# 5. Beyond Music Blocks

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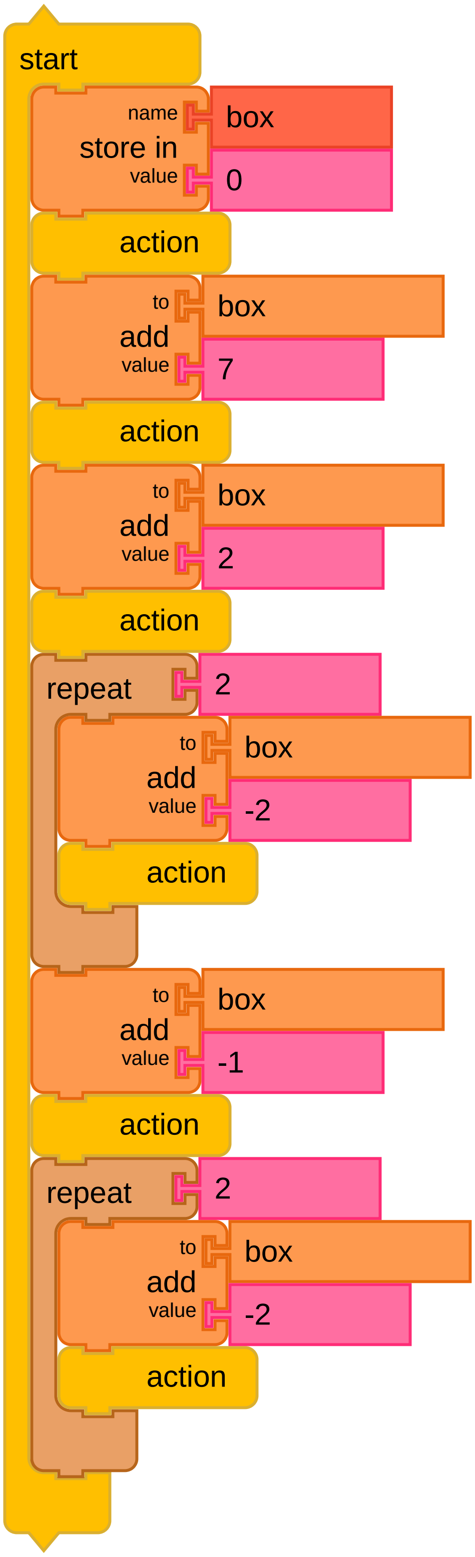
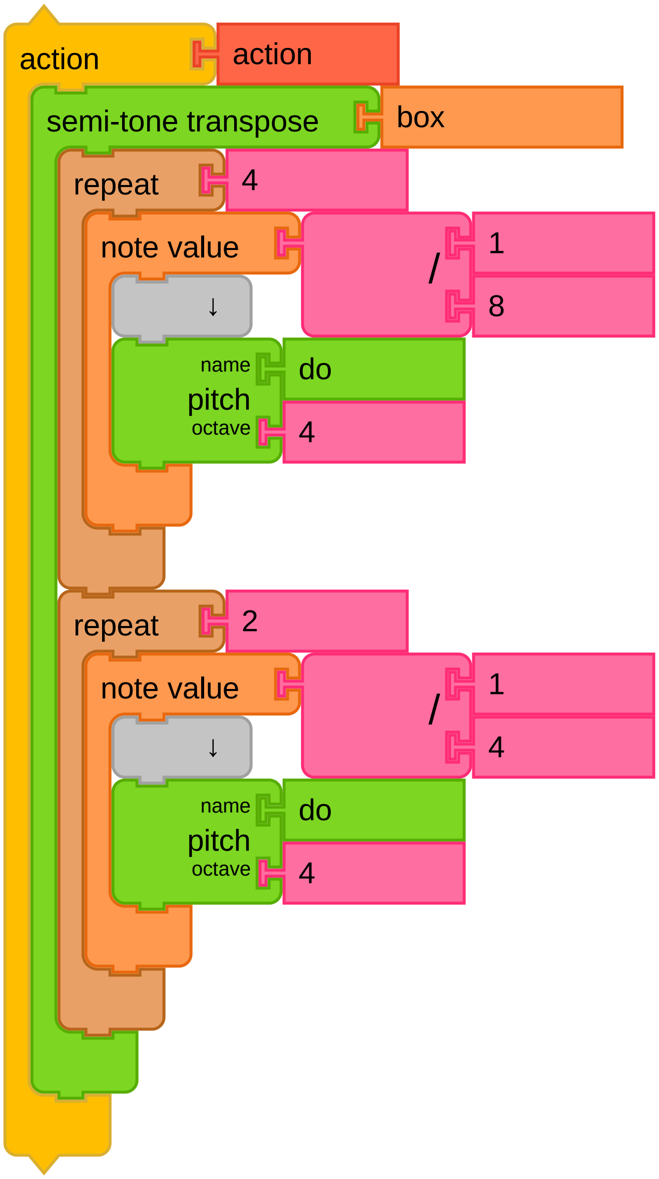
Music Blocks is a waypoint, not a destination. One of the goals is to point the learner towards other powerful tools.

