

## 3.3 Note Value Transformations

### 3.3.1 Dotted Notes



You can "dot" notes using the *Dot* block. A dotted note extends the rhythmic duration of a note by 50%. E.g., a dotted quarter note will play for  $\frac{3}{8}$  (i.e.  $\frac{1}{4} + \frac{1}{8}$ ) of a beat. A dotted eighth note will play for  $\frac{3}{16}$  (i.e.  $\frac{1}{8} + \frac{1}{16}$ ) of a beat. A double dot extends the duration by 75% (i.e. 50% + [50% of 50%]). For example, a double-dotted quarter note will play for  $\frac{7}{16}$  (i.e.  $\frac{1}{4} + \frac{1}{8} + \frac{1}{16}$ ) of a beat (which is the same as  $\frac{4}{16} + \frac{2}{16} + \frac{1}{16} = \frac{7}{16}$ ).

The dot block is useful as an expression of musical rhythm--it is convenient and helps to organize musical ideas (e.g. many melodies use dots as the basis of their rhythmic motifs), however you can achieve the same rhythmic result as dot by putting the calculation directly into note value as well. For example, indicating  $\frac{3}{8}$  instead of  $\frac{1}{4}$  will result in a dotted quarter note.

The chart below shows two common examples, dotted quarter and dotted eighth, and how to achieve them with either the dot block or by direct calculation into a note's note value.

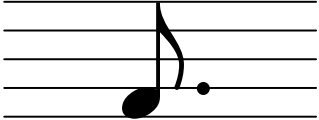
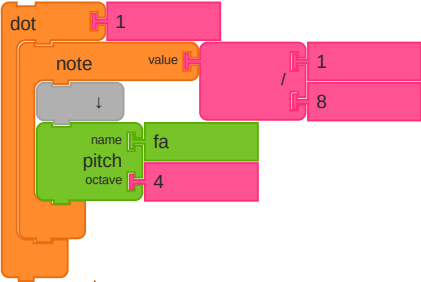
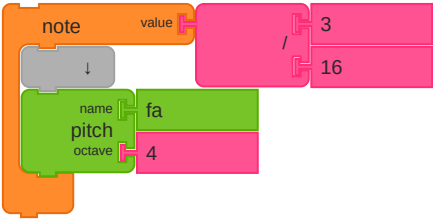
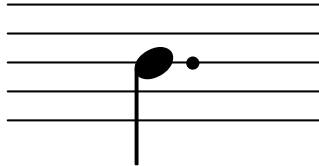
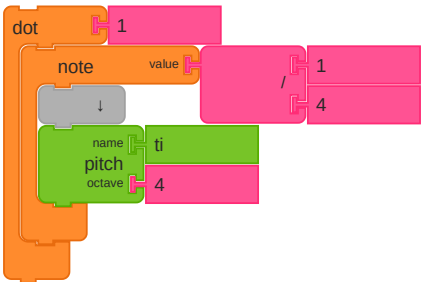
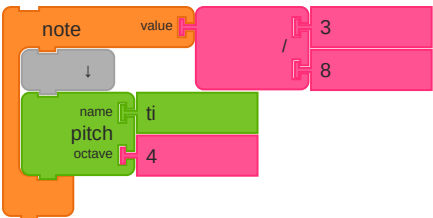
# Using Dotted Notes

The dot increases the value of a note by half of its value.

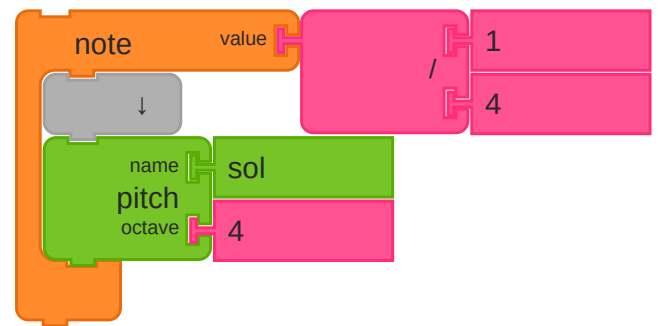
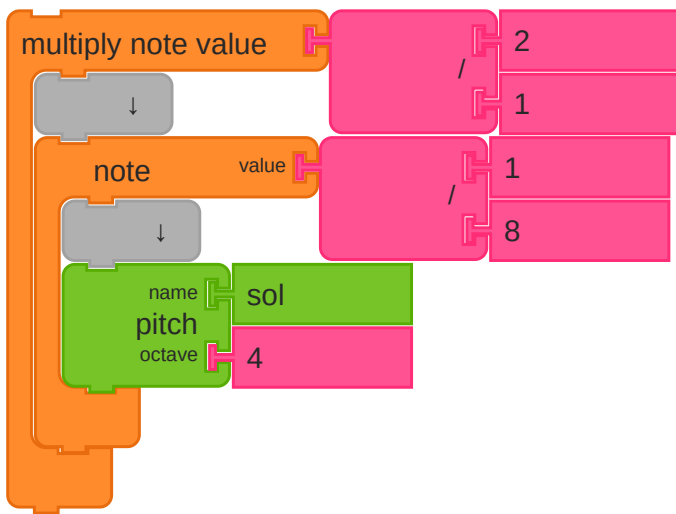
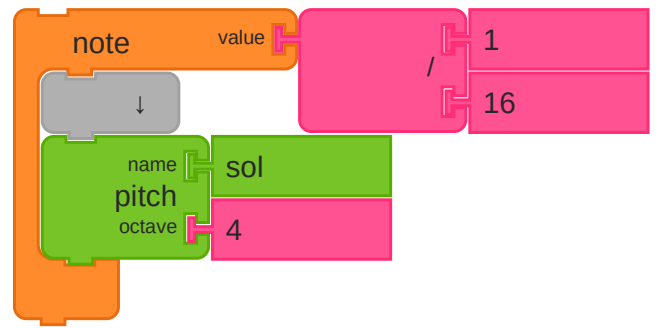
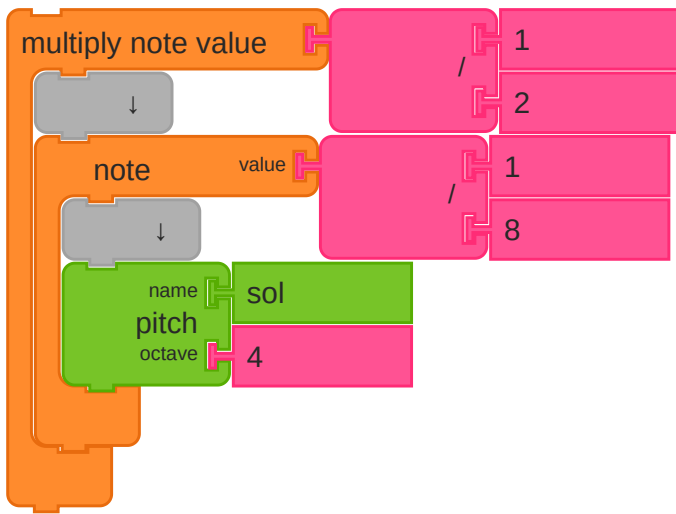
x= value of note

