Science Olympiad — BirdSO 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 gets 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 there are spare calculators in the kit, you may loan up to one per team to use for the test.
    iv. 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 KFXMFXYF
   SAMPLE SENTENCE

   and the students answered (underlined letters indicate mistakes)
   SAMPL<u>F</u> S<u>F</u>NT<u>F</u>NC<u>F</u>

   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
   SAMP<u>UL</u> 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 6×100=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:36	96
X:42	72
X:48	48
X:54	24

X:31	116
X:37	92
X:43	68
X:49	44
X:55	20

X:32	112
X:38	88
X:44	64
X:50	40
X:56	16

X:33	108
X:39	84
X:45	60
X:51	36
X:57	12

X:34	104
X:40	80
X:46	56
X:52	32
X:58	8

X:35	100
X:41	76
X:47	52
X:53	28
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	12
2	11
3	9
4	10
5	8
6	24
7	20
8	7
9	6
10	23
11	21
12	19
13	18
14	5
15	4
16	2
17	22
18	16
19	3
20	Timed
21	26
22	17
23	15
24	14
25	13
26	1
27	25
28	27

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 **[250 points]** Solve this timed aristocrat. When you have solved it, raise your hand so that the time can be recorded and the solution checked.

B ZCBA FQDPCK NSGJ ADP FDHJMQSVN MD MQSVE BXDPM.
A PLAY SHOULD GIVE YOU SOMETHING TO THINK ABOUT.

OQJV S FJJ DVJ BVK PVKJUFMBVK SM MQJ LSUFM MSHJ,
WHEN I SEE ONE AND UNDERSTAND IT THE FIRST TIME,

MQJV S EVDO SM TBV'M XJ HPTQ NDDK.
THEN I KNOW IT CAN'T BE MUCH GOOD.

	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	2	9	2	5	1	3		11	5	1	12	3	2	5	7		9	2	2	10		2		1
Replacement	Y	A	L	O	K	S	V	M	X	E	D	F	T	G	W	U	H	Q	I	C	R	N	J	B	Z	P

1) **[200 points]** Solve this uplifting Aristocrat.

KTHTHNTK, VT MGG AECHNGT, TITKO JZT JS CA. ERME'A
REMEMBER, WE ALL STUMBLE, EVERY ONE OF US. THAT'S

VRO UE'A M LJHSJKE EJ PJ RMZX UZ RMZX.
WHY IT'S A COMFORT TO GO HAND IN HAND.

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

2) **[300 points]** Solve this Aristocrat.

NXG FNNGACN NY HJMGLUG F AFL JH NXG VKGFNGHN XYLYK
THE ATTEMPT TO SILENCE A MAN IS THE GREATEST HONOR

PYI UFL RGHNYE YL XJA. JN AGFLH NXFN PYI KGUYVLJDG
YOU CAN BESTOW ON HIM. IT MEANS THAT YOU RECOGNIZE

XJH HICGKJYKJNP NY PYIKHGMZ.
HIS SUPERIORITY TO YOURSELF.

	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	1	7	13	8	4	8	6	7	2	14		4		1			3	2		6	11	1
Replacement	M	Q	P	Z	W	A	E	S	U	I	R	N	L	T	J	Y	D	B	X	K	C	G	V	H	O	F

3) **[250 points]** Solve this Aristocrat.

UMHG ISPNQFMIPLR SNKILIUI LK XKNDLKB KNU DPFU UPLKBI
TRUE SCHOLARSHIP CONSISTS IN KNOWING NOT WHAT THINGS

GALIU, CHU DPFU UPGJ ZGFK; LU LI KNU ZGZNMJ CHU
EXIST, BUT WHAT THEY MEAN; IT IS NOT MEMORY BUT

VHTBZGKU.
JUDGMENT.

	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	2	3		4	6	4	8	2	9	8	3	6		6	1	1	2	1	13	1		1		4
Replacement	X	G	B	W	Z	A	E	U	S	Y	N	I	R	O	F	H	L	P	C	D	T	J	Q	K	V	M

4) **[300 points]** Solve this Aristocrat.