## 5.1 Lilypond

One such tool is Lilypond (http://lilypond.org), a music engraving program.



```
start
  store in  name box  value 0
  action
  add  to box  value 7
  action
  add  to box  value 2
  action
  repeat 2
    add  to box  value -2
    action
  add  to box  value -1
  action
  repeat 2
    add  to box  value -2
    action
```



```
action  action
  semi-tone transpose  box
    repeat 4
      note value  1 / 8
        ↓
        pitch  name do  octave 4
    repeat 2
      note value  1 / 4
        ↓
        pitch  name do  octave 4
```

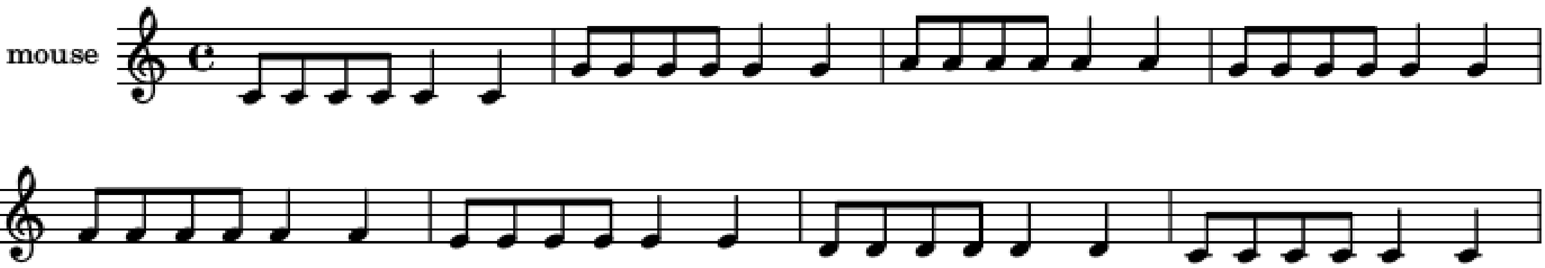
The *Save as Lilypond* option from the Save menu will transcribe your composition (Only available in Advanced Mode).

Note that if you use a *Print* block inside of a note, Lilypond will create a "markup" or annotation for that note. It is a simple way to add lyrics to your score.

```
\version "2.18.2"

mouse = {
c'8 c'8 c'8 c'8 c'4 c'4 g'8 g'8 g'8 g'8 g'4 g'4 a'8 a'8 a'8 a'8 a'4
a'4 g'8 g'8 g'8 g'8 g'4 g'4 f'8 f'8 f'8 f'8 f'4 f'4 e'8 e'8 e'8 e'8
e'4 e'4 d'8 d'8 d'8 d'8 d'4 d'4 c'8 c'8 c'8 c'8 c'4 c'4
}

\score {
<<
\new Staff = "treble" {
\clef "treble"
\set Staff.instrumentName = #"mouse" \mouse
}
>>
\layout { }
}
```



RUN LIVE (https://musicblocks.sugarlabs.org/index.html?id=1523043053377623&run=True)

# 5.2 Other Exports

In addition to Lilypond, there are several other export formats supported, including ABC, MusicXML, WAV, SVG, and PNG.

