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| **Topic/Duration** | **Custom Functions Part 2 / 1 Class period/ 50 minutes** |
| **Priority Standards** | **Georgia Music Technology**:   1. [**MSMTC6.CR.2**](https://case.georgiastandards.org/f3b94c72-9c0d-11e8-b85c-3b1a3079ae6e/437e30dc-fc39-11ea-becb-0242ac150004/2042)**-** Select and develop musical ideas for defined purposes and contexts. a. Select melodic, rhythmic, and harmonic ideas to develop into a larger work using digital tools and resources. 2. [**MSMTC6.PR.2**](https://case.georgiastandards.org/f3b94c72-9c0d-11e8-b85c-3b1a3079ae6e/62c7d47c-fc0f-11ea-841e-0242ac150004/2016) - Analyze the structure and context of varied musical works (e.g. arrangement, composition, improvisation, mixed-media project, orchestration, sound design) and their effects on the presentation. a. Recognize how context, structural aspects of the music, and digital media/tools inform prepared and improvised performances.   **Foundations of Computer Programming Standards**   1. [**MS-CS-FCP-3.2**](https://case.georgiastandards.org/00fcf0e2-b9c3-11e7-a4ad-47f36833e889/731f5cab-5d1e-46f4-bba0-c26268b93022/565) Develop a working vocabulary of computational thinking including ... algorithms, … abstraction, parallelization. 2. [**MS-CS-FCP-4.5**](https://case.georgiastandards.org/00fcf0e2-b9c3-11e7-a4ad-47f36833e889/a85ce778-24f2-4a67-b169-d2e6862e72c2/573) Implement a simple algorithm in a computer program. |
| **Supporting Standards** | **Foundations of Computer Programming Standards**   1. [**MS-CS-FCP-3**](https://case.georgiastandards.org/00fcf0e2-b9c3-11e7-a4ad-47f36833e889/35695273-4888-4f59-89a5-45ef323b432f/563)Utilize computational thinking to solve problems. 2. **[MS-CS-FCP-6](https://case.georgiastandards.org/00fcf0e2-b9c3-11e7-a4ad-47f36833e889/baad1ebb-16df-40e5-b8f8-4b62e6310b74/585)** Create digital artifacts to address a current issue requiring resolution. |
| **Student Facing Goals** | Students will be able to...   * use custom functions to organize their song in a musical form. |
| **Essential Question & Enduring Understanding** | **How can custom functions help us to organize our code and structure of our music composition?**  Custom functions allow us to create repeating song sections without writing lines and lines of code. We can organize our songs into sections and call them multiple times without writing repetitive code. This assists the creative process in song writing allowing you to make changes in the code easily to compose the best possible song. By calling the functions in different orders, you can also include repetition and variation of sections.  **How do custom functions help us organize our code and make it more concise?**  Custom functions allow us to perform actions multiple times over the course of our script without having to rewrite code, as well as allow us to make changes to a function that will create that change across our entire script rather than having to make the change manually in multiple places. |
| **Evidence of Learning** | **Formative**: Rewrite a song script using custom functions to map out the form. |
| **Materials** | EarSketch  Template EarSketch scripts |
| **Vocabulary** | * **Custom Function:** A block of code that performs a specific, user-defined task. * **Argument:** Information given to a function when it is used. Arguments fill in the place of parameters when using a function. * **Parameter:** A variable used in a function definition. In EarSketch, a parameter may be a sound name, track number, etc. |

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| **Resources** | |
| Link 1: Engage Warmup Song <https://www.youtube.com/watch?v=X715EumTGo8>  **EarSketch script links:**  Link 2: Explain Script:  <https://earsketch.gatech.edu/earsketch2/?sharing=kyKe5cIlHAU4uEYK5vFkaw>  [Link 3: Elaborate Template](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)  <https://earsketch.gatech.edu/earsketch2/?sharing=q_203NxZn2vgAlUbYiLsYQ>  [Link 4: Elaborate Solution](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)  [[https://earsketch.gatech.edu/earsketch2/?sharing=pgPrEs4tASPr7G3yLRu6Qw](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)](https://earsketch.gatech.edu/earsketch2/?sharing=pgPrEs4tASPr7G3yLRu6Qw) | [EarSketch Curriculum Panel (Links):](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)  [Chapter 7.2:](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)  <https://earsketch.gatech.edu/earsketch2/?curriculum=/en/v2/custom-functions:creatingyourcustomfunctions&language=python>  [Chapter 7.4:](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)  <https://earsketch.gatech.edu/earsketch2/?curriculum=/en/v2/custom-functions:yourfullsong&language=python> |

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| **[Teacher Preparation](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)** |
| 1. [Review sample code and add in extra comments if needed to help explain the concepts to students.](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) 2. [Provide the link for the EarSketch demonstration to the students through Google Classroom/email. The solution script can be found in the notes of the PowerPoint as well.](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) |

[Lesson Implementation](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)