Formula:  $x + \frac{x}{2} =$  value of dotted note

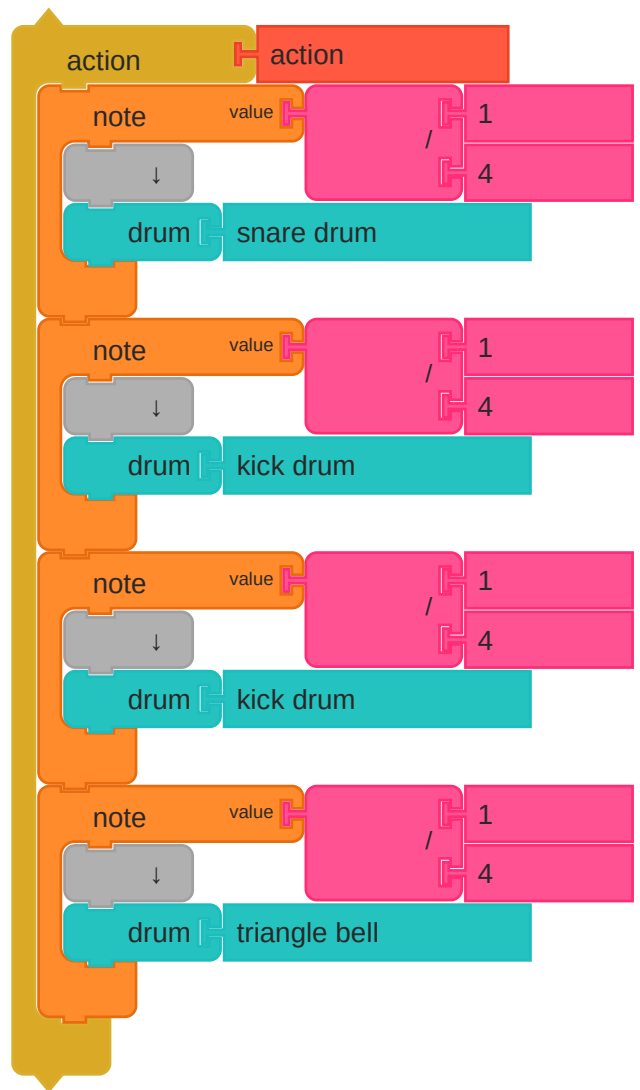
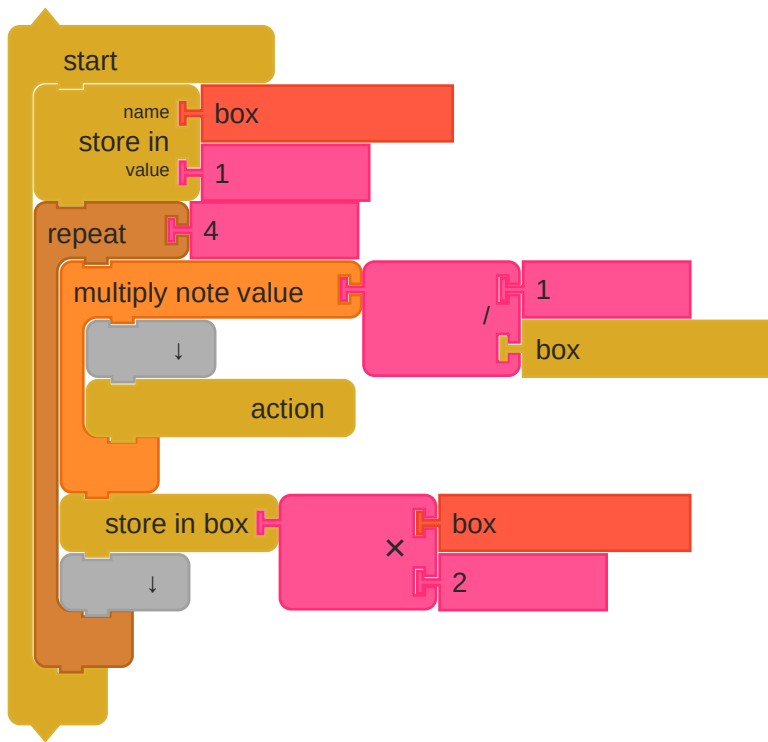
Examples:

Western Notation	Music Blocks Notation with dot	Music Block Notation without dot
 <p>For <math>x = 1/8</math>,</p> $\frac{1}{8} + \frac{1}{(8*2)} = \frac{1}{8} + \frac{1}{16} = \frac{2}{16} + \frac{1}{16} = \frac{3}{16}$		
 <p>For <math>x = 1/4</math>,</p> $\frac{1}{4} + \frac{1}{(4*2)} = \frac{1}{4} + \frac{1}{8} = \frac{2}{8} + \frac{1}{8} = \frac{3}{8}$		

## 3.3.2 Speeding Up and Slowing Down Notes via Mathematical Operations



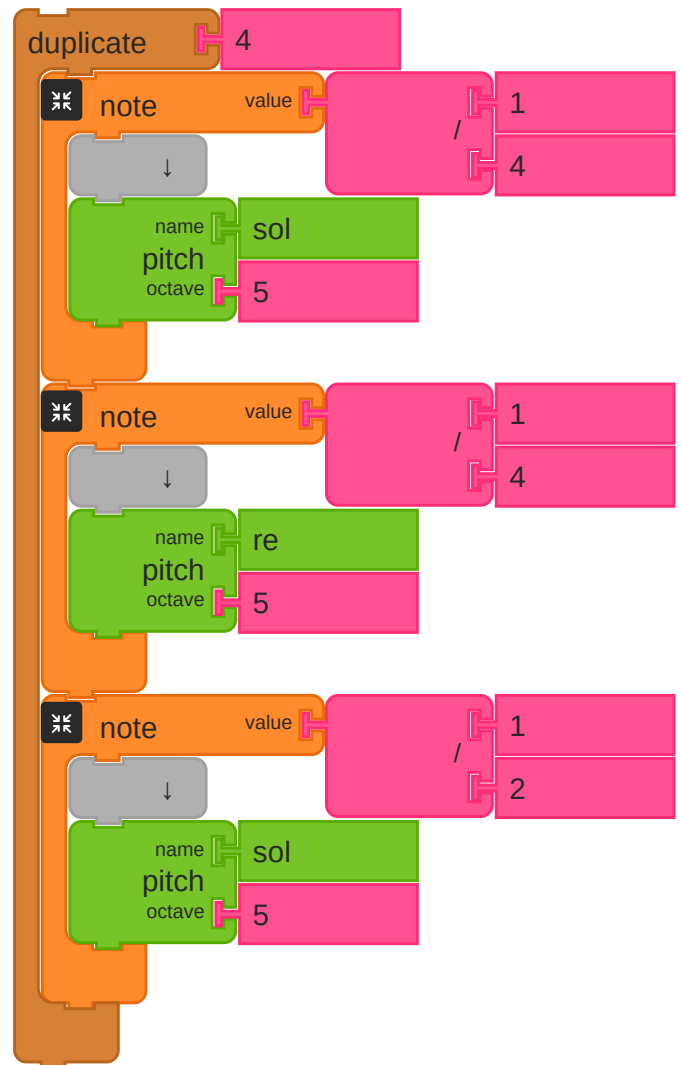
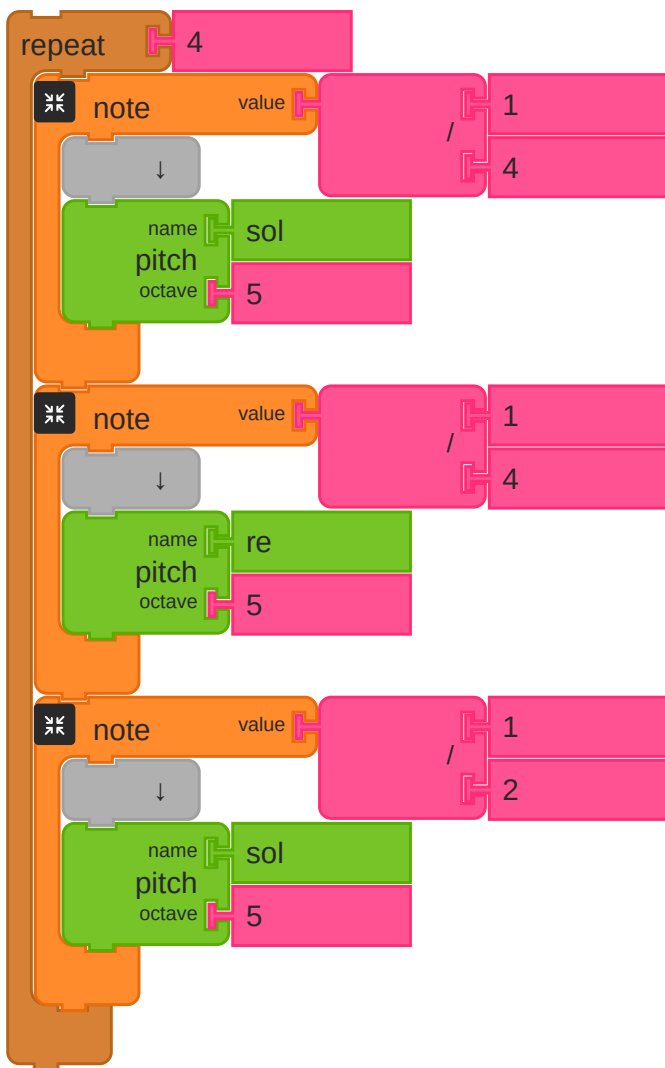
You can also multiply (or divide) the note value, which will change the duration of the notes by changing their note values. Multiplying the note value of an  $1/8$  note by  $1/2$  is the equivalent of playing a  $1/16$  note (i.e.  $1/2 * 1/8 = 1/16$ ). Multiplying the note value of an  $1/8$  note by  $2/1$  (which has the effect of dividing by  $1/2$ ) will result in the equivalent of a  $1/4$  note.



