EARSKETCH
MUSIC MIXING WITH PYTHON PROGRAMMING

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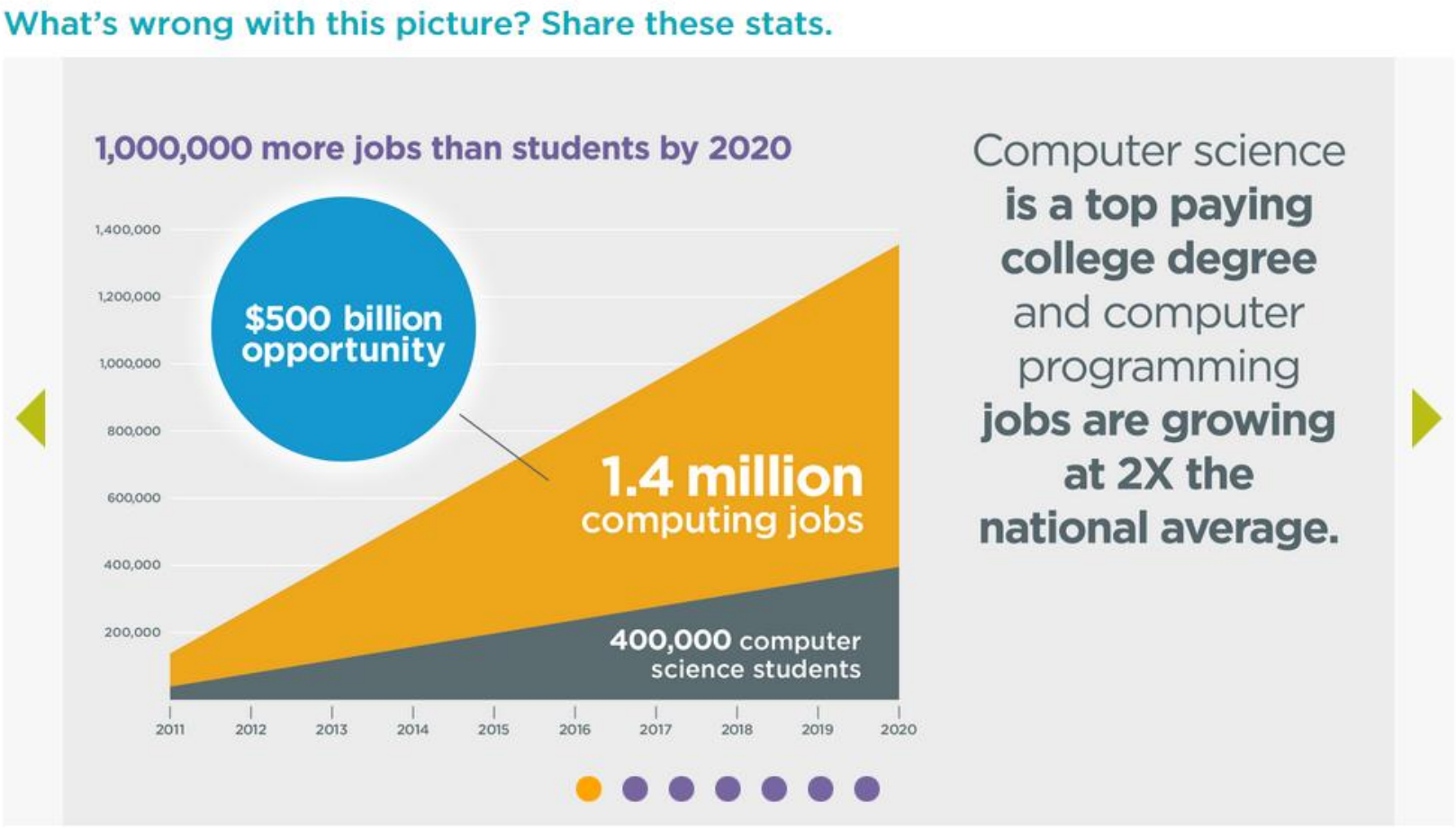
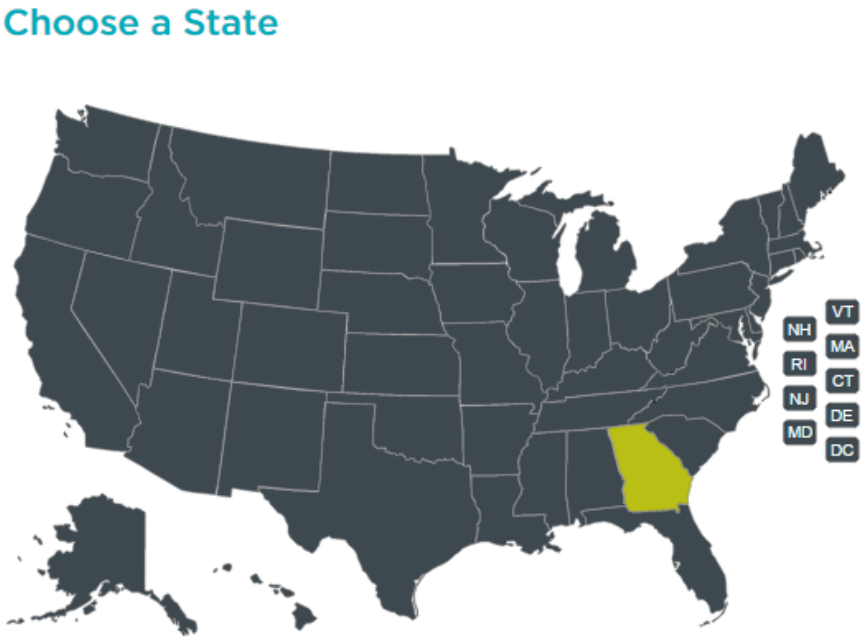
Georgia Institute of Technology

