HACKER TRAINING

Learn about cryptography and how to use a replacement cipher. Then create messages to encode and decode with others in your group.

Grade Level: 2nd – 6th grade

Preparation Time: 15 minutes

Activity Time: 30-45 minutes

Grouping: Flexible

Objective: To introduce youth to the concept of cryptography by creating and decoding simple replacement ciphers.

Materials

- Writing Materials (Paper/Pencil, Whiteboard/Marker, Computer, etc)

Before the Activity

1. Review instructions and practice creating a cipher.

Focus: Knowledge of cryptography can help youth navigate the digital landscape more safely and responsibly, developing important skills for the future, and expose youth to career opportunities.

- Cybersecurity: As more of our personal and financial information is transmitted over digital networks, it is crucial for young people to understand how cryptography works and how it is used to protect sensitive data. This knowledge can help them to be more aware of the risks of cyber attacks and how to protect themselves online.
- Career Opportunities: As the demand for cybersecurity professionals continues to grow, having knowledge of cryptography can provide young people with a valuable skillset and open up career opportunities in fields such as cybersecurity, information technology, and cryptography research.
- Critical Thinking: Learning about cryptography requires a level of mathematical and logical thinking, which can help young people to develop critical thinking skills that can be applied to other areas of their lives.

The goal of cryptography is to provide secure communication and protect sensitive information from unauthorized access.

Symmetric cryptography involves the use of a single secret key to encrypt and decrypt data. This key is shared between the sender and the recipient of the message, and both parties must

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keep it secret. Symmetric cryptography is typically faster and more efficient than asymmetric cryptography, but it requires a secure method for key distribution.

Asymmetric cryptography, also known as public-key cryptography, uses a pair of keys: a public key and a private key. The public key is used to encrypt the data, while the private key is used to decrypt it. The public key can be freely distributed, while the private key is kept secret by the owner. Asymmetric cryptography is slower and more computationally intensive than symmetric cryptography but does not require a secure method for key distribution.

Simple Replacement Cipher (Caesar)

A replacement cipher is a type of encryption technique that involves substituting each letter in a message with a different letter or symbol. In a simple example, each letter in the alphabet is replaced with a different letter, so that "A" might become "X", "B" might become "Y", and so on.
The resulting message appears to be gibberish but can be easily decoded by someone who knows the substitution pattern. It can be used to protect messages and data from being read by unauthorized parties.

Activity Directions

1. Introduce the concept of cryptography and explain how it works to protect messages and data from being read by unauthorized parties.
2. Explain that we will be creating and decoding a simple replacement cipher, which involves replacing each letter in the alphabet with a different letter or symbol.
3. Write out a replacement cipher on the board or on a separate piece of paper (Here is an example called (Caesar Negative 3 (because each letter is mapped to the letter which is 3 behind it), but any mapping will work):

Negative 3 Replacement Cipher:

Original:	A	B	C	D	E	F	G	H	I
Coded:	X	Y	Z	A	B	C	D	E	F

Original:	J	K	L	M	N	O	P	Q	R
Coded:	G	H	I	J	K	L	M	N	O

Original:	S	T	U	V	W	X	Y	Z	
Coded:	P	Q	R	S	T	U	V	W	

4. Have the youth practice encoding and decoding simple messages using the replacement cipher. For example:
    a. Encode the message "HELLO" as "EBBKH"
    b. Decode the message "EBBKH" as "HELLO"
5. Encourage the youth to create their own replacement ciphers, using different symbols or letters to replace the letters of the alphabet. They can practice encoding and decoding messages using their own cipher.

To make the activity more engaging, you can turn it into a game by having youth compete to see who can create the most complex replacement cipher or

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