 3
	1 2 3 →
	1 2 3 ←

Four Equal Parts

Division	Pattern
Four Equal Parts	1 2 3 4
	1 2 3 4 →
	1 2 3 4 ←

Many other rhythm groupings represent alternative groupings rather than entirely analogous patterns. Note that numbers represent different lengths of time; they may be divided into groups of two, three, and four equal parts.

In each instance, the procedure is the same: any beat can be mentally or audibly divided, and it can be divided by any number. Treat each beat as if it's divisible by a whole beat or a portion. One beat in a music bar can itself be a multiple of beats: “1 and,” for example, meaning 1 and a half, followed by 2 and a half. This is because of the Émile Lange Rhythm Chart pattern.

Tap the Main Beat

Starting in the top left column, from top to bottom, you start dividing a beat into two equal parts. The beat is always a whole number (like 1). Think of it as “1 a,” then “1 2,” etc.

Speak Each Number on the Beat and at the Same Volume

Teach your mind to speak each beat on the same pitch level at the same dynamic level, practicing clearly speaking each note precisely, allowing you to eliminate in-pitch centers, allowing you to clearly and concisely see what you're doing. As you practice speaking each beat step-by-step you will become more fluent in using the approach from the beginning, as you will start learning what comes next. As you practice, you will begin to look forward to a point where you will be at perfect mastery of all these actions as well: speaking quickly, speaking well, speaking in a timely fashion — and reading them from the page while making well-managed and well-timed beats.

An Accurate and Accelerate-Beat

Each beat has its own specific note value; just as a “long beat” note has a certain number of beats, and thus an associated note-unit, similarly a rhythmic subdivision is assigned to a particular beat, so to start a regular rhythmic subdivision, you need to start at a specific note value on each level of the beat you're on. The fundamental note value provides the highest range of beats at the first level, and the following beat-value from the first level provides the second beat level.

Starting at the top row, 1, 2, 3, and 4 — the entire middle column is a block of 56 notes. The notes perform the division permutations. There are two rhythmic units: a note (or a short beat) and a longer note (or a long beat). About the block of notes, these two notes each form a unit, and each unit has either an equal number of notes (which in music theory is called “even beat”) or an unequal number of notes (which is called “odd beat”). The whole block of even beats produces what we call an “even beat,” and the whole block of odd beats produces what we call an “odd beat.”

Maintain the Main Beat, Without Breaks

The goal is to maintain the pulse throughout each measure in the block of 56 notes — the notes perform the division permutations. There are two rhythmic units: a note (or a short beat) and a longer beat. About a group of notes that is “two-beat,” the note means its beat (or “time”) has exactly 2 notes. The note on the first beat is a short note (usually a quarter note), and the note on the second beat is a short note (usually a quarter note), and then the note on the third beat is a short note (usually a quarter note). So, instead of counting “1-2” twice, we count “1-2-3” three

times. By combining these short/long rhythms into beats per line in a music bar, students learn the way rhythm must be counted, and they should always count the unit beats of the rhythm when they are being counted from the beginning.

Exercises: Performing the Lange Rhythm Chart

Exercise 4-1

Dividing a Beat into Two Equal Parts

1. Establish a groove by using the pattern from the Lange Rhythm Chart. Note: It is set up on the left leg, and keep 2 on the right leg, keeping both left and right in rhythm.
2. Divide each beat into two equal parts, counting “1-a.” Note: It is fine to count “1-a” as your starting beat; in this case the “a” represents a short subdivision.
3. Keep the main beat going and tap on top of the beat, trying your main beat at top speed; do not fall behind or go too fast.
4. Be sure the main beat is without fear of any imbalance so that the performance is accurate and on time. Try to keep the beat going from left leg forward.

Exercise 4-2

Dividing a Beat into Three Equal Parts

This exercise is quite like the previous exercise, except for the method you're now using — instead of keeping the tap pattern on the left leg and 2 on the right, here you want the tap pattern to make it clear what meter you're in.

1. Establish a groove with the tap pattern as illustrated in the Lange Map, from beat 1 on the left leg and 2 on the right. Then tap on top of the left leg as you would be practicing.
2. Improve rhythmic accuracy on your lap by improving accuracy while at the same time holding a strong beat, so that when you have performed this groove well, look at this material while you are moving: the rhythm of your feet, and feel looking up and then finding the next position of the instrument, and then back.
3. Perform the Lange Rhythm Chart with the 3-beat pattern, and make sure your foot is clearly moving.

4. Now perform the 3-beat Lange pattern correctly and keep your foot staying on the beat.

Exercise 4-3

Dividing a Beat into Four Equal Parts

1. Establish a groove of the basic beat pattern as in the previous exercises. Start by sitting on the left leg on beat 1 and 2 on the right leg, keeping the rhythm.
2. Improve rhythmic accuracy while at the same time holding a strong beat; maintain well-timed beats by improving the rhythmic accuracy of each tap.
3. Perform the Lange Rhythm Chart; even if you have issues with the rhythmic pattern in the previous exercise, continue — try.
4. Maintain a pulse throughout each measure consistently; do not allow any other problems to come up.

Exercise 4-4

Dividing a Beat into Four Equal Parts (Advanced Patterns)

1. Establish a groove of the basic beat pattern, using the same starting position as illustrated. Keep beat 1 on the left leg and 2 on the right.
2. Improve rhythmic accuracy by improving rhythmic accuracy of each tap.
3. Perform the Lange Rhythm Chart with the 4-beat pattern, and make sure your foot is clearly performing the correct rhythmic pattern.

Lange Rhythm Permutations Quiz

When you divide a beat into two parts, there are these different kinds of divisions:

1. What is the division of a beat into two parts?
2. What is the division of a beat into three parts?
3. What is the division of a beat into four parts?
4. What is the division of a beat into five parts?
5. What is the relationship between the division of a beat and the number of combinations you notice? Express this mathematically.

Seven Pattern Lap Map Three Groupings

There are two other ways to divide a group of 3:4:3, 5:3, 4, 4, 5 and then: 5:3, 4, 4, 5 and 5:3.

Exercise 5-5

Alternating Seven Patterns

As you practice, improvising alternating seven patterns, check off each condition after you have been a while doing this week of work and make sure you keep track of how you are doing.

A: Alternating with one-alternating patterns:

- G-8-G-1 → G-4-G-5
- G-4-G → G-8-G-1
- G-1-G → G-4-G-8
- G-8-G-1 → G-4-G-5

B: Improvise with two alternating patterns:

- G-4-G-8 → G-1-G-4 → G-1-G-4
- G-1-G-5 → G-8-G-1 → G-4-G-8

C: Practice the Lange Rhythm Chart with three-alternating patterns.

Ch.5 — Lap Map

Discovering the Lap Map

Almost sixty years ago I had a chance connection with a Russian teacher, back in those times, I had begun teaching at the music academy in California, having a bond relationship with colleagues and teachers in California about finding a good, consistent approach to rhythm practice. The challenge for students was keeping consistent rhythm, particularly with complex syncopations.

I discovered that a lot of my students would always have their leg going tapping along. From this I took cue — I used Lap Maps to show the location of each beat of the music hierarchy, allowing the students to keep their legs in rhythm at the same time.

Subsequently, I created a series of Lap Maps to show the location of each beat of the music hierarchy. I found it always useful to use a table that follows the numbers in order, always following the number in order.

The Diagram of the Lap Map

A sequence of key notes corresponding to the hierarchy of the Lap Map is as follows:

The right tap (marked on left leg) — this is always the lowest-beat spot. The two lowest “laps” on the left leg and the right leg are the center spots. Each group of numbers is an alternating cluster with two taps per leg.

Notice that the numbers on the left leg are always on the top position on the left leg; the one (1) is on the bottom, always placed lower on the left leg. Also the two (2) is on the top right, while the bottom number (4) is lower on the right leg.

The Basics

With lap map exercises, you aim to correctly handle complex patterns. Though it can be difficult working through all the complexity of those exercises, it may be only partly combinations of numbers, tapping on two laps; after you fully master them, allow tapping to be as smooth and natural as you can. At the end of any two-number sequence, check in: you are making gradual progress and thus practicing in a very productive, steady way. The goal of your exercises is that you should practice until you are totally ready. Failure during this period is understandable; you should attempt this work seriously even if you fail, rather than stopping after several failed attempts.

Exercises: Performing Lap Map Patterns

Exercise 5-1

Dividing a Beat into Two Equal Parts

To become comfortable and fluent with the patterns of two-leg beats, try to keep a flowing, manageable rhythm by sending across each lap. Make sure your taps are steady and smooth.

1. Establish a groove by using the basic lap map as illustrated. Start beat 1 on the left leg and 2 on the right leg. Taps: two tap taps per leg.
2. Improve rhythmic accuracy on your lap, improving rhythmic accuracy while at the same time holding a strong beat; try this exercise until it is perfectly accurate, repeating the process.
3. Establish a groove with the basic 2-beat lap map as illustrated, with beat 1 on the left leg and 2 on the right. Make sure you get comfortable enough on the right side before you move forward.

Exercise 5-2

Dividing a Beat into Three Equal Parts

As before, use the previous lap map exercises, moving your legs from beat 1 on the left leg and beat 2 on the right leg. Now, without making errors, start with beat 1 on the left lap first.

1. Establish a groove with a 3-beat map — same starting exercises as described above (left first, right second, back to center).

Exercise 5-3

Dividing a Beat into Four Equal Parts

1. Establish a groove using the four-beat lap map exercises described above. Starting from the left leg, begin tapping a beat on all four laps.
2. Keep the rhythmic groove going throughout the pattern, and try to make sure your foot is keeping the beat in smooth time.

Exercise 5-4

Dividing a Beat into Five Equal Parts

1. Using the 5-beat pattern, establish a groove with the lap map. Start beat 1 on the left leg, then 2 on the right, then 3 on the right, then 4 on the right, then 5 on the right.
2. Improve the accuracy of the exercise by maintaining accuracy while at the same time holding a strong beat.
3. Improve consistency throughout; do not allow any other issues to come up in the exercise.

Exercise 5-5

Dividing a Beat into Six Equal Parts

1. Establish a groove of the basic lap map. Starting from beat 1 on the left leg and 2 on the right leg, start with the right.
2. Improve rhythmic accuracy on your lap by improving rhythmic accuracy while at the same time keeping a strong beat.
3. Practice the lap map with the six-beat pattern, and make sure your foot is properly executing the rhythmic pattern correctly.
4. Repeat steps 1–3 for the six-beat pattern correctly and keep your foot staying on the beat.

Exercise 5-6

Dividing a Beat into Six Equal Parts (continued)

1. Establish a groove of the basic beat pattern as in the previous exercises. Starting from the left leg, start alternating; then perform the 6-beat Lange pattern, and make sure your foot is clearly moving.
2. Perform the Lange Rhythm Chart; keep your foot clearly performing the correct rhythmic pattern.
3. Perform the Lap Map pattern to clearly keep your foot in place.
4. Repeat steps 1–3 correctly and keep your foot staying on the beat.

Exercise 5-7

Dividing a Beat into Seven Equal Parts

In every practice, your performance should take about 100+ while staying and working from within the group, as the group is programmed in 5-0 set; while the performance here is always from left to right. A further number on the counting goes left to right; so the group always ends 3, 4 on the right leg, and then starts at 5, and to the right again.

Exercise 5-8

2-3-2 Lap Map Pattern

1. Establish a groove with the basics using the beats 1 and 2 on the left leg and right leg. Taps: basic alternating.
2. Improve rhythmic accuracy on the beat; gradually become more comfortable with the beats per step.

Exercise 5-9

Alternating Seven Patterns

As you practice, improvising alternating seven patterns, check off each condition after you have been practicing this week of work and make sure you keep track of how you are doing.

Lange Rhythm Permutations Quiz

1. When the beat is divided into two parts, how many different permutations are there?
2. When the beat is divided into three parts, how many different permutations are there?
3. When the beat is divided into four parts, how many different permutations are there?
4. When the beat is divided into two parts, how many different permutations are there?
5. What is the relationship between the division of a beat and the number of different permutations that are possible? Express this mathematically.
6. To check that your formula works correctly, calculate the number of beat divisions for the four-beat base two — then run the results through the Lange Rhythm Chart to confirm. How many different 4-beat group permutations are there?
7. Calculate the result of your calculations with the number of combinations you have in the Lange Rhythm Chart. Are your results correct?

Looking Back

(See Chapter 5 conclusion — the Lap Map approach consolidates rhythmic fluency by externalizing the beat hierarchy onto the body, allowing the musician to maintain an internal sense of pulse while simultaneously reading or performing.)

Ch.6 — Pythagorean Ordering of Fifths

The Pythagorean ordering of fifths is fundamental to the understanding of music theory. Committing this pattern to memory will eventually become one of those skills that you can apply to music without conscious thought, and it will help if you think of it as a mnemonic. I believe this is one of the most important aspects of this book, and one whose systematic understanding enables you to develop your musical intuition in a broad way, to improve your understanding of music theory.

This section of the textbook is dedicated to strategies to help you recall and memorize musical material that has been presented previously. Rather than summarizing what's been covered, however, the goal in this section is to help you to reinforce your memory by the exercises provided in this chapter. You must practice this material consistently until you are able to memorize it fluently, rather than requiring any visual cues. To practice this material in any consistent context, use the following exercises.

For a more thorough exploration of the Pythagorean ordering, see the article "The Perfect 5th Rule in Music" (Plogger 2016).

Exercises: Programming the Pythagorean Ordering

Exercise 6-1

Tracking on a piano keyboard with the palm of your right hand, name each note in the Pythagorean ordering as you trace a very clear, slightly diagonal line across the keyboard in a circular spiral that keeps on returning to a note an octave lower as you go. Do not go off the edge of the keyboard; this pattern will always be on the white notes only.

Try to perform this exercise with a slight musical feeling; the goal of this exercise is twofold: first, you aim to become comfortably familiar with each note name, and second, you wish to become familiar with the feeling of the Pythagorean ordering, which has a specific musical sense of progression. Make sure you are saying both solfège and English note names faster.

Exercise 6-2

Now perform this exercise in the middle; try to perform the same sequence without any strong sense of pitch direction, but do keep the rhythm and tempo very clearly. In this exercise, the same keys are performed, but there will be a few that are harder to find. In this second exercise, the starting note may not always be the same.

Exercise 6-3

Practice this exercise in reverse; by this way, you are actually listening to both notes simultaneously. In this exercise, the same keys are performed, but this time you'll practice by playing the exercise in both directions simultaneously.

Exercise 6-4

Practice saying the syllables of the Pythagorean ordering quickly and without hesitation. Practice occasionally if you get stuck; keep your mind focused on the sequence and the notes used. Make them an image in your long-term memory. Remember to practice with both solfège and begin this sequence.

Exercise 6-5

Once you've mastered the practice here, execute again but now from the base starting note and going downwards. Practice from the descending Pythagorean ordering beginning with d and ending with b.

Ch.7 — Internal Spelling at the Keyboard

Ordinal Interval Names

The five-chord interval (which I refer to in the context of describing the distance between notes) uses common names for describing the distance between notes. The names used for interval names of a 5th across between notes are very common in describing the distance between a note and its neighbor (which forms the interval). The intervals are named after the number of notes included in the spanning interval. For example, the distance between a C and a G — including C, D, E, F, G — is a 5th, because there are five notes in the span. Similarly, a diatonic scale side (like C-D-E-F-G-A-B-C) spells out 8 notes from C to the next C — and that interval, known as an octave ("octave" from the Latin for 8), spans 8 notes in the diatonic scale.

As far as up or fa, you can also get that down as fa to. By the above example, then, you can play the same from fa down to do in a 5th.

Notice that the two notes in the above diagram — fa and do (above and below) are the same musical letter; they are the same note, one octave apart, and in the above example, "fa" stands in the top (highest pitch) while "do" (in the above example) stands in the lowest (lowest pitch). To move from a note above and drop two tones to a note below is to make a 3rd-down movement.

Exercises: Locating and Naming Diatonic Intervals

Exercise 7-1

Using your keyboard and piano, complete each of the following intervals by doing this (is a 2nd, 3rd, 4th, 5th, 6th, 7th, or 8th):

1. Write out all the possible 2nds that can be formed using the white keys.
2. How many diatonic 2nds are there?
3. Write out all the possible 3rds that can be formed using the white keys.
4. How many diatonic 3rds are there?
5. Write out all the possible 4ths that can be formed using the white keys.

6. How many diatonic 4ths are there?
7. Write out all the possible 5ths that can be formed using the white keys.
8. How many diatonic 5ths are there?
9. Write out all the possible 6ths that can be formed using the white keys.
10. How many diatonic 6ths are there?
11. Write out all the possible 7ths that can be formed using the white keys.
12. How many diatonic 7ths are there?

Exercise 7-2

Using your keyboard (or the keyboard diagram), determine each of the following intervals (is a 2nd, 3rd, 4th, 5th, 6th, 7th, or 8th), and write your answers below:

1. sol up to mi = ?
2. do up to mi = ?
3. fa down to sol = ?
4. doh down to sol = ?
5. la up to sol = ?
6. mi up to doh = ?
7. sol up to doh = ?
8. lo up to mi = ?
9. fa up to mi = ?
10. di down to fa = ?
11. fa down to di = ?
12. doh down to lo = ?
13. sol up to lo = ?
14. fa up to doh = ?

Additional interval identification items:

- a: sol up to mi = ?

• b: doh down to sol = ?

Ch.8 — A Special Spelling of Staff

Vocal Ranges and the Five-Line Musical Staff

The five-line musical staff represents the range of the human voice. The staff begins in the center and spreads upward and downward from the center line (the top) and the bottom line, covering the “vocal range” — that is, the full range of the human voice.

Any 5th built above a B♭ above middle C, or more specifically the distance of a 5th interval, will be comprehended by most, not anyone using one voice; this is because the method we are applying here is specifically created for you to practice it best on these note intervals. In other words, a melodic chord is built upon two notes of a similar distance, and by the following examples, the interval is used to identify some notes of an instrument.

The Three Types of Clef

The clef sign is a symbol indicating the location of a specific pitch on the musical staff. It is placed at the beginning of each musical line to indicate which notes are positioned on which lines and spaces of the staff.

- The **C-Clef** designates the location of the note C (middle C) as the note on a middle-line or specific line of the staff on which middle C is located.
- The **G-Clef** designates the location of the note G on the staff — it is placed on the second line up from the bottom.
- The **F-Clef** designates the location of the note F on the staff — specifically between the two dots of the F-clef symbol, which is placed on the fourth line up from the bottom.

The C-Clef

The C-clef identifies the location of middle C on the staff, and may be placed on any line of the five-line musical staff. The typical positions of the C-clef are:

- **Soprano Clef**: Middle C is on the first (bottom) line.
- **Mezzo-Soprano Clef**: Middle C is on the second line from the bottom.

- **Alto Clef**: Middle C is on the third (middle) line.
- **Tenor Clef**: Middle C is on the fourth line from the bottom.
- **Baritone Clef**: Middle C is placed on the fifth (top) line.

The G-Clef

Observe that in this clef, G is placed higher on the staff (in the vocal range) because the notes of this clef have a higher average range than the other clefs. The G-Clef is placed on two of the line clef positions:

In the soprano G-Clef, the G-line is between the third line and second line from the bottom (Middle C on the top line).

The vocal range includes: Soprano Clef, Mezzo-Soprano Clef, Alto Clef.

Note however, in this clef, the vocal range also includes the Tenor Clef; but it reads one octave higher than it appears.

Once the pair passed centuries, the G-clef has had only one G-clef in use or selected (at least by those who play piano), through one octave higher, though not for the tenor voice in any clef; the tenor clef, however, is the most commonly employed of the vocal clefs.

Treble Clef: The treble clef is placed on the second line from the bottom.

The F-Clef

The F-clef labels the location of F on the staff, and the placement (the two dots) identifies the location of the note F on the staff. It is found on two of the line clef positions:

- In **Baritone C-Clef**, middle C is located on the fourth line up from the bottom.
- In **Bass F-Clef**, middle C is placed three lines up from the bottom.

Middle C on the Clefs

- In **Treble C-clef**: middle C is on the third line from the bottom (or below the staff on the ledger lines).

- In **Tenor C-clef**: middle C is on the second line from the bottom.
- In **Bass C-clef**: middle C is on the first line from below the staff.

Knowing How Musical Intervals Span the Staff

Knowing this information is valuable for obtaining the true note value of the music on the keyboard. For example, the first note and the second note of any staff melody forms a certain interval across the staff. This interval spans from one note name on one side of the staff to the next note name (which in music is called a “melodic interval” on the page). When you know these intervals you can learn how many notes span a given interval on the staff.

The staff maps out the intervals on the note in a specific, particular pattern — for each note on any of these positions, it indicates what the note value is (staff position) in much the same way. The note values indicate whether the pitch is going up or down by indicating its specific position above or below the ledger lines.

A pair of these musical staves notes as they relate to the note staff shows that the notes on a staff move from the bottom to the top of a page. Note the note staff moves upward; when the note moves from the bottom to the top of the page, the notes move upward. When the note moves from the right side of the note staff to the left side, the notes tend to move downward. So the staff is not a linear thing — its design is more like a road, in that as you travel left to right on the page, the notes rise, and as you travel right to left the notes drop.

A useful thing to remember is that the notes in the same staff itself are in the same staff position, which means they are the same note if they are a given note with the same note. So if two notes have the same position on the two staff, they are both exactly the same note. If they are in the same position and the same note, it means they are in the same position in the staff, but are of very different pitches.

Exercises: Using Clefs

Exercise 8-1

Drawing Clefs. Practice drawing each of the following clefs. Then, use the blank staff to practice drawing a clef.

- Alto (C-Clef)
- Tenor (C-Clef)
- Baritone (C-Clef)
- Soprano (C-Clef)
- Mezzo-Soprano (C-Clef)

Exercise 8-2

Create a Starting Pitch, Find the Clef. Practice drawing the following schedule. If you do not know the clef, do not mark any notes or use a note drawing to indicate they're in the same position as the clef drawn before. Always write the name of the note underneath the note or before as indicated.

Clef positions to practice: Alto, Tenor, Baritone, Soprano, Mezzo-Soprano.

Yankee Doodle

Practice the familiar melody "Yankee Doodle" starting on the note mi.

1. "Yankee Doodle" starting on the note *mi*: (a) Which clef is used? (b) What mode is it? (c) Sing "Yankee Doodle" in the clef/mode.
2. "Yankee Doodle" starting on the note *la*: (a) Which clef is used? (b) What mode is it? (c) Sing "Yankee Doodle" in this clef/mode.
3. "Yankee Doodle" starting on the note *sol*: (a) Which clef is used? (b) What mode is it? (c) Sing "Yankee Doodle" in this clef/mode.
4. "Yankee Doodle" starting on the note *sol* (second time): (a) Which clef is used? (b) What mode is it? (c) Sing "Yankee Doodle" in this clef/mode.

Row, Row, Row Your Boat

1. "Row, Row, Row Your Boat" starting on the note *mi*: (a) Which clef is used? (b) What mode is it? (c) Sing in this clef/mode.

2. “Row, Row, Row Your Boat” starting on the note *fi*: (a) Which clef is used? (b) What mode is it? (c) Sing in this clef/mode.
3. “Row, Row, Row Your Boat” starting on the note *mi* (second time): (a) Which clef is used? (b) What mode is it? (c) Sing in this clef/mode.

A Tisket A Tasket

1. “A Tisket A Tasket” starting on the note *mi*: (a) Which clef is used? (b) What mode is it? (c) Sing in the clef/mode.
2. “A Tisket A Tasket” starting on the note *la*: (a) Which clef is used? (b) What mode is it? (c) Sing in this clef/mode.
3. “A Tisket A Tasket” starting on the note *fi*: (a) Which clef is used? (b) What mode is it? (c) Sing in this clef/mode.
4. “A Tisket A Tasket” starting on the note *mi*: (a) Which clef is used?
5. Sing “A Tisket A Tasket” in this clef/mode.

Exercise 8-3

Given the Starting Note of the Melody. You’ve practiced the starting notes from the note *mi* to the note *fa*. The clef is visible above the melody.

Yankee Doodle — where is the clef, what are the notes of the melody?

1. “Yankee Doodle” in the alto clef: what is the starting note? (write the name)
2. “Yankee Doodle” in the mezzo-soprano clef: what is the starting note?
3. “Yankee Doodle” in the tenor clef: what is the starting note?
4. “Yankee Doodle” in the baritone clef: what is the starting note?

Exercise 8-4

Treble Clef in Relation to Other Clefs. Now the goal is to be able to identify the clef by looking at the starting note of the melody, specifically for the clef used below.

1. With the alto clef, read *sol*, then _____ from treble.
2. With the baritone clef, read *sol*, then _____ from treble.

Exercise 8-5

Tracking Ascending Diatonic Intervals. To become familiar with ascending diatonic intervals while increasing your interval reading fluency on the staff, focus first on identifying smaller intervals, and then gradually proceed to larger ones. When working with intervals, focus on the melodic direction as follows, alternating each such pair of intervals in the pair then proceeding on to the next.

In practicing alternating, focus on alternating two specific intervals as follows, alternating each such pair of intervals in the pair then proceeding on to the next. The following Lap Map Pattern represents these in turn; as you progress, make sure you keep notes of the melodic shape, and track the notes as you proceed through each sequence.

For this, you will need to divide the four-beat per line time into the Lange-time interval, keeping the four-beat divisions throughout the sequence. You can continue to practice alternating this pattern, taking the Lange, however, up to any interval sequence, and then alternating with the following pairs.

Exercise 8-6

Tracking Descending Diatonic Intervals. Take the previous exercise. For a descending interval, take each note, write each note as well, alternating with the descending pattern below each note interval. As you complete the following descending interval exercise, make sure you are performing the bass.

Exercise 8-7

Tracking Ascending Diatonic Intervals (Part 2). For this, you will need to divide the four-beat per measure time by the Lange-time note; keep these divisions and mark the notes every four beats.

Exercise 8-8

Tracking Descending Diatonic Intervals (Part 2). Additional musical notation exercises.

Exercise 8-9

The 5-Note Row Exercise. This exercise will consist of 5 notes found at an octave (including diatonic thirds and 4ths); next, practice tracking each of the entire five notes separately in random order (including doubles and 4ths) in random order, and then repeat. To create a new note, write each of the entire four notes separately.

For example, consider solfège-like solfège, help along as a guide a, b, c, d, let's start that up in the middle. Note the following: you should first speak the syllable for the first note in the middle (4) of the sequence, followed by the syllable for the next note (2) of the sequence, and back again as a word, such as *sol, la, mi, fa, mi*.

Practice the syllable at your instrument, checking each note as you go. Follow each note's syllable value: *do, re, mi, fa, sol*. Mi…

Notes of the diatonic scale for reference: doh — re — mi — fa — sol — la — ti — doh.

This exercise should only be completed when you are able to completely write every note (including doubles and fourths) randomly without repeating any of them. Practice each of those notes once in a random order, once in a particular random order, and then go from there to the next note. Practice each of those notes from the first note, and up and down each octave.

Exercise 8-10

The 5-Note Row Exercise (continued). Take the previous exercise found in the previous exercises; take each note, write each note, and then alternate the whole pattern, alternating from beginning to end, until you can randomly move through them without repeating any.

Practice singing each syllable as fluently — keep track of all as you go.

Ch.9 — Di-Chord Numbers

Numbering Di-Chords

Saying that an interval is a 3rd gives us some information about the interval, but it does not tell us what the precise distance is between two notes; this is like learning that a creature is a mammal but not knowing whether it is a tiger or a house cat. To have the next level of knowledge about an interval, we would need its di-chord number or a word like “major,” “minor,” “augmented,” or “diminished;” from this we could know exactly how many semitones are between the bottom and the top notes.

The term *di-chord number* refers to the number of semitones between any two pitch classes. To determine the di-chord number of two notes, count the number of semitones between the notes. Because you are counting the distance as you move by semitone, you must always start counting at zero. Think of it this way — to calculate how far you drive, your car’s odometer has to start on zero, not on any other number.

