TechFest digital

Aberdeen and North-East Scotland's Festival of Science, Technology, Engineering & Mathematics
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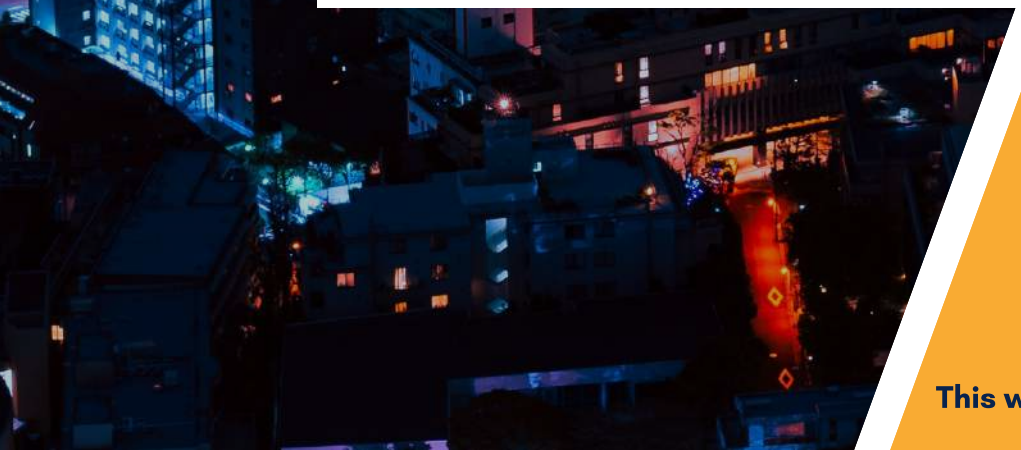
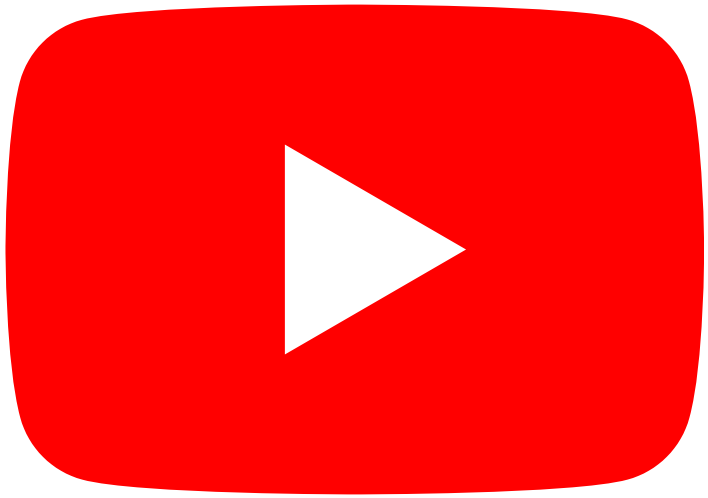
CODE BREAKERS



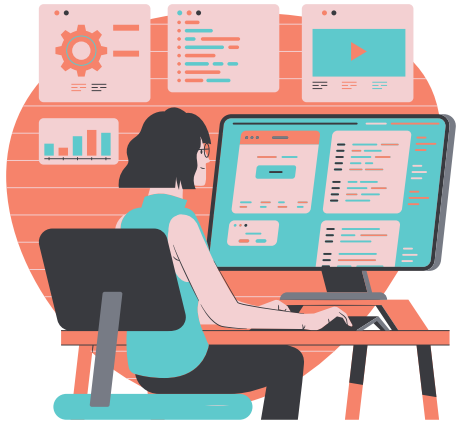
This workshop was launched as a part of Caithness International Science Festival 2021.

STEM SUPERSTARS ARE YOU READY?



Click to hear about your secret mission

CODES AND CIPHERS



Cryptography refers to the use of codes and ciphers to keep information secret. There are records showing that cryptography has been used by humans for thousands of years!

But what is the difference between a code and a cipher? Well, a code is a way of changing a message by replacing each word with another word that has a different meaning. For example, the message “walk the dog” could become “feed the cat” if the word “walk” is represented by the codeword “feed”, and similarly for “dog” and “cat”. This type of code has the advantage of allowing the sender to send messages that appear harmless on the face of it, but actually conceal a more sinister meaning. However, it does rely on both parties having access to the codebook, which would contain all the codewords. If the codebook was lost or stolen, that method of communication would then be compromised!

