Introduction to Music Theory

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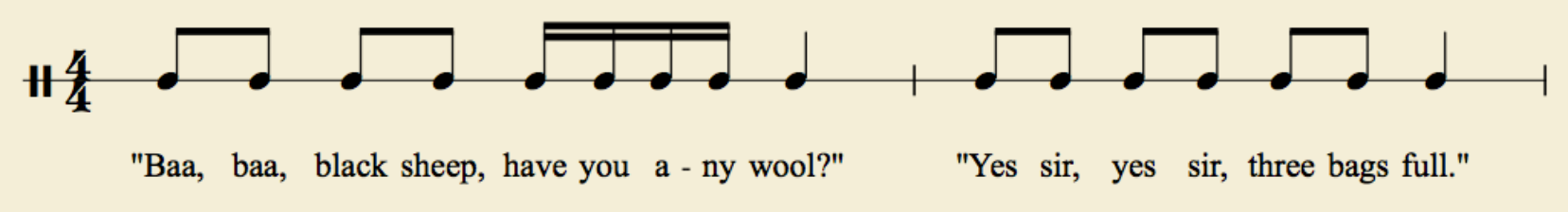
http://qums.org.au

Rhythm: a simple example



Rhythm: Western Notation

- Establish a beat at some arbitrary *'tempo'*, then define rhythms relative to that beat

- We usually will **group** the beat into repeated sets: *'bars'* or *'measures'*
- Subtle **emphasis** means we feel the pattern: ***one*** *two three four*

- Rhythmic interest comes from variation within the context of the beat
- The simplest variations: d o u b l i n g and halving

Rhythm: Modern Western Symbols

Each row down the table, the note duration halves.
So 32 semiquavers equal one breve.

breve	
semibreve	
minim	
crotchet	
quaver	
semiquaver	

Rhythm: time signatures

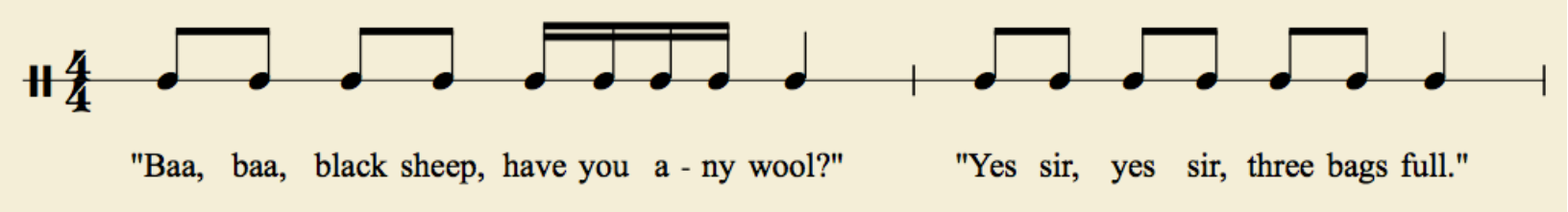
Time signatures are a bit like a fraction:

- Top number: how many beats per bar?
- Bottom number: just which note duration is a beat, anyway?

Note name	Symbol	Time Signature 'denominator'
semibreve		1
minim		2
crotchet		4
quaver		8
semiquaver		16

Common Time Signatures	Usual emphasis pattern
2/2	
2/4	
3/4	
4/4	
6/8	
7/8	

Rhythm: a simple example



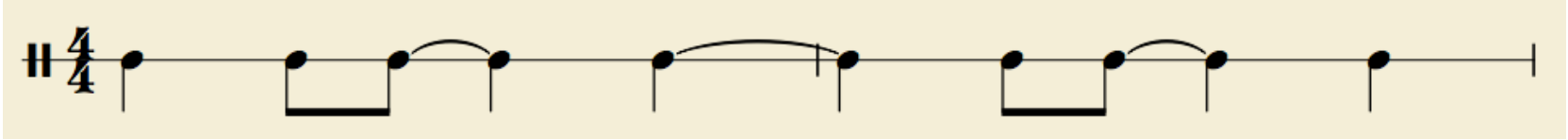
A few more bits of notation:

- *'bar lines'* (separate bars)
- *'beams'* (join quavers and/or semiquavers together by the tail)
- *'neutral clef'* (the 𝄡 at the start; indicates *no pitched melody*)
- *'staff line'* (the continuous horizontal line)

