Music Theory For Sound Designers

Why Music Theory?

- 1. The right music is a ***powerful communicator***.
- 2. Supporting music for drama, game design, ambiance ***is not difficult*** to create if you understand a few basic musical relationships.
  - Fundamentals
    - Scale - Meter - Key
  - Cookbook strategies
    - Tension - Resolution - Simple Melodic Backgrounds
    - Simple repeatable building blocks
  - The right combination of notes
    - Happy notes - Sad notes - Tense notes

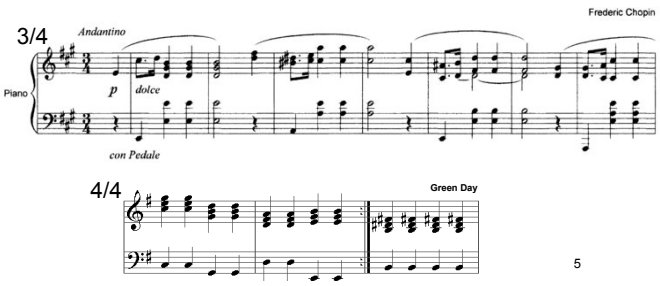
Why Music Theory?

- 3. Software such as loop editors and sequencers use basic musical structure, notation, and terminology for the GUIs.
  - Need a basic musical terminology to make the most of the tools
- 4. If more sophisticated music is required, as producer you need to communicate with musicians.

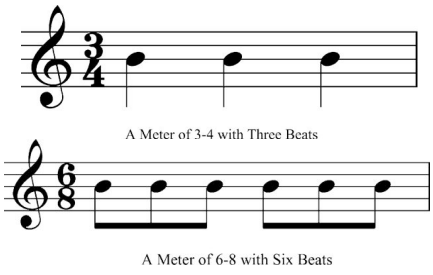
Beats and Meter

- Beats
  - Fundamental pulses at regular time interval
- Measure
  - A handy building block - usually about 1 to 4 seconds long
  - In pop music, something aspect of the music often repeats (with variations), like a basic drum or bass pattern
- Meter
  - Beats per some measure of time, or
  - How many beats/notes in a measure

- Measures are sometimes called ***bars***
  - Examples: blues and pop music
  - Probably based on the vertical bars in music notation.



Meter Notation



Tempo

Beats Per Minute (bpm) Tempo Notation

bpm

50

70

114

144

200+

Table 5-3. Italian and English tempo conversion chart

Tempo Marking	English Translation
Largo	Slowly and broadly
Larghetto	A little less slow than largo
Adagio	Slowly
Andante	At a walking pace
Moderato	At a moderate pace
Allegretto	Not quite allegro
Allegro	Quickly
Presto	Fast
Prestissimo	Very fast

Music Structure

- Traditional music has an underlying shape, which constitutes its ***form***.
  - Think of form as the way musical building blocks are ***arranged***.
  - Building blocks might be ***measures*** (short) or ***movements*** (long sections) or just ***verses*** and ***choruses***.
  - Classical music forms
    - "Ternary" ABA
    - "Arch" ABCBA

- Example: ***blues*** has several basic forms that are used over and over, based on measures, also called "bars"

- 8-bar blues A A B A C B A C
- 12-bar blues A A A A B B A A D C A C

- Most of *our* pop music is based on blues forms.

We Get Much of Our Western Harmonic Theory from Pythagoras

- Music harmony and practice could be said to derive from the work Pythagoras did on music and vibration.
- He reasoned music would be easiest to enjoy if it were based on straightforward mathematical ratios.
- We still use them today! Either he was right or we've simply gotten used to them.

The Math Behind Western Music

Table 5-6. Intervallic multipliers

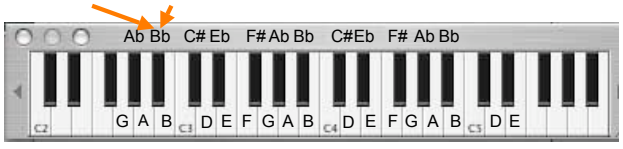
Interval Name	Frequency Multiplier
Unison	1.0000
Minor second	1.0595
Major second	1.1225
Minor third	1.1892
Major third	1.2599
Perfect fourth	1.3348
Tritone	1.4142
Perfect fifth	1.4983
Minor sixth	1.5874
Major sixth	1.6818
Minor seventh	1.7818
Major seventh	1.8897
Perfect octave	2.0000

Example	Hz
C	262
D	294
E	330
F	349
G	393
A	440
B	495
C	524

The original simpler ratios of Pythagoras have been "tempered" over the years, mostly to allow for tuning of instruments. And so the ratios are slightly different from his originals.