In the above example, the sequence of drum note values is decreased over time, at each repetition.

RUN LIVE (<https://musicblocks.sugarlabs.org/index.html?id=1523106271018484&run=True>)

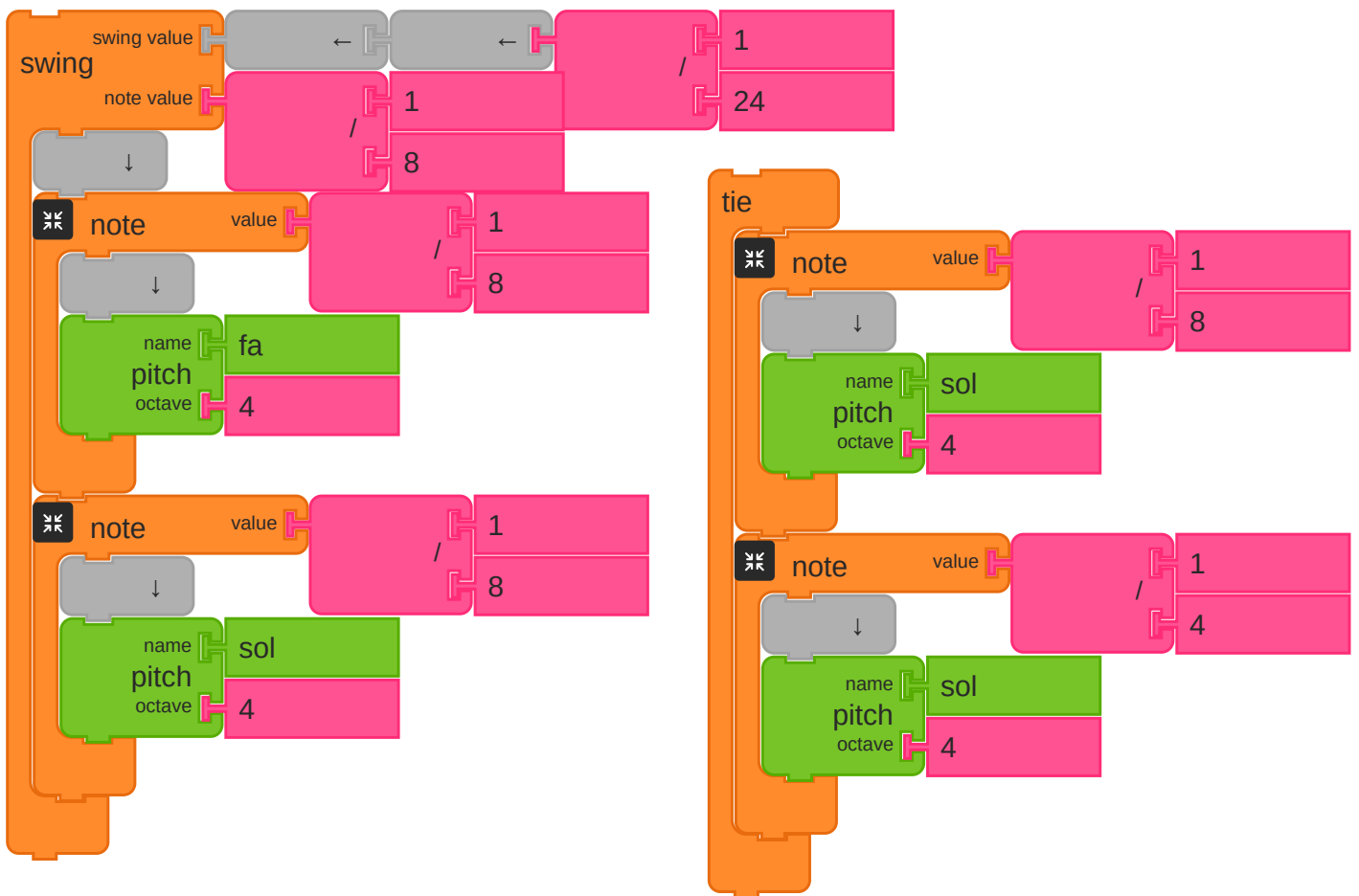
### 3.3.3 Repeating Notes



There are several ways to repeat notes. The *Repeat* block will play a sequence of notes multiple times; the *Duplicate* block will repeat each note in a sequence.

In the example, on the left, the result would be Sol, Re, Sol, Sol, Re, Sol, Sol, Re, Sol, Sol, Re, Sol; on the right the result would be Sol, Sol, Sol, Sol, Re, Re, Re, Re, Sol, Sol, Sol, Sol.

### 3.3.4 Swinging Notes and Tied Notes



The *Swing* block works on pairs of notes (specified by note value), adding some duration (specified by swing value) to the first note and taking the same amount from the second note. Notes that do not match note value are unchanged.

In the example, *re5* would be played as a  $1/6$  note and *mi5* would be played as a  $1/12$  note ( $1/8 + 1/24 === 1/6$  and  $1/8 - 1/24 === 1/12$ ). Observe that the total duration of the pair of notes is unchanged.

Tie also works on pairs of notes, combining them into one note. (The notes must be identical in pitch, but can vary in rhythm.)

