

code**for**folsom

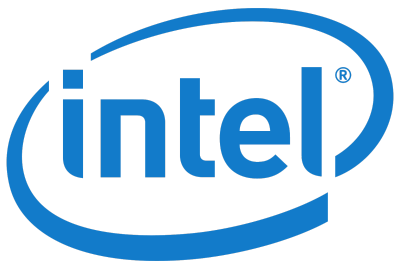


A cybersecurity boot camp organized by **YELLOW**



Encryption

Session 4



YELLOW CIRCLE INC
PO Box 2383
Elk Grove, CA 95759-2383

Teacher Lesson Plan



Encryption

Session Name:

Encryption

Summary:

Students learn how alphanumeric symbols can be encoded for a multitude of fun purposes and computer security. In this session students learn about codes, and are asked to make their own with a limited number of symbols. Students discover the relationship among encryption, decryption, and shared keys.

Time Allotment:

75 minutes

Learning Objectives:

- *History of Encryption*
- *Introduce students to simple codes*
- *Symmetric encryption and decryption workings*
- *The relationship between encryption and decryption*
- *Encryption schemes such as Cipher Wheels / the Enigma Machine*

Supplies:

- *Scrap paper / notepad to take notes*
- *Public Key/Private Key box*
- *Binary cipher activity worksheet (print)*
- *Paper enigma craft (print - 2 pages)*
- *Cipher strips (print)*
- *Laptop / computer with Internet access to research topic of selected project*



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Learning Activities:

- **(2 - 5 minutes) - Teacher Introduction**

Introduce yourself to students if you are new to the classroom. If you are continuing from a previous session, start with welcome back.

- **(2 - 5 minutes) - Volunteers Introduction**

Introduce any new volunteers that might be present. Teachers will be provided with a quick bio of each volunteer who are helping in the classroom. Only new volunteers need to be introduced.

- **(5 minutes) - Session overview**

In computing, encryption is the method by which plaintext or any other type of data is converted from a readable form to an encoded version that can only be decoded by another entity if they have access to a decryption key. Encryption is one of the most important methods for providing data security, especially for end-to-end protection of data transmitted across networks.

Encryption is widely used on the internet to protect user information being sent between a browser and a server, including passwords, payment information and other personal information that should be considered private. Organizations and individuals also commonly use encryption to protect sensitive data stored on computers, servers and mobile devices like phones or tablets.

- **(10 minutes) - Student Activity: Simple encryption with binary**

- *Pass binary encryption worksheets to students*
- *Instruct students to use the table to come up with their own encrypted word*
- *After 5 minutes, have the students pass the worksheet to different student*
- *Now it is time to decrypt the word*
- *Have students use the table to figure out encrypted word*

- **(5 minutes) - Binary activity review**

Take few minutes to review how binary code replaced the original word and how number, letters, and/or symbols can be used to encrypt messages

- **(5 minutes) - Video : Encryption as Fast As Possible**

- Codes (ciphers) are used to keep messages secret
- <https://www.youtube.com/watch?v=dut9EnbFym0>
- Stop playback at 3:48 to avoid sponsor commercial

- **(5 minutes) - Class activity - Secret messages**

Teacher demonstrates writing and encoding a message on screen (students may also experiment using their cell phones or laptops)

Teacher copies encoded message link and demonstrates decrypting the message using the key

<https://codemoji.org/>

- **(5 minutes) - Types of Encryption discussion**

Unencrypted data, often referred to as plaintext, is encrypted using an encryption algorithm and an encryption key. This process generates ciphertext that can only be viewed in its original form if decrypted with the correct key. Decryption is simply the inverse of encryption, following the same steps but reversing the order in which the keys are applied. Today's most widely used encryption algorithms fall into two categories: symmetric and asymmetric.

- **(7 minutes) - Video: Symmetric Key and Public Key Encryption**

<https://www.youtube.com/watch?v=ERp8420ucGs>

- **(10 minutes) - Student Activity: Symmetric Key Cipher**

- Pass out Create your own cipher worksheet

- *Provide instructions to students on how to use top row by substituting letters or symbols for each of the letters*
- *Have students work in pairs (or groups) to complete the first row by assigning a number, letter or symbol to each on the first strip (row)*
- *Have each student write and encode a message using their common symmetric cipher*
- *Have students trade their encoded messages and decode the message using the common symmetric cipher*
- **(3 minutes) - Video: What is Public Key Infrastructure (PKI)**
 - https://www.youtube.com/watch?v=i-rtxrEz_E8
 - *How PKI works to securely send and receive messages*
 - *Stop playback at 2:30 to avoid sponsor commercial*
- **(10 minutes) - Public Key / Private Key Demo**

Give a brief overview of PKI to students, and show how Public Key/Private Key Works

 - *Display the Public Key/Private Key box.*
 - *Explain that the top lock uses the public key to encrypt messages.*
 - *Explain that once message is encrypted (in the box), it cannot be decrypted with the public key.*
 - *Explain that the only way that the message can be decrypted is by decrypting the message (opening the box) using the private key (The lock on the front).*
 1. *Have 2 students write their favorite color, team, or other neutral message on a small piece of paper*
 2. *Give the 2 students each a public key (key to top lock)*

3. *Have students unlock the public key lock, roll up the message, place the message in the slot, and lock the lock.*
4. *Demonstrate that once the message is encrypted (in the box) the public key can't decrypt the message.*
5. *Use the public key to unlock the Public Key lock and turn the box over and show the message won't shake out*
6. *Allow students to try an unlock the Private Key lock with their keys*
7. *Demonstrate the use of the Private Key for decryption by opening the box and reading the messages.*

- **(5 minutes) - Public Key / Private Discussion**

Explain that PKI can be complex to implement, but it still relies on keys and encryption to secure messages

- **(5 minutes) - Wrap Up**

Remind students about importance of Encryption as it pertains to history, and the current implementations in cyber security

The primary purpose of encryption is to protect the confidentiality of digital data stored on computer systems or transmitted via the internet or any other computer network. The Payment Card Industry Data Security Standard requires merchants to encrypt customers' payment card data when it is both stored at rest and transmitted across public networks.

- **(2 minutes) - Session Feedback**

Have volunteers distribute feedback form to students, and give them few minutes to fill out the survey.

Volunteers to collect feedback forms and save them for event manager.

- **(2 minutes) - What's next?**

Inform students that this is end of the day. All students must head back to Cafeteria before being picked up by their parents / guardians.