How many notes are possible?

- 12 and then we repeat (at 2xHz or 1/2xHz)
  - ***A Bb B C C# D Eb E F F# G Ab A***
- Looking at a piano keyboard, the sharps(#) and flats (b) are the black keys.
- Bb and A# would be the same note.

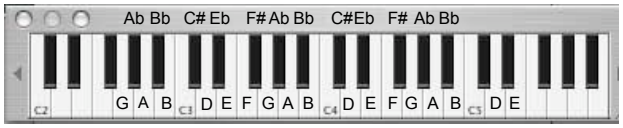


A Musical *Scale*

- For our purposes, think of a ***scale*** is a set of musical notes that ***sound good together***.
  - So if we stick to the notes of a particular scale, ***it will usually sound right***.
- C major scale: C D E F G A B C
  - Very common key
  - Falls on the white notes on a keyboard!
  - Easy for beginners to work with

Defining a Scale in Steps

- **"half step"** is the next key on a piano
  - A to Bb or Bb to B etc
- **"whole step"** skips a key on a piano
  - A to B or B to C# etc

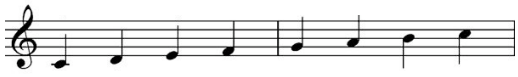


Sometimes a half-step is called a "semitone"

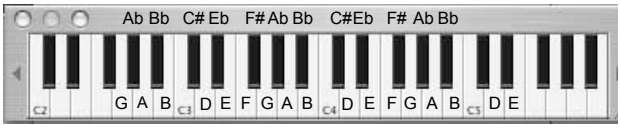
Scales and Emotions

- **Major scale-** ***steady, strong, happy***
  - First note, whole step, whole step, half step, whole step, whole step, whole step, half step
    - W W H W W W H
- **Minor scale-** ***darker, sadder, complex***
  - First note, whole step, half step, whole step, whole step, half step, whole step, whole step
    - W H W W H W W
- Useful information for sound designers

C major Scale Pattern

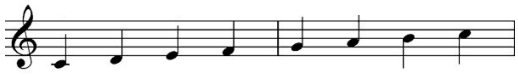


	C	D	E	F	G	A	B	C
Steps →	W	W	H	W	W	W	H	

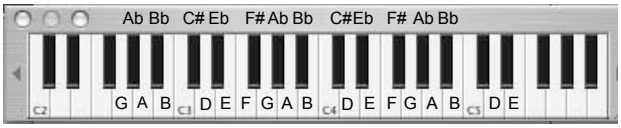


Break

C major Scale



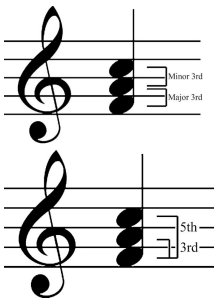
	C	D	E	F	G	A	B	C
Number of note in the scale →	1	2	3	4	5	6	7	8



Scale Degrees

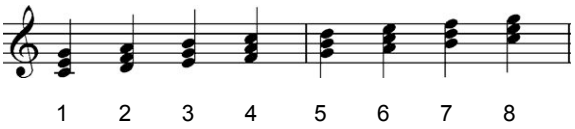
- Each note of a scale has a specific number applied to it.
- The first note is called ***one***, the second is called ***two*** or ***second***, and so on up to the ***octave***, which is number ***eight***.
  - (Sometimes 9th, 11th, 13th are specified too.)
- This is shortcut terminology when building harmonic and melodic formations. Sometimes we know the number of the note in the scale that we want, even if we don't know the key!