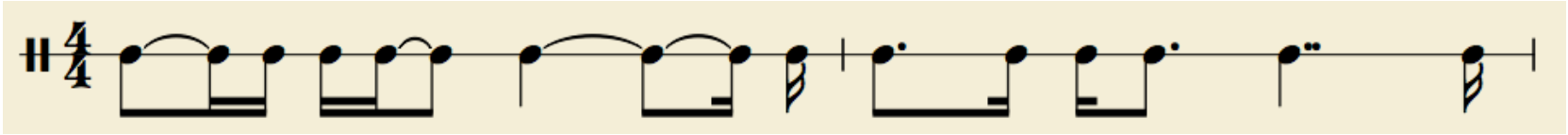
Now you know what every bit means!

Rhythm: more complexity

- *'Stems'* can also point downwards, by the way
- *'Ties'* let us combine multiple (sequential) notes, even going across barlines!



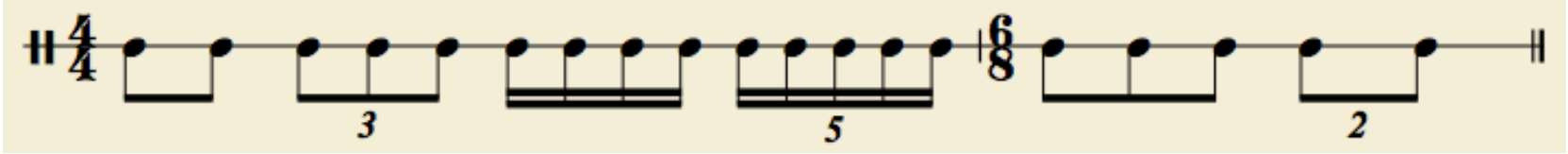
- *'Dots'* indicate +50% to the duration of a note. You can even have two dots, for +75%. Both bars below sound identical:



Rhythm: even more complexity

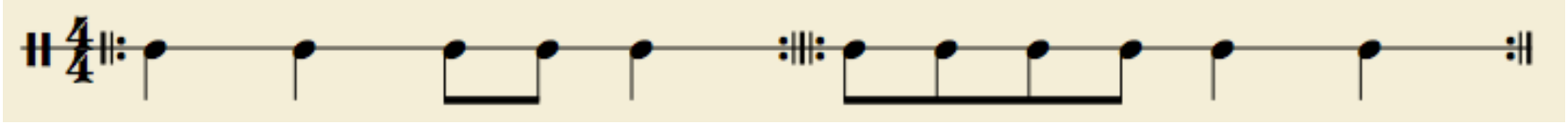
Tuplets

- Because just halving gets boring occasionally
- Usually a *triplet*, but higher numbers possible, or *duplets* when the default division is into three



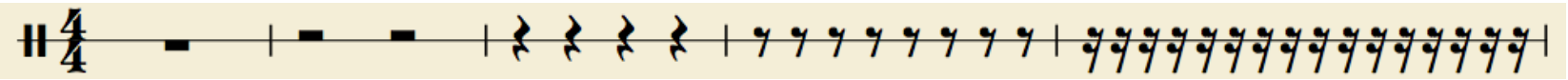
Repeats

- Notational convenience to say ‘do that again’
- A special type of barline.
- Like parentheses: one at the start, one at the end