Why Learn to Program?



Why Learn to Program?



Georgia

20,371 open computing jobs
(growing at 4.8x the state average)

1,836 computer science graduates

133 schools teach computer science

- CS counts as math or science credit
- Clear certification pathways for CS teachers
- CS curriculum standards

Georgia fact-sheet | **More advocacy tools**

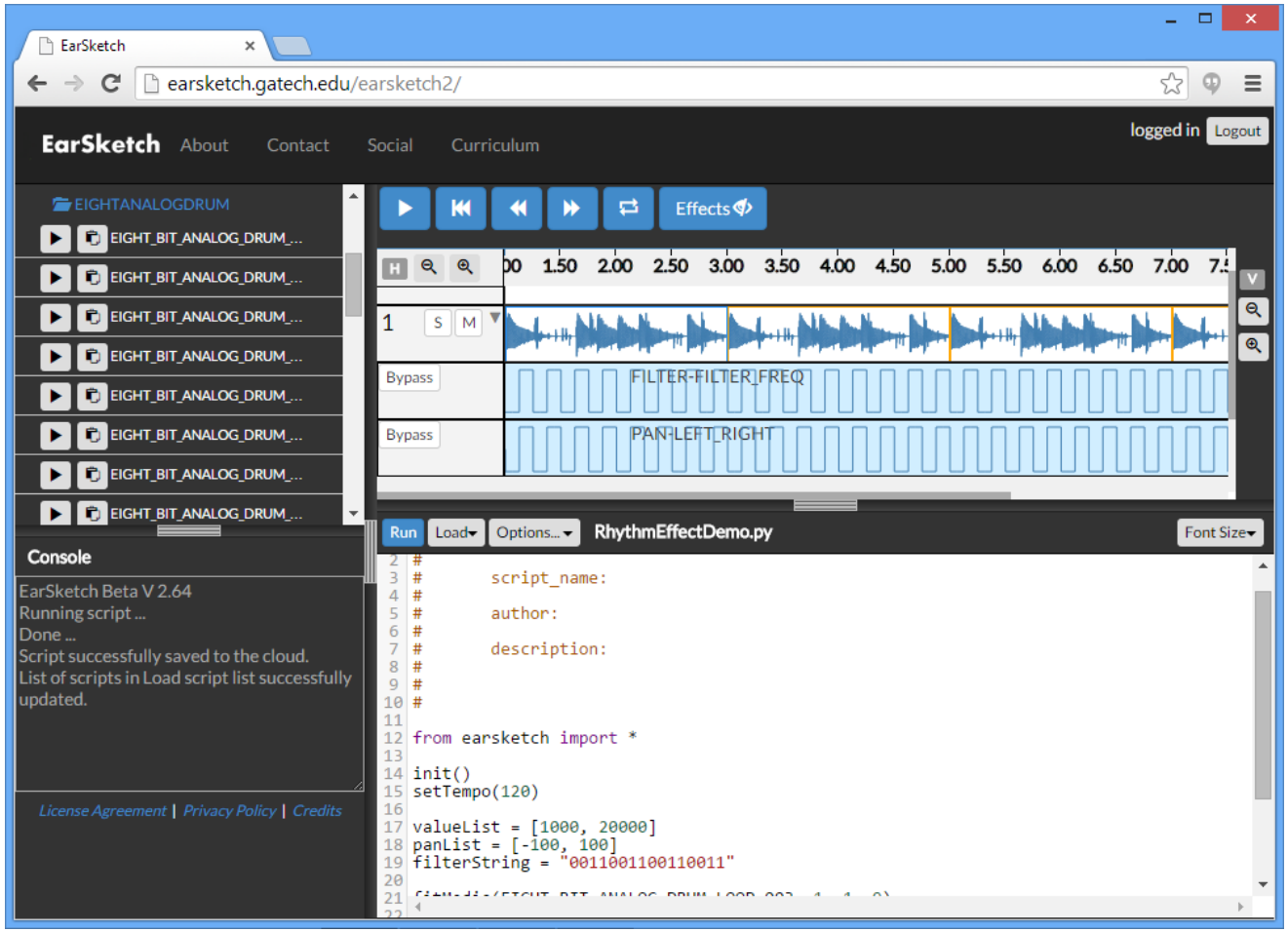
Georgia is one of 25 states where students **can** count computer science for credit towards high school graduation!