FR LIGTFRD YNLIKU, QI ULOGG LIGT YCKUIGHIU, XYK
IN HELPING OTHERS, WE SHALL HELP OURSELVES, FOR

QLONIHIK DYYE QI DFHI YCN PYBTGINIU NLI PFKPGI ORE
WHATEVER GOOD WE GIVE OUT COMPLETES THE CIRCLE AND

PYBIU VOPW NY CU.
COMES BACK TO US.

	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	3	2	4	7	3	15		5	6		6	4	5	3	3		3	7	1	1	1	9	
Replacement	Z	M	U	G	D	I	L	V	E	Y	R	H	J	T	A	C	W	N	X	P	S	B	K	F	O	Q

5) **[300 points]** Solve this Aristocrat with errors.

YVOP'AO XEO YZ QO RJL, EKDDP, MAKEEP MOZMDO UVZ XEO
THEY'RE USE TO BE MAD, SILLY, PRISSY PEOPLE WHO USE

YZ EJP EUJP AKIS UJE J EKIO ZC J MZAO HZWJQXDJAP.
TO SAY SWAY RING WAS A SINE OF A PORE VOCABULARY.

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

6) **[350 points]** Solve this Aristocrat with errors.

QNDK ECCA TX ITLBL CS FTRA QNLR UCVM YMDTR TX
WHAT GOOD IS PIECE OF MIND WHEN YOUR BRAIN IS

XBDKKLMLA TR KTRU ITXBLX?
SCATTERED IN TINY PISCES?

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

7) **[350 points]** Solve this Aristocrat.

VBRRXKB EA VENB KHWPBTAOREHW; ER UXAR IB YTBAF OWS
LETTUCE IS LIKE CONVERSATION; IT MUST BE FRESH AND

KTEAD, AH ADOTNVEWJ RFOR ZHX AKOTKBVZ WHREKB RFB
CRISP, SO SPARKLING THAT YOU SCARCELY NOTICE THE

IERRBT EW ER.
BITTER IN IT.

	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	10		2	10	3		5	2	1	6			2	5	1		12	1	6	1	4	6	3	1	2
Replacement	S	E	X	P	I	H	Z	O	B	G	C	Q	W	K	A	V	J	T	D	R	M	L	N	U	F	Y

8) **[550 points]** Solve this unhinted Patristocrat.

XKJRA KGGBE PJRYE WYWEB QAJYR ZNYGM SWYRV IKAJR
QUANT UMMEC HANIC SISCE RTAIN LYIMP OSING BUTAN

YRRBQ CSYEB ABZZW GBAPJ AYAYW RSANB AAPBQ BJZAP YRV
INNER VOICE TELLS METHA TITIS NOTYE TTHER EALTH ING

Quantum mechanics is certainly imposing. But an inner voice tells me that it is not yet the real thing.

	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	11	9	1		4		4		1	6	3		1	2		4	3	9	3			2	5	1	10	4
Replacement	T	E	V	Z	C	K	M	J	B	A	U	W	P	Y	F	H	R	N	O	D	X	G	S	Q	I	L

9) **[600 points]** Solve this Patristocrat in which W maps to G.

AQWWP KWPIC RZUMR KRSPH PXTPE IWQQJ SQZUQ DZTRW
JOGGI NGISV ERYBE NEFIC IALIT SGOOD FORYO URLEG

IXKJU QDZSR REPEI XTIQC RZUWQ QJSQZ EFRWZ QDKJP
SANDY OURFE ETITS ALSOV ERYGO ODFOR THEGR OUNDI

EBXYR IPESR RTKRR JRJ
TMAKE SITFE ELNEE DED

Jogging is very beneficial. It's good for your legs and your feet. It's also very good for the ground. It makes it feel needed.

	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	2	3	6	1		1	6	6	5		1			8	11	14	5	4	4		7	4	1	7
Replacement	J	M	V	U	T	H	P	C	S	D	N	X	B	Z	W	I	O	E	F	L	Y	Q	G	A	K	R

10) **[550 points]** Solve this unhinted Patristocrat.

