

# Science Olympiad — TAMS

## Codebusters Test - Captains Tryouts

### 2020

### 2019

TAMS Codebusters Test - Captains Tryouts 2020

**Scoring:**

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

Question	Value	Incorrect letters	Deduction	Score
Timed	200			
1	100			
2	100			
3	100			
4	150			
5	150			
6	150			
7	200			
8	200			
9	200			
10	250			
11	300			
12	300			
13	300			
14	350			
15	350			
16	400			
17	450			
18	500			
19	500			
20	500			
<b>Bonus</b>				
<b>Final Score</b>				



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

<b>AAAA</b>	A	<b>AABBA</b>	G	<b>ABBAA</b>	N	<b>BAABA</b>	T
<b>AAAAB</b>	B	<b>AABBB</b>	H	<b>ABBAB</b>	O	<b>BAABB</b>	U/V
<b>AAABA</b>	C	<b>ABAAA</b>	I/J	<b>ABBBA</b>	P	<b>BABAA</b>	W
<b>AAABB</b>	D	<b>ABAAB</b>	K	<b>ABBBB</b>	Q	<b>BABAB</b>	X
<b>AABAA</b>	E	<b>ABABA</b>	L	<b>BAAAA</b>	R	<b>BABBA</b>	Y
<b>AABAB</b>	F	<b>ABABB</b>	M	<b>BAAAB</b>	S	<b>BABBB</b>	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	••••-		••••-	3								
-----	0	•-----	1	••••-	2	••••-	4								
•••••	5	-••••	6	--•••	7	••••-	8								
						-----•	9								

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

**FC JEX GHYK KE HIPFBTB BOIBSSBYIB, JEX IHY ABK KPBNS**

**KEVHJ. HQ EC KPFQ QBIEYV, DXFK VEFYA SBQQ-KPHY-**

**BOIBSSBYK GENW.**

	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>Frequency</b>	2	14	2	1	8	5	2	6	6	3	9			2	2	4	5		5	1		3	1	3	7	
<b>Replacement</b>																										

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1) [100 points] Solve this quote by John D. Rockefeller Jr.

DNL BLGKLD FA BOGGLBB EB DF TF DNL GFXXFM DNEMP

OMGFXXFMIJ ZLII.

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

2) [100 points] Solve this quote by Barbara Harrison.

TIZHGI CK WICWEI RHGGNAOS AJIHV. TIZHGI CK AJIHV

RHGGNAOS WICWEI.

	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		4		2		6	6	10	2	2			2	2			2	2	2		2	4			2
Replacement																										

3) [100 points] Solve this Atbash cipher

G	S	V	I	V	R	H	Z	Y	F	R	O	W	R	M	T	X	Z	O	O	V	W	G	S	V	Y	F	I	Q

  

P	S	Z	O	R	U	Z	R	G	R	H	G	Z	O	O	V	I	G	S	Z	M	Z	M	B	L	G	S	V	I

  

Y	F	R	O	W	R	M	T	R	M	G	S	V	D	L	I	O	W

4) [150 points] Solve this Caesar cipher.

J	U	N	J	H	I	U	U	B	L	F	Z	P	V	T	P	N	F	U	J	N	F	U	P	T	P	M	W	F		

  

U	I	J	T	D	J	Q	I	F	S	J	U	X	J	M	M	C	F	U	J	N	F	D	P	O	T	V	N	J	O	H

  

C	F	D	B	V	T	F	P	G	U	I	F	O	V	N	C	F	S	P	G	M	F	U	U	F	S	T

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5) [150 points] Decode this Vigenère cipher using the key: BANANA

B	L	B	T	B	F	Q	E	B	P	Y	E	M	I	X	E	G	O	F	A	G	A	C	P	M	E	F	O	I	E	S

O	E	A	A	G	F	S	.
							.

6) [150 points] Solve this Baconian cipher.

**BAAABABBBAAAAAABAAABAABAABAABBBABAAAABBBABAAAB**



7) [200 points] Solve this aristocrat which is a popular phrase in a song..