Take Action

Sources: **The Conference Board, National Science Foundation, Code.org database. More info.**

What is EarSketch?

- Online Programming and Music Mixing Workstation



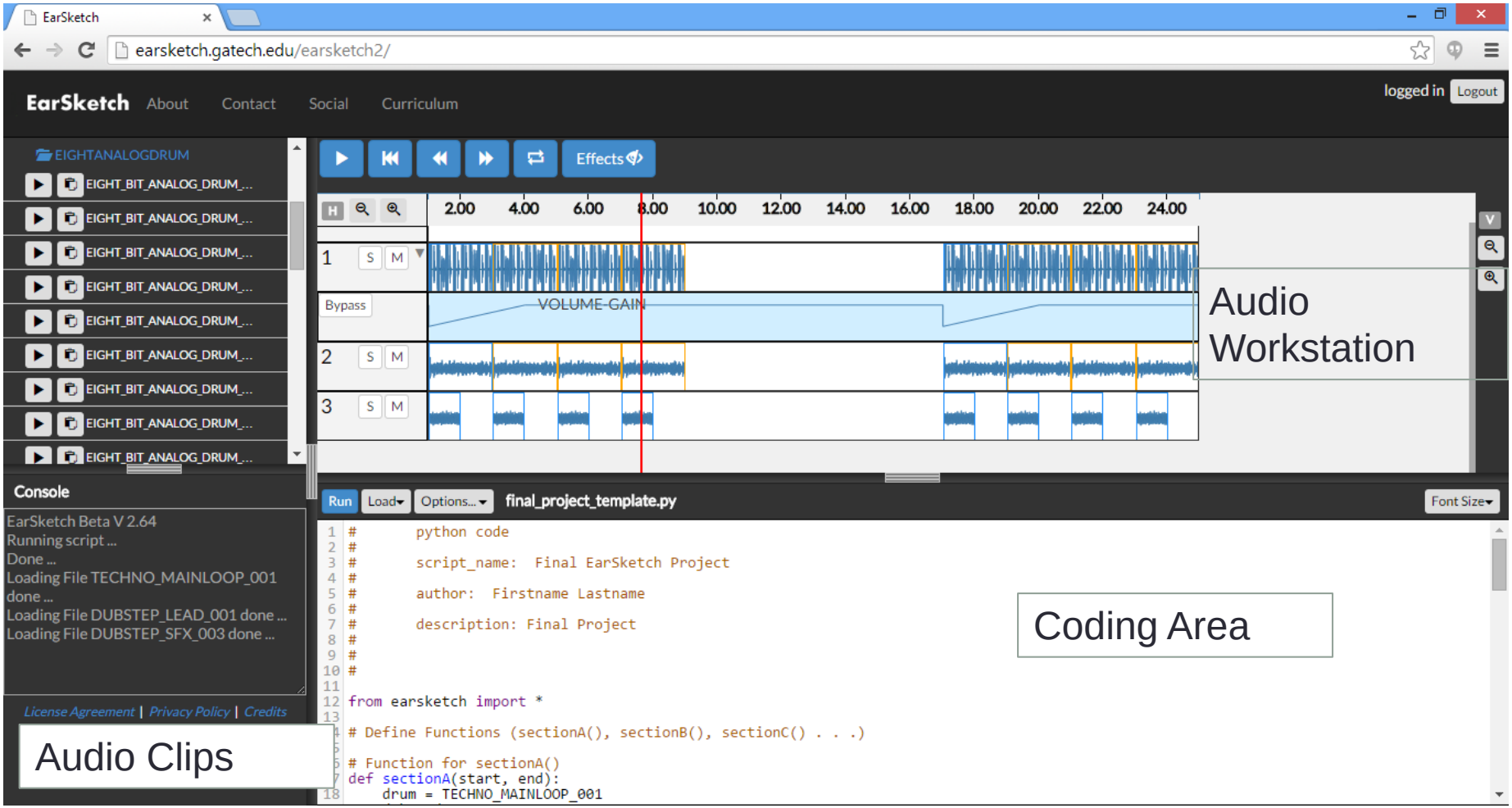
-Used at Georgia Tech to teach Digital Music Mixing.

