

# Cipher Hunt

Find the secret agent!



# Find the secret agent

**You've found a secret folder, it has some funny documents!**

**They're all jiberish and and there are a lot of emoji!**

**You seem to have a:**

1. Caesar Cipher
2. Vigenere Cipher
3. Substitution Cipher

# Find the secret agent

## They seem to be linked!

1. Crack the Caesar to get a hint to the Vigenere
2. The Vigenere seems to have some coloured marks. Maybe they'll be useful!
3. You've got a handy, **colourful** frequency chart and a lot of **emoji**! There are some highlighted patches in the substitution cipher!
4. Find the secret agent and tell them a password!



# Cracking 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?**




1. There are only 2 words that are only a single letter long!
2. Look for letters that appear a lot! 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**

# Vigenere Ciphers

Vigenere ciphers are like several Caesar ciphers combined.

Instead of one rotation key number we have a **keyword**. eg: “gpn”.

Keyword		
g	p	n
6	15	13
		

“gpn” is a way of telling you the different rotations, 6, 15 and 13.




# Vigenere Ciphers

We rotate through the different letters/keys of the cipher!

So we use different ones on different letters.

It's handy to use multiple cipher wheels!

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




Keyword		
g	p	n
6	15	13
		

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

# Vigenere Ciphers

To decrypt a Vigenere Cipher it's just like decrypting several Caesar ciphers!

Shift the key and rotate your cipher wheel the same direction. Look up the code letter in purple to find the decoded in green.

Keyword		
g	p	n
-6	-15	-13
		

z	w	v	y
↓	↓	↓	↓
g	p	n	g
-6	-15	-13	-6
↓	↓	↓	↓
t	h	i	s

x	f
↓	↓
p	n
-15	-13
↓	↓
i	s

g
↓
g
-6
↓
a

h	r	i	g	r	z
↓	↓	↓	↓	↓	↓
p	n	g	p	n	g
-15	-13	-6	-15	-13	-6
↓	↓	↓	↓	↓	↓
s	e	c	r	e	t

b	r	y	h	n	m	t
↓	↓	↓	↓	↓	↓	↓
p	n	g	p	n	g	p
-15	-13	-6	-15	-13	-6	-15
↓	↓	↓	↓	↓	↓	↓
m	e	s	s	a	g	e

# Vigenere Ciphers - Example

Copy in the key! In this puzzle the key is “GPN”

Repeat the key over and over again on a loop.

z	w	v	y		x	f		g		b	r	y	h	n	m	t	!
↓	↓	↓	↓		↓	↓		↓		↓	↓	↓	↓	↓	↓	↓	
g	p	n	g		p	n		g		p	n	g	p	n	g	p	
↓	↓	↓	↓		↓	↓		↓		↓	↓	↓	↓	↓	↓	↓	

Don't put it in spaces or punctuation slots



# Vigenere Ciphers - Example

## Start decrypting!

Let's start with all the letters with the key letter "g".  
Use your cipher wheel, line up the "A" with the "G".



Look up the letters on the **purple** wheel! Find the matching **green** letters.

z	w	v	y		x	f		g		b	r	y	h	n	m	t	!
↓	↓	↓	↓		↓	↓		↓		↓	↓	↓	↓	↓	↓	↓	
g	p	n	g		p	n		g		p	n	g	p	n	g	p	
↓	↓	↓	↓		↓	↓		↓		↓	↓	↓	↓	↓	↓	↓	
t			s					a				s			g		

Don't put it in spaces or punctuation slots

# Vigenere Ciphers - Example

## More decrypting!

Repeat for the letters with the key letter “p”. Line up the “A” with the “P” on your wheel.



Look up the letters on the **purple** wheel! Find the matching **green** letters.

z	w	v	y		x	f		g		b	r	y	h	n	m	t	!
↓	↓	↓	↓		↓	↓		↓		↓	↓	↓	↓	↓	↓	↓	
g	p	n	g		p	n		g		p	n	g	p	n	g	p	
↓	↓	↓	↓		↓	↓		↓		↓	↓	↓	↓	↓	↓	↓	
t	h		s		i			a		m		s	s		g	e	

# Vigenere Ciphers - Example

## More decrypting!

Repeat for the letters with the key letter “p”. Line up the “A” with the “N” on your wheel.



Look up the letters on the **purple** wheel! Find the matching **green** letters.

z	w	v	y		x	f		g		b	r	y	h	n	m	t	!
↓	↓	↓	↓		↓	↓		↓		↓	↓	↓	↓	↓	↓	↓	
g	p	n	g		p	n		g		p	n	g	p	n	g	p	
↓	↓	↓	↓		↓	↓		↓		↓	↓	↓	↓	↓	↓	↓	
t	h	i	s		i	s		a		m	e	s	s	a	g	e	

# Substitution Ciphers

Substitutions ciphers are where we switch one letter for another.

Or in this case replace a letter with an emoji!

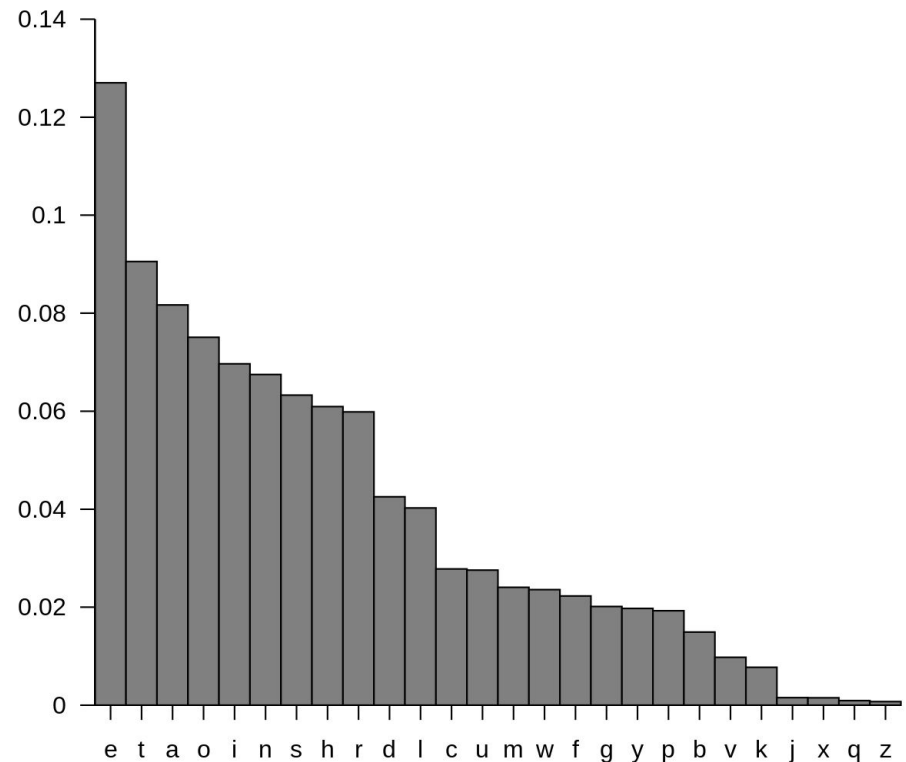


A = B	H = A	O = O	V = L
B = V	I = D	P = Y	W = P
C = G	J = Z	Q = F	X = U
D = Q	K = C	R = J	Y = I
E = K	L = W	S = X	Z = R
F = M	M = S	T = H	
G = N	N = E	U = T	

# Substitution Ciphers

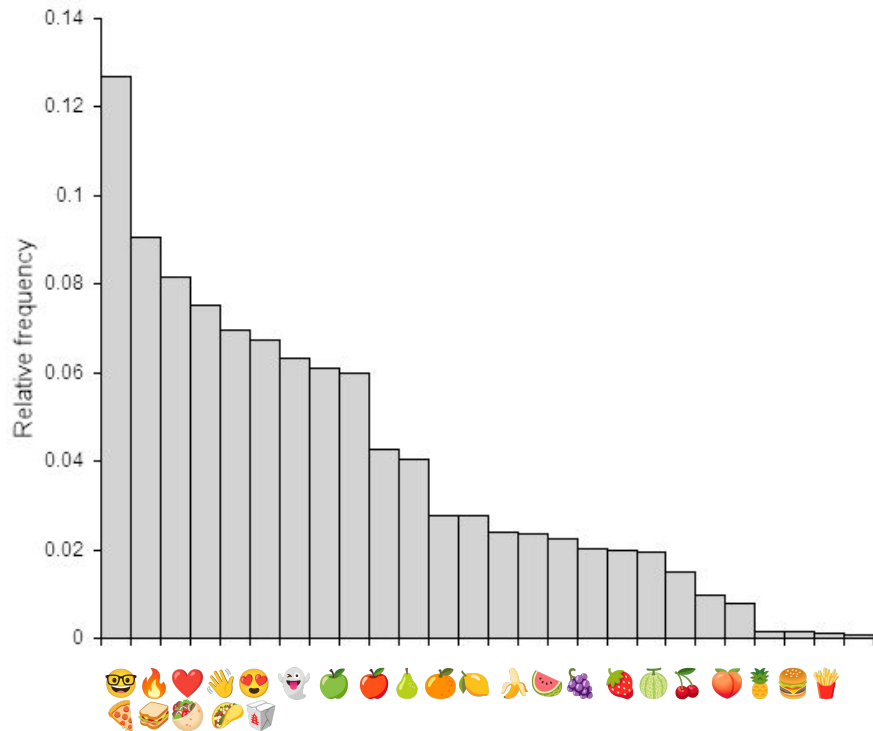
The chart to the right shows the **frequency distribution** of different letters in english texts.

