Science Olympiad — SSSS sonia22 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	125			
2	200			
3	150			
4	300			
5	250			
6	350			
7	200			
8	300			
9	200			
10	100			
11	100			
12	200			
13	250			
14	250			
15	250			
16	300			
17	150			
18	300			
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%				

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

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

HX UF HETVFQ XZ YX YWF HJZ 'YTV UF IXJZQ E HFE XI

LPFFZ EZQ UF VTDFQ KFZFEYW YWF UEDFH TZ XJP AFVVXU

HJKREPTZF

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

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1) **[125 points]** Solve this Caesar cipher.

M	J	Q	Q	T	,		N	Y	'	X		R	J		N		B	F	X		B	T	S	I	J	W	N	S	L		N	K		F	K	Y	J	W
					,				'																															

F	Q	Q		Y	M	J	X	J		D	J	F	W	X		D	T	Z	'	I		Q	N	P	J		Y	T		R	J	J	Y		Y	T
																			'																		

L	T		T	A	J	W		J	A	J	W	D	Y	M	N	S	L

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2) **[200 points]** Solve this Aristocrat. Hint: ruby red shoes

MWMW, R'DL C PLLKRXF AL'TL XWM RX JCXICI CXHBWTL.

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

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3) **[150 points]** Encode this Vigenere cipher with the key "Hello"

L	O	U	I	S	I	T	H	I	N	K	T	H	I	S	I	S	T	H	E	B	E	G

I	N	N	I	N	G	O	F	A	B	E	A	U	T	I	F	U	L	F	R	I	E	N

D	S	H	I	P

4) **[300 points]** A quote has been encoded using the Pollux Cipher for you to decode. You are told that **1=●**, **3=–**, **5=×**, **7=×**, **9=–**

44774122749724197177197132272307497319374127794171729 32

74704732171704477990732773724217277913721732794273471

722271127733374132774427972317107927932717231741 2

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5) **[250 points]** A quote has been encoded using the Morbit Cipher for you to decode. You are told that `2=●●`, `4=●−`, `6=●×`, `8=×−`, `1=−●`, `3=−×`

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

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

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6) **[350 points]** Solve this Baconian.

BABAAAABBBAABAAABBAAABAAAAABABABAAAABBAAAAABBABABBBABBABAAA

BAABAAABABAAABABABAAAABBAABAABAABAAAABABBAABAABAAABABBABAAB

ABBAABABAAAAABBABBAABBAAAABABABAAABAAABABBABBABBAABAAABBBAA

BAABAAAAABABBAAAAABAAAABABBAAAABAABBABABABBAABAABAAABBAABAA

BBABABABBAABAABAAABABBBAAABAAAAAAAABAABABAAAABBAAAABBABABAA

ABBABBAAAAAAABBBAAABABBABAABABBABAAABAAABAAABAAABBABBABABAB

BABABAAABAABAABAABAAABAABAAAAABAABAA

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7) **[200 points]** Solve this aristocrat (K1 alphabet).

XIFO ZPV IBWF CBMBODF JO ZPVS MJGF, XPSL CFDPNFT BO

K1	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	2	2		6	1		2	2		1	2	1	4	4			2	1		2	1	2		2
Replacement																										

8) **[300 points]** Solve this patristocrat. Hint: This quote starts with "A life..."

HWASJ GOJZV YHCAZ RYAGV HCJGA GZQVQ ZWMYQ DJXQZ

QDHEW JEBVY QDJBG JSBWV XHZHW ASJGO JZVNQ AZRZQ

VXAZR

	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	3	2	3	2		6	6		9			1	1	2		8	3	3			7	5	3	4	10
Replacement																										

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9) **[200 points]** Solve this Hill Cipher. Key: LEAD

$$\begin{pmatrix} L & E \\ A & D \end{pmatrix} \equiv \begin{pmatrix} 11 & 4 \\ 0 & 3 \end{pmatrix}$$

D	V	W	D	M	C	H	Y	I	U	Q	F	F	Q	B	M

10) **[100 points]** Solve this Baconian.

ABBABABBBBABAABABBABBAABABBBBABBABBBBBBABBBBBBBBBBAB

BBBAABBBBBBABAABAABABBBABBBBAABBABBBABAABABABAABBABBB

AABABAABBBBABBABBBABBBABBABABBAABAABBAABBBAA

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11) **[100 points]** Solve this Caesar.

O	Z	S	L	'	K	M	H	?	Y	S	K	H	J	A	U	W	K	.
				'				?										.

12) **[200 points]** Solve this Aristocrat

SGG HXJ TJZSNB ISM IHNZ PJXZ, AW RZ CSKZ PCZ IHXJSVZ

PH YXJBXZ PCZN

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

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13) **[250 points]** Solve this Aristocrat.

JBW UBI'O WIUFCXOGIU! N HBWTUG KGU HTGXX. N HBWTUG

RFFI G HBIOFIUFC. N HBWTU'PF RFFI XBAFRBUJ, NIXOFGU

BV G RWA, ZKNHK NX ZKGO N GA.

	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	9	2			10	10	6	8	2	4			7	5	1		4		4	10	1	6	6		2
Replacement																										

14) **[250 points]** A quote has been encoded using the Morbit Cipher for you to decode. You are told that **1=–●**, **2=●×**, **3=●●**, **4=×●**, **5=××**, **6=●–**, **7=×–**

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

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

7 9 7 3 8 7 9 4 6 2 7 6 2 3 3 7 9 7 6 2 9 8 6 3 4 8

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

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

1 7 2 6 5 9 2 2 8

15) **[250 points]** Solve this aristocrat with errors.

VMRZ PI DNM PJHZNZIHPJK... PJ HLZ ZJO, IGF UR GN

KNZCHZIH XCPJI, AZWUFZ GN KNZCHZIH IHNZJHLI.

	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		3	1		2	3	9	8	6	3	2	2	7	1	5		2			2	1	1	1		12
Replacement																										

16) **[300 points]** Solve this Patistocrat.

CQPMP BIPYC ATPNM PNEUP TBCJQ NYJCI BMRJG NEELM

PUAWP 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
Frequency	2	3	4		3		1		2	3		1	4	4		8	2	1		2	2		1		3	
Replacement																										

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17) **[150 points]** The following quote needs to be encoded with the Affine Cipher using ***a*=9** and ***b*=19**.

I		W	I	L	L		T	E	L	L		Y	O	U		S	O	M	E	T	H	I	N	G	,		B	U	T		I		W	A	R	N
																									,													

Y	O	U	,		I	T		I	S		A		L	I	E	.
			,													.

18) **[300 points]** Solve this patristocrat, which has been encoded using a K1 cipher.

JIBWF MFBSO FEGSP NNZNJ TUBLF TBOEJ BNTVS FJDBO

SFQFB UUIFN FYBDU MZ

K1	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		8		2	2	9	1		2	4		1	2	5	3	1	1		4	3	4	1	1		1	2
Replacement																										