QFBBX KWNNX NKULN UOIDQ XKQFS XKVFN NQFYX KVTWO
HAPPI NESSI SNOTS OMUCH INHAV INGAS SHARI NGWEM

FCWFE XSXKV ZHTQF LTWVW LZILT WOFCW FEXJW ZHTQF
AKEAL IVING BYWHA TWEGE TBUTW EMAKE ALIFE BYWHA

LTWVX SW
TWEGI VE

Happiness is not so much in having as sharing. We make a living by what we get, but we make a life by what we give.

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

11) **[650 points]** Solve this K2 Xenocrypt with keyword OINK.

MSNIN QNHRCPQN INONMOCLHYIL QC KYFFY, MNPL NQRY
PUEDE SENTIRSE DECEPCIONADO SI FALLA, PERO ESTA

OLHINHYIL QC HL FL CHRNHRY.
CONDENADO SI NO LO INTENTA.

Replacement	Y	Z	O	I	N	K	A	B	C	D	E	F	G	H	J	L	M	Ñ	P	Q	R	S	T	U	V	W	X
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			5			3		7	5		1	7	3	10		3	2	5	4	1						6	

Translation: *You may be disappointed if you fail, but you are doomed if you don't try.*

12) **[650 points]** Solve this Xenocrypt.

MX TJYLSW ÑGWXFW C JDOGFCS KMW WX WNÑW YMXFJ XJ
UN HOMBRE TIENDE A OLVIDAR QUE EN ESTE MUNDO NO

IMWFW ÑWXWSDJ ÑJFJ. MXC WDWHHGJX WN ÑJFJ DJ KMW DW
PUEDE TENERLO TODO. UNA ELECCION ES TODO LO QUE LE

KMWFC.
QUEDA.

	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			4	5		7	3	2	1	11	3	1	7	2	5	1				3	1			17	8	2	
Replacement	Y	X	A	L	J	D	I	C	P	O	Q	B	U	S	T	V	Z	Ñ	W	R	H	G	K	E	N	M	F

Translation: *A man is too apt to forget that in this world he cannot have everything. A choice is all that is left him.*

13) **[200 points]** Encode these words of wisdom utilizing the Affine cipher (a = 3, b = 18).

D	O	N	'	T		W	O	R	R	Y		A	B	O	U	T		T	H	E		W	O	R	L	D		C	O	M	I	N	G		T	O
B	**I**	**F**	**'**	**X**		**G**	**I**	**R**	**R**	**M**		**S**	**V**	**I**	**A**	**X**		**X**	**N**	**E**		**G**	**I**	**R**	**Z**	**B**		**Y**	**I**	**C**	**Q**	**F**	**K**		**X**	**I**

A	N		E	N	D		T	O	D	A	Y	.		I	T	'	S		A	L	R	E	A	D	Y		T	O	M	O	R	R	O	W		I	N
S	**F**		**E**	**F**	**B**		**X**	**I**	**B**	**S**	**M**	.		**Q**	**X**	**'**	**U**		**S**	**Z**	**R**	**E**	**S**	**B**	**M**		**X**	**I**	**C**	**I**	**R**	**R**	**I**	**G**		**Q**	**F**

A	U	S	T	R	A	L	I	A	.
S	**A**	**U**	**X**	**R**	**S**	**Z**	**Q**	**S**	.

14) **[200 points]** Encode this message using the Affine cipher (a = 3, b = 16)

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

A	G	E	.
Q	**I**	**C**	.

15) **[200 points]** Solve this Affine cipher that ends in SM.

O	G	P	J	R		D	G	P		A	P	Y	R		G	X	Y	R		U	X	D	K	R	M		X		U	X	E	O		P	W
T	**H**	**O**	**S**	**E**		**W**	**H**	**O**		**L**	**O**	**V**	**E**		**H**	**A**	**V**	**E**		**P**	**A**	**W**	**N**	**E**	**D**		**A**		**P**	**A**	**R**	**T**		**O**	**F**

O	G	R	L	E		K	X	E	H	L	J	J	L	J	F	.
T	**H**	**E**	**I**	**R**		**N**	**A**	**R**	**C**	**I**	**S**	**S**	**I**	**S**	**M**	.

16) **[250 points]** Encode this quote using a Vigenere cipher - keyword THANKS.