-Tool for Programming

-Free!

-Web based

EarSketch Workstation: 3 Windows



Essential Elements we will use in Python:

- **Comments**
  ```
  # This is a comment – meant for Humans
  ```
- **Includes** – loading preset methods or data
  ```
  from earsketch import *
  ```
- **Functions** – telling the computer “what to do”
  ```
  fitMedia(drums, 1, 1, 5)
  ```
- **Variables** – Names for information stored by program
  ```
  Beat1 = “0+++0+++0+0+0+++”
  ```
- **Tabs:** Enclose code in sections

EarSketch Python Functions

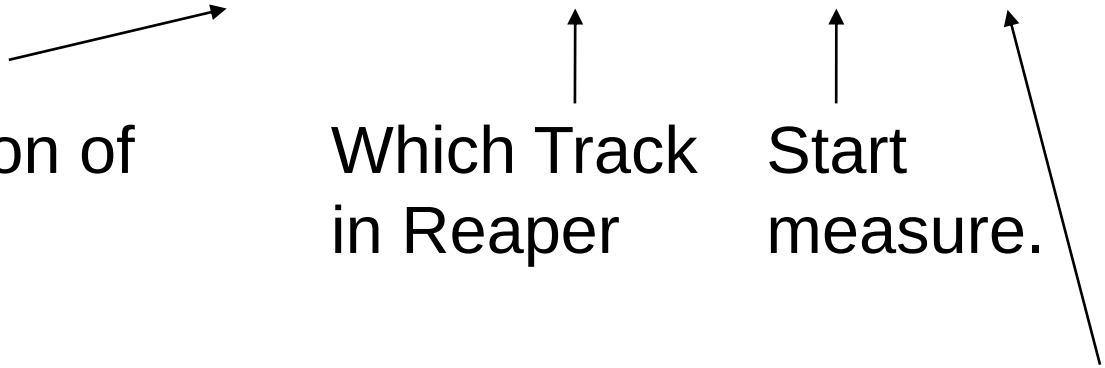
- `init()`
  Start New Reaper File
- `setTempo(120)`
  Beats per minute in remix
- `println("Hello")` -
  Prints message in console

EarSketch Python Functions

- `fitMedia(file, track, start, end)`
- `makeBeat(file, track, measure, beatString)`
- `fitMedia(music, track, start,end)`
- `setEffect(track, effect, parameter, vS, mS, vE, mE)`
- `rhythmEffects(track, effect, parameter, list, measure, string)`

“fitMedia” Function

```
fitMedia(file, track, start, end)
```



Location of Media Sound

Which Track in Reaper

Start measure.