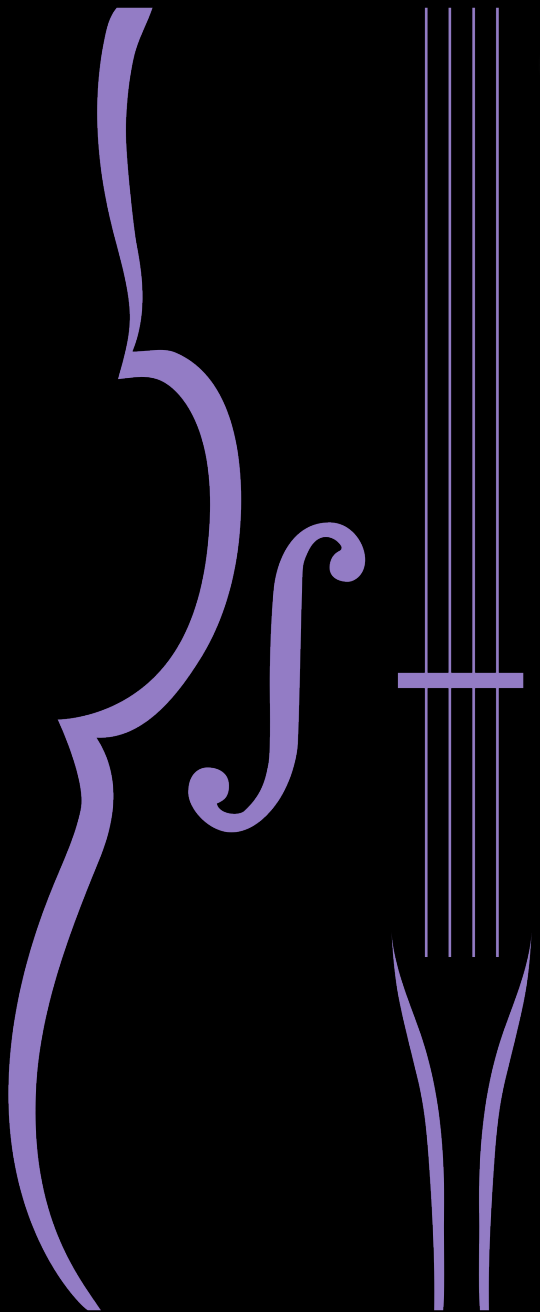
Rhythm: having a rest

- Sometimes, you're not playing or singing!
- This is called a *'rest'*
- Sometimes a rest might only last for a short time, just the length of what would be a note
- Each duration of rest has its own symbol:



semibreve, minim x2, crotchet x4, quaver x8, semiquaver x16

Commercial Interlude...



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Waves upon waves

- Sound waves are just varying pressure in air
- Pressure waves varying at constant *frequency* are heard as a continuous *tone*
- Physical instruments (e.g. voice, cello, flute) produce not just a pure sine wave (at the *'fundamental frequency'*), but a set of *'harmonic overtones'*
- *Overtone:* another sine wave, with its frequency at an integer multiple of the *fundamental* (and much-reduced amplitude)

Pitch on the brain

- Your brain knows an ideal harmonic series
- So, you recognise each note as a single note, with a *'pitch'* at its fundamental frequency…
- And with a certain character (*'timbre'*), because each instrument's overtones are **consistently** distorted compared to the ideal
- Notes with frequency ratios that are exact multiples of two sound **very** similar
- This is probably because of constrained resources – every neuron **could** be doing something else!
- Only have pitch recognisers for a certain frequency range, all others get doubled/halved
- This means you perceive pitches logarithmically: each doubling is the same 'distance'.

Sweet Harmony

- Those ideal harmonic series sound really pure
- Practical instruments have fairly consistent distortions to the harmonic series → less pure
- Two simultaneous pitches whose fundamentals **are** harmonic-series-related will have that same relation all the way along their harmonic series, even if the individual series themselves are distorted!

The ‘major triad’ from overtones

- So let’s try some harmonic-series-related notes. We’ll halve frequencies to keep it all in one doubling-range, and we’ll skip over even harmonics, because they’re ‘the same’
- {1, 3, 5} becomes {1, 5/4, 3/2}
- Play them together and it sounds vaguely happy.

