

Science Olympiad — KingDJ777's Code Busters 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	110			
2	250			
3	500			
4	200			
5	200			
6	350			
7	400			
8	250			
9	200			
10	450			
11	300			
12	250			
13	200			
14	250			
15	350			
16	350			
17	500			
18	300			
19	450			
20	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

AAAA	A	AABBA	G	ABBAA	N	BAABA	T
AAAAB	B	AABBE	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	••••- 4			
-••• B	-••- X	••--- 2	••••- 3	-----• 9			
----- 0	•----- 1	--••• 7	---•• 8				
••••• 5	-•••• 6						

Timed Question **[200 points]** Solve this quote by Jackie Chan for the movie Karate Kid. When you have solved it, raise your hand so that the time can be recorded and the solution checked.

RMT WXZV OXTDWO CV X ZVUR PCAMUOXSO JVFFMS. JPKV

QPJJ GSMEG TF HMQS, ITO QV EXS EWMMFV QWVOWVU MU SMO

OM FOXSH IXEG TA.

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

KingDJ777's Code Busters Test

1) [110 points] Solve this quote from the movie Moana which has been encoded with the Caesar cipher.

T	F	F	U	I	B	U	M	J	O	F	X	I	F	S	F	U	I	F	T	L	Z	N	F	F	U	T	U	I	F
T	F	B	J	U	D	B	M	M	T	N	F	B	O	E	O	P	P	O	F	L	O	P	X	T	I	P	X		
G	B	S	J	U	H	P	F	T																					

2) [250 points] A quote by Robert Jordan has been encoded using the Morbit Cipher for you to decode. You are told that 4=-●, 9=xx, 5=--, 8=x-, 3=●x, 6=-x

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

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

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

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

7

3) **[500 points]** A famous phrase from Ralph Waldo Emerson has been encoded as a Patristocrat using a K1 alphabet about making one's own path in life. What did he say?

FQPQV IQYJG TGVJG RCVJO CANGC FIQKP UVGCF YJGTG

VJGTG KUPQR CVJCP FNGCX GCVTC KN

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	1		9			4	11		2	6	3			3	1	4	5	2		4	2	7		1	2	
Replacement																										

4) **[200 points]** A quote has been encoded using the Pollux Cipher for you to decode. You are told that the quote ends with **NONE**.

805594002551025778868206675617286716859108199188828676

7545212618795541706691089745204420598

KingDJ777's Code Busters Test

5) **[200 points]** The following quote has been encoded with the Vigenère Cipher using a very common word for the key. The deciphered text starts with **DREAM**.

Z	R	R	T	I	A	F	B	B	Y	B	N	H	L	Y	B	R	E	S	H	N	E	I	X	N	L	V	O	A	A

F	B	B	Y	B	N	H	L	Q	B	A	T	B	W	W	Y

6) **[350 points]** Using a key of BUZZ, which is an encryption matrix, decode this quote by Robert Schiuller using the Hill Cipher with a 26-character alphabet.

$$\begin{pmatrix} B & U \\ Z & Z \end{pmatrix} \equiv \begin{pmatrix} 1 & 20 \\ 25 & 25 \end{pmatrix}$$

H	T	D	W	I	F	A	E	A	F	S	H	E	J	Z	F	O	Z	Q	O	

7) [400 points] Alexa severely misheard a quote from Thanos in the movie Avengers: Infinity Wars and then encoded it as an aristocrat using a K1 alphabet. What did it come out as?

FXF ZPV DPVME LOPU MJWF XJUI ZPV'SF PXO GBJMVSF.

XFBS EJE UIBU CSJOH FXF? CBDL UXP NF.

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	3	9	1	1	2	5		2	3	1	3	6			4		5	4	1	6		2
Replacement																										

8) [250 points] The following quote by Neil Tyson needs to be decoded with the Vigenère Cipher with a keyword of DEARTH.

H Z E I R V Q I O W N Z L W , I E M O H G O J F P F

T E I L W H G T Z O L , S V E T B V X W . I W T O X Q A E

W P V E G I X L V A I K A F R Y , L V M O L Q L Z O L . L R A

Y N U G V E U U P O P I F G N D P A O B L V , C O L P P O P N F M

M L R D R G V W L E I .

KingDJ777's Code Busters Test

9) [200 points] The following quote needs to be encoded with the Affine Cipher using $a=19$ and $b=9$.

W	I	P	E	O	U	T	Y	O	U	R	O	W	N	T	E	A	R	S	B	E	C	A	U	S	E	I	F			
P	E	O	P	L	E	C	O	M	E	T	O	Y	O	U	T	H	E	Y	W	I	L	L	C	O	M	E	F	O	R	A
D	E	A	L	.																										