End Measure

Example:

```
fitMedia(HIP_HOP_DRUMS1_2M, 1, 1, 9)
```

Setting Volume Effects

- `setEffect(track, VOLUME, GAIN, level, start, level2, end)`

- Example

```
setEffect(1, VOLUME, GAIN, -40, 1, 10, 5)
```

Selected List of Effects and Parameters

- VOLUME
  - GAIN
- DELAY
  - DELAY_TIME
- CHORUS
  - CHORUS_LENGTH
  - CHORUS_NUMVOICES
- DISTORTION
  - DISTO_GAIN
- FILTER
  - FILTER_FREQ
- PAN
  - LEFT_RIGHT

“makeBeat” Method

```
makeBeat(file, track, measure, BeatString)
```

Location of Media Sound

Which Track in Reaper

What measure.

Example: “0+++0+++0+0+0+++”

Example:

```
makeBeat(drums, 1, 1, “0+0+0+++00-00+++”)
```

Beat String notation

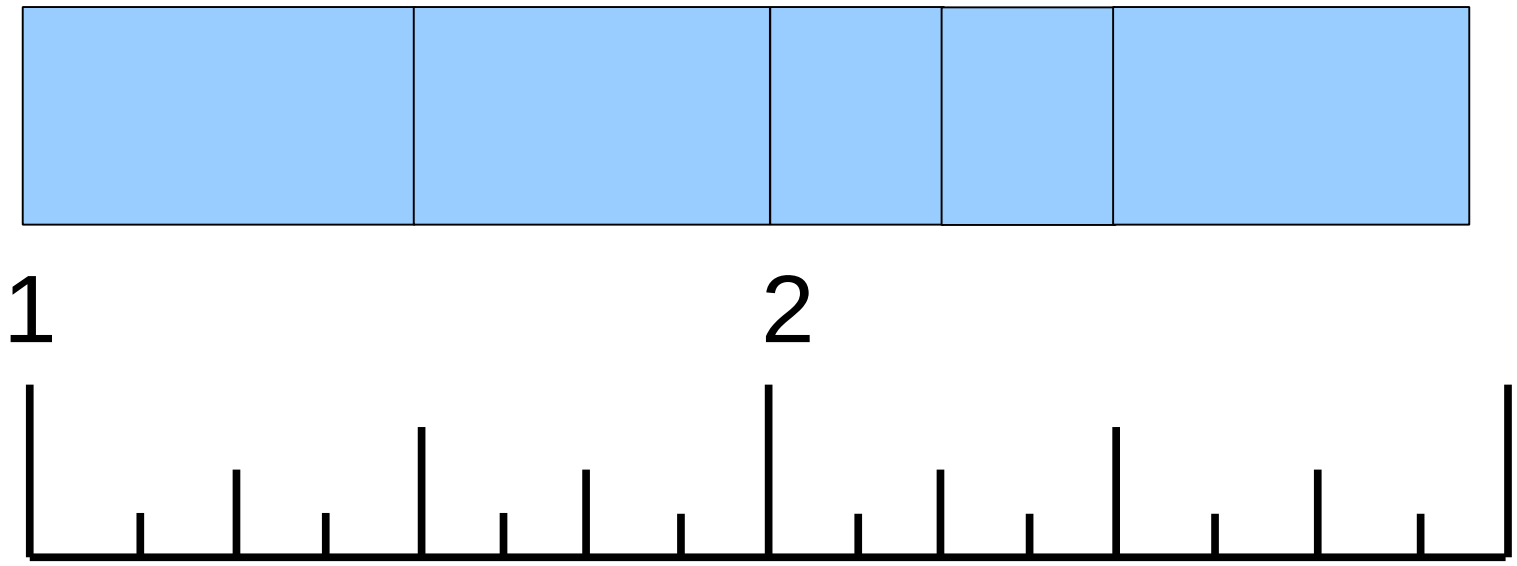
"0, 1, 2, 3 . . . " = Which Media Sound you want for the segment of beat. Correspond to placement in a List that is one based.

Note: 0 will refer to a sound if it is the only media file in the argument.

"+" Means extend or loop the Media sound 1/16th of a measure.