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

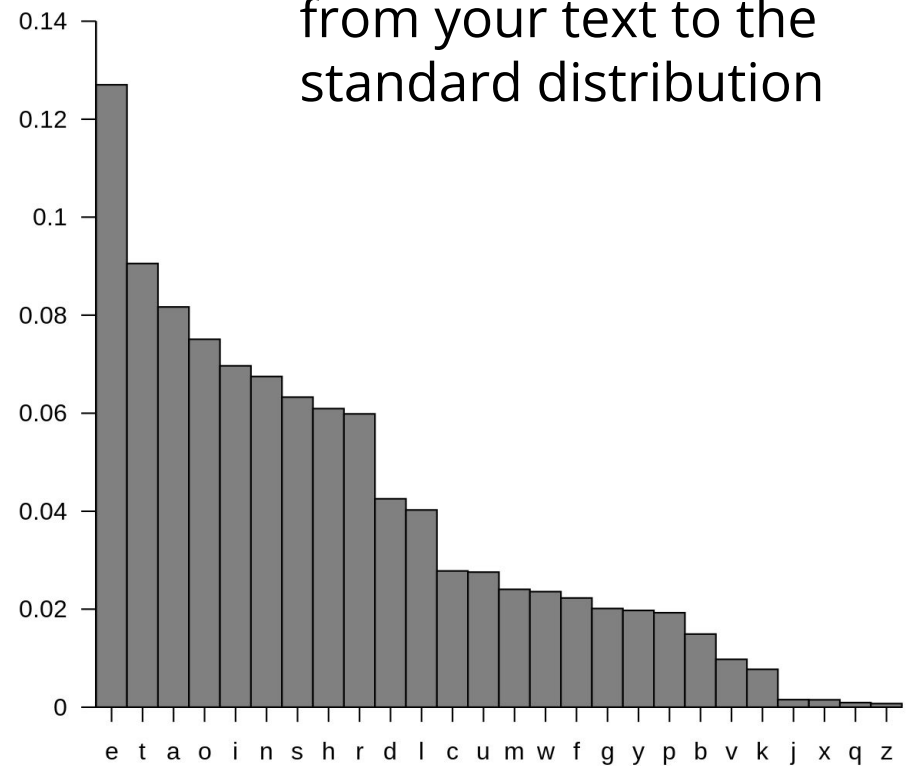


e t a o i n s h r d l c u m w f g y p b v k j x q z

# Substitution Ciphers

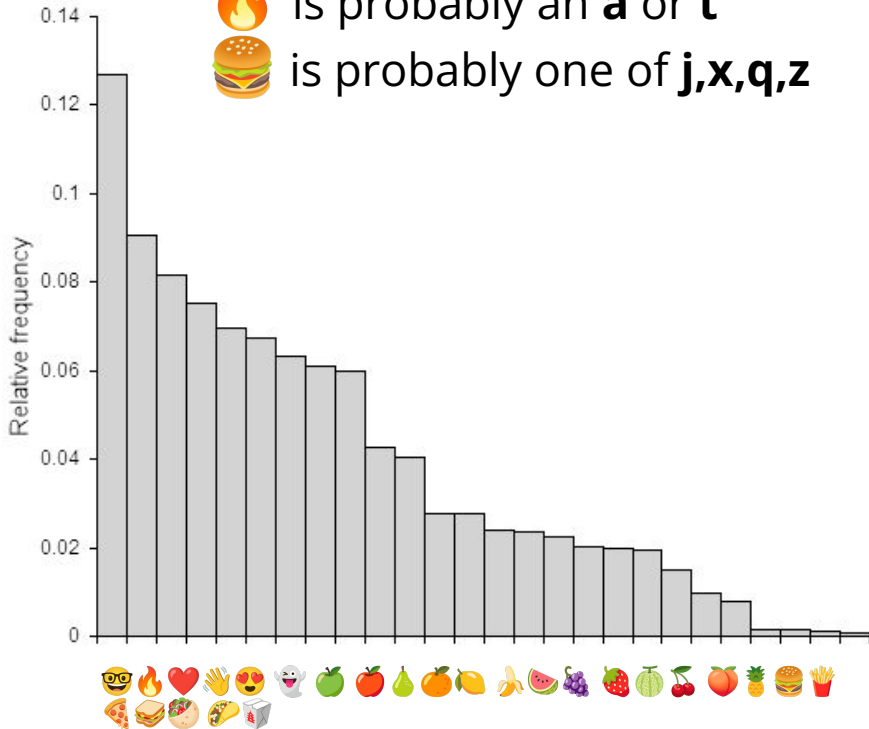


Match up frequencies from your text to the standard distribution



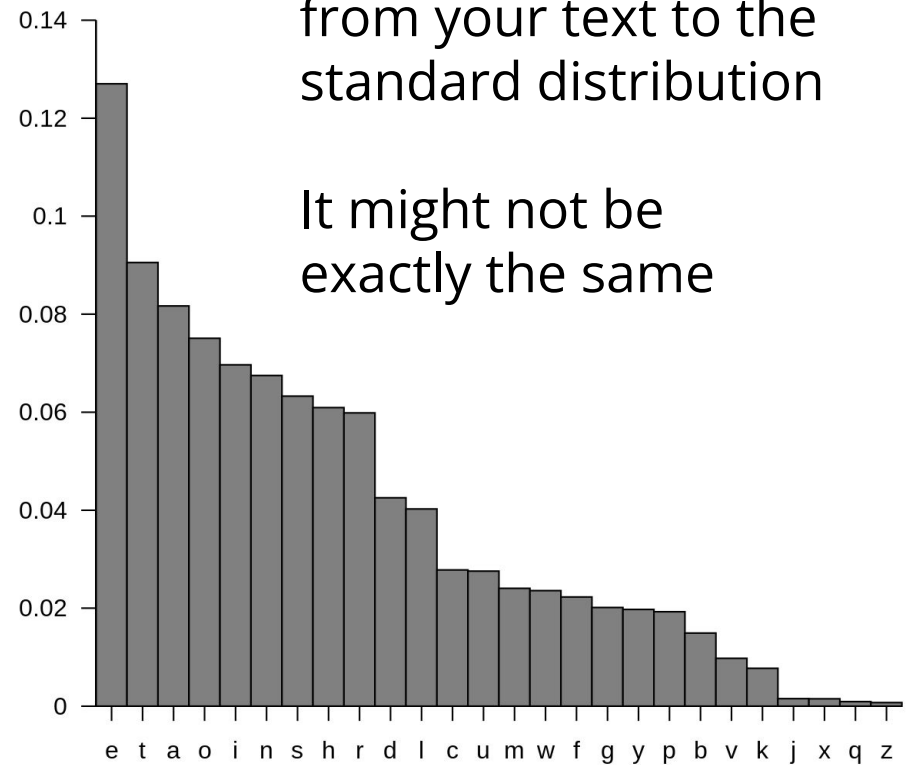
# Substitution Ciphers

🧐 is probably **e**  
🔥 is probably an **a** or **t**  
🍔 is probably one of **j, x, q, z**



Match up frequencies  
from your text to the  
standard distribution

It might not be  
exactly the same



# Find the secret agent

## They seem to be linked!

1. Crack the Caesar to get a hint to the Vigenere
2. The Vigenere seems to have some coloured marks. Maybe they'll be useful!
3. You've got a handy, **colourful** frequency chart and a lot of **emoji**! There are some highlighted patches in the substitution cipher!
4. Find the secret agent and tell them a password!

