



**Intermathematics**

Maths Resources for International Schools



AN ARTHIT OURAIRAT INSTITUTION



BISP PRESENTS

# **FOBISIA CODE BREAKING MATHS CHALLENGE**

JOIN SCHOOLS FROM  
AROUND SE ASIA IN A  
CODE BREAKING  
COMPETITION

Students must use logical  
thought and problem  
solving skills to crack the  
codes. Who can break all  
the codes to solve the  
challenge?

**Date:** 18-22nd September 2023

**Year Group:**

**Year 4 to Year 13**

(and teacher solutions  
also invited)

**REGISTER**





## Message from our Principal

I am delighted to encourage everyone to compete in the FOBISIA Mathematics code breaking competition 2023. Here at British International School, Phuket we strive to inspire learning and ignite passion and competitions like this can generate excitement outside the traditional classroom setting and introduce students to some of the wonderful applications of mathematics. I know students will benefit greatly from applying their mathematical and logic skills in such an interesting and practical environment. Good luck to all our participants.

**Simon Meredith**

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## About [British International School Phuket](#)

British International School, Phuket (BISP) is a co-educational day and boarding school, established in 1996 and set in extensive landscaped grounds. The school aims to deliver the highest standards of teaching and learning to an international community emphasising wellbeing and passion on a modern and well equipped campus.

The school is divided into Early Years, Primary and Secondary levels and offers the IB Diploma, IGCSE and the Cambridge ESOL examinations. British International School, Phuket also offers an externally assessed programme from London Academy of Music and Dramatic Arts and high-performance academies in Football, Golf, Swimming, Tennis and Aerial Arts.

Inspire learning; Nurture wellbeing; Ignite passion.

Media Contact: [media@bisphuket.ac.th](mailto:media@bisphuket.ac.th)



## Introduction

BISP is proud to be hosting the FOBISIA Mathematics competition 2023 for international schools from across Asia. Last year we had close to 90 schools taking part with over 10,000 students completing at least one code level. We hope that this year's event will be equally successful.

There is a close link between mathematics and code breaking: The skills that make good mathematicians, problem solving, logical thought and perseverance are the same skills that make great code breakers. We're really excited in the BISP Mathematics department to share our passion for maths with students around the world.

We wish all our talented students from around Asia good luck in their challenge!

**Andrew Chambers**

## Essentials

The competition will run through my site: [www.schoolcodebreaking.com](http://www.schoolcodebreaking.com). I have made 5 specific code levels for the Fobisia challenge (see in the menu under Fobisia code challenge). There are also a number of other challenges available on the site as extension.

## About the levels

FOBISIA Level 1A and Level 1B is suitable for both KS2 and KS3.

FOBISIA Level 2 is a little harder and is more suitable for KS3 and above.

FOBISIA Level 3 is a slightly different puzzle - as it's in the form of a spy thriller. The code difficulty is aimed more at Y9, KS4 students and above.

FOBISIA Level 4 is a single page with 3 codes combined. This is rated extreme – and is an open category – i.e. also open to teachers. This should only be attempted by code breaking experts!

I would expect that students could complete 1-2 code levels in one hour (depending on help/ability etc.). There are also a number of other code levels available on the site – including the 2022 code challenges (though I will not collect data on these entries).

### **About the data collection**

When students complete a level they will access a password protected google sheet. This will ask for the correct password and then they can enter the following information:

First name, last name, name of school (dropdown choice), year group (dropdown choice) and class (optional). If you have large numbers of entrants then you may wish to tell students to add a class (but make sure they all type exactly the same).

This data will then populate a google spreadsheet - which will note the time completed as well as the above data. So after the completion of the competition schools will be able to see all successful entrants from their school along with the time submitted. This allows schools to have a competition to see who finishes first (if you wish).

### **About the certificates**

I will send pdf template certificates - so that schools that wish to present to some/all students can do so. There is no real competition between schools as such - although I can give some data as to which school had the most successful entrants etc. - if you wish to use this.

### **Digital versions of the codes:**

At the end of the pdf you will also find a digital copy of the Level 1-4 challenge questions and the answers to the Level 1A and 1B challenge. The answers are not intended to be shared with students - but should support teachers in giving assistance when students are struggling. This allows schools to run an activity if the students do not have access to computers or the internet.



## **Frequently asked questions**

### **1. When is it?**

The competition will be held between Monday 18th and Friday 22nd September 2023.

### **2. Who can take part?**

This competition is open to any FOBISIA school (and other schools by invitation).

### **3. What happens during the competition?**

I have designed 5 different code challenges – of which students can try and complete any level. Level 1A, 1B and Level 2 both consists of 6-7 codes. Level 3 has 4 codes. After each code is cracked then students enter a password to access the next clue. When they have completed all the codes in the round then they get to enter their names into the leaderboard. At the end of the competition I will share a spreadsheet of the leaderboard entrants for each school. I will also provide a certificate (template) so that schools can award prizes to individual students if they choose. There will be no “winner” as such – i.e. this will not be judged as a competition between schools, rather a chance to celebrate achievement within your school.