# Using Notes with Ties


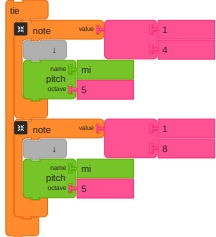
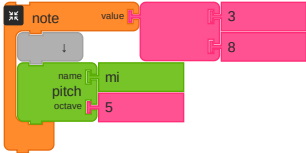

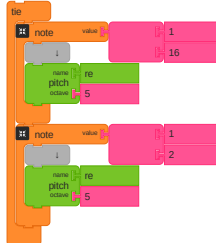
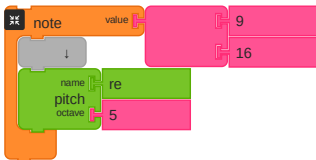
A tie connects two notes of the same pitch\* and indicates that they are to be played as the sum of the two notes.

x= value of note 1

y= value of note 2

Formula:  $x + y =$  total value of notes contained within tie

Examples:

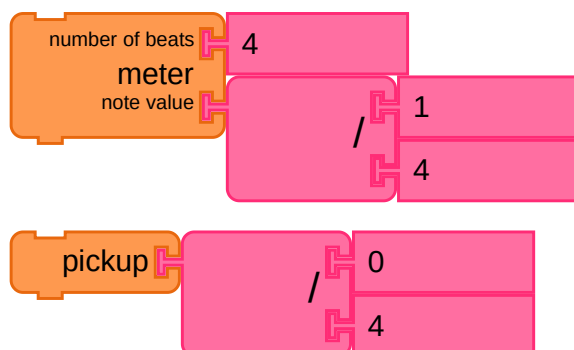
Western Notation	Music Blocks Notation with tie	Music Block Notation without tie
 $\frac{1}{4} + \frac{1}{8} = \frac{3}{8}$ <p>Find common denominator:  <math>x = \frac{1}{4}</math>  <math>y = \frac{1}{8}</math>  <math>2 * \frac{1}{4} = \frac{2}{8} + \frac{1}{8} = \frac{3}{8}</math></p>		
 $\frac{1}{16} + \frac{1}{2} = \frac{9}{16}$ <p>Find common denominator:  <math>x = \frac{1}{16}</math>  <math>y = \frac{1}{2}</math>  <math>8 * \frac{1}{2} = \frac{8}{16} + \frac{1}{16} = \frac{9}{16}</math></p>		

\* Ties affect rhythm, not pitch. For tie to work, both pitches must be exactly the same. If not, it will be considered a slur.

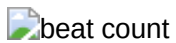
## 3.3.5 Beat

The beat of the music is determined by the *Meter* block (by default, it is set to 4:4).

The *Pickup* block can be used to accommodate any notes that come in before the beat.



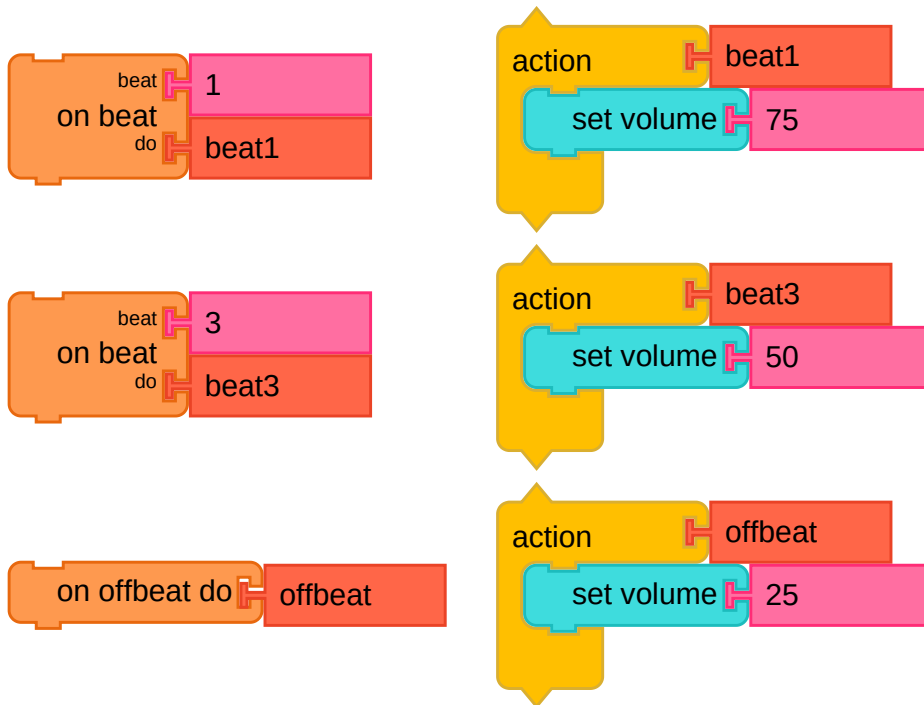
The Beat count block is the number of the current beat, eg 1, 2, 3, or 4. In the figure, it is used to take an action on the first beat of each measure.



The Measure count block returns the current measure.

### measure count

Specifying beat is useful in that you can have the character of a note vary depending upon the beat. In the example below, the volume of notes on Beat 1 and Beat 3 are increased, while the volume of off beats is decreased.