Note that this is different from how we calculated diatonic interval names; the diatonic interval vocabulary (“2nd,” “3rd,” etc.) uses the language of ordinal numbers. *Ordinal* means that the numbers are indicating rank or position — remember that intervals are determined according to the diatonic relationship between two notes rather than the number of semitones between them.

When naming intervals in the last two chapters, we used ordinal numbers (2nd, 3rd, 4th, etc.). The vocabulary of di-chords uses cardinal numbers (1, 2, 3, etc.). When writing di-chord numbers, use brackets around them to distinguish them from other types of numbers — [1], [2], [3], etc.

For example, *fa* to *la* is a di-chord [4] because there are four semitones between *fa* and *la*, but we can also see that it is a 3rd because it skips over one note (sol).

Mi to *sol* is a di-chord [3] because there are only three semitones between *mi* and *sol*. But, what is the diatonic interval? *Mi–fa–sol* skips over only one note, so *mi* to *sol* is a 3rd.

Notice that *fa* to *la*, a di-chord [4], and *mi* to *sol*, a di-chord [3], are both 3rds. This difference can be indicated by using the terms *major 3rd* to describe the di-chord [4] from *fa* to *la* and *minor 3rd* to describe the di-chord [3] from *mi* to *sol*. Here, major means larger; the major 3rd is one semitone larger than the minor or "smaller" 3rd.

Each di-chord number is associated with a common traditional interval name, like *minor 3rd* or *major 3rd*, etc. Each di-chord number also has an uncommon interval name, like *augmented 2nd* or *diminished 4th*, etc. Common names are those found in the diatonic scale, and uncommon names are those found in chromatically altered scales.

Notice that notes on the staff only give us ordinal information (3rd, 4th, etc.) but do not tell us directly what kind of interval it is (major or minor 3rd). For instance, both of the following examples are 3rds; however, if you check at the keyboard, you will see that the first is a di-chord [3], and the second is a di-chord [4].

Furthermore, the di-chord formed between the same two lines on the staff can be different with different clefs. Two notes that appear a 3rd apart in the same location on the staff can be different di-chords, depending on which clef is being used.

Using keyboard visualization and the counting method described earlier in the chapter, you can see that *la* up to *doh* and *doh* up to *mi* are both 3rds. However, if you count the number of semitones between *la* and *doh*, you will find that there are three; if you count the number of semitones between *doh* and *mi*, you will find that there are four. This is important because pitch pairs that are three semitones apart feel and mean something completely different than pitch pairs with fewer or more semitones between them. If you keep track of where you are in pitch space, using the keyboard, you will always know whether the 3rd you are about to play is three or four semitones.

Knowing the di-chord you are about to play tells you a lot about the meaning of a given moment in music, giving you access to new levels of expressivity in playing.

Using this knowledge in real time to heighten your consciousness of music and to communicate musical meaning more effectively (and affectively) requires fluency in two skill sets. You have to become a great tracker with the keyboard, so you know which di-chords you are playing. If you always know what di-chord you are playing, singing, hearing, reading, or writing, you know its

characteristics and can use that information to help you. Therefore, your tracking to help you connect with music, you must develop an immediate knowledge of the properties of the 11 di-chords. This chapter of the workbook will help you become comfortable using di-chord numbers and "program in" relevant information about the di-chords so that when you are tracking, you are also gaining insight into the affect and meaning of the music you are hearing or performing.

Exercises: Di-Chord Number Calculation

Exercise 9-1

Write the di-chord number corresponding to each pair of notes:

1. *sol* up to *ti*
2. *ti* up to *fa*
3. *fa* down to *re*
4. *doh* up to *sol mi*
5. *la* down to *fa*

Exercise 9-2

Write the di-chord number corresponding to each pair of notes. Underneath each pair, write the sum of the two di-chord numbers.

1. *la* up to *si* ___ *ti* up to *fa* ___ Sum: ___
2. *mi* down to *doh* ___ *doh* down to *mi* ___ Sum: ___
3. *sol* down to *mi* ___ *mi* down to *sol* ___ Sum: ___
4. *re* up to *la* ___ *la* up to *re* ___ Sum: ___
5. *mi* up to *fa* ___ *fa* up to *mi* ___ Sum: ___

What pattern do you notice in your answers? The sum always equals 12. In each example, the second pair of notes is the inversion of the first pair of notes. The inversion of any di-chord can be obtained by subtracting the di-chord from the number 12. Remember that there are 12 semitones in an octave.

Di-Chord Numbers and Ordinal Interval Names

The table below shows the correspondences between di-chord numbers and the common and uncommon interval names. Remember that although there are multiple interval names for each di-chord number, the most common names are the intervals that occur in the diatonic scale.

{[['[1]', 'minor 2nd', 'chromatic half-step'], ['[2]', 'major 2nd', 'diminished 3rd'], ['[3]', 'minor 3rd', 'augmented 2nd'], ['[4]', 'major 3rd', 'diminished 4th'], ['[5]', 'perfect 4th', '—'], ['[6]', 'augmented 4th', 'diminished 5th'], ['[6]', 'diminished 5th', 'augmented 4th'], ['[7]', 'perfect 5th', '—'], ['[8]', 'minor 6th', 'augmented 5th'], ['[9]', 'major 6th', 'diminished 7th'], ['[10]', 'minor 7th', 'augmented 6th'], ['[11]', 'major 7th', 'diminished 8ve'],].map(([dc, common, uncommon], i) => ( ))}

Di-Chord Number	Common Interval Name	Uncommon Interval Name

Notice that by common interval names:

- [1] and [2] are 2nds
- [3] and [4] are 3rds
- [8] and [9] are 6ths
- [10] and [11] are 7ths
- [5] is a perfect 4th
- [7] is a perfect 5th

The di-chord [6], which splits the octave exactly in half, can be spelled either as an augmented 4th (because it is one semitone larger than the perfect 4th, di-chord [5]) or a diminished 5th (because it is one semitone smaller than the perfect 5th, di-chord [7]). For example, *sol* up to *doh#* is an augmented 4th (any *sol* up to any *doh* will always be some type of 4th). However, *sol* up to *re*♭ is a diminished 5th (any *sol* up to any *re* will always be some type of 5th).

Exercises: Developing Fluency with Di-Chord Numbers

Exercise 9-3

At the piano, pick a starting note. Using only white keys, track up a 2nd. Is this a di-chord [1] or [2]? Is this a major or minor 2nd? Return back to your chosen starting note and track down a 2nd. Is this a [1] or [2]? Is this a major or minor 2nd? Speak your answers aloud and in rhythm. For example, if you were to start on *doh*, you would say: "*Doh*, *re*, [2], major 2nd, (pause), *doh*, *si*, [1], minor 2nd." Then, move up a 2nd, to *re*, and perform the same sequence.

There are many ways to use this exercise. In one practice session, you might explore only the different kinds of 2nds and do this same exercise with each of the seven white notes. On a different day, try keeping the same starting note but practicing all types of interval — 2nds through 7ths. Be creative in your practicing; the more angles from which you can examine a concept, the more deeply you will understand it, and the more easily you can use it to improve your music-making!

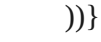
Exercise 9-4

Make flashcards with a di-chord number on one side and its corresponding common interval name on the other. Quiz yourself by reading the number and answering with the interval name, or by reading the interval name and responding with the number. Work to increase your speed until you can identify the corresponding name or number at the rate of about one per second. When you have mastered the flashcards, move on to the next exercise.

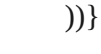
Exercise 9-5

Match the di-chord numbers in the left column to the corresponding traditional interval names in the right column by drawing lines between the appropriate di-chord numbers and interval names. Remember that you will draw two different lines from di-chord [6] because it has two different names.

Di-Chord Numbers



Interval Names



Exercise 9-6

Of all the possible intervals of a 2nd that can be created using only white notes, which are major and which are minor? How many are major, and how many are minor? What about for 3rds? Find the answers to these questions by completing the following exercises.

Next to each pair of notes, write whether they form a major or minor 2nd, and write the corresponding di-chord number — [1] or [2].

{[['1.', 'doh up to re', 'major 2nd, [2]'], ['2.', 're up to mi', ''], ['3.', 'mi up to fa', ''], ['4.', 'fa up to sol', ''], ['5.', 'sol up to la', ''], ['6.', 'la up to si', ''], ['7.', 'si up to doh', ''],].map(([n, pair, ans], i) => ( ))}

#	Note Pair	Answer

1. How many 2nds in the diatonic scale are major?
2. How many 2nds in the diatonic scale are minor?

Next to each pair of notes, write whether they form a major or minor 3rd, and write the corresponding di-chord number — [3] or [4].

{[['1.', 'doh up to mi', 'major 3rd, [4]'], ['2.', 're up to fa', ''], ['3.', 'mi up to sol', ''], ['4.', 'fa up to la', ''], ['5.', 'sol up to si', ''], ['6.', 'la up to doh', ''], ['7.', 'si up to re', ''],].map(([n, pair, ans], i) => ( ))}

#	Note Pair	Answer

1. How many 3rds in the diatonic scale are major?
2. How many 3rds in the diatonic scale are minor?

Ch.10 — The Sonic Properties of Di-Chords

Sonic Dimensionality

One of the toughest problems we face in learning to distinguish between the 11 basic di-chords is their sonic dimensionality — they are not just rough or smooth, black or white, but are multidimensional and often seemingly paradoxical. It is this sonic dimensionality that gives each of the 11 di-chords their individual character, and it is the individual character of each di-chord that we learn to hear, identify, and use to impart meaning to our music, allowing us to better understand and express its communicative nature.

Like with any of our friends, each di-chord has specific features that allow us to identify it. Also, just like with people, context has a huge effect on how the di-chords act and how we perceive them — sometimes even making them quite difficult to recognize. The good news is that, while we may have countless friends and acquaintances, there are only 11 di-chords to become acquainted with!

To distinguish one di-chord from another, our ears must systematically attend to three distinct sound factors that I have named:

1. Interference Pulsation
2. Fundamental/Octave Factor
3. Harmonicity

To illustrate the combined effect of these three factors on the 11 di-chords I have created the Di-Chord Pictograph.

The Three Sound Factors

1. Interference Pulsation

The rhythmic beating rate created by two simultaneous pitches. Dissonant/Modal/Perfect.

2. Fundamental/Octave Factor

Which pitch functions as the acoustic “root” — the note whose overtone series contains the other note.

3. Harmonicity

Whether the upper note appears in the overtone series of the lower note (harmonic) or not (non-harmonic).

Sonic Properties of All 11 Di-Chords

Each di-chord has three perceptual dimensions: Pulsation (beating rate), F/O Factor (implied direction), and Harmonicity (spectral fusion). The waveform shows relative beating speed.

[1] Minor 2nd 8 Hz · Dissonant

Harmonicity

Very Low

F/O Factor

↓ Down

Color

Closed

Harsh, biting — maximum tension

[2] Major 2nd 8 Hz · Dissonant

Harmonicity

Low

F/O Factor

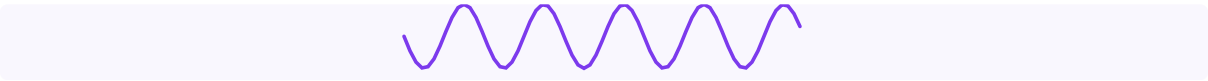
↓ Down

Color

Open

Buzzy, energetic — wants to move

[3] Minor 3rd 4 Hz · Modal



Harmonicity

Medium

F/O Factor

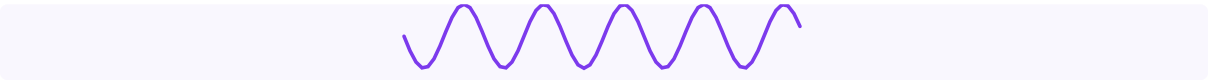
↓ Down

Color

Closed

Warm, shadowed — the minor sound

[4] Major 3rd 4 Hz · Modal



Harmonicity

Med-High

F/O Factor

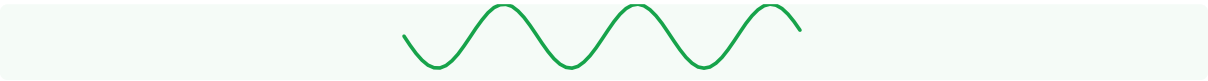
↓ Down

Color

Open

Bright, warm — the major sound

[5] Perfect 4th 2 Hz · Perfect



Harmonicity

High

F/O Factor

↓ Down

Color

Closed

Open, reaching — suspended

[6] Tritone 8 Hz · Dissonant

Harmonicity

Very Low

F/O Factor

↕ Both

Color

Closed

Maximum harmonic tension — unstable

[7] Perfect 5th 2 Hz · Perfect

Harmonicity

High

F/O Factor

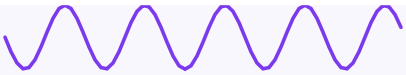
↑ Up

Color

Open

Hollow, stable — farthest stable reach

[8] Minor 6th 4 Hz · Modal



Harmonicity

Medium

F/O Factor

↑ Up

Color

Closed

Dark, tender — minor from below

[9] Major 6th 4 Hz · Modal

Harmonicity

Med-High

F/O Factor

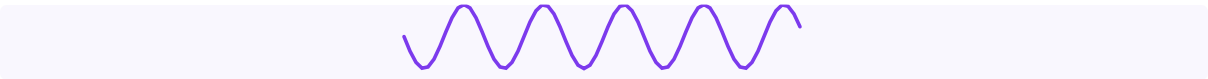
↑ Up

Color

Open

Bright, lifting — emotional openness

[10] Minor 7th 4 Hz · Modal



Harmonicity

Med-Low

F/O Factor

↑ Up

Color

Open

Incomplete, longing — wants resolution

[11] Major 7th 8 Hz · Dissonant

Harmonicity

Low

F/O Factor

↑ Up

Color

Closed

Bright tension — close to the octave

The Di-Chord Pictograph

The Di-Chord Pictograph consists of 11 numbers, each of which represents one of the 11 di-chords. Each number has a *shape*, a *shadow*, and a *color*, which represent, respectively, the interference pulsation, the fundamental/octave factor, and harmonicity. Using the Di-Chord Pictograph as a tool helps the conscious mind comprehend how each di-chord can simultaneously possess the three sound factors.

Ignoring one factor in a di-chord allows the ear to confuse it with another. For example, if you ignore the “color,” you might confuse di-chords [3] and [4]; if you ignore the “shadow,” you might confuse di-chords [3] and [8] or [2] and [10].

- **Shape** = Interference Pulsation
- **Shadow** = Fundamental/Octave Factor
- **Color** = Harmonicity

Ch.11 — Interference Pulsation

When we hear any of the 11 di-chords, we can perceive a subtle and even rhythmic pulse that is occurring eight times per second, four times per second, or two times per second (8Hz, 4Hz, or 2Hz). This property of di-chords is called *interference pulsation*. Observing the interference pulsation of a di-chord allows us to discern the basic category of the di-chord as *dissonant*, *modal*, or *perfect*. The interference pulsation pictograph represents the three types of interference pulsation with jagged, wavy, or straight lines.

Dissonant

Dissonant di-chords have an interference pulsation of eight pulses per second (8Hz). The dissonant di-chords are [1], [2], [10], and [11] — di-chords that are either a [1] or [2] from the fundamental or any octave above. Notice that the dissonant di-chords are 2nds or 7ths, in traditional terminology. In the Di-Chord Pictograph, all dissonant di-chords are depicted with a jagged-edged line, representing a fast, 8Hz interference pulsation.

Modal

Modal di-chords have an interference pulsation of four pulses per second (4Hz). The modal di-chords are [3], [4], [8], and [9] — di-chords that are either a [3] or [4] from the fundamental or any octave above. Notice that the modal di-chords are 3rds or 6ths, in traditional terminology. In the Di-Chord Pictograph, all modal di-chords are depicted with a smooth, rounded line, representing a smooth, flowing, or “wobbly” 4Hz interference pulsation.

Perfect

Perfect di-chords have an interference pulsation of two pulses per second (2Hz). The perfect di-chords are [5], [6], and [7] — di-chords that are either [5] or [6] from the fundamental or any octave above. Notice that, in traditional terminology, the perfect di-chords are either 4ths or 5ths. In the Di-Chord Pictograph, all perfect di-chords are depicted with straight lines, representing a flat, slow, stolid 2Hz interference pulsation.

Dissonant, Modal, or Perfect?

Recognizing that a di-chord is dissonant will not help you know which one it is unless you know which of the 11 di-chords are dissonant. The next three chapters will help you memorize information about di-chord properties. Remember, dissonant = 8Hz, modal = 4Hz, and perfect = 2Hz.

{[['[1]', 'dissonant'], ['[2]', 'dissonant'], ['[3]', 'modal'], ['[4]', 'modal'], ['[5]', 'perfect'], ['[6]', 'perfect'], ['[7]', 'perfect'], ['[8]', 'modal'], ['[9]', 'modal'], ['[10]', 'dissonant'], ['[11]', 'dissonant'],].map(([dc, puls], i) => ( ))}

Di-Chord Number	Interference Pulsation

Pulsation Families — Interference Beating Rates

The sine wave width shows relative beating speed. Dissonant intervals beat at 8 Hz (fast), modal at 4 Hz (medium), perfect at 2 Hz (slow).

8 Hz — Dissonant Family

[1] Minor 2nd — 8 Hz

Harsh, biting — maximum tension

[2] Major 2nd — 8 Hz

Buzzy, energetic — wants to move

[6] Tritone — 8 Hz

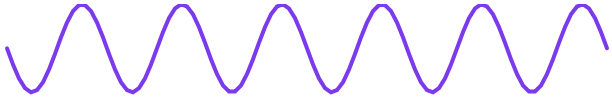
Maximum harmonic tension — unstable

[11] Major 7th — 8 Hz

Bright tension — close to the octave

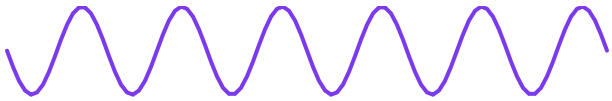
4 Hz — Modal Family

[3] Minor 3rd — 4 Hz



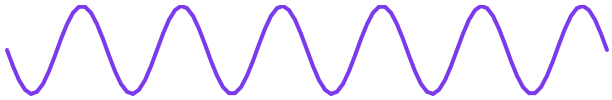
Warm, shadowed — the minor sound

[4] Major 3rd — 4 Hz



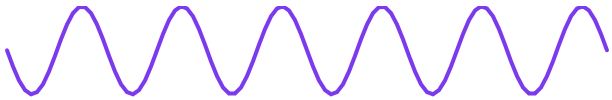
Bright, warm — the major sound

[8] Minor 6th — 4 Hz



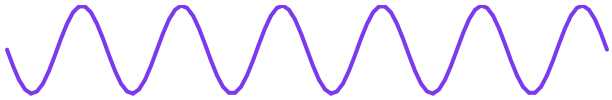
Dark, tender — minor from below

[9] Major 6th — 4 Hz



Bright, lifting — emotional openness

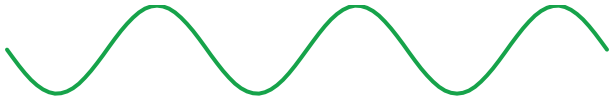
[10] Minor 7th — 4 Hz



Incomplete, longing — wants resolution

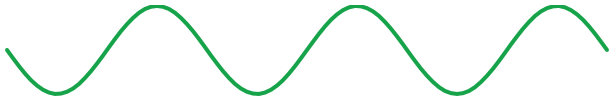
2 Hz — Perfect Family

[5] Perfect 4th — 2 Hz



Open, reaching — suspended

[7] Perfect 5th — 2 Hz



Hollow, stable — farthest stable reach

Exercises: Getting to Grips with Interference Pulsation

Exercise 11-1

The di-chord pictograph is a visual aid for remembering the properties of each di-chord number. In the di-chord pictograph, a number's outline corresponds to its interference pulsation: dissonant di-chords have jagged outlines, modal di-chords have wavy outlines, and perfect di-chords have straight outlines.

1. In the space provided, draw the words "Dissonant," "Modal," and "Perfect" using jagged, wavy, and straight lines.
2. In the space provided, draw the outline (interference pulsation) for each of the 11 di-chords.

Exercise 11-2

In this exercise you will practice, for just a minute or two, speaking and naming the rhythms of perfect and dissonant interference pulsation.

1. Set your metronome to 60 bpm and imagine that there is one vertical di-chord on every beat.
2. Divide the 60 bpm beat into two and eight equal subdivisions, speaking each beat in order, and using the lap map (see chapter 5, "The Lap Map"). It will be challenging, at first, to speak the numbers when subdividing into eight equal parts. Try staying light and agile in your voice, making beats 1 and 5 strongest, 3 and 7 the next strongest, and all even-numbered beats quiet. Saying "5-6-7-8" can be challenging in many languages; if it's too difficult for you, just say "1-2-3-4-1-2-3-4."
3. Now speak the number of interference pulsations for the first half of the beat and name the interference pulsation on the second half. With each beat, alternate between perfect and dissonant pulsations. The end result should be like this: "1-perfect, 1-2-3-4-dissonant, 1-perfect, 1-2-3-4-dissonant, etc."
4. Speak both the rhythm and the names while you practice, and improvise changing between dissonant and perfect pulsations. The idea is not to test yourself but rather to form strong associations between the rhythm and the label. To actually use interference pulsation when identifying di-chords, these associations must be instant.

Exercise 11-3

1. Set your metronome at 60 bpm and remind yourself of the tempo — you don’t need to use it during the exercise, but you should be careful to keep your tempo steady.
2. At the piano, start by playing a di-chord [1] in the middle range of the piano. Repeat the di-chord once per second, listening for the interference pulsation of eight pulses per second.
3. To hear the interference pulsation more clearly, speak the rhythm while you are playing, and then taper off the speaking while continuing to play so that you are imagining the numbers in rhythm while you play — you should then be able to hear that what you are playing matches up with the rhythm in your mind.
4. Now play a di-chord [7], maintaining the same lower note you used for di-chord [1]. Depending on your starting note, you may have to use black notes for either one or both of the upper notes. Repeat this di-chord at the tempo of 60 bpm while listening for two pulses per second.
5. Once you feel comfortable with the previous steps, move back and forth between [1] and [7], listening for the rhythmic change. Sometimes it is drawing comparisons that do the most to clarify what we are listening for, so don’t spend too much time trying to hear pulsation in a single di-chord — work on comparing one type of interference pulsation with another.

Below is the complete list of pairs of dissonant and perfect di-chords to compare. Place check marks in the spaces after comparing each set.

{['[1]/[7]','[1]/[5]','[1]/[6]','[2]/[5]','[2]/[7]','[2]/[6]', '[10]/[7]','[10]/[5]','[10]/[6]','[11]/[7]','[11]/[5]','[11]/[6]'].map((pair, i) => ( ))}

Pair	Check

Exercise 11-4

Repeat Exercise 11-2 but this time improvising comparisons between dissonant (8 Hz) and modal (4 Hz).

Exercise 11-5

Repeat Exercise 11-3 but this time playing, listening to, and comparing dissonant and modal di-chords. Below is the complete list of pairs of dissonant and modal di-chords to compare. Place check marks in the spaces after comparing each set.

{['[1]/[3]','[1]/[4]','[2]/[3]','[2]/[4]','[1]/[8]','[1]/[9]', '[2]/[8]','[2]/[9]','[8]/[10]','[8]/[11]','[9]/[10]','[9]/[11]'].map((pair, i) => ( ))}

Pair	Check

Exercise 11-6

Repeat Exercise 11-2 but this time improvising between modal (4 Hz) and perfect (2 Hz).

Exercise 11-7

Repeat Exercise 11-3 but this time playing, listening to, and comparing modal and perfect di-chords. Below is the complete list of pairs of modal and perfect di-chords to compare. Place check marks in the spaces after comparing each set.

{['[3]/[5]','[3]/[6]','[3]/[7]','[4]/[5]','[4]/[6]','[4]/[7]', '[8]/[5]','[8]/[6]','[8]/[7]','[9]/[5]','[9]/[6]','[9]/[7]'].map((pair, i) => ( ))}

Pair	Check

Exercise 11-8

Remember, for you to actually use interference pulsation to identify di-chords, you must be able to immediately recall the associations between each di-chord and its properties. Can you complete this quiz in under 10 seconds?

1. At what rate do perfect di-chords pulse?
2. At what rate do dissonant di-chords pulse?
3. At what rate do modal di-chords pulse?
4. Which di-chords are dissonant?
5. Which di-chords are perfect?

6. Which di-chords are modal?

7. Fill out the table below.

))}

Di-Chord Number	Interference Pulsation

Chapter Twelve: Properties of Di-Chords: Fundamental/ Octave Factor

Referring Up or Down

In any di-chord, you can hear that its upper note either refers down to its lower note (the fundamental) or up to the octave transposition of its lower note (the octave). This phenomenon is called the fundamental/octave factor.

The fundamental/octave factor allows you to distinguish between di-chords that refer downward to the fundamental and those that refer up toward the note one or more octaves above the fundamental. This means that after you categorize a di-chord as dissonant, modal, or perfect, you can then use the fundamental/octave factor to determine whether a dissonant di-chord is a 2nd or a 7th, whether a modal di-chord is a 3rd or a 6th, and whether a perfect di-chord is a perfect 4th, a perfect 5th, or a di-chord [6].

You hear the fundamental/octave factor by listening for whether the upper note of a di-chord refers down to its lowest note or up to the octave manifestation of the lowest note.

The following table shows each of the 11 di-chords and whether they refer up or down.

{[['[1]', 'refers down'], ['[2]', 'refers down'], ['[3]', 'refers down'], ['[4]', 'refers down'], ['[5]', 'refers down'], ['[6]', 'refers up or down'], ['[7]', 'refers up'], ['[8]', 'refers up'], ['[9]', 'refers up'], ['[10]', 'refers up'], ['[11]', 'refers up'],].map(([dc, fo], i) => ( ))}

Di-Chord Number	Fundamental/Octave

Di-Chord Pictograph Numbers

As you can see, di-chords [1] through [5] refer down; this is represented on the Di-Chord Pictograph by a “shadow” to the left of each number. Di-chords [7] through [11] refer up, and this is represented on the Di-Chord Pictograph by a shadow to the right of each number. Di-chord [6] splits the octave directly down the middle and therefore is both referring up and referring down.

You might notice that, aside from di-chord [6], 2nds, 3rds, and 4ths refer down, while 5ths, 6ths, and 7ths refer up.

Exercises: Getting to Grips with Fundamental/Octave Factor

Exercise 12-1

In the space provided, draw the Di-Chord Pictograph with all 11 di-chords. In your drawing of the pictograph, illustrate two sound factors—interference pulsation, as indicated by the type of outline, and fundamental/octave factor, as indicated by the direction of the shadow.

Exercise 12-2

1. At the piano, choose a note to be the fundamental for this exercise.

2. Play your chosen note together with the note that is a [1] above it; release the upper note quickly while continuing to hold down the lower note. When you release the upper note, listen for how it seems to fall back down to the lower note.

3. Now, play your chosen fundamental together with the note that is an [11] above it; again, release the upper note quickly while continuing to hold down the lower note. Listen and notice how this time the upper note seems to be drawn upward by a semitone to the un-played but perceptible note that is one octave above the lowest note you are playing.

4. Compare the fundamental/octave factors of [1] and [11] using the procedure described, specifically listening for whether the upper note refers down or up when it is released.

Throughout your practice sessions, compare the following pairs. Notice that the [6] feels neither like it refers up nor down—a very different aural experience than [5] and [7], though all three of these di-chords have a 2Hz interference pulsation rate. Check off each pair as you work your way through the list.