### **4. What age is this suitable for?**

This has primarily been designed for KS2-KS4 students. KS2 students may benefit from in class support. The Level 3 and Level 4 codes would provide a challenge for KS5 and above.

### **5. What is the cost?**

It's free to enter.

### **6. How many students can take part from one school?**

As many as you like!

### **7. How do you recommend this event is run?**

This works well as a stand-alone lesson – and students should be able to complete a level within one hour. Students can work independently or in groups. It can also be run as a homework activity or as an off-timetable gifted and talented activity. Schools with longer time to devote to this can also use the code breaking resource pack to teach more code breaking skills.



## **8. What if my students don't have access to a computer?**

I have provided a paper version of the code levels that can be done by printing out.

## **9. Teacher recommendations**

It is recommended that teachers planning to do this challenge have worked through at least one level themselves (Level 1 answers are given). This allows teachers to support students that may be struggling.

## **10. Tech issues?**

The only tech issue I find is when students enter an incorrect password, and then later try to enter a correct one. In this case the next screen may not load. This can be resolved by refreshing the page.

## **11. Password protected?**

Currently the 5 Fobisia code levels are password protected on the website – I will remove the passwords on Sunday night so that they are all accessible on Monday morning.

## **12. Level 1 answers?**

I've provided the Level 1A and 1B code answers so that teachers can have this as a worked solution to support students.

## **13. Answers to other levels?**

The Level 2, Level 3, Level 4 have no answers available to teachers to preserve the competition element.

## **14. After the competition?**

After the competition has finished the codes will still be available on the site – so potentially students can still try cracking these later on.

## **15. Difficulty?**

The Level 1A, 1B and Level 2 codes should be accessible for KS2 and KS3 students (possibly with teacher support needed). The Level 3 code is intended for older students and the Level 4 code is extreme – and open to teachers as well.

## **16. Emails?**

During the competition given the number of schools taking part I won't really be able to respond to too many emails – please keep these to any big issues!



## 17. Results?

After the event I can share some excel sheet data with students who have completed each level – again because of the numbers of participants this will likely be in the form of a large excel sheet sorted in school name order which can be searched. When students have completed a level they will fill in a Google form – this will ask for first name, last name, school, year and class (optional). Students can simply add an initial for their last name if you would prefer to not have this data shared.

## 18. Certificates?

I will send out a pdf certificate template in 2 versions: certificate of participation and certificate of merit. It is up to each teacher how to award these – you may decide to award to the first to finish in each class, or the students who crack the most levels etc.

## 19. Marketing

I will also provide some generic marketing style quotes – so that you can have a nice write up about the event on your website/media etc.!

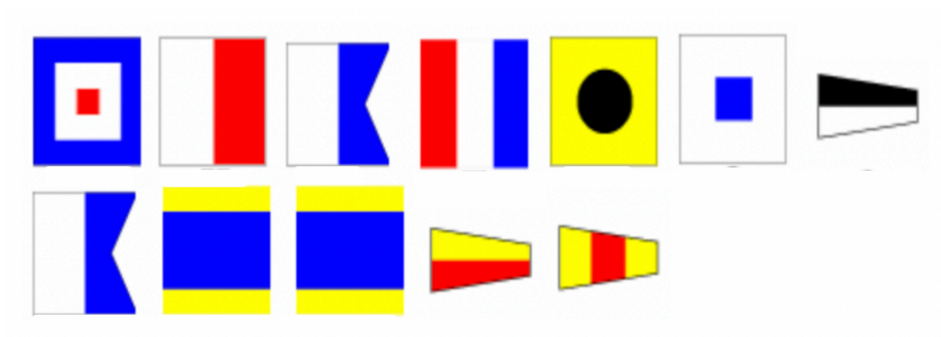


## Level 1A: Clue 1



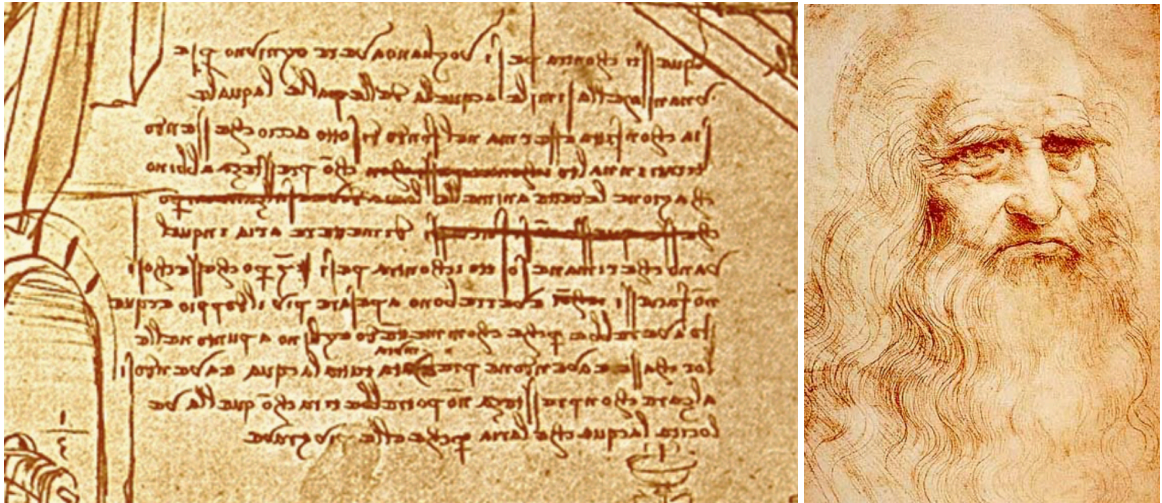
The International Code of Signals is an international system of signal for use by ships to communicate important messages if other forms of communication are not possible. What is the following message saying?

