

# Science Olympiad — 2022 BirdSO Mini C

## Exam Preparation

You will need:

1. Folders for each of the teams to hold the tests
2. Sufficient copies of the test for all teams. They don't need to be stapled.
3. Multiple timers which have a lap function on them - ideally one per volunteer. The timer app on an iPhone or Android Phone that has a stopwatch function with lap function is sufficient.

Before the event begins:

1. Practice starting the timers and using the lap function to record the times. Make sure volunteers understand how to use the lap function and are not accidentally stopping the timer completely.
2. Memorize the answer to the timed question.
3. Check to make sure that this key matches the test you are proctoring.
4. Place one copy of the test for each team in the provided folders with the first page outside the folder.
5. Adjust desks and chairs – teams may have up to 3 students for this event.

## Running the Event

1. When the students enter the room, instruct them to sit down, DO NOT OPEN THE FOLDER, and put their names, school name and school number on the first page.
2. Encourage them to write their team number on all the other pages AFTER they begin the test. This way if their papers get separated from each other we can make sure to give them credit.
3. **CRITICAL:** Check to see that students have ONLY brought
  - i. Something to write with (pencils, pens, erasers)
  - ii. Five function calculators (addition, subtraction, multiplication, division, and usually square root). The calculator can have a simple memory store/recall function but must not have a modulus or other scientific and programmable functions. If their calculator doesn't meet these requirements, they may not use it.
  - iii. If the student has a smart watch (Apple watch, Samsung Gear, etc.) they will need to put it away.
4. Instruct the students that if they answer the timed question within 10 minutes, they can be awarded a bonus if they solve the timed question with no more than 2 letters incorrect.
  - i. When they have a solution for the cryptogram they should raise their hand.
  - ii. Let them know that you will announce when the 10-minute time is up. After the first 10 minutes, no additional bonus points will be awarded.
  - iii. When you see a team raise their hand, hit the LAP function and head to the team.
  - iv. Determine if their answer is correct (see next page for grading), If so, write the time on their score sheet.
  - v. If their score is incorrect (more than 2 letters incorrect), tell the team that the answer is wrong, but DO NOT tell them what is wrong. They can continue to work on the question and raise their hand again to be checked. A team has an unlimited number of attempts during the 10-minute bonus.
5. Tell the teams that they do not have to fill in the frequency table. It is simply there as an aid to them solving the cryptogram. It will not be graded.
6. Some students may never have used a non-scientific calculator. You should have them enter a simple formula on their calculator:  $1 / 26 = * 26 = ..$  Most will be surprised to see that the answer is not rounded to 1 as they expected but .9999999999
7. When the timers hit the 10-minute point, announce that no bonus points will be awarded and put away the timers. The students may continue to work on the question, but they may not receive any extra points.

8. A team is not restricted to only the timed question during the 10 minutes. They can move on or split up the work if they would like, but it is in their best interest to try for the bonus.
9. When time is up, have the students put writing instruments down and put their answer pages back into the folder in the correct order.

## How to grade

1. Teams can have up to two incorrect letters total on their cryptogram and still be correct. The frequency of the incorrect letter is irrelevant. See the example below.

If the cryptogram was as shown:

**KZBAOF KFXMFXYP**  
**SAMPLE SENTENCE**

and the students answered (underlined letters indicate mistakes)

**SAMPLE SENTENCE**

then it counts as four mistakes (even though the mistake was only in the letter E) and the answer DOES NOT count. However, if they put

**SAMPUL SENTENCE**

It is considered correct with two letter mistakes.

