

Code Busters

2018 – 2019

Division C

Names: _____

School: _____

Team Number: _____

DO NOT BEGIN UNTIL YOU ARE INSTRUCTED TO DO SO.

This test contains 16 questions. You will have 50 minutes to complete this test. The first question will be timed, and you will receive a time score based on how quickly you solve it.

In order to achieve full points on a given question, you **DO NOT** need to fill out the frequency tables. They are solely there for your reference.

Letter	A	B	C	D	E	F	G	H	I	J	K	L	M
Number	0	1	2	3	4	5	6	7	8	9	10	11	12
Letter	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Number	13	14	15	16	17	18	19	20	21	22	23	24	25

Point Total: _____ /5600 Time Score: _____ /2400

Total Score: _____ /8000

Question 1 (300 points, timed)

Solve this aristocrat, which is a quote by Wyatt Earp. When you have solved it, raise your hand so that the time can be recorded and the solution checked.

UMPVN VP UVHI, SWN MKKWTMKE VP IQITENYVHJ.

Ciphertext Letter	A	B	C	D	E	F	G	H	I	J	K	L	M
Frequency					2			2	3	1	3		3
Plaintext Letter													
Ciphertext Letter	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Frequency	3		3	1		1	2	2	4	2		1	
Plaintext Letter													

Question 2 (100 points)

Encrypt the following quote using the Vigenère cipher and the key LUCIAN.

LIFE IS SHORT, SCIENCE IS LONG.

Question 3 (100 points)

Decrypt the following quote by Immanuel Kant using Lincoln's Gettysburg Address as a running key.

XQCVFES ZW OEJSRDDR B ONFOLKRUY.

Question 4 (150 points)

Decrypt the following quote by Neil DeGrasse Tyson that has been encoded using a Caesar cipher.

AKQMVKM TQBMZIKG QA BPM IZBMZG BPZWCOP EPQKP BPM

AWTCBQWVA WN BWUWZZWE'A XZWJTMUA NTWE.

Question 5 (150 points)

Decrypt the following quote by Mahatma Gandhi that has been encoded using the affine cipher. The first two letters of the plaintext are MY.

DVIXMRXZDVDRZZLHR.

Question 6 (200 points)

Solve this aristocrat, which is a quote by Bonnie Bassler.

VDF NRKQ RS RSGRXCGQ CHHDWRCGRDS LRGA PCWGQYRC, CSU

VDF WDFNUS'G HFYKRRKQ LRGADFG GAQX.

Ciphertext Letter	A	B	C	D	E	F	G	H	I	J	K	L	M
Frequency	3		6	6		5	9	3			3	2	
Plaintext Letter													
Ciphertext Letter	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Frequency	2		1	5	10	5		2	2	3	2	2	
Plaintext Letter													

Question 7 (200 points)

Encrypt the following phrase using the Hill cipher and the key $\begin{bmatrix} I & N \\ T & O \end{bmatrix} = \begin{bmatrix} 8 & 13 \\ 19 & 14 \end{bmatrix}$.

SCIENCE OLYMPIAD C

Question 8 (300 points)

Decrypt the following quote by Karl Pearson that has been encoded using the Baconian cipher.

BAAAB BAABA AAAAA BAABA ABAAA BAAAB BAABA ABAAA

AAABA BAAAB ABAAA BAAAB BAABA AABBB AABAA AABBA

BAAAA AAAAA ABABB ABABB AAAAA BAAAA ABBAB AABAB

BAAAB AAABA ABAAA AABAA ABBAA AAABA AABAA.

Question 9 (350 points)

Decrypt the following quote by Brad Anderson that has been encoded using the Vigenère cipher. The first three letters of the plaintext are PER.

C M E W V A G I A K R M F P N P S B U I O I G X Y M.

Question 10 (350 points)

Suppose Cody uses RSA encryption to send a number x to Buster using the public key $(1205, 2279)$. If the ciphertext is 1195 and Buster's private key is 29, what is x ?

Question 11 (500 points)

Solve this Patristocrat, which is a quote by Hale Irwin. You are given part of the key in the frequency table.

TJJON ICVND JRYMX ZORHO LXYVI JEJDF JHIJW GZYZF JGHZY

JSXZD FXRSM HYMZC JDJYJ DEJYX TJIJD CS.

Ciphertext Letter	A	B	C	D	E	F	G	H	I	J	K	L	M
Frequency			3	6	2	3	2	4	4	16		1	3
Plaintext Letter					V								
Ciphertext Letter	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Frequency	2	3			3	3	2		2	1	5	7	5
Plaintext Letter									T				

Question 12 (500 points)

Suppose a message was encoded using the Hill cipher with the key

$$\begin{bmatrix} O & N & E \\ M & A & T \\ R & I & X \end{bmatrix} = \begin{bmatrix} 14 & 13 & 4 \\ 12 & 0 & 19 \\ 17 & 8 & 23 \end{bmatrix}.$$

Compute the decryption matrix.

Question 13 (550 points)

Solve this aristocrat that has several spelling mistakes.

ARQ MY, C KYMQ EPMVPNF UJNX QVRAANP LCQU DTPNCME

GCDQPJSD.

Ciphertext Letter	A	B	C	D	E	F	G	H	I	J	K	L	M
Frequency	3		4	3	2	1	1			2	1	1	4
Plaintext Letter													
Ciphertext Letter	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Frequency	4		5	5	2	1	1	2	2		1	2	
Plaintext Letter													

Question 14 (550 points)

Solve this xenocrypt, which is a quote by Salvador Dali.

KXCX VVN RXD DJQQBXO FJB OX QBXOPCXC.

Ciphertext Letter	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Frequency		3	3	2		1				2	1			1
Plaintext Letter														

Ciphertext Letter	Ñ	O	P	Q	R	S	T	U	V	W	X	Y	Z
Frequency		3	1	3	1				1		8		
Plaintext Letter													

Question 15 (650 points)

Solve this patristocrat, which is a quote by Bobby Unser.

QGNGJ APHCH CNHPO EZGUT QTOZH JOHYG QJNKD DZHFK AEZGU

TQTOZ HJOHY GQJ.

Ciphertext Letter	A	B	C	D	E	F	G	H	I	J	K	L	M
Frequency	2		2	2	2	1	6	8		5	2		
Plaintext Letter													

Ciphertext Letter	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Frequency	3	5	2	5			4	2				2	5
Plaintext Letter													

Question 16 (650 points)

Decrypt the following quote.

HTGEE RTARE HTOES BATLC TEEHO MERLG ROIYO NEVCR MONII

GZT.

Ciphertext Letter	A	B	C	D	E	F	G	H	I	J	K	L	M
Frequency	2	1	2		8		3	3	3			2	2
Ciphertext Letter	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Frequency	2	5			5	1	6		1			1	1