

Science Olympiad — Scioly person 1's Codebusters Test

Names of participants: (Please print neatly)

School Name: _____

Check your team: Varsity JV1 JV2 JV3

Warning: Do not open this packet until given permission to do so.

Note: There are useful notes after this page.

Scoring:

Time to solve first problem: _____ (use to calculate Bonus below)

Question	Value	Incorrect letters	Deduction	Score
Timed	200			
1	300			
2	300			
3	325			
4	200			
5	150			
6	600			
7	600			
8	250			
9	375			
10	200			
11	125			
12	350			
13	300			
14	350			
15	550			
16	600			
17	600			
18	600			
19	500			
20	200			
Bonus				
Final Score				

The following tables might be useful during the event.

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

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
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

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

1	3	5	7	9	11	15	17	19	21	23	25
1	9	21	15	3	19	7	23	11	5	17	25

AAAAA	A	AABBA	G	ABBAA	N	BAABA	T
AAAAB	B	AABBB	H	ABBAB	O	BAABB	U/V
AAABA	C	ABAAA	I/J	ABBBA	P	BABAA	W
AAABB	D	ABAAB	K	ABBBB	Q	BABAB	X
AABAA	E	ABABA	L	BAAAA	R	BABBA	Y
AABAB	F	ABABB	M	BAAAB	S	BABBB	Z

Frequency Table of English letters:

E - 12.51%	S - 6.54%	C - 3.06%	G - 1.96%	K - 0.67%
T - 9.25%	R - 6.12%	U - 2.71%	W - 1.92%	X - 0.19%
A - 8.04%	H - 5.49%	M - 2.53%	Y - 1.73%	J - 0.16%
O - 7.60%	L - 4.14%	F - 2.30%	B - 1.54%	Q - 0.11%
I - 7.26%	D - 3.99%	P - 2.00%	V - 0.99%	Z - 0.09%
N - 7.09%				

Frequency Table of Spanish letters:

E - 14.08%	I - 5.98%	M - 3.08%	Y - 1.09%	Z - 0.47%
A - 12.16%	L - 5.24%	P - 2.89%	V - 1.05%	Ñ - 0.17%
O - 9.20%	D - 4.67%	B - 1.49%	G - 1.00%	X - 0.14%
S - 7.20%	T - 4.60%	H - 1.18%	F - 0.69%	K - 0.11%
N - 6.83%	U - 4.69%	Q - 1.11%	J - 0.52%	W - 0.04%
R - 6.41%	C - 3.87%			

For the purposes of cryptograms it is customary to treat n and ñ as distinct letters, but a and á are the same letter. Likewise for e and é, and i and í. In other words, all the accent marks get amputated when working with cryptograms. Also, while some older Spanish dictionaries consider ch, ll, and rr, to be their own letters—this has fallen out of modern usage. Accordingly, “burro” is considered as five letters: “b-u-r-r-o” and not as four letters “b-u-rr-o.”

Morse Code:

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	--••

0	-----
1	•-----

2	••----
3	•••---

4	••••-
5	•••••

6	-••••
7	--•••

8	----••
9	-----•

•	E
••	I
•••	S
••••	H
-•••	B
-----	0
•••••	5

-	T
•-	A
••-	U
•••-	V
-••-	X
•----	1
-••••	6

-•	N
•-•	R
••-•	F
-•-•	C
••---	2
--•••	7

--	M
•--	W
•-••	L
-•--	Y
••••-	3
----••	8

-••	D
•--•	P
--••	Z
••••-	4
----•	9

-•-	K
•---	J
--•-	Q

-••	G
-----	---

---	O
-----	---

Timed Question **[200 points]** Decode this quote by Nelson Mandela. When you have solved it, raise your hand so that the time can be recorded and the solution checked.

ZYPO R SRO DM HPODPH WYP TDJYW WB ADEP WYP ADKP YP

QPADPEPM DO, YP YRM OB FYBDFP QVW WB QPFBS P RO

BVWARZ.