**ABC** notation is a shorthand form of musical notation. In basic form it uses the letters A through G, letter notation, to represent the given notes, with other elements used to place added value on these – sharp, flat, the length of the note, key, ornamentation (See https://en.wikipedia.org/wiki/ABC_notation (https://en.wikipedia.org/wiki/ABC_notation)).

**MusicXML** is an XML-based file format for representing Western musical notation. The format is open, fully documented, and can be freely used under the W3C Community Final Specification Agreement (See https://en.wikipedia.org/wiki/MusicXML (https://en.wikipedia.org/wiki/MusicXML)).

**WAV** (Waveform Audio File Format) is an audio file format standard, developed by IBM and Microsoft, for storing an audio bitstream on PCs (See https://en.wikipedia.org/wiki/WAV (https://en.wikipedia.org/wiki/WAV)).

**PNG** (Portable Network Graphics) is a raster-graphics file format that supports lossless data compression (See https://en.wikipedia.org/wiki/Portable_Network_Graphics (https://en.wikipedia.org/wiki/Portable_Network_Graphics)). You can save your artwork as PNG.

**SVG** (Scalable Vector Graphics) is an Extensible Markup Language (XML)-based vector image format for two-dimensional graphics with support for interactivity and animation (See https://en.wikipedia.org/wiki/Scalable_Vector_Graphics (https://en.wikipedia.org/wiki/Scalable_Vector_Graphics)). You can also save your artwork as SVG.

Note that artwork saved as PNG or SVG can subsequently be imported into Music Blocks to be used with either the *Show* or *Avatar* blocks.

**Help artwork**

Note for translators: The artwork used by the help widget (and used in this README file) can be created by typing *Alt-H* into Music Blocks. Artwork for each block will be generated and saved by the browser.

# 5.3 The JavaScript Editor

There are practical limits to the size and complexity of Music Blocks programs. At some point we expect Music Blocks programmers to move on to text-based programming languages. To facilitate this transition, there is a JavaScript widget that will convert your Music Blocks program into JavaScript.