**Clue:**





## Level 1A: Clue 2



Follow in the footsteps of the genius Leonardo Da Vinci – who devised a special code to keep his work safe from prying eyes. Can you find the hidden password below?

Clue:

רמבדח זי פמזור פוה ס מורר

החפצמבשור זי רפלכלות





## Level 1A: Clue 3



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

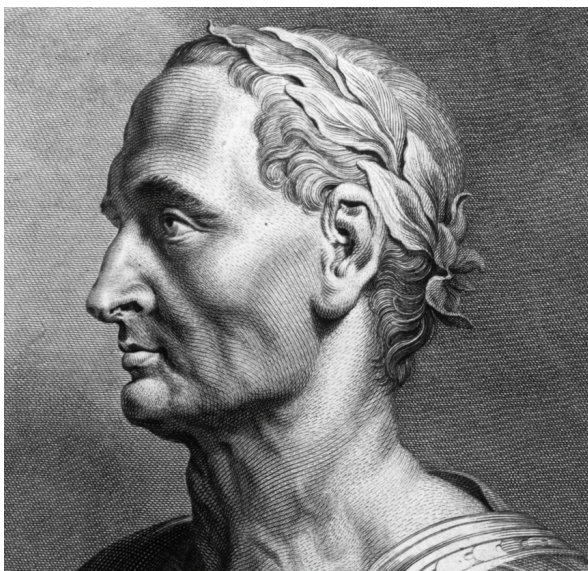
Descartes was responsible for the coordinate grid – which is why it is named the Cartesian plane. Can you use Descartes' grid to find the hidden message below?

Clue:

$(3,5)$   $(5,3)$   $(4,3)$   $(2,4)$   $(3,2)$   $(1,5)$   $(5,2)$   
 $(1,1)$   $(2,3)$   $(1,5)$   $(5,2)$   $(4,4)$   $(5,3)$   $(4,3)$   
 $(4,2)$  !  
 $(5,2)$   $(3,2)$   $(4,4)$   $(1,5)$   $(4,3)$   $(2,4)$   $(2,3)$   
 $(5,5)$   
 $(4,4)$   $(4,2)$   
 $(5,1)$   $(5,3)$   $(1,1)$   $(3,2)$   
 $(1,2)$   $(1,5)$   $(4,2)$   $(4,2)$   $(3,1)$   $(5,3)$   $(3,2)$   $(4,5)$



## Level 1A: Clue 4



No code breaking competition is complete without this most famous code of them all!

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
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

Clue:

Ltnsl bjqq pjju ltnsl ymj sjcy ufxxbtwi  
nx jvzfynts



**Level 1A: Clue 5**



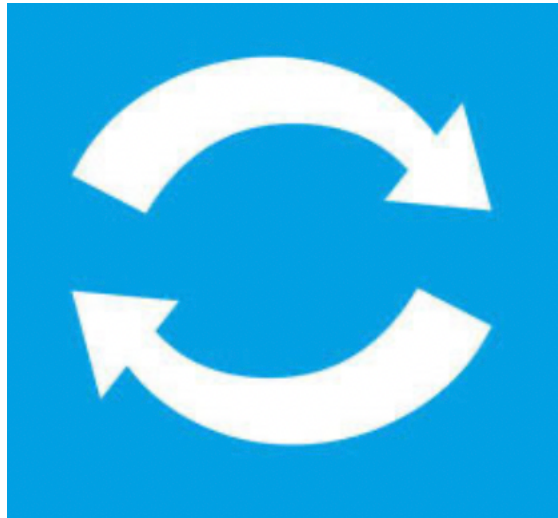
Sometimes all that is needed is a change of perspective. Can you find what this message says?