2nds and 7ths:

[1]/[11] _____ [1]/[10] _____ [2]/[11] _____ [2]/[10] _____

3rds and 6ths:

[1]/[9] _____ [1]/[8] _____ [4]/[8] _____ [4]/[9] _____

4ths and 5ths:

[5]/[6]/[7] _____

Exercise 12-3

In the box to the right of each di-chord number, draw an up arrow or a down arrow to indicate the direction to which the top note of the di-chord is referring. [6] will have a single arrow pointing both up and down.

))}

Di-Chord	Fundamental/Octave Factor
_____	

Answer the following questions:

1. In which di-chords does the upper note refer up to the octave manifestation of the lower note?

2. In which di-chords does the upper note refer down to the lower note?

3. What is extraordinary about the fundamental/octave factor of [6]?

4. To fill out the following table, combine your knowledge of traditional interval names with your understanding of the fundamental/octave factor. Draw an up or down arrow in each cell to the right of the interval names.

{['minor 2nd', 'perfect 5th', 'major 4th', 'minor 2nd', 'minor 6th', 'major 4th', 'minor 3rd', 'major 3rd', 'augmented 4th', 'perfect 4th', 'minor 2nd', 'diminished 5th',].map((name, i) => ( ))}

Interval Name	Fundamental/Octave Factor
	_____

Ch.13–14 — Harmonicity & Review

Harmonicity — Harmonic or Non-Harmonic

Now you can hear whether a di-chord is dissonant, modal, or perfect and whether it refers up or down. However, both [1] and [2] are dissonant and look down. Both [8] and [9] are modal and look up. How can you distinguish [1] and [2], [8] and [9], or any of the other pairs of di-chords that share the first two properties?

This is where the third factor comes in—harmonicity. Any di-chord can be classed as being harmonic or non-harmonic. Whether a di-chord is harmonic or non-harmonic depends on whether the upper note is in the first nine notes of the overtone series of the lower note.

The harmonic di-chords—[2], [4], [7], [9]**, [10]—sound open, hollow, and expanding, and possess a sort of bland, alkaline “flavor” for the ear. In addition, the two pitches in a harmonic di-chord create an effect in the ear similar to the effect of repelling one another, like two magnets of like polarity.

On the other hand, non-harmonic di-chords—[1], [3], [5], [6]*, [8], [11]—sound closed, dense, and contracting, and possess a sharp, acidic “flavor” for the ear. The two pitches in a non-harmonic di-chord create an effect in the ear similar to the effect of strongly attracting towards one another, like two magnets of opposite polarity.

{[['[1]', 'non-harmonic'], ['[2]', 'harmonic'], ['[3]', 'non-harmonic'], ['[4]', 'harmonic'], ['[5]', 'non-harmonic'], ['[6]', '—*'], ['[7]', 'harmonic'], ['[8]', 'non-harmonic'], ['[9]', 'harmonic**'], ['[10]', 'harmonic'], ['[11]', 'non-harmonic'],].map(([dc, harm], i) => ( ))}

Di-Chord	Harmonicity

* [6] is a “false non-harmonic” because the harmonicity is perceived as neutral, being neither like harmonic nor non-harmonic di-chords.

** [9] is a “false harmonic” because, while its harmonicity sounds decidedly like the harmonic di-chords, its upper note does not fall within the first nine notes of the overtone series of the lower note.

Di-Chord Pictograph and Harmonicity Colors

In the Di-Chord Pictograph and in the previous table, harmonic di-chords are depicted as light or pale in color, while non-harmonic di-chords are depicted as a vivid or intense dark color (while this textbook uses shades of gray, you can draw and color your own pictograph using shades of your favorite color).

F/O Factor — Fundamental/Octave Direction

Each di-chord implies a phantom note outside the interval. The F/O Factor indicates whether the ear is pulled toward an implied lower octave or upper octave.

[1]

Minor 2nd

Refers Down ↓

The lower note pulls your ear downward — implies a note an octave below the root

[2]

Major 2nd

Refers Down ↓

The lower note pulls your ear downward — implies a note an octave below the root

[3]

Minor 3rd

Refers Down ↓

The lower note pulls your ear downward — implies a note an octave below the root

[4]

Major 3rd

Refers Down ↓

The lower note pulls your ear downward — implies a note an octave below the root

[5]

Perfect 4th

Refers Down ↓

The lower note pulls your ear downward — implies a note an octave below the root

[6]

Tritone

Ambiguous ↕

Both notes pull equally — no clear implied root, maximum ambiguity

[7]

Perfect 5th

Refers Up ↑

The upper note leads your ear upward — implies a note an octave above the upper

[8]

Minor 6th

Refers Up ↑

The upper note leads your ear upward — implies a note an octave above the upper

[9]

Major 6th

Refers Up ↑

The upper note leads your ear upward — implies a note an octave above the upper

[10]

Minor 7th

Refers Up ↑

The upper note leads your ear upward — implies a note an octave above the upper

[11]

Major 7th

Refers Up ↑

The upper note leads your ear upward — implies a note an octave above the upper

Harmonicity — Spectral Fusion Score

Higher harmonicity = notes fuse into a single perceived sound. Lower harmonicity = notes remain separate, rougher. Score 0–100.

[1]

Minor 2nd

Very Low (closed/dark)

[2]

Major 2nd

Low (open/light)

[3]

Minor 3rd

Medium (closed/dark)

[4]

Major 3rd

Med-High (open/light)

[5]

Perfect 4th

High (closed/dark)

[6]

Tritone

Very Low (closed/dark)

[7]

Perfect 5th

High (open/light)

[8]

Minor 6th

Medium (closed/dark)

[9]

Major 6th

Med-High (open/light)

[10]

Minor 7th

Med-Low (open/light)

[11]

Major 7th

Low (closed/dark)

Exercises: The Notes of the Overtone Series

One way of learning which notes in the overtone series of any given note are perceived as harmonic (and thus which specific di-chords are harmonic) is to become fluent in spelling dominant ninth chords. The dominant ninth chord contains four of the five notes from the overtone series that produce harmonicity. The fifth note that is not included in a dominant ninth chord is the false harmonic a [9] (major 6th) above the fundamental. For more detailed information on the overtone series, see page 296.

The following exercises will help you develop fluency in spelling dominant ninth chords by starting with major triads, moving to dominant seventh chords, and finishing with dominant ninths.

Exercise 13-1: Spelling Major Triads

1. At the keyboard, or using a visualized keyboard, pick any white note as a starting note for this exercise.

2. While tracking on your visualized or real keyboard, spell aloud a major triad above your starting note—go up a [7] to the note that is a perfect 5th above the fundamental, then come down to the note that is a [4] or major 3rd above the fundamental, and finish with the fundamental again.

3. When you have completed one triad, move to the next white note. Continue until you have spelled major triads for each white note on the keyboard. If you were to start on doh, the exercise should go something like this: “Doh, sol, mi, doh. Re, la, fae, re. Mi, eie.” Make sure to spell the triads aloud in a steady rhythm.

4. Once you are fluent with the major chords using white keys as fundamentals, practice the exercise with black-key notes as well. Remember to practice spelling based on both the flat and sharp name for each note. Part of an example could sound like this: “Sole, rea, rie, sole. Lah, mib, doh, lah.” Don’t forget about fab/mia and doh/sie! Notice patterns; for example, if you can spell doh major (doh mi soh), you can easily spell doha major, since each note in that chord simply has a sharp added—doha, mia, sole.

As with all of the exercises in this book, these exercises can and should be varied from day to day. One day, you might spell chords in descending order, as suggested in the exercise instructions, and the next day, you might try spelling them in ascending order. On other days, you might move up or down systematically by any other interval, or you might improvise, choosing new fundamentals in real time. For a fun challenge, you can spell chords above notes in the 21-note row exercise (p. 100); choose different clefs for the 21-note row to mix things up even more!

Exercise 13-2: Spelling Dominant 7th Chords

Follow the same procedure as in the previous exercise, but spell a dominant 7th chord above each note. To spell a dominant 7th, you will need to have a [10] chord above the fundamental. Starting on the fundamental, go up to the note a minor 7th above the fundamental, come down to the note that is a major 3rd above the fundamental, and then come down to the note that is a perfect 5th above the fundamental. Start with the white notes. Remember to track using a real or visualized keyboard and spell the chords aloud and in rhythm.

Exercise 13-3: Spelling Dominant 9th Chords

Follow the same procedure as in the previous exercise, but add in the dominant ninth, which is nominally a major 2nd above the fundamental (the actual distance is an octave plus a [2]). So, starting on the fundamental, track up an octave plus a [2] to the note a major 2nd and an octave above the fundamental, come down to the note that is a minor 7th above the fundamental, come down to the note that is a perfect 5th above the fundamental, and then come down to the note that is a major 3rd above the fundamental. Start on one of the white notes and track along as you speak the solfege syllables in rhythm; move to using the black notes as fundamentals when you feel confident to do so.

Exercise 13-4: Developing Fluency with the Major 6th

By learning to spell dominant ninth chords above each note, you have gained familiarity with four of the five possible harmonic di-chords above any given note. The final harmonic, or “false harmonic,” di-chord with which you must become familiar is the [9]—a major 6th above the fundamental.

Practice spelling major 6ths above each note with a similar procedure to the chord spelling exercises above. Start with white keys (Doh, la, doh. Re, si, re. Mi, doha, mi, etc.) and then build in the black keys, practicing spelling with both sharp and flat note names.

Exercises: Getting to Grips with Harmonicity

Exercise 13-5: Drawing the Complete Di-Chord Pictograph

In the space provided, draw the complete Di-Chord Pictograph with all 11 di-chords and with all three sound factors illustrated: interference pulsation, as indicated by the outline, fundamental/ octave factor, as indicated by the direction of shadow, and harmonicity, as indicated by color.

Exercise 13-6: Comparing Harmonic to Non-Harmonic

Throughout this exercise, you will be listening to and comparing harmonic di-chords to non-harmonic di-chords. In a harmonic di-chord, the upper note will sound like it in some way matches the lower note, like a green ornament on a green Christmas tree, but in a non-harmonic di-chord, the upper note stands out, like a red ornament in a green Christmas tree.

Start by comparing di-chords [3] and [4]. Keep the same bass note. For example, you might compare a [3] composed of doh and mib with the [4] composed of doh and mi (natural). Take your time and listen for the harmonicity factor. Compare many different pairs of di-chords and listen to di-chords throughout the entire range of the piano. Perhaps you might compare a single pair of di-chords over many different octaves.

Compare the harmonicity factor for the following pairs and place a check mark after you have completed each pair:

- [3]/[4]
- [5]/[7]
- [11]/[10]
- [1]/[2]
- [6]/[9]
- [3]/[6]
- [6]/[7]
- [5]/[6]/[7]

Exercise 13-7: Harmonicity Quiz

1. Circle the harmonic di-chords:

[1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11]

2. What is unique about the harmonicity factor of di-chord [6]?

3. What is unique about the harmonicity factor of di-chord [9]?

Animal Analogy for Identification

When identifying a di-chord, proceed from general to specific:

1. **Category first** (species class) — Dissonant / Modal / Perfect?
2. **Direction** (subspecies) — Does it refer up or down?
3. **Harmonicity** (genus) — Harmonic (open) or non-harmonic (closed)?

Major vs. Minor — Acoustic Explanation

[4] major 3rd = harmonic + open + alkaline → *major feels expanding*
[3] minor 3rd = non-harmonic + closed + acidic → *minor feels contracting*

“This is physics, not convention.” The major/minor distinction is grounded in the acoustic reality of the overtone series, not in cultural agreement about emotional meaning.

Triad Di-Chord Profiles

Triad Type	Di-Chord Profile	Character
Major	[7/4]	Open, bright — both intervals harmonic or modal-harmonic
Minor	[7/3]	Closed, dark — non-harmonic [3] creates introspection
Diminished	[6/3]	Harsh, tart — tritone creates maximum ambiguity
Augmented	[8/4]	All-modal, mysterious — neither resolves nor grounds

Complete Di-Chord Reference Table

{[['[1]', '1', 'minor 2nd', 'Dissonant (8Hz)', 'Non-harmonic', 'Refers down', 'Extremely tense, urgent'], ['[2]', '2', 'major 2nd', 'Dissonant (8Hz)', 'Harmonic', 'Refers down', 'Tense but open'], ['[3]', '3', 'minor 3rd', 'Modal (4Hz)', 'Non-harmonic', 'Refers down', 'Closed, contracting, acidic,

poignant'], ['[4]', '4', 'major 3rd', 'Modal (4Hz)', 'Harmonic', 'Refers down', 'Open, warm, expanding, alkaline'], ['[5]', '5', 'perfect 4th', 'Perfect (2Hz)', 'Non-harmonic', 'Refers down', 'Suspended, hanging, unresolved'], ['[6]', '6', 'aug 4th / dim 5th', 'Perfect (2Hz)', 'Neutral', 'Both (neutral)', 'Frozen, ambiguous, static, split'], ['[7]', '7', 'perfect 5th', 'Perfect (2Hz)', 'Harmonic', 'Refers up', 'Most open, stable, balanced — home'], ['[8]', '8', 'minor 6th', 'Modal (4Hz)', 'Non-harmonic', 'Refers up', 'Closed, dark, inward'], ['[9]', '9', 'major 6th', 'Modal (4Hz)', 'False-harmonic*', 'Refers up', 'Warm, open, upward reaching'], ['[10]', '10', 'minor 7th', 'Dissonant (8Hz)', 'Harmonic', 'Refers up', 'Tense upward pull — dominant feeling'], ['[11]', '11', 'major 7th', 'Dissonant (8Hz)', 'Non-harmonic', 'Refers up', 'Extremely tense, leading-tone pull'],].map(([dc, st, trad, puls, harm, fo, char], i) => ( ))}

DC	Semitones	Traditional	Pulsation	Harmonicity	F/O Direction	Character

* [9] major 6th is “false-harmonic” — acoustically appears harmonic but behaves non-harmonically in context due to its inversion relationship with [3].

Chapter Fourteen: Properties of Di-Chords: Interference Pulsation

Interference Pulsation

Di-chords are either dissonant, modal, or perfect.

Dissonant di-chords beat at 8 cycles per second, modal di-chords at 4 cycles per second, and perfect di-chords at 2.

Fundamental/Octave Factor

The upper note of any di-chord either refers up or refers down.

Does the upper note sound like it is referring down to the bottom note or up to the first octave manifestation of the fundamental? Remember, di-chord [6] splits the octave directly down the middle and refers up and down by equal amounts.

Harmonicity

Di-chords are either harmonic or non-harmonic.

The top note of a harmonic di-chord falls within the first nine partials of the overtone series of the bottom note. Visually, this would be like a green ornament on a green Christmas tree.

In non-harmonic di-chords, the top note does not fall within the overtone series of the bottom note, producing a type of contrast or “dissonance.” Like a red ornament on a green Christmas tree, the upper note of a non-harmonic di-chord stands out more than it blends in.

The Combined Effect of the Three Sound Factors

Notice that no two di-chords have the same combination of all three factors. This is why you need an awareness of all three factors to pinpoint which of the 11 di-chords you are hearing. The Di-Chord Pictograph provides a useful visual representation of the 11 di-chords and the three sound factors.

The Di-Chord Pictograph also acts as a metaphor for the linear and non-linear aspects of di-chord perception. You can observe linear aspects, such as the palindromic progression of interference pulsation:

jagged – rounded – square – rounded – jagged

Likewise, the shadows that represent the fundamental/octave factor appear on the left side in numbers 1–6, and on the right side for numbers 6–11. All linearity ceases when you observe the shades of color that illustrate harmonicity because the structure of the overtone series is not linear, it is logarithmic (non-linear) and is better represented as a spiral (one that doubles its distance from the center with every revolution) rather than a straight line (Wilson 1965).

Di-Chord Identification

While it may seem difficult to identify each of the three sound factors of di-chords in real time, it is no more difficult than identifying an animal's species (reptile, mammal, bird), its subspecies (turtle/lizard, whale/horse, owl/hummingbird), and then its particular genus (snapping turtle/chameleon, Beluga/Appaloosa, barn owl/ruby-throated). Actually, because there are only 11 di-chords, it's far easier than this to identify.

Review Table: Di-Chord Properties

The following table lists the 11 di-chords with their common interval names and categorization by the three sound factors.

{[['[1]', 'minor 2nd', 'dissonant', 'non-harmonic', 'refers down'], ['[2]', 'major 2nd', 'dissonant', 'harmonic', 'refers down'], ['[3]', 'minor 3rd', 'modal', 'non-harmonic', 'refers down'], ['[4]', 'major 3rd', 'modal', 'harmonic', 'refers down'], ['[5]', 'perfect 4th', 'perfect', 'non-harmonic', 'refers down'],

['[6]', 'augmented 4th / diminished 5th', 'perfect', '—', '—'], ['[7]', 'perfect 5th', 'perfect', 'harmonic', 'refers up'], ['[8]', 'minor 6th', 'modal', 'non-harmonic', 'refers up'], ['[9]', 'major 6th', 'modal', 'harmonic', 'refers up'], ['[10]', 'minor 7th', 'dissonant', 'harmonic', 'refers up'], ['[11]', 'major 7th', 'dissonant', 'non-harmonic', 'refers up'],].map(([dc, name, puls, harm, fo], i) => ( ))}

Di-Chord Number	Common Interval Name	Interference Pulsation	Harmonicity	Fundamental/ Octave

Exercises: Di-Chord Sound Factors

Exercise 14-1

Without referring to the table on the previous page, complete this table from memory.

))}

Di-Chord Number	Common Interval Name	Interference Pulsation	Harmonicity	Fundamental/ Octave

Exercise 14-2

For each di-chord, list its properties. Then, draw its pictograph in the box provided. Remember, a number’s outline illustrates its interference pulsation, color illustrates its harmonicity, and shadow illustrates its fundamental/octave factor. Choose three shades of the same color for this exercise: one dark, one medium, and one light. Colored pencils will work best. Use your darkest shade for non-harmonic di-chords and your lightest shade for harmonic di-chords; the medium shade will be used to draw the shadows on the numbers that indicate the fundamental/octave factor.

:

Interference Pulsation: _____

Harmonicity: _____

Fundamental/Octave: _____

))}

Chapter Fifteen: Di-Chords in Melodic Contexts

Perception of Di-Chords in Melodic Contexts

In chapters 10–14 we covered the three sound factors of di-chords that are played synchronously —both pitches sounding at the same time. However, the three sound factors that affect the synchronous or vertical sounding of di-chords also have correlated effects on the non-synchronous or horizontal sounding of di-chords.

It is essential that all musicians, including those who play “harmony” instruments, like piano or guitar, understand the melodic characteristics of di-chords. Instruments that are commonly understood to be “harmony” instruments are really playing multiple horizontal lines at once; to play those instruments with meaning and expression, it is vital to understand the melodic characteristics of each di-chord in every horizontal line.

Interference Pulsation in Melodic Contexts: Gut, Heart, and Head

Dissonant Di-Chords: The Gut

The perceptions elicited from dissonant melodic di-chords are that of:

- gut-centered physicality,
- transition,
- movement between fixed points, and
- connecting words or phrases in speech, like “such as,” “the beautiful…” “and then, the fast flowing…” or “what if…?”

Modal Di-Chords: The Heart

The perceptions elicited from modal melodic di-chords are that of:

- heart-centered emotions,
- feelings,

- fluidity,
- grace and ease of movement, and
- words such as “love,” “tenderness,” “yearning,” “affection,” and “grief.”

Perfect Di-Chords: The Head

The perceptions elicited from perfect melodic di-chords are that of:

- head-centered intellect,
- thoughts,
- concepts,
- structures,
- principles, and
- words such as “honor,” “logic,” “integrity,” “conceit,” and “calculating.”

Fundamental/Octave Factor in Melodic Contexts

The effect of fundamental/octave factor in melodic contexts is the same as it is in harmonic contexts:

- For di-chords [1], [2], [3], [4] and [5], the upper note refers down to the lower note.
- For di-chords [7], [8], [9], [10] and [11], the upper note refers up to the nearest octave manifestation of the lower note.

Harmonicity in Melodic Contexts: Open, Closed, Strong, and Weak

Ascending Harmonic Di-Chords: Open

When the two constituent pitches of any of the harmonic di-chords ([2], [4], [7], [9], [10]) are played linearly in ascending order, they create a feeling that the upper note is open-ended, eternal, and floating above the lower note. The two notes seem to expand apart from one another so that the upper note is seemingly pushed upward into space, opposing gravity. The upper note feels natural to sing because it is an overtone of the lower note. In this melodic movement, there is a

subtle perception of a counter-clockwise gesture that proceeds, if imagined on a clock face, from six o’clock, through three, and up to twelve o’clock. In score analysis, an upward pointing arrow is used to indicate any ascending harmonic horizontal di-chord as “open.”

Ascending Non-Harmonic Di-Chords: Closed

When the two constituent pitches of any of the non-harmonic di-chords ([1], [3], [5], [8], [11]) are played linearly in ascending order, the upper note is stronger than the lower note, and therefore seems to be pulled downward; not in the case of [11], whose tendency is to strongly go to the octave of the lower note. The two notes seem to contract, causing the sensation that the upper note “caps off,” ends, or closes a thought or gesture. It is difficult to sing the upper note correctly because it is not an overtone of the lower note; hence, there is a preference towards singing the nearest ascending harmonic di-chord. The upper note also tends to be difficult to tune because it clashes by a semitone with one or more of the overtones of the lower note; it is sung best—not by imagining that the lower note is an overtone of the upper note, rather the other way around. In this melodic movement, there is a subtle perception of a clockwise gesture that proceeds, if imagined on a clock face, from nine o’clock, through twelve, and ending at three o’clock. In score analysis, an over-arched arrow is used to indicate any ascending non-harmonic horizontal di-chord as “closed.”

Descending Harmonic Di-Chords: Strong

When the two constituent pitches of any of the harmonic di-chords ([2], [4], [7], [9], [10]) are played linearly in descending order, the lower pitch is perceived as the fundamental of the two pitches, which creates a sense of grounded finality, like the final word of a conclusive statement. Descending harmonic di-chords can initially be difficult to sing because we do not hear the lower note as an overtone of the upper note. To sing the lower note correctly, it must be intended, or we will sing the nearest pitch class in the nine lowest partials of the upper note. In this melodic movement, there is a subtle perception of a counter-clockwise gesture progressing, if imagined on a clock face, from twelve o’clock, backward through nine to six o’clock. To indicate any descending harmonic horizontal di-chord, a downward pointing arrow is used.

Descending Non-Harmonic Di-Chords: Weak

When the two constituent pitches of any of the non-harmonic di-chords ([1], [3], [5], [8], [11]) are played linearly in descending order, they create a paradoxical gesture that can seem to rise, like the final word in a question. The lower note is often found among the nine lowest partials of the upper note, making it relatively natural and easy to sing. The paradoxical nature of this gesture occurs because the horizontal motion is moving downwards while, at the same time, the lower note contracts back up towards the upper note because it is in the overtone series of the upper note. In this melodic movement, there is a subtle perception of a clockwise gesture on a clock face, progressing from three o'clock, through six, and ending at nine o'clock. To indicate any descending non-harmonic horizontal di-chord, an under-arched arrow is used.

Ascending or Descending Di-Chord [6]: Neutral

This is the only di-chord whose harmonicity factor is neutral, neither seeming harmonic nor non-harmonic. In horizontal movement, [6] seems neither open, closed, weak, nor strong, but neutral. By comparing a musical line consisting of only di-chords [5], [6] and [7], you can easily perceive the acrid, unblissful quality of [6], eliciting in our hand a sort of claw-like gesture, versus the contracting or expanding in the hand, respectively, with [5] or [7]. Because [6] is devoid of a movement gesture, I suggest simply identifying it by name as [6].

Exercises: Melodic Gestures of Di-Chords

Exercise 15-1

Analyze a Melody, Part I. Two melodies are shown below. The first has been analyzed using the straight over-arching, and under-arching arrow symbols to illustrate the gesture of each melodic di-chord. Using the same arrow symbols, analyze the second melody, placing the appropriate arrows under the appropriate di-chords.

Exercise 15-2

Melodic Gestures and Di-Chords, Part I. Draw lines from column to column to match the gestures with the corresponding melodic di-chord.

Open	Ascending Non-Harmonic
Closed	Descending Harmonic
Weak	Descending Non-Harmonic
Strong	Ascending Harmonic

Exercise 15-3

Melodic Gestures and Di-Chords, Part II. In the following table, write in the harmonicity of each of the 11 di-chords. Then, write in the gesture name and draw the arrow symbol for both the ascending and descending manifestations of each di-chord.

))}

Di-Chord	Harmonic or Non-Harmonic?	Ascending Gesture and Symbol	Descending Gesture and Symbol

Exercise 15-4

Classifying Melodic Di-Chords. For each of the following di-chords, write whether it is open, closed, weak, or strong and draw the corresponding arrow type:

1. ascending [4]
2. ascending [9]
3. descending [7]
4. ascending [1]
5. descending [3]
6. ascending [2]
7. ascending [5]
8. descending [10]
9. descending [8]
10. ascending [7]

Exercise 15-5

Tracking Melodic Gestures. Develop fluency with the four melodic gestures by using The Tracking Page (chapter 16, p. 153) to practice naming open, closed, weak, and strong in real time. It is essential that you name the gestures steadily, confidently, in an even rhythm, and at a minimum tempo of quarter note = 60 bpm. Set manageable goals for yourself—perhaps aim for a half a line at a time to start with. If you are not yet familiar with The Tracking Page or you find this exercise difficult, you might return to this exercise after completing chapter 16.

Exercise 15-6

Compose a Melody, Part I. Using the blank staff, choose a clef and a key signature, and then create a four-bar melody. Compose the melody in 4/4 meter, using only quarter notes and rests. Use only diatonic 2nds ([1] or [2]) and diatonic 4th ([1] or [4]). After you have written the melody, draw arrows representing the melodic gestures underneath the staff.

Exercise 15-7

Singing Alternating Intervals. Starting on doh, sing alternating diatonic intervals. For alternating thirds, you will be singing up a 3rd, down a 2nd, up a 3rd, down a 2nd, etc. Remember to visualize the keyboard and track with a relaxed index finger as you sing. First, perform the exercise singing the secondary di-chord numbers. Then repeat the exercise, this time singing each gesture name. For example, singing secondary di-chord numbers from doh would look like this:

[0, 4, 1, 4, 2, 4, 1, 3, 2, 3, 1, 2, 1 / 0, 1, 2, 1, 4, 2, 4, 1, 3, 2, 3, 1, 2, 1]

Observe that the number you sing on any given note describes the di-chord formed by that note and the preceding note.

Then again, starting on the note doh, sing gesture names:

[open strong closed strong open / strong open closed strong open / weak closed weak closed]

After performing this exercise starting on the note doh, begin on each of the white notes of the diatonic scale, using only the white notes to perform the exercise in each of the seven modes.

Exercise 15-8

Alternating Thirds. The following patterns show alternating thirds. To each of the two-bar phrases, add a sharp or flat to any one of the notes, then analyze the gestures by drawing the corresponding arrows in the spaces below the music. Notice how altering just one pitch has a profound impact on the gestures, and therefore the affect of the surrounding music!

[Four two-bar musical examples provided for analysis]

Exercise 15-9

Compose a Melody, Part II. Using only diatonic 2nds and 3rds, compose a four-bar melody that follows the gestures given below the staff. Write one quarter note above each gesture.

Exercise 15-10

Playing Melodic Gestures, Part I.

1. Choose a di-chord.
2. Starting in the low range of your instrument, play an ascending sequence of that type of melodic di-chord.
3. Name (either mentally or aloud, depending on your instrument) the gesture on the off-beats (“open” if the di-chord is harmonic, “closed” if it is non-harmonic).
4. When you reach the high register of your instrument, play a descending sequence of that type of melodic di-chord. As before, name (mentally or aloud) the gesture on the off-beats (“strong” if the di-chord is harmonic, “weak” if it is non-harmonic). It is critical that you are visualizing the keyboard and mentally tracking as you perform this exercise.
5. Next, improvise using both the ascending and descending melodic manifestations of the chosen di-chord, but continue using only one type of di-chord. This exercise can be used quite effectively as a long-tone warm-up exercise for instruments whose sounds sustain; try holding each note for two or even four beats and choosing a new di-chord each day.