Ciphers, on the other hand, are based on symbols (or syntax). Ciphers use a set of instructions (an algorithm) which is known by the sender and the receiver to convert one set of symbols (e.g. letters) into another set of symbols (e.g. numbers or pictures). In some ways, ciphers are easier to use than codes as the users only have to remember one set of instructions, instead of an entire codebook! However, when using a cipher it's obvious that the message has been encoded, which may rouse unwanted suspicion. In addition, you run the risk of an external party being able to break the code and read the message! So it is the job of the cryptographer to create a system which is easy to use, but hard to break!

LET'S TAKE A LOOK AT AN EXAMPLE OF A SIMPLE CIPHER:

A	B	C	D	E	F	G	H	I	J	K	L	M
1	2	3	4	5	6	7	8	9	10	11	12	13

N	O	P	Q	R	S	T	U	V	W	X	Y	Z
14	15	16	17	18	19	20	21	22	23	24	25	26

In this example, each letter of the alphabet is matched with a number. To decode the message below you need to turn the numbers back into letters.

19,20,5,13   18,5,3,18,21,9,20   18,5,16,15,18,20,9,14,7   6,15,18   4,21,20,25

Answer:

_ _ _ _   _ _ _ _ _ _ _   _ _ _ _ _ _ _ _ _   _ _ _   _ _ _ _

NOW LET'S TRY MAKING THIS CIPHER A LITTLE TRICKIER TO CRACK! FOR THE MESSAGE BELOW YOU'LL HAVE TO SOLVE THE MATHS QUESTIONS TO FIND OUT THE NUMBERS YOU NEED TO TRANSLATE. HAVE A GO!

52 – 39 = ___

10 ÷ 10 = ___

4 x 5 = ___

30 – 22 = ___

10 + 9 = ___

81 ÷ 9 = ___

(6 x 3) + 1 = ___

(3 x 4) ÷ 2 = ___

7 x 3 = ___

9 + 5 = ___

Answer:

_ _ _ _ _ _ _ _ _ _

KEYWORD CIPHER

With this type of cipher a secret keyword is placed at the beginning and shifts the remaining letters of the alphabet, not used in the keyword, to the right. The letters that are not used in the keyword are placed in line in alphabetical order. So only people who know the secret keyword are able to decode the message!

For example, if the secret code was AGENT X the cipher would read like this:

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

Can you use the keyword cipher to decode the secret message?

QRTJ XLPETQ SKDRT

Answer:

_ _

Let's try another example of a keyword cipher. This time the secret code is BINOCULARS. Using the code word can you complete the cipher below and decode the secret message?

