

## Lesson 2.5: Secret Codes

(Suggestion: break it down to 2 sessions)

### Objectives

In this lesson, students will be able to:

- ❖ Define a pattern to encrypt messages so they can securely communicate
- ❖ Use a defined pattern to decrypt a message receive
- ❖ Create a musical tune and encrypt it

### Agenda

1. Introduction	5 mins
2. Our secret patterns	20 mins
3. Send your favorite number	10 mins
4. I am a composer	30 mins
5. Wrap Up and Reflections	5 mins

### Preparation

- Creating our encryption pattern (one per student)
- Practicing Encryption - Practicing Decryption (one per student or per pair of students)
- Encrypt your favorite number” (one per student)
- Create your own favorite tune (One per student)

### Resources & Links



## 1. Introduction



Why do people keep secrets? (ask for suggestions from students)

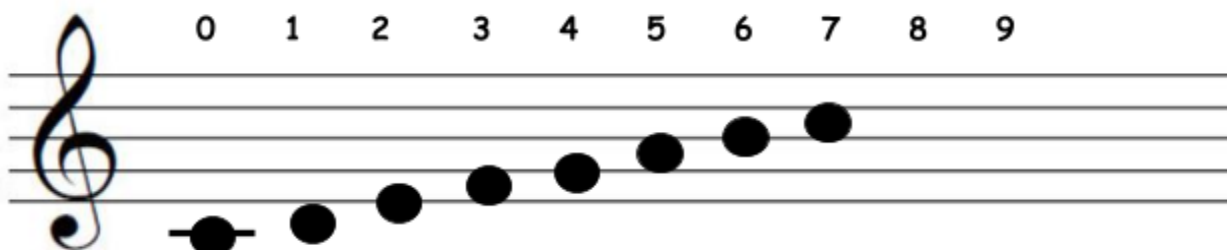
Connecting devices to a network or the Internet provides great benefit, but care must be taken to protect devices and information from unauthorized access. Messages can be protected by using secret languages or codes. Patterns help to ensure that the intended recipient can decode the message. Students create a pattern that can be decoded and translated into a message.

Explain to students: Last time, we created a network. We were talking to each other in order to send a message using a string cup. This time, we are going to send our messages silently, and use some code so that nobody else can guess what we are sending. This process is called **encryption**

Imagine we would like to send numbers to each other without anyone being able to decrypt our secrets if they intercept the message.

## 2. Our secret patterns

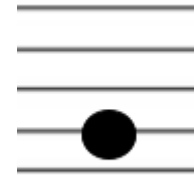
If I am on a network (refer to Lesson 2.4), at a certain node and I need to secretly share my favorite number with somebody at the next node, I can decide to “disguise” my number by replacing it by one or more symbols. My friend (on the next node) and I need to agree on the set of symbols to be used. For example, we can choose a music note for each of the digit from 0 to 9 on a code based on music notes as shown below:



Each note on the C Major Scale has been associated with a digit from 0 to 7. Distribute the activity sheet: “Creating our encryption pattern” and explain that the digit 0 can be represented by the note “Do” or C, the digit 1 can be represented by the next note on the scale (“Re” or D). Ask students to complete the last 2 notes for digits 8 and 9?

Here is how you use encrypt the number 4:

You would need to draw 5 bars for the scale and a black dot on the second line from the bottom that correspond to the note G






If we want to encrypt a number with 2 digits, we will need 2 symbols:


For example 41 would be



Distribute Practicing Encryption to students and have them work on finding the notes to encrypt the numbers (either alone or in pairs)

Solution:

Number	Code
5	
16	
37	





136	
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Explain to students: Once the message is received, the other person needs to decode the message to understand which number was sent. That process is called “Decryption”



Distribute the activity “Practicing Decryption” and complete the first one with the students. Let them work on the next 3 on their own

Solution:

Code	Number
	2
	66
	58
	706

### 3. Send your favorite number



Distribute the “Encrypt your favorite number”. Review the instructions with the students and have them work through the activity in pairs.

### 4. I am a composer

Developing music literacy means discovering the expressive elements of music, understanding the basic concepts of music, knowing the terminology that is used to comprehend music, developing the skills necessary to produce music, and being able to reflect, critique, and connect personal experience to music. During this project, students can compose a small tune of their choosing and then use our encryption protocol to encode it.



Distribute the activity “Create your own favorite tune” (this part can also be done during a Music class) and the students first work on music instruments to compose a simple musical tune on the C Major Scale. They then encrypt their tune using the encryption pattern defined in class and give it to another student that will need to decrypt and if possible play the tune.

### 5. Wrap Up and Reflections



#### Reflection Points:

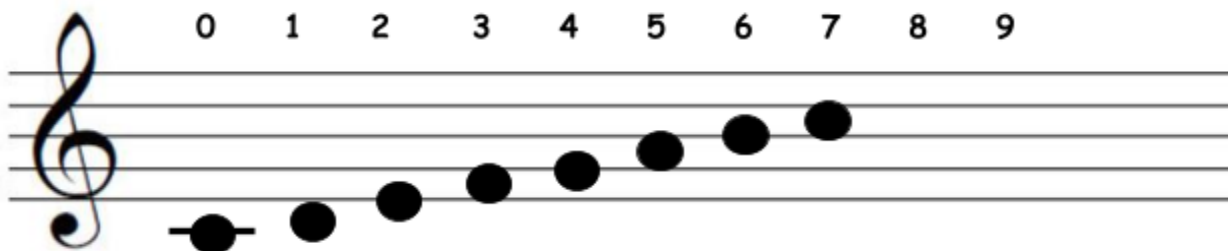
- When do you think we might need to make our message “secret”?
- Could you define in your own words the meaning of encrypting a message or decrypting a message?
- Why do people keep secrets? When do you think we should encrypt messages when using the internet?

