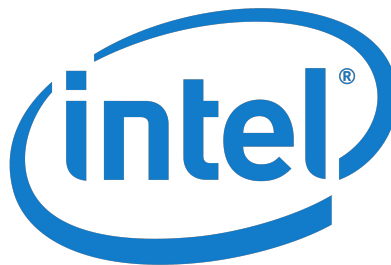


CYBER SECURITY BOOT CAMP

Encryption

Session 4

Sponsored by:



YELLOW CIRCLE INC
PO Box 2383
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Teacher Lesson Plan

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
- 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

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) - Volunteer Introductions

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.

- (5 minutes) - Student activity - Secret messages

- *Students can use their cell phones or laptops to do this*
- *Teacher can also demonstrate this on their screen*
- *<https://codemoji.org/>*

- (6:44 minutes) - Video: Mary Queen of Scot's Cipher

- *Codes have been used throughout history to keep messages secret. One famous example is Mary Queen of Scots.*
- *https://www.youtube.com/watch?v=_htopuN4pCk*

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

- *Pass binary encryption worksheets to students*
- *Give students overview of activity*

- *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 hid the simple word*
- (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.*
- (8 minutes) - Video: Enigma in Pringles Can
 - <https://www.youtube.com/watch?v=pZsuxZXN33g>*
 - Pass "Papercraft Enigma" sheets for students to take home*
- (15 minutes) - Student activity, Cipher Strips
 - *Pass cipher strips worksheet and encryption worksheet 2*
 - *Provide instructions to students on how to use strips by moving letters*
 - *Advanced students can come up with their own characters to fill in*
 - *Students can use different strips for each word in plain text*
 - *Inform student to write their key method on worksheet two*
 - *Have them encrypt a plain text sentence into encrypted text*

- (5 minutes) - Public Key / Private key examples

Give a brief overview of PKI to students, and show some private key examples

- (5 minutes) - Movie Trailer - The Imitation Game

- <https://youtu.be/S5CjKEFb-sM?t=18>
- Teacher can stop it at any time past 1:00 timestamp.
- Recommend students to watch the movie in their spare time

- (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 a 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.

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:

10010001000101100110010011001001111

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.

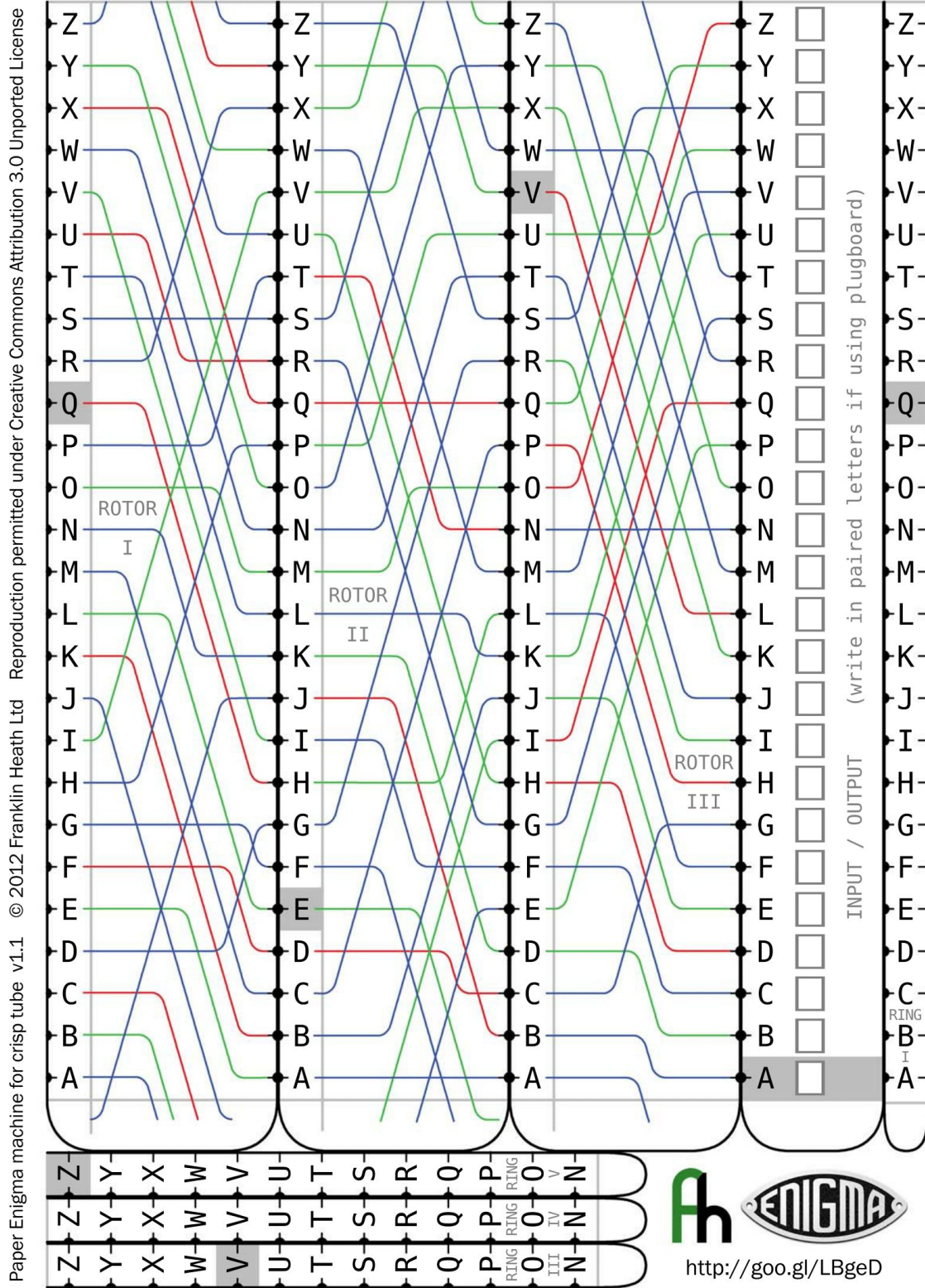
Encoding:

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.

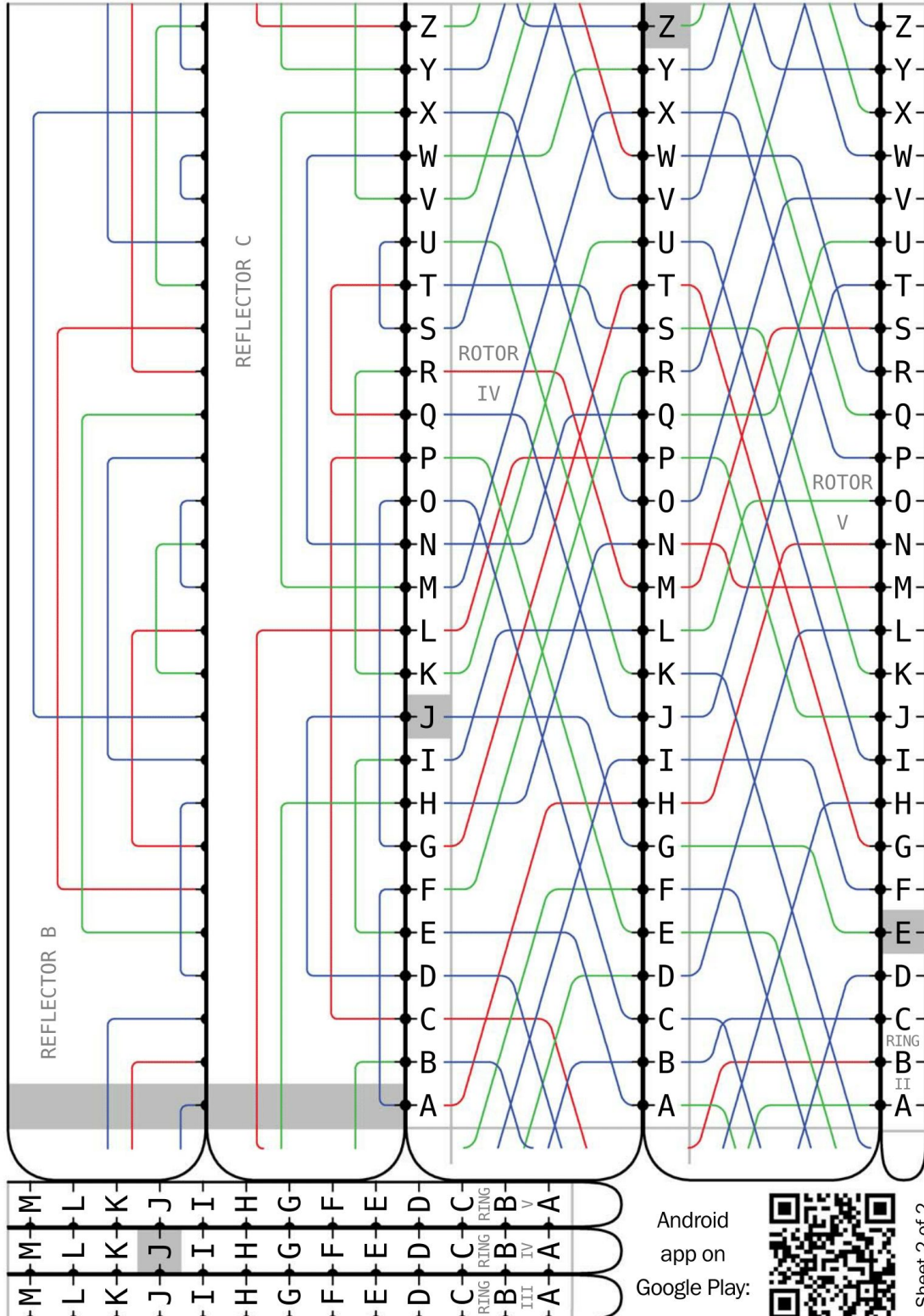
Give your paper to another member of your class. Challenge them to decode it.

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





Paper Enigma machine for crisp tube v1.1 © 2012 Franklin Heath Ltd Reproduction permitted under Creative Commons Attribution 3.0 Unported License



Android
app on
Google Play:



Sheet 2 of 2



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

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

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

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

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

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

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

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

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

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

Student worksheet 2 / 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

(Optional - Time permitting): Encode a question, and give it to another pair of students with your keys. Now decode the message and answer the message using your key.