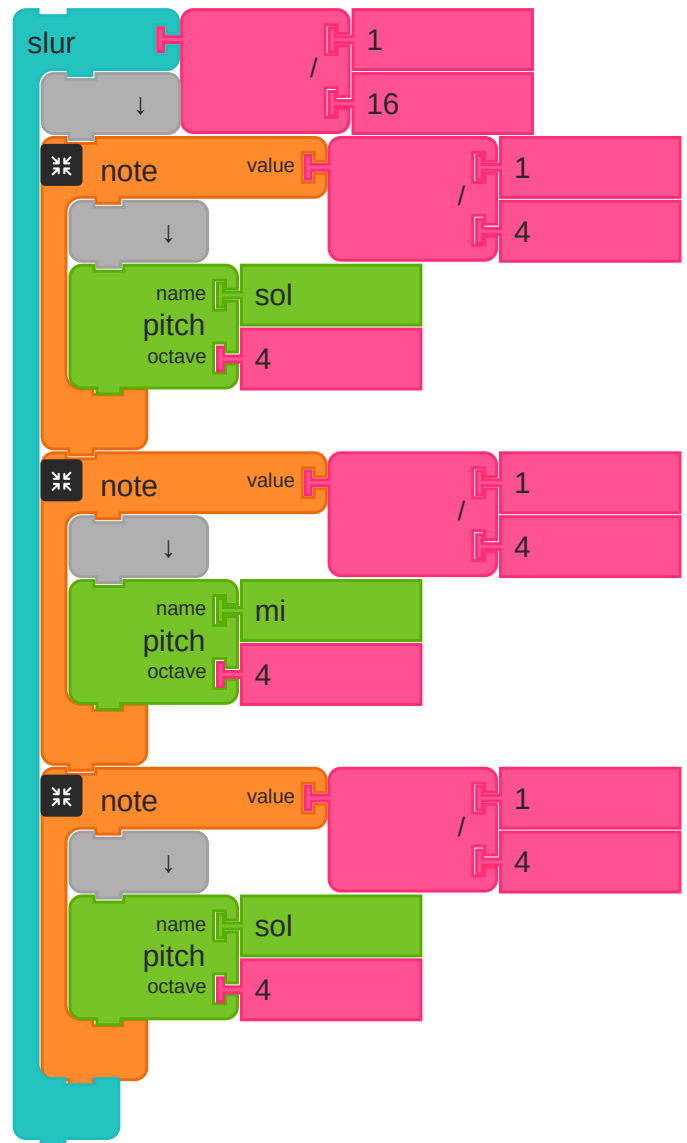
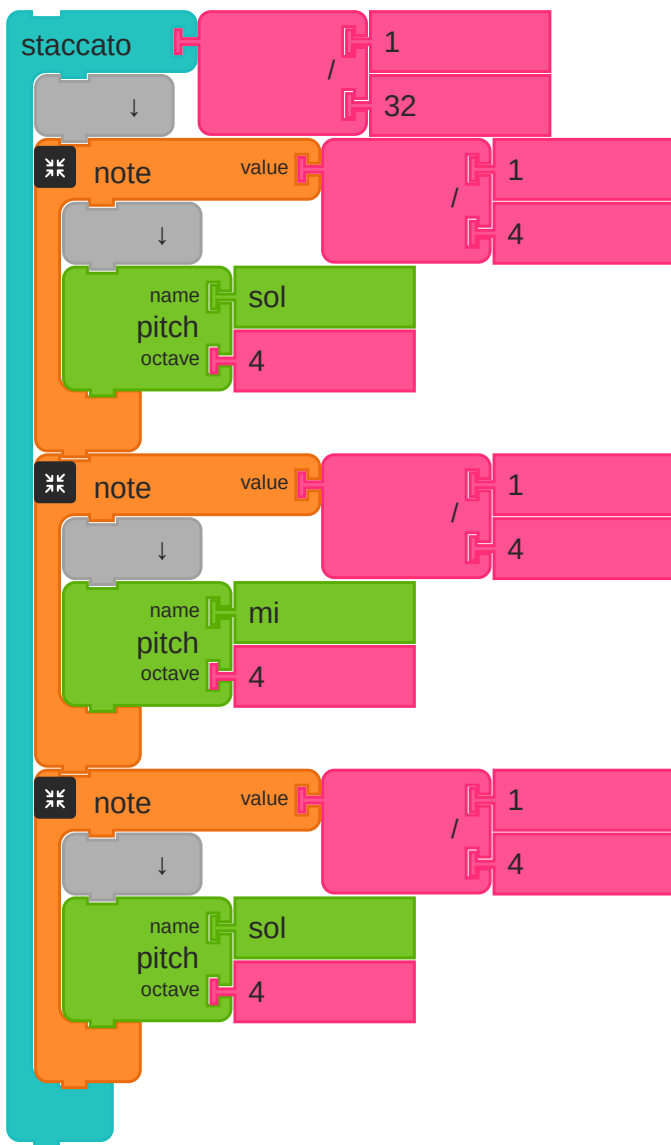


The *On-Beat-Do* and *Off-Beat-Do* blocks let you specify actions to take on specific beats. (Note that the action is run before any blocks inside the note block associated with the beat are run.)

More examples can be found in the Graphics section below.

### 3.3.6 Staccato and Slur

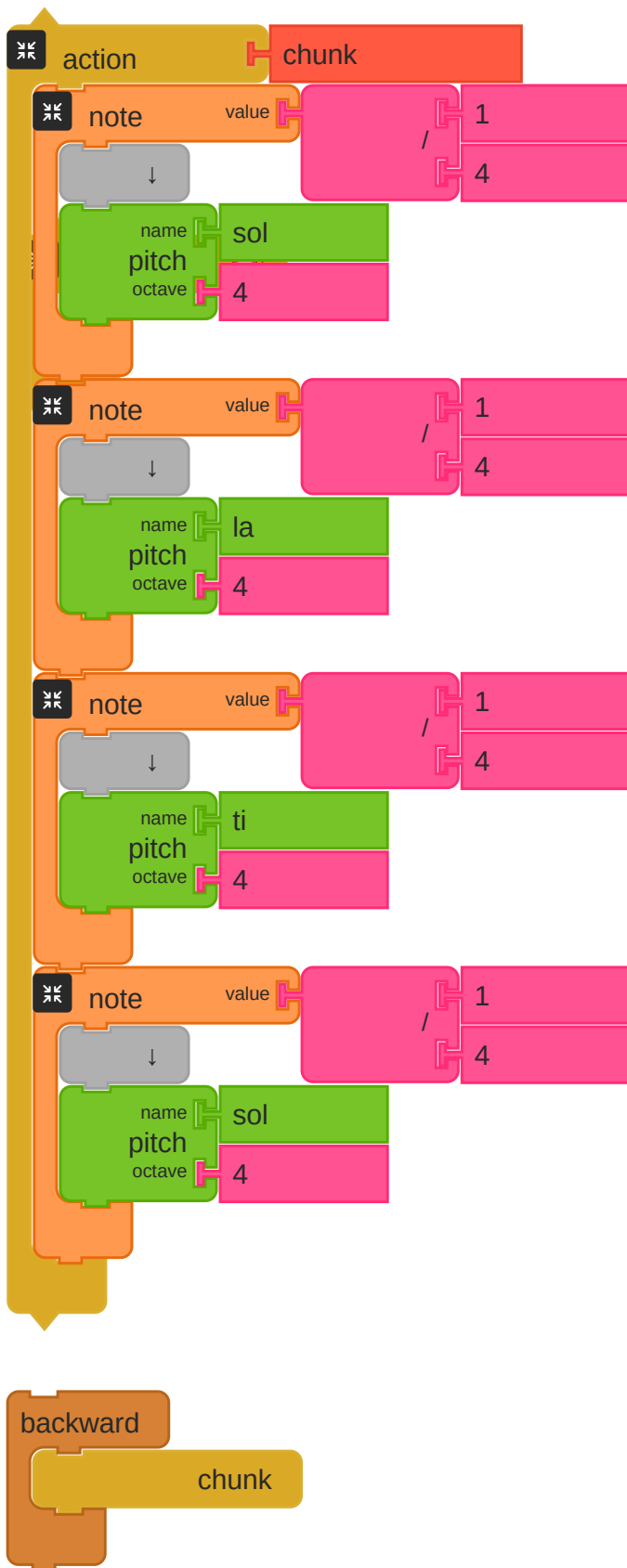




The *Staccato* block shortens the length of the actual note—making them tighter bursts—while maintaining the specified rhythmic value of the notes.

The *Slur* block lengthens the sustain of notes—running longer than the noted duration and blending it into the next note—while maintaining the specified rhythmic value of the notes.

