

Science Olympiad — Stuyvesant

Scoring:

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

Question	Value	Incorrect letters	Deduction	Score
Timed	300			
1	200			
2	300			
3	350			
4	400			
5	300			
6	650			
7	300			
8	250			
9	250			
10	350			
11	300			
12	600			
13	250			
14	350			
15	600			
16	550			
17	300			
18	250			
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	•-	F	••-•	K	-•-	P	•--•	U	••-
B	-•••	G	--•	L	•-••	Q	--•-	V	•••-
C	-•-•	H	••••	M	--	R	•-•	W	•--
D	-••	I	••	N	-•	S	•••	X	-••-
E	•	J	•---	O	---	T	-	Y	-•--
								Z	--••

0	-----	2	••----	4	••••-	6	-••••	8	----••
1	•-----	3	•••--	5	•••••	7	--•••	9	-----•

•	E	-	T	-•	N	--	M	-••	D	-•-	K	-••	G	---	O
••	I	•-	A	•-•	R	•--	W	•--•	P	•---	J	••••-			
•••	S	••-	U	••-•	F	•-••	L	--••	Z	--•-	Q				
••••	H	•••-	V	-•-•	C	-•--	Y								
-•••	B	-••-	X	••---	2	•••--	3	••••-	4						
-----	0	•-----	1	---•••	7	----••	8	-----•	9						
•••••	5	-••••	6												

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School: _____

Timed Question **[300 points]** Below is a passage by American writer Jodi Picoult that has been encoded with a random alphabet Aristocrat cipher. What did it say? When you have solved it, raise your hand so that the time can be recorded and the solution checked.

EA EY X MUERE LBFJ NQO SQDF AQRQJF AQ ROMB YBXY NQO

MXJ'Y AFF MSFXUSN?

	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	3		1	3	8				3		1	4	3	3		6	3	3		2			4	4	
Replacement																										

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Page 1

1) **[200 points]** What did this quote from American author Robert Anton Wilson encrypted with the Caesar cipher say?

I	P	M	P	I	X	D	C	X	H	G	D	Q	Q	T	G	N	Q	P	H	T	S	D	C	B	D	C	D	E	D	A	N

D	U	L	T	P	E	D	C	H

2) **[300 points]** Don Cheadle, Actor & UN Environment Goodwill Ambassador once said this, encrypted with the Vigenère cipher using the key "TREES". What did he say?

P	Y	E	X	A	L	D	S	V	W	B	D	T	S	J	M	R	R	X	L	A	R	R	K	G	H	U	E	R	V	V	C

I	E	F	T	Z	V

3) **[350 points]** Solve this Morbit cipher that encrypts a quote from Mary Frances Berry, an American historian and lawyer, concerning justice. You are given that 2=●, 4=●-, 7=●●, 8=—, 9=●x. What does it say?

4 6 7 7 3 1 9 3 9 6 1 4 9 8 6 8 3 3 7 5 6 8 6 1 3 7 9

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

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

2 3 3 2 3 7 5 4 1 9 2 9 3 9 1 7 1 8 1 9 1 5 2 7 3

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

1 6 7 3 7 3

4) **[400 points]** The following quote by Civil Rights activist Rosa Parks is encrypted using the Pollux cipher given that 1=●, 3=x, 4=x, 6=-, 7=●. What does it say? Page 3

92556458047649195441883395288396121700452986623999405

49093300478734679520211129383197491037945069348703358

3109292263110721546430787214767046002300252017339974751

269938764504518

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5) **[300 points]** Below is a quote said by G-Man from the game *Half-Life 2* encoded with a Baconian cipher. You know that the last word spells "WORLD". What does it say?

42365728943567283572395723546723894657823954672357289

35742357682395742356897243567823957235467829435726835

94672839572357235472365723587235723945726389572357423

65782357235792435678293547236895742357268395723547623

85972435672357283579423572635782359723546728359723468

579234567238954672357829357246

6) **[650 points]** Emiliano Zapata, a leading figure in the Mexican Revolution, said this, encrypted with a Spanish Xenocrypt cipher. What does it say?

CG PZ YXH SQCEGTGX VXIX WÑ VQWKÑZ, NQW PZ YXHX VXD

VXIX WÑ OZKGWIPZ.

	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	1		4	2	3		2			1	3	1	3	3		1	1		4	5	9	2	5
Replacement																											

7) **[300 points]** Cris Cyborg, a Brazilian-American mixed martial artist, once said this about her fights. It has been encrypted with a random alphabet Aristocrat cipher. What does it say?

S PNQL LU DNEA KJANL TSKRLO, ADULSUQNV TSKRLO, TUJ

NVV DZ TNQO NQH AWAJZUQA PNLFRSQK.