T H A N K S T H A N K S T H A N K S T H A N K S T H A N K S

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

T H A N K S T H A N K S

U	N	I	N	G		R	E	E	N	J		O	Y
N	**U**	**I**	**A**	**Q**		**J**	**X**	**L**	**N**	**W**		**Y**	**Q**

17) **[200 points]** Decode this Vigenere cipher given the keyword MONKAS.

M	O	N	K	A	S	M	O	N	K	A	S	M	O	N	K	A	S	M	O	N	K	A	S
I	S	E	K	R	W	X	M	G	R	I	F	W	D	R	Y	P	D	Q	V	N	F	E	Y	A
W	**E**	**R**	**A**	**R**	**E**	**L**	**Y**	**T**	**H**	**I**	**N**	**K**	**P**	**E**	**O**	**P**	**L**	**E**	**H**	**A**	**V**	**E**	**G**	**O**

M	O	N	K	A	S	M	O	N	K	A	S	M	O	N	K	A	S	M	O	N	K	A
C	Q	C	E	F	E	S	H	X	L	W	E	G	G	R	E	Q	M	U	E	O	E	O	U	H	U	E	S
O	**D**	**S**	**E**	**N**	**S**	**E**	**U**	**N**	**L**	**E**	**S**	**S**	**T**	**H**	**E**	**Y**	**A**	**G**	**R**	**E**	**E**	**W**	**I**	**T**	**H**	**U**	**S**

18) **[300 points]** Solve this Vigenere cipher given that it ends in HUMOR.

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

F	U	N	N	Y	F	U	N	N	Y	F	U	N	N	Y	F	U	N	N	Y	F	U	N	N
T	O	G	B	D	Q	C	S	R	G	X	U	F	R	L	X	Y	B	S	F	Z	G	B	E
O	**U**	**T**	**O**	**F**	**L**	**I**	**F**	**E**	**I**	**S**	**A**	**S**	**E**	**N**	**S**	**E**	**O**	**F**	**H**	**U**	**M**	**O**	**R**

19) **[300 points]** Solve this Baconian cipher.

```
2314567235723572893572301547682903145762358907213547 2
AABBABAAAAAAAAAABBAAAAABBABABBABBABBAABAAABBBAABAABAA
  G    R    A    N    D    M    O    T    H    E    R

3567238572359723572035712354726893570123457235726835 9
AABAAABAAAAABAAAAAABAAABAAABAABBBAAABBAABAAAAAAABBAAB
    S    A    R    E    J    U    S    T    A    N

7203517235468907214356723859720357123456728359702351 7
AABAABAAAABBBBBAABBAABAAABABAABAAABAABABAABAABABAAABA
 T    I    Q    U    E    L    I    T    T    L    E

2354672835792357203154723 6
AAABBAABAAABAAAAABABABAAAB
   G    I    R    L    S

Grandmothers are just antique little girls.
```

20) **[350 points]** Solve this Baconian cipher of a Homer Simpson quote that ends in LY.

```
1248132485126478124891248124810248312481256487190243 5
AAAAABAAABAABABAAAAABAAAAAAAAAABAAABAAAAAABBAABABBAABB
  A    S    F    A    R    A    S    A    N    Y    O

8617924810248312546781290435861274819023481254861248 1
ABABBAAAABAAABAABABBAAABBABBABAABAAABBABAAAABAABAAAAA
    N    E    K    N    O    W    S    W    E    R

2748124812904813526748124980312481254681274981248102 3
ABAAAAAAAABBAAABBABBAAAAABABBAAAAAABABAAABABAAAAAABAB
 E    A    N    O    R    M    A    L    F    A    M

5468124789102354
BABAAAABABABBA
   I    L    Y

As far as anyone knows, we're a normal family.
```

21) **[300 points]** Solve this Hill cipher given a decryption matrix of LUBRICANT.

$$\begin{pmatrix} O & R & S \\ T & D & L \\ N & N & Y \end{pmatrix} \equiv \begin{pmatrix} 14 & 17 & 18 \\ 19 & 3 & 11 \\ 13 & 13 & 24 \end{pmatrix} \qquad Decode \begin{pmatrix} O & R & S \\ T & D & L \\ N & N & Y \end{pmatrix}^{-1} \equiv \begin{pmatrix} 11 & 20 & 1 \\ 17 & 8 & 2 \\ 0 & 13 & 19 \end{pmatrix}$$