**Clue:**

r	o	a	o	s	e
a	d	p	w	i	n
e	y	e	s	d	o
n	l	n	s	r	c



**Level 1A: Clue 6**



HT FE NI LA IW NN NI PG SA WS RO ID  
CS AH PM OI N



## **Level 1B: Murder Mystery information:**

A murder has been committed in the maths department! A body has been discovered surrounded by mathematical objects and only the hardworking maths teachers were in school, doing long division sums for fun at the weekend. One of them must be the murderer. (Scroll down to see a list of students who have completed the task)

**Your task, should you choose to accept it, is to find:**

- 1) The murderer
- 2) The room
- 3) The murder weapon

**The murder suspects are:**

- 1) Al Jabra – he was wearing a white, T-shirt with 2 stripes and ripped jeans on the day of the murder.
- 2) Polly Gon – she was wearing a knee-length green skirt, white blouse and gold watch.
- 3) Lisa Perbound- she was wearing a blue Adidas T-shirt with 3 stripes on the sleeves, Bermuda shorts and a baseball cap.
- 4) May Trix – she was wearing a black and white t-shirt with an odd number on it, trousers and shiny black shoes.
- 5) Ella Ment- she was wearing a blue knitted jumper with a picture of pi on the front, and brown cords.

**The possible rooms are:**

- 1) The Canteen
- 2) The Tuck-shop
- 3) Room 16
- 4) Room 25
- 5) Room 17
- 6) Room 1

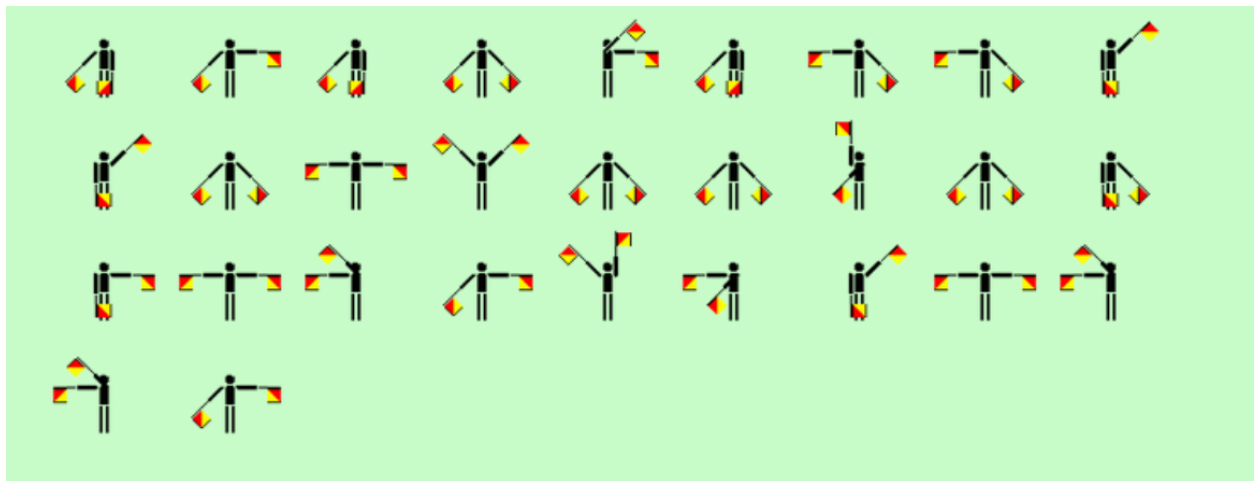
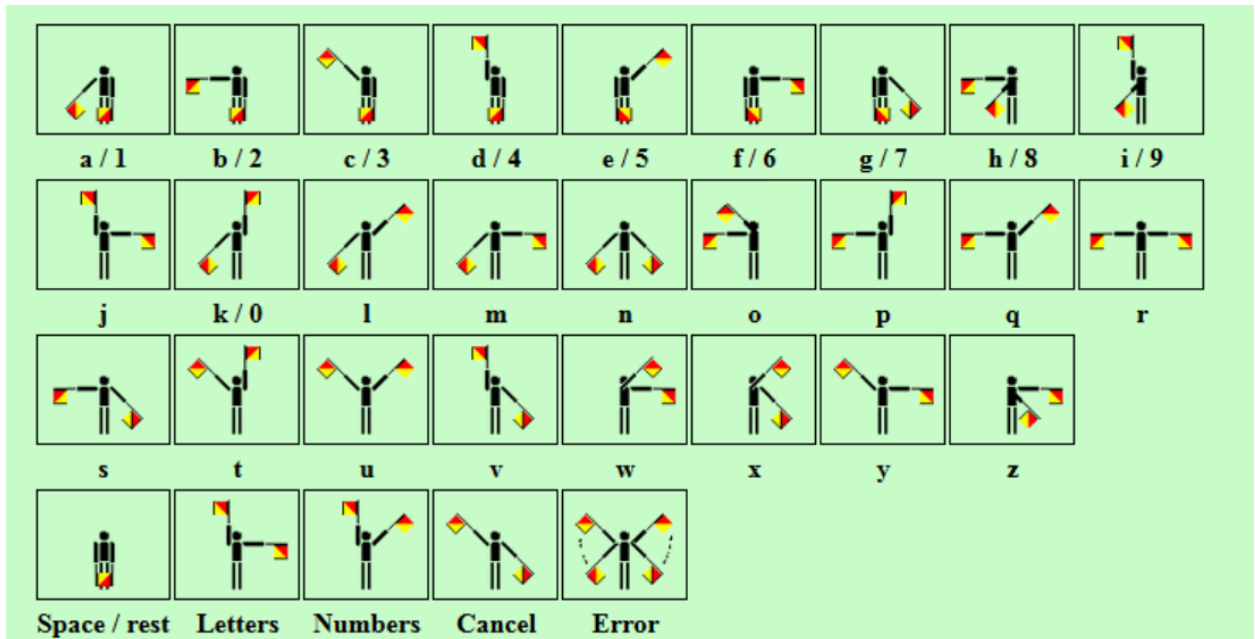
**The possible murder weapons are:**

