

C - Code Busters - C - Nov 7 Country-wide SO Practice - 11-07-2020

- You have 50 minutes to complete the test
- There is no timed question
- You may use the resources provided in the guidelines. (<https://scilympiad.com/Data/shared/testRefs/CodebustersReference.pdf>)
- Good luck!

1. (200.00 pts) You know what to do, it's monoalphabetic!

This is the timed question, solving this question faster will give you more points. After 10 minutes, you may answer the question but you will not receive extra points.

Type your letters below the corresponding given letters. Your letters can be lower or upper case.

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

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

W	O	E	N	N	E	N	E	O	F	T	O	V	Q	N	Q	W	D	S	V	D	F
A	N	D	I	I	D	I	D	N	T	K	N	O	W	I	W	A	S	L	O	S	T

2. (300.00 pts) Decrypt the following ciphertext, which was encrypted using an Affine cipher where $a=7$ and $b=4$.

Type your letters below the corresponding given letters. Your letters can be lower or upper case.

H	b	g	y	r	d	q	a	y	o	t	s	g	y	n	w	r	y	c	d	g	z	u	g	i	a	g	j	f	g	t	i	g	r	s	g	.
T	H	E	O	N	L	Y	S	O	U	R	C	E	O	F	K	N	O	W	L	E	D	G	E	I	S	E	X	P	E	R	I	E	N	C	E	.

3. (350.00 pts) When using a specific Affine cipher, the letters 'cq' decrypt to 'td'. Provide the A and B values used in the decryption.

- A) A = 13, B = 3
- B) A = 12, B = 5
- C) A = 17, B = 17
- D) A = 23, B = 2

4. (250.00 pts) Decrypt the following Aristocrat. This exam is off to a great start.

Type your letters below the corresponding given letters. Your letters can be lower or upper case.

O	M	V	Q	D	N	V	A	N	H	V	Q	M	V	S	A	M	O	V	I	J	F	S	J	M	V	J	D	J	U	D	E	V
G	R	E	A	T	P	E	O	P	L	E	A	R	E	F	O	R	G	E	D	I	N	F	I	R	E	I	T	I	S	T	H	E

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

5. (450.00 pts) Decrypt the following ciphertext. It was encrypted using a Hill Cipher with the provided key...

$$\begin{bmatrix} 6 & 24 & 1 \\ 13 & 16 & 10 \\ 20 & 17 & 15 \end{bmatrix}$$

Type your letters below the corresponding given letters. Your letters can be lower or upper case.

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

R	P	W	A	W	U	P	V	C	N	S	R	R	T	O	G	Y	U	U	D	E	K	G
B	E	G	O	O	D	T	O	B	E	E	V	I	L	S	O	M	E	T	I	M	E	S

6. (350.00 pts) Encrypt the following plaintext using a Hill cipher with the decryption key below.

$$\begin{bmatrix} 25 & 0 \\ 2 & 7 \end{bmatrix}$$

Type your letters below the corresponding given letters. Your letters can be lower or upper case.

S	o	f	t	l	y	c	a	i	l	t	h	e	m	u	s	t	e	r	l	e	t	t	h	e	c	o	m	r	a	d	e	a	n	s	w	e	r
I	W	V	T	P	O	Y	I	P	B	H	Z	W	O	G	M	H	G	J	Z	W	P	H	Z	W	U	M	C	J	Q	X	U	A	N	I	M	W	L

h	e	r	e
T	K	J	Y

7. (600.00 pts) The following Xenocrypt is an excerpt from a Spanish poem. Decrypt the first two lines. The entire poem is provided for reference.

¡AYN CNKDGIU NKN!
 DUKZWGIU LNR UZKN
 LGKULU Q SNKLN.
 RYH LN BUELZR...
 DUKZWGIU LNR UZKN,
 AYNLUXN UCZ, UCZ, UCZ.
 EG XN AYZNKNI WUKUK,
 WUKUKXN EG AYZNKNI...
 DUKZWGIU LNR UZKN,
 LGKULU Q SNKLN.
 RYH LN BUELZR...
 DUKZWGIU LNR UZKN,
 AYNLUXN UCZ, UCZ, UCZ.
 AYNLUXN UCZ.
 DUKZWGIU ¿NIXUI UCZ?

Type your letters below the corresponding given letters. Your letters can be lower or upper case.

A	Y	N	C	N	K	D	G	I	U	N	K	N	I	D	U	K	Z	W	G	I	U	L	N	R	U	Z	K	N	L	G	K	U	L	U	Q
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

A	Y	N	C	N	K	D	G	I	U	N	K	N	I	D	U	K	Z	W	G	I	U	L	N	R	U	Z	K	N	L	G	K	U	L	U	Q
Q	U	E	H	E	R	M	O	S	A	E	R	E	S	M	A	R	I	P	O	S	A	D	E	L	A	I	R	E	D	O	R	A	D	A	Y

S	N	K	L	N
V	E	R	D	E

8. (400.00 pts) Find the key that was used to encrypt the following Vigenère ciphertext.

Plaintext: Exit light, enter night, take my hand.
 Ciphertext: Qbbt wtojt, qrmec yqihf, xtkp xg jazh.

Expected Answer: metallica

9. (400.00 pts) Encrypt the following plaintext with the key 'SLEEP'

Type your letters below the corresponding given letters. Your letters can be lower or upper case.

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

S	T	I	T	I	O	U	S
D	X	M	I	A	Z	Y	W

10. (400.00 pts) The following is from a historic United States document.

[FREQUENCY]

Type your letters below the corresponding given letters. Your letters can be lower or upper case.

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

N	G	U	U	O	M	W	G	E	M	K	E	M	G	N	M	J	M	D	V	G	U
T	A	L	L	M	E	N	A	R	E	C	R	E	A	T	E	D	E	Q	U	A	L

11. (350.00 pts) This message was found in catacombs below the streets of modern-day Rome. Well, not really, but it's still a Caesar cipher.

Type your letters below the corresponding given letters. Your letters can be lower or upper case.

H	k	I	t	i	b	a	d	b	z	o	I	t	k	p	q	e	I	p	b	t	e	I	p	b	b	h	e	b	o
K	N	O	W	L	E	D	G	E	C	R	O	W	N	S	T	H	O	S	E	W	H	O	S	E	E	K	H	E	R

12. (350.00 pts) Decrypt the following Pollux cipher.

Dots are at least 7, 4, and 2.

Dashes are at least 5 and 9.

Xs are at least 6.

295071194976274405956958624704009698501594158911868956690472214608565890899652

Expected Answer: WE CHOOSE TO GO TO THE MOON

13. (500.00 pts) The following RSA ciphertext was encrypted using a very insecure key, $e = 7$, $n = 55$. Decrypt it and provide the private key exponent.

Select only two answers

(Mark ALL correct answers)

- A) 27
- B) 3
- C) 9
- D) HOWDY
- E) PIZZA
- F) TEXAS

14. (400.00 pts) Solve the following Aristocrat.

Type your letters below the corresponding given letters. Your letters can be lower or upper case.

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

15. (200.00 pts) The strength of RSA lies in the difficulty of factoring the product of sufficiently large _____ numbers.

prime