Stewards Academy

ICT KS3 Year 7 Spring 1 Blended Learning Booklet

Name:

Form:

Aim to complete one lesson each week. Write out the title and LI and then complete the tasks.

The Knowledge Organiser on page 4 and 5 have some key information and vocabulary to help you with this unit.

Upload all work onto ClassCharts for feedback.

Contents

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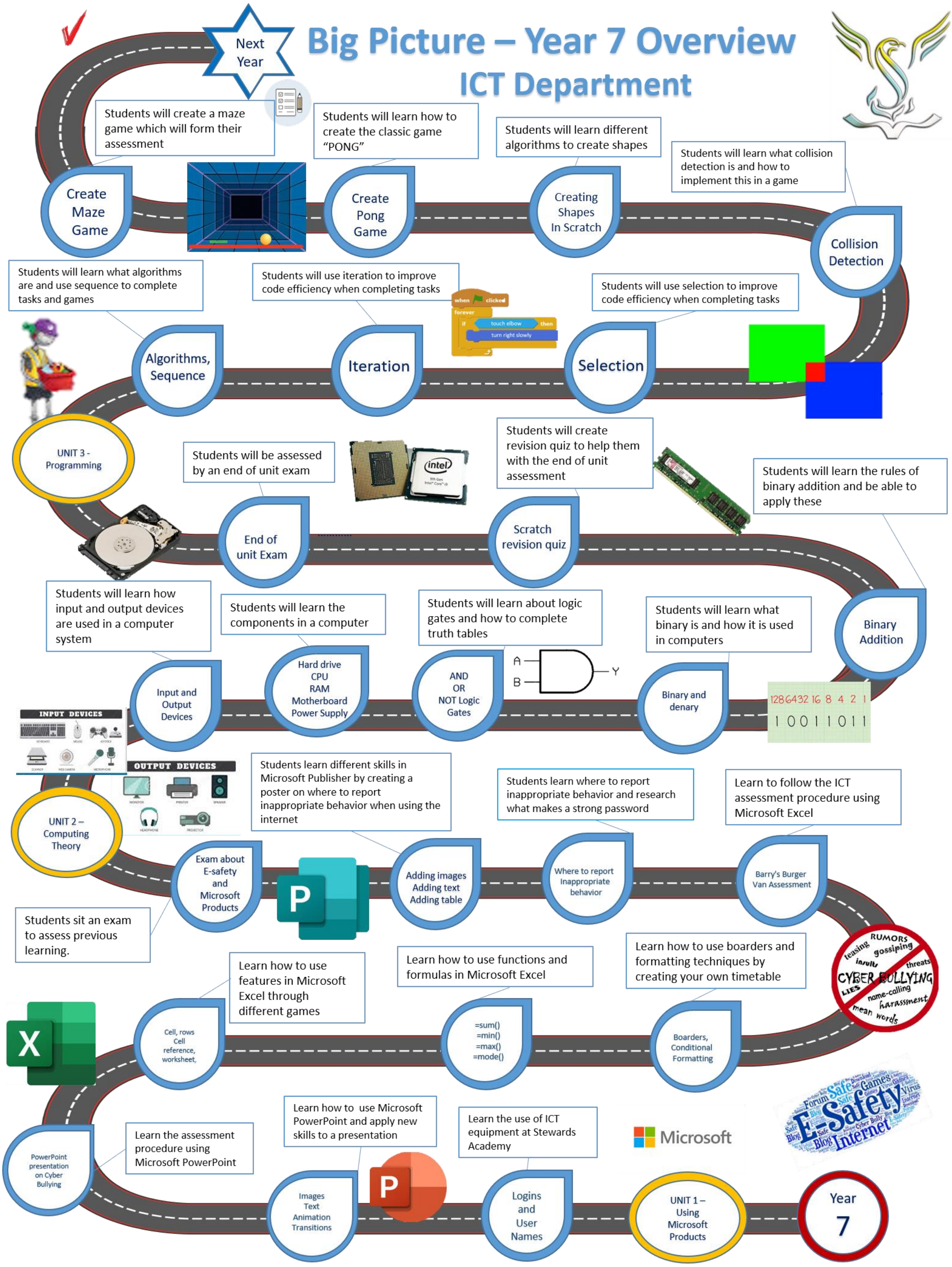