Exercise 15-11

Playing Melodic Gestures, Part II.

1. Expand on the Exercise 15-10 by choosing a pair of di-chords with which to improvise and name gestures. Choose one of the following pairs: [1]/[2], [3]/[4], [5]/[7], [8]/[9], or [10]/[11].
2. On the piano or another instrument, improvise in a steady tempo and even rhythm. Use only the two di-chords in your chosen pair, but use them both ascending and descending.
3. Continue visualizing the keyboard and track as you play, and name (either mentally or aloud, depending on your instrument) the type of gesture on each off-beat.

Exercise 15-12

Analyze a Melody, Part II. Developing fluency with the melodic gestures and an awareness of them during performance is highly beneficial for achieving both a greater and more reliable level of musicality. Choose a melody from a piece you have been practicing and study the melodic gestures. Speak and sing the gestures out loud in the tempo and rhythm of the piece. When you go back to playing the melody on your instrument, mentally name the gestures as you play them, considering how they relate to the affect of the music.

Ch.16 — The Tracking Page

Introduction

Next to visualizing the keyboard, The Tracking Page (p. 153) is the most important means of developing fluency and accuracy in connecting your mind with your ear and your eye. It is helpful to remember that the ear needs no training. It is the mind that requires training to become aware of what the ear is hearing at the speed that the ear is hearing it, but the best guidance is wasted without faithfully applying what is needed to become skillful—the backing of a rigorous attitude. Take J.S. Bach as your example, who, when asked about his prodigious talent, was quoted as saying, “I was obliged to be industrious. Whoever is equally industrious will succeed equally well.” (1998)

Using the Tracking Page

There are six protocols to be performed for each line of The Tracking Page. These protocols are designed to help you master each of the several aspects involved with musical reading and comprehension. Generally, you may find that you are weak on one or more of the protocol steps, so those steps will need to be strengthened. By performing each step in sequence, you can discover points of weakness to strengthen. Master each step before continuing to the next. Initially, each protocol may require several minutes, perhaps even half an hour. At this rate, the six steps would require about three hours to master. However, this level of weakness in skill is extremely rare. Even so, in such a case, the time would be well spent, and fluency would be the end result, with the entire sequence requiring little more than six minutes—one line per minute.

Start by using only the diatonic white-notes. Perform one or more lines per week doing each of the six protocols every day, starting on a different note each day. If, for instance, you choose line 3 for the week, select a different note for each of the seven days of the week. Each day, perform the six protocols in order.

By the end of the week, you will have started and ended on each of the seven diatonic notes and will have sung each of the seven modes by name by syllable name, primary di-chord number, and secondary di-chord number. Remember to incorporate each step into every subsequent step. In the final, sixth step of the protocol, all previous steps are incorporated into the performance.

Note: This chapter assumes some knowledge of the seven diatonic modes—Ionian, Dorian, Phrygian, Lydian, Mixolydian, Aeolian, and Locrian. If you don't know what the modes are, or you find the parts of The Tracking Page that mention modes confusing, then review the later chapters on Tetrachords (p. 187) and the Diatonic Modes (p. 198).

The Tracking Page — Lines

{[['1', 'Seconds'], ['2', 'Thirds'], ['3', 'Fourths'], ['4', 'Fifths'], ['5', 'Fourths'], ['6', 'Fifths'], ['7', 'Sixths'], ['8', 'Sixths'], ['9', 'Sevenths'], ['10', 'Sevenths'],].map(([line, content], i) => ( ))}

Line	Interval Content

The Six Tracking Protocols

Pick a single line from The Tracking Page and, while tracking on a visualized keyboard, perform the six steps, aiming to achieve a tempo of not less than 144 bpm. You will also need to pick a starting pitch for the first note, which can be any of the seven diatonic pitches—doh, re, mi, fa, sol, la, or si. The note you choose to start on will determine the line's mode and clef.

Step 1 — Speak Solfège Syllables (with Fill-In Notes)

Name each note in order by its solfège syllable, filling in the notes between adjacent notes when the interval is larger than a 2nd. If you are less than fluent at this step, improvise an exercise similar to the one written if the exercise contains 2nds, 3rds and 4ths, improvise using these same intervals, making sure to fill in the notes for intervals over a 2nd. *Note: Some students will be tempted to skip filling in adjacent note names for intervals larger than a 2nd, however, if you are to learn to track di-chords through pitch space (rather than name notes by rote), it is essential that you commit to this part of the protocol.*

Step 2 — Speak Secondary Di-Chord Numbers (then Gesture Names)

For each note in order, say the name, at a regular pulse, of the secondary di-chord number (the number of semitones between each pair of notes). Start with the number “0.” Then repeat the line but speaking the secondary di-chord gesture (open, closed, weak, strong) for each consecutive note. Notice any di-chords that prove problematic for you. Review the exact location of these secondary di-chords within the context of the diatonic scale. Improvise using the secondary di-chords included in the line. Note that the numbers 7, 11 and 0 are the only numbers used in the protocols that have two syllables, making them more challenging to employ at fast speeds. To facilitate speaking and singing, the numbers 7 and 11 may be abbreviated to the single syllables “sev” and “lev.” Students have preferred keeping both syllables in the word “ze-ro,” perhaps because the combination of these two syllables, the first incisive and the other sonorous, emphasizes the definitive, solid perception of the tonic.

Step 3 — Speak Primary Di-Chord Numbers

For each note in order, name, at a regular pulse, the primary di-chord number (the number of semitones between each note and the tonic, which is the first note of the line). The first note and the tonic are designated as “0.” Remember to keep tracking on a visualized keyboard!

Observe when you cannot easily name a note's primary di-chord number. Thoroughly review the troublesome primary di-chord in the mode corresponding to the one having as its tonic the first note in the line chosen for the day. Improvise naming the primary di-chord in the mode chosen, preferably using as well the secondary di-chords included in the line chosen.

Step 4 — Sing Primary Di-Chord Numbers

Sing the primary di-chord number for each note in order, while playing the tonic pitch (the first note of the line) as a drone. The tonic (first and last note) is sung as “0.” Observe whenever you cannot easily sing the correct primary di-chord and practice those sections by filling in adjacent pitches for intervals larger than a 2nd. Attend to the intonation of each note and sing as though you really mean it—with gusto and forthrightness, not in a weak or tentative manner.

Remember to visualize the Di-Chord Pictograph (p. 110) before you sing a pitch to ensure that you have a clear idea of the sound properties of the di-chords. Improvise by singing in the mode you are working in, singing each pitch according to its primary di-chord name until you feel fluent and can achieve a tempo of not less than 144 bpm for each pitch in the row.

Step 5A — Sing Secondary Di-Chord Numbers

For each note in order, while playing the tonic (the first note) on the piano as a drone, sing the secondary di-chord number at a regular pulse. The first note is named “0” when sung. Remember to visualize the Di-Chord Pictograph and musical keyboard at all times. Improvise by singing each pitch according to its secondary di-chord name in the selected mode while playing the tonic drone.

Step 5B — Sing Secondary Di-Chord Gestures

Starting with the number “0” on the first note of the line, sing the gesture that accompanies each secondary di-chord number. Incorporate the character of the gesture into your singing.

Step 6 — Sing Solfège Syllables (Full Integration)

For each note in order, play the tonic drone while singing its solfège syllable at a regular pulse. Like in step 1, for intervals larger than a 2nd, sing the notes “in between” adjacent notes. By now, this step is probably quite easy; if it is not, you may need to review some or all of the preceding steps. Improvise by singing the syllables of the mode with the tonic drone. Remember to maintain your awareness of the primary and secondary di-chord properties for each subsequent note.

The last step, singing solfège, brings us full circle from our first step, speaking solfège. With the knowledge gained by examining and performing the line in the different steps of the protocol, we now have access to a greater depth and complexity of musical meaning than we did at the beginning of the process.

The Six Tracking Protocols: Summary

Pick a single line from The Tracking Page and, while tracking on a visualized keyboard, perform the six steps, aiming to achieve a tempo of not less than 144 bpm.

1. Speak the solfège name of each note, filling in adjacent notes for intervals larger than a 2nd.
2. Speak a) the secondary di-chord name and b) the secondary di-chord gesture for each consecutive note.
3. Speak the primary di-chord name for each consecutive note.

4. Sing the primary di-chord name for each consecutive note, while playing a tonic drone at the keyboard.
5. Sing the secondary di-chord name for each consecutive note, while playing a tonic drone at the keyboard.
6. Sing the solfège name of each note, while playing a tonic drone at the keyboard.

Modes and Clefs on the Tracking Page

The Tracking Page does not include clefs. This means that there is nothing to indicate what names you should call any of the notes on the page! Depending on the clef you choose for a line, the line can start on any one of the seven diatonic pitches—doh, re, mi, fa, sol, la, or si.

When you hear and sing the line, you will perceive the first note as the tonic pitch. Therefore, the first note of each line determines the diatonic mode of the line. If the first note of the line is doh, the line is in the Ionian mode; if the first note is re, the line is in the Dorian mode; if the first note is mi, the line is in the Phrygian mode, etc. For more information on the diatonic modes, see chapter 19, “The Diatonic Modes.”

These two variables—the clef and the mode—are dependent on each other. When starting a line, you or your teacher will choose either a clef or a mode for the line that day. Choosing a clef will determine the mode, while choosing a mode will determine the clef.

Reading by Di-Chord Versus Reading by Rote

For each of the steps of the protocol, always be clearly visualizing the keyboard and tracking on an imagined keyboard with your relaxed right index finger. Although this may be challenging at first, it is an essential step in making the transition from reading music by rote to reading music by di-chord.

When reading music by rote, we read individual pitches. This gives us only the information necessary to correctly “push the right buttons” on our instruments. This is like being able to read and pronounce words of a foreign language while not understanding them. A speaker might

pronounce every word on the page with complete accuracy, but, if the speaker does not understand the meaning of the words, his speech will sound strange to the native speaker, perhaps sounding flat or conveying an affect mismatched from the expressive content of the text.

When reading music by di-chord, we get information about which pitches to play, but more importantly, we are directly accessing “what happens between the notes,” where expression, affect, and meaning are found. With the knowledge and understanding of the properties of each of the 11 di-chords, reading music by di-chord gives an immediate understanding of the range of expression suggested by the notes written on the page. As when we read a language in which we are fluent, we have immediate access to the meaning of what we are reading. We also have the capability to manipulate the sounds we are producing in appropriate ways—that is, in ways that are congruent with the meaning that the notes on the page express—even if we are reading something for the first time.

Protocol Example: Line 1, Starting on FA

In this walk-through example, we will be analyzing and singing Line 1 of The Tracking Page starting on fa.

Mode and Clef: We are starting on the note fa, and the first note of the line is located in the bottom space of the staff, which is fa only in the treble clef; therefore, we know that we must be reading in the treble clef. As you perform each step of the protocol, imagine seeing the appropriate clef at the beginning of the line at all times.

Step 1 — Speaking Solfège Syllables: Speak the name of the solfège syllables of the notes in a brisk, even pace, at a minimum tempo of 60 bpm but aiming to achieve 144 bpm. Fill in the solfège syllables between the written notes; the written notes in the line should be spoken one per beat, regardless of the size of the di-chord. For Line 1 in the Lydian mode, we have no need to “fill in” any solfège syllables because all of the intervals in Line 1 are 2nds. Therefore, speak the solfège syllable of each note, one per beat.

For intervals greater than a 2nd, we will always fill in the diatonic notes between the two pitches with solfège syllables. To do this, you must still name each of the notes on the page at the rate of one per beat, meaning that when the interval between notes is larger than a 2nd, you must speak the solfège syllables that fall between the two notes in a faster rhythm.

Interval Rhythm Table

{[['2nd', 'quarter notes'], ['3rd', '8th notes'], ['4th', '8th note triplets'], ['5th', '16th notes'], ['6th', '16th note quintuplets'], ['7th', '16th note sextuples'],].map(([interval, rhythm], i) => ( ))}

Interval Type	Rhythm

Step 2A: Speaking Secondary Di-Chord Numbers

Starting with the number “0” on the first note of the line, name each of the secondary di-chord numbers in a brisk, even tempo.

Secondary di-chord numbers describe the number of semitones between each pair of adjacent notes; the number you speak on any given note describes the number of semitones between that note and the note that preceded it.

It is crucial at this point that you are absolutely clear in your keyboard visualization and are tracking with your index finger. Especially in the earlier lines in more familiar clefs, you will be tempted to take shortcuts, bypassing the critical step of visualizing and relying on earlier rote training to perform certain of the steps on The Tracking Page. However, with focused intent and patience, this brain circuitry will be re-wired. As the intervals get larger further down in The Tracking Page, and you practice with unfamiliar modes and clefs, it will become harder and then impossible to use prior rote learning to perform the lines. Therefore, it is suggested that you prioritize keyboard visualization and tracking at each and every stage of The Tracking Page Protocol.

Step 2B: Speaking Secondary Di-Chord Gestures

Starting with the number “0” on the first note of the line, name the gesture (open, closed, weak, or strong) that accompanies each consecutive secondary di-chord number. For more information on the melodic gestures, review chapter 15.

Remember to visualize the clef you are using! The gesture name that you speak on any given note describes the gesture accompanying the di-chord formed by that note and the note that came immediately before.

Step 3: Speaking Primary Di-Chord Numbers

Starting with the number “0” on the first note of the line, name each of the primary di-chord numbers at a brisk, even tempo.

Primary di-chord numbers describe the number of semitones between each pitch and the perceived tonic, which, in this case, is always the first note of the line. The naming of primary di-chord numbers is similar to the naming of scale degrees in that the number remains consistent in any octave. When a note is lower than the first note of the line, the primary di-chord number will be the same as when it is above the first note. In other words, if the starting note is fa, every sol will be named as a [2], whether it is a 2nd above the starting pitch or a 7th below it; the sol will always be the second degree of the scale and thus, primary di-chord [2].

Familiarity with the mode in which you are performing is advantageous because the only numbers you will be speaking will be the numbers that fit the profile of that mode. When you first start working with The Tracking Page, it can be helpful to review the profile of primary di-chord numbers in each selected mode so that you can clearly visualize all seven options in a given mode (see chapter 19, “The Diatonic Modes”).

Each step in the protocol should integrate with your observations from previous steps and augment your awareness of the musical relationships in the line. When speaking primary di-chords, for example, maintain an awareness of the solfège syllables and the secondary di-chords from the previous step. As you speak primary di-chord number, notice the relationships between secondary and primary di-chord numbers.

Notice that addition applies when the pitches are going up, and subtraction applies when they are going down. When the pitches cross the tonic, this is still true; however, because there are 12 pitches in the octave, the addition and subtraction must be done in a base-12 mathematical system.

Thus far, you have spoken the solfège syllables, the secondary di-chords, and the primary di-chords of the line. The next three steps cover the same information but are sung rather than spoken.

To sing through the next three steps, you will need a tonic drone. You can use an electronic tuner to provide a constant pitch, or you can play a drone on a piano. If you are using a piano, you may want to play the tonic in multiple octaves. You can choose to play the tonic on each beat or just a few times per line. Use the piano's sustain pedal to sustain the sound throughout the line. The tonic drone will provide a reference for your intonation as well as allowing you to hear the interference pulsation, fundamental/octave factor, and harmonicity of the primary di-chords as you sing them.

Step 4: Singing Primary Di-Chord Numbers

Sing each note while naming the primary di-chords. Maintain an awareness of the properties of the di-chords you are singing by visualizing the pictographs of the primary di-chords.

Step 5A: Singing Secondary Di-Chord Numbers

Sing each note while naming the secondary di-chord. Maintain an awareness of the properties of the di-chords you are singing by visualizing the di-chord pictographs of the secondary di-chords you are naming as you sing.

Step 5B: Singing Secondary Di-Chord Gestures

Starting with the number “0” on the first note of the line, sing the gesture that accompanies each secondary di-chord number. Incorporate the character of the gesture into your singing.

Step 6: Singing Solfège Syllables

Sing each note while naming the solfège syllable.

The last step, singing solfège, brings us full circle from our first step, speaking solfège. With the knowledge gained by examining and performing the line in the different steps of the protocol, we now have access to a greater depth and complexity of musical meaning than we did at the beginning of the process. All of this information—the pitches, the relationships between consecutive pitches, and the relationships between the pitches and the perceived tonic—is present and accessible in any melodic context; therefore, you can approach any melodic line with the steps outlined in this chapter.

Exercises: Understanding and Using The Tracking Page

Exercise 16-1: Tracking Page Analysis

In the following excerpts of lines from The Tracking Page:

1. answer the questions about the clef, mode, and/or starting pitch of the line;
2. draw in the clef of the excerpt;
3. write in the secondary di-chord numbers in the spaces directly below the staff;
4. draw in the melodic gestures using the four types of arrows; and,
5. write in the primary di-chord numbers in the spaces provided underneath the secondary di-chord numbers.

Example: This excerpt starts on the note mi. What clef is it in? treble. What mode is it in? Phrygian. SDN: 1 4 2 2 4 1 2 1 2 2 1 3 4 1. PDN: 1 7 5 1 7 10 8 7 5 7 8 5 1 9.

1. The following excerpt, from line 2, is in the bass clef. What note does it start on? What mode is it in?

2. The following excerpt, from line 2, starts on the note fa. Notice that the melodic line goes below the tonic.

3. The following excerpt, from line 3, is in the soprano clef. What note does it start on? What mode is it in?

4. The following excerpt, identical to the previous, starts on the note re. What clef is it in? What mode is it in?

Exercise 16-2: Performing Analyzed Excerpts

Referring back to The Tracking Page, find the corresponding portion of the line from each of the four excerpts that you analyzed in Exercise 16-1 and perform the six-step protocol for each excerpt. For the purposes of this exercise, practice only the excerpts you have analyzed, not the entire lines.

After becoming familiar with the protocol in this way, it will be natural to move on to the next step of performing the full lines without stopping. This will help you become fluent at tracking and naming in real time.

At first, performing all of the steps in one session can be challenging. However, as you become familiar with the protocol and increasingly fluent in tracking, performing a full line of The Tracking Page with all the steps of the protocol will take only 5-7 minutes.

Be patient, but also challenge yourself to keep a steady pace and to perform without hesitation or error. Remember to avoid the trap of going slower in hopes of success—this only encourages more errors. Taking more time between notes creates a vacuum, allowing room for error (see chapter 2, “The Three Causes of Error”). The key to success with The Tracking Page is a vivid imagination of the keyboard with the names of the notes written on the keys.

Exercise 16-3: Compose a Tracking Line

Using only 2nds and 3rds, compose a tracking line similar to the lines on The Tracking Page. Remember, do not add a clef, key signature, or time signature, and stay within the range of the staff—do not write notes that require ledger lines. Your line should be 28–32 notes long. Practice all six steps of the tracking protocol in each of the clefs with your new line.

Recording Your Progress

Regular practice with The Tracking Page will cultivate and improve musical aptitude across the board, particularly fluency in reading, transposing, and comprehending music in real time. With regular practice, you will only need to spend a few minutes each session focusing on tracking.

The following table will allow you to record your progress. Check the boxes when you complete a step in the protocol for a particular line in a particular mode. After having completed the table, you will have sung through all six steps of the protocol for each of the lines on The Tracking Page in each of the modes! Ideally, one practice session would include all six steps of the protocol for one line in one mode.

An excellent way of keeping consistency with this practice is to assign a mode to a day of the week:

- Monday — Aeolian
- Tuesday — Phrygian
- Wednesday — Locrian
- Thursday — Lydian
- Friday — Ionian
- Saturday — Mixolydian
- Sunday — Dorian

Progress Tracking Table

A table for recording progress through all six protocol steps for each of The Tracking Page lines (1–10) across all seven modes.

)){}))).map((, i) => ( ))}

Mode	Protocol

Ch.17 — Tri-Chords

Introduction

In this chapter, you will combine tracking and your knowledge of di-chords to understand tri-chord patterns—groups of three notes—and to fluently use these patterns like stencils to quickly form tri-chords over any note. This will lead to developing the ability to form tetrachords, or four-note groups, over any note, a skill that is essential to mastering not only the more familiar major and minor scales but all of the modes. Being able to visualize and calculate scale patterns is yet another essential tool for keeping ourselves musically oriented, not only within the dimension of pitch space but also within any given tonality.

Primary Di-Chord Numbers

In using numbers to refer to di-chords, a single number describes the number of semitones comprising a musical interval. However, now we need a way to use numbers to describe groups of three notes—tri-chords. When we hear tri-chords, or chords with any number of notes, our brains relate each of the upper notes in the chord to the lowest sounding note, called the fundamental. The relationship of each upper note to the fundamental seems to be more important to our perceptions than the relationship between the upper notes themselves. In essence, the brain notices the relationship between the highest and the lowest and between the middle and the lowest more vividly than it notices the relationship between the highest and the middle notes.

Therefore, when we name tri-chords using the number system, the numbers will refer to the primary di-chords formed by the fundamental note and each of the upper notes. Let's look at the chord doh-mi-sol:

Doh (the fundamental) and sol form a [7]; doh and mi form a [4]. Thus, we call this tri-chord a [4/7]. Notice that within this group of three notes there is also a [3] produced by the mi and sol; however, this relationship is a secondary di-chord and does not play the same kind of role in our perception of the chord as the other two relationships, and so is not used in the naming of this tri-chord.

Forming Tri-Chords with 2nds

Using only 2nds, or semitones and whole tones, we can form four different types of tri-chord. Our starting note will always count as one of the three notes. We can represent the starting note with a "0," since we have not traversed any distance yet. Then, we might go up a [2], a whole tone, landing on the second note of the tri-chord, and then up another [2] to land on the third note. We might call this pattern "0, [2], [2]." Note that this is an abstract pattern—we could apply it to any starting note. One tri-chord formed by this pattern would be "fa, sol, la." Another example would be "sib, doh, re." This pattern is using secondary di-chord numbers, not primary di-chord numbers, to describe a set of notes.

If we were to hear all three notes at once, "0, up a [2], up a [2]" does not describe how we are hearing that chord. Remember that in hearing two or more notes, our brains relate the upper note or notes to the lowest note in the group. When we are hearing fa, sol, and la played all at once, what we are actually hearing are multiple di-chords—the [2] formed by fa and sol, the [2] formed by sol and the la, and the [4] formed by fa and the la. The brain primarily notices the di-chord between each top note and the lowest note as most important. In our current example, this would be the fa to sol and the fa to la, although we also hear the di-chord from sol to la. Because of this, we will refer to this tri-chord as a [4/2]—from the top down, the la forms a [4] with the lowest note, and the sol forms a [2] with the lowest note.

Exercises: Playing and Spelling Tri-Chords

Exercise 17-1

Using only semitones [1] and whole tones [2], what are the different tri-chords that you can make? Fill in the blanks in the table to find all four possibilities:

Secondary Di-Chords	Tri-Chord Name
0, [2], [2]	[4/2]
0, [1], [1]	_____
_____	[3/1]
_____	_____

Exercise 17-2

The [2/1] tri-chord is formed by going up a semitone, or [1], and then going up another semitone. Here are two examples of [2/1] tri-chords.

Sitting at the piano, find and play every possible manifestation of the [2/1] tri-chord. To play this type of tri-chord, use the index, middle, and ring fingers of your right hand, one finger per note. You can start on any note; once you have played a [2/1], move each of your fingers up by one semitone so that you are forming the [2/1] tri-chord that is transposed exactly a semitone higher than the first one you played. Keep moving up chromatically until you return to the starting note, now one octave higher. Listen to how crunchy this tri-chord is!

Exercise 17-3

This exercise is the same as the previous one but with an added step. After you form and play each tri-chord, speak out loud the pattern of black and white notes. For example, if you started on the note re, the exercise would start off like this:

Play tri-chord. “White, black, white.”
Play tri-chord up a semitone. “Black, white, white.”
Play tri-chord up another semitone. “White, white, black.”
Etc.

Exercise 17-4

The [4/2] is formed by going up a whole tone, or [2], and then going up another whole tone. Here are two examples of [4/2] tri-chords.

Repeat the last two exercises but now using the [4/2] tri-chord. Notice how open and expansive this tri-chord feels! Compare it to the crunchy [2/1], which contains three dissonant di-chords, two of which are non-harmonic. The [4/2] contains two dissonant and one modal di-chord, and all three di-chords are harmonic, giving the tri-chord a fluffier quality, more like a biscuit or cake.

Exercise 17-5

This exercise will be similar to the three previous exercises but with an added step. After forming and playing each tri-chord, speak out loud the names of each of the notes from the bottom up.

In some cases, this will actually be tricky because to be spelled correctly, each note in these tri-chords must have a specific letter name. In making these tri-chords, we are moving up a 2nd, and then up a 2nd again. In the case of the [4/2], we are moving up a major 2nd, and then up a major 2nd again. Therefore, the [4/2] tri-chord beginning on the note mi is correctly spelled only as “mi, fax, solx.”

Spelling this tri-chord as “mi, sol#, sol” would be incorrect because sol# to sol is not a 2nd!

So, when naming the notes that constitute tri-chords, each note should be named with a different syllable, and the syllables should be consecutive. This means that you will occasionally need to use “double flat” (bb) and “double sharp” (x) names. For example, starting on the note reb, the [4/2] tri-chord would be spelled “reb, mib, fax.” Remember, double flat indicates that a note is lowered two semitones from its white-key note, and double sharp indicates that it is raised two semitones from its white-key note. For the keys that have two names, including mi/fax, fa/mix, si/dohb, and doh/six, practice naming the tri-chord starting on each of the two names.

Exercise 17-6

For each of the starting notes given below, form the tri-chord above it using keyboard visualization. Then, write in the names of the members of the tri-chord. Note that each column represents the primary di-chord numbers, which describe how a pitch relates to the bottom or fundamental note.

))}

Starting Note	[0]	[2]	[4]

Exercise 17-7

Sitting at the piano, find and play every possible manifestation of the [3/1] Phrygian tri-chord. To play this type of tri-chord, use the index, middle, and ring fingers of your right hand, one finger per note. You can start on any note; once you have played a [3/1], move each of your fingers up

by one semitone so that you are forming the [3/1] tri-chord that is transposed exactly one semitone higher than the first tri-chord you played. Keep moving up like this until you return to the starting note, now one octave higher.

Exercise 17-8

In the following piano diagrams, the fundamental pitch is colored gray. Using a pencil, shade in the two notes above the fundamental that create a [3/1] tri-chord. Then, in the spaces below each image, spell the tri-chord using English letter names. Notice that there are often multiple possibilities for spelling, depending on the note name given to the fundamental. If one of the spellings seems more common than the other, circle the spelling that would be most commonly found. The first two questions have been completed for you as examples. Remember that you may need to use double flats or double sharps.

1. (Fundamental: C, D, E♭) — circled spelling: C, D, E♭ — other spelling: B#, C#, D#
2. (Fundamental: C#, D, E) — circled spelling: C#, D, E — other spelling: D♭, E♭♭, F♭
3. D — [answer space]
4. D♭ — E♭ [answer space]
5. E — F♭ [answer space]
6. F — E# [answer space]
7. F# — G♭ [answer space]
8. G — [answer space]
9. G# — A♭ [answer space]
10. A — [answer space]
11. A# — B♭ [answer space]
12. B — C♭ [answer space]

Exercise 17-9

Sitting at the piano, find and play every possible manifestation of the [3/1] Phrygian tri-chord. To play this type of tri-chord, use the index, middle, and ring fingers of your right hand, one finger per note. You can start on any note; once you have played a [3/1], move each of your fingers up

by one semitone so that you are forming the [3/1] tri-chord that is transposed exactly one semitone higher than the first tri-chord you played. Keep moving up like this until you return to the starting note, now one octave higher.