- 1) A wooden metre ruler
- 2) A large wooden cube
- 3) A dusty trundle wheel
- 4) A sharp compass
- 5) A large maths textbook
- 6) An oversized calculator





## Level 1B: Code 1





**Intermathematics**

Maths Resources for International Schools

**Level 1B: Code 2**

*rebmuh eraugs a si moor ehT*

**Level 1B: Code 3**

PAXG RHN WXVBIAXK MABL  
FXLLTZX BG YNEE RHN PBEE  
LXX MATM MAX FNKWXXKK PTL  
PXTKBGZ T M LABKM

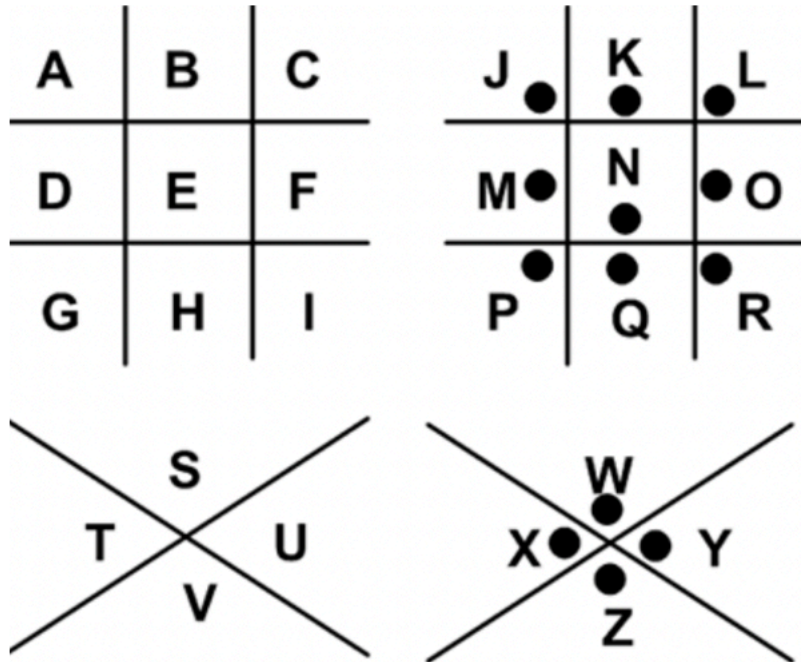
F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C	D	E
																		E							

### Level 1B: Code 4

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

D4, B3, A5, C2, A1, C3, E2, B3, C4, D2,  
A1, C3, B1, D2, C4, C2, D4, B3, A5, D2,  
C4,C4, C2, B4, D3, C3, C4, D4, B2, D5,  
B4, C1, D4, E4

## Level 1B: Code 5



□□ >□□ □□□□□ □□  
 □ □□□□□ □□□□□ □□□ □□□□





**Level 1B: Code 6**

TSRROLEAOIAVNBHMDTKAIRMTNEUEIUEOP  
CNOWHENMR


Split the above text into equal lines of 3 to fill in the grid.



## Level 1B: Code 7

00100

01100

10100

00100

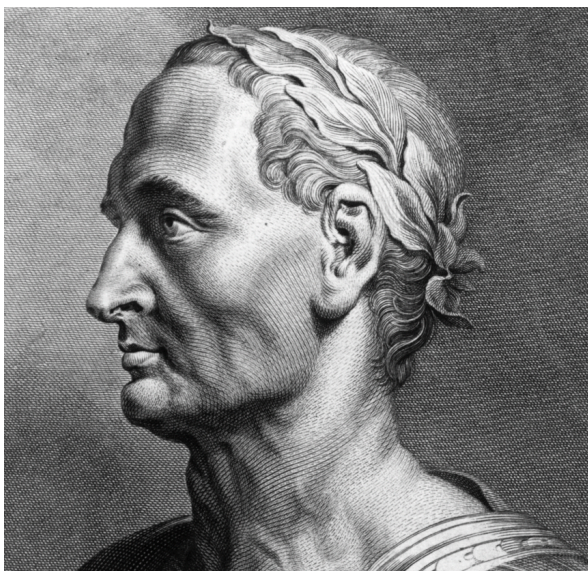
11111


Fill in the grid above by having 0 as a blank space and 1 as a shaded in space. It should create a picture of the image on the clothes of the murderer.