KS3 Knowledge Organiser - Computing

Binary

As computers only understand 1s and 0s, all data must be converted into binary to be processed. Binary can be used to represent all numbers in our standard number system. (base 2)

128	64	32	16	8	4	2	1
1	0	0	1	1	0	1	1

128 + 0 + 0 + 16 + 8 + 0 + 2 + 1 = 155

Binary Numbers are easier to Convert using Tables

Drawing a table with binary place values in the first row makes binary to denary conversion easier.

EXAMPLE: Convert the 8-bit binary number 00110101 to a denary number.

1) Draw up a table with binary place values in the top row. Start with 1 at the right, then move left, doubling each time.

128	64	32	16	8	4	2	1
0	0	1	1	0	1	0	1

Each column is just a power of 2, i.e. 2^3, 2^2, 2^1, 2^0.

2) Write the binary number 00110101 into your table.
3) Add up all the numbers with a 1 in their column: 32 + 16 + 4 + 1 = 53

So 00110101 is 53 in denary.

This works with all binary numbers — just draw as many columns as you need, doubling each time.

8-bit numbers can represent the denary numbers 0-255. 16-bit numbers can show the numbers 0-65535, and 32-bit can show the numbers 0-4294967295.

Convert Denary to Binary by Subtracting

When converting from denary to binary, it's easier to draw a table of binary place values, then subtract them from largest to smallest. Have a look at this example:

EXAMPLE: Convert the denary number 79 into an 8-bit binary number.

1) Draw an 8-bit table.
2) Move along the table, only subtracting the number in each column from your running total if it gives a positive answer.
3) Put a 1 in every column that gives a positive answer, and a 0 in the rest.

128	64	32	16	8	4	2	1
0	1	0	0	1	1	1	1

~~79 − 128 = −49~~ 79 − 64 = 15 ~~15 − 32 = −17~~ ~~15 − 16 = −1~~ 15 − 8 = 7 7 − 4 = 3 3 − 2 = 1 1 − 1 = 0

So 79 converted to an 8-bit binary number is 01001111.

There are other methods to convert denary to binary, so just choose the one you are most comfortable with.

Denary/ Decimal

Decimal is the number systems humans use. In our standard number system we have ten different digits. (0,1,2,3,4,5,6,7,8,9) (Base 10)

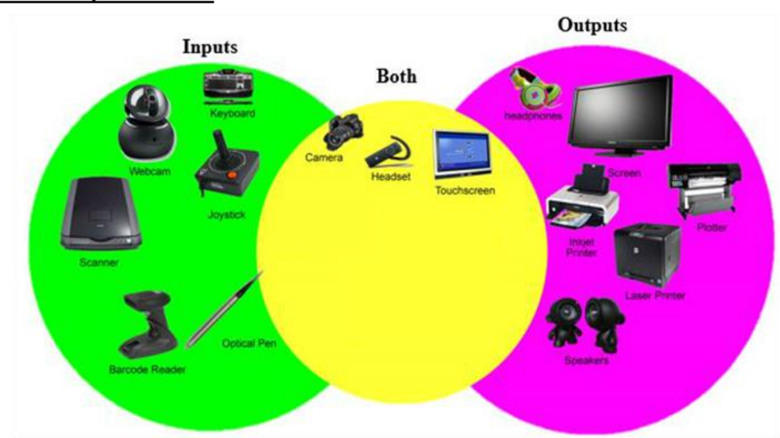
BINARY
IT'S AS
EASY AS
01 10 11

Hexadecimal Numbers

Hexadecimal is another number system used regularly in programming. Hex uses a combination of digits and letters in order to represent a number.