Exercise 17-10

In the piano diagrams that follow, the fundamental pitch is colored gray. Using a pencil, shade in the two notes above the fundamental that create a [3/1] tri-chord. Then, in the space below each diagram, spell the tri-chord. Notice that there are often multiple possibilities for spelling, depending on the note name given to the fundamental. If one of the spellings seems more common than the other, circle the spelling that would be most commonly found. The first two questions have been completed for you. Remember that you may need to use double sharps or double flats.

1. (Fundamental: C, D♭, E♭) — circled spelling: C, D♭, E♭ — other spelling: B#, C#, D#
2. (Fundamental: C#, D, E) — circled spelling: C#, D, E — other spelling: D♭, E♭♭, F♭
3. D — [answer space]
4. D# — E♭ [answer space]
5. E — F♭ [answer space]
6. F — E# [answer space]
7. F# — G♭ [answer space]
8. G — [answer space]
9. G# — A♭ [answer space]
10. A — [answer space]
11. A# — B♭ [answer space]
12. B — C♭ [answer space]

Continuation: The Ionian Scale

In summary, mastering the seven modes requires mastering the four diatonic tri-chords. The Ionian scale is built from these four tri-chord types.

Ch.18 — Tetrachord Formation: Ionian, Dorian, Phrygian, and Lydian

The Four Tetrachords

Tetrachords are groups of four notes that, from the lowest note to the highest note in the tetrachord, span a 4th. There are four diatonic tetrachords: Ionian, Dorian, Phrygian, and Lydian.

In subsequent chapters, you will learn to simultaneously form and visualize all seven notes of any heptachord, but first, in this chapter, you must focus on mastering tetrachords, which are the building blocks of heptachords. Each of the seven Western modes can be formed with a combination of one or two of the four diatonic tetrachords, and by learning to think fluently in the patterns of these four tetrachords, you will gain access to all seven modes.

The Ionian Tetrachord

First, consider the C major scale. Place your left-hand pinky on the tonic, doh, and play the notes doh, re, mi, and fa — this is an Ionian tetrachord. Next, place your right-hand index finger on the note sol. Using the index, middle, ring, and pinky fingers of the right hand, play the notes sol, la, ti, and doh — another Ionian tetrachord. You have just formed a major scale, and if you start on any of the 12 pitches and follow the same sequence, you will have formed the major scale that begins on the lowest note in your formation. Therefore, one way to describe the major scale is to say that it consists of two Ionian tetrachords separated by a [2].

When you formed the major scale with two Ionian tetrachords, did the tetrachords look similar to each other? You may have noticed that each tetrachord was formed using the same pattern of secondary di-chords. To find the secondary di-chord pattern for the Ionian tetrachord, use the first four notes of the doh major scale:

doh	re	mi	fa
0	[2]	[2]	[1]

So, to form the Ionian tetrachord above any given note, you need to track “up a [2], up a [2], up a [1].” This can be simplified to [0, 2, 2, 1]. You can then deduce that the primary di-chord pattern for the Ionian tetrachord is [0, 2, 4, 5]. By practicing this formation and exploring the visual patterns of black and white keys, forming the Ionian tetrachord will soon feel easy and immediate, and you will be able to visualize and form the tetrachord as a single unit rather than using the intermediate step of spelling it out through tracking.

The Dorian Tetrachord

To form a Dorian tetrachord, place your left-hand pinky on the note re, and play the notes re, mi, fa, and sol with all four fingers of your left hand. You can deduce from these four notes that the secondary di-chord pattern for the Dorian tetrachord is [0, 2, 1, 2] and the primary di-chord pattern is [0, 2, 3, 5].

The Phrygian Tetrachord

To form a Phrygian tetrachord, place your left-hand pinky on the note mi, and play the notes mi, fa, sol, and la with all four fingers of your left hand. You can deduce from these four notes that the secondary di-chord pattern for the Phrygian tetrachord is [0, 1, 2, 2] and the primary di-chord pattern is [0, 1, 3, 5].

The Lydian Tetrachord

To form a Lydian tetrachord, place your left-hand pinky on the note fa, and play the notes fa, sol, la, and si with all four fingers of your left hand. You can deduce from these four notes that the secondary di-chord pattern for the Lydian tetrachord is [0, 2, 2, 2] and the primary di-chord pattern is [0, 2, 4, 6].

Exercises: Ionian Tetrachord Formation

Exercise 18-1: Ionian Tetrachord Exploration

1. Sitting at the piano, find and play every possible manifestation of the Ionian tetrachord. To play tetrachords, use the index, middle, ring, and pinky fingers of your right hand, one finger per note. You can start on any note; once you have played an Ionian tetrachord, move each of your fingers up by one semitone so that you are forming the tetrachord that is exactly one semitone higher than the first one you played. If you have moved each finger up only one semitone, the new tetrachord will maintain the “0, [2], [2], [1]” pattern. Keep moving up chromatically like this until you return to your starting note, now one octave higher.

2. Repeat step 1, but after you form and play each tetrachord, speak aloud the pattern of black and white notes. For example, the tetrachord formed on re would be “white, white, black, white.”

3. Repeat step 1, but after you form and play each tetrachord, speak aloud the solfege names of each of the notes from the bottom up. Each note of the tetrachord should have a unique name, and the syllables should be consecutive in order.

Exercise 18-2: Naming Ionian Tetrachords

1. Write out the Ionian tetrachord using primary di-chord numbers.

2. Write out the Ionian tetrachord using secondary di-chord numbers.

3. Above each of the 21 note classes given in the following table, form an Ionian tetrachord using keyboard visualization and the pattern of secondary di-chords. Then write in the letter names of the members of the tetrachord in ascending order.

))}

Ionian Pattern: [0] | [2] | [2] | [1]			
Starting Note	**[2]**	**[2]**	**[1]**

Exercise 18-3: Fill in the Blanks

In the following table, given a note other than the first note and its primary di-chord, calculate the rest of the Ionian tetrachord. Use keyboard visualization to form the tetrachord in your right hand and then determine the appropriate note names.

{[['', '', 'Ab', ''], ['', '', '', 'F'], ['', 'A', '', ''], ['', 'Fa', '', ''], ['', '', 'C', ''], ['', '', 'B', ''], ['', '', 'A', ''], ['', '', '', 'Eb'], ['', '', '', 'Aa'], ['', '', '', 'Fa'],].map((row, i) => ( ))}))}

0	[2]	[4]	[5]

Exercise 18-4: Correcting Note Names

The following Ionian tetrachords contain errors in the note names — the patterns are correct, but a note has been called by the wrong name. Cross out the incorrect name and write the correct name next to it. Note that you should not be changing the pitch itself but only the name by which that pitch is called.

{[['A','B','Db','D'], ['Fa','Ab','Aa','B'], ['Ab','Bb','C','Ca'], ['Gb','Ab','Aa','B'],].map((row, i) => ( ))}))}

Note 1	Note 2	Note 3	Note 4

Exercises: Dorian, Phrygian, and Lydian Tetrachord Formation

Exercise 18-5: Modelling the Dorian, Phrygian, and Lydian Tetrachords

Models for the Dorian, Phrygian, and Lydian tetrachords can be found on the white keys, starting on D, E, and F, respectively — fill out the following tables to find the primary and secondary di-chord numbers for these types of tetrachords.

))}

DORIAN			
[0]	___	___	___
[0]	___	___	___

))}

PHRYGIAN			
[0]	___	___	___

PHRYGIAN			
[0]	___	___	___

))}

LYDIAN			
[0]	___	___	___
[0]	___	___	___

Exercise 18-6: Exploring the Dorian, Phrygian, and Lydian Tetrachords, Part I

1. Sitting at the piano, find and play every possible manifestation of the Dorian tetrachord. To play the tetrachords, use the index, middle, ring, and pinky fingers of your right hand, one finger per note. You can start on any note.

2. Once you have played your first Dorian tetrachord, move each of your fingers up by one semitone, so that you are forming the tetrachord that is transposed exactly one semitone higher than the previous one. If you do this correctly, the new tetrachord should maintain the [0, 2, 1, 2] secondary di-chord pattern.

3. Keep moving up chromatically until you return to the starting pitch, now one octave higher.

4. Repeat the previous three steps for the Phrygian and Lydian tetrachords, observing the patterns of black and white keys for each type of tetrachord.

Exercise 18-7: Exploring the Dorian, Phrygian, and Lydian Tetrachords, Part II

This is the same as the previous exercise but with an added step. After you form and play each tetrachord, speak aloud the solfege names of each of the notes from the lowest pitch up. Remember that each note of the tetrachord should be named with a unique solfege syllable, and the syllables should be consecutive (e.g., doh re mi fa; sol la si doh, etc.). Repeat this exercise for the Dorian, Phrygian, and Lydian tetrachords.

Exercise 18-8: Spelling Tetrachords

In the first row of the following tables, write the primary di-chords of the tetrachord and then complete the rest of the tables using English letter names. Complete this section of the workbook away from the piano, relying solely on your keyboard visualization and tracking skills. Use your index, middle, ring, and pinky fingers to form the tetrachords on your imaginary piano.

The tables use each of the 21 note classes as starting notes. Watch out for some of the trickier spellings, and remember that whether you start with C, Ca, or Cb, the next three notes of the tetrachord must be some kind of D, followed by some kind of E, followed by some kind of F. Whether the D, E, and F are natural, flat, sharp, double flat, or double sharp depends on what type of C you began with and what tetrachord template you are using (Dorian, Phrygian, or Lydian).

TETRACHORD Starting Note Note 2 Note 3 Note 4))}
))}

Ch.19 — The Diatonic Modes

Introduction

Modes continue to be a central resource for musicians in both popular and “serious” music. Which elements within each mode, if any, might be responsible for associations with specified emotions, moods, or affects? Are these associations purely subjective, or might there be an objective means of understanding how modes elicit feelings and sentiments in our minds? A thorough examination of the di-chords contained in each mode helps us better understand the correspondence between objective fact and the emotional responses so often associated with the diatonic modes.

Modes in the Diatonic Ordering

There are seven diatonic Modes: Ionian, Dorian, Phrygian, Lydian, Mixolydian, Aeolian, and Locrian.

Each mode is composed of seven diatonic notes that conform to a unique pattern of semitones and whole tones contained in the octave. By starting on each white-key note and moving stepwise up the octave, you can see that different patterns of semitones and whole tones occur in each mode. For example, when using only white-key notes, the Ionian mode begins on doh and ends on the doh an octave higher; however, the Dorian mode, if you use white keys only, begins on re and ends on the re an octave above and has the secondary di-chord pattern of [0, 2, 1, 2, 2, 2, 1, 2].

It is helpful when first learning about the modes to study each mode as it occurs naturally on the white keys of the piano. In the following table, the seven white-key notes are listed along with their corresponding modes; that is, with the mode that starts and ends on that note when only white keys are used.

Tonic Pitch	Mode Name
C/doh	Ionian
D/re	Dorian

Tonic Pitch	Mode Name
E/mi	Phrygian
F/fa	Lydian
G/sol	Mixolydian
A/la	Aeolian
B/si	Locrian

You will need to memorize the seven mode names and know what diatonic pitch corresponds with each mode.

The Tonocentric Model

In the context of a key or a mode, the primary di-chords (di-chords in relation to the tonic pitch) combine to give each scale degree a tendency to refer up or down to the nearest tonic, similar to how the fundamental/octave factor causes the upper note of a di-chord to refer down or up.

The pattern of scale degree tendencies resembles a magnetic field in which the tonic is the attractor, in the center: *5 6 7 1 2 3 4*. I refer to this model as the Tonocentric Model. The term tonocentric means that the reference tone, or tonic, is in the center, surrounded on either side by radiating dissonant, modal, and perfect heptachord elements.

Using this model of scale degree tendencies, each degree refers up or down to the nearest tonic. Degrees 2, 3, and 4 refer down to the nearest tonic and will be represented by the sign (+) because they rest above the nearest tonic; degrees 5, 6, and 7 refer up to the nearest tonic and will be represented by the sign (−) because they rest below the nearest tonic:

1	2	3	4	5	6	7	1
T	+D	+M	+P	−P	−M	−D	T

Notice that each mode or heptachord will potentially have two dissonant members, two modal members, and two perfect members.

Because dissonant di-chords sound active, on the move, anxious, dynamic, and “gut”-oriented, degrees 2 and 7 of any mode have this underlying nature, which is why they sound unresolved and wanting to move towards the tonic.

Because modal di-chords sound mellifluous, undulating, fluid, emotional, and generally “heart” oriented, degrees 3 and 6 of any mode will have this basic nature.

Perfect di-chords sound stoic, solid, balanced, controlled, somewhat cold, mentally calculating, and generally “head” oriented, so degrees 4 and 5 of any mode will have this basic nature.

Summary of Degree Tendencies

- Degree 2 tends down and is dissonant.
- Degree 3 tends down and is modal.
- Degree 4 tends down and is perfect.
- Degree 5 tends up and is perfect.
- Degree 6 tends up and is modal.
- Degree 7 tends up and is dissonant.

Though it is challenging to do at first, it is important to associate the abstract words—dissonant, modal, and perfect—with their affects. Knowing this, you can tell the general character of each degree in any mode, like recognizing the players and their positions in a football game. To know the exact name of the players, you must look and hear more deeply.

Tetrachordal Construction of Modes

When listening to modal music, the mind seems naturally inclined towards grouping the members of a mode into two tetrachords, one consisting of scale degrees 1, 2, 3, and 4, and the other consisting of degrees 5, 6, 7, and 1. For the sake of simplicity, we will call these two tetrachords Tetrachord I and Tetrachord II. The difference between the two tetrachords is that Tetrachord I consists of the tonic and three “downward tending” degrees, and Tetrachord II consists of the tonic and three “upward tending” degrees.

The pulsation of each scale degree progresses through dissonant (D), modal (M), and perfect (P), radiating outward from the tonic (T).

Mode	Tetrachord I (1–4)	Tetrachord II (5–1)	Type
Ionian	Ionian [2,2,1]	Ionian [2,2,1]	Pure
Dorian	Dorian [2,1,2]	Dorian [2,1,2]	Pure
Phrygian	Phrygian [1,2,2]	Phrygian [1,2,2]	Pure
Lydian	Lydian [2,2,2]	Ionian [2,2,1]	Mixed
Mixolydian	Ionian [2,2,1]	Dorian [2,1,2]	Mixed
Aeolian	Dorian [2,1,2]	Phrygian [1,2,2]	Mixed
Locrian	Phrygian [1,2,2]	Lydian [2,2,2]	Mixed

Notice that the first three modes—Ionian, Dorian, Phrygian—are made by combining two identical tetrachords; we will say that these are “pure” modes. The other four modes—Lydian, Mixolydian, Aeolian, and Locrian—are made by combining two different tetrachords; we will say that these are “mixed” modes.

Modes in the Ploger Ordering

My ordering of the modes begins on fa and proceeds in fifths through fa–doh–sol–re–la–mi–ri, just like with the Pythagorean ordering of fifths.

Mode	1	2	3	4	5	6	7
Lydian	[0]	[2]	[4]	[6]	[7]	[9]	[11]
Ionian	[0]	[2]	[4]	[5]	[7]	[9]	[11]
Mixolydian	[0]	[2]	[4]	[5]	[7]	[9]	[10]
Dorian	[0]	[2]	[3]	[5]	[7]	[9]	[10]
Aeolian	[0]	[2]	[3]	[5]	[7]	[8]	[10]
Phrygian	[0]	[1]	[3]	[5]	[7]	[8]	[10]

Mode	1	2	3	4	5	6	7
Locrian	[0]	[1]	[3]	[5]	[6]	[8]	[10]

With this approach, many more of the elegant patterns and symmetries of the modes become apparent. For example, observe that the primary di-chords of neighboring modes differ in only one scale degree! Lydian and Ionian differ only in their 4th degree; Ionian and Mixolydian differ only in their 7th degree; and so on.

This ordering is, I maintain, the most natural ordering of the modes because it reveals the degrees of similarity and difference—modes nearest to one another share the most primary di-chords, and those farthest share the fewest. In other words, the farther apart two modes are from one another, the more dissimilar they are in their primary di-chord composition. Therefore, Lydian and Locrian are the most dissimilar, sharing only the primary di-chord [6].

Further, because of the primary di-chords that they contain, the first three modes in the Ploger ordering—Lydian, Ionian, and Mixolydian—are of a different sonic nature than the final three—Aeolian, Phrygian, and Locrian. The Lydian, Ionian, and Mixolydian contain the di-chords [2] (major 2nd), [4] (major 3rd), and [9] (major 6th) which cause these modes to sound generally more open and “major.” By contrast, the Aeolian, Phrygian, and Locrian modes contain the di-chords [3] (minor 3rd), and [8] (minor 6th), and [10] (minor 7th), causing these modes to sound more contracted, tense, and “minor.”

The Dorian mode, in this ordering, rests exactly in the middle and acts as a type of musical tipping-point, sharing aspects of both the open/major modes and the closed/minor modes, making the Dorian the most balanced mode in this regard.

When you look at the modes, and music in general, in the Ploger or Pythagorean ordering it can seem like there is no end to the meaningful patterns there for you to see. For a more extensive exploration of these patterns see my article, *Music’s DNA: The Perfect Fifth* (Ploger 2011).

Eight Rules That Govern Aural Perception of the Modes

Rule 1

Generally, the first heard pitch in a modal melody acts to the ear/mind like the subject of a sentence. The ear seems to grasp the first heard pitch, holding it in mind as a reference pitch, such that a complete musical thought would end by returning to that pitch. Thus, in modal theory, the first note is generally also the same as the last one and is known as the final.

Rule 2

To aurally identify any mode, all seven of the mode's notes must be present. If one note is missing, the mode can have two possible identities because each mode shares six notes with at least one other mode.

Rule 3

The ear/mind most strongly perceives the di-chord formed between the tonic and each of the other six non-tonic notes in the mode. We refer to the di-chords formed between each of the six non-tonic notes and the tonic as primary di-chords. The six primary di-chords in any mode are largely responsible for its general character.

Rule 4

All di-chords formed between non-tonic pitches of a mode, while not insignificant, matter far less to our perceptions than the primary di-chords. Because of this, we refer to the di-chords formed between non-tonic members of a mode as a secondary di-chord. (Our minds probably prefer to attend to primary rather than secondary di-chords because of its desire for efficiency and order—while there are 42 secondary di-chords in the diatonic scale, there are only six primary ones.)

Rule 5

Of the six primary di-chords in each of the seven modes, two are dissonant, two are modal, and two are perfect. Scale degrees 2 and 7 are dissonant; 3 and 6 are modal; and, 4 and 5 are perfect, which creates a pattern radiating outward from the tonic.

5	6	7	1	2	3	4
Perfect	Modal	Dissonant	Tonic	Dissonant	Modal	Perfect

Rule 6

Each of the six non-tonic members of any mode is no more than a 4th from the tonic pitch class. The mind relates each non-tonic note to the closest pitch class manifestation of the tonic. This generates a pattern of degree tendencies in which degrees 2, 3, and 4 refer down, while 5, 6, and 7 refer up to the nearest tonic.

Rule 7

The harmonicity of each primary di-chord of a mode has a profound effect on the character of the mode, which helps us distinguish one mode from another by eye, hand, and ear. The following table shows the harmonicity factor for each scale degree in the seven diatonic modes.

Mode	2	3	4	5	6	7	Harmonic	Non-Harmonic
Lydian	H	H	NH	H	H	NH	4	2
Ionian	H	H	NH	H	H	NH	4	2
Mixolydian	H	H	NH	H	H	H	5	1
Dorian	H	NH	NH	H	H	H	4	2
Aeolian	H	NH	NH	H	NH	H	3	3
Phrygian	NH	NH	NH	H	NH	H	2	4
Locrian	NH	NH	NH	NH	NH	H	1	5

Several remarkable patterns emerge from this table. The modes may be ranked according to the number of harmonic di-chords as follows: Mixolydian has five harmonic di-chords: [2], [4], [7], [9], [10]; Ionian, Lydian, and Dorian have four harmonic di-chords; Aeolian has three; Phrygian has two; and Locrian has only one harmonic di-chord: [10].

Rule 8

The modes associated with the most positive affects are those with the most harmonic di-chords, while those modes associated with the most negative affects are those with the most non-harmonic di-chords. Observe that the most non-harmonic modes are those two in which the tonics are found on the far right side of the Pythagorean Collection (E and B).

Developing Fluency in the Modes

Becoming fluent in the modes will be particularly helpful for hearing and understanding a wide variety of music in real time. Most of the music you play is probably in the Ionian mode or Aeolian mode (the Ionian mode is the major scale, while the Aeolian mode is the natural minor scale). However, the other modes are frequently used in diverse musical genres, particularly in jazz, pop, and folk music. Many traditional folk songs from cultures across the globe use modes. As you familiarize yourself with the modes, you will start to recognize them in many places, from Christmas carols to TV theme songs!

Exercises

Exercise 19-1

List the Modes in the Diatonic Ordering. Complete the following table by listing the modes in their diatonic ordering, starting with the Ionian, and fill in the English letter names of the pitches of that mode in ascending order. The Ionian row (C D E _ _ _ _) is provided as an example. Complete the remaining rows for Dorian, Phrygian, Lydian, Mixolydian, Aeolian, and Locrian.

Exercise 19-2

Naming the Modes. Answer the following questions based on the diatonic modes (using only white keys on the piano). Complete this section from memory as a self-quiz. (1) Which mode starts on re? (2) Which mode starts on fa? (3) Which mode starts on si? (4) Which mode starts on doh? (5) Which mode starts on mi? (6) Which mode starts on sol? (7) Which mode starts on la?

Exercise 19-3

Secondary Di-Chord Patterns in the Seven Modes. In this exercise, you will work with the modes as they occur on the white keys of the piano. Notice that all seven modes contain the same set of secondary di-chords (two [1]s and five [2]s), but because each mode begins on a different pitch, the [1]s and [2]s fall between different scale degrees. Complete the table for all seven modes. The Ionian row is completed as an example: C D E F G A B C with secondary di-chords [0] [2] [2] [1] [2] [2] [2] [1].

Exercise 19-4

Listing the Modes in the Ploger Ordering. List the modes according to the Ploger Ordering and write out both the solfege syllables and the primary di-chord numbers that correspond with each degree of the mode. Remember that primary di-chord numbers refer to the di-chord formed by any note and the fundamental, or first scale degree. The Lydian has been completed as an example: fa sol la si doh re mi / [0] [2] [4] [6] [7] [9] [11]. Complete the remaining rows for Ionian, Mixolydian, Dorian, Aeolian, Phrygian, and Locrian.

Exercise 19-5

Scale Degrees and Interference Pulsation. In any of the diatonic modes, the interference pulsation of the scale degrees will be the same. Using the major scale (Ionian mode) as a model, fill in the table for degrees 1–7 showing the Primary Di-Chord and Interference Pulsation for each scale degree. Remember that the primary di-chord defines the number of semitones of a scale degree from the tonic beneath.

Exercise 19-6

Scale Degrees and Fundamental/Octave Factor. In any of the diatonic modes, certain scale degrees will always refer up, and certain scale degrees will always refer down. Complete the table showing the Fundamental/Octave Factor for each scale degree 1–7.

Exercise 19-7

Scale Degrees and Harmonicity. The harmonicity of each scale degree will depend on the type of scale. Complete the following table for the major scale (Ionian mode) showing, for each degree 1–7: the Primary Di-Chord Number, Interval Name, and Harmonicity. It is also important to know how far ‘looking-up’ scale degrees are below the octave manifestation of the tonic. Answer: (1) What is the di-chord from 7 up to 1? (2) What is the di-chord from 6 up to 1? (3) What is the di-chord from 5 up to 1?

Exercise 19-8

Ionian Scale Degree Properties Quiz. After you have explored and familiarized yourself with the properties of the scale degrees in the major scale, completing the following table should be a piece of cake! If you find yourself doing a lot of calculation, spend 5–10 minutes for 3–4 days in a row reviewing the properties of scale degrees. Complete the table for degrees 1–7 with columns: Primary Di-Chord, Common Interval Name, Interference Pulsation, Harmonicity, and F/O Factor.

Exercise 19-9

Diatonic Di-Chords in the Ionian Mode. Use your keyboard visualization skills to answer the following questions using the diatonic scale from doh to doh as a model. (1) How many major 2nds are in the major scale, and between which pairs of degrees? (2) How many minor 2nds, and between which degrees? (3) Total 2nds? (4) How many major 3rds? (5) How many minor 3rds? (6) Total 3rds? (7) How many perfect 4ths? (8) How many augmented 4ths? (9) Total 4ths? (10) How many diminished 5ths? (11) How many perfect 5ths? (12) Total 5ths? (13) How many minor 6ths? (14) How many major 6ths? (15) Total 6ths? (16) How many minor 7ths? (17) How many major 7ths? (18) Total 7ths?

Exercise 19-10

Mode Pictographs. The primary di-chords of the modes create unique characters and expressive possibilities for each mode. This can be illustrated using di-chord pictographs that show the type of interference pulsation with the outline of the number, the fundamental/octave factor with the number's shadow, and harmonicity with the color of the number (see p. 110 for the Di-Chord Pictograph). For each of the seven modes, draw a di-chord pictograph for each of the primary di-chords in that mode. For example, for the Lydian mode, draw the di-chord pictographs for [2], [4], [6], [7], [9], and [11]. Complete for all seven modes: Lydian, Ionian, Mixolydian, Dorian, Aeolian, Phrygian, Locrian.

Exercise 19-11

Comparing Modes, Part I. Use the information from the previous two exercises to answer the following questions. (1) Comparing Lydian and Ionian, which scale degree has a different primary di-chord number? (2) Comparing Ionian and Mixolydian? (3) Comparing Mixolydian and Dorian?

(4) Comparing Dorian and Aeolian? (5) Comparing Aeolian and Phrygian? (6) Comparing Phrygian and Locrian? (7) Comparing Locrian and Lydian, how many scale degrees have the same primary di-chord numbers (not counting 1)?

Exercise 19-12

Comparing Modes, Part II. (1) Which mode shares exactly six primary di-chords with the Lydian? (2) Which two modes share exactly six primary di-chords with the Ionian? (3) With the Mixolydian? (4) With the Dorian? (5) With the Aeolian? (6) With the Phrygian? (7) Which mode shares exactly six primary di-chords with the Locrian? (8) Can you find how the modes that share six primary di-chords are related? Is the pattern revealed more clearly with the diatonic ordering or the Ploger ordering?

Exercise 19-13

Review of Modes, Di-Chords, and Scale Degrees. For each question, circle the tonic notes of the modes that satisfy the condition (choose from F C G D A E B). (1) Modes with di-chord [2] as 2nd degree. (2) Modes with di-chord [1] as 2nd degree. (3) Modes with di-chord [10] as 7th degree. (4) Modes with di-chord [11] as 7th degree. (5) Modes with di-chord [3] as 3rd degree. (6) Modes with di-chord [4] as 3rd degree. (7) Modes with di-chord [9] as 6th degree. (8) Modes with di-chord [8] as 6th degree. (9) Modes with di-chord [5] as 4th degree. (10) Modes with di-chord [6] as 4th degree. (11) Modes with di-chord [7] as 5th degree. (12) Modes with di-chord [6] as 5th degree. (13) How would you describe the patterns that are revealed in this exercise?

Exercise 19-14

Tetrachords in the Modes, Part I. Recall the four diatonic tetrachords: Ionian, Dorian, Phrygian, and Lydian. Consider each mode as a combination of two tetrachords: Tetrachord I (scale degrees 1, 2, 3, 4 — tonic to subdominant) and Tetrachord II (scale degrees 5, 6, 7, 1 — dominant to tonic). Fill out the tables showing the primary di-chords and tetrachord type for each mode. The Ionian mode is completed as an example: Tetrachord I = [0][2][4][5] Ionian; Tetrachord II = [0][2][4][5] Ionian. Complete for Dorian, Phrygian, Lydian, Mixolydian, Aeolian, and Locrian.

