



KNOX
GRAMMAR
SCHOOL

STATE

DA VINCI DECATHLON 2019

CELEBRATING THE ACADEMIC GIFTS OF STUDENTS
IN YEARS 9, 10 & 11



CODE BREAKING - SOLUTIONS

TEAM NUMBER _____

1	2	3	4	5	6	7	Total	Rank
/18	/8	/8	/12	/12	/12	/20	/90	

QUESTION 1: PICTURE PERFECT

18 MARKS

Daily life seems, to most, unremarkable. Careful analysis, however, allows for observation of tiny details that provide a wealth of information. Detectives use these observations and deductive reasoning to decode the slight imbalances in an unremarkable landscape.

Below is an everyday idyllic holiday landscape. Observe closely and answer the questions on the first page of the Answer Sheet using only what you can see (1 mark each). For each question, also provide the observation you made to decode the image (1 mark) and where required on the answer sheet the deductive reasoning that led to the answer from that observation (1 mark).



QUESTION 2: DISPUTE ON THE GLOBAL LANDSCAPE

8 MARKS



The United Nations Security Council met for an urgent meeting. Across the international landscape, there were accusations of hacking. Ministers from the countries below made the following statements:

Germany: 'There has been deliberate hacking into our network. Our algorithm was altered and now the system computes that $1 + 2 = 8$. We believe it was the United States of America'

USA: 'That is a wild and untrue accusation. We were also hacked, and our system now processes that $2 + 2 = 6$. The French first made our software, so we think they used a backdoor to alter the system'

France: 'We have done no such thing. In fact, our system says $5 + 10 = 7$. We must be a victim too'

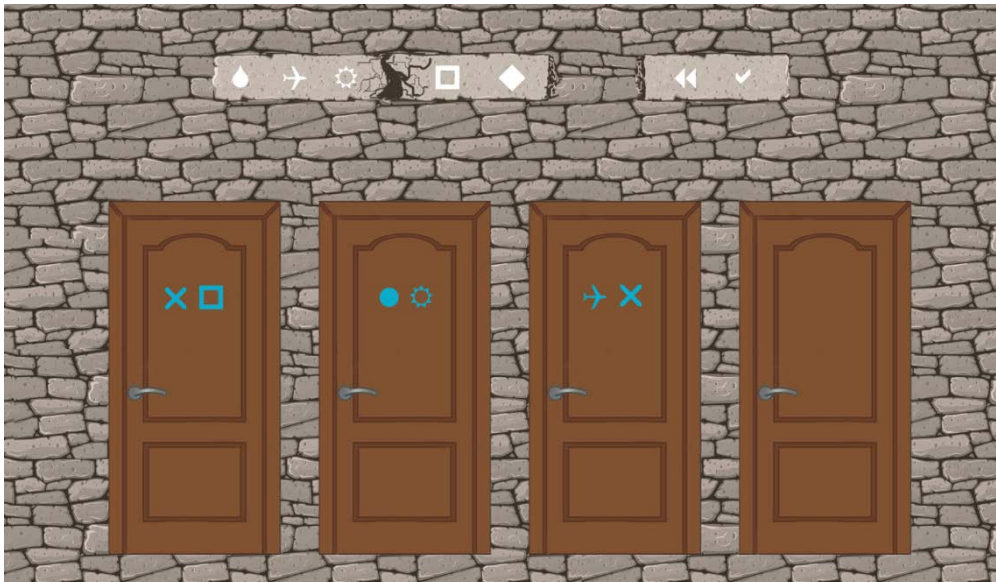
Japan: 'We too have the same problem; our system suggests $15 + 2 = 7$ '

The countries suspect it may in fact be a single independent hacker who has infiltrated systems globally. State the algorithm the virus is maliciously using to encrypt the information into non-sensical results. Then apply this to Germany, America and France.

QUESTION 3: A DARING ESCAPE

8 MARKS

A common landscape in films sees a protagonist facing 4 doors. One must be chosen. Three lead to less than desirable outcomes while one is a path to safety. Below is a similar landscape. There are four doors, three with codes of two symbols. There are 10 symbols available, but three have fallen of this ageing wall. Your task is to work out the two symbols that should be placed on the final door along with where the 'X' and '●' symbols should be placed in the symbol key.