2. For questions which have a numeric answer (such as determining the a= and b= values), no mistakes are allowed.
3. Teams do NOT have to fill in the frequency table. It is simply there as an aid to them solving the cryptogram. It WILL NOT be graded. It is included in the answer key as an aid to the grader.
4. When scoring the Baconian ciphers (with strange text or symbols), they can write the answer under the Baconian symbols or on the line provided. Note that you will see lots of As and Bs, but they are not graded as the answer, only what they put on the answer line.
5. As you score each question, if correct, put the number of incorrect letters (0, 1, or 2) next to the question number on the scoring page. Also, put the value for the question into the score column. If they get more than 2 letters wrong, subtract 100 points from the score until it would be zero. If a question is worth 240 points and they get 4 letters wrong, you would start with 240 points (for up to 2 letters wrong) and then subtract 100 points for the next two letters wrong ending up with a final score of 40 points for that question. If they had gotten 5 or more letters wrong on a 240 point question, they would receive 0 points for that question. With a 650 point question, they could get 8 letters wrong and receive 50 points (2 free letters then  $6 \times 100 = 600$  points off). Just put the incorrect cost deduction on the score sheet and subtract it from the value for the question. Under no circumstance should the score for any question be less than zero. Note that while the timed question must have 2 or fewer letters incorrect in order to get the timing bonus, a team solving the timed question after the 10 minutes passed would be accepted as correct with 3 incorrect letters receiving 100 points for the timed question.
6. If they correctly answered the timed question in 10-minutes or less with 2 or fewer letters incorrect, you need to compute the bonus time. Take the value for the minute from this first table below

0:xx	2,160	1:xx	1,920	2:xx	1,680	3:xx	1,440	4:xx	1,200
5:xx	960	6:xx	720	7:xx	480	8:xx	240	9:xx	0

and then add the seconds value from this table:

X:00	240	X:01	236	X:02	232	X:03	228	X:04	224	X:05	220
X:06	216	X:07	212	X:08	208	X:09	204	X:10	200	X:11	196
X:12	192	X:13	188	X:14	184	X:15	180	X:16	176	X:17	172
X:18	168	X:19	164	X:20	160	X:21	156	X:22	152	X:23	148
X:24	144	X:25	140	X:26	136	X:27	132	X:28	128	X:29	124

X:30	120	X:31	116	X:32	112	X:33	108	X:34	104	X:35	100
X:36	96	X:37	92	X:38	88	X:39	84	X:40	80	X:41	76
X:42	72	X:43	68	X:44	64	X:45	60	X:46	56	X:47	52
X:48	48	X:49	44	X:50	40	X:51	36	X:52	32	X:53	28
X:54	24	X:55	20	X:56	16	X:57	12	X:58	8	X:59	4

For example if they solved the time question at the 6:46 mark, you would add 720 (from the 6:xx entry in the first table) to 56 (from the X:46 entry in the second table) to get a bonus of 776. If they had solved it in exactly 4:00 minutes, you would add 1200 and 240 to get a bonus of 1440.

- 7. Add up all the scores and put the total on the bottom of score sheet.
- 8. You must break all ties. Indicate the tie breaker by adding .1 to the score of the team ahead. With multiple teams tied, you will add more. I.e. if five teams all scored 200 points, the final scores that you would enter on the score sheet would be 200.4, 200.3, 200.2, 200.1 and 200.
- 9. To determine how to break the tie, you need to look at the correctly answered questions in the order from the table below. If both teams answered the same (i.e. they answered the question with zero mistakes) then you go on to the next question. If one team had no mistakes and the other team had one mistake, then the team with no mistakes is ahead. For example, if one team answered question #8 (which is the highest value question) and another team didn't, the first team will be ahead.

Tie Breaker Order	Question #
1	14
2	13
3	12
4	16
5	11
6	28
7	33
8	15
9	24
10	10
11	9
12	25
13	8
14	7
15	26
16	6
17	23
18	32
19	29
20	22
21	Timed
22	20
23	5
24	27
25	19
26	4
27	21
28	30
29	3

<b>Tie Breaker Order</b>	<b>Question #</b>
30	2
31	31
32	1
33	18
34	17

0. If there is still a tie (typically when you have teams which answered either zero, one or two questions) then you will need to look at the tie breaker questions again and count the number of correctly answered letters. The team with the most correctly matched letters is to be ahead.

Timed Question **[300 points]** Solve this Aristocrat about birds! When you have solved it, raise your hand so that the time can be recorded and the solution checked.