10) [450 points] Solve this Xenocrypt, which is a quote by Christobal Colon.

ODOKB CNFBC KBXBH PN KFDHBF NS GKNBOG LBCQB TDN

XJNFPBC PN EJCQB SB KGCQB.

	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		12	6	3	1	4	3	2		2	5	1		7		3	3	3		2	1				2		
Replacement																											

11) [300 points] A quote has been encoded using the Morbit Cipher for you to decode. You are told that the quote ends with **LOVE**.

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

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

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

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

1 8 7 4 6 3

12) [250 points] Using a key of **BETH**, encode the given phrase using the Hill Cipher with a 26-character alphabet.

$$\begin{pmatrix} B & E \\ T & H \end{pmatrix} \equiv \begin{pmatrix} 1 & 4 \\ 19 & 7 \end{pmatrix}$$

L	I	F	E	H	U	R	T	S	A	L	O	T	M	O	R	E	T	H	A	N	D	E	A	T	H

KingDJ777's Code Busters Test

13) [200 points] Solve this quote from the movie Mulan.

VXO MJCIOT VXSV KJCCLD RQ SZUOTDRVH RD VXO LCDV TSTO

SQZ KOSYVRMYJ CM SJJ.

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

14) [250 points] Solve this aristocrat which is a quote by Dante Alighieri talking about "sorrow."

WNHGH VT RP FGHLWHG TPGGPA WNL R WP GHSLMM VR EVTHGK

WNH WVEH ANHR AH AHGH NLYYK.

	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	1	8	12			2	4	2	5		4		4	1	3		4	6		2	
Replacement																										

15) [350 points] The following quote has been encoded using the Affine Cipher. You are told that **z** decodes to be **F** and **q** decodes to be **E**.

V	R	Q	B	C	T	I	Q	D	G	T	H	K	C	D	Q	Y	G	D	Q	Z	E	B	B	O	W	Q	B	C	C	S

G	V	G	Z	E	T	T	O	M	V	C	D	O	V	R	Q	M	G	H	H	Q	D	A	V	P	Q	Y	C	K	Q	M

16) [350 points] Decode this Baconian Cipher, a quote by Veronica Roth, that ends in the work YOU.

AM TWO BACK A A BOOK ACRES A SHOT A BOOK BACON ABBEY

A PLAN BE ITS A CASE BACON EARTH ACRES A CASE BE OLD

BADLY A CASE BACON AM TWO BE OLD A BOOK A BABY BE ITS

A GOOD BE OLD BE ITS A BOOK BE ITS BE ITS A CASE

A BEAT ACRES BACON A HAND A PLAN BACK A ACRES A CASE

BABES A CASE BADLY A SHOT BACK A A PLAN A HAND BADLY

A PLAN BE OLD

KingDJ777's Code Busters Test

17) **[500 points]** Special Agent, Alexia, has the following RSA public key:

$$n = 12559051 \quad e = 3215365$$

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

$$12559051 = 1733 * 7247$$

Compute the value of their private key:

Enter the computed private key:

18) **[300 points]** Solve this Aristocrat which is a quote by R. Brault.

LAX LNSX OXUFJFE MW IJWX JH LM CIUFL LNXXH, SFZXN

PAMHX HAUZX QMS ZM FML XBCXVL LM HJL.

	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	1	2		1	5		5	2	4		9	7	3	1	1	1		3		3	1	2	11		3
Replacement																										

19) [450 points] A famous phrase from William Shakespeare has been encoded as a Patristocrat using a K1 alphabet. What did he say?

P_MO_DF W_XL_DE F_ZD_WQ F_OD_XS E_FV_IW X_LD_WL S_VD_WS I_SS_YV

Q_MR_YX D_WL_FW X_DR_XS X_LD_MV D_RI

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

20) [300 points] Solve this Aristocrat which is a quote by Jack Handey.

W_OS_ZL_O D_ZC J_LV_FV_JV_PO M_ZX_OZ_HO, D_ZC M_RZ_CN_A E_UN_G U X_VN_O

V_H F_RO_VL M_RZ_OM. F_RU_F E_UD E_RO_H D_ZC J_LV_FV_JV_PO F_RO_X,

D_ZC U_LO U X_VN_O U_EU_D S_LZ_X F_RO_X U_HA D_ZC R_UQ_O F_RO_VL

M_RZ_OM.

	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		6	7	4	8	1	4		4		7	6	4	17	2	1	10	2		10	11	1	6		12
Replacement																										