QUESTION 4: SURREPTITIOUS SCRAMBLING

12 MARKS

For each of the questions below encode the new word and describe the encryption used.
Note that each part is separate and uses a different encryption!

- a) If APPLE is NINE and ORANGE is SEVEN, what is GRAPE? What is the encryption used?

- b) If CAR is TWO and TRAIN is THREE, what is FERRY?

- c) If SONG is ONE, SINGING is TWO and SUNG is ONE, what is HOCKEY?

QUESTION 5: A SEA OF DIGITS

12 MARKS

Below is a landscape of digits that appeared on a granite tablet.

```
3222312222444454555563335
3020310100302013030161002
3242301210325322252163432
3020300101302022030251021
3121322221334344343354545
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Hidden in this sea is a two-digit message. It is said that the digit landscape above is an advanced compression of a message in text that used to be divided on 5 long vertical columns that faced the sea. Now they are one sea of digits to remember the landscape that once was their home. What was the old message in text, and what is the two-digit message? Hint: A correct variation of the tablet has the bottom line as: 2121222221334344343354545

QUESTION 6: A SERENE SCENE

12 MARKS

Below is a cubist landscape of colour – from dark blue in the top left-hand corner, indigo and silver at the end of the first row, to gold in the second row and cream near the centre of the final row. The landscape contains a hidden message about a rule. What is the encrypted message? It is rumoured the message is about something in the image from Question 3.



QUESTION 7: FAMILIAR TERRAIN

20 MARKS

This concluding question contains a series of encrypted messages about landscapes.
Decrypt the codes and write your decryption on the answer sheet.

a) 2 0 22 33 2 88 8 999 0 444 7777 0 444 66 0 8 44 33 0 33 999 33 0
666 333 0 8 44 33 0 22 33 44 666 555 3 33 777 7777 0 7 44 666
66 33 0

b) A CKGVO HTWLKF D LJOJWSYD JRJFS, QYL HIGH
HJOISKSOC LL EAC XWWL N WZQUHEFO LVHK.

c) -. .-. .-. // -- --- ..- .- .- ..- .- // .- .- .- // - // -..... --..... -.-. -.-.
// .- .- .- // - // .- .- .- // --- ..- // .- .- .- // -.-. -.-. -.-. // ... -.-
. .- .-. .- -- //

d) Q TUIUHJ YI Q FBQSU MYJXEKJ UNFUSJQJYED

ANSWER SHEET

QUESTION 1

Note: deductions below are only suggestions, many are simple and overlap with observation.
1 mark for each row.

QUESTION	How many people are camping together?
ANSWER	Four
OBSERVATION	Four names on duty list OR 4 pieces of cutlery/plates

QUESTION	Did they arrive today, or a few days ago?
ANSWER	A few days ago
OBSERVATION	Spider's web on tent
DEDUCTION	This would take more than a few hours (particularly if during the day). Likely they arrived the day before today at the earliest.

QUESTION	How did they get there?
ANSWER	By boat
OBSERVATION	Ores left by the tree

QUESTION	Which direction is the wind blowing?
ANSWER	From the south
OBSERVATION	Flag direction and looking at trees, branches on one side are longer
DEDUCTION	Branches on south side of trees are normally longer, so the south is the direction that the flag is waving.

QUESTION	What time of day is it?
ANSWER	Morning
OBSERVATION	Shadow of Peter is behind him
DEDUCTION	Shows the sun is to their East = morning.