## Creating our Encryption Pattern

Encryption: Converting a set of information into a secret code

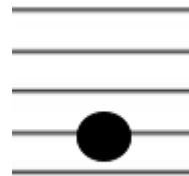
For our activity we would like to encrypt numbers, so we need to find a secret symbol for each digit from 0 to 9. We decided to use musical notes

We decided that 0 will be represented by the notes "Do" (or C). You have all the notes except for digit 8 and digit 9. Can you complete the drawing?



Great!

Here is how you use encrypt the number 4:







## Practicing Encryption

Create secret codes for different numbers:

Number	Code
5	<p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
16	<p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
37	<p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
136	<p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>

## Practicing Decryption

Find the number for each of the secret codes:

Code	Number
	
	
	
	



## Encrypt your favorite number

Your name: \_\_\_\_\_ Your partner's name: \_\_\_\_\_

### Instructions:

- Think of a number with 2 digits (from 10 to 99)
- Using the music code table, draw the 2 notes that represent your number

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- Give your activity paper to your friend. Using the code table, your friend guess which number you were thinking of

Your friend's answer: \_\_\_\_\_

Was it your number (check one)?  YES  NO

## Create your own favorite tune

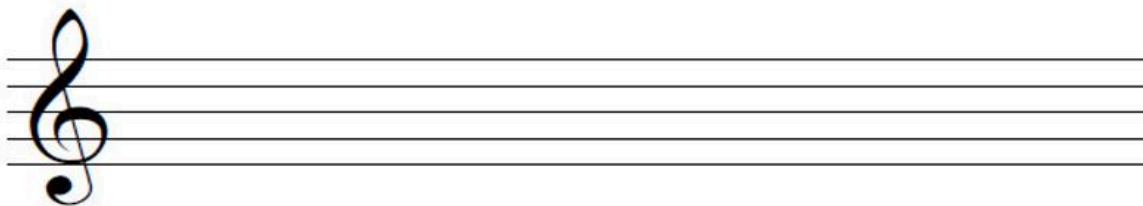
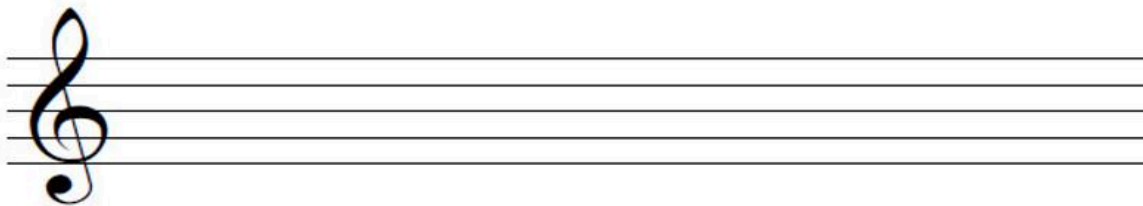
Compose your own music, using few notes in Major C

**TREBLE CLEF LINES AND SPACES**

**C D E F G A B C D E F G**

**C D E F G A B C D E F G**

You can practice note names on the staff and keyboard by going to [www.musictheory.net](http://www.musictheory.net) under "TOOLS" tab, then find "UTILITIES". Use the "POP-UP PIANO".



Write the code symbols to pass to your partner

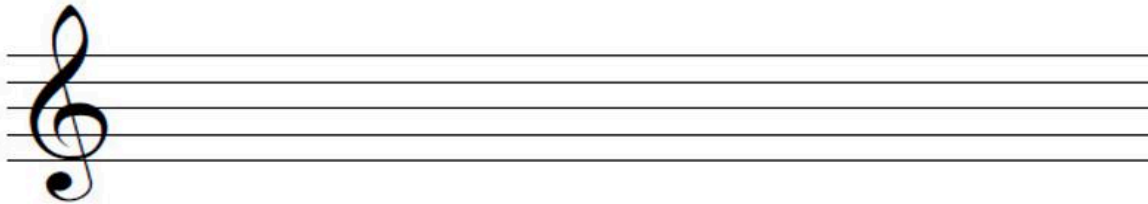
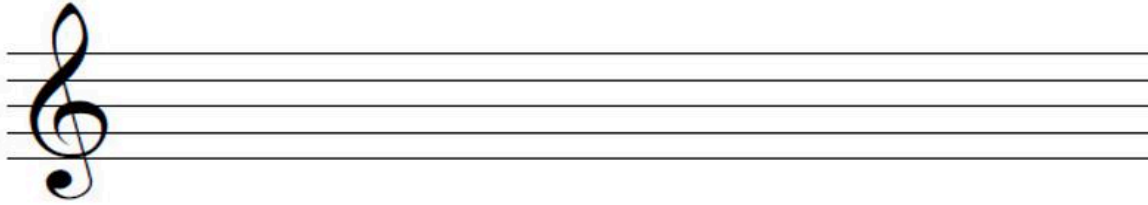
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Take the activity sheet from your partner

Decrypt your partner's tune:



## Standard Alignment (inference with other subject)

### California Arts Standards Visual and Performing Arts Content (Music)

**Creating—Anchor Standard 1:** *Generate and Conceptualize Artistic Ideas and Work*

2.MU:Cr1

- a. Improvise **rhythmic** and **melodic patterns** and **musical ideas** for a specific **purpose**.
- b. Generate **musical** patterns and **ideas** within the **context** of a given **tonality** (such as major and minor) and **meter** (such as duple and triple).

**Creating—Anchor Standard 2:** *Organize and Develop Artistic Ideas and Work*

2.MU:Cr2

- b. Use **iconic** or **standard notation** and/or recording technology to combine, sequence, and document personal **musical ideas**.