# technocamps

# Cyber Security In Primary
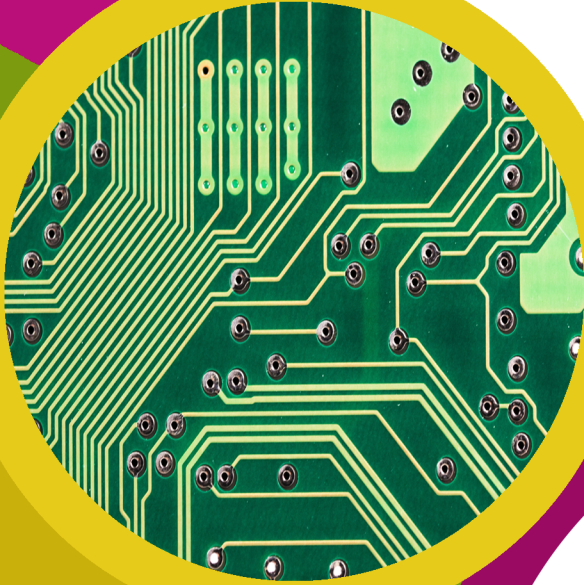
## Overview

Cyber Security is essential for keeping data safe. Password security in particular affects everyone and is especially important for learners to understand due to how many data breaches are caused by passwords. In this workshop we will look into how to make strong passwords and how to use basic encryption.

## Online

Digital Resources:

**https://tc1.me/educonf23resources**

## Learning Objectives?

- Understand why we need strong passwords.
- Be able to create strong passwords.
- Understand what encryption and decryption means, particularly in the context of Morse Code and Caesar Cipher.

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## Links to Science and Technology AoLE

**Computation:**

**(PS2)** I can follow algorithms to determine their purpose and predict outcomes.

**(PS3)** I can explain the importance of securing the technology I use and protecting the integrity of my data.

**(PS3)** I can explain how my data is used by services, which can help me make more informed decisions when using technology.

## Links to Other AoLEs

**Health & Wellbeing:**

**(PS2)** I can identify and assess risks.

**(PS3)** I can identify and assess risks, and I can take steps to reduce them.

**Mathematics & Numeracy:**

**(PS3)** I can demonstrate an understanding of the idea of input, application of a rule (including inverse operations) and output, using a function machine

## The Four Purposes and Cross-Curricular Skills

This resource provides **Critical Thinking and Problem-Solving** opportunities. Students are required to use the methods provided in tasks to crack the codes of locked boxes and to create an algorithm using block-based programming. They are able to analyse errors, identify solutions, and deduce the next steps.

While discussing cyber security and online safety learners will have the opportunity to develop their **Personal Effectiveness** by evaluating how safe they are online, and use **Planning and Organising** to develop strategies to protect themselves and others

The **Interacting and Collaborating** and **Data and Computational Thinking** sections of the **DCF** apply to this resource. Students will learn to break down the problems presented to them, and code efficiently using selection and events to create an algorithm. Learners will work together to build a secret code receiver with their micro:bits.

## Why Is Learning This Important?

This resource provides learners with the opportunity to learn about the importance of online safety and password security. They will create simple algorithms with a demonstrable application, using a block-based programming language. It introduces concepts such as selection, loops, and event-based programming which are critical to most common programming languages. The resource also teaches the importance of strong and secure passwords and allows for collaborative and interactive activities to showcase this. This resource can be expanded to introduce students to text-based programming such as Python.

## Suggested Approaches Key

In this suggested approach we use the following colours to differentiate the types of activities:

- **Yellow - Explain.** Teachers should explain the slide/example to the class.
- **Green - Discuss.** Teachers should start an open discussion with the class to get them to feedback some answers/ideas.
- **Purple - Activity.** Students are expected to complete an activity whether it be in their workbooks or on the computer, followed by a discussion of their solutions.
- **Green - Introduction/Conclusion.** The introduction/conclusion is also colour coded green. Teachers should hand out materials in the introduction and conclude the session and collect materials at the end.

## Introduction

Begin with introductions, and a brief explanation of the Technocamps programme, before handing out any resources required by learners and any additional aids for learners with additional learning needs.

## Explain: Topics Covered Today

Today we will be learning how to be secure online by creating strong passwords. By the end of the session we will understand the way in which passwords are easily crackable and the importance of being secure.