Denary	Hex	Binary	Denary	Hex	Binary
0	0	0000	8	8	1000
1	1	0001	9	9	1001
2	2	0010	10	A	1010
3	3	0011	11	B	1011
4	4	0100	12	C	1100
5	5	0101	13	D	1101
6	6	0110	14	E	1110
7	7	0111	15	F	1111

Input and Output Devices



KS3 Knowledge Organiser - Computing

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Logic Gates

Logic gates take binary information and give an output based on the Boolean operations (NOT, AND, OR)

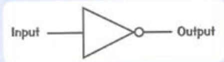
- Logic gate a special circuits built onto computer chips
- Each Logic gates has a corresponding truth table

NOT gate

1) NOT gates take a single input and give a single output.
2) The output is always the opposite value to the input. If 1 is input, it outputs 0. If 0 is input, it outputs 1.

It can help to think of 1s as TRUE and 0s as FALSE.

NOT gate symbol



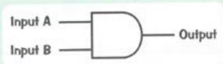
NOT truth table

Input	Output
0	1
1	0

AND gate

1) AND gates take two inputs and give one output.
2) If both inputs are 1, the output is 1, otherwise the output is 0.

AND gate symbol



AND truth table

Input A	Input B	Output
0	0	0
0	1	0
1	0	0
1	1	1

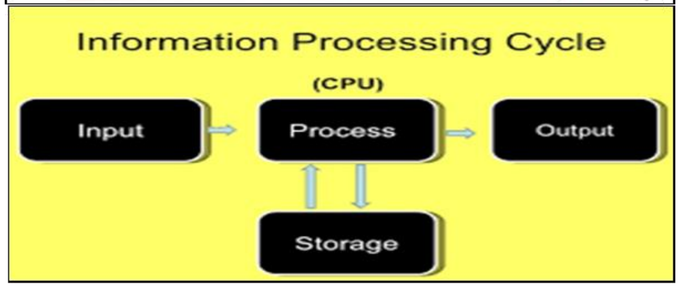
OR gate

1) OR gates take two inputs and give one output.
2) If one or more inputs are 1, then the output is 1, otherwise the output is 0.

OR gate symbol

OR truth table

Input A	Input B	Output
0	0	0
0	1	1
1	0	1
1	1	1



Cloud Computing

Hosting is where a business uses its servers to store files for another person or organisation.

A recent use of internet is for general storage of user files and also providing online software. This is cloud computing, or simply 'The Cloud'.

Cloud storage has some pros and cons.

Pros of the cloud

- Users can access files from any connected device.
- Easy to increase how much storage is available
- No need to buy expensive hardware to store data.
- No need to pay IT staff to manage the hardware.
- Cloud host provides security and back ups for you.
- Cloud software will be updated automatically.

Cons of the cloud

- Need connection to the Internet to access files.
- Dependent on host for security and back-ups.
- Data in the cloud can be vulnerable to hackers.
- Unclear who has ownership over cloud data.
- Subscription fees for using cloud storage and software may be expensive.

Components in a PC

Power Supply Unit(PSU): There is a PSU Inside every computer that provides its power.

Hard Drive: A hard disk is a magnetic storage device for digital data.

RAM: RAM is the memory to store computer programs whilst they are running.

CPU: A CPU (Central Processing Unit) is the core of every Personal Computer. Without it, no PC can function.

Motherboard: The Motherboard is the main printed circuit board in the computer.

ROM: Rome tells the CPU how to boot up.

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Lesson 1

LI: Understand how to convert binary to denary

DART

Binary Numbers

Computers only process binary data, which means that all data is stored, and calculations are done, just using 0s and 1s. But luckily, you can convert binary numbers into normal (decimal) numbers.

Counting in Binary is Similar to Counting in Decimal

Here, 'decimal' is talking about the number system, not a decimal number like 2.5.