	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
Frequency	4	6		8	2	3		2		1	1		3		6	15	3	5	2	1		2	7		8	2
Replacement																										

Sciolyperson1's Codebusters Test

1) **[300 points]** Decode this quote by Anne Frank which has been encoded with the Pollux Cipher. 4,6 = O, 5,7,3 = X, and 0 = -

822544665211545686254561455885686554884541542265822852621

55411546581485428855215615141565522152546845858165664

55684656254116581265182255252115122

2) **[300 points]** Decode this quote by Bob Marley, which has been encoded with the Baconian Cipher.

51627890512679085167285967801256978506178256785960781

56279085126907812596078156728590671856279850678156297

80561782567901852678950671856782596708516297801529670

182596701829560178256

3) [325 points] Decode this quote by Charles Dickens which has been encoded with the Baconian Cipher.

zqxwcnexzcnzuxicnqzxcwnzxecnzuxicqwnzxcnzxceunzixcnqw

zexcunizxqcnwzxeucnizxqcnzxcnzexuicqnwzeuxcnzxciqnzw

xeucniqwzxcnzxecnzxucnizxqcnzxcwecnzxucqnzxcwecunzxcin

zxqcnwzxcunzixcnzxcwecnuzxiqcnzeuxcnizxqcnwzxcuinz

qxcwnzxc

4) [200 points] Decode this phrase which has been encoded with the caesar cipher.

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

Sciolyperson1's Codebusters Test

5) [150 points] Encode this phrase using the Caesar cipher with an offset of 16.

E	N	V	I	R	O	N	M	E	N	T	A	L	C	H	E	M	I	S	T	R	Y

6) [600 points] Decode this quote which has been encoded as a Xenocrypt.

OY DBZJPZ XH ZARNPZ, OY CZXPZ NHOH DBZJZ MBYXUH OY

HOLRUYX; NR TBZUZN JZMHJUYJDZ NRZDTJZ ZNPYJZ MHXPRCH

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	Ñ	O	P	Q	R	S	T	U	V	W	X	Y	Z
Frequency	1	4	2	4				8		7		1	3	6		5	5		5		2	4			5	7	16
Replacement																											

7) [600 points] Decode this quote by Rodrigo Díaz de Vivar which has been encoded as a Xenocrypt.

LFLEG AÑLMWÑ EZHTGRSZL TZW BZR OFÑ LZ RFTSÑWZL HZWSW

G ASÑHTZ .

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

8) [250 points] Encode the phrase "Acceleration" with the Hill Cipher, with the keyword "hill".

$$\begin{pmatrix} H & I \\ L & L \end{pmatrix} \equiv \begin{pmatrix} 7 & 8 \\ 11 & 11 \end{pmatrix}$$

A	C	C	E	L	E	R	A	T	I	O	N

Sciolyperson1's Codebusters Test

9) [375 points] Decode this phrase given the encryption key "princeton".

$$\begin{pmatrix} P & R & I \\ N & C & E \\ T & O & N \end{pmatrix} \equiv \begin{pmatrix} 15 & 17 & 8 \\ 13 & 2 & 4 \\ 19 & 14 & 13 \end{pmatrix} \quad \text{Decode} \begin{pmatrix} P & R & I \\ N & C & E \\ T & O & N \end{pmatrix}^{-1} \equiv \begin{pmatrix} 20 & 25 & 0 \\ 23 & 19 & 14 \\ 8 & 7 & 19 \end{pmatrix}$$

S	U	N	V	T	F	H	G	M	B	U	R	K	K	O	S	E	G	Z	U	T

10) [200 points] Decode this quote by Benjamin Franklin which has been encoded with the Vigenère cipher with keyword "scioly".

L	G	T	Z	X	C	S	P	L	W	Q	M	J	I	M	H	E	C	S	E	P	A	P	Y	F	F	Q	F	P	K

W	O	J	S	C	G	F	X	W	Z	G	C	E	G	I	B	O	G	D	G	I	F	Y

11) [125 points] Encode the phrase "boomilever towers and bridges" with the Vigenere Cipher with the key "balsa".

