

## Section 1 Lecture 6 – Substitution ciphers - Exercises

Q1) Try to decrypt the following phrase which has been encrypted using a simple substitution cipher, so one letter is always represented by the same letter. Use your knowledge of the English language to try and work out some of the letters. Once you have a few, the rest should start to slot into place. It is a simple substitution cipher - only letters are encrypted - the punctuation symbols are not encrypted, so the ? is really a ?, for example.

HX KJH HTTEUZH XU Z AENL FLLX EUDLB, “IQES MQ FEFFEYL, ZV SHO IOK ZXKH KAL METAZXL JQHXY VZYOQLU, JZGG KAL QZYAK EXUJLQU THML HOK?” Z EM XHK EFGL QZYAKGS KH EIIQLALXB KAL DZXB HV THXVOUZH HV ZBLEU KAEK THOGB IQHNHDL UOTA E COLUKZHX.

This quote is from Charles Babbage, renowned for being the inventor of the first computer.

Q2) Try to decrypt the following message, which is created by a substitution cipher. Spaces and punctuation are not encrypted. This is a quote by the renowned current cryptography writer Bruce Schneier.

HRALIOJ HCA LCWYHL WA: DUGUO WDTUOUALRMCLU LHU CMIWDL IV MIDUJ, LRMU, CDT UVVIOL AIMUIDU FRXX UKNUDT LI LHFCOL C AUPWORLJ AJALUM. RL'A CXFCJA QULLUO LI CAAWMU LHU FIOAL. CAAWMU JIWO CTGUOACORUA COU QULLUO LHCD LHUJ COU. CAAWMU APRUDPU CDT LUPHDIXIYJ FRXX AIID QU CQXU LI TI LHRDYA LHUJ PCDDIL JUL. YRGU JIWOAUXV C MCOYRD VIO UOOIO. YRGU JIWOAUXV MIOU AUPWORLJ LHCD JIW DUUT LITCJ. FHUD LHU WDUKNUPLUT HCNNUDA, JIW'XX QU YXCT JIW TRT.

Q3) You have the following substitution 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
+	%	\$	£	~	#	?	/	<	!	>	*	&	(	=	)	@	:	Δ	\		○	-	©	◇	∞

(i) Encrypt the message “THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG” using this substitution cipher.

(ii) Decrypt the message \$:◇)\=?+:)/◇<Δ<(\~:~Δ\<(?Δ=&~\<&~Δ

Q4) Try to complete the substitution cipher puzzle attached (from Radio Times, February 2019)

*Q5) Optional questions on patterns in the English language:*

*(i) Are there any English words which contain three consecutive pairs of identical letters, (such as XXYYZZ)?*

*(ii) What is the longest English word you can write without repeating any letters?*

*(iii) The phrase “THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG” is called a pangram – it is a phrase that contains all 26 letters of the English alphabet. Create more pangrams yourself.*