## Padlocked Bicycle

- I have padlocked my bicycle, with a 5 digit code, to keep it secure.
- However, I have forgotten the code.
- You need to learn about creating a secure password and how passwords can be encrypted.
- In order to discover the bicycle code, you need to answer questions, decrypt passwords and find hidden clues, in order to gain access to boxes.
- Inside each box is another problem, when solved will give you more clues.
- When you have all the clues, you can then code a microbit to receive the 5 digit code for the bicycle.
- Unlock my bicycle, so I can get home! (You could padlock a cupboard, a set of drawers or anything else in the classroom)

## Resources

1. Laptops or PCs
2. 1 microbit to send encrypted bicycle code
3. Microbits for the learners, in order to receive the final code
4. Caesar shift wheel (or use online tools)
5. Morse code sheet (or use online tools)
6. 3 lockable boxes, each with a 4 digit padlock
7. Bicycle (optional) with a 5 digit padlock
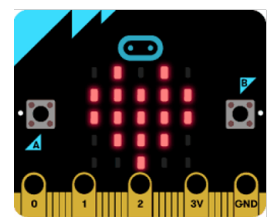
## Why Are Passwords Important?

- They secure our data
- They protect our identities
- They prevent unauthorised access to our accounts

## Why Is Password Security Important?

A strong and secure password reduces the risk of cybercriminals accessing our data because more complex and longer passwords are more difficult to crack through brute force methods. 80% of all data breaches are due to poor passwords.

Ask the learners what sorts of data are cybercriminals after?

- Email addresses
- Home address
- Phone numbers
- List of passwords
- School accounts

- Social media information
- Geographic location
- Your gaming sites' details
- Bank accounts
- Computer details

## Cyber Attacks Are Constant

Go to **tc1.me/threatmap** to see attacks taking place right now. It outlines the most targeted, countries, industries and malware (software used with malicious intent to compromise a computers security) types.

Allow the learners to explore the website looking at the different features of the website, such as the breakdown by country or increasing the rate of attacks (top left of the website).

**Note:** These are only the threats that have been caught. Successful attacks will not appear on this website.

## Developing Secure Passwords

Ask the learners to develop a list of good advice and bad advice when creating a password. Use a passphrase to help remember the new secure password.

There is a list of good and bad advice for passwords on the slides.

Go to **tc1.me/nordpass** to check how secure a password is.

The longer the password, the more secure the password.

This is due to the fact that for each character, there is exponentially more options that the password could be.

## Try Decrypting a Password Using Morse Code

Use the Morse Code sheet to help decrypt the password. The learners can then encrypt their own messages using Morse Code.

-.. / -. / -..- / . / . --.- ..- .- .-.. / --... ..--- / -.--

D N X E EQUAL 72 Y

Does Nine Times Eight equal 72? Yes

## Morse Code

Morse code is a system of communication that uses dots and dashes to represent letters. It was invented in the 1830's by Samuel Morse. Morse code was a way to communicate a message with only electrical pulses and the silence between them. The telegraph operator would encode a message and use a machine to tap out the signals to send that message along telegraph wires.. Morse code was also sent by ships using flashing lights.

It was used until the late 20th Century, and its invention completely changed long-distance communication.

| Letter | Morse |
|--------|-------|
| A | .- |
| B | -... |
| C | -.-. |
| D | -.. |
| E | . |
| F | ..-. |
| G | --. |
| H | .... |
| I | .. |
| J | .--- |
| K | -.- |
| L | .-.. |
| M | -- |

| Letter | Morse |
|--------|-------|
| N | -. |
| O | --- |
| P | .--. |
| Q | --.- |
| R | .-. |
| S | ... |
| T | - |
| U | ..- |
| V | ...- |
| W | .-- |
| X | -..- |
| Y | -.-- |
| Z | --.. |

| Digit | Morse |
|-------|-------|
| 0 | ----- |
| 1 | .---- |
| 2 | ..--- |
| 3 | ...-- |
| 4 | ....- |
| 5 | ..... |
| 6 | -.... |
| 7 | --... |
| 8 | ---.. |
| 9 | ----. |

## Caesar Cypher

Caesar Cypher is a method of encryption, which changes each letter of the plaintext by a certain "shift" of the alphabet e.g. the plaintext "ABCDE" with a shift value of 2 would become "CDEFG".