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| **[Engage / Explore: Review of connecting functions to form Time: 10](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) *[Minutes](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)*** | |
| **[Section Goal:](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)** [Students will review the concept of song form as well as learn how to organize a song using a sandwich metaphor.](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) | |
| **[Student Activities](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)**   * [Listen to song “Bury It” by Chvrches](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) * [Think about the musical form and share how you might code this song in EarSketch based on your prior lesson learning.](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) * [Write the ingredients for two types of sandwiches](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) * [Def Turkey Sandwich](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)   + [White Bread](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)   + [Cheddar Cheese](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)   + [Tomato](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)   + [Turkey](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)   + [Mustard](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)   + [White Bread](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) * [Def Chicken Parm](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)   + [Roll](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)   + [Chicken](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)   + [Tomato Sauce](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)   + [Parmesan Cheese](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)   + [Roll](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) * [Imagine you had to take the class lunch order - would you write down all the ingredients for the turkey sandwich for each student, or just write Turkey, Ham, Chicken. Which method is easier?](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) * [Think about how you can define a function in EarSketch just like you defined your sandwich. You can define a “verse” or “chorus” and call it when you want to play those lines just as you can order a turkey or ham sandwich and know the ingredients.](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) | **[Teacher Activities](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)**   * [Play the song “Bury It” by Chvrches (Link 1). Ask students to sketch the form of the song.](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) * [Play the song a second time and stop at various time stamps. Did the students guess the correct form?](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) * [Ask the students how they would code this form in EarSketch as a whole class activity. Write the student guided code on the board. (For this activity, it is more about writing #Verse (four fitMedias without arguments), #Chorus (four fitMedias without arguments), #Verse (same four fitMedias without arguments), etc.](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) * [Remind students that at the end of the previous lesson - they learned about an alternate way to write song sections using a different method called custom functions. Using custom functions would make the code that the students helped write on the board a lot more concise.](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) * [Ask students to imagine if every time they wanted to order a sandwich, they had to order all the ingredients separately. Instead of saying they wanted a turkey sandwich, they would have to order two slices of white bread, one piece of cheese, one slide of tomato, mustard, and three pieces of turkey. If they were writing down the class lunch order – imagine how long that would be. (Slide 5)](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) * [Ask students to define two sandwiches by their ingredients. Now that the sandwiches are defined, you can take the class lunch order by just writing the name of the sandwich – Turkey, Ham, Veggie etc. (Slide 5, 6)](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) * [This is how custom functions work – you can define your chorus or verse and call them for certain measures without having to write all your fitMedias (or ingredients). Show the comparison of sandwiches and custom functions (Slide 7).](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) |
| **[Coding Connections: N/A](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)** | |

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| **[Explain: Creating section functions in ES Time: 10 minutes](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)** | |
| **[Section Goal:](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)** [Students will learn how to utilize custom functions in order to map out the form of their song.](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) | |
| **[Student Activities](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)**   * [Look at a sample code provided by your teacher; how can we use custom functions to make this code more concise. Share your ideas. Code along as your teacher demonstrates how to organize code into custom functions and call those functions. Learn about the advantages of using custom functions to create form in your song and have more concise code.](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) | **[Teacher Activities](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)**   * [Show students a sample of code that is just organized by fitMedia(). Here is an example or you can use code from the prior lesson.](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)    + [Ask students: how can they make this code more concise?](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)   + [Ask students: what parameters do they need to write their functions? What may change between the verse and the chorus? (Slide 8).](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)   + [Demonstrate in EarSketch in the sample code of how you change a code organized by comments and fitMedia() to have custom functions. (Link 2, Slide 9) Include how to define a function, indent the function, and change the start, end measure to variables. Ask students why the start/end measures are variables.](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) * [Demonstrate how to call a function and organize function calls (Slide 10).](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) * [Discuss the advantages of using custom functions in your code. Model making changes within a custom function and re-running the code.](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) |
| **[Coding Connections: N/A](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)** | |

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| **[Elaborate: Apply your Skills Time: 20 minutes](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)** | |
| **[Section Goal:](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)** [Students will demonstrate an understanding of custom functions by writing custom functions for an ABAB form song.](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) | |
| **[Student Activities](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)**   * [Rewrite a given Earsketch script to use custom functions for each section.](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) | **[Teacher Activities](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)**  [Provide students with a pre-written song script in Earsketch and task them with replacing each section with a custom function (Link 3, Slide 11).](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)   * [Hint: the students may want to use multiple custom functions because the sections are different in instrumentation.](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) |
| **[Coding Connections: N/A](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)** | |

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| **[Evaluate: Reorganizing with custom functions Time: 20 minutes](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)** | |
| **[Section Goal:](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)** [Students will further demonstrate their understanding of custom functions by utilizing custom functions in their own songs/scripts. (Mini-task)](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) | |
| **[Student Activities](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)**   * [Utilize custom functions to create their own structured song in EarSketch.](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) | **[Teacher Activities](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)**   * [Distribute or project Mini-Task Assignment. Explain the assignment to the students. Provide time for questions. Support students as they complete the mini-task (Slide](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc) *[12).](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)* |
| **[Coding Connections: N/A](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)** | |

**[Differentiation:](https://earsketch.gatech.edu/earsketch2/?sharing=7i558MWgFKf-JqEXrQNVhEMN_pB5G_uGpBAbTb2R_gc)**