Filling out the major scale

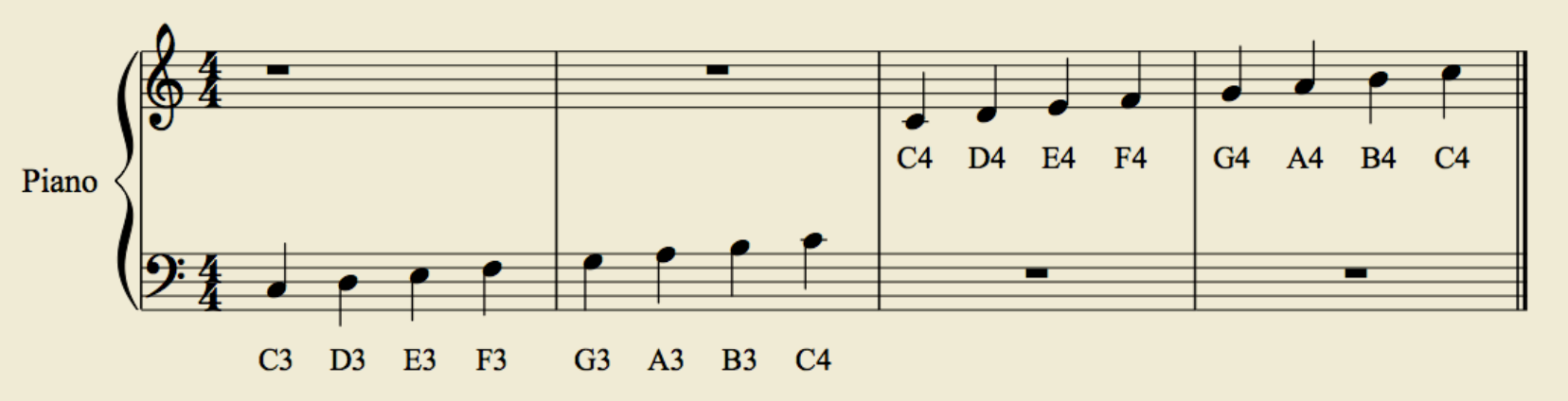
- That pitch at the 3/2 harmonic seems OK. What happens if we build another triad with it as the base?
  - {3/2, 9/2, 15/2} becomes {9/8, 3/2, 15/8}
- And what if we went **down** by 3/2, so that the new pitch had our original as its 3/2?
  - {2/3, 1, 10/3} becomes {1, 4/3, 5/3}
- Seven pitches, and then the eighth note is the 'doubling': the *'octave'*
- Note the 'gaps' (ratios from one note to the next): *big-big-**small**, big-big-big-**small***

Decimals	1.00	1.13	1.25	1.33	1.50	1.67	1.88	2.00
Ratios		*1.13*	*1.11*	***1.07***	*1.13*	*1.11*	*1.13*	***1.07***

Notation: Letters and Numbers

- We use the letters *A* through *G* for the seven basic notes, with an optional number to say which octave it's in.
- However, for weird historical reasons, a piano is laid out such that the ***C*** scale is the default.
- This propogates through to everything else
- We talk about *'intervals'* between notes: e.g. A to A (itself) is *'unison'*, C to D is a *'second'*, G to E is a *'sixth'*. Just count up, starting at 1. The octave is therefore the *'eighth'*.
- We often refer to notes by their interval to the 'first' note – this is called a *'scale degree'.* Use Roman numerals for this.

Notation: Staves & Clefs



- Pitched music is organised into five-line staves. Each line or space represents a pitch.
- Each staff can only represent about 11 notes…
- *Ledger lines* let us go off the staff
- *Clefs* let us use multiple staffs covering different ranges
- Here we have *treble* (upper) and *bass* (lower) clefs
- Treble is focused on G4; bass on F3
- The two *C4s* in the middle are the same pitch – Middle C!

Filling in the gaps

- Remember how two ‘gaps’ were only about half the size of the other five?
- That sounded OK, but what if we want to start at a different pitch? If we use the exact same set of frequencies, it will sound weird, because the big and small ‘gaps’ will be in a different order.
- Some instruments (e.g. pianos) can’t be retuned easily!
- What if we had **twelve** distinct pitches, dividing the octave by thirteen small (& evenly spaced) gaps?