DHBDE CDRBCYDIRBKE BC DE BAUKQORDER AORQBI KY RVO  
AVIAN SATISFACTION IS AN IMPORTANT METRIC OF THE  
  
CSIIOCC KY RVBC RKSQEDAOER.  
SUCCESS OF THIS TOURNAMENT.

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

1) [240 points] Solve this Aristocrat which is a large leap in logic.

VHEN ENB LHMB KG HZZKAIEHAB ROZX WIZWBL DBCHWHZB IZC  
WITH THE RISE OF INNOVATIVE LUNG CANCER MEDICINE AND  
ELBIEDBZE, ENBLB NIM ZBABL SBBZ I SBEEBL EHDB EK  
TREATMENT, THERE HAS NEVER BEEN A BETTER TIME TO  
MDKQB.  
SMOKE.

	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	18	2	4	11		1	7	6		4	6	3	4	1		1	1	2			1	3	1		9
Replacement	V	E	D	M	T	Q	F	I	A	P	O	R	S	H	U	Y	K	L	B	Z	J	W	C	G	X	N

2) [250 points] Solve this Aristocrat.

ISTBT WR DHISWDQ ZHBT WDIWZWKCIWDQ ISCD C JBH NK HE  
THERE IS NOTHING MORE INTIMIDATING THAN A CROWD OF  
LTHLGT NTCBWDQ VMBQTB PWDQ JBHNDR RWDQWDQ IST  
PEOPLE WEARING BURGER KING CROWNS SINGING THE  
DCIWHDCG CDISTZ WD MDWRHD.  
NATIONAL ANTHEM IN UNISON.

	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	7	16	1		2	8	8	2	2	2	2	3		1	7	4	5	9		1	13			3
Replacement	X	R	A	N	F	J	L	O	T	C	D	P	U	W	Y	K	G	S	H	E	V	B	I	Z	Q	M

3) [265 points] Solve this Aristocrat which is a puzzling conundrum.

LP G UQQE VGNF OYYR, GCQ JYX BXRRYBQE SY NY YF JYXC  
IN A FEEDBACK LOOP, ARE YOU SUPPOSED TO COOK YOUR  
YKP UYYE SY UQQE VGNF LPSY SDQ OYYR?  
OWN FOOD TO FEED BACK INTO THE LOOP?

	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	3	4			2	1	2		3	2	3	7	4	4		3	2		3	15	
Replacement	V	S	R	H	D	K	A	Q	X	Y	W	I	G	C	L	N	E	P	T	M	F	B	Z	U	O	J

4) [280 points] Solve this Aristocrat about winter.

`HGR HOM RMFRYS YK XGJGSX, AMTOFAR YTZMT F UGTZRY  
`TIS THE SEASON OF GIVING, PERHAPS ORDER A BIRDSO  
ROGTH KYT F QYJ MZ YSM YK CYWTR?  
SHIRT FOR A LOVED ONE OF YOURS?

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

5) [290 points] This Aristocrat was encoded using a **K1** Alphabet. What is the keyword?

Keyword Answer:

REHABILITATION

DJIQ FPB LIRPXI K SPROPH, FPBH TMHAO YKOMIQO PQ OJI  
WHEN YOU BECOME A DOCTOR, YOUR FIRST PATIENT ON THE  
  
VPL MA UPQOK AMO SPDQ KQS AKF, "SPROPH, XF WHILA  
JOB IS GONNA SIT DOWN AND SAY, "DOCTOR, MY KREBS  
  
REFRNI MA LHPWIQ."  
CYCLE IS BROKEN."

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	6	2		2		5		6	8	2	5	4	5	1	7	12	8	5	4	1	1	1	2	2	1	
Replacement	S	U	V	W	X	Y	Z	R	E	H	A	B	I	L	T	O	N	C	D	F	G	J	K	M	P	Q

6) [320 points] Solve this Aristocrat about a contest. The ciphertext character **"V"** decodes to **"T"**.