You should now have a 3 digit number relating to the murderer, the room and the object.



## Level 2: Code 1



Here is Roman code to start you off:

A	B	C	D	E	F	G	H	I	J	K	L	M	0	1	2	3	4
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
N	O	P	Q	R	S	T	U	V	W	X	Y	Z	5	6	7	8	9

Code:

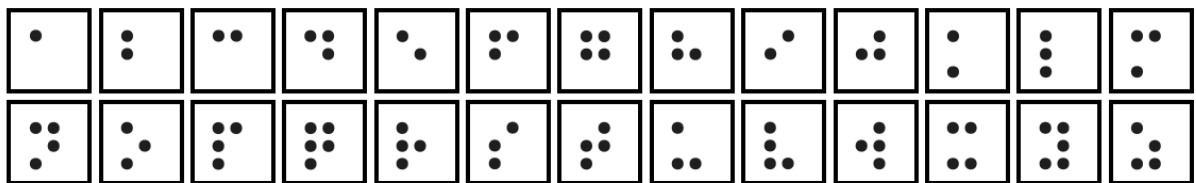
Jung vf 2 zhygvcyvrq ol 1



## Level 2: Code 2



Louis Braille was the inventor of a reading and writing system intended for use by visually impaired people.



Clue:





## Level 2: Code 3

Number	1	2	10	20	33
Break-down		$1 \times 2$		$10 \times 2$	$10 \times 3 + 1 \times 3$

Number	71	143	181
Break-down	$60 \times 1 + 10 \times 1 + 1 \times 1$	$60 \times 2 + 10 \times 2 + 1 \times 3$	$60 \times 3 + 1 \times 1$

Babylonian maths is a base-60 system what this means is that the digit symbol can represent 1 or 60 depending on where it is. A left digit symbol with a large space after it means it's representing 60. You can see some examples of numbers in Babylonian script above.

Use this pattern to work out the following number:

**Clue:**

$$\begin{array}{r}
 \text{Babylonian symbol for 33} \quad \text{Babylonian symbol for 20} \\
 + \\
 \text{Babylonian symbol for 1} \quad \text{Babylonian symbol for 30}
 \end{array}$$



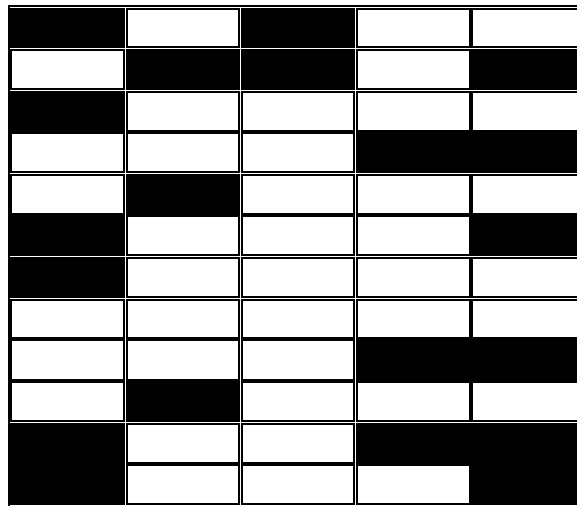


## Level 2: Code 4

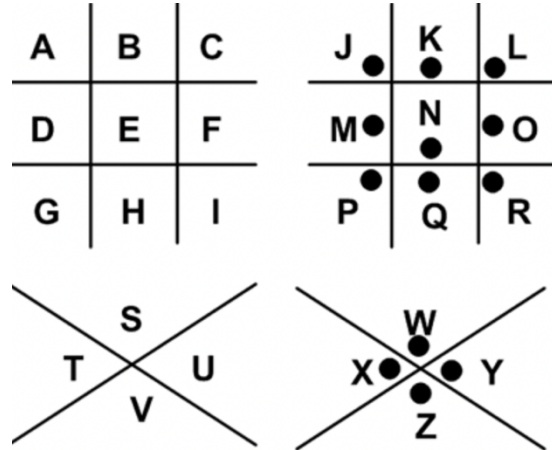
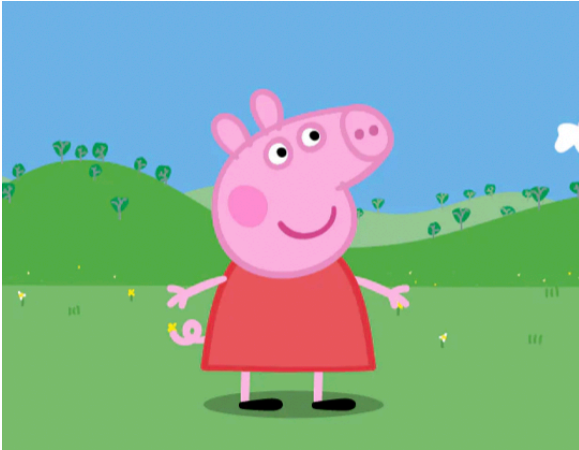


A	00000	N	01100
B	00001	O	01101
C	00010	P	01110
D	00011	Q	01111
E	00100	R	10000
F	00101	S	10001
G	00110	T	10010
H	00111	U/V	10011
I/J	01000	W	10100
K	01001	X	10101
L	01010	Y	10110
M	01011	Z	10111

Francis Bacon invented this particular code in the 16<sup>th</sup> century. It's been given a modern twist here!