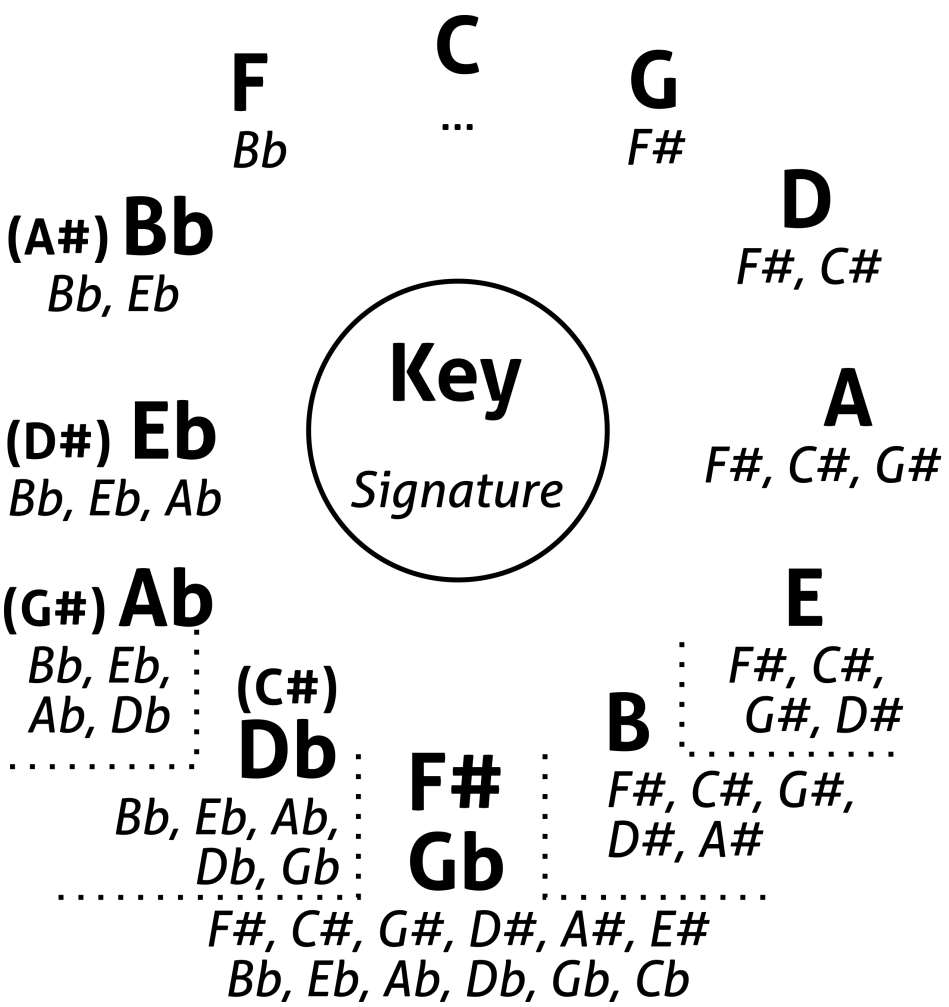
C ***(B,#)*** ***261.6***	**C#** **Db** **277.2**	**D** **293.7**	**D#** **Eb** **311.1**	**E** **(Fb)** **329.6**	**F** **(E#)** **349.2**	**F#** **Gb** **370.0**	**G** **392.0**	**G#** **Ab** **415.3**	**A** **440.0**	**A#** **Bb** **466.2**	**B** **(C’#)** **493.9**	***C’*** ***(B#)*** ***523.3***

Sharps, Flats and Naturals

- We'll almost always be using a seven-note scale, so we want to keep using the seven-letter system regardless of starting note
- We have 12 pitches available, but pick seven
- So, we will **adjust** our existing notes **up or down** by a **small-gap** if needed, to maintain our BBS-BBBS order from the start pitch (whatever it might be)
- A sharp (up) looks like a hashtag: ♯
- A flat (down) looks like a stylised 'b': ♭
- To cancel either, use a *'natural':* ♮
- Also, we actually call a big gap a *'tone'* and a small gap a *'semitone'.* You can even have quarter-tones!

Keys and The Circle of Fifths

- We can start our TTS-TTTS pattern at any of the 12 notes, and each needs a different set of sharps or flats – the 'key'
- This makes a really cool pattern:



- Each step around the circle is five letters: a *'fifth'*
- Each step, add another sharp or flat to the scale
- Clockwise: Sharpen the ***'7th'***
- Anti-clockwise: Flatten the ***'4th'***
- Can you see the patterns?

Major, Minor and Mode

- What if we **want** to start on a different pitch but keep the existing notes?
- This is called a *'mode'*; there's seven in total.
- In particular, starting on what would otherwise be the sixth scale degree gives a 'sad' sound, rather than 'happy'. The order of gaps is TS-TTS-TT.
- The key difference is that the third is now one semitone lower in pitch. The interval back to the root is smaller, so we call this a *'minor third'* and the normal version a *'major third'.* From there we get the 'major' and 'minor' scales.
- There are several types of minor scale, but all have a minor third