WBWQD WBWSV PDPIW, CX TXTCI, VLW QTQCI CQCMX WIWPV  
EVERY EVENT CYCLE, AS USUAL, THE RURAL ARABS ELECT  
  
CKCZS VLW VZVIW CSN CRCQN CYCQV GQJF VLW ZQZXL WSWFD.  
AGAIN THE TITLE AND AWARD APART FROM THE IRISH ENEMY.

	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	12	3		2	1		5	1	1	4	1	2		3	8	1	4	3		8	13	4	1	4
Replacement	J	V	A	Y	Z	M	F	K	L	O	G	H	B	D	X	C	R	W	N	U	Q	T	E	S	P	I



7) [325 points] Solve this Aristocrat.

QS GRWE SLZJH L HYLWW HXQVS QR DJIHDJOSQAJ SG INQR L  
IT ONLY TAKES A SMALL SHIFT IN PERSPECTIVE TO RUIN A  
  
DJIVJOS DXGSGBILD~~X~~.  
PERFECT PHOTOGRAPH.

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

8) [340 points] Solve this Aristocrat which contains a taxon.

OPP HWNLKTLQYLJGK NCXONTLGX BPLXAY QJGQWN YAOY LY  
ALL JURISDICTIONS REGARDING FLIGHT CONCUR THAT IT  
  
KAJWPT DC LSMJKKLDPC BBN AESCGJMYCNOGK YJ OULOYC.  
SHOULD BE IMPOSSIBLE FOR HYMENOPTERANS TO AVIATE.

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

9) [345 points] Solve this Aristocrat.

NZILU TIWVD LG SYUULWS OQZLWS. FYU'G UZJ HLVHLWS  
FRUIT PUNCH IS GETTING BORING. LET'S TRY KICKING  
MYSYUBOFYG WYCU ULXY.  
VEGETABLES NEXT TIME.

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

10) [355 points] Solve this *meta* Aristocrat.

VRKQ SIEWLJQVWXQ VWQV KQ N GJTVKQVNHV GWCVNT  
THIS CODEBUSTERS TEST IS A MULTISTAGE MENTAL  
SNYNSKVD WPNG VRNV YXIHVWQQKUWTD HWVQ GIXV  
CAPACITY EXAM THAT PROGRESSIVELY GETS MORE  
SRNTTWCHKCH VRXIJHRIJV.  
CHALLENGING THROUGHOUT.

	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	2	1		4	6	5	4	6	1		8		1	9	5	4	5	1	13	11	5	2	
Replacement	J	Z	N	Y	D	W	M	G	O	U	I	B	Q	A	F	X	S	H	C	L	V	T	E	R	P	K

11) [430 points] Solve this Aristocrat. All the words are English words spelled correctly, but the message is nonsense until you read it aloud. The ciphertext character "A" decodes to "O".

LEL PJL TUD VAA ACVG CL-BCLGLUYL FL. PJLTC RZCE  
EYE THE INK BOO ORBS RE-PRESENCE ME. THEIR VARY

GFZKK ZCP LUN PJLE'CL GA KAUGO TUPA JL LZC KEL  
SMALL ART END THEY'RE SO LONGS INTO HE EAR LYE

FAICUTUO AIC VIP LTQQLK. QTUL ZKKLE LEL'F ZV ACV.  
MOURNING OUR BUT EIFFEL. FINE ALLEY EYE'M AB ORB.

	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	9	1	11	1	6	4	5		3	4	7	21		1	2	6	3	1		6	8	5			1	6
Replacement	O	P	R	K	Y	M	S	Z	U	H	L	E	X	D	G	T	F	V	W	I	N	B	J	Q	C	A

12) [520 points] Solve this innovative Patristocrat.

PXOPJ QIOLO SCALL PDOPX ONLMP NXMQP DCGOC FCQOT  
ONEOF THESE DAYSS OMEON EISGO INGTO MAKEA WATER

YPQQK OQICQ IOCQL APBTS TNXGF INKOA PBCTO PBQCX  
BOTTL ETHAT HEATS YOURD RINKW HILEY OUARE OUTAN

SCYPB Q  
DABOU T

One of these days someone is going to make a water bottle that heats your drink while you are out and about.