1) Our standard number system has ten different digits (0, 1, 2, 3, 4, 5, 6, 7, 8, 9). This is called decimal, denary or base-10.
2) The place values from right to left increase by powers of 10 (e.g. 1000, 100, 10, 1).
3) Binary only uses two different digits (0 and 1) — we call this base-2.
4) So in binary, the place values from right to left increase by powers of 2 (e.g. 8, 4, 2, 1).
5) The box on the right shows the decimal numbers 0-15 and their matching binary values.

0	=	0	8	=	1000
1	=	1	9	=	1001
2	=	10	10	=	1010
3	=	11	11	=	1011
4	=	100	12	=	1100
5	=	101	13	=	1101
6	=	110	14	=	1110
7	=	111	15	=	1111

Play the game below – Follow the link

https://learningcontent.cisco.com/games/binary/index.html

Convert Binary Numbers to Decimal Using a Table

Using tables can help you quickly convert numbers from binary to decimal.

EXAMPLE: **Convert the 4-bit binary number 1001 into a decimal number.**

1) Draw a table with binary place values in the top row and the binary number in the bottom row.
2) Write down the powers of 2 that have a 1 in their column. In this case it's 8 and 1.
3) Add these values together to find the decimal number.

8	4	2	1
1	0	0	1

8 + 1 = **9**

For longer binary numbers, use the same method. You'll just need to add more columns.

EXAMPLE: **Convert the 8-bit binary number 01011001 into a decimal number.**

1) Draw up the table in the same way, but with 8 columns. Put powers of 2 in the top row and the binary number in the bottom row.
2) Write down the powers of 2 that have a 1 in their column: 64, 16, 8 and 1.
3) Add these values together to find the decimal number.

128	64	32	16	8	4	2	1
0	1	0	1	1	0	0	1

64 + 16 + 8 + 1 = **89**

Binary to Denary Workbook

In this workbook, you will be asked to calculate denary numbers from their binary equivalent. Fill out the missing boxes on each table.

The first row are the position values

The second row is where the binary number is entered

The third row is the calculation, where the two are multiplied together

The fourth is the result

The fifth is where you work out the denary equivalent of your starting binary number.

Example 1: binary number = 00000011

128	64	32	16	8	4	2	1
0	0	0	0	0	0	1	1
128 * 0	64 * 0	32 * 0	16 * 0	8 * 0	4 * 0	2 * 1	1 * 1
0	0	0	0	0	0	2	1
Answer	2 + 1 = **3**						

Example 2: binary number = 00001011

128	64	32	16	8	4	2	1
0	0	0	0	1	0	1	1
128 * 0	64 * 0	32 * 0	16 * 0	8 * 1	4 * 0	2 * 1	1 * 1
0	0	0	0	8	0	2	1
Answer	8 + 2 + 1 = **11**						

Task 1: binary number = 00001111

128	64	32	16	8	4	2	1
0	0	0	0	1	1	1	1
128 * 0	64 * 0	32 * 0	16 * 0	8 * 1	4 * 1	2 * 1	1 * 1
Answer							

Task 2: binary number = 00101010

128	64	32	16	8	4	2	1
0	0	1	0	1	0	1	0
128 * 0	64 * 0	32 * 1	16 * 0	8 * 1	4 * 0	2 * 1	1 * 0
Answer							

Task 3: binary number = 01011011

128	64	32	16	8	4	2	1
0	1	0	1	1	0	1	1
128 *	64 *	32 *	16 *	8 *	4 *	2 *	1 *
Answer							

Task 4: binary number = 00101101

128	64	32	16	8	4	2	1
Answer							

Task 5: binary number = 11001100

128	64	32	16	8	4	2	1
Answer							

Task 6: binary number = 11100010

128	64	32	16	8	4	2	1
Answer							

Task 7: binary number = 01101001

128	64	32	16	8	4	2	1
Answer							

Task 8: binary number = 00010001

128	64	32	16	8	4	2	1
Answer							

Task 9: binary number = 10000101

128	64	32	16	8	4	2	1
Answer							

Task 10: binary number = 00100111

128	64	32	16	8	4	2	1
Answer							

Task 11: binary number = 11101110

128	64	32	16	8	4	2	1
Answer							

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Lesson 2

LI: to understand how to convert denary to binary

Opening question?