B	O	O	M	I	L	E	V	E	R	T	O	W	E	R	S	A	N	D	B	R	I	D	G	E	S

12) [350 points] Decode this quote by Dr. Suess which has been encoded as an aristocrat with errors.

AZF CJLY KFFWJDEQ DE AZFW CJYV. AFZ CJLYY TZZS DE

AZFW QCZYQ. AZF MJE QSYYYW FWQYOT JED VDWYPSDZZE AZF

PCZZQY.

	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
Frequency	6		5	6	6	9				6	1	2	1		1	2	6		3	2		2	6		11	13
Replacement																										

Sciolyperson1's Codebusters Test

13) [300 points] Decode this quote by Thomas Edison which has been encoded as an aristocrat.

ANT DTBQFBMF SBQVGBMM UWBM WG DWCWGD NY. FKB JAMF

RBTFQWG SQI FA MNRRBBE WM QUSQIM FA FTI ZNMF AGB

JATB FWJB.

	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
Frequency	6	12	1	3	1	10	5		3	3	1		9	4			6	3	3	5	2	1	7		1	1
Replacement																										

14) [350 points] Decode this quote by Winston Churchill, which has been encoded as an aristocrat.

LH CPB GJJR BPLQ HCPH QJSYAKPAI LB HCJ TYKBH DYKS YD

NYOJKRSJRH JMAJEH PZZ HCYBJ YHCJK DYKSB HCPH CPOJ

GJJR HKLJQ DKYS HLSJ HY HLSJ.

	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
Frequency	3	6	7	4	1		2	15	1	16	8	6	1	1	2	7	3	4	7	1					10	2
Replacement																										

15) **[550 points]** Decode this sentence, which has been encoded as an aristocrat.

SKVVG T SRNPJ SROOCVG YQ SRRJVOVKKHVJ, SVPPHWS SRRG

NP SKNOOHWS PAV SRRGHVJ

	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
Frequency	1		1				4	4		4	4			3	5	5	1	8	10	1		9	2		1	
Replacement																										

16) **[600 points]** Decode this quote by James Cameron, which has been encoded as a patristocrat.

MUKBE ZYCKB EPOBH JZPMW MNEJB EZJKX MOXHS WMCZH

UHMJE PYKBE RMJJU HMJHI BDYYD YPKBS YYJZY ZZENN YZZ

	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
Frequency		7	2	2	7			6	1	8	5		8	3	2	4		1	2		3		2	2	9	9
Replacement																										

Sciolyperson1's Codebusters Test

17) [600 points] Decode this quote by David Brinkley, which has been encoded as a patristocrat.

MKZTT WKKUZ OSMPD KGPWR IGTMP OMHMU DVSUG ZPXMA

DGPRD AIAIW JVDTL KGAIW VKIMQ WAIVG RPMAI DS

	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
Frequency	6			6			6	1	7	1	6	1	8		2	6	1	3	3	4	3	4	5	1		3
Replacement																										

18) [600 points] Builderguy135 and his friend Umaroth have the following RSA public key:

$$n = 387103 \quad e = 294267$$

Unfortunately for them, A quantum computer has successfully factored their n

$$387103 = 521 * 743$$

Compute the value of their private key:

Enter the computed private key:

19) **[500 points]** Andrew and his friend Sophia have faithfully followed the steps of the RSA key-generation algorithm. Here are the results:

$$p = 419$$

$$q = 389$$

$$n = 162991$$

$$\phi = 162184$$

$$e = 3019$$

Unfortunately, they don't know how to compute the value of d and need you to do that final step for them.

Enter the computed value of d , NOT the formula.

20) **[200 points]** Encode this name of a parasite where $a = 18$ and $b = 5$.

D	I	P	H	Y	L	L	O	B	O	T	H	R	I	U	M	L	A	T	U	M