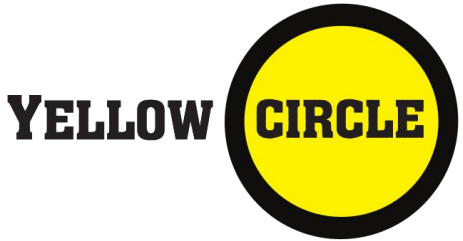

TECHNOLOGY CAMP

Authentication & Encryption

Day 1 : Session 3

Session Overview

Authentication is the way a computer understands who it is interacting with.

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.

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What is Authentication?

Authentication is the process of determining whether someone or something is, in fact, who or what it is declared to be. It is a process in which the credentials provided are compared to those on file in a database of authorized users information on a local operating system or within an authentication server. If the credentials match, the process is completed and the user is granted authorization for access.

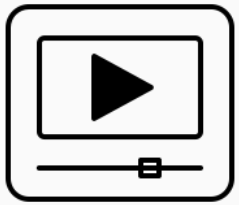
Class Discussion

What makes authentication strong?

- *Something you know*
- *Something you are*
- *Something you have*

What is two-factor authentication (2FA)?

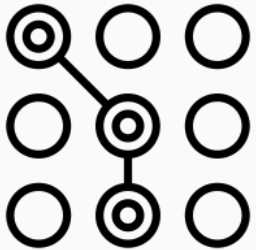
- Lets watch it:
  - *https://www.youtube.com/watch?v=0mvCeNsTa1g*
  - *Teacher materials: video-1.3.1*



Class Discussion

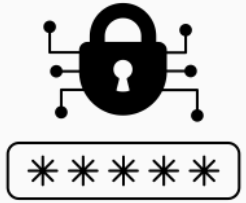
Discuss

- What is two-factor?
- Why is it safer than passwords?
- Potential problems with two-factor
- Teaching family & friends



What is Encryption

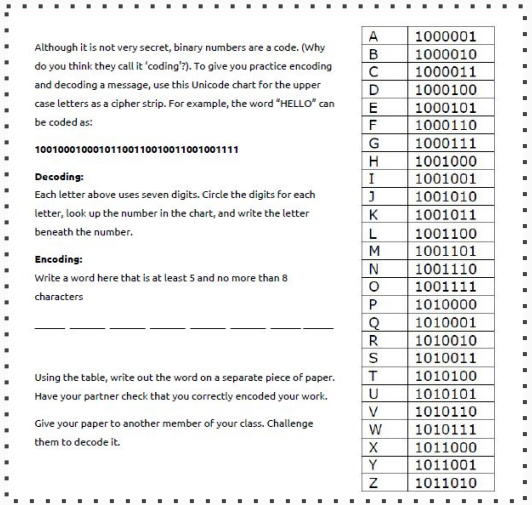
In computing, encryption is the method by which plaintext or any other type of data is converted from a readable form to an encoded version that can only be decoded by another entity if they have access to a decryption key. Encryption is one of the most important methods for providing data security,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



Student Activity

Simple encryption with Binary

- Pass binary encryption worksheets
- Create a secret word using binary
- Pass the sheet to someone else
- Time to decrypt the word
- Use table to decrypt
- Keep your words respectable



Although it is not very secret, binary numbers are a code. (Why do you think they call it 'coding'?). To give you practice encoding and decoding a message, use this Unicode chart for the upper case letters as a cipher strip. For example, the word "HELLO" can be coded as:

1001000100010110011001001100100111

Decoding:
Each letter above uses seven digits. Circle the digits for each letter, look up the number in the chart, and write the letter beneath the number.

Encoding:
Write a word here that is at least 5 and no more than 8 characters

____ ____ ____ ____ ____ ____ ____ ____

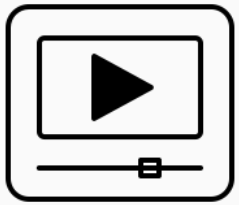
Using the table, write out the word on a separate piece of paper. Have your partner check that you correctly encoded your work.

Give your paper to another member of your class. Challenge them to decode it.

A	1000001
B	1000010
C	1000011
D	1000100
E	1000101
F	1000110
G	1000111
H	1001000
I	1001001
J	1001010
K	1001011
L	1001100
M	1001101
N	1001110
O	1001111
P	1010000
Q	1010001
R	1010010
S	1010011
T	1010100
U	1010101
V	1010110
W	1010111
X	1011000
Y	1011001
Z	1011010

PBS NOVA LABS / Cyber Codes

- Discuss: Codes are used to keep messages secret
- Lets watch it:
  - *https://www.youtube.com/watch?v=q6FanLhvsEs*
  - *Teacher materials: video-1.3.2*
- Discuss with students



Types of Encryption

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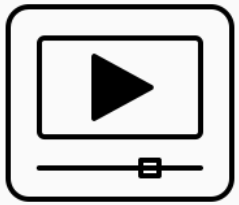
Different ways

- Goal is to go from plaintext to ciphertext
- Encryption algorithms
- Encryption keys
- Symmetric Encryption
- Asymmetric Encryption