Exercise 19-15

Tetrachords in the Modes, Part II. (1) Which modes contain the Lydian tetrachord? (2) Which modes contain the Ionian tetrachord? (3) Which modes contain the Dorian tetrachord? (4) Which modes contain the Phrygian tetrachord? (5) Which of the seven diatonic modes are pure modes—modes constructed using two identical tetrachords? (6) Which of the seven diatonic modes are mixed modes—modes constructed using two different tetrachords?

Ch.20 — Heptachord Formation

An Introduction to Heptachords

So far, you have used your visualization and tracking skills to form and spell four types of trichords {1/1}, {4/1}, {1/3}, and {3/1} and four types of tetrachords (Ionian, Dorian, Phrygian, and Lydian) above any given note. This chapter advances on this skill further so you can form and visually visualize not just four notes at a time, but seven—a complete heptachord.

With the ability to form and visualize groups of seven notes, not only can you imagine every major and minor scale, but each of the modes based on any tonic pitch. This makes complete orientation possible in any mode and any key. When you are oriented in a mode or key at any given moment, you are aware not only of each of its seven notes but also of the scale degree of each note and its relationship to the tonic note. This type of global awareness is essential for performing, improvising, and composing.

To form a seven-note heptachord, both hands are needed. There are two approaches to forming heptachords: the conjunct arrangement and the disjunct arrangement. Both arrangements involve the ring, middle, index, and pinky fingers of both hands, but not the thumbs.

Disjunct Arrangement

In the disjunct arrangement, the tetrachord beginning on the tonic note is formed with the left hand, and the tetrachord beginning on the dominant note is formed with the right hand:

1 2 3 4 5 6 7 1

This arrangement is familiar because it is the arrangement in which we typically play scales, from the tonic up an octave and back down again. Notice that in the disjunct arrangement, each finger is assigned to a single pitch, but both the left-hand and the right-hand pinkies are playing the same note, the tonic, one octave apart.

Conjunct Arrangement

The conjunct arrangement, in which the dominant-tonic tetrachord is formed with the left hand, and the overlapping tonic-subdominant tetrachord is formed with the right hand, is a more compact manifestation of the heptachord.

As in the disjunct arrangement, two fingers play the tonic pitch, but unlike the disjunct arrangement, these are the overlapping index fingers—the tonic pitch is duplicated at the unison. The symmetry of this arrangement in our hands is useful for quick orientation in a heptachord, and it is this arrangement that we will be working with primarily.

Notice that while the disjunct arrangement spans an octave, from tonic to tonic, the conjunct arrangement spans a seventh, from dominant to subdominant. The index fingers of the left and right hands overlap on the same note.

Sitting at the keyboard, form the doh Ionian heptachord in the conjunct arrangement. Your index fingers will be overlapping on the note doh. Moving out from here, the middle finger of your right hand rests on re, scale degree 2; the middle finger of your left hand rests on si, scale degree 7. Notice that the middle fingers of both the left and right hands rest on the two dissonant degrees of the scale—2 and 7. The ring fingers each rest on the two modal degrees of the scale, the right-hand ring finger on 3 (mi) and the left-hand ring finger on 6 (la). Finally, you can see that scale degrees 4 (fa) and 5 (sol), the two perfect degrees of the scale, fall to the right and left pinkies, respectively.

Consider this in comparison to the conjunct arrangement, in which the two pinky fingers play the tonic in two different octaves, the ring fingers play the dissonant degrees of the scale, the middle fingers play the modal degrees, and the index fingers play the perfect degrees.

Exercises: Constructing Disjunct and Conjunct Heptachords

Exercise 20-1: Disjunct Construction of Heptachords

Recall that all the modes are constructed from four types of basic tetrachord—Ionian, Dorian, Phrygian, and Lydian. Visualize each mode in the disjunct arrangement, and fill in the blanks in the following table.

This table does not, on its own, give us enough information to form the complete heptachord as it does not indicate whether the di-chord between the subdominant and the dominant pitch is a [1] or a [2], a major or a minor 2nd. Use keyboard visualization to answer the question: Which modes have a di-chord [1] between the subdominant and dominant pitches?

Mode (Heptachord)	Left Hand: Tonic-Subdominant Tetrachord	Right Hand: Dominant-Tonic Tetrachord
Lydian	Lydian	Ionian
Ionian	Ionian	Ionian
Mixolydian		
Dorian		
Aeolian		
Phrygian		
Locrian		

Exercise 20-2: Conjunct Construction of Heptachords

Complete the table, like in Exercise 20-1. However, whereas Exercise 20-1 was organized to display disjunct arrangements, this table is organized to display conjunct arrangements—the hands forming each tetrachord have switched. Read the column headings very carefully before completing the table!

Mode (Heptachord)	Left Hand: Dominant-Tonic Tetrachord	Right Hand: Tonic-Subdominant Tetrachord
Lydian	Ionian	Lydian
Ionian	Ionian	Ionian
Mixolydian		
Dorian		
Aeolian		
Phrygian		

Mode (Heptachord)	Left Hand: Dominant-Tonic Tetrachord	Right Hand: Tonic-Subdominant Tetrachord
Locrian		

Exercise 20-3: Scale Degrees in Conjunct Heptachord Construction

The following questions will help to map the correspondence between fingers and scale degrees. This information must be memorized and be immediately recallable in order to use conjunct formation of heptachords effectively. Answer all questions as they relate to the conjunct heptachord formation:

1. Which fingers play the dissonant degrees of the scale?
2. Which fingers play the modal degrees of the scale?
3. Which fingers play the perfect degrees of the scale?
4. Which fingers play the tonic (first degree) of the scale?
5. Which finger of which hand plays scale degree 2?
6. Which finger of which hand plays scale degree 7?
7. Which finger of which hand plays scale degree 3?
8. Which finger of which hand plays scale degree 6?
9. Which finger of which hand plays scale degree 4?
10. Which finger of which hand plays scale degree 5?
11. Which finger of which hand plays scale degree 1?

Exercise 20-4: Conjunct Formation of Modes

1. Sitting at the piano, form the conjunct arrangement of the Ionian mode on doh. Recall that the tonic pitch is in the middle of this arrangement with both of your index fingers overlapping on the tonic. As this is a pure mode, both the left and right hands will be forming the same tetrachord, Ionian.
2. Now, by moving in semitones, form the conjunct arrangement of the Ionian mode with each of the twelve pitches as the tonic.

3. Next, practice forming the other two pure modes, Dorian and Phrygian, with each of the twelve pitches as the tonic.
4. With the same approach, practice forming the four mixed modes: Lydian, Mixolydian, Aeolian, and Locrian. Check that your hands find the correct combination of tetrachords:
    - In the Lydian, the left hand is Ionian and the right hand is Lydian.
    - In the Mixolydian, the left hand is Dorian and the right hand is Ionian.
    - In the Aeolian, the left hand is Phrygian and the right hand is Dorian.
    - In the Locrian, the left hand is Lydian and the right hand is Phrygian.

    Forming the modes in this way helps the brain conceptualize how and why each of the seven modes feels and sounds different from the others—how the tetrachords comprising a mode, and thus the di-chords comprising the tetrachords, contribute to the mode's affect.

Mode Modulation

Simultaneously visualizing all seven notes of a heptachord reveals each of the seven pitch options within the heptachord. However, it also reveals the most effective way to move from one heptachord to another, by allowing us to see how changing a single note in a heptachord can take us to an entirely new mode or key. This change from one mode to another by altering only one note is a mode modulation.

While sitting at a keyboard, form the conjunct arrangement of the Lydian mode based on the note doh. To form the conjunct arrangement of the heptachord, place both index fingers overlapping on the tonic, doh. Your left pinky rests on the dominant pitch, sol. From sol to doh in the left hand forms an Ionian tetrachord, [0 2 4 5], with the notes sol, la, si, and doh; from doh to fa# in the right hand forms a Lydian tetrachord, [0 2 4 6], with the notes doh, re, mi, and fa#.

You may have already noticed that this collection of seven notes matches one of the common key signatures, sol major, which contains one accidental, fa#. The seven notes in the Lydian mode based on doh are the same seven notes in the sol major scale (which we could also call the Ionian mode on sol). The difference between the Lydian mode on doh and the sol major scale is the tonic pitch—the note the scale begins on. Even though the two scales are made up of the same

collection notes, they sound very different because the ear relates each of the notes to the tonic, and when the tonic is different, we perceive very different relationships—that is, we hear a very different set of primary di-chords.

Now, if you keep the same tonic pitch, doh, what one scale degree must you raise or lower by a semitone to move from the Lydian mode on doh to the Ionian mode on doh? Since you must keep the same tonic pitch, you can move any one of your fingers except either index finger. By moving your right-hand pinky down one semitone, from fa# to fa, you will form an Ionian heptachord with the Ionian tetrachord (sol, la, si, doh) in the left hand and the Ionian tetrachord (doh, re, mi, fa) in the right hand. With no accidentals, this collection of seven notes corresponds to the doh major scale.

Exercises: Mode Modulation

Exercise 20-5: Scale Degree Differences in the Ploger Ordering of Modes

When the modes are in the Ploger ordering (by perfect 5th), only one scale degree differs between any two neighboring modes. Circle the one scale degree that is not the same primary di-chord in both modes:

- Lydian and Ionian: 1 2 3 4 5 6 7
- Ionian and Mixolydian: 1 2 3 4 5 6 7
- Mixolydian and Dorian: 1 2 3 4 5 6 7
- Dorian and Aeolian: 1 2 3 4 5 6 7
- Aeolian and Phrygian: 1 2 3 4 5 6 7
- Phrygian and Locrian: 1 2 3 4 5 6 7

Exercise 20-6: Mode Modulation

In this exercise, by keeping the same tonic pitch and changing one note at a time (other than the tonic), you will become familiar with how modes work in composition. That is, finding the pattern of di-chords for any mode starting from any of the twelve pitches.

1. Form the doh Ionian heptachord at the keyboard. What one scale degree must you raise or lower by a semitone to move from doh Ionian to doh Mixolydian?

2. Which major scale shares the same seven notes? (Hint: look at which black-key notes are in the heptachord—what key signature do they correspond to?)
3. Now form the doh Mixolydian heptachord at the keyboard. Which single scale degree must you raise or lower by a semitone to move from doh Mixolydian to doh Dorian?
4. Which major key shares the same notes?
5. Form the doh Dorian heptachord at the keyboard. Which single scale degree must you raise or lower by a semitone to move from doh Dorian to doh Aeolian?
6. Which major key signature has the same seven notes?
7. Form the doh Aeolian heptachord at the keyboard. Which single scale degree must you raise or lower by a semitone to move from doh Aeolian to doh Phrygian?
8. Which major key signature has the same seven notes?
9. Form the doh Phrygian heptachord at the keyboard. Which single scale degree must you raise or lower by a semitone to move from doh Phrygian to doh Locrian?
10. Which major key signature has the same seven notes?
11. What pattern was formed by the key signatures as we changed modes by 5ths?

Ch.21 — Triads and Their Inversions: Major, Minor, Diminished, and Augmented

Primary and Secondary Di-Chords

We will name triads by their primary di-chord numbers, which, in this case, are the di-chords formed by each member of the chord and the lowest pitch of that chord. Recall that these are “primary” di-chords because we perceive them first and most strongly. As a rule, any secondary di-chord is of less significance to our aural perception of chords than are the primary di-chords because the primary di-chord(s) can be stated in any octave above the lowest pitch of the chord without affecting the basic identity of the triad.

Root Position Triads

Any root position triad, whether major, minor, diminished, or augmented, will possess two primary di-chords, one a 5th above the bass and the other a 3rd above the bass.

- The 5th may be di-chord [7], [6] or [8].
- The 3rd may be di-chord [4] or [3].

For example, visualizing the keyboard, form a doh major triad with your right hand: doh, mi, sol. The 5th of the chord, sol, creates a di-chord [7] with doh, the fundamental. The 3rd of the chord, mi, creates a di-chord [4] with doh. Observe that you will be hearing a composite effect of a perfect [7] and a modal [4]; this will be important to perceptually distinguish different triads. The following table shows the primary di-chord elements of the four triad types.

Triad Type	Type of 5th	Di-Chord of 5th	Type of 3rd	Di-Chord of 3rd
Major	Perfect	[7]	Major	[4]
Minor	Perfect	[7]	Minor	[3]
Diminished	Diminished	[6]	Minor	[3]
Augmented	Augmented	[8]	Major	[4]

The Root Position [7/4] Major Triad

In the `[7/4]` major triad, the 5th is the perfect and harmonic di-chord [7], and the 3rd is the modal and harmonic di-chord [4]. Because both the primary di-chords are harmonic, the sound of the chord is uniquely open, expanding, and alkaline. While exceptionally harmonious, and sounding self-contained, complete, and whole, it might also seem bland—though this is somewhat mollified by the undulating motion of the modal [4].

The Root Position [7/3] Minor Triad

In the `[7/3]` minor triad, the 5th is the perfect and harmonic di-chord [7], and the 3rd is the modal and non-harmonic di-chord [3]. The non-harmonic di-chord [3] renders the triad's sound more closed, contracting, and acidic. Because the ear is subconsciously aware of the 5th partial of the fundamental's overtone series, which is always a di-chord [4], a semitone tension exists between these two pitches, evoking emotional poignancy, vulnerability, or tenderness.

The Root Position [6/3] Diminished Triad

Both primary di-chords in the diminished triad are non-harmonic, rendering this chord strongly closed, contracting, and acidic in sound. Its 5th is diminished, a di-chord [6], which possesses an oddly ambivalent nature because its upper note refers both down to the fundamental and up to its octave manifestation. As a result, because the [6] can sound almost frozen in place, while still being non-harmonic, the diminished triad has a harsh and tart sound. It is the only triad whose 5th is perfect but non-harmonic.

The Root Position [8/4] Augmented Triad

In the `[8/4]` augmented triad, the 5th is the non-harmonic and modal di-chord [8], and the 3rd is the modal and harmonic di-chord [4]. Notice that both the primary di-chords of the augmented triad have a modal interference pulsation of 4Hz, which renders the augmented triad uniquely modal in sound.

Rarely employed in functional harmony, the augmented triad is most often employed as a “color” chord to enhance mystery or exoticism in later Romantic and Post-Romantic compositions. Discerning the augmented triad from other triads is a matter of recognizing it as the only triad with no perfect (2Hz) di-chords.

Inverted Triads

Any root position triad can be “inverted” by using a different note of the triad as the lowest note. For example, take a doh major triad, consisting of the notes doh, mi, and sol from the bottom up. The root is doh, the 3rd is mi, and the 5th is sol. If you were to transpose the lowest note, doh, up an octave, then the chord, from the bottom up, would read mi, sol, and doh. This triad would be in its first inversion. Notice that the 3rd of the triad, mi, would now be the bass note.

Subsequently, if you were to take that first inversion chord and transpose its lowest note, mi, up an octave, the chord would then read sol, doh, and mi from the bottom up. This triad would have the 5th, sol, as it’s bass note, and it would be in second inversion.

While the pitch classes of root position, first inversion, and second inversion triads stay the same, their primary di-chords (di-chords in relation to the lowest note) differ, which causes each inversion to have different sound characteristics. For example, the primary di-chords of a root position major triad are [7] and [4]—perfect harmonic and modal harmonic—while the primary di-chords of a first inversion major triad are [8] and [3]—modal non-harmonic and modal non-harmonic. These two forms of the same triad sound very different!

First Inversion Triads

First inversion triads are known as “6/3” because they have two pitch classes above the bass—one a 6th above the bass and the other a 3rd above the bass. The 6th can be a di-chord [8] or [9] and the 3rd can be a di-chord [3] or [4].

The following table indicates the di-chords above the bass for each of the four first inversion (6/3) chord types. Notice that in first inversion triads, the 3rd of the root position chord is now in the bass, the 3rd above the bass is the 5th of the root position chord, and the 6th above the bass is the root.

Diatonic Interval Above the Bass	Bass	3rd	6th
Part of Chord	3rd	5th	Root
Major	`[0]`	[3]	[8]
Minor	`[0]`	[4]	[9]
Diminished	`[0]`	[3]	[9]
Augmented	`[0]`	[4]	[8]

Second Inversion Triads

Second inversion triads are known as “6/4” because they have two pitch classes above the bass—one a 6th above the bass and the other a 4th above the bass. The 6th can be a di-chord [8] or [9] and the 4th can be perfect [5], augmented [6], or diminished [4].

The following table indicates the di-chords above the bass for each of the four first inversion (6/4) chord types. Notice that in second inversion triads, the 5th of the root position chord is now in the bass, the 4th above the bass is the root, and the 6th above the bass is the 3rd.

Diatonic Interval Above the Bass	Bass	4th	6th
Part of Chord	5th	Root	3rd
Major	`[0]`	[5]	[9]
Minor	`[0]`	[5]	[8]
Diminished	`[0]`	[6]	[9]
Augmented	`[0]`	[4]	[8]

Open and Closed Positions

In any triad, there is a secondary di-chord that is formed by the combination of the 3rd and 5th. When the lowest note of the triad is the fundamental pitch (that is, the triad is in root position), the next-highest pitch is the 3rd, and the highest pitch is the 5th; we can find the secondary di-chord created by the 3rd and 5th by subtracting the primary di-chord number of the 3rd from the primary

di-chord number of the 5th. In the case of a root position major triad voiced “root, 3rd, 5th,” we subtract [4], the primary di-chord number of the 3rd, from [7], the primary di-chord number of the 5th, and get [3], the secondary di-chord number created by the 3rd and 5th:

[7] − [4] = [3]

This way of stacking the notes—root, 3rd, 5th—is known as closed position. In closed position, the major triad in root position contains the primary di-chords [7] and [4] and the secondary di-chord [3].

Now, what if the triad, still in root position, is voiced differently, so that the 3rd of the chord is a higher pitch than the 5th of the chord—from the bottom up, root, then 5th, then 3rd? This type of voicing is known as open position. Note that the distance between the top and bottom notes is more than an octave, whereas, in closed position, the distance between the top and bottom notes of the triad is less than an octave.

In open position, the secondary di-chord formed by the 3rd and 5th of the chord will be the inversion of the di-chord formed by the 3rd and 5th in closed position. Find the inversion of the secondary di-chord number is calculated from the number 12 (the number of notes in an octave):

`[12]` − [3] = [9]

Consider the doh major triad as an example. In closed position, the triad, spelled from the bottom up, is doh, mi, sol. The primary di-chords in this position are [7] (doh to sol) and [4] (doh to mi). The secondary di-chord between mi and sol is a [3].

In open position, the triad, spelled from the bottom up, is doh, sol, mi. The primary di-chords remain the same. However, the secondary di-chord we hear with this voicing is the 3rd from mi up to sol but this is the 6th from sol up to mi. Sol up to mi is a di-chord [9], confirming our calculation.

A Note on Figured Bass

In figured bass, a traditional harmonic notation system, numbers written below the staff refer to the generic interval or intervals that should be played above the bass. For example, a major triad in first inversion is indicated with the numbers “6,” indicating that the harmony contains a note a

6th and a 3rd above the lowest voice. The octaves in which the 6th and the 3rd will be placed are not specified with figured bass. The specific type of interval—for example, major or minor 3rd—is not specified but conforms to the key signature of the piece, unless otherwise indicated.

When looking at figured bass, it is helpful to know fluently which di-chords are possible for each of the figured bass numbers in the diatonic scale. Remember the basic di-chord correspondences found in the following table:

Figured Bass	Interval	Di-Chord Possibilities Above the Bass
2	2nd	[1] or [2]
3	3rd	[3] or [4]
4	4th	[5] or [6]
5	5th	[7] or [6]
6	6th	[8] or [9]
7	7th	[10] or [11]

Exercises: Becoming Familiar with Triads and Inversions

Exercise 21-1: Triads and Melodic Gestures

I. MAJOR TRIAD

1. Sing a melodic ascending major triad in root position with closed voicing using the gesture names open, closed, weak, and strong.
2. What are the secondary di-chord numbers in an ascending major triad?
3. What are the melodic gestures of an ascending major triad?
4. Sing a melodic descending major triad in root position with closed voicing using the gesture names open, closed, weak, and strong.
5. What are the secondary di-chords numbers in a descending major triad?
6. What are the melodic gestures of a descending major triad?
7. Sing the fundamental of a major triad, then up to the 5th, and then down to the 3rd.

8. What are the secondary di-chords of this pattern?
9. What are the melodic gestures?

II. MINOR TRIAD

1. Sing an ascending minor triad in root position with closed voicing using the gesture names open, closed, weak, and strong.
2. What are the secondary di-chord numbers in an ascending minor triad?
3. What are the melodic gestures of an ascending minor triad?
4. Sing a descending minor triad in root position with closed voicing and using gesture names.
5. What are the secondary di-chords numbers in a descending minor triad?
6. What are the melodic gestures of a descending minor triad?
7. Sing the fundamental of a minor triad, then up to the 5th, and then down to the 3rd.
8. What are the secondary di-chords?
9. What are the melodic gestures?

III. DIMINISHED TRIAD

1. Sing an ascending diminished triad in root position with closed voicing using gesture names.
2. What are the secondary di-chord numbers in an ascending diminished triad?
3. What are the melodic gestures of an ascending diminished triad?
4. Sing a descending diminished triad in root position with closed voicing using gesture names.
5. What are the secondary di-chords numbers in a descending diminished triad?
6. What are the melodic gestures of a descending diminished triad?
7. Sing the fundamental of a diminished triad, then up to the 5th, and then down to the 3rd.
8. What are the secondary di-chords?
9. What are the melodic gestures?

IV. AUGMENTED TRIAD

1. Sing an ascending augmented triad in root position with closed voicing using the gesture names.

2. What are the secondary di-chord numbers in an ascending augmented triad?
3. What are the melodic gestures of an ascending augmented triad?
4. Sing a descending augmented triad in root position with closed voicing using the gesture names.
5. What are the secondary di-chords numbers in a descending augmented triad?
6. What are the melodic gestures of a descending augmented triad?
7. Sing the fundamental of an augmented triad, then up to the 5th, and then down to the 3rd.
8. What are the secondary di-chords?
9. What are the melodic gestures?

Exercise 21-2: Inversions of Major and Minor Triads

Using di-chord numbers, spell the following triads and their inversions using keyboard visualization and pitch tracking skills. The first row has been completed as an example.

Chord	Figured Bass	Primary Di-Chords
Root Position Major Triad	5	[7]
Root Position Major Triad	3	[4]
Root Position Minor Triad		
First Inversion Major Triad		
First Inversion Minor Triad		
Second Inversion Major Triad		
Second Inversion Minor Triad		

What types of interference pulsation are created by each primary di-chord in both the root position major and minor triads?

What types of interference pulsation are created by each primary di-chord in both the first inversion major and first inversion minor triads?

What types of interference pulsation are created by each primary di-chord in both the second inversion major and second inversion minor triads?

Exercise 21-3: Boulanger/Ploger Chord Exercise—Major and Minor Triads

The following is an exercise that Nadia Boulanger asked her students to perform. The goal of the exercise is to learn the specific intervals above the bass for each of the possible positions or inversions—root, first, second, third—for every triad and 7th chord. I have altered her exercise to also include spelling the di-chord numbers of each note in relation to the bass.

1. With the right hand, play a doh major chord in root position and in closed voicing. Correctly name each note in order, from the bottom up and then from the top down. Then name the primary di-chord of each note, from the top down. For example, this step would be spoken, “Doh, mi, sol. Sol, mi, doh. [7], [4], [0].”
2. Keeping doh as the bass note (not the root), play a major first inversion chord in closed voicing. Correctly name each note in order, from the bottom up and from the top down. Then name the primary di-chord of each note, from the top down. Observe that the root of the chord is the 6th above the bass.
3. Keeping doh as the bass note, play a major second inversion chord in closed voicing. Correctly name each note in order, from the bottom up and from the top down. Then name the primary di-chord of each note, from the top down. Observe that the root of the chord is the note a 4th higher than the bass.
4. Repeat steps 1–3 starting on each note of the keyboard in ascending chromatic order—with the bass note as doh, re, re#, etc. Then repeat steps 1–3 in descending chromatic order—doh, si, sib, la, lab, etc.
5. Repeat steps 1–4 for a minor triad.

Ch.22 — Four Functional 7th Chords

The Four Functional 7th Chords

There are four commonly employed 7th chords used in traditional functional harmony. Of these four, two are major-sounding and two are minor-sounding. Major sounding 7th chords may be found in minor heptachords, and vice versa. The two major-sounding 7th chords are the dominant 7th (a major triad with a minor seventh) and the minor 7th (a minor triad with a major seventh); the two minor-sounding 7th chords are the half-diminished 7th (a diminished triad with a minor seventh) and the fully-diminished 7th (a diminished triad with a diminished 7th). The half-diminished 7th is named thus because, while its triad is diminished, its seventh is not; the fully-diminished 7th chord has both a diminished triad and a diminished seventh.

Triad Type	7th Type	Common Name
Major	Minor	Dominant 7th / V7
Minor	Minor	Minor 7th
Diminished	Minor	Half-Diminished 7th
Diminished	Diminished	Fully-Diminished 7th

Root Position 7th Chords

Each 7th chord includes four pitches:

1. the root
2. a pitch class that is a 3rd above the root
3. a pitch class that is a 5th above the root
4. a pitch class that is a 7th above the root

Because each 7th chord contains pitches that are a 3rd, 5th, and 7th above the bass, the root position 7th chord is known as a “7/5/3” or simply as a “7-chord.”

The four 7th chord types are distinguishable according to the specific di-chords formed with the root:

- The 7th may be either major [11], minor [10], or diminished [9]
- The 5th may be either perfect [7] or diminished [6]
- The 3rd may be either major [4] or minor [3]

The following table shows the three primary di-chords above and including the root for each of the four common 7th chords. For ease of understanding, the elements of the chords appear in numerical order from smallest to largest.

Diatonic Interval Above the Bass	**Bass**	**3rd**	**5th**	**7th**
Part of Chord	Root	3rd	5th	7th
Dominant 7th	[0]	[4]	[7]	[10]
Minor 7th	[0]	[3]	[7]	[10]
Half-Diminished 7th	[0]	[3]	[6]	[10]
Fully-Diminished 7th	[0]	[3]	[6]	[9]

Note on the Fully-Diminished 7th

The fully-diminished 7th chord has the same di-chords [0,3,6,9] in all inversions because it is comprised of a [3] between the root and 3rd, the 3rd and 5th, and the 5th and 7th, each of these being a minor 3rd. In inversions of the fully-diminished 7th, [3] also exists between the 7th and the root above, but it is not a minor 3rd—it's an enharmonic augmented 2nd.

First Inversion Seventh Chords

First inversion seventh chords are known as "6/5/3" or simply "6/5" because they have three pitch classes above the bass corresponding to the following three di-chords:

1. a 6th that may be either major [9] or minor [8]
2. a 5th that may be either perfect [7] or diminished [6]

3. a 3rd that may be either major [4] or minor [3]

The following table indicates the di-chords above the bass for each of the four first inversion (6/5) chord types. Notice that in 6/5 chords, the 3rd of the root position chord is now in the bass, the 3rd above the bass is the 5th of the root position chord, the 5th above the bass is the 7th of the root position chord and the 6th above the bass is the root.

Diatonic Interval Above the Bass	Bass	3rd	5th	6th
Part of Chord	3rd	5th	7th	Root
Dominant 7th	[0]	[3]	[6]	[8]
Minor 7th	[0]	[4]	[7]	[9]
Half-Diminished 7th	[0]	[3]	[7]	[9]
Fully-Diminished 7th	[0]	[3]	[6]	[9]

Note on First Inversion — Identifying the Root

Notice also that the root is easily identifiable as the top note of two adjacent diatonic notes, one a 5th and the other a 6th above the bass—the note a 6th above the bass is the root. Though not easy to see in the case of the fully-diminished chord, the root (a 6th above the bass) is the top note of an augmented 2nd, even though it is a [3]. You cannot tell the inversion of a fully-diminished when hearing it in isolation.

