

Sonic Pi Generative Music Unit Plan

Lesson # 1 - Using Random Events to Write A Song

Lesson Objectives

Students will be able to write a program which simulates using random events to choose sequences of notes and rhythms to be used in a song

Suggested Duration

1 period (45 minutes)

NYS Computer Science and Digital Fluency Learning Standards

7-8.IC.1 Compare and contrast tradeoffs associated with computing technologies that affect individuals and society.

7-8.CT.6 Design, compare and refine algorithms for a specific task or within a program.

Vocabulary

Indeterminate - Not definitely or precisely determined or fixed; not known in advance.
Aleotric - Depending on the throw of a dice or on chance; random.

Assessments

- Assess _____. Check for the ability to:
 - Create data structures which hold a specific number of values
 - Use methods that randomly select values from data structures
 - Use a loop to repeat the same functions with different arguments

Do Now

Play students excerpt of "Music of Changes" by John Cage.

Link: [📺 John Cage: Music of Changes \(1951\)](#)

While listening, have students write down:
"I notice..." and "I wonder..."

Get student responses.

Address student wonders about how the music was written.

Ask students how they think this music was written. Get responses.

Inform students this piece was written using a series of coin flips to choose each part of the piece including notes values, volume, duration, tempo etc.

This type of music is called Indeterminate or Aleatoric. John Cage felt that this type of composing was a way to remove human choice and ego from the musical composition process by having all decisions made by random events instead of the composer making those decisions themselves.

Lesson

Part 1 - Making a song based on random events

1. Inform students they are going to make their own composition based on random events.
2. Hand out ***Randomized Song Instructions and Template sheets***.
Go over directions for the assignment.
Show students Random.org webpages for dice rolls and coin flips.
Do a couple of examples with students first.
 - Have students choose 6 random number
 - Have students choose 2 random sleep values
 - Go through dice roll and coin flips to choose values
3. Have students complete the song template.
4. Once students have finished the song template, they can go into Sonic Pi and enter the data for their song and listen to how it sounds.

Note: Tell students the most efficient way to enter their code into Sonic Pi is to copy and paste the words ***play*** and ***sleep*** 16 times first. Then go through and enter the values for each function.

Part 2 - Refactoring Randomized Song

1. Tell students we want to recreate the process of writing this song in Sonic Pi without needing to roll dice or flip a coin.

Things for students to consider:

- How should we store our notes and sleep values
- How can we randomly choose our notes and sleep values once we have picked the values we want to use.
- How many times does our code play and sleep

2. Have students work on how to write a program to make a Randomized song.

Example Code solution:

```
1 notes = [40, 50, 60, 70 ,80, 60]
2 time = [0.5, 1.25]
3 16.times do
4   play notes.choose
5   sleep time.choose
6 end
```

Wrap Up/Assessment

Inform students that there are functions in Sonic Pi that are capable of replicating rolling a dice or flipping a coin.

dice - This will return a value between 1 and 6

rand_i - This function will return a value of 0 or 1

Ask students to consider what might be the pros/cons of using a computer program to automate the process of rolling dice and coin flips.

Also have them consider what are some real world examples of where we would need to have a number or sequences of numbers generated randomly.

Students should submit their code and complete the wrap up questions in submission document posted on Google Classroom

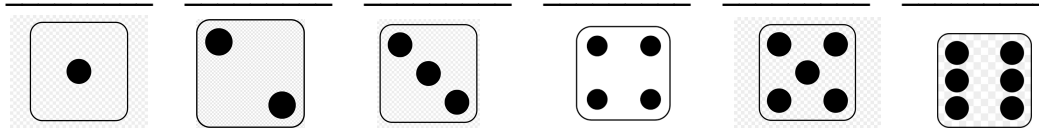
Exit Slip: [Lesson 1 - Random Event Simulation submission document](#)

Randomized Song Instructions

Task: You will create a song that is composed by using random events to decide the notes and sleep values.

Choose 6 numbers between 40 and 100. These will be your play values.

Write each number above one of the sides of the die:



Choose two numbers between 0.125 and 2. These will be your sleep values.

Write each number above one of the sides of the coin



Directions

You are going to make a piece of music that is determined by the results of random events (dice rolls and coin flips)

Go here for dice roll simulation (choose **roll 1 virtual dice**): <https://www.random.org/dice/>

Go here for coin flip simulation (choose **flip 1 virtual coin**): <https://www.random.org/coins/>

After each roll of the die, write down the number which corresponds to that side of the die for the play value.

After each coin flip, write down the number which corresponds to that side of the coin for the sleep value.

Note: It is not specified whether you should alternate between a die roll and coin flip or if you should do all the die rolls and then all the coin flips. You can make this decision (or have a random event determine what you should do!)

Randomized Song Template

Write the results of your random events here.

play		play	
sleep		sleep	
play		play	
sleep		sleep	
play		play	
sleep		sleep	
play		play	
sleep		sleep	
play		play	
sleep		sleep	

Random Event Simulation submission document

1. Copy and paste the code for your randomized song in the box below

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2. Consider 2 Pros and 2 Cons to using a computer simulation for random events like dice rolls and coin flips.

Write your responses in the boxes below

<u>Pros</u>	<u>Cons</u>

3. Give at least two real world examples where there needs to be a random number or a random sequence of numbers chosen.

<u>Example #1</u>	<u>Example #2</u>