Melody

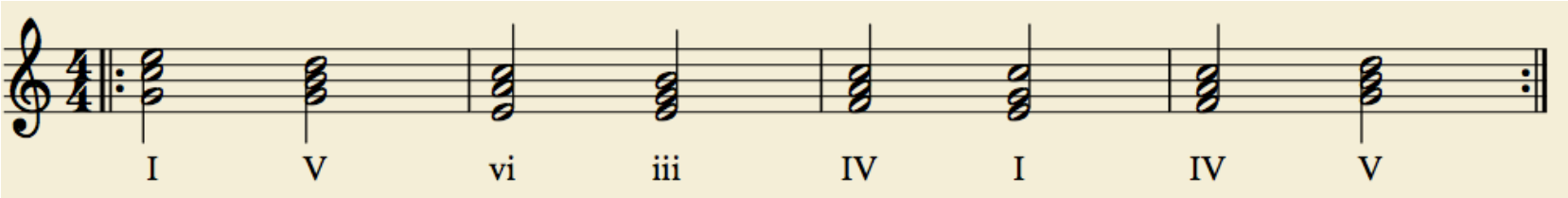
- “The bit that you sing”
- Instrumental melodies are often singable, too
- Proceed mostly with ‘steps’ (up/down a letter) and ‘skips’ (two)
- Occasionally ‘jump’, but not by more than an octave unless you know what you’re doing.

Chords

- 3 or more notes played together form a *'chord'*
- Most important note: the 'root' (which is distinct from the starting note of the scale). Referred to either by root's scale degree or its letter.
- Other notes within the chord are usually referred to by their interval to the root.
- Notes don't have to be played 'in ascending order'; the different orders are called *'inversions'*
- Many pop songs use just four chords:
  - **I** *(1^{st} , 3^{rd} , 5^{th}) 'tonic'*
  - **V** *(5^{th}, 7^{th}, $9^{th}=2^{nd}$) 'dominant'*
  - **IV** *(4^{th}, 6^{th}, $8^{th}=1^{st}$) 'subdominant'*
  - **vi** *(6^{th}, 8^{th}, $10^{th}=3^{rd}$) 'submediant';* equivalent to **i**

Chords, pt. 2

- Chords often come in *progressions*
- Often start or finish on the *tonic*
- Progress through related keys
- Example: Pachabel: **I, V, vi, iii, IV, I, IV, V**
- Use inversions wisely: keep pitches similar.