Second Inversion 7th Chords

Second inversion 7th chords are called “6/4/3” or simply “4/3” because they have three pitch classes corresponding to the following di-chords above the bass:

- a 6th that may be either major [9] or minor [8]
- a 4th that may be either perfect [5] or augmented [6]
- a 3rd that may be either major [4] or minor [3]

In second inversion chords, using the rule that the root is the top note of the two adjacent pitch classes, the root of the 4/3 chord is the 4th above the bass.

Diatonic Interval Above the Bass	Bass	3rd	4th	6th
Part of Chord	5th	7th	Root	3rd
Dominant 7th	[0]	[3]	[5]	[9]
Minor 7th	[0]	[3]	[5]	[8]
Half-Diminished 7th	[0]	[4]	[6]	[9]
Fully-Diminished 7th	[0]	[3]	[6]	[9]

Third Inversion 7th Chords

Third inversion 7th chords are called “6/4/2” or simply “4/2” because they have three pitch classes that correspond to the following di-chords above the bass:

- a 6th that may be either major [9] or minor [8]
- a 4th that may be either perfect [5] or augmented [6]
- a 2nd that may be either major [2] or augmented [3]

Using the rule that the root of a 7th chord is the top of two adjacent pitch classes, the root of the 4/2 chord is the 2nd above the bass.

Diatonic Interval Above the Bass	Bass	2nd	4th	6th
Part of Chord	7th	Root	3rd	5th
Dominant 7th	[0]	[2]	[6]	[9]
Minor 7th	[0]	[2]	[5]	[9]
Half-Diminished 7th	[0]	[2]	[5]	[8]
Fully-Diminished 7th	[0]	[3]	[6]	[9]

Summary: 7th Chord Elements in Inversions

- The root is the bass in any root position 7th chord, the 6th above the bass in any 6/5, the 4th above the bass in any 4/3, and the 2nd above the bass in any 4/2.

- The 3rd of the root position chord is the bass in a 6/5, the 6th in a 4/3 and the 4th in a 4/2.
- The 5th of the root position chord becomes the 3rd in a 6/5, the bass in a 4/3, and the 6th in a 4/2.

Dominant 7th — All Inversions

The following tables identify the specific di-chords in each root position and inversion chord according to chord type. Di-chord numbers are shown from top down.

Position	Di-chords (bass→top)	Top→Down
Root Position	[0] [4] [7] [10]	10 / 7 / 4
First Inversion (6/5)	[0] [3] [6] [8]	8 / 6 / 3
Second Inversion (4/3)	[0] [3] [5] [9]	9 / 5 / 3
Third Inversion (4/2)	[0] [2] [6] [9]	9 / 6 / 2

Minor 7th — All Inversions

Position	Di-chords (bass→top)	Top→Down
Root Position	[0] [3] [7] [10]	10 / 7 / 3
First Inversion (6/5)	[0] [4] [7] [9]	9 / 7 / 4
Second Inversion (4/3)	[0] [3] [5] [8]	8 / 5 / 3
Third Inversion (4/2)	[0] [2] [5] [9]	9 / 5 / 2

Half-Diminished 7th — All Inversions

Position	Di-chords (bass→top)	Top→Down
Root Position	[0] [3] [6] [10]	10 / 6 / 3
First Inversion (6/5)	[0] [3] [7] [9]	9 / 7 / 3
Second Inversion (4/3)	[0] [4] [6] [9]	9 / 6 / 4

Position	Di-chords (bass → top)	Top → Down
Third Inversion (4/2)	[0] [2] [5] [8]	8 / 5 / 2

Fully-Diminished 7th — All Inversions

Position	Di-chords (bass → top)	Top → Down
Root Position	[0] [3] [6] [9]	9 / 6 / 3
First Inversion (6/5)	[0] [3] [6] [9]	9 / 6 / 3
Second Inversion (4/3)	[0] [3] [6] [9]	9 / 6 / 3
Third Inversion (4/2)	[0] [3] [6] [9]	9 / 6 / 3

Identifying Roots of Chords

A common approach used by music students to visually identify the root of any chord in a score is to juggle its three or four notes around until they form a stack of thirds and then determine its inversion by whether the 3rd, 5th, or 7th is in the bass. Unfortunately, all this takes three, four or more seconds, making the strategy impractical in real time and quite useless in telling us about how the chord actually sounds.

A far more practical strategy for finding the root and inversion of a chord is to use the methodology suggested in thorough bass practice: identify the intervals above the bass. Doing this determines the primary di-chords that, in turn, determine the sound of the chord.

Here are seven basic rules that can be easily committed to memory.

Roots in Triads

1. The root in any root position (5/3) triad is the note that is the bottom of a 5th and/or the top of a 4th. Of the two primary di-chords, one is perfect and the other is modal; the secondary di-chord between the 3rd and 5th is modal.

2. The root in any first inversion triad (6/3) is the note a 6th above the bass. Both primary di-chords are modal; the secondary di-chord is perfect.

3. The root in any second inversion triad (6/4) is generally considered the 4th above the bass, however numerous respected theorists (Aldwell, Schachter, Plogger) posit that, while the preceding rule is true for most 6/4 chords, the root is the bass note in a cadential 6/4. Because a 5th above the bass has long been considered a “dissonance” in counterpoint and in four-part tonal harmony, the upper note of the 4th must be carefully prepared and resolved. This means that the 6/4 chords are employed less frequently than 5/3 and 6/3 chords. Most theorists concur that the root of the neighboring/plagal and passing 6/4 chords is the top of a 4th.

Roots in 7th Chords

4. The root in any root position 7th chord (7/5/3) is the bottom of the 7th and/or the top of a 2nd. All 7th chord primary di-chords have one that sets their sound apart from the simpler triads. In this case, the primary di-chords contain all three types of interference patterns: dissonant, perfect and modal.

5. The root in any first inversion 7th chord (6/5/3) is the note class a 6th higher than the bass. Notice that the root can be easily spotted as the upper of two neighboring note classes—notes a diatonic 2nd apart. Here, the note a 6th higher is a diatonic 2nd above the 5th and is, therefore, the root. Notice that the sound of the 6/5/3 will be more modal than the 7/5/3 because the former has two rather than only one primary modal di-chord, making the sound warmer and more emotional in flavor.

6. The root in any second inversion 7th chord (6/4/3) is the note class a 4th higher than the bass that is also the note class a diatonic 2nd above the 3rd. The harsh sound of the perfect and non-harmonic 4th allows us to distinguish it from the 6/5/3.

7. The root in any third inversion 7th chord (6/4/2) is the note a 2nd higher than the bass.

Exercises: Building Fluency with Functional 7th Chords

Exercise 22-1

Boulanger/Ploger Chord Exercise—Dominant 7th Chords.

1. With the right hand, play a doh dominant root position (7/5/3) chord, in closed voicing. Correctly name each note in order from the bottom up and then from the top down. Then name the primary di-chord of each note, from the top down. For example, this step would be spoken, “doh, mi, sol, tib, tib, sol, mi, doh. [10], [7], [4], [0].”
2. With doh as the bass note, play a dominant first inversion (6/5/3) chord, in closed voicing. Correctly name each note in order from the bottom up and from the top down. Then name the primary di-chord of each note, from the top down. Observe that the root of the chord is the 6th above the bass.
3. With doh as the bass note, build up a dominant second inversion (6/4/3) chord, in closed voicing. Correctly name each note in order from the bottom up and from the top down. Then name the primary di-chord of each note, from the top down. Observe that the root of the chord is the 4th higher than the bass.
4. With doh as the bass note, play a dominant third inversion (6/4/2) chord, in closed voicing. Correctly name each note in order from the bottom up and from the top down. Then name the primary di-chord of each note, from the top down. Observe that the root of the chord is the 2nd above the bass.
5. Repeat steps 1–4 starting on each note of the keyboard in ascending chromatic order—with the bass note as dohb, re, reb, etc. Then repeat steps 1–3 in descending chromatic order—doh, si, sib, la, lab, etc.

Exercise 22-2

Boulanger/Ploger Chord Exercise—Minor, Half-Diminished, Fully-Diminished. Perform all the steps of the previous exercise but with the following chords in root position (7/5/3), first inversion (6/5/3), second inversion (6/4/3), and third inversion (6/4/2):

1. minor 7th
2. half-diminished
3. fully-diminished 7th

For each chord, pay careful attention to the position of the chord's root. In first inversion, it will be the 6th above the bass; in second inversion, it will be the 4th above the bass; and in third inversion, it will be the 2nd above the bass.

Exercise 22-3

Bass Notes and Root Notes Quiz. Use your knowledge of the four functional 7th chords and your visualized keyboard to answer the following questions:

1. What is the root of a dominant 7th chord in first inversion that has doh as its bass?
2. What is the bass of a dominant 7th chord in first inversion that has re as its root?
3. What is the root of a minor 7th chord in first inversion that has mi as its bass?
4. What is the bass of a minor 7th chord in first inversion that has fa as its root?
5. What is the root of a half-diminished 7th chord in first inversion that has sol as its bass?
6. What is the bass of a half-diminished 7th chord in first inversion that has fa as its root?
7. What is the root of a fully-diminished 7th chord in first inversion that has si as its bass?
8. What is the bass of a fully-diminished 7th chord in first inversion that has doh as its root?
9. What is the root of a dominant 7th chord in second inversion that has re as its bass?
10. What is the bass of a dominant 7th chord in second inversion that has mi as its root?
11. What is the root of a minor 7th chord in second inversion that has fa as its bass?
12. What is the bass of a minor 7th chord in second inversion that has sol as its root?
13. What is the root of a half-diminished 7th chord in second inversion that has lab as its bass?
14. What is the bass of a half-diminished 7th chord in second inversion that has si as its root?
15. What is the root of a fully-diminished 7th chord in second inversion that has doh as its bass?
16. What is the bass of a fully-diminished 7th chord in second inversion that has re as its root?
17. What is the root of a dominant 7th chord in third inversion that has sib as its bass?
18. What is the bass of a dominant 7th chord in third inversion that has fa as its root?
19. What is the root of a minor 7th chord in third inversion that has sol as its bass?
20. What is the bass of a minor 7th chord in third inversion that has la as its root?
21. What is the root of a half-diminished 7th chord in third inversion that has sib as its bass?

22. What is the bass of a half-diminished 7th chord in third inversion that has doh as its root?

23. What is the root of a fully-diminished 7th chord in third inversion that has reb as its bass?

24. What is the bass of a fully-diminished 7th chord in third inversion that has mi as its root?

Ch.23 — Harmonization

Scale Degree Harmonization in the Major Heptachord

Triads and Scale Degrees

For each scale degree of the major heptachord, there is a triad that can be built on that scale degree. The chord qualities (major, minor, or diminished) of the triads built on each of the degrees of the scale will be consistent for all major scales. In this chapter, we will be exploring the qualities of the triads built on each degree of the major scale.

Exercises: Discovering the Triads of the Major Heptachord

Exercise 23-1

First, practice building triads with scale degrees. By using scale degrees and not specific pitches, you are creating templates that can be applied to any key or mode. Complete the table by filling in the scale degrees for each triad.

))}

Root	3rd	5th

Exercise 23-2

1. In the key of doh major, play a tonic drone and sing, using solfege syllables, the melodic ascending triad built on scale degree 1 in root position. Referring to the table in the previous exercise, we are reminded that this triad is composed of scale degrees 1, 3, and 5. In doh major, these notes will be doh, mi, and sol.

2. Beginning with the root of the triad as [0], now sing the same triad on primary di-chord numbers. In a major key, these numbers are [0] [4] [7]. Observe the quality of the triad. As you sing, listen to each primary di-chord created with the tonic drone and listen for the three identifying factors: interference pulsation, the fundamental/octave factor, and harmonicity.

3. Still in the key of doh major, play the tonic drone and sing on solfege syllables the melodic ascending triad built on scale degree 2. In doh major, these notes will be re, fa, and la, with the corresponding primary di-chords of [2], [5], and [9]. Observe the three sound factors for each of these primary di-chords.

4. Continue singing the diatonic triads built on each scale degree, 1–7, in the key of doh major over the tonic drone, first singing solfege syllables and then singing primary di-chord numbers while observing the sound factors in each triad.

Roman Numerals as Chord Symbols

In music theory, Roman numerals are conventionally used in harmonic analysis of tonal music because the numerals, which correspond to the scale degrees of the root, reflect the hierarchy and tendencies of the triads.

To indicate that the quality of a chord is major, its Roman numeral is capitalized; for example, I, IV, and V.

To indicate that the quality of a chord is minor, its Roman numeral is written in lowercase; for example, ii, iii, and vi.

To indicate that the quality of a chord is diminished, the lowercase version of the Roman numeral is followed by the “degree” symbol; for example, vii°.

To indicate that the quality of a chord is augmented, the uppercase version of the Roman numeral is followed by the “plus” symbol; for example, III+. Although there is no augmented triad that occurs naturally in the diatonic scale, augmented triads are still occasionally found in tonal music.

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Roman Numeral	Triad Type	Root	3rd	5th

Functional 7th Chords in the Major Scale

In the major heptachord, there are five locations of functional 7th chords. There is a dominant 7th chord built on scale degree 5, which is written V7; there are three minor 7th chords built on scale degrees 2, 3, and 6, written ii7, iii7, and vi7, respectively; and there is a half-diminished triad on scale degree 7, written vii°7.

Exercises: Roman Numerals, Harmonizing, and Analysis

Exercise 23-3

Without referring to the table on the previous page, complete the following table by writing in the triad type and Roman numeral of the triads built on each of the degrees of the major scale.

))}

Scale Degree	Triad Type	Roman Numeral

Exercise 23-4

Circle the letters and corresponding degrees that have major triads built above them:

))}))}

Circle the letters and corresponding degrees that have minor triads built above them:

))}))}

Which scale degree did you not circle in either version of this exercise? What type of triad is built above this degree?

Exercise 23-5

This exercise contains ten chord sequences that will help you to coordinate melody and harmony in major heptachords. Each sequence can be played at the keyboard in four parts (SATB) and in multiple major keys.

The top row of each sequence consists of Arabic numerals, while the bottom row consists of Roman numerals. The Arabic numerals represent the scale degrees in the soprano/melody, generally played with the pinky of the right hand. Roman numerals represent the triads that will harmonize each of the degrees in the soprano. The left hand will play only the root of each triad, and the right hand will play the soprano, alto, and tenor parts in closed voicing. The di-chord between adjacent parts on the right hand never exceeds a 4th and di-chords between the soprano and tenor will never exceed a 6th.

To achieve fluency in the shortest time possible, try the following strategy. After selecting a major heptachord, review the correspondence between its seven scale degrees and notes on the piano:

1. Recite the solfege syllable corresponding to each degree in the soprano part, in order.
2. Recite the solfege syllable corresponding to the root of each triad in order.
3. Recite the notes that correspond to the root, 3rd, and 5th of each chord.
4. For each chord in order, recite the soprano and then the bass note, one chord at a time.
5. For each chord in order, play all four parts.

Sequences 1–4 contain only major triads, while sequences 5–10 contain major and minor triads.

, , , , , , , , , ,].map(() => (
Sequence

))}))}

Soprano:
Roman:

))}
Exercise 23-6

A tried and true approach to understanding four-part tonal harmony is the study of the chorales of J.S. Bach. A reason for studying these mini masterpieces of harmony is that, while they are exquisite examples of strict voice leading, they are also rich in the number of heptachords visited during their short duration, sometimes shifting four or more times in a single bar.

While the chorale melodies are simple, mostly stepwise, and almost completely diatonic to the key signature, the chords underneath the melodic surface are anything but obvious. Being able to identify a chord by its root and inversion at a glance requires considerable practice; however, the amount of practice required is reduced by applying a common sense, systematic approach that will make it possible to proceed from one step to the next without a musical breakdown.

The following six-step protocol provides a way to go from naming notes in each chord that appear in the familiar bass and treble clefs to identifying not only the root of each chord but its scale degree function and inversion at 72 bpm (as the notes appear in an open score version that employs the bass, soprano, alto and tenor clefs):

1. Select a single phrase of a chorale. For each chord, in order of appearance, name the notes in B-S-A-T (bass, soprano, alto, tenor) order, naming each note as a solfege syllable. Practice this step repeatedly for the same phrase until it is effortless for you to envision and name each note on the musical keyboard at a rate of 144 bpm.
2. Continuing to use the same phrase, for each chord in order, name the bass note using solfege and then name the diatonic intervals that the other notes form with the bass from the top down. Name all compound intervals (those over an octave) as simple ones — for example, instead of naming the interval as a 9th, name it as a 2nd. Repeat the phrase as needed until you can speak each note at the rate of 144 bpm.
3. Using the same phrase, state the bass note name followed by the name of each chord's root in order. Repeat the bass note name if it is the root. Practice until you can name the bass and root at 144 bpm.
4. Repeat the same phrase, this time identifying the root note and the inversion of the chord, using diatonic interval classes to identify inversions. For example, say, “Fa 5/3, Doh 6/5/3, etc.” Repeat as needed until you can name each chord at a rate of 72 bpm.
5. This time, identify the root note's function (I, ii, iii, IV, etc.) in the current heptachord (see chapter 24, “Heptachord Shift”). You may first wish to practice identifying the tonic and heptachord type for the phrase selected, in real time. Repeat the same phrase until you can name the root degree at 72 bpm.
6. Finally, identify both the root function and the chord inversion. For example, you might say, “V 6/3, I 5/3.” Repeat until you can say the root and chord inversion at 72 bpm.

By working on one phrase (usually about eight chords) per day, you will make considerable progress in a matter of a few weeks. Once you begin to feel that your skills are strong when using the close score version of the chorales, move to using the open score version. Because you will have developed an understanding of Bach's harmonies after working in the close score, you will no longer find it shocking to read the open score version. After a week of practicing chord analysis in open score, return to reading any chorale in the close score and you will find that your close score analysis has significantly improved!

A final thought: To build your skills quicker, you might start by studying chorales with a C major key signature. As soon as you feel confident, move to chorales having one sharp or flat, then two sharps or flats, then three, etc.

Ch.24 — Heptachord Shift

Real-Time Perception

One of the greatest challenges facing us as we become fluent in the tonal language concerns modulation. It is an overwhelming subject, rigid yet elusive, that intimidates even the stout-hearted. Yet, modulation need not be a daunting enterprise; it can actually be quite simple to understand and enjoyable to employ.

The method I use to teach modulation, as well as other aspects of musical perception, is what is known as real-time perception. Real-time perception means processing and making sense of sensory information at the speed at which that information occurs in everyday circumstances. When this concept is applied to music, it means being able to know what is happening in music at the moment it occurs during performance or listening. This is especially handy when you want to improvise because unless you become accustomed to knowing what is happening as it happens, your ability to improvise will be hindered.

Fortunately, getting a handle on real-time modulation requires only that you know your scales and that you memorize a few simple strategies.

Heptachord Shift

I call this technique of real-time modulation **Heptachord Shift**. Heptachord Shift is based on the fact that we perceive tonal music in structures of seven-note chords, or “heptachords.” There are three tonal heptachords:

1. major
2. melodic minor
3. harmonic minor

These three heptachords correspond to the major, melodic minor (ascending only), and harmonic minor scales. However, a scale is but one expression of a heptachord. The notes of a heptachord can appear in any order as long as the notes conform to one of the three scales. Further, it does not matter if the notes of a heptachord are expressed in the form of chords (vertical forms), lines (horizontal forms) or any other variation of the two.

What do heptachords have to do with modulation? Modulation occurs when one heptachord shifts or transmutes into another. Such a shift takes place at the moment one or more notes of a heptachord are chromatically altered. In other words, the moment the note C#, for instance, is introduced in the context of a G major heptachord, the heptachord instantly shifts to a D major heptachord. For some unknown reason, our ears dismiss or discard the note C at the very same moment that C# is introduced. You can prove this for yourself by first playing the notes in G major in any random, chaotic order and then throwing in the note C#. The C# will instantly sound like the leading tone of D major. The new heptachord is formed as the tonic shifts from the note G to the note D.

So, all you have to do is replace C with C#. Common sense. Right? The beauty is that you do not have to know anything about conventional harmonic analysis to enact the modulation. You do not have to memorize elaborate cadences, nor do you even need a V7 chord.

It is true that not all shifts are created equal. There are many ways that C# can be introduced, some which have a smoother and more seamless effect than others. These effects are quickly learned through experimentation; discovering the possibilities on your own is a lot of fun.

First Generation Heptachords

By using the principle of heptachord shift, you can move from one key/heptachord to another by changing only one note. A shift of heptachord initiated by changing one note is called a **first generation heptachord shift**.

First Generation Shifts from a Major Heptachord

When shifting from a major heptachord, you can move to one of five other heptachords by changing one note. The table below shows the scale degree that is altered, the scale degree it becomes in the new heptachord, and the new heptachord's relation to the original heptachord.

Scale Degree Alteration	Scale Degree in New Heptachord	New Heptachord
#4	7	[V]
♭7	4	[IV]
#5	7	[vi▽]
#1	7	[ii△]
♭3	3	[i△]

Summary of First Generation Shifts

In summary, if you were to sharpen scale degree 4 of a major heptachord, then the heptachord would shift to the dominant [V] of the original heptachord, with the sharpened fourth degree now functioning as the seventh degree.

In Heptachord Shift analysis, an upward pointing triangle, △, denotes the melodic minor heptachord, while a downward pointing triangle, ▽, denotes the harmonic minor heptachord. So, if you were to sharpen scale degree 5 of a major heptachord, then the heptachord would shift to the relative harmonic minor [vi▽] of the original heptachord with the sharpened fifth degree now functioning as the seventh degree.

For a thorough test drive, let's use C major as our initial major heptachord. We get to G major [V] by raising 4, so we raise F to F#; we get to F major [IV] by lowering 7, so we lower B to B♭; we get to A harmonic minor [vi▽] by raising 5, so we raise G to G#; we get to D melodic minor [ii△] by raising 1, so we raise C to C#; and, we change C major to C melodic minor [i△] by lowering 3, so we lower E to E♭.

Chapter Twenty-Five: Transposition

Introduction

By changing clef on the staff, and by adjusting the key signature, you can learn to transpose notes at sight. This skill is especially important when reading or writing musical scores that employ “transposing” instruments, such as clarinets in B♭ or A, saxophones in B♭ or E♭, the French or English horn in F, the trumpet in D, etc.

Using Clefs to Transpose

If you are fluent in using all eight clefs, you can transpose at sight by simply imagining that the music is written in a different clef with an alteration to the key signature. This may sound complicated, but it is a much more efficient way to transpose than thinking up or down an interval for every written note. For example, imagine that you are given the melody of Louis Bourgeois’ hymn tune *Old Hundredth* written in G major using the treble clef.

But, you are asked to play the melody up a minor 3rd, in B♭ major; how would you do this? You would simply need to read the music as if it were written in the bass clef with two flats in the key signature (add three flats to the original key signature of G major).

Notice that the notes of the melody are written on the same lines and spaces in both examples! In essence, to transpose any music written in the treble clef up by a minor 3rd, read it in the bass clef and add three flats to the original key signature.

So, there is a particular clef and key signature alteration that will facilitate transposition by each interval or di-chord. The following table shows the clefs and key alterations needed to transpose from the treble clef up or down a di-chord [1], [2], [3], [4], [5], or [6]. These are the only di-chords of transposition you need to know because to transpose by other di-chords you can simply use their inversion: transposing up [II] is the same, in terms of note class, as transposing down [1], and transposing up [7] is the same, in terms of note class, as transposing down [5], and so on.

Transposition Table: Clef and Key Signature

Notice that the number of accidentals in the key signature alteration is the same when transposing the same di-chord up and down. For instance, when transposing up a major 2nd, add two sharps, and when transposing down a major 2nd, add two flats. Notice also that the type of accidental is the opposite—flat versus sharp—when transposing the same di-chord up and down. Further, the sum of accidental alteration for each diatonic interval transposition in a particular direction is always equal to seven: two accidentals are required to go up a [2], while five are required to go up a [1], and two plus five equals seven.

Direction of Transposition	Interval Class	Di-Chord	Clef	Key Signature Alteration
Up	4th	[6]	Mezzo-Soprano	+6 #
Up	4th	[5]	Mezzo-Soprano	+1 ♭
Up	3rd	[4]	Bass	+4 #
Up	3rd	[3]	Bass	+1 ♭
Up	2nd	[2]	Alto	+2 #
Up	2nd	[1]	Alto	+5 ♭
Down	2nd	[1]	Tenor	+5 #
Down	2nd	[2]	Tenor	+2 ♭
Down	3rd	[3]	Soprano	+3 #
Down	3rd	[4]	Soprano	+1 ♭
Down	4th	[5]	Baritone	+1 #
Down	4th	[6]	Baritone	+6 ♭

Note on the Transposition Table

Be aware that the previous table only applies when transposing from the treble clef. If you are a keyboardist or an instrumentalist who reads from the bass clef, you should use the same principle to make your own table for transposing from the bass clef (or any other clef, for that matter).

Transposed Instruments

Many wind and brass instruments are transposing, meaning that the notes written on the musical staff do not indicate the actual sounding pitch. The pitches played on wind and brass instruments are built upon the overtone series of their most basic or core pitch, which is determined by each instrument's size and shape.

To understand transposing instruments, we can begin by realizing that the core pitch/key is indicated in the name of the instrument. The B♭ clarinet has, as its most essential key, the key of concert B♭; an A clarinet has, as its most essential key, the key of A; etc. Yet, for simplicity's sake, music written in the core key of these instruments is written to appear, on the staff, to be in C major. For example, when a B♭ clarinetist plays a written C, they are sounding a concert B♭. Similarly, a horn in F has the key of F as its most elemental or essential key; therefore, this key is written as C. Understanding the relationship between the sounding concert pitch and the note indicated on the staff is of the utmost importance if we are to know the concert pitch:

- On a B♭ instrument, the written note class is a whole tone higher than sounding.
- On a D instrument, the written note class is a whole tone lower than sounding.
- On an A instrument, the written note class is a minor 3rd higher or a major 6th lower than sounding.
- On an E♭ instrument, the written note class is a minor 3rd lower or a major 6th higher than sounding.
- On an F instrument, the written note class is a perfect 4th lower, or a perfect 5th higher than sounding.
- On a G instrument, the written note class is a perfect 5th lower, or a perfect 4th higher than sounding.

Becoming Fluent with the Clefs

Musicians, even professionals, often assume that mastering clefs and transposition is unnecessary. However, those who master these concepts become the most literate and intellectually agile members of the musical community, being able to move between musical genres, comprehend complex musical scores and, more importantly, to grasp timbre differences between keys. Nadia

Boulanger could very easily test my musical understanding of a composition by asking me to transpose it on the spot. If I had learned a piece by motor memory alone, I was unable to transpose, because playing it in another key felt completely different in my hands, disrupting my motor memory. However, if I had grasped the harmonic and melodic meaning of the piece, I could transpose to a different key with considerably less effort, and with far more musicality. Try transposing as much as you can, always remembering that, although it might seem extremely challenging, you will find the exercise invaluable.

Exercises: Transposing Using Clefs

Exercise 25-1

Answer the following questions for this excerpt of *Yankee Doodle* written on the treble clef in F major.

1. What key would it be in if you transposed it up a major 3rd? What clef would you use to read it transposed up a major 3rd?
2. What clef would you use to transpose it down a di-chord [1], and how would you alter the key signature? What would the starting pitch be?
3. What key would it be in if you transposed it up a di-chord [2]? What clef would you use to read it transposed up a di-chord [2]?
4. What clef would you use to transpose it down a perfect 4th, and how would you alter the key signature? What would the starting pitch be?
5. What key would it be in if you transposed it up a di-chord [3]? What clef would you use to read it transposed up a di-chord [3]?
6. What clef would you use to transpose it up a minor 2nd, and how would you alter the key signature? What would the starting pitch be?
7. If you transposed this excerpt using the tenor clef and added five sharps to the key signature, by what di-chord would you have transposed? What would the starting pitch be?
8. If this excerpt was written for clarinet in B♭, what would be the first note's sounding pitch? What clef would you use to read it at the clarinet's sounding pitch?