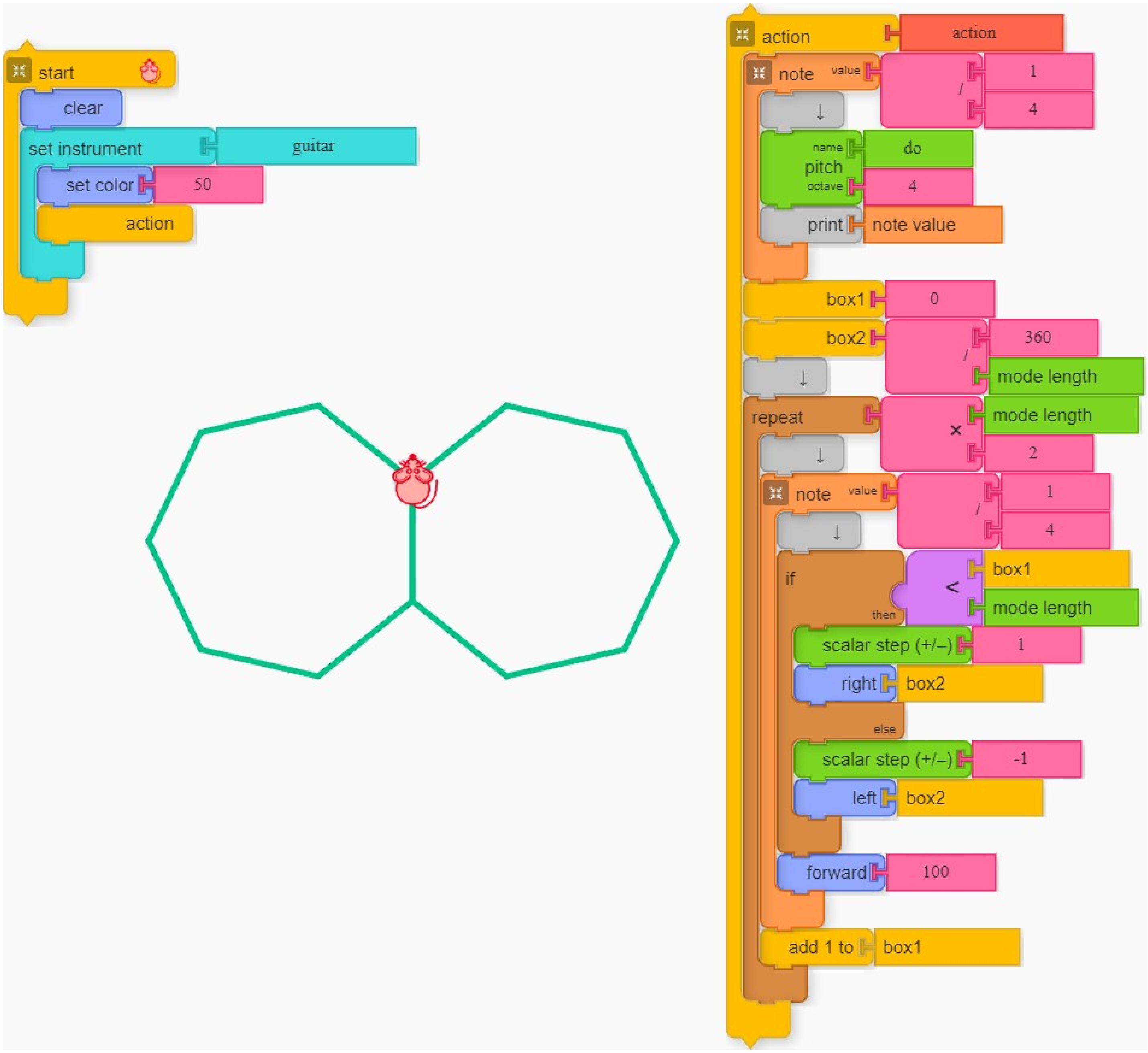
The JavaScript code is written and viewed on the **JavaScript Editor** widget which can be opened by pressing on the "*Toggle JavaScript Editor*" ( <> ) button in the auxilliary menu.

## Example code

For the block stacks (and mouse art generated after running),

```
let action = async mouse => {
    await mouse.playNote(1 / 4, async () => {
        await mouse.playPitch("do", 4);
        console.log(mouse.NOTEVALUE);
        return mouse.ENDFLOW;
    });
    let box1 = 0;
    let box2 = 360 / mouse.MODELENGTH;
    for (let i0 = 0; i0 < mouse.MODELENGTH * 2; i0++) {
        await mouse.playNote(1 / 4, async () => {
            if (box1 < mouse.MODELENGTH) {
                await mouse.stepPitch(1);
                await mouse.turnRight(box2);
            } else {
                await mouse.stepPitch(-1);
                await mouse.turnLeft(box2);
            }
            await mouse.goForward(100);
           return mouse.ENDFLOW;
        });
        box1 = box1 + 1;
    }
    return mouse.ENDFLOW;
};
new Mouse(async mouse => {
    await mouse.clear();
    await mouse.setInstrument("guitar", async () => {
        await mouse.setColor(50);
        await action(mouse);
        return mouse.ENDFLOW;
    });
    return mouse.ENDMOUSE;
});
MusicBlocks.run();
```

Here's the complete API (../js/js-export/samples/sample.js) of methods, getters, setters.



```
start
  clear
  set instrument  guitar
    set color  50
    action

action  action
  note  value  1 / 4
    ↓
    pitch  name  do
           octave  4
    print  note value
  box1  0
  box2  360 / mode length
  ↓
  repeat  mode length × 2
    ↓
    note  value  1 / 4
      ↓
      if  box1 < mode length
      then
        scalar step (+/–)  1
        right  box2
      else
        scalar step (+/–)  -1
        left  box2
      forward  100
    add 1 to  box1
```

the following code is generated: