Playfair Cipher Explained

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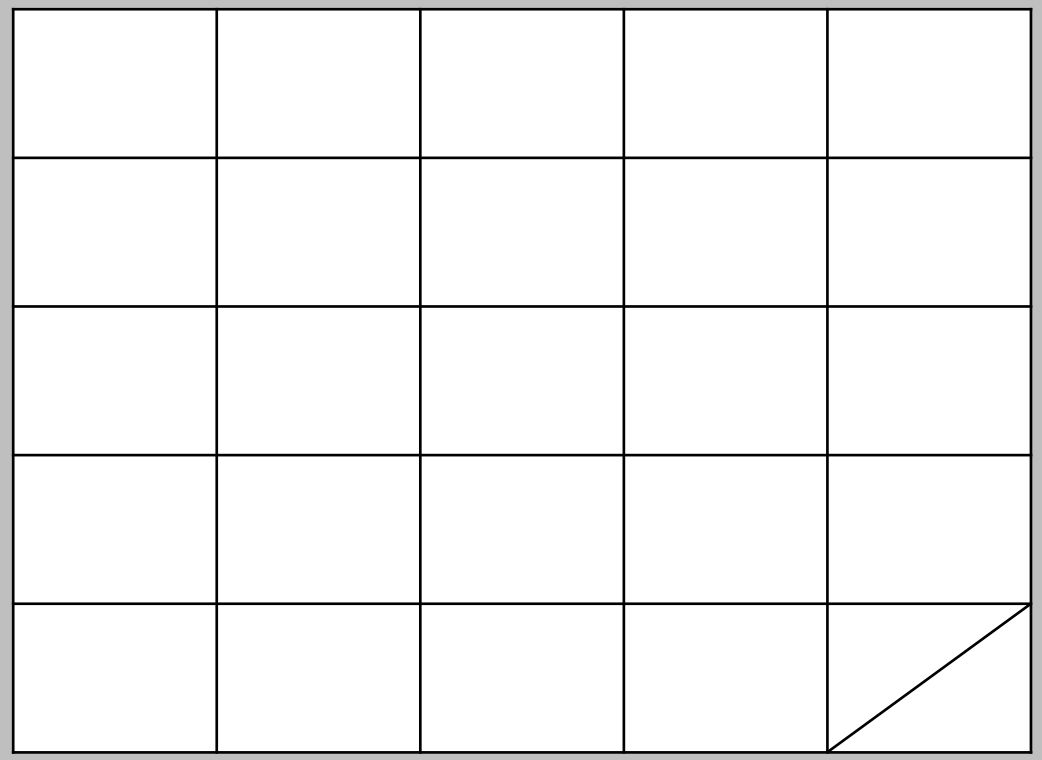
What is a Playfair Cipher



A Playfair Cipher is a 5x5 Grid that uses the letters of the English alphabet. Each grid takes on one letter, except for the final grid taking on two letters.

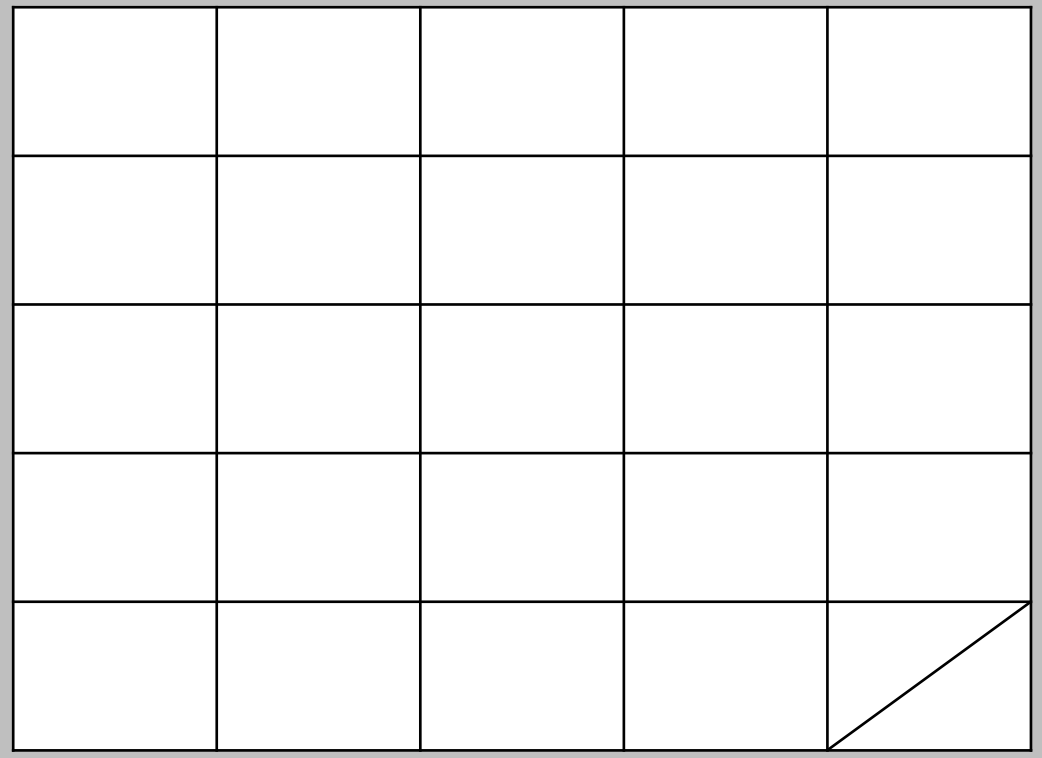
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

What is a Playfair Cipher

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 Playfair Cipher is a 5x5 Grid that uses the letters of the English alphabet. Each grid takes on one letter, except for the final grid taking on two letters.

Key Code

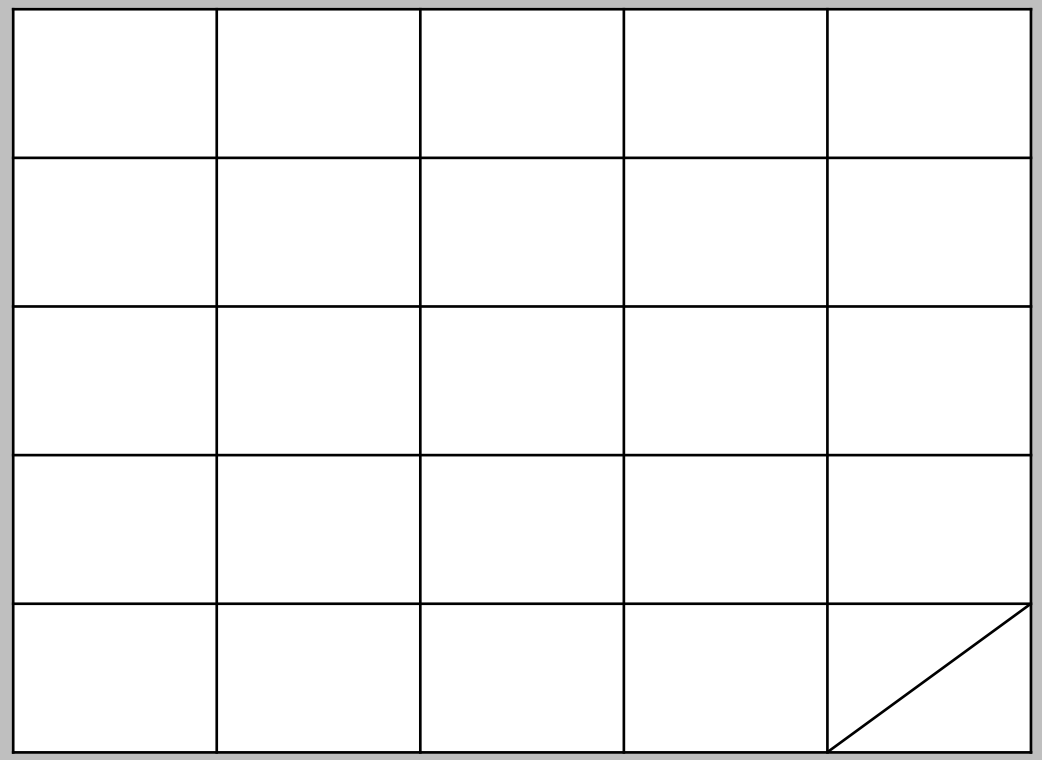


Two people decide on a Key Code. It can be a word, sentence or phrase.