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

8) **[250 points]** Helen Keller, American author and political activist, once said this to *inspire* you. It has been encrypted with a K2 Aristocrat cipher. What does it say?

JKQBGBOG BO QAP RZBQA QAZQ FPZSO QJ ZNABPUPGPHQ.

HJQABHE NZH IP SJHP VBQAJTQ AJKP ZHS NJHRBSPHNP.

Replacement																										
K2	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	8			1	1	3	8	1	7	2			4	3	10	10	2	4	1	1	1				6

11) **[300 points]** Willy Wonka once said "We are the music makers, and we are the dreamers of dreams". Encrypt it using the Vigenère cipher using the key "CANDY".

W	E	A	R	E	T	H	E	M	U	S	I	C	M	A	K	E	R	S	,	A	N	D	W	E	A	R	E	T	H	E		

D	R	E	A	M	E	R	S	O	F	D	R	E	A	M	S	.
																.

12) **[600 points]** Special Agent, Benjamin, has the following RSA public key:

$$n = 145801 \quad e = 79229$$

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

$$145801 = 691 * 211$$

Compute the value of their private key.

Enter the computed private key:

13) [250 points] South African political leader and revolutionary Nelson Mandela once said these words encrypted with a Baconian cipher. You are told that the first word is "ANY". What did he say?

+--+--+ / *+ - / *+ / -+* - / *+ -+--+ / *+ -+ / * - / *+ -+--+ / -+--+* / -+* -+ - / *+ -
 / + - *+ -+ / -+* - / + - * / *+ - / + - *+ -+ - / *+ / - * / + - *+ - / +--+* / * -+--+ - / + - *+ /
 -+* - / +--+--+* -+--+ - / + - *+ -+ / * -+ / -+* - / * / + -+--+* / - *+ -+ - / +* - / *+ - / +
 -+* - / - *+ - / +* - / +* / * - / *+ -+ - / *+ / -+--+ - * / + - * / + -+* -+ - / + - *+ / - * / +* -
 / + -+* -+--+ / - *+ - / +* -+ / - *+ - / *+ / * -+ - / + - *+ -

14) [350 points] The following text is taken from William Faulkner's *The Sound and the Fury* and has been encrypted with a random alphabet Aristocrat cipher. What did it say?

OC ' F VUC ETRV PUG JRMSOFR CTMC VUCTOVD NMV TRSH PUG -

JRSODOUV, HJOIR, MVPCTOVD - OC ' F ETRV PUG JRMSOFR

CTMC PUG IUV ' C VRRI MVP MOI .

	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			10	3	2	4	4	2	4	4			8	1	10	6		11	4	7	8	12				
Replacement																										

15) **[600 points]** Mother Abbess said this to Maria about facing her problems in the movie *The Sound of Music*. It has been encrypted with the Patristocrat cipher. What did it say?

HCZBC MDUNU TCEEN TUZUY JMHUC YMMJN DKMJK MVZJF

EUHNI JKDCS UMJWC OUMDU HIJKD CSUMJ EBSUM DUEBW

UIJKT UZUFJ ZYMJE BSU

	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	7	6	6	2		4	3	11	5		11	4	1				4	3	16	1	2		3	5
Replacement																										

16) **[550 points]** Alfred in the movie *The Dark Knight* said this to Bruce Wayne about the choices Batman can make. It has been encrypted with the Patristocrat cipher. What did Alfred say?

FNRPV QPGNJ FNRFH TRNJF PJVHH VNNIZ NRPVQ PGNJF

NWTMF JRFHT RN

	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	4	1	5			1	10		5	2	6		3		4	1			1
Replacement																										

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17) [300 points] The following was said by author Shannon L. Alder, but was encrypted using an Aristocrat cipher. What did it originally say?

SIWR UX VTIWRO MYR FIFRKM PIZ SRM JI ID XIFRIKR

LRHBZXR MYRP KRRO PIZ MI.

	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		3		1	10	1	3	1	5		2	3		12	2	1	1	1	2	3	2	3
Replacement																										

18) [250 points] John Cena once said the following about his attire. It has been encoded with an Aristocrat cipher. What did the message originally say?

R	W	L	M	'	G	S	Z	E	V	Z	M	B	V	O	Z	Y	L	I	Z	G	V	F	M	R	U	L	I	N	H	;	R
X	L	N	V	G	L	G	S	V	I	R	M	T	R	M	Z	G	-	H	S	R	I	G	,	Z	K	Z	R	I			
L	U	H	M	V	Z	P	V	I	H	Z	M	W	H	L	N	V	H	S	L	I	G	H	.								