### 3.3.7 Backwards



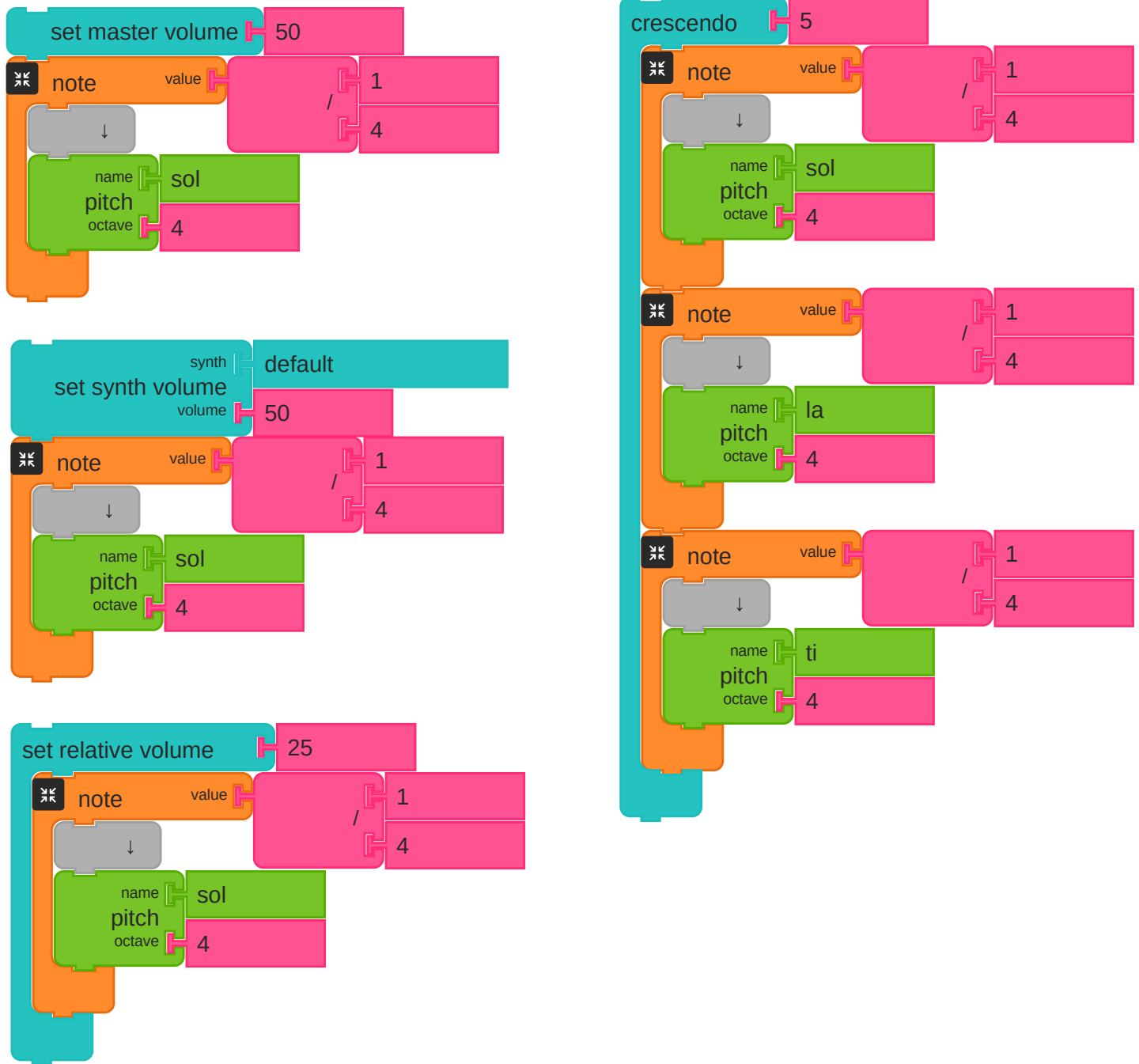
The *Backward* block will play the contained notes in reverse order (retrograde). In the example above, the notes in chunk are played as sol , Ti , La , sol , i.e., from the bottom to the top of the stack.

An example from Bach is provided. In the example, there are two voices, one which plays the composition forward and one that plays the same composition backward. RUN LIVE (<https://musicblocks.sugarlabs.org/index.html?id=1522885752309944&run=True>)

Note that all of the blocks inside a *Backward* block are reverse, so use this feature with caution if you include logic intermixed with notes.

## 3.4 Other Transformations

### 3.4.1 Set Volume and Crescendo



The *Set master volume* block will change the master volume. The default is 50 ; the range is 0 (silence) to 100 (full volume).

The *Set synth volume* block will change the volume of a particular synth, e.g., violin , snare drum , etc. The default volume is 50 ; the range is 0 (silence) to 100 (full volume). In the example, the *synth name* block is used to select the current synth.

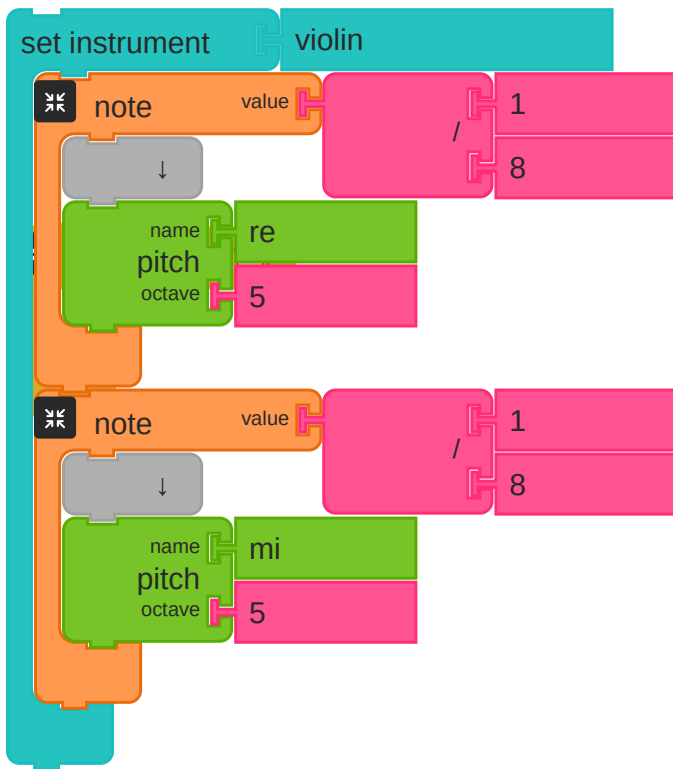
As a convenience, a number of standard volume blocks are provided: from loudest to quietest, there is *fff*, *ff f*, *mf*, *mp*, *p*, *pp*, and *ppp*. In musical terms "f" means "forte" or loud, "p" means "piano" or soft, and "m" means "mezzo" or middle.

The *Set Relative Volume* block modifies the clamped note's volume according to the input value of the block in an added (or subtracted when negative) percentage with respect to the original volume. For example, `100` would mean doubling the current volume.