To use the Caesar Cypher wheel, you rotate the outer wheel so that the outer "A" lines up with the number on the inner ring that you wish to shift by.
To **encrypt**, the message you read from the **outside** in and to decrypt, you read from the inside out.
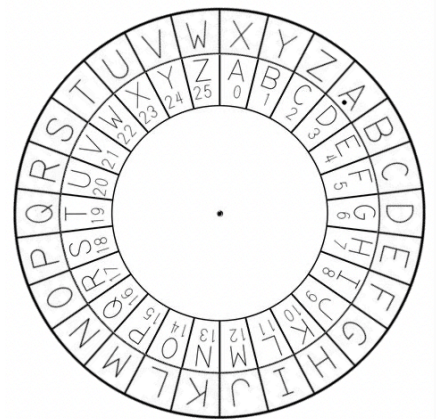
Visit **https://tc1.me/CaesarCypher** to see this in action.

## Decrypt a Password Using A Caesar Shift

Use the wheel to decrypt a secret password. The learners can then encrypt their own message or password.

**Encrypted:** YMNX UFXXBTWI MFX ST XDRGTQX GZY NX QTSL
**Shift 5:** This password has no symbols but is long

T LX RZTYR 2 ESP RLXP ZY ESP 21DE
**What are the clues to help you work out the shift?** The T is either an A or I
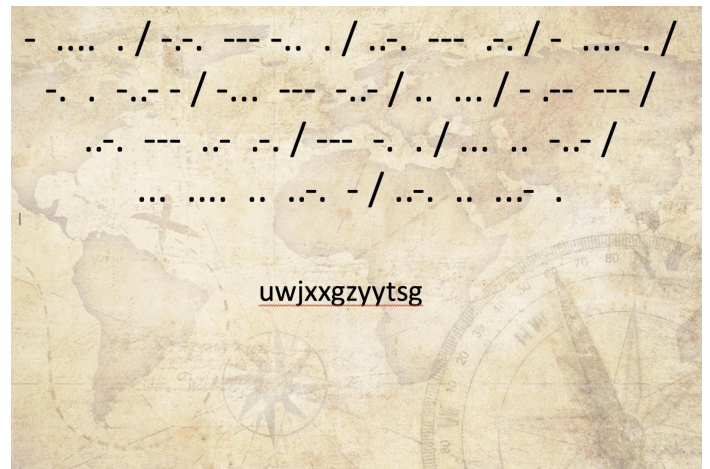**What is the password?** I am going 2 the game on the 21st

## The Start

- Answer the questions, based on secure passwords, in order to find the code for the first box. **3553**
- Encourage the learners to discuss their thinking before committing to an answer

## Box 1

- In the 1st box there is a pen drive with a file on it. The file shows a map with morse code and a Caesar shift (5).
- **2416 Press button B**



```
- .... . / --. --- -.. . / ..- --- -. / - .... . /
-. . -..- - / -... --- -.- / .. ... / - -- --- /
..-. --- .. -. / --- -. . / ... .. -..- /
... .... .. ..-. - / ..- .. ...- .

uwjxxgzyytsg
```

## Box 2

In box 2 is a picture of 3 Cliffs Bay. You need to zoom in and search the picture for the 4 numbers and the 2nd action. **8619 Press the logo**

**To set up the picture:**
- Add a picture to a word document
- Insert a textbox and type up a clue
- Remove the textbox lines and background colour
- Select the text
- Click on text fill, more fill colours, pipette tool
- Select the background colour and the text should be hidden
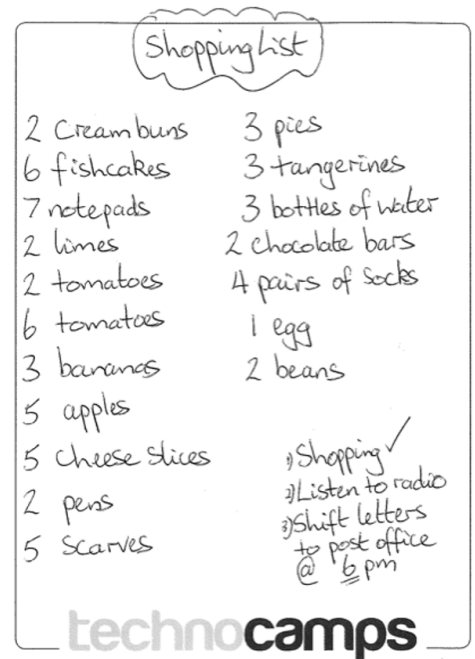- Export your word document as a PDF

## Box 3

In box 3 is a shopping list.