	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	4	9	2		2	2		4	1	2	5	2	4	11	11	10		3	4				5	2	
Replacement	Y	U	A	M	V	W	K	P	H	F	L	S	G	I	E	O	T	J	D	R	Z	X	Q	N	B	C

13) [550 points] Solve this Patristocrat from a very confused speaker. The ciphertext character "M" decodes to "O".

DMBEH XRMCF RXXRJ XJBDL JVYXR JXXAD XERHN JBNYI  
IONCE THOUG HTTHA TANIM ALSTH ATTWI TCHED ANDSP  
  
JYLHN XCQBH NDBXM WHQUT XMKHP JDQDX DYDBX RHBJL H  
ASMED TURNE DINTO JERKY TOBEF AIRIT ISINT HENAM E

I once thought that animals that twitched and spasmed turned into jerky. To be fair it is in the name.

	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	7	2	8	2	1		8	1	8	1	3	4	4		1	3	6		1	1	1	1	13	4	
Replacement	W	N	U	I	C	G	V	E	P	A	B	M	O	D	Z	F	R	H	X	Y	K	L	J	T	S	Q

14) [575 points] Solve this motivational Patristocrat.

IDXQZ IDJAI YZCRD JRNYZ JNRPD ATCRI DXBAT ORMXP  
YOUMA YONLY HAVEO NECHA NCETO LIVEY OURLI FEBUT  
  
IDXQT FYPYZ CRQXA PTKAR NYZJN RGPDG DACRP YTGLX  
YOUMI GHTHA VEMUL TIPLE CHANC ESTOS OLVET HISQU  
  
RGPTD J  
ESTIO N

You may only have one chance to live your life, but you might have multiple chances to solve this question!

	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	1	4	9		1	4		5	5	1	1	1	4	1	7	3	10		6				6	6	5
Replacement	L	R	V	O	K	G	S	X	Y	N	P	Q	B	C	F	T	M	E	J	I	W	D	Z	U	H	A

15) [375 points] Solve this Xenocrypt.

DW MNAUÑ CQ DWS JÑMCJJNÑW IC KSBNWSQ RDC VDCQXUSW  
UN LIBRO ES UNA COLECCION DE PAGINAS QUE MUESTRAN  
  
RDC DW XÑIÑ CQ VSQ RDC MS QDVS IC QDQ KSUXCQ.  
QUE UN TODO ES MAS QUE LA SUMA DE SUS PARTES.

	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	1	10	9					3	3	2		3	3	5			9	3	8		3	3	6	3		
Replacement	B	G	E	U	V	X	F	W	D	C	P	K	L	I	O	Ñ	J	S	Q	A	Z	R	M	N	T	H	Y

Translation: A book is a collection of pages that show a whole is more than the sum of its parts.

16) [430 points] Solve this Xenocrypt that has been encoded using a K2 Alphabet. The keyword/key phrase is in English.

OVW ILBREGW WVR LRB IZBR KRSGZWKVR XBZB FKDKGQCZG.  
LOS GUANTES SON UNA GRAN INVERSION PARA DICIEMBRE.  
  
QBREKGRGR OBW QBRVW DBOKGREGW XBZB GWDZKCKZ  
MANTIENEN LAS MANOS CALIENTES PARA ESCRIBIR  
  
ZBXKFBQGREG.  
RAPIDAMENTE.

Replacement	B	C	D	F	G	H	I	J	K	M	Ñ	O	Q	R	U	V	X	Y	Z	W	E	L	S	P	N	T	A
K2	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		13	2	3	4	2	11		2		9	2				3		4	12	1			4	8	3		8

Translation: Gloves are a great investment for December. They keep your hands warm for fast typing.

17) [205 points] Solve this quote which has been encoded with the **Caesar Cipher**.

