Solving the puzzle

You've found a secret file that you believe has the name of a secret agent and a password they will respond to.

There seem to be a series of steps that will give you hints along the way:

1. **Solve the Caesar cipher**
   You don't know the key to the cipher, you'll have to figure it out!

2. **Solve the Vigenere cipher**
   Hopefully you find a key to help solve this one.

   Some of the letters seem to be missing, you might have to figure out what those are from the letters and words around them.

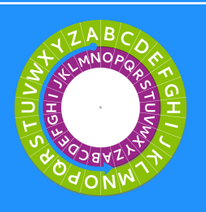
   There are some interesting ***coloured marks***. Maybe they'll be useful later!

3. **Solve the substitution cipher**
   All the letters of this text seem to be replaced with emoji. Use the frequency analysis table and any ***other hints*** you found to help you find the name and password.

Find the agent and tell them the password!

Vigenere Ciphers

Vigenere ciphers are like several Caesar ciphers combined.
Instead of one rotation key number we have a **keyword**, for instance our keyword might be **"gpn"**. "gpn" is a way of telling you the different rotations, 6, 15 and 13.

Keyword		
g	p	n
6	15	13
		

This is what it looks like if we encrypt the message "this is a secret message":

t	h	i	s		i	s		a		s	e	c	r	e	t		m	e	s	s	a	g	e
↓	↓	↓	↓		↓	↓		↓		↓	↓	↓	↓	↓	↓		↓	↓	↓	↓	↓	↓	↓
g	p	n	g		p	n		g		p	n	g	p	n	g		p	n	g	p	n	g	p
↓	↓	↓	↓		↓	↓		↓		↓	↓	↓	↓	↓	↓		↓	↓	↓	↓	↓	↓	↓
6	15	13	6		15	13		6		15	13	6	15	13	6		15	13	6	15	13	6	15
↓	↓	↓	↓		↓	↓		↓		↓	↓	↓	↓	↓	↓		↓	↓	↓	↓	↓	↓	↓
z	w	v	y		x	f		g		h	r	i	g	r	z		b	r	y	h	n	m	t

Caesar Ciphers

We learnt about encrypting and decrypting Caesar Ciphers in the labs!

GPN → JSQ

FRGH → CODE

But how do we decrypt if we don't know the key?

There are only 2 words that are only a single letter long! Look for them they'll help you figure out the key!

Is there a letter in your cipher that appears a lot?? It's probably the letter e! **Letters from most to least frequently used are:**

e t a o i n s h r d l c u m w f g y p b v k j x q z

Substitution Ciphers

Substitutions ciphers are where we switch one letter for another. Or in this case replace a letter with an emoji.

The best way to figure out which letters are which is to use **frequency analysis**.

The chart to the right shows the **frequency distribution** of different letters in english texts.

Not all texts will have the same distribution. But this gives you some hints about which are popular in general!