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

Q	C	B	O	O	K	Y	C	L	F	N	K	M	J	Q	P
S	**E**	**S**	**T**	**O**	**C**	**O**	**N**	**C**	**E**	**R**	**N**	**U**	**S**	**Z**	**Z**

22) **[250 points]** Encode this message using the Hill cipher. The given decryption matrix is JINX.

$$\begin{pmatrix} D & I \\ N & R \end{pmatrix} \equiv \begin{pmatrix} 3 & 8 \\ 13 & 17 \end{pmatrix}$$

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

S	I	B	L	E	T	O	O	U	R	S	E	L	V	E	S
O	**G**	**N**	**S**	**I**	**L**	**Y**	**E**	**O**	**D**	**I**	**Q**	**T**	**G**	**A**	**U**

23) **[300 points]** Special Agent, Haileigh, has the following RSA public key:

$n = 287809 \quad e = 270077$

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

```
287809 = 449 * 641
```

Compute the value of their private key:

Enter the computed private key:

20053

24) **[450 points]** Daniel and Alexander are accountants for a very large bank, and have started a friendship. They communicate via email, because they live thousands of miles apart. Alexander gets curious and asks Daniel the year that they were born. Daniel doesn't mind telling Alexander, but they know that the bank monitors all employee emails, and is afraid of being the victim of age discrimination. Therefore, Alexander suggests that they use RSA, and they provides their public key: (52537, 23321). Daniel replies with the ciphertext 24967. Alexander's private key is 42401. In what year was Daniel born?

Enter the answer:

1962

25) **[150 points]** Solve this Pollux cipher given that it begins with THOS.

```
24111143004111414413041111432044111411111411421414411401
-x●●●●x---x●●●x●xx●--x●●●●x---xx●●●x●●●●x●●x-●x●xx●●x-●
T H    O   S   E  W   H    O    S   H    I  N  E  I  N

44241111414411141401314222421401144121412431401044124101
xx-x●●●●x●xx●●●x●x-●-●x---x-●x-●●xx●-●x●-x-●x-●-xx●-x●-●
  T H    E  S   E C    O   N  D    R   A  N  K    A  R

41441401214121141141331411141421144311140102443411 1141
x●xx●x-●-●x●-●●x●●x●--●x●●●x●x-●●xx-●●●x-●--xx-x●●●●x●
 E  E C    L    I  P    S   E D    B    Y     T H    E

44112141141014111 40
xx●●-●x●●x●-●x●●●x-
  F    I  R   S   T
```

26) **[200 points]** A quote has been encoded using the Morbit Cipher for you to decode. You are told that 3=●×, 1=×−, 2=●−, 5=×●, 8=−×, 9=●●.

```
8 9 9 5 4 9 9 5 2 1 8 2 1 3 5 9 5 7 3 9 5 6 5 3 8
-x●●●●x●xx●●●●x●●-x--x●-x-●xx●●●x●--●x●●x●-●x●●x-x
T H    E/ H    U   M  A  N  /S   P    I  R   I  T

1 3 3 3 6 3 9 3 1 1 7 4 2 1 2 3 6 6 1 7 1 8 2 6 5 6 3
x-●x●x●x-●●x●●●xx-x---xx●-x-●-●x-●-●x---x--x●--●x●-●●x
/N  E E D   S   /T O  / A  C    C    O   M  P    L

9 5 9 5 9 3 1 1 7 4 8 2 3 9 5 2 1 8 2 6 5 9 3 1 1 7
●●x●●●x●●●●xx-x---xx-x●-●x●●x●●-x--x●--●x●●●●xx-x---
I  S   H    /T O  / T R   I  U   M  P    H    /T O

4 6 9 5 4 9 9 5 8 2 6 5 7 3 6 7
xx-●●●x●xx●●●●x●-x●--●x●--●x-●--
/ B    E/ H    A  P    P    Y
```

27) **[100 points]** Encode this quote using a Caesar shift of 5.

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

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