R	T	T	F	I	U	Z	E	X	K	F	U	R	E	K	V	'	J	Z	E	W	V	I	E	F	,	K	N	F	F	W
A	C	C	O	R	D	I	N	G	T	O	D	A	N	T	E	'	S	I	N	F	E	R	N	O	,	T	W	O	O	F
K	Y	V	K	Y	I	V	V	D	F	J	K	V	M	Z	C	G	V	F	G	C	V	Z	E	Y	Z	J	K	F	I	P
T	H	E	T	H	R	E	E	M	O	S	T	E	V	I	L	P	E	O	P	L	E	I	N	H	I	S	T	O	R	Y
N	V	I	V	K	Y	F	J	V	N	Y	F	R	J	J	R	J	Z	E	R	K	V	U	R	I	F	D	R	E		
W	E	R	E	T	H	O	S	E	W	H	O	A	S	S	A	S	I	N	A	T	E	D	A	R	O	M	A	N		
V	D	G	V	I	F	I	.																							
E	M	P	E	R	O	R	.																							

18) [215 points] Encode this quote with the **Caesar Cipher** and a shift of 7.

O	H	,	Y	O	U	L	I	K	E	S	A	L	A	D	?	N	A	M	E	A	N	I	T	A	L	I	A	N	,	A
V	O	,	F	V	B	S	P	R	L	Z	H	S	H	K	?	U	H	T	L	H	U	P	A	H	S	P	H	U	,	H
R	A	N	C	H	,	A	N	D	O	N	E	T	H	O	U	S	A	N	D	I	S	L	A	N	D	S	.			
Y	H	U	J	O	,	H	U	K	V	U	L	A	O	V	B	Z	H	U	K	P	Z	S	H	U	K	Z	.			

19) [280 points] Solve this quote which has been encoded with the **Vigenère Cipher** with the keyword **MAPLE**.

M A P L E M A P L E M A P L E M A P L E M A P L E M A P L E

F	H	T	D	Q	M	L	A	C	I	P	L	T	L	J	R	E	A	W	M	Z	T	D	E	L	Q	C	D	W	H
T	H	E	S	M	A	L	L	R	E	D	L	E	A	F	F	E	L	L	I	N	T	O	T	H	E	C	O	L	D

M A P L E M A P

N	L	J	P	T	A	N	S
B	L	U	E	P	O	N	D

20) [295 points] Solve this quote which has been encoded with the **Vigenère Cipher** with the keyword **STRONG**.

S T R O N G S T R O N G S T R O N G S T R O N G S T R O N G

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

S T R O N G S T R O N G S T R O N

A	Y	P	C	H	M	S	O	V	A	R	G	C	G	Z	T	R
I	F	Y	O	U	G	A	V	E	M	E	A	K	N	I	F	E

21) [275 points] Solve this quote which has been encoded with the **Affine Cipher** with the pair **(A,B) = (11,5)**.

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

22) **[300 points]** Solve this quote that has been encoded with the **Affine Cipher**. The ciphertext character "Y" decodes to "R" and the ciphertext "S" decodes to the letter "N".

O	W	L
T	H	E

Y	L	F	T	N	S
R	E	A	S	O	N

O	W	L
T	H	E

C	N	T
L	O	S

F	S	B	L	C	L	T
A	N	G	E	L	E	S

F	R	Y	I	N	Y	O
A	I	R	P	O	R	T

V	N	Q	L
C	O	D	E

W	F	T
H	A	S

F	S
A	N

"	U	"
"	X	"

R	T
I	S

O	N
T	O

W	L	C	I
H	E	L	P

P	N	J
Y	O	U

G	L	L	C
F	E	E	L

A	L	O	O	L	Y
B	E	T	T	E	R

F	A	N	J	O
A	B	O	U	T

Z	F	R	O	R	S	B
W	A	I	T	I	N	G

F	Y	N	J	S	Q
A	R	O	U	N	D

R	G
I	F

P	N	J	Y
Y	O	U	R

G	C	R	B	W	O
F	L	I	G	H	T

B	L	O	T
G	E	T	S

Q	L	C	F	P	L	Q	.
D	E	L	A	Y	E	D	.