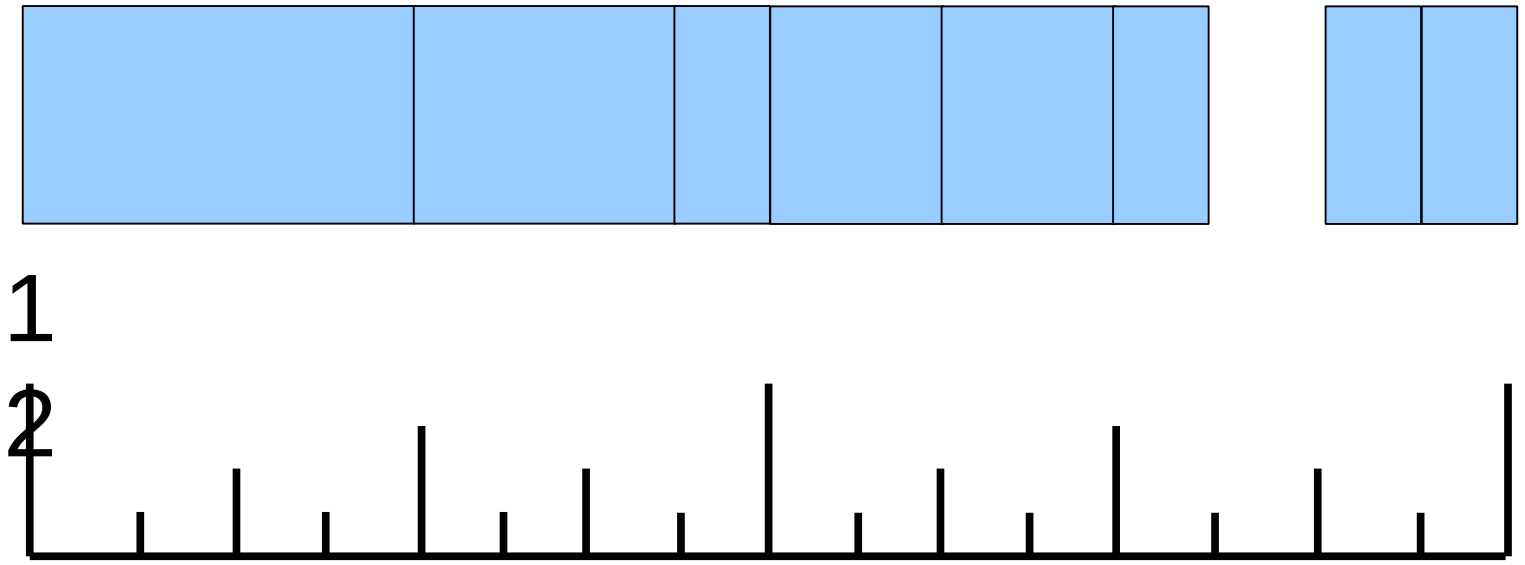
"-" Means 1/16th measure of rest.

"0+++0+++0+0+0+++"