Key Code: SC CODES IS GREAT

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

Key Code

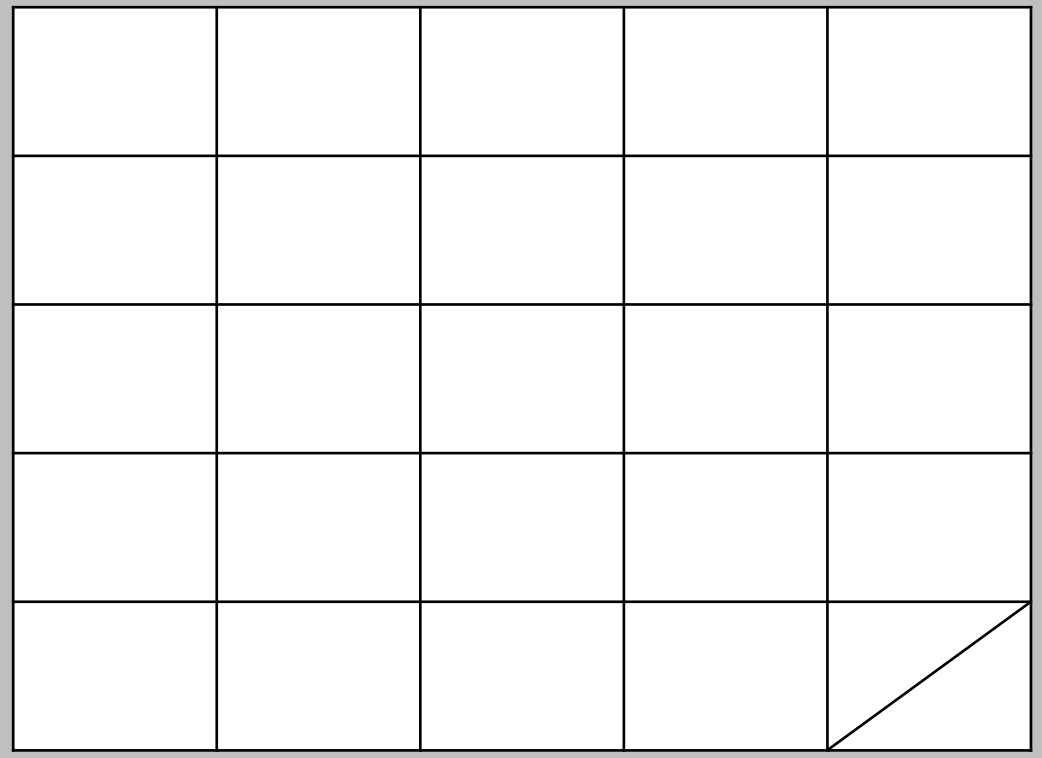


We must remove duplicate letters, without changing the order.

Key Code: SC ODE I GR AT

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

Key Code



These letters are also removed from the alphabet.

Key Code: SC ODE I GR AT

B F H J K L M N P Q U V W X Y Z

Key Code

S	C	O	D	E
I	G	R	A	T

The Key Code letters are now placed into the 5x5 Grid first.

B F H J K L M N P Q U V W X Y Z

Key Code

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

Then the remaining alphabet letters will placed into the grid

Making The Digram

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

Now that the Grid is complete, we can encode our message.

Making The Digram

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

Playfair Cipher does not use punctuation. All punctuation and spaces must be removed.

Before:

Message: HELLO WORLD!

After:

Message: HELLOWORLD

Making The Digram

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

Now we must make a Digram. A Digram is a grouping of 2 letters.

Message: HE LL OW OR LD

Making The Digram

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

Digram letters can not be the same letters. We will add the letter “X” between the identical letters.

Message: HE LXL OW OR LD

Making The Digram

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

We now must make Digrams again by refactoring the message.

Message: HE LX LO WO RL D

Making The Digram

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

Digrams are always 2 letters. If the final digram is a single letter, we make it a digram by adding the final letter in the grid.

Message: HE LX LO WO RL DZ

Encoding The Message

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

Now we can encode the message.

HE LX LO WO RL DZ

Encoding The Message

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

There are 3 rules when we encode. Start by finding the first two letters in the first Digram. (Color coding to illustrate)

HE LX LO WO RL DZ

↓ ↓ ↓ ↓ ↓ ↓

___ ___ ___ ___ ___ ___

Encoding The Message

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

If the letters are in different Columns, and Different rows, Starting with the first letter, while remaining in the first letters row, move to the second letters column .