## Level 2: Code 5



Maybe Peppa can help with this one?

V E L L E V O > E > N O O O J  
O > J J O J V > N O O O > > V E J J

**Level 2: Code 6**



### THE WIND IN THE WILLOWS

than taking it by storm. I haven't said my last word yet. Now I'm going to tell you a great secret."

Toad sat up slowly and dried his eyes. Secrets had an immense attraction for him, because he never could keep one, and he enjoyed the sort of unhallowed thrill he experienced when he went and told another animal, after having faithfully promised not to.

"There — is — an — underground — passage," said the Badger, impressively, "that leads from the river-bank, quite near here, right up into the middle of Toad Hall."

"O, nonsense! Badger," said Toad, rather airily. "You've been listening to some of the yarns they spin in the public-houses about here. I know every inch of Toad Hall, inside and out. Nothing of the sort, I do assure you!"

"My young friend," said the Badger, with great severity, "your father, who was a worthy animal — a lot worthier than some others I know — was a particular friend of mine, and told me a great deal he wouldn't have dreamt of telling you. He discovered that passage —

310

The book code is a very secure way of spies communicating whilst in deep cover in enemy countries and was frequently used during the 20<sup>th</sup> Century. Can you spot how the numbers uncover a hidden message in the text?

**Code:**

20:3

3:1

2:1

10:2

21:1



## Level 3: Operation mole hunter! Level 3: Code 1



You are the Spy Controller of Freedonia – and have just been handed some worrying news – one of your spies has been passing secret information to a hostile country. Operation Mole Hunter must uncover:

- (1) The name of the spy
- (2) The secrets that have been stolen
- (3) The country that he/she is working for.

You dispatched Freedonia's top spy catcher – but unfortunately he was murdered yesterday. Nevertheless you manage to find his notebook hidden under a floor board in his house. It is full of codes. Can you crack them all to save your country?

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

Code:

Odubfikifkktubshfubitqgv

### Level 3: Code 2



You rush to the Ministry of Defence and demand to see the safe where they keep the most Top Secret of all nuclear secrets. Sure enough it has been opened and the secrets are missing.

You consult the notebook to try to crack the next clue:

tragsawheiaAodteta heslssititlCubhmyf  
ewaacethnisfnyepse


### Level 3: Code 3



You quickly consult the Personnel department to work out who in the organization has initials of AC. You narrow it down to 3 potential suspects:

Alan Chamberlin – a senior Controller responsible for the Asia region.

Alice Chester – a field agent with expertise in South American politics.

Aaron Campbell – a retired former spy now living in South Africa.

In the notebook you see what looks like a half-finished grid and another grid with some letters:

5				7
		6		
	4		8	
10		2		
3		9		1

SP	IC	IN	IT	SI
ES	IN	ON	AX	SO
FR	RE	XX	BL	EL
EF	IV	ES	UT	XX
PY	HA	ED	YL	TH

### Level 3: Code 4



Ok getting close – we now the name of the spy and the secrets that are missing. Last we need to know the country the secrets are being passed to. Time to consult the notebook again.

**Clue:**

Q tlqpa tlw mnyptjs qo Ckcxupqc qp Ouytl  
Ckwjqmc

$$P \equiv a^{-1}(C - K) \text{ Mod } 26$$

$$a^{-1} = 21, K = 2$$

	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
C	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
P																										

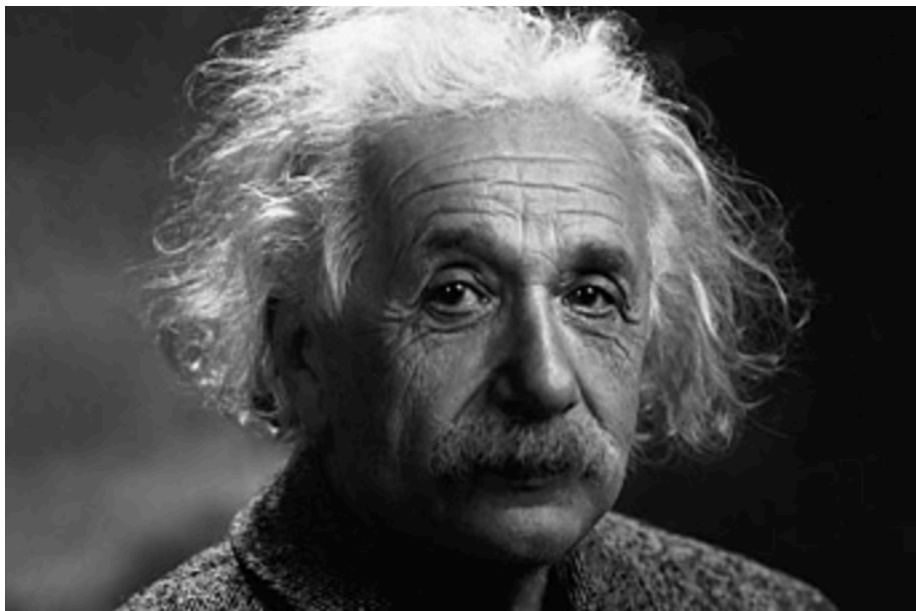
**Math note:**

When you calculate a number *Mod m*, you need to find the remainder of a number when divided by *m*.