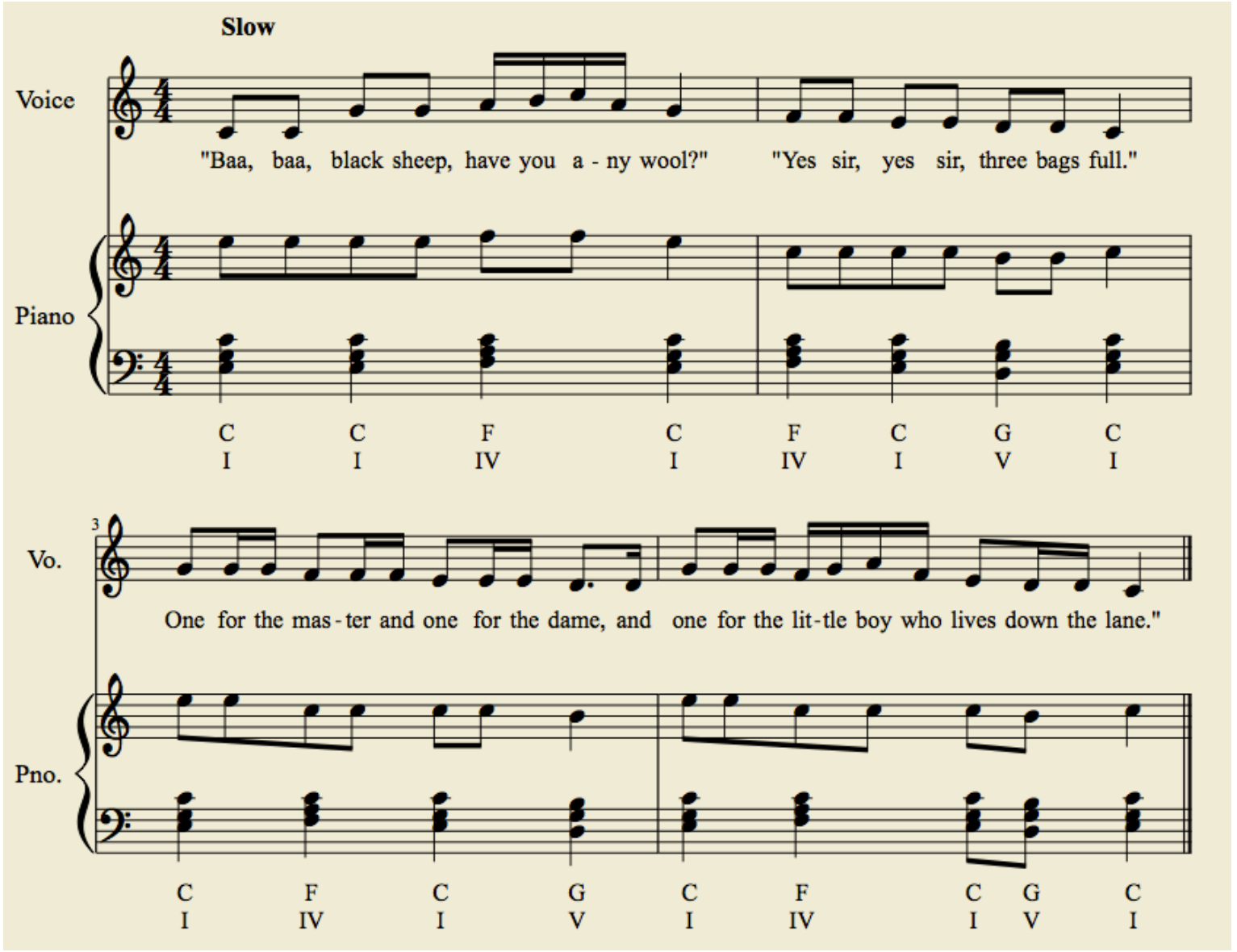


- *Cadences* are the 'final' chord transition. Strongest is **V** to **I** (or to **i**).

Melody and harmony

- Remember how some beats in a bar got more emphasis than others? On those beats, the melody will almost always be on a note from the current chord. Off beat doesn't have to be from chord.
- Similarly, the harmony line(s) will have *different* note(s) from the relevant chord – ideally each note is covered

Putting it all together



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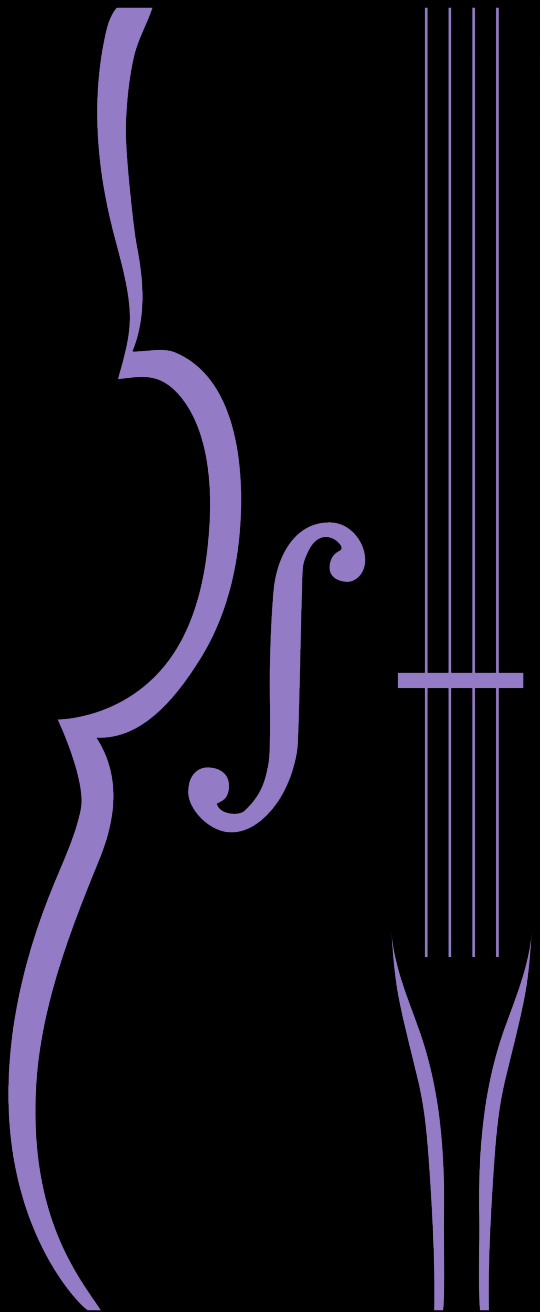

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