The number of items refers to the position of the letter in the item, e.g 3 turnips would be r, as r is the 3rd letter in the word

The full code: **RADIO173**

Remember to shift the code received from the microbit 6 (shift letters at 6 pm)

Shopping List

2 Cream buns    3 pies
6 fishcakes     3 tangerines
7 notepads      3 bottles of water
2 limes         2 chocolate bars
2 tomatoes      4 pairs of socks
6 tomatoes      1 egg
3 bananas       2 beans
5 apples
5 cheese slices   1) Shopping ✓
2 pens            2) Listen to radio
5 scarves         3) Shift letters
                     to post office
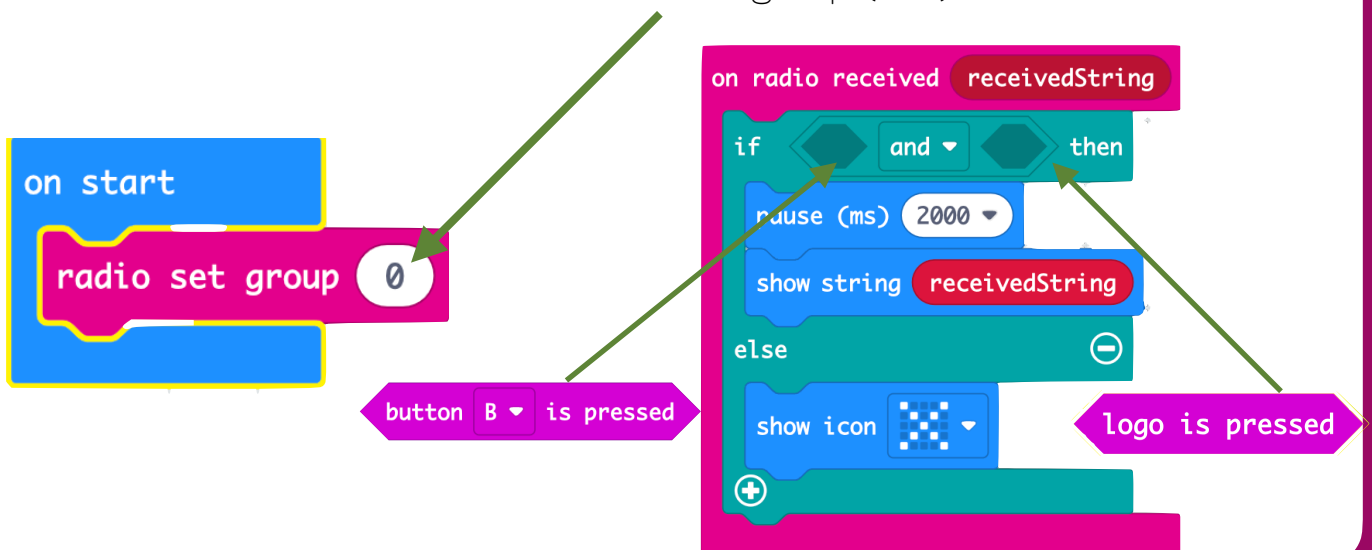                     @ 6 pm

## Sending the code

- This code needs to be downloaded onto the teacher's microbit.
- It sends out the code YOD TOTK ZCU LUAX UTK
- Shift 6 and you get 69241
- The radio can only send a maximum of 19 characters(including spaces)

```
on start
    radio set group  173
```

```
forever
    radio send string  "YOD TOTK ZCULUAXUTK"
    pause (ms)  1000
```

## Receiving the code

- This code needs to be downloaded on to the learners' microbits
- The learners then need to add the radio group (173) and the 2 actions

```
on start
    radio set group  0
```

```
on radio received  receivedString
    if          and          then
        pause (ms)  2000
        show string  receivedString
    else                                ⊖
        show icon  [ ]
    ⊕
```

button B ▾ is pressed

logo is pressed

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