Chords and Their "Intervals*"



- Three or more notes sounding simultaneously is considered a chord.
- Major Chord
  - Root note
  - Note up four ½ steps*
  - Note up three more ½ steps*
- (F major shown)

Chord Scale (C major)

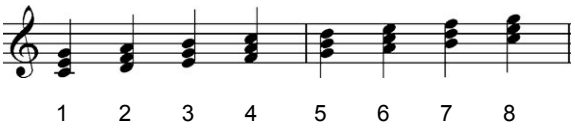


Each chord built of three notes:

Root note (one of the notes in the C major scale)
Second note four ½ steps up
Third note three ½ steps up from that

Assigning Numbers to a Chord Scale

(C major used for example)



We use these numbers as shorthand to:

- Refer to a particular chord in an arrangement
- To identify building blocks (the "form") of a production

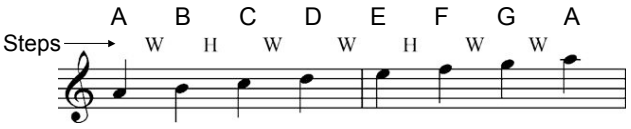
Example "12-bar Blues": 1 1 1 1 4 4 1 1 5 4 1 5

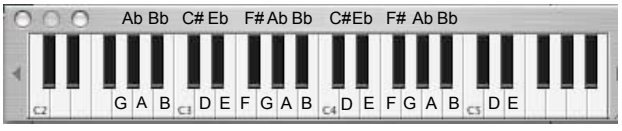
Note using numbers instead of notes means we can use the form to play the piece in any key! The starting chord might change, but the numbers would be the same in any key.

Break

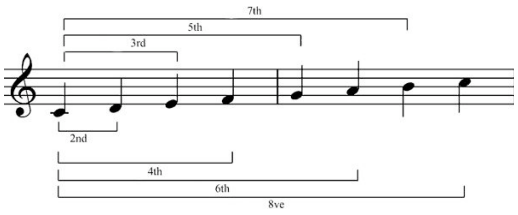
Minor Scale Pattern

- Steps W H W W H W W
- Example: *A Minor* (The easiest one to remember!)





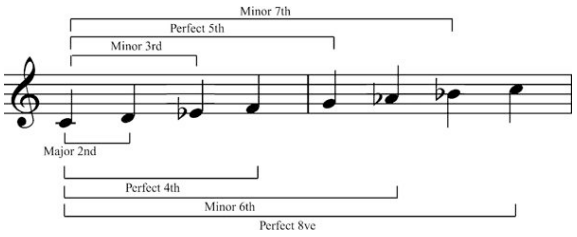
Scale Intervals (C major scale shown)



C D E F G A B C

W W H W W W H

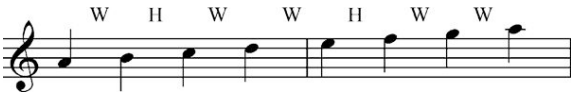
Scale Intervals (C minor scale shown)



C D Eb F G Ab Bb C

W H W W H W W

A minor

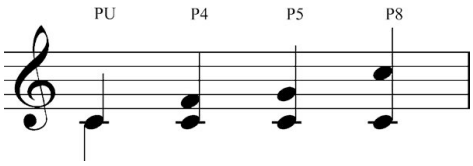


A B C D E F G A

W H W W H W W

Intervals

- Perfect intervals with C



Intervals

- All Intervals

Table 5-5. Interval names and equivalents

Interval Name	Half Steps Required to Create the Interval
Perfect unison	0
Minor second	1
Major second	2
Minor third	3
Major third	4
Perfect fourth	5
Tritone/diminished fifth/augmented fourth	6
Perfect fifth	7
Minor sixth	8
Major sixth	9
Minor seventh	10
Major seventh	11
Perfect octave	12

Consonant and Dissonant Intervals

- Associated with western (European) music. *(and therefore, our usual audience)*
- Consonant intervals are ***comfortable.***
- Dissonant intervals cause ***tension*** and desire to be resolved to consonant intervals.

Typical Sound Track **Interval** Strategies

Start with **two notes**

Octave	Purity, peace, unity
Fifth	Harmony, obvious change
Fourth	Harmony, gentle change
Third	Harmony, interest
Flatted Third	Darker, sad
Second	Tension
Flatted Second	Discord, real problems Uncomfortable

- *Useful information for sound designers!*

Using frequency equivalents and Multiplier Ratios for Non-Musical Sounds

- When combining sounds in a sound track, the frequencies associated with the rest of the sound track need to be considered.
  - Example: We can find the average frequency of a kitchen blender in a restaurant and match a second machine to it in a perfect 5th, to give the impression everything is "running harmoniously."
  - Also, we generally avoid placing multiple sounds, with the same average frequencies, in the same location in the sound field. They tend to mask each other.