Symmetric Key and Public Key Encryption

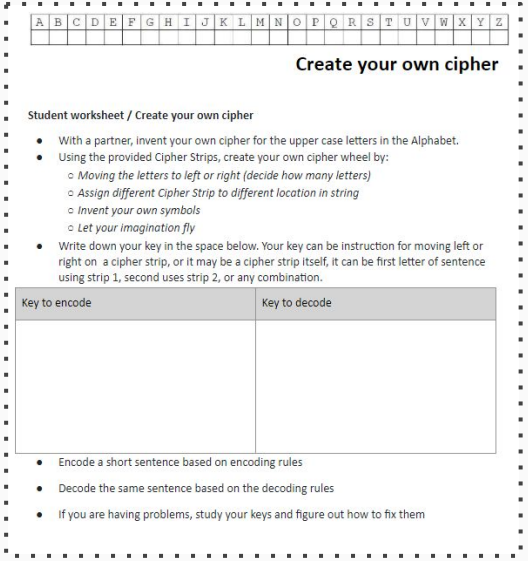
- Different forms of Encryption
- Lets watch it:
  - *https://www.youtube.com/watch?v=AQDCe585Lnc*
  - *Teacher materials: video-1.3.3*



Student Activity

Cipher Strips

- Pass cipher strips sheets / worksheet
- Creating keys by moving characters
- Make a harder key
- Write down key method
- Encrypt a simple sentence



A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z

Create your own cipher

Student worksheet / Create your own cipher

- With a partner, invent your own cipher for the upper case letters in the Alphabet.
- Using the provided Cipher Strips, create your own cipher wheel by:
  - *Moving the letters to left or right (decide how many letters)*
  - *Assign different Cipher Strip to different location in string*
  - *Invent your own symbols*
  - *Let your imagination fly*
- Write down your key in the space below. Your key can be instruction for moving left or right on a cipher strip, or it may be a cipher strip itself, it can be first letter of sentence using strip 1, second uses strip 2, or any combination.

Key to encode	Key to decode

- Encode a short sentence based on encoding rules
- Decode the same sentence based on the decoding rules
- If you are having problems, study your keys and figure out how to fix them

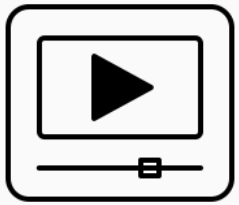
Public Key / Private Key

Public Key / Private Key Demo

- Public key to encrypt
- Private key to decrypt

What is your pa$$w0rd?

- Lets watch it:
  - *https://www.youtube.com/watch?v=opRMrEfAIiI*
  - *Teacher materials: video-1.3.4*



Public Key / Private Key

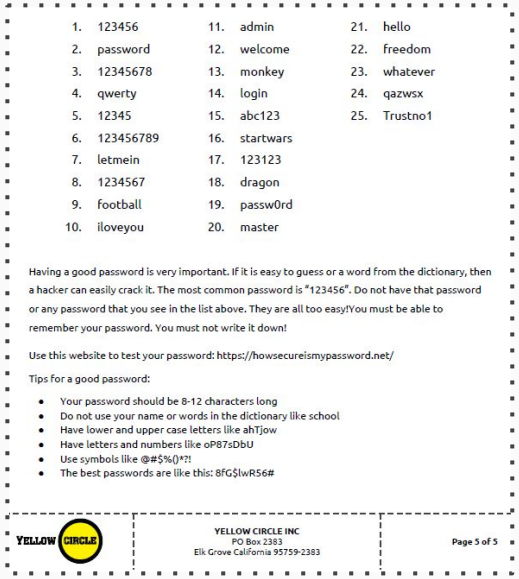
Modern Encryption

- Using PKI
- How are keys exchanged
- Private key to decrypt
- Public key to encrypt

Student Activity

How secure is your password?

- Pass “top worst passwords” sheet
- Groups or Individuals
- DO NOT share / use their own passwords
- https://howsecureismypassword.net/
- Test some passwords from worksheet



1. 123456	11. admin	21. hello
2. password	12. welcome	22. freedom
3. 12345678	13. monkey	23. whatever
4. qwerty	14. login	24. qazwsx
5. 12345	15. abc123	25. Trustno1
6. 123456789	16. startwars	
7. letmein	17. 123123	
8. 1234567	18. dragon	
9. football	19. passw0rd	
10. iloveyou	20. master	

Having a good password is very important. If it is easy to guess or a word from the dictionary, then a hacker can easily crack it. The most common password is “123456”. Do not have that password or any password that you see in the list above. They are all too easy!You must be able to remember your password. You must not write it down!

Use this website to test your password: https://howsecureismypassword.net/

Tips for a good password:

- Your password should be 8-12 characters long
- Do not use your name or words in the dictionary like school
- Have lower and upper case letters like ahTjow
- Have letters and numbers like oP87sDbU
- Use symbols like @#$%()*?!
- The best passwords are like this: 8fG$lwR56#

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YELLOW CIRCLE INC
PO Box 2383
Elk Grove California 95759-2383

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Closing / Wrap-up

What we learned...

- Authentication process
- Multi-factor authentication
- Passwords: Weak & Strong
- Biometrics
- Encryption / Decryption
- Ciphers / Codes / Keys
- Protecting data / documents