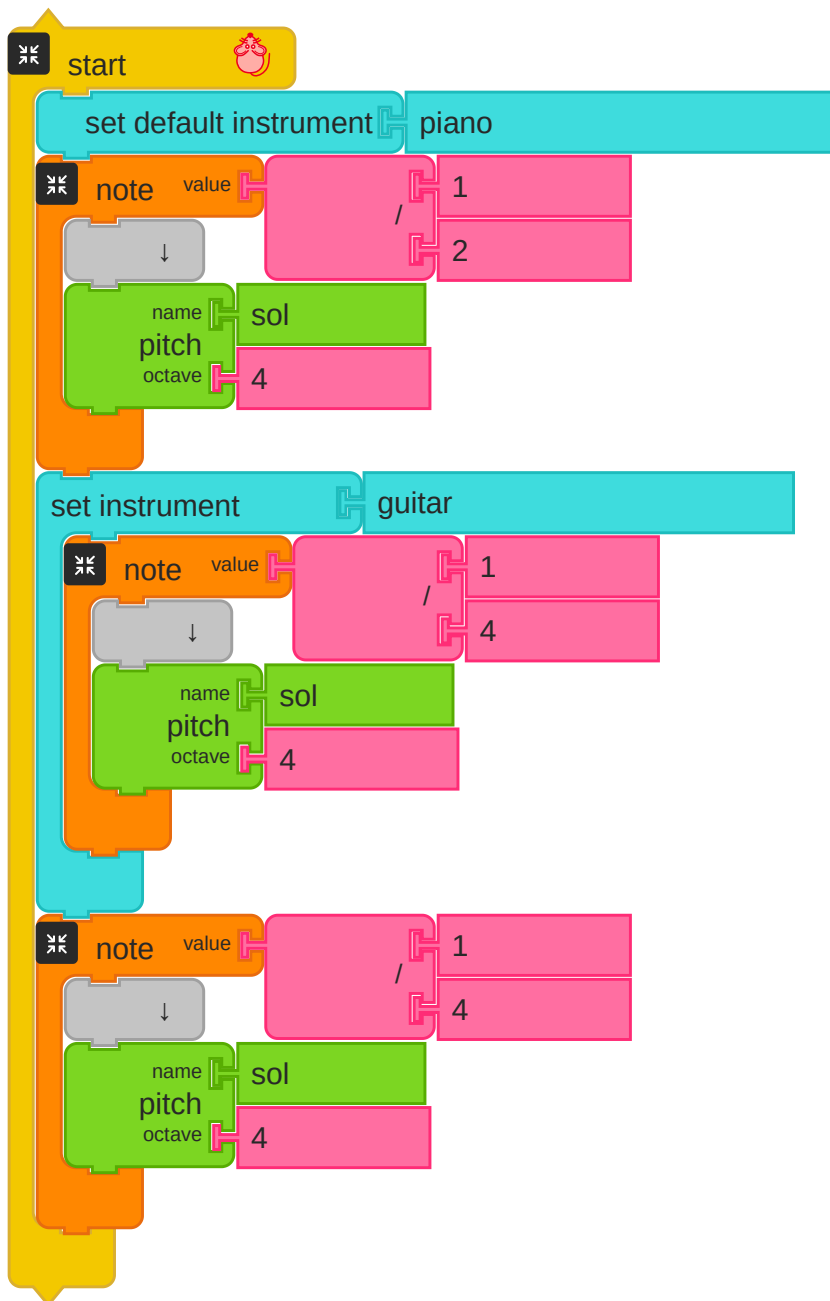
The *Crescendo* block will increase (or decrease) the volume of the contained notes by a specified amount for every note played. For example, if you have 3 notes in sequence contained in a *Crescendo* block with a value of `5`, the final note will be at 15% more than the original value for volume.

NOTE: The *Crescendo* block does not alter the volume of a note as it is being played. Music Blocks does not yet have this functionality.

### 3.4.2 Setting Instrument

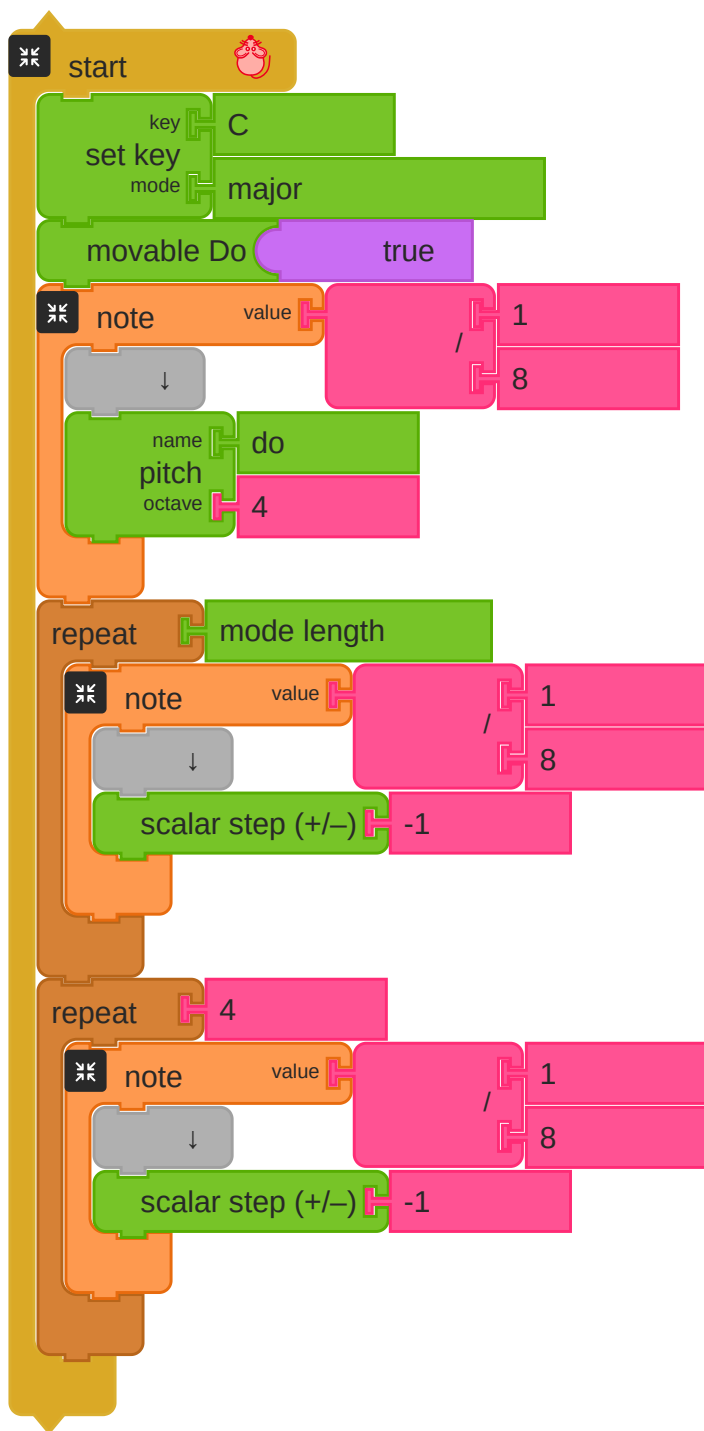


The default instrument is an electronic synthesizer, so by default, that is the instrument used when playing notes. You can override this default for a group of notes by using the *Set Instrument* block. It will select an instrument for the synthesizer for any contained blocks, e.g., violin.

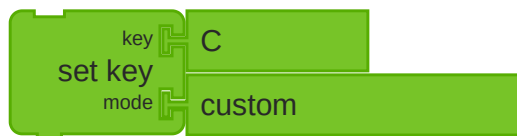
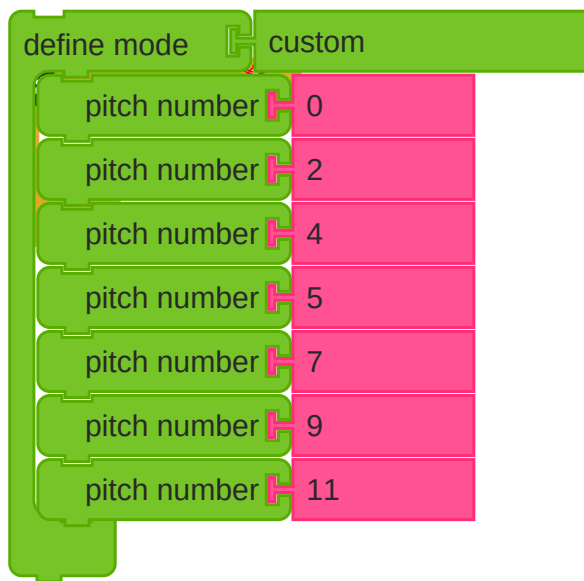


You can also override the default using the *Set default instrument* block. In the example above, the default instrument is set to piano, so any note that is not inside of a *Set instrument* block will be played using the piano synthesizer. The first note in this example is piano; the second note is guitar; and the third is piano.