For example  $10 \text{ Mod } 7 \equiv 3$  because when you do  $10 \div 7$  you get a remainder of 3.



## Level 4: Test of Genius



DBEBFJCGFDFIJHJDCDIEGCGEDDIDCHJF  
ACIIEBJHB

01110010100101001110000010000000111110  
0000001000001110010100101001110

.-- . . . . . . . . . / -- . . .  
-- . . / . . . . . / -- . . . / . . . .  
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/ -- . . . . . . . . / -- . . . / --  
. . . . .

## Level 1A: Answers

(Do not share with students until after the competition has finished!)

### Level 1A: Code 1

Clue: Use the flags to find out what letter they represent.

What is 6 add 70? (Password answer 76)

### Level 1A: Code 2

Clue: Mirror writing.

Reading this is easier with a mirror! The next password is reflecting

### Level 1A: Code 3

Clue: Use the coordinate grid to find the letters

Congratulations! Triangle is your password.

### Level 1A: Code 4

Clue: Caesar shift with the top letter going to the bottom letter in the table.

Going well keep going the next password is equation.

### Level 1A: Code 5

Clue: Reading up rather than down?

Nearly done password is cone.

### Level 1A: Code 6

Clue: Look at the picture – maybe things could be swapped?

THE FINAL WINNING PASSWORD IS CHAMPION

## Level 1B: Answers

(Do not share with students until after the competition has finished!)

### Level 1B: Code 1

Clue: Use the flags to find out what letter they represent.

A man was seen running from the room

### Level 1B: Code 2

Clue: Backwards writing

The room is a square number

### Level 1B: Code 3

Clue: Caesar shift – X goes to E

WHEN YOU DECIPHER THIS MESSAGE IN FULL YOU WILL SEE THAT THE MURDERER WAS WEARING A T SHIRT

### Level 1B: Code 4

Clue: Use the coordinate grid

The man who ran from the room is not guilty

### Level 1B: Code 5

PigPen cipher

On the floor is a large wooden cube

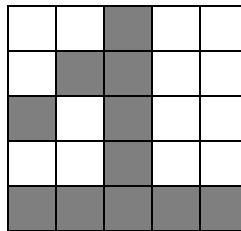
## Level 1B: Code 6

Clue: transposition cipher:

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

THISMURDERTOOKPLACEINAROOMWITHANEVENNUMBER

## Level 1B: Code 7



One

## Level 1B: Answer

4) May Trix – she was wearing a black and white t-shirt with an odd number on it, trousers and shiny black shoes.

3) Room 16

2) A large wooden cube

Number is 432.

## Level 2: Answers

### Level 2 Code 1:

What is 7 multiplied by 6 (answer is 42)

### Level 2 Code 2:

the word is polygon

### Level 2 Code 3:

$212 + 86 = 298$

### Level 2 Code 4:

word is radius.

### Level 2 Code 5:

So close to the end expand is the next word

### Level 2 Code 6:

Your secret word is animal

## Level 3: Answers

### Level 3 Code 1:

nuclear secrets are missing

### Level 3 Code 2:

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

There was a glass case with the initials AC found by the empty safe!

### Level 3 Code 3:

16	11	6	23	18
21	4	25	8	13
10	15	2	19	24
3	20	9	14	1

TH ES PY RE SP ON SI BL ED EF IN IT EL YL IV ES IN SO UT HA FR IC A

THE SPY RESPONSIBLE DEFINITELY LIVES IN SOUTH AFRICA

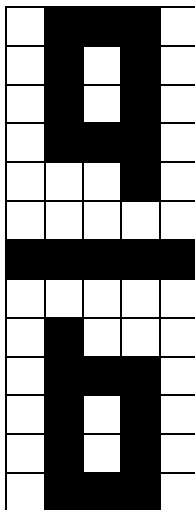
### Level 3 Code 4:

I think the country is Amazonia in South America



## Level 4: Answers

3.1415926535 8979323846 2643383279 5028841971 (gives pi)



(gives rational)

PINPWWPYE DELCE ALCE ZQ ESP LYDHPC TD ESP ZAAZDTEP ZQ ZFED

Then Caesar shift with key 11

EXCELLENT START PART OF THE ANSWER IS THE OPPOSITE OF OUTS (gives ins)

Three clues give: pi, rational, ins. Rearrange to get inspirational.