---

23) **[315 points]** Solve this quote that has been encoded with the Baconian Cipher.

TMNTOMNOTNMTONMTONMOTMTNOMTNMTMTMOTMTNONMTMTMTONMO  
AABABABBABAABBAABBABAAABBAABAAAAABAAABBBAAAAAABBAB

**F O G O D E C H A O**

TNMOTMNTMTOMTNMTMOTMNTMTMTMTMTMOTNMTOMNTOMNOTMNTON  
ABABAABAAABAABAAABAABAAAAAAAAAABABAABABABABBAABABB

**L I T E R A L L Y M**

MTOMTMTMTMTNOMTNMTMOTMNOTNMTMTMONTONTONTONTMTMTON  
AABAAAAAAAAABBAABAAABAABBABAAAAABBABBAABBABBAAAAABB

**E A N S G R O U N D**

MTOMNTOMTMNTMTMTMOTM  
AABABABAAABAAAAAABAA

**F I R E**

**Fogo de Chao literally means "ground fire".**

★(Special Bonus Question) 24) **[365 points]** Solve this quote that has been encoded with the **Baconian Cipher**. It begins with the letter "**P**".

GREEN	LIONS	SPEAK	LOYAL	TANKS	GLASS	LABEL	WAGES	LUCKY
ABBBA	BAAAA	ABBAB	BAAAB	AAABA	ABAAA	BAABB	BAABA	BAABA
<b>P</b>	<b>R</b>	<b>O</b>	<b>S</b>	<b>C</b>	<b>I/J</b>	<b>U/V</b>	<b>T</b>	<b>T</b>

BLEND	MEANT	RUMOR	EMILY	WALES	ALLEY	ALIAS	NOSES	AGING
ABBAB	ABAAA	BAAAB	BAABA	BABBA	ABBBA	ABAAA	AAABA	AAAAA
<b>O</b>	<b>I/J</b>	<b>S</b>	<b>T</b>	<b>Y</b>	<b>P</b>	<b>I/J</b>	<b>C</b>	<b>A</b>

GRAVY	MEALS	DUDES	AGILE	FIGHT	LARRY	IS TWO	WHOLE
ABABA	ABABA	BABBA	AAABB	BAAAA	BABBA	AAABA	BAABB
<b>L</b>	<b>L</b>	<b>Y</b>	<b>D</b>	<b>R</b>	<b>Y</b>	<b>C</b>	<b>U/V</b>

DOING	MULTI	AGILE	BEERS	BLEND	DO NOT	GRAND	CHEEK
BAAAA	AABAA	AAABB	ABBBA	ABBAB	BAAAA	ABAAB	AABBB
<b>R</b>	<b>E</b>	<b>D</b>	<b>P</b>	<b>O</b>	<b>R</b>	<b>K</b>	<b>H</b>

A KING	TEETH	AS OLD	BEARS	CHEAT	SADLY
ABAAA	ABBAA	AAABB	ABABA	AABAA	AABBA
<b>I/J</b>	<b>N</b>	<b>D</b>	<b>L</b>	<b>E</b>	<b>G</b>

**Prosciutto is typically dry cured pork hind leg.**

25) [340 points] Solve this quote that has been encoded with the **Pollux Cipher**. 1=—, 2=x, 3=●, 4=●, 5=x, 7=—

48849107567342473356409136752435646994759364572402476

●---x---x●-●●x●-●●x●●-x-●●-xx●●x●●●xx●-xx●●●x-x●-x●-●  
P O L L U X I S A S T A R

953651695774562072465869632237896321233462536649432444

xx●●x-●xx--●xx--●●xx-●xx●xx●--x●●x-x●●●●xx●●●●xx●●●●  
I N G E M I N I W I T H H I S