HE LX LO WO RL DZ

↓ ↓ ↓ ↓ ↓ ↓

K

Encoding The Message

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

Now do the same for the second letter. Remaining in the second letters row, move to the first letters column.

HE LX LO WO RL DZ

↓ ↓ ↓ ↓ ↓ ↓

KO ___ ___ ___ ___ ___

Encoding The Message

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

The first digram is now encoded. Repeat this process.

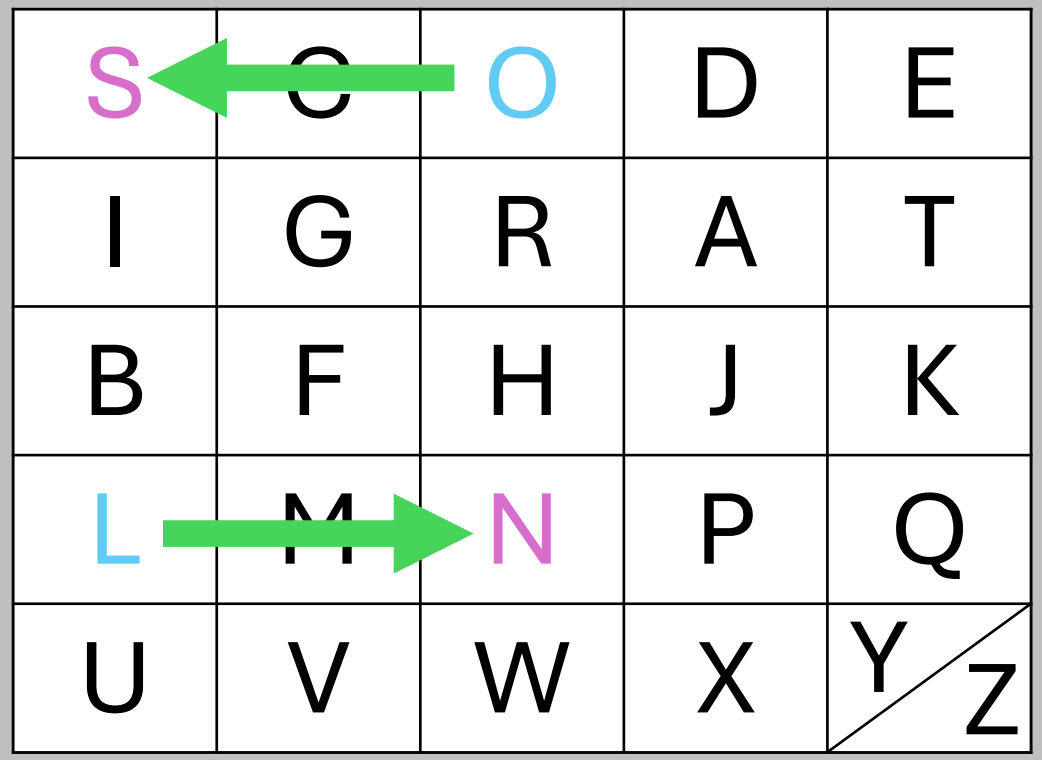
This encodes the second digram.

