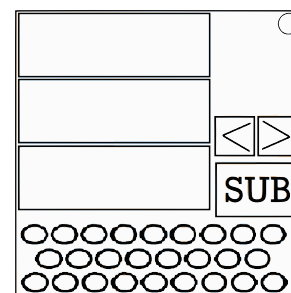# On the Subject of the Yellow Cipher

"They call me mellow yellow" – *said no cipher ever.*

On the module, you will see 3 screens, a keyboard, 2 arrows, and a submit button that displays the current page you're on.

Pressing the right arrow takes you to the next page. Pressing the left arrow takes you to the previous page. There is a total of 2 pages.

On page 1, the top screen shows a 6 letter encrypted word, the middle and bottom screen shows an encrypted number.

On page 2, the top screen shows another encrypted number, the middle screen shows an eight letter word, the bottom screen shows 4 numbers separated by dashes.

Follow the mechanics down below to decrypt your word:

Step 1: Morbit Cipher

First thing we need to do is to decipher the 3 encrypted numbers shown on the middle and bottom screens on page 1 and the top screen on page 2. Catenate the 3 screens into one string of numbers.

Next take the word on the middle screen on page 2 and write numbers 1-8 under the word in such a way that the accending numbers are going in alphabetical order. If there's a tie between letters, then accend in reading order. Ex: Flapjack -> 47185236

Then write this string underneath the 8 number key:

<div align="center">

...−−−xx

.−x.−x.−

</div>

Now what you should have is a key that shows each number that translates into the characters below them.

Take the entire encrypted number and use the key to translate to dots, dashes, and Xs. Read it as morse code treating the Xs as spaces between letters.

Morse Code Table

A ● ▬	U ● ● ▬
B ▬ ● ● ●	V ● ● ● ▬
C ▬ ● ▬ ●	W ● ▬ ▬
D ▬ ● ●	X ▬ ● ● ▬
E ●	Y ▬ ● ▬ ▬
F ● ● ▬ ●	Z ▬ ▬ ● ●
G ▬ ▬ ●	
H ● ● ● ●	
I ● ●	
J ● ▬ ▬ ▬	
K ▬ ● ▬	1 ● ▬ ▬ ▬ ▬
L ● ▬ ● ●	2 ● ● ▬ ▬ ▬
M ▬ ▬	3 ● ● ● ▬ ▬
N ▬ ●	4 ● ● ● ● ▬
O ▬ ▬ ▬	5 ● ● ● ● ●
P ● ▬ ▬ ●	6 ▬ ● ● ● ●
Q ▬ ▬ ● ▬	7 ▬ ▬ ● ● ●
R ● ▬ ●	8 ▬ ▬ ▬ ● ●
S ● ● ●	9 ▬ ▬ ▬ ▬ ●
T ▬	0 ▬ ▬ ▬ ▬ ▬

You should now have a deciphered word, this will be used as a keyword for the next step.

Example

F	L	A	P	J	A	C	K
4	7	1	8	5	2	3	6
●	●	●	−	−	−	X	X
●	−	X	●	−	X	●	−

41743178|...x.-..x..x.--.|SLIP

Step 2: Trifid Cipher

First thing you need to do is create a key. To do so, take the keyword you deciphered from step 1 and remove any duplicate letters. Take the entire alphabet and remove any letters that is shown in the keyword.

If the number of batteries is odd, place the alphabet at the end of the keyword. Otherwise, place the alphabet at the beginning of the keyword.

Finally place these rows of numbers underneath your key:

<div align="center">

111111111222222222333333333
111222333111222333111222333
123123123123123123123123123

</div>

With the encrypted word from the top screen of page 1, turn each letter into a 3 digit number using the key you made above. Split the numbers into rows so that each row contains 6 numbers.

Read the numbers top to bottom, left to right to get a new sequence of numbers. Then take each 3 digit number and translate it back into a letter using the key you made.

The resulting letters forms your new enciphered word.

<div align="center">

Example

</div>

S	L	I	P	A	B	C	D	E	F	G	H	J	K	M	N	O	Q	R	T	U	V	W	X	Y	Z
1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3
1	1	1	2	2	2	3	3	3	1	1	1	2	2	2	3	3	3	1	1	1	2	2	2	3	3
1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2

<div align="center">

TUSVZM -> 312 313 111 321 332 233

</div>

<div align="center">

3	1	2	3	1	3
1	1	1	3	2	1
3	3	2	2	3	3

</div>

<div align="center">

313 113 212 332 123 313 -> UIGZBU

</div>

Step 3: Hill Cipher

For this cipher, you will need the encrypted word you got from step 2 and the 4 numbers on the bottom screen on page 2. The numbers are ordered like this: A-B-C-D

First, you need to calculate the inverse number, N, of the equation. The equation looks like this: $N((AD - BC) \% 26) \% 26 = 1$

Once you figure out what N is, then arrange the 4 numbers like so:

D	-B
-C	A

Multiply each number by N and modulo by 26 (Add/Subtract 26 until it's a number between 0 – 25).

Split the encrypted word into letter pairs. For each pair do the following:

- Turn both letters into alphabetic positions.
- Take the 1st number and multiply it by the top left number.
- Multiply the 2nd number by the top right number.
- Sum the 2 numbers together and modulo by 26 and turn the number back into a letter to get the first letter (Z = 0).
- Use the 1st original number (the number before you multiplied it) and multiply it by the bottom left number.
- Use the 2nd original number (the number before you multiplied it) and multiply it by the bottom right number.
- Sum the 2 numbers together and modulo by 26 and turn the number back into a letter to get the second letter (Z = 0).

The resulting letters forms your decrypted word.

Example

9 10 18 13 –> 13 –10 –18 9

$N((9 * 13) - (10 * 18)) \% 26 = 1 \Rightarrow N(-63) \% 26 = 1 \Rightarrow N(15) \% 26 = 1 \Rightarrow 7(15) \% 26 = 1$

91	-70
-126	63

13	8
4	11

UI -> 21 9
GZ -> 7 0
BU -> 2 21

$(13 * 21) + (8 * 9) \% 26 = 7 => G$
$(4 * 21) + (11 * 9) \% 26 = 1 => A$
$(13 * 7) + (8 * 0) \% 26 = 13 => M$
$(4 * 7) + (11 * 0) \% 26 = 2 => B$
$(13 * 2) + (8 * 21) \% 26 = 13 => L$
$(4 * 2) + (11 * 21) \% 26 = 2 => E$

Once you finally have your decrypted word, you can submit it. Once you start typing, all the screens will go black and the bottom screen will show what you are typing.

To clear it, just click one of the arrows. This goes to one of the pages and clears any input you put in. It will not let you go over 6 letters on input.

Once you are satisfied with your input, press the button labeled "SUB" to submit your answer. On a strike, the module will go back to the first page of the module, but it does not regenerate.