Frequency Multipliers

Table 5-6. Intervallic multipliers

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Unison	1.0000
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Minor sixth	1.5874
Major sixth	1.6818
Minor seventh	1.7818
Major seventh	1.8897
Perfect octave	2.0000

Other Ways Musical Notes Can Support Communication

- Low Tones - heavier, more important
- Rising Tones - about to happen
- 3/4 Time - graceful
- Resolving - tension is over
  - Resolving - ending on the home chord
  - Resolving - from a suspended chord
    - From CFG to CEG
  - Resolving - from an augmented chord
    - From CEG# to CEG

Transposing Keys

- Use the software tools to move from C to any other major key.
  - Example in Tracktion
    - Select notes in the sequencer editor
    - Choose transpose from the options at bottom
    - A "semitone" is a half-step
    - So 2 semitones would move the key from C to D
    - 2 more semitones would move the key from D to E
    - 5 semitones would move the key from C to F
    - 7 semitones would move the key from C to G

End

(General music information is included on the following slides.)

Rhythm

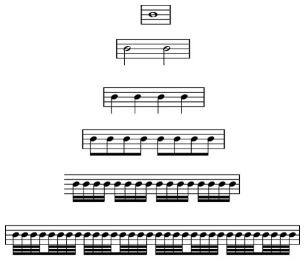
- Common Meaning
  - Reoccurring beat pattern (may include contrasts)
- Formal Meaning
  - How whole notes are divided up in a measure

- The rhythm is usually clear to the listener with a little practice.

Rhythm Patterns in Pop Music

- Usually last for some multiple of **four** measures
- For example, the ***verse*** and ***chorus*** parts of a popular song often last for 16 or 32 measures each.

Rhythm Notation



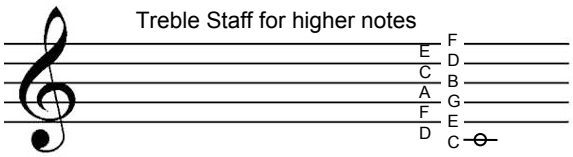
Rhythmic Breakdown of a Whole Note

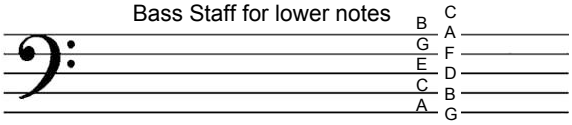
- The variation of duration of sounds or other events over time.

Dynamics Notation

Table 5-2. Italian and English dynamic conversion chart.

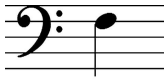
Dynamic Marking	Italian Word	English Translation
ppp	Pianississimo	Very, very soft
pp	Pianissimo	Very soft
p	Piano	Soft
mp	Mezzo piano	Medium soft
mf	Mezzo forte	Medium loud
f	Forte	Loud
ff	Fortissimo	Very loud
fff	Fortississimo	Very, very loud





Clefs

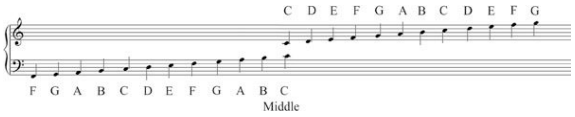
G line is marked by the ***treble clef*** icon



F line is marked by the ***bass clef*** icon

Grand Stave or Staff

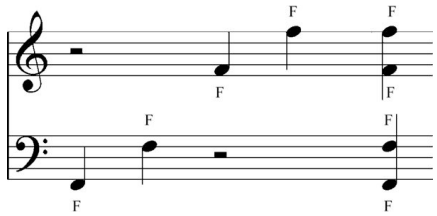
- Contains the treble and bass clefs
- Also called the “keyboard” stave



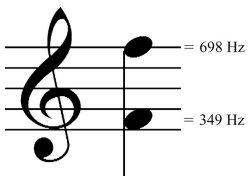
Notes are named ABCDEFG and then repeat

The Octave

- A musical interval that is produced by doubling the frequency of the lower pitch.

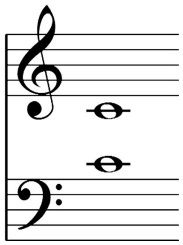


Frequency Equivalents



- Every pitch can be equated to a specific frequency.
- This frequency is considered an equivalent to the pitch.
- Very important when designing a sound track around music or dialogue.
- (**F**s an octave apart)

Between the treble and bass clef: Middle C



- Middle C can be indicated by one ledger line (—) below the treble stave or one ledger line above the bass clef stave. (The same note!)
- Ledger lines are used for notes that are above or below either stave.

Chord Scale (C major)