HE LX LO WO RL DZ

↓ ↓ ↓ ↓ ↓ ↓

KO PU ___ ___ ___ ___

Encoding The Message

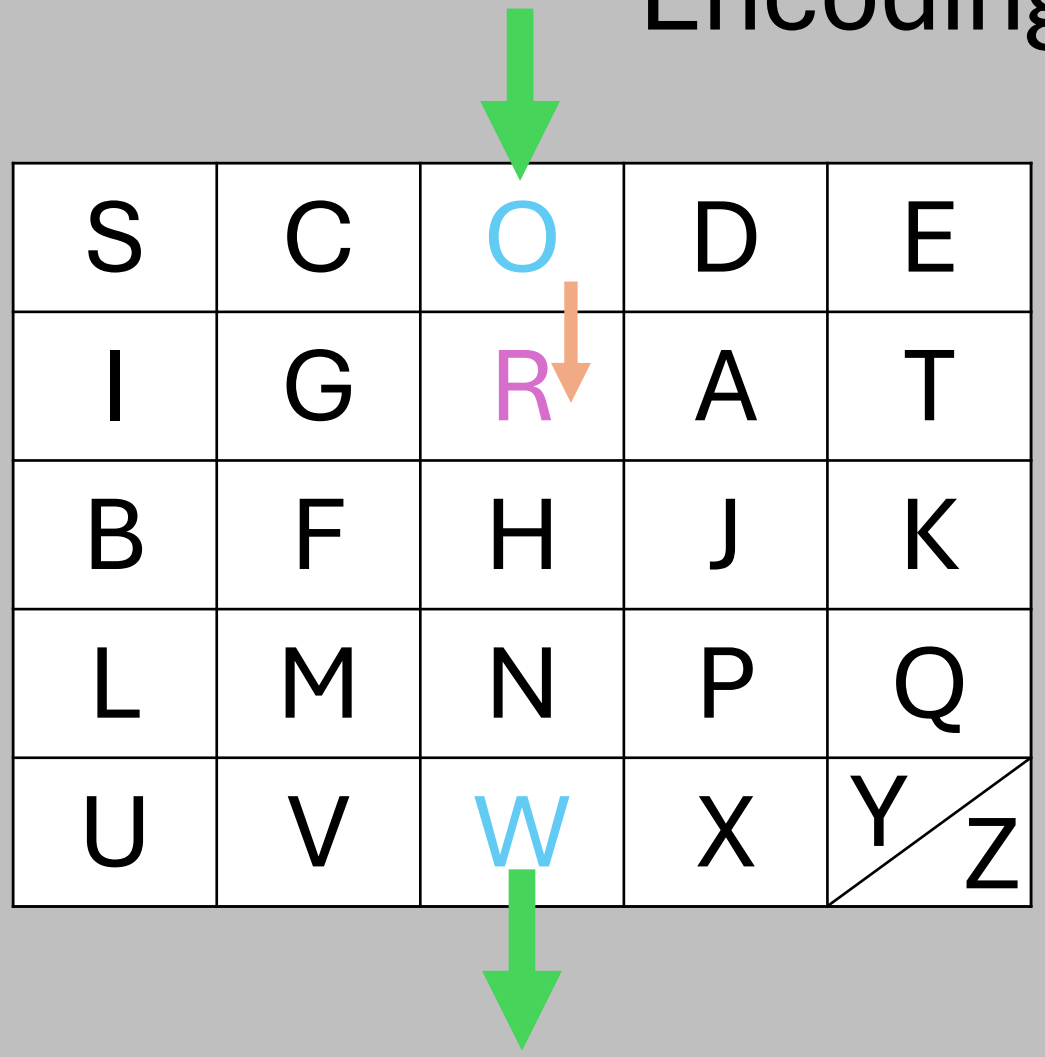


The second digram is now encoded. Continue the process with the third digram.

This encodes the third digram.

HE	LX	LO	WO	RL	DZ
↓	↓	↓	↓	↓	↓
KO	PU	NS	___	___	___

Encoding The Message



The Second rule. If both letters are in the same column, shift down by 1. The column loops back to the top.

HE	LX	LO	WO	RL	DZ
↓	↓	↓	↓	↓	↓
KO	PU	NS	OR	___	___

Encoding The Message

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

Continue these patterns until the encoding process is complete.
The third rule, while not having an example, if both letters are in the same row, shift to the right by one.

HE	LX	LO	WO	RL	DZ
↓	↓	↓	↓	↓	↓
KO	PU	NS	OR	IN	EX

Message is Encoded

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

Now that the message is encoded, we can add all the letters together. This makes it look more like random letters than a cipher.

KO PU NS OR IN EX

Encoded Message: KOPUNSORINEX

Decoding The Message

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

Decoding the message is almost the same as Encoding. The only difference being, if the letters are in the same column, shift up by 1. If the letters are in the same row, shift left by 1.

KO	PU	NS	OR	IN	EX
↓	↓	↓	↓	↓	↓
HE	LX	LO	WO	RL	DZ

Decoding The Message

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

We can now try making words out of the decrypted message. We can make HELXLO WORLDZ. If we think back to encoding, we had to add an X to separate identical letters. We also had to add a Z so the final letter was not alone. We can now undo these changes.

Decoded Message: HELLO WORLD

Rules For Encoding / Decoding

Encoding

- If the letters are in different rows and different columns, remaining the that letters row, move to the target column.
- If letters are in the same column, shift the letters down by one.
- If the letters are in the same row, shift the letters right by one.

Decoding

- If the letters are in different rows and different columns, remaining the that letters row, move to the target column.
- If letters are in the same column, shift the letters up by one.
- If the letters are in the same row, shift the letters left by one.