9263632479313456473997336967391775754463962674251686937

xx●●●●x●-x●-●●x●●-●xx-●●●x●-●x---x-x●●●●xx●-●xx-●-●x●-  
H A L F B R O T H E R C A

53632898179483

x●●●x-x---x●-●  
S T O R

26) [320 points] Solve this quote that has been encoded with the **Morbit Cipher**. 1=x—, 2=●x, 3=—●, 4=x●, 5=—, 6=xx

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

-x●●●●x●x●●●x●xx●-●●x●●x-●●●x●x●-●x●-x●-●●x●●●xx●-  
T H E S E / L I B E R A L S / A

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

x●-●x●xx●x●●●-x●x-●xx-x●●-x●-●x-●x●●x-●x--●xx●●●-x  
R E / E V E N / T U R N I N G / V

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

●x●-●x-●●●x●●●xx●-●x●-●x---x--●x●-●xx●●●xx●●●xx●●x  
E R B S / P R O G R E S S I

8 9 4

●●●-x●  
V E

★(Special Bonus Question) 27) [285 points] Solve this quote that has been encoded with the **Pollux Cipher**. It ends with **"WICE"**.

458815282864521633814647966256981765530323289632286905  
-●●●x●x●x●-●-●xx-●●●x---x---x●-●-●xx-●●●x●x●x●-●-●xx●-●-x●  
B        E E P        B        O        O        P        B        E E P        W        E  
  
17533628105263298457499768378043812623535750786857314  
x●●●●-x●xx●x-●x-●-●x---x-●●x●x-●●xx-x●●●●x●xx●-●●x●x-  
V        E        E N C        O        D        E D        T H        E L        E T  
  
24157598213652238065706929960543785875779784628329863  
x-x●x●-●xx●-●xx●●x-●xx--x---x●-●x●●●x●xx-x●--x●●x-●-●  
T E R        R        I N        M O        R        S        E T W        I C  
  
13  
x●  
E

28) [405 points] Solve this quote that has been encoded with the **Porta Cipher**. The keyword is **"SUBJECT"**.

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

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

29) **[300 points]** Solve this phrase that has been encoded with the **Hill Cipher** with keyword **LION**.

$$\begin{pmatrix} L & I \\ O & N \end{pmatrix} \equiv \begin{pmatrix} 11 & 8 \\ 14 & 13 \end{pmatrix}$$

T	P	W	N	I	R	I	E	J	G	Z	A	K	C
P	L	A	T	E	P	E	C	T	O	N	I	C	S

30) **[270 points]** Encode this phrase with the **Hill Cipher** with keyword **WHITELIST**.

$$\begin{pmatrix} W & H & I \\ T & E & L \\ I & S & T \end{pmatrix} \equiv \begin{pmatrix} 22 & 7 & 8 \\ 19 & 4 & 11 \\ 8 & 18 & 19 \end{pmatrix}$$

T	A	B	L	E	O	F	C	O	N	T	E	N	T	S
K	I	P	S	P	K	C	X	E	J	D	C	R	B	I

$$\begin{pmatrix} S & T & A \\ R & G & A \\ Z & E & D \end{pmatrix} \equiv \begin{pmatrix} 18 & 19 & 0 \\ 17 & 6 & 0 \\ 25 & 4 & 3 \end{pmatrix} \quad Decode \begin{pmatrix} S & T & A \\ R & G & A \\ Z & E & D \end{pmatrix}^{-1} \equiv \begin{pmatrix} 14 & 25 & 0 \\ 21 & 16 & 0 \\ 20 & 13 & 9 \end{pmatrix}$$

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

ILSGNAPKNCRAAIE TRTNK

	I	L			
S	G	N	A	P	
K	N	C	R	A	
A	I	E	T	R	
T		N		K	

**Answer: SKATING IN CENTRAL PARK**

33) [375 points] Solve this quote that has been encoded with the **Railfence Cipher** with between 2 and 5 rails inclusive. There may be an offset.

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

Answer: \_SUBSCRIBE TO BIRD SCIENCE OLYMPIAD ON YOUTUBE.\_