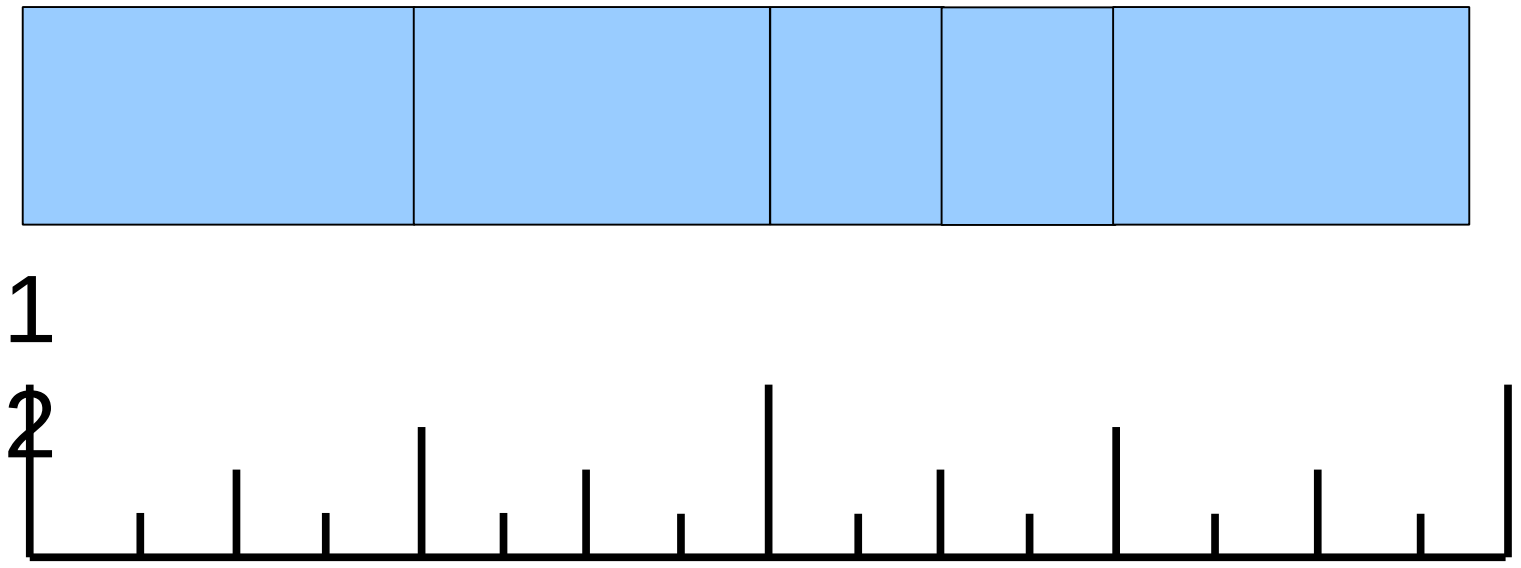

```
makeBeat(ELEKTRO_HOUSE_DRUMS3_2M, 1, 1,
"0+++0+++0+0+0+++")
```

“0+++0++00+0+0-00”



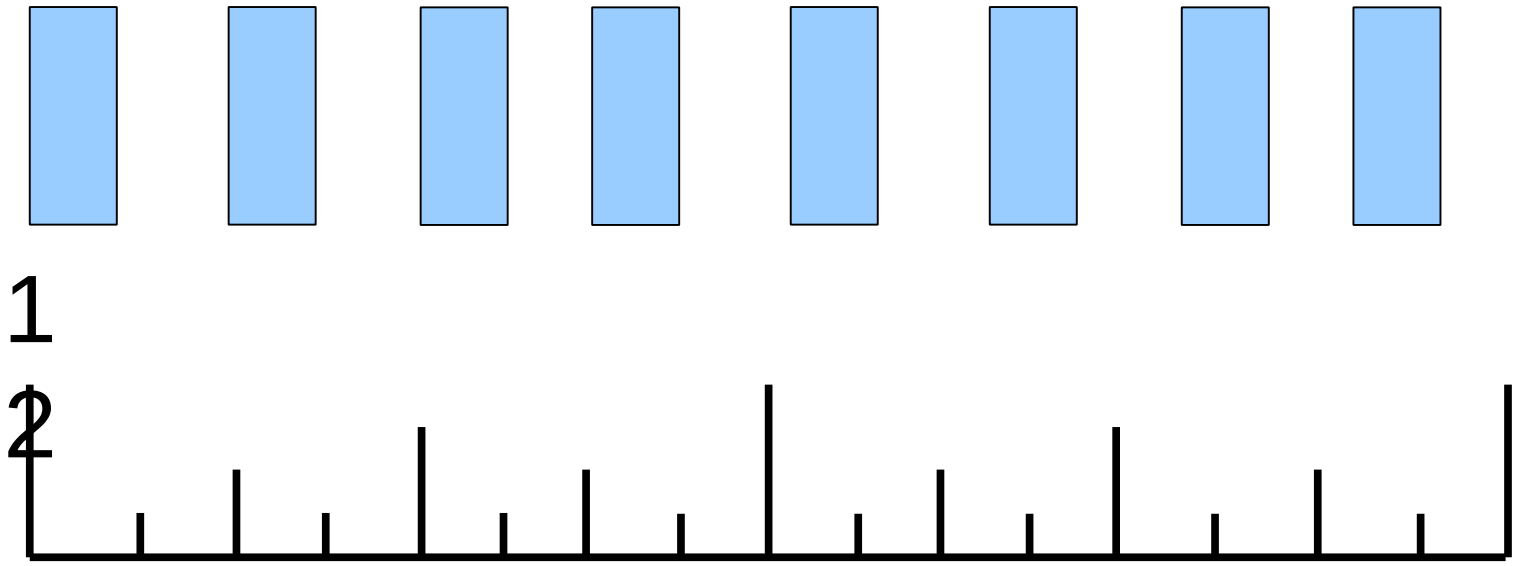

```
makeBeat(ELEKTRO_HOUSE_DRUMS3_2M, 1, 1, “0+++0++00+0+0-00”)
```