**M'Z TXMUT SX SVFN ZB GXDJN SX SGN XYK SXLU DXVK.**

	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>Frequency</b>		1		2		1	2			1	2	1	2	3					5	2	2	2		7	1	2
<b>Replacement</b>																										

8) [200 points] Encode the plaintext using the Hill Cipher with keyword: DIRT

$$\begin{pmatrix} D & I \\ R & T \end{pmatrix} \equiv \begin{pmatrix} 3 & 8 \\ 17 & 19 \end{pmatrix}$$

R	E	A	D	T	H	I	S	P	A	G	E

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9) [200 points] Encode the plaintext using the Affine Cipher.  $a = 3$ ,  $b = 7$

N	O	T	A	L	L	H	E	R	O	E	S	W	E	A	R	C	A	P	E	S

10) [250 points] Decode this using Vigenère. Key = GRAPE

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

11) [300 points] Decrypt using hill cipher. Keyword = TART

$$\begin{pmatrix} T & A \\ R & T \end{pmatrix} \equiv \begin{pmatrix} 19 & 0 \\ 17 & 19 \end{pmatrix}$$

M	I	I	M	E	U	N	S	U	M	R	Y	W	T	E	B

12) [300 points] Solve this quote by Alexander Graham Bell.

**ETFQB ABQ WAAZ UFAXQX SBALTQZ WAAZ ACQBX; MVL EQ XA**

**ADLQB FAAJ XA FABY SBW XA ZQYZQLDVFFN VCAB LTQ**

**UFAXQW WAAZ, LTSL EQ WA BAL XQQ LTQ ABQX ETRUT ACQB**

**DAZ VX.**

	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>Frequency</b>	24	11	3	3	4	6				1		9	1	1			17	1	3	7	3	4	6	10	2	7
<b>Replacement</b>																										

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13) [300 points] Solve this Caesar Cipher.

O P X	U I J T	D B F T B S	D J Q I F S	R V F T U J P O	J T	F W F O
M P O H F S	U I B O	U I F	Q S F W J P V T .	J U	J T	X P S U I
N P S F	Q P J O U T	B G U F S	B M M .			

14) [350 points] Decode using Affine cipher.. a = 15, b = 21

O X	I X U	H Q V K	V	K V O H D Q	K R	U W D	W L I O	E D H F
-----	-------	---------	---	-------------	-----	-------	---------	---------

15) [350 points] Solve this patristocrat. Hint: "Sam I Am"

**TGRRW RTTUS WKDSN**

	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>Frequency</b>				1			1				1			1				3	2	3	1		2			
<b>Replacement</b>																										

16) [400 points] A quote has been encoded using the Morbit Cipher for you to decode. You are told that 1=●●, 2=●-, 3=●x, 4=-●

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

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

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17) **[450 points]** A quote has been encoded using the Pollux Cipher for you to decode. You are told that 1=●, 2=●, 3=●, 4=-, 5=-, 6=-, 7=x, 8=x

**68211182272110833811308642601149318483702151825911186161933842**

**724049110410452**

18) **[500 points]** Solve this patristocrat.

**ULKPQ DJNCG DZDET PQKNF**

	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>Frequency</b>			1	3	1	1	1			1	2	1		2		2	2			1	1					1
<b>Replacement</b>																										

19) [500 points] Solve this Xenocrypt.

DZ IZD Y CY NYVZCHGFPY Y MZQUPYP WZMYXHCCZV. ZOPZV

IYG UZPÑLF VLV YLOZV GFMEVHOYG NYVZCHGY.

	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			5	2		4	5	4	2			3	3	2	1	3	5	1				2	8	1	1	12	11
Replacement																											

20) [500 points] Solve this Patristocrat.

OZQQT JXWII VPXWI XUVYW SVUVO SYWDS NQYHO

	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				1	3	1	3		3	1	2	4	4	3	3	1
Replacement																										