QUESTION	Where did Alex go?
ANSWER	Catching butterflies
OBSERVATION	Can see the butterfly net.

QUESTION	Who was on duty yesterday?
ANSWER	Colin
OBSERVATION	C on bag left person is holding; J on a bag against the tent with photography gear; Alex from previous question is catching butterflies
DEDUCTION	Today Colin and Alex must not be on duty. James is likely the one taking photos as his bag has photography gear inside. Peter is on duty today, so Colin was yesterday.

QUESTION 2

ENCRYPTION	Translates each number to the appropriate language then counts it letters (5 marks)
GERMANY	Eins + zwei = 8 (1 mark)
AMERICA	Two + two = 6 (1 mark)
FRANCE	cinq + dix = 7 (1 mark)

QUESTION 3

DOOR SYMBOLS	<p>Water drop, rewind symbol (3 marks for each)</p> <p>Working (not required):</p> <p>Make letters 0 to 9, then X4, Y2, 1X.</p> <p>This provides 64, 32 and 16.</p> <p>So 08 must be the next number = water drop, rewind symbol</p>
POSITION OF 'X'	7 th position from the left
POSITION OF 	4 th position from the left (first gap)

QUESTION 4

2 marks for answer, 2 marks for encryption description

(A)	EIGHT – scrabble score
(B)	4, consonants in words
(C)	1, number of words that have letter below the base line.

QUESTION 5

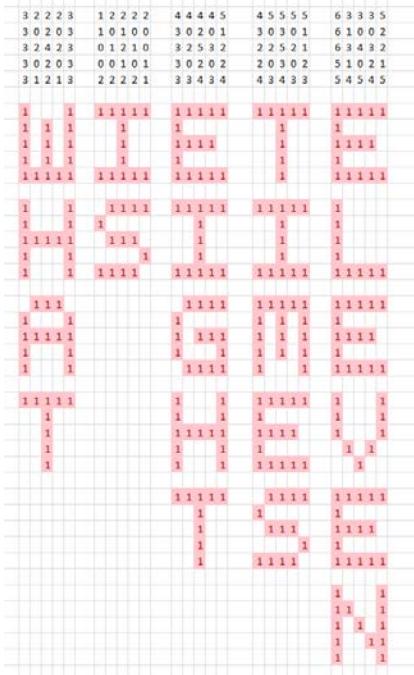
2 marks only if they split the code up correctly (5x5 squares)

6 marks if they then make progress with forming letters out of these numbers

THEN (in addition to the 6 marks above)

5 marks = one mark for each word (what, is, eight, times, eleven)

1 mark = 88 (total of 12 marks)

<p>MESSAGE IN TEXT</p>	<p>WHAT IS EIGHT TIMES ELEVEN</p>
<p>TWO-DIGIT MESSAGE</p>	<p>88</p>
<p>WORKING</p>	 <p>The image shows a grid of numbers from 0 to 9 at the top, followed by a grid of 1s. The 1s are arranged to form the words 'WHAT IS EIGHT TIMES ELEVEN' in a grid. The words are arranged in a 4x4 grid: 'WHAT' (row 1), 'IS' (row 2), 'EIGHT' (row 3), and 'TIMES ELEVEN' (row 4). The letters are formed by the 1s in the grid.</p>

QUESTION 6

Up to 6 marks awarded for progress (2 marks identifying and listing colours, 3 marks for identifying the letters of the colour names are determined by the row)

THEN (in addition to the 5 marks above)

7 marks = 1 mark for each word found, 1 mark for correct rearrangement to form the message

MESSAGE	RULE IS ALL OLD DOORS ARE DECAYED
WORKING	<p>Write all the colour names out.</p> <p>Row = letter to choose of the colour name.</p> <p>DOORS IS</p> <p>ALL ARE</p> <p>OLD RULE</p> <p>DECAYED</p> <p>They then reorder these words to form the message.</p> <p>Colours:</p> <p>RED, ORANGE, YELLOW, GREEN, BLUE , PINK, PURPLE, BLACK</p> <p>GREY, WHITE, BROWN, CREAM, SILVER, GOLD, INDIGO, DARK BLUE</p>

QUESTION 7

5 marks for each code. 1 mark off for each word that contains an error.

(A)	BEAUTY IS IN THE EYE OF THE BEHOLDER'S PHONE (mobile phone traditional format – press number twice to reach the letter)
(B)	A PHOTO SPEAKS A THOUSAND WORDS, BUT WITH PHOTOSHOP IT CAN TELL A THOUSAND LIES (key cipher, key = landscapes)
(C)	MOUNTAINS ARE THE BEGINNING AND THE END OF ALL NATURAL SCENERY (morse)
(D)	A DESERT IS A PLACE WITHOUT EXPECTATION (Caesar shift A= Q).