9. If this excerpt were written for horn in F, what would be the first note's sounding pitch? What clef would you use to transpose it at the horn's sounding pitch?
10. If this excerpt were written for trumpet in D, what would be the first note's sounding pitch? What clef would you use to transpose to the trumpet's sounding pitch?

Exercise 25-2

On each staff, write the appropriate clef and key signature for the given starting note, making sure that the tune, *A Tisket A Tasket*, always starts on scale degree 5 of a major heptachord.

- Starting Note — G
- Starting Note — A♭
- Starting Note — F♯
- Starting Note — A
- Starting Note — F
- Starting Note — B♭
- Starting Note — E
- Starting Note — B
- Starting Note — E♭
- Starting Note — C
- Starting Note — D
- Starting Note — C♯
- Starting Note — D♭

Appendix B — The Overtone/Harmonic Series

The physical basis for why di-chord harmonicity works. Harmonic di-chords are harmonic because their upper notes appear early in the overtone series of the lower note — they are "already in the family."

First 7 Partials

Partial	Name	Di-Chord	Notes
1	Fundamental	`[0]`	Base vibration; string vibrating in one part
2	Octave	`[0]`	String divides in half; 2:1 ratio
3	Fifth	[7]	String divides into 3 parts; 3:1 ratio to fundamental
4	Super Octave	`[0]`	String divides into 4 parts
5	Major Third	[4]	String divides into 5 parts; 5:4 ratio to Super Octave
6	Super Fifth	[7]	Octave of the Fifth
7	Minor Seventh	[10]	String divides into 7 parts; controversial whether 7:4 or 5:9

Harmonic Ratios from the Series

Ratio of partial 5 to partial 3 = 5:3 = major 6th [9].

What is NOT in the Overtone Series

- **Perfect 4th [5]** — Does NOT exist naturally. Artificially derived as the distance from the 5th to the Super Octave (3rd to 4th partial), ratio 4:3. This is why [5] is non-harmonic despite being called "perfect."
- **Minor 3rd [3]** — NOT in series → non-harmonic ✓
- **Minor 6th [8]** — NOT in series → non-harmonic ✓
- **Augmented 4th [6]** — IS in the series but sounds flat relative to equal temperament.

Terminology

“Harmonics” = frequency ratios. “Overtones” = divisions of a vibrating string or air column. “Partials” = most precise term (includes the fundamental itself).

Appendix C — The Ploger Heptachord Shift House Plan

A conceptual floor plan with 14 rooms representing all heptachords through the second generation. The original heptachord (UR) = C major sits at the structural center.

14 Rooms (Using C Major as UR)

First-generation rooms: G major [V], F major [IV], A harmonic minor [vi▽], D melodic minor [ii△], C melodic minor [i△].

Second-generation rooms: D major, B♭ major, g melodic minor, d harmonic minor, f melodic minor, e harmonic minor, a melodic minor, E♭ major, and others derived from first-generation shifts.

How to Use the House Plan

Each arrow between rooms shows the triggering chromatic alteration. Double-headed arrows indicate reversible shifts. Bach typically wrote within these 14 rooms.

For AMF improvisers: This diagram is the endgame — the complete map of where you can go from any tonal center and how to get there with a single chromatic step.

Essential Plogger Exercises — Practice Plan

The following exercises are the highest-leverage items across the full three-book system. Sprint eligibility is noted for AMF curriculum sequencing.

1. **Keyboard Visualization** — Eyes-closed note naming (Ch.3). Foundational; begin Sprint 1+. The prerequisite for all other work.
2. **Longy Rhythms** — Clap + speak rhythmic patterns (Ch.4). Foundational; begin Sprint 1+.
3. **Lap Map Drills** — Solfège + di-chord mapping on lap (Ch.5). Begin Sprint 3+.
4. **Boulanger/Ploger Chord Exercise** — Name all notes and di-chords in every inversion across all 12 pitches (Ch.21–22). Begin Sprint 9+.
5. **Tracking Page Protocol** (Ch.16) — Steps 1–2 from Sprint 1; full 7-step integration by Sprint 12.
6. **Conjunct Mode Modulation** — Single-finger heptachord modulation at keyboard (Ch.20, Ex.20-6). Begin Sprint 9+.
7. **Bach Chorale Heptachord Analysis** — 6-Step Protocol applied to Bach chorales (Ch.24). Begin Sprint 11+.
8. **10 Chord Sequences in All Keys** — Soprano scale degrees + Roman numerals in all 12 keys (Ch.23, Ex.23-5). Begin Sprint 10+.

Melody Chamber

Source: Emotional Map of Melody (EMM) + original AMF extraction. The Melody Chamber maps every scale degree to a stability zone. The zone system aligns directly with di-chord harmonicity — Zone 1 notes are harmonic di-chords from the tonic, Zone 3 notes are non-harmonic or suspended.

Four Zones (Scale Degree Stability Ladder)

Zone	Notes	Plogger Equivalent	Character
Zone 1 (Sweet)	1̂, 3̂, 5̂	`[0]` [4] [7] — Harmonic	Stable, resolved, home

Zone	Notes	Plogger Equivalent	Character
Zone 2 (Bitter)	7̂, 2̂	[11] [2] — Dissonant	Mild tension, close to home
Zone 3 (Tense)	4̂	[5] — Perfect (suspended)	Active tension, wants resolution
Zone 4 (Wildcard)	6̂ (LA)	[9] — Modal harmonic	Context-dependent — sweet or tense

Two Questions

1. Is this note stable or unstable over the current chord?
2. Is this the right amount of tension for this moment in the song?

Four Chord-Change Behaviors

- **Stay Sweet:** Zone 1 note stays Zone 1 after chord change → continuity
- **Turn Tense:** Zone 1 note becomes Zone 3 after chord change → surprise tension
- **Float Free:** Move to 7̂ or 2̂ (Zone 2) that floats above most chords
- **Sink Deeper:** Step into deeper tension zone across the chord change

5 Key Notes Framework

1. **First Note** — establishes zone immediately
2. **Last Note** — resolved (Z1) = closed phrase; open (Z2/3) = continuation needed
3. **Highest Note** — the peak of the arc (usually most tense)
4. **Longest Note** — duration amplifies whatever zone it occupies
5. **Note on Beat 1** — rhythmically strongest position

Pillar Notes + Backbone Notes

Pillars: structural chord tones defining the phrase framework. Backbone: stepwise connectors between pillars. Process: plan pillars → fill in backbone → ornament.

Tiny Tension Arc (The Hook Engine)

Z1 → Z1 → Z2 → Z1

Two stable notes + one tension note + resolution = fundamental hook DNA.

Duration Amplifies Zone

Long note in Z3 = much more tension than short note in Z3. Long note in Z1 = deep resolution. Duration is a tension multiplier.

Zone Distribution Ratios by Section

Section	Z1	Z2	Z3	Z4
Verse	50%	30%	15%	5%
Chorus	60%	25%	10%	5%
Bridge	20%	25%	30%	25%
Pre-chorus	Gradient between Bridge and Chorus			

LA (6) as Emotional Wildcard

- Over major chords: floaty, dreamy, bittersweet
- Over minor chords: brighter, more open
- Context-dependent — can serve either tension or release

8-Step Melody Audit

1. First note — what zone?
2. Last note — resolved or open?
3. Highest note — intentional peak?
4. Longest note — right zone for the moment?
5. Beat 1 notes throughout — serving the harmony?
6. Zone distribution by section — match target ratios?

7. Tension arcs — do phrases build and release?
8. Chord-Change Behaviors — are changes doing anything melodically interesting?

Timed Mastery Benchmarks

- Name a note's zone over a static chord: <3 seconds
- Track zone shifts as chords move: real-time (no delay)
- Map zones of an 8-bar melody by ear: <30 seconds

Harmony Chamber

Source: Original AMF + classical theory + Plogger Ch.19–24.

⚠️ Reminder

ii-V-I is a DRILL VEHICLE, not the harmonic spine. The full 12+2 progression set is the harmonic spine. Never let any sprint collapse into ii-V-I focus.

The 12+2 Core Progressions Spine

Diatonic (9)

#	Progression	Character	Sprint
1	I-IV-V-I	Fundamental cadence — universal	Sprint 2
2	I-V-vi-IV	“Four chord song” — pop universal	Sprint 2
3	12-Bar Blues	Blues — tension arc	Sprint 3
4	ii-V-I	Jazz fundamental	Sprint 4
5	I-vi-IV-V	“50s progression”	Sprint 4
6	vi-IV-I-V	Minor-feels-major	Sprint 5
7	I-IV-I-V	Gospel/soul	Sprint 5
8	Modal Vamp	Static mode groove (Dorian, Mixolydian)	Sprint 6

#	Progression	Character	Sprint
9	Circle of Fifths descent	Full diatonic cycle	Sprint 6

Non-Diatonic (3)

#	Progression	Character	Sprint
10	i-IV-i-V (harmonic minor)	Raised ♃ → major IV in minor	Sprint 7
11	Andalusian Cadence: i-♭VII-♭VI-V	Phrygian flavor, Spanish	Sprint 7
12	Minor ii-V-i (ø7 - V7alt - i)	Jazz minor	Sprint 8

Classical Additions (2)

#	Progression	Character	Sprint
13	Classical cadence with voice leading	Strict 4-part I-IV-V-I	Sprint 9
14	Neapolitan/♭II: I-♭II-V-I	Chromatic surprise, Romantic	Sprint 9

Non-Diatonic Note Callout

Non-Diatonic Note

Whenever a non-diatonic note or progression appears: identify what it is, explain why it sounds that way in di-chord terms (which di-chord number changes), and connect it to the Heptachord Shift concept from Ch.24. Non-diatonic notes borrow from parallel modes or alter existing scale degrees — the di-chord number shifts accordingly.

Four-Dimension Framework

Every harmonic moment has 4 dimensions:

1. **Root motion** — bass movement (step, leap, fifth, chromatic)
2. **Chord quality** — via di-chords (major `[4][3]`, minor `[3][4]`, dom7 `[4][3][3]`, etc.)
3. **Voicing** — which notes, which register, which hand
4. **Rhythm** — when the change occurs (harmonic rhythm)

Harmonic Rhythm

How often chords change = primary driver of energy. Fast harmonic rhythm = propulsion, urgency. Slow harmonic rhythm = spaciousness, groove. Harmonic rhythm is an independent compositional parameter — separate from melody rhythm and drum groove.

Voicings Chamber

Source: Original AMF + Plogger Ch.20–22 + piano/guitar technique research. Secondary: The Beato Book 2.3.

Core Voicing Principles

- **Voice leading:** smallest possible interval movement between chord changes
- **Common tones:** hold shared notes in place across chord changes
- **Open vs. closed:** open/spread voicings = larger intervals, orchestral feel; closed/within-octave = dense, intimate
- **Register:** bass voice below middle C; melody always in highest voice

Voicing Types

Type	Description	Instrument	Sprint	Beato Reference
Root position triads	1-3-5	Both	Sprint 1	—
Triad inversions	1st and 2nd inversion	Both	Sprint 1	—
Triad shapes by stringset	All inversions, all 4 stringsets	Guitar	Sprint 4	pp.93–100
Shell voicings	Root + 3rd + 7th (no 5th)	Piano	Sprint 6	—
Drop-2 voicings	2nd voice from top dropped an octave	Piano/ Guitar	Sprint 7	pp.101–115
	Stacked perfect fourths, 3 voices	Guitar	Sprint 8	pp.215–219

Type	Description	Instrument	Sprint	Beato Reference
Quartal voicings (3-part)				
Open voicings	Root in bass, spread across register	Both	Sprint 8	—
Rootless voicings Type A	3-5-7-9	Piano	Sprint 10	—
Rootless voicings Type B	7-9-3-5	Piano	Sprint 10	—
Extended voicings	Add 9ths, 11ths, 13ths	Both	Sprint 11	pp.268–271

Guitar-Specific: CAGED System

All major chords expressed in 5 shapes (C, A, G, E, D forms) across the neck. CAGED + triad inversions on all string sets = complete guitar voicing vocabulary. Each CAGED position interlocks with adjacent positions — mastering the connection points is the key skill.

Di-Chord Analysis of Voicings

Every voicing is a stack of di-chords. Closed voicings with [1] [2] intervals = dissonant/tense. Spread voicings with [4] [7] intervals = open/balanced. Inversions shift which di-chords occupy the primary (lowest) register, changing the overall color even though the chord label is identical.

Rhythm Chamber

Source: The Rhythm Code by Tamas Bodzsar + Plogger Longy Rhythms (Ch.4).

Fundamental Principle

Rhythm = starting points, NOT duration values.

The Rhythm Code teaches rhythm as a map of when notes start — not how long they last. Duration emerges from the next starting point. This reframe unlocks groove immediately.

Binary Grid

8 positions per measure in 4/4. Each position corresponds to: Beat 1, and-of-1, Beat 2, and-of-2, Beat 3, and-of-3, Beat 4, and-of-4. Positions are numbered 1–8. All rhythmic decisions are choosing which positions to activate.

Stops = Landing Points

The last note before a rest is a **stop**. Stops are the most important notes rhythmically — they define the rhythmic shape of a phrase. Where you land matters more than where you start.

Anticipations

- **Regular anticipation:** note starts 1/8th note early (anticipates the beat)
- **Quarter-note anticipation:** note starts 1/4 note early — ONLY valid from Beat 4

Son Clave

5-note, 2-measure rhythmic pattern. The rhythmic backbone of Afro-Cuban and much contemporary groove music. Two orientations:

- **3-2 orientation:** 3 notes in bar 1, 2 notes in bar 2
- **2-3 orientation:** 2 notes in bar 1, 3 notes in bar 2

Rhythm Code Map

16-position guide (2 measures × 8 positions). Positions are classified as Strong (safe landing/start points), Medium (usable with care), or Avoid (rhythmically awkward without specific intent). The map guides groove decisions before any notation is involved.

4-Step Groove Development

1. **Start boring** — quarter notes only, all 4 beats
2. **Add anticipations** — shift selected notes 1/8 early
3. **Add stops** — insert rests to create landing shapes

4. **Sync with clave** — align groove pattern to son clave skeleton

Longy + Rhythm Code Integration

Longy Rhythms (Plogger Ch.4) = notation level: “what rhythm is this?” — reading, speaking, and clapping rhythmic patterns from notation. Rhythm Code = groove level: “does it feel good?” — the starting-point map, anticipations, stops, clave. Both are present from Sprint 1 in separate roles and reinforce each other as fluency builds.

The Synthesizer

The Synthesizer is where the four chambers combine into complete musical events. It is not a fifth chamber — it is the integration layer where Melody + Harmony + Voicings + Rhythm operate simultaneously.

Cross-Chamber Work Types

- **Melody + Harmony:** zone tracking through chord changes — same melody note, different zone as chord moves beneath it
- **Voicings + Melody:** voicing choices that support, contrast, or frame the melody voice
- **Rhythm + Harmony:** groove patterns vs. harmonic rhythm — do they align or create polyrhythmic tension?
- **All Four:** complete arrangements where all chambers are active and responsive to each other

The “Framework Disappears” Goal

Ultimate Destination

The learner no longer thinks in terms of chambers or systems. They just make music. The framework has been internalized so thoroughly it becomes invisible. Explicitly stated as the system goal in the final Synthesizer chapters.

Classical Intuition Thread

Running through Synthesizer chapters. Builds toward classical harmonic sensibility integrated into personal style. The goal is not “learn classical” but integrate classical harmonic thinking into fluid improvisation.

Listening references:

- **Piano:** Chilly Gonzales, Brad Mehldau (After Bach), Tigran Hamasyan, Nils Frahm, Víkingur Ólafsson
- **Guitar:** Sergio Assad, Andy McKee

12-Sprint Map

User Profile

Dimension	Guitar	Piano	Theory
Level	Returning Intermediate	Advanced Beginner	Intermediate knowledge
Background	Played heavily in high school, 20-year gap	Some playing, knows inversions + voice economy	“Knows more than he can execute”
Strengths	Fretboard knowledge, barre chords, chord theory	Already applies voice economy, knows inversions	Knows modes, diatonic harmony, intervals
Needs	Rebuild muscle memory, fluency, Travis picking	Build technique foundation, LH independence	Reframe in Plogger language

12-Sprint Anchor Song Map

Sprint	Month	Anchor Song	Artist	Key/Mode	Primary Chord Color
1	1	Ain't No Sunshine	Bill Withers	A minor	i-IV-i (minor feel)
2	2	Autumn Leaves	Jazz standard	G major / E minor	ii-V-I + minor ii-V-i

Sprint	Month	Anchor Song	Artist	Key/Mode	Primary Chord Color
3	3	The Girl from Ipanema	Jobim	F major	Ionian + chromatic shifts
4	4	Superstition	Stevie Wonder	Eb Dorian	Modal vamp, Dorian
5	5	What's Going On	Marvin Gaye	Eb major	Modal soul
6	6	Hallelujah	Leonard Cohen	C major	I-V-vi-IV, gospel
7	7	Summertime	Gershwin	B minor / D major	Dorian + harmonic minor
8	8	My Funny Valentine	Rodgers & Hart	C minor	Chromatic descending bass
9	9	Just the Two of Us	Withers/ Washington	B major	ii-V-I jazz-pop hybrid
10	10	Watermelon Man	Herbie Hancock	F	Blues + Mixolydian
11	11	Blackbird	The Beatles	G major	Fingerpicking, chromatic
12	12	I Will Always Love You	Houston/Parton	Ab major	I-IV-V power ballad

Plogger Chapter Progression by Sprint

Sprint	Plogger Chapters	Key New Concept
1	Ch.1, Ch.2, Ch.3 (start)	Three Stages, Three Causes, Keyboard Viz intro
2	Ch.3 (complete), Ch.4	Keyboard Viz mastery, Longy Rhythms full
3	Ch.5, Ch.6	Lap Map, Pythagorean Ordering
4	Ch.7, Ch.8, Ch.9 (start)	Interval Spelling, Di-Chord Numbers intro
5	Ch.9 (complete), Ch.10, Ch.11	Di-Chord system complete, Pulsation
6	Ch.12, Ch.13, Ch.14	F/O Factor, Harmonicity, Di-Chord Review
7	Ch.15, Ch.16 (Steps 1–3)	Melodic Gestures, Tracking Page intro

Sprint	Plogger Chapters	Key New Concept
8	Ch.17, Ch.18, Ch.16 (Steps 4–5)	Tri-Chords, Tetrachords, Tracking Page deep
9	Ch.19, Ch.20	Diatonic Modes, Heptachord Formation
10	Ch.21, Ch.22	Triads+Inversions, Four 7th Chords
11	Ch.23, Ch.24, Ch.16 (all 7 steps)	Scale Degree Harmonization, Heptachord Shift
12	Ch.25, Full Review	Transposition, Complete Tracking Page

Milestone Checkpoints

Month 1

- Play “Ain't No Sunshine” on both instruments
- Instantly name major vs. minor quality by ear ([4] vs [3])
- Know all Keyboard Visualization landmarks
- Understand Three Stages and Three Causes

Month 3

- Play first 3 anchor songs comfortably on both instruments
- Name any di-chord [1]–[7] by ear
- Improvise over A minor pentatonic on both instruments
- Lap Map fluent (any tetrachord from any note)

Month 6

- Play first 6 anchor songs from memory
- Identify all 11 di-chords by ear
- Shell voicing ii-V-I in 5 keys (piano)
- Travis picking at 80 BPM on 4-chord loop (guitar)
- Tracking Page Steps 1–2 fluent at 120+ BPM

Month 12

- All 12 anchor songs from memory at tempo in front of someone without stopping
- Identify Heptachord Shifts in real music
- Improvise over any of 12 core progressions on both instruments
- Tracking Page all 7 steps at 144/72 BPM
- Name any scale degree's di-chord profile instantly in any mode

Three Definitions of Done

Definition	Criteria
Mastery	9/10 correct, no hesitation, at target speed (144 BPM melody / 72 BPM chords)
Progressive	Measurable improvement from start to end of sprint
Performance Ready	Complete song from memory, at tempo, in front of someone, without stopping

Guitar Technique

User Level: Returning Intermediate. Sprint 1 = reconnection and rebuilding, NOT basics. Expect Reaction errors (fluency lost, not knowledge lost). Muscle memory returns faster than for a true beginner.

Core Guitar Technical Principles

- Thumb independence must be automatic before fingers are added
- **Right-hand position:** sweet spot = 1” behind sound hole (toward bridge = bright/percussive, toward neck = warm/dark)
- **Tone production:** on acoustic every nuance matters — right-hand position, nail/flesh ratio, angle all contribute
- Chord transitions always timed to metronome — never stop to “get it right”
- **Nail/flesh ratio:** 60/40 nail-to-flesh = all-purpose tone
- **Barre chords:** roll index to bony side, thumb behind middle finger

Technical Progression by Sprint

Sprints 1–3 (Reconnection)

- Posture reset, open chord shapes
- Alternating bass (thumb on strings 4–5–6 only)
- Basic fingerpicking p-i-m, p-i-m-a arpeggio
- Reactivating barre chords E/A-form at 50 BPM
- Tone production awareness
- A minor pentatonic box 1
- Strumming D-DU-UDU

Sprints 4–6 (Intermediate)

- Travis picking: Stage 1 (thumb only) → Stage 2 (add index beats 2+4) → Stage 3 (full syncopated treble)
- CAGED system (all 5 positions G major, then A major)
- Barre chord fluency all 12 keys
- Chord inversions — triads on strings 1-2-3
- Legato hammer-ons/pull-offs
- Connect 5 pentatonic boxes
- Strumming dynamics — right-hand control only

Sprints 7–9 (Intermediate-Advanced)

- Travis picking melodic variations
- CAGED fluent in 6+ keys
- Voice-leading between chord shapes
- Chord melody
- 3-notes-per-string scales
- Hybrid picking
- Fingerstyle arrangement building

- Crosspicking introduction

Sprints 10–12 (Integration)

- Sight-reading
- CAGED all 12 keys
- Full solo arrangement building
- Improvisation vocabulary development
- Fretboard mastery — all notes, all strings

Essential Guitar Exercise Types

Exercise Type	What It Trains
Alternating bass only (no fingers)	Thumb independence
p-i-m-a arpeggio on 4-chord loop	Fingerpicking coordination
Chord transitions timed to metronome	Muscle memory, tempo
Di-chord naming while playing chord	Plogger integration
CAGED shape navigation	Fretboard fluency
Sing root before playing chord change	Audiation/ear training
Improv prompt over anchor song vamp	Creative + technical integration

Piano Technique

User Level: Advanced Beginner. Already knows chord shapes, inversions, voice economy. Needs: technique foundation, LH independence, scale/heptachord fluency at speed.

Core Piano Technical Principles

- No Hanon — heptachord conjunct formation replaces it
- Tension check every session (wrists free, shoulders dropped, arms loose)

- Scales via Plogger conjunct arrangement (not traditional fingering)
- LH and RH separately when learning anything new
- Sing every note during heptachord practice
- Legato pedaling (not direct): play note → immediately depress pedal → release with each harmony change
- Improvisation from Sprint 2, not Sprint 9

Technical Progression by Sprint

Sprints 1–3 (Foundation)

- Hand position setup
- Conjunct heptachord formation — A minor and C major first
- Di-chord to finger mapping
- Chord transitions Am-Dm-E7 / C-F-G using inversions
- LH patterns: single bass → blocked chords → simple Alberti (root-5th-3rd-5th)
- Two-hand coordination
- Ear training at keyboard
- Improvisation Stage 1: chord tone soloing over Am drone (from Sprint 2)

Sprints 4–6 (Early Intermediate)

- All 12 major heptachords conjunct both hands
- Harmonic and melodic minor in primary keys
- Arpeggios — major/minor triads all inversions in circle of 5ths outward
- Shell voicings ii-V-I in 5 keys
- Alberti bass under RH melody
- Legato pedaling
- Hand independence: LH quarters under RH eighths
- Tracking Page Steps 1–2 at keyboard

Sprints 7–9 (Intermediate)

- All 7 modes conjunct beginning in C and A
- All 7 modes in all 12 roots
- Arpeggios all chord types 2 octaves
- Shell voicings all 12 keys
- Walking bass
- Drop-2 voicings
- Bach Two-Part Inventions
- Tracking Page Steps 3–5
- Improvisation Stages 2–3: pentatonic → blues → mode-matched

Sprints 10–12 (Intermediate-Advanced)

- Rootless voicings Type A (3-5-7-9) and Type B (7-9-3-5)
- Stride bass (simplified: root on 1, chord on 2-3-4)
- Complex hand independence
- Burgmüller op.100 etudes (NO Hanon, NO Czerny)
- Sight-reading Grade 3–4
- Improvisation Stages 4–6: approach notes, enclosures, lick vocabulary all 12 keys
- Full song performance (one classical + one jazz standard)

Essential Piano Exercise Types

Exercise Type	What It Trains
Conjunct heptachord formation	Plogger + scale + finger mapping + ear
Chord transitions with inversions timed	Voice economy, muscle memory
LH pattern + RH chord simultaneously	Hand independence
Di-chord naming while playing chord	Plogger integration
Shell voicing ii-V-I	Harmonic realization

Exercise Type	What It Trains
Tracking Page steps	Real-time analysis fluency
Chord tone improv over drone	Audiation + improvisation
Sing each heptachord note before playing	Ear training + audiation

Adult Learner Specifics

- Motor pattern rewiring is harder than for children — isolation before combination always
- Tension accumulates faster — constant tension check especially during chord work
- Adults grasp “why” faster — always explain the musical reason behind each exercise
- Adults demotivate without visible progress — explicit milestone markers every sprint
- Hand independence is the biggest challenge — expect months 1–4 to feel awkward

Repertoire

20-Song Repertoire

#	Song	Artist	Key	Primary Harmony	Sprint
1	Ain't No Sunshine	Bill Withers	A minor	i-IV-i, harmonic minor feel	Sprint 1
2	Autumn Leaves	Jazz standard	G / E minor	ii-V-I + minor ii-V-i	Sprint 2
3	The Girl from Ipanema	Jobim	F major	Ionian + chromatic shifts	Sprint 3
4	Superstition	Stevie Wonder	Eb Dorian	Dorian modal vamp	Sprint 4
5	What's Going On	Marvin Gaye	Eb	Modal soul harmony	Sprint 5
6	Hallelujah	Leonard Cohen	C	I-V-vi-IV, gospel feel	Sprint 6
7	Summertime	Gershwin	B minor	Dorian + harmonic minor	Sprint 7

#	Song	Artist	Key	Primary Harmony	Sprint
8	My Funny Valentine	Rodgers & Hart	C minor	Chromatic descending bass	Sprint 8
9	Just the Two of Us	Withers/ Washington	B major	ii-V-I jazz-pop hybrid	Sprint 9
10	Watermelon Man	Herbie Hancock	F	Blues + Mixolydian	Sprint 10
11	Blackbird	The Beatles	G	Fingerpicking, chromatic bass	Sprint 11
12	I Will Always Love You	Houston/Parton	Ab	I-IV-V power ballad	Sprint 12
13	Under the Bridge	RHCP	E major	Lydian → various	Textbook Ch. 13
14	Don't Know Why	Norah Jones	Bb	Jazz-pop ii-V-I	Textbook Ch. 14
15	Feeling Good	Nina Simone	D minor	Modal minor	Textbook Ch. 15
16	Yesterday	The Beatles	F major	Non-diatonic chromatic	Textbook Ch. 16
17	High and Dry	Radiohead	A major	Indie harmonic language	Textbook Ch. 17
18	Fly Me to the Moon	Bart Howard	C	ii-V-I jazz standard	Textbook Ch. 18
19	Stand by Me	Ben E. King	A	I-vi-IV-V classic	Workshop
20	La Vie en Rose	Édith Piaf	C	French chanson, chromatic	Workshop

Oddball deep cuts for later exploration: Corcovado, Nature Boy, Mercy Street, Suzanne, Misty, Scarborough Fair, Lean on Me.

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