# **GarageBand: Create Music with Multiplication and Codes Outline**

*Create a high-level outline for the activity which describes the challenge presented to students, applied math (if applicable), headings of “What You Should Know Sections” to include, overview of project steps, and possible Extend Yourself Activities to build out.*

**Technology Name:** GarageBand

**Activity Title: Making Music with Multiplication**

**Grade Level:** 3rd

**Math Standards Alignment/Grade Level:**

**3.OA.A.7:** Fluently multiply whole numbers up to 12 x 12.

**3.NF.A.2:** Understand a fraction as a number that represents a part of a whole. (Relates to understanding musical notes as divisions of an octave.)

**Activity Idea/Challenge Description:**

In this project, you will be using your multiplication skills to make music! After solving multiplication problems, you will use a code to translate the answers into notes. You will use those notes in GarageBand to create a melody with the piano keyboard.

**What You Should Know (High Level Topics):**

* **T**he basics of GarageBand (would this be sending them to the GarageBand Information page?)
* **Number Sense**
  + **Number Sense**: This refers to understanding how numbers work, including their value based on their position within a number. In this case, it specifically mentions place value, which means understanding the significance of each digit based on its position (ones, tens, etc.).
  + **Interpreting Two-Digit Number**s: This means being able to break down a two-digit number into its individual digits and understand their combined value. For example, in the number 27, the "2" represents twenty and the "7" represents seven, combining to make twenty-seven.
  + **Multiplication Fluency**
    - Multiplying two-digit numbers sounds tricky, but it's basically like doing single-digit multiplication twice! Let’s practice by multiplying 12 x 34
* **Music Notation**
  + By combining notes, scales, rhythms, and other musical elements, we create intricate sounds . Learning to read and understand musical notation empowers you to unlock these intricate structures, appreciate the nuances of music, and even create your own music.
  + **The Staff:** Look at the picture above. It looks like a five-lined ladder with four spaces in between. Each line and space has a designated musical name, forming the backbone of our notation system: Do, Re, Mi, Fa, Sol, La, Ti, and back to Do. This is the musical alphabet. These names form the basic "alphabet" of music.
    - The cycle of Do, Re, Mi, etc. doesn't just repeat once on the staff. It can continue higher and lower, creating different "octaves." Each octave is a set of eight notes, starting with a Do and ending with the next Do. This repeating cycle across octaves allows for a wide range of pitches to be written and played, from very low to very high.
    - The picture below shows a piano keyboard with the notes that are associated with each of the keys.
  + **Notes:** These are the musical characters that reside on the lines and spaces. Think of them as symbols representing different pitches and durations. They come in various shapes and sizes, dictating how long they are held:
    - Whole note: big and round, lasting four beats.
    - Half note: oval shape, lasts for two beats.
    - Quarter note: tiny oval, lasting just one beat.
    - Eighth note:it looks like it has a flag, each is worth half a beat.

The diagram below shows the notes in this order: whole note, half note, quarter note and eighth note.

(pictures to be included)

* + **Octaves in Music:** Imagine a piano keyboard. It has repeating patterns of white and black keys. Each pattern represents an octave. An octave is a set of 8 notes (Do-Re-Mi-Fa-Sol-La-Ti-Do) that sound similar but have different pitches. The higher the octave, the higher the pitch of the notes.

Learning to read music is like unlocking a secret language. With practice, the notes and symbols become music.

* **Translating Answers into Music** 
  + **Understanding Code:**
    - What is code? A code is a set of instructions written in a special language.
    - Our musical code: In this lesson, you’ll use a special code to translate multiplication answers into musical notes.
  + **Translating the Code:**
    - After you solve the multiplication problems, you will find the matching note and write these down on your worksheet. When you have all of the numbers translated into the notes, you will play these on the keyboard in GarageBand.
      * For example, using the problem we solved earlier where the answer was 408, the notes would be F (4) Rest (0) C-high octave (8)

1 = C

2 = D

3 = E

4 = F

5 = G

6 = A

7 = B

8 = C (high octave)

9 = D (high octave)

0 = Rest

* + - **What does high octave mean in the code?**
    - In the code, "8" represents "C (high octave)" and "9" represents "D (high octave)". This means these notes are in a higher octave than the regular "C" and "D" notes. To finding them on the keyboard:
      * **Locate Middle C**: Find the white key closest to the middle of the keyboard. This is called "Middle C".
      * **Count Up for High Octaves:**
        + For "C (high octave)": Move up 8 white keys from Middle C.
        + For "D (high octave)": Move up 9 white keys from Middle C.

**Career Connection(s):**

* **Music Teacher:** Music teachers use fractions to explain rhythm, ratios to tune instruments, and even probability to analyze compositional patterns. Understanding various instruments, playing styles, and musical genres is essential. Teachers must effectively communicate musical concepts and inspire students to explore the math-music connection.
* **Composer**: Composers must understand advanced music theory, often involving complex mathematical concepts. This empowers composers to create innovative soundscapes. They use algorithms to generate melodies, manipulate sound frequencies, and design intricate musical structures. Mastery of composition techniques, proficiency in playing multiple instruments, and a strong understanding of musical history are crucial. Composers need a keen ear and creative vision to translate their mathematical ideas into captivating music.
* **Music Therapist:** Music therapists use music and mathematical analysis to design therapeutic interventions for various conditions. They can use music to improve cognitive function and emotional well-being. Music with specific tempos and frequencies might be prescribed to regulate mood, improve sleep, or enhance communication.

**Project/Activity Steps (High Level Steps):**

* Practice multiplying two digit numbers
  + Worksheet with 20 problems to answer
* Translate the Worksheet answers into code
* Play the notes, in order, on the keyboard in GarageBand
  + Create a melody using their multiplication answer notes. Each digit in their answer becomes a note in their melody.
* Create an original, simple ten note tune
* Translate that tune from notes, into numbers.

**Project Submission Item(s):**

* Melody created from multiplication worksheet
* Original melody with number system included

**Extend Yourself Idea(s):**

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* + Extend the original song and write a short rap or song that teaches others how to multiply double digit numbers
  + Extend the original song and add different instruments in GarageBand
  + Explore different time signatures in GarageBand, like 3/4 or 6/8, and adapt their compositions