### 3.4.3 Setting Key and Mode

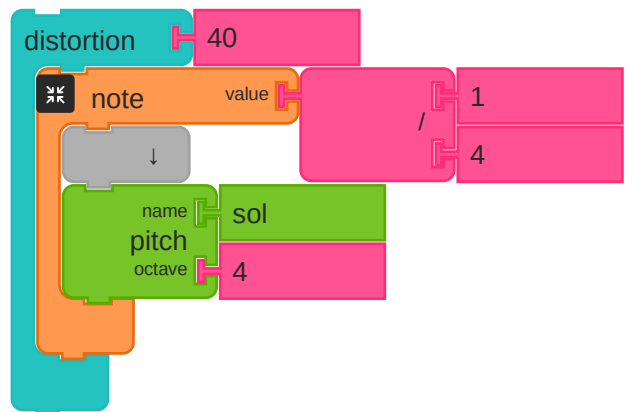
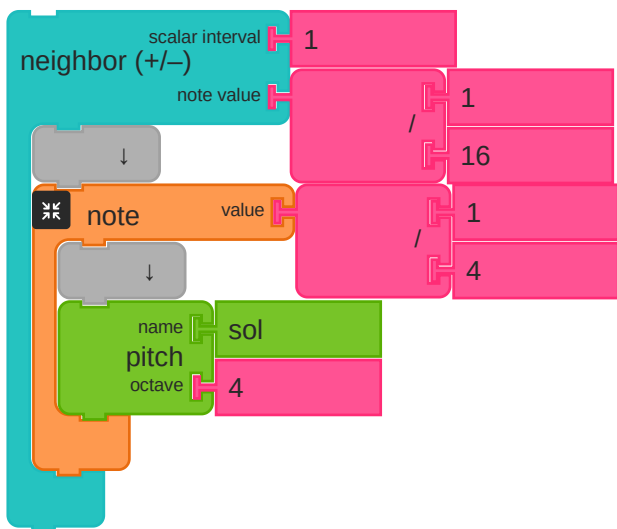
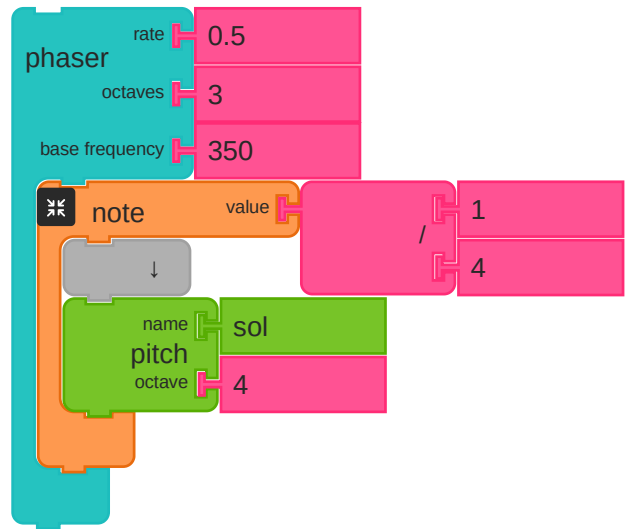
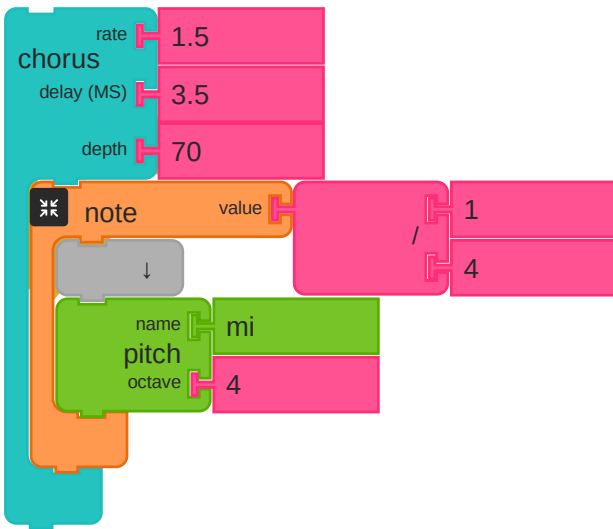
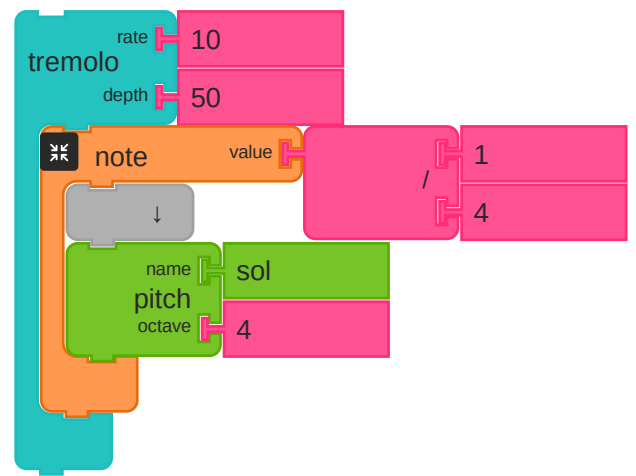
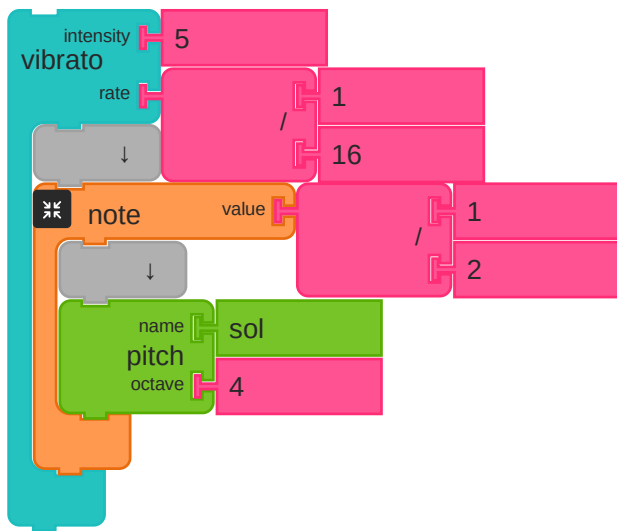


The *Set Key* block will change the key and mode of the mapping between solfege, e.g., *Do* , *Re* , *Mi* , to note names, e.g., *C* , *D* , *E* , when in C Major. Modes include Major and Minor, Chromatic, and a number of more exotic modes, such as Bebop, Geez, Maqam, etc. This block allows users to access "movable Do" within Music Blocks, where the mapping of solfege to particular pitch changes depending on the user's specified tonality.



The *Define mode* block can be used to define a custom mode by defining the number and size of the steps within an octave. You can use your custom mode with the *Set key* block.

#### 3.4.4 Vibrato, Tremelo, et al.



The *Vibrato* Block adds a rapid variation in pitch to any contained notes. The intensity of the variation ranges from 1 to 100 (cents), e.g. plus or minus up to one half step. The rate argument determines the rate of the variation.

The other effects blocks also modulate pitch over time. Give them a try.