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

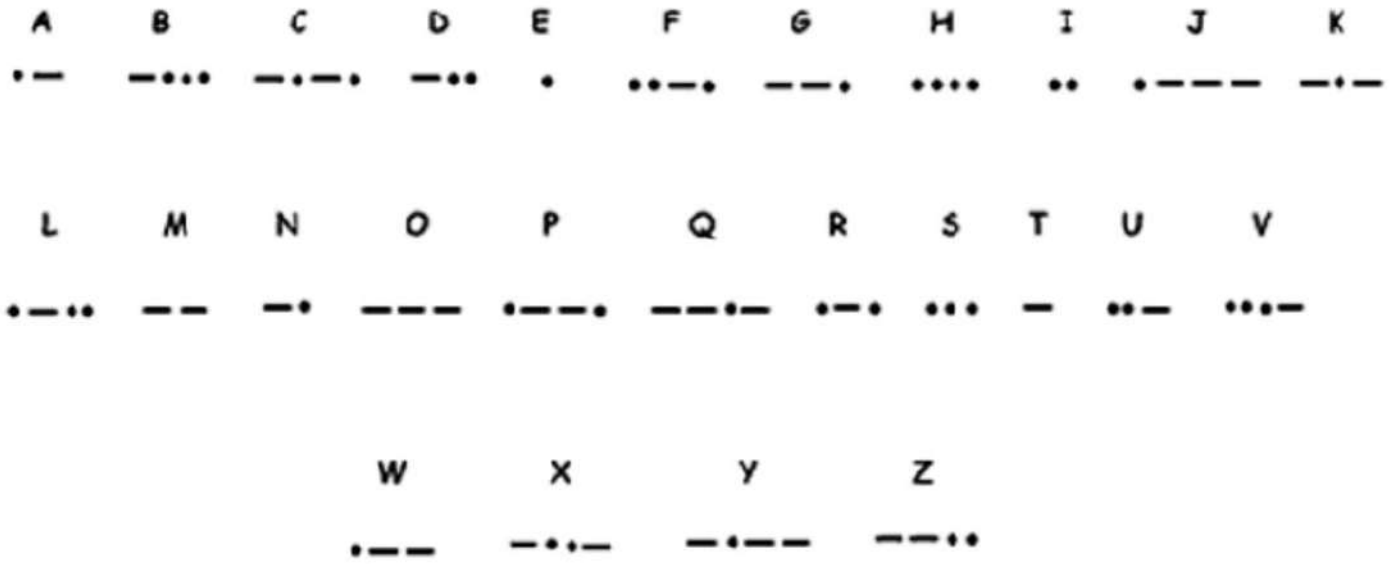
UHM YHTM CYCP HGEY

Answer:

_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

MORSE CODE

Samuel Morse invented Morse code, which is a series of dots and dashes that represent different letters. Morse code can be communicated through sound (using audio tones where each dash is three times as long as each dot), flashing lights or can be written as follows.



If we write TECHFEST in Morse code it looks like this:

- . -.-. .... ..-. . ... -

Can you write your name in Morse code?

Your Name:

Can you decipher the below Morse code to reveal the Marie Curie quote?

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

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

Answer:

_ _

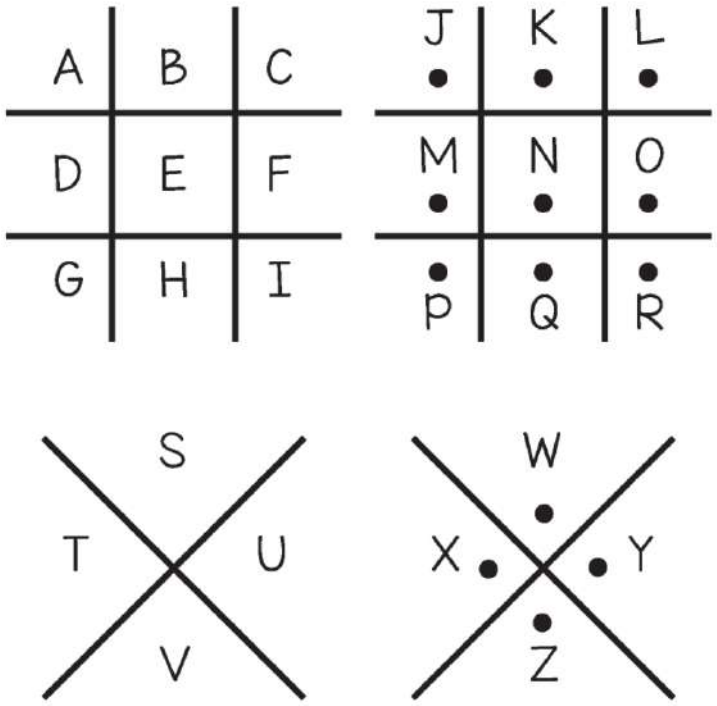
Despite being called Morse code, it is actually a cipher, not a code. However, although technically different codes and ciphers are often used as interchangeable terms in casual conversation.

Learning Morse code is a great way to send messages!

PIGPEN CIPHER

When using a Pigpen Cipher, every letter of the alphabet is paired with a geometric symbol consisting of fragments of a grid with and without dots. This type of cipher has been used by many groups throughout history and has even been used to mark Freemason tombstones!

The geometric grids are drawn out as follows:



Using this cipher, STEM SECRET AGENT would be written like this:

Can you use the cipher to decode this Albert Einstein quote?

Answer:

___ _____ _____ __
__ _____ ____
_____ ___

CREATE YOUR OWN SECRET MESSAGE!

Now we've learned a little bit about codes and ciphers the rest is up to you!

Your mission is to send the TechFest team of secret agents a coded message. You could use one of the ciphers you learned about above or come up with your own! You can use the template below to get you started if you like, but don't be afraid to break the mould and get creative! You may decide to create a symbol or picture for each of the 26 letters in the alphabet, or come up with your own algorithm or keyword.

Send your secret message (along with the instructions on how to decode it!) to the TechFest secret agents using one of these secure channels of communication (click here for instagram and for facebook) and one of our agents will write back to you!

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

GOOD LUCK RECRUIT – THE WORLD OF STEM IS COUNTING ON YOU!

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MAKE SURE TO SEND US YOUR SECRET CODED MESSAGE!

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