"0+++0+++0+0+0+++"




```
makeBeat(ELEKTRO_HOUSE_DRUMS3_2M, 1, 1, "0+++0+++0+0+0+++")
```

“0-0-0-0-0-0-0-0-”




```
makeBeat(ELEKTRO_HOUSE_DRUMS3_2M, 1, 1, “0-0-0-0-0-0-0-0-”)
```

For Loops: Skip Counting

```
fillDrum = HIP_HOP_SYNTHDRUMS2_2M
beat = "0+++0+++0-000+00"

for measure in range(1, 9, 2):
   makeBeat(fillDrum, 1, measure, beat)
```

measure is the "index variable" = assigned values from the range()

(1, 9, 2) means start counting at 1,
end before 9 [meaning 8] and skip count by 2:

(1, 3, 5, 7)

Functions: Recycle and Reuse!

```
def sectionA(start, end):
    stompDrums = HIPHOP_STOMP_BEAT_002
    bongoDrums = HIPHOP_DUSTYPERCUSSION_002
    keys = HIPHOP_SOLOMOOGLEAD_001
    scratch = ELECTRO_SFX_WHITENOISE_SCATTER_002

    fitMedia(stompDrums, 1, start, end)
    fitMedia(bongoDrums, 2, start, end)
    fitMedia(keys, 3, start, end)

    for measure in range(start, end):
        if measure % 2 == 0:
            fitMedia(scratch, 4, measure, measure+1)
```

Now I can use this section anywhere!

```
sectionA(1, 9)
sectionA(17, 25)
```

Creating a Function

1. Definition:

```
def sectionA(start, end):
```

2. Decide on Variables for Music

```
stompDrums = HIPHOP_STOMP_BEAT_002
bongoDrums = HIPHOP_DUSTYPERCUSSION_002
keys = HIPHOP_SOLOMOOGLEAD_001
scratch = ELECTRO_SFX_WHITENOISE_SCATTER_002
```

3. Write fitMedia() calls

```
fitMedia(stompDrums, 1, start, end)
fitMedia(bongoDrums, 2, start, end)
fitMedia(keys, 3, start, end)
```

4. Write any For Loops

```
for measure in range(start, end):
    if measure % 2 == 0:
        fitMedia(scratch, 4, measure, measure+1)
```

5. Set Effects

Rhythm Effects

```
# Define List of Values for Effects
valueList = [1000, 20000]
panList = [-100, 100]

# Define BeatString for Effects
filterString = "0011001100110011"

# Music for Track
fitMedia(EIGHT_BIT_ANALOG_DRUM_LOOP_003, 1, 1, 9)

# For Loop to call Effects
for m in range(1, 9):
    rhythmEffects(1, FILTER, FILTER_FREQ, valueList, m, filterString)
    rhythmEffects(1, PAN, LEFT_RIGHT, panList, m, filterString)
```

Exercises for Workshop

- Create EarSketch Account
- Mix1: (AB Section Exercise)
  - Use fitMedia and setEffect
  - Music in sections
- Mix2: (makeBeat and For Loop Exercise)
  - makeBeat
  - For Loop Structure
- Mix3: (Defining Functions Exercise)
- Final Mix

Final Mix Project Goal

- Define Three Functions
  - sectionA(start, end)
  - sectionB(start, end)
  - sectionC(start, end)
- Each function will have at least 3 musical clips
- At least one function will use a for loop and makeBeat
- At least one function will use effects

- Call your functions to create a music mix
  - ABABCBB
  - At least 64 Measures