

Cryptography Murder Mystery

Lesson Plan – For Teacher Use Only

Focus Question

Decode clues to find the identity of the murderer, the murder weapon, and the room in which the murder took place

Learner Objectives

I can:

- Use a variety of cryptography ciphers to decode a message
- Think critically to make sense of several clues to solve a problem
- Work productively in a group

Materials

For each group you should have the following:

- **Cryptography Murder Mystery Cover Sheet** – lists subjects, locations, and weapons and includes space for a group to record their solution
- **Clues 1-8** - it works best to cut these ahead of time to provide groups with clues that they can easily share among the different individuals
- **Alphabet Templates** – provide groups with a page of these templates to make it easier for them to modify their ciphers

For the classroom you should have the following:

- **Cryptography Resource Posters** printed and hung up around the room. It helps to have multiple copies to avoid congestion as individual posters.

Classroom Setup

Students should start class sitting in groups of 4-5 at a table or some other centralized location.

Cryptography Resource Posters should be hung up around the room and piles/folders of clues and cover sheets should be printed and prepared to give to each group when it's time to start the task.

Lesson	
3-5 min	<p>Setting the Stage</p> <p>Hand out the Cryptography Murder Mystery Cover Sheets, one of each per group. Read through this as a class so that students are familiar with the task.</p> <p>To introduce the concept of cryptography, it helps to show a brief video or demonstration in front of the class. The YouTube video by Khan Academy called What is Cryptography? (https://youtu.be/Kf9KjCKmDcU) provides a good introduction to the general concepts of encoding information using ciphers.</p>
2 min	<p>Hand out Clues</p> <ol style="list-style-type: none"> 1. <i>"This challenge is based off of the game Clue where players need to identify a murder suspect, location, and weapon. There are 6 options given for each category and every clue that a group deciphers will narrow that list down. In order to solve the mystery, you and your group will need to solve all 8 clues that have been provided"</i> 2. Hand out the stacks of 8 clues to each group 3. <i>"As you can see, each of these clues has been encrypted using a different cipher, there are resources posted around the room about the basic techniques used in different ciphers. You may use these to help you decipher your clues but you will need to figure out with clues go with which ciphers"</i> 4. Point out the Cryptography Resource Posters hanging around the room 5. To avoid having groups totally splitting up and standing in different locations around the room for the whole task, it can work to encourage them to take pictures so that they have the resources to bring back with them to their seats.
~30 min	<p>Work Time</p> <ol style="list-style-type: none"> 1. Groups should work together to make their way through the clues to ultimately narrow their lists down to one single murderer, location, and weapon. <p>A note about the clues: <i>Each of the clues is encoded using a different cipher technique. None of these ciphers are too intense and the keys are given when needed so students should be able decrypt the messages without having to employ frequency analysis or other more advanced cryptography techniques. One of the biggest challenges for the students is that even though the resource posters provide the information about each cipher, it isn't always obvious which cipher to use for a particular clue.</i></p> <ol style="list-style-type: none"> 2. Walk around the classroom while students are working to observe group dynamics and/or provide hints to groups that are getting stuck 3. Once students are confident that they have solved the mystery, have them call you over and present the evidence that has informed their response. 4. Groups will naturally finish at different times. If students are starting to get bored, you can employ them as assistants for other groups as they finish up.

Wrap Up (optional)

From Turing's machine that helped crack the Enigma Cipher to end World War II to the exciting advances today in Bitcoin and Blockchain technologies, cryptography is a huge part of our history and our present. [This video from SciShow](https://youtu.be/-yFZGF8FHSg) (<https://youtu.be/-yFZGF8FHSg>) does a great job highlighting some of these impacts. If you don't have as much time, you can just show the last couple minutes (starting at 5:58) to focus on the applications of ciphers.

Accommodations/Modifications

Encourage groups to work persistently through the challenge and the feeling of being stuck. If it looks like a group has stopped making progress, it may be necessary to provide some hints to help them down a productive path. Try to limit the hints to 1-2 things that will help the group wherever they are at.

Some possible hints to consider:

1. What cipher do you think that clue is encoded using?
2. What does the "Key" or "Keyword" provided on some clues tell you about the code?
3. Check that they have interpreted the clue message correctly when eliminating options

Solution

It is highly recommended that you try this task for yourself first before looking at the solutions. You will have a much better idea of the process to help your students through if you have gone through it beginning to end from their point of view. That said, it is really handy to have a page with all of the solutions to have with you as you walk around during the task. These solutions contain the clue number, cipher used, and encoded message for each of the 8 clues. They are also color coded to indicate whether they are information about the suspect, location, or weapon.

1	Pigpen	The murderer shares their name with an element
2	Polybius Square	The murder weapon can be used for making measurements
3	Atbash Cipher	The murder took place in a prime numbered room
4	Affine Cipher	Watch out for suspects with a color in their name
5	Caesar Cipher	This tool is often used in chemistry
6	Phone Characters	Bad things happen in rooms that start with two
7	Keyword Cipher	You should never trust someone with a PHD
8	Morse Code	There is no I in team or in the name of the murder weapon
Dr. Silver		Beaker