Have we done this before?

Play the game below – Follow the link

https://learningcontent.cisco.com/games/binary/index.html

We have converted denary to binary in the game we played last lesson. Spend 5 minutes playing the game again to refresh your memory.

DART

Binary Numbers

Now it's time to learn how to convert the other way — from decimal numbers to binary numbers.

Convert Decimal to Binary by Subtracting

The easiest way to learn the method here is to look at an example:

EXAMPLE:

Convert the decimal number 71 into an 8-bit binary number.

128	64	32	16	8	4	2	1
0	1	0	0	0	1	1	1
128>71	71-64=7	32>7	16>7	8>7	7-4=3	3-2=1	1-1=0

1) Draw a table with 8 columns. Put powers of 2 in the top row.
2) 71 is the running total that you subtract numbers from.
3) Starting from the left of the table, if the top row value is less than or equal to the running total, then subtract it from the running total. E.g. 128 > 71, so the running total stays at 71. In the next column, 64 < 71 so 71 – 64 = 7 is the new running total.
4) Put a 1 in any column where you subtracted from the running total.
5) Then read off the binary number from the bottom row of the table.

So 71 as a binary number is **01000111**.

Denary to Binary Workbook

Example:

128	64	32	16	8	4	2	1
0	0	0	0	0	0	1	1

Example	Denary = 3
Answer in binary	00000011
Calculation for answer	(1 * 1) + (2 * 1) = 3

Task 1:

128	64	32	16	8	4	2	1
0	0	0	0	0	1	1	0

Task 1	Denary = 6
Answer in binary	
Calculation for answer	(2*1) + (4*1) = 6

Task 2:

128	64	32	16	8	4	2	1

Task 2	Denary = 15
Answer in binary	
Calculation for answer	

Task 3:

128	64	32	16	8	4	2	1

Task 3	Denary = 21
Answer in binary	
Calculation for answer	

Task 4:

128	64	32	16	8	4	2	1

Task 4	Denary = 39
Answer in binary	
Calculation for answer	

Task 5:

128	64	32	16	8	4	2	1

Task 5	Denary = 54
Answer in binary	
Calculation for answer	

Task 6:

128	64	32	16	8	4	2	1

Task 6	Denary = 78
Answer in binary	
Calculation for answer	

Task 7:

128	64	32	16	8	4	2	1

Task 7	Denary = 99
Answer in binary	
Calculation for answer	

Task 8:

128	64	32	16	8	4	2	1

Task 8	Denary = 106
Answer in binary	
Calculation for answer	

Task 9:

128	64	32	16	8	4	2	1

Task 9	Denary = 180
Answer in binary	
Calculation for answer	

Task 10:

128	64	32	16	8	4	2	1

Task 10	Denary = 200
Answer in binary	
Calculation for answer	

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Lesson 3

LI: to understand the rules of binary addition

DART

Add Binary Numbers Using Column Addition

1) Adding binary numbers may look a bit strange at first. This is because you cannot have the number 2 in binary.
2) To help you add in binary, you need to remember these four rules.
3) The example below shows how to do column addition in binary.

- 0 + 0 = 0
- 1 + 0 = 1
- 1 + 1 = 10
- 1 + 1 + 1 = 11

EXAMPLE: **Add the following 4-bit binary numbers together: 0110 and 0111**

```
    0  1  1  0
 +  0  1  1  1
 -------------
    1  1  0  1
 -------------
    1  1
```

1) First, put the binary numbers into columns.
2) Starting from the right, add the numbers in each column together, using the rules above.

0 + 1 = 1, so put a 1 on the answer line.

1 + 1 = 10, so put a 0 on the answer line and carry the 1 into the next column.

1 + 1 + the carried 1 = 11, so write a 1 on the answer line, and carry a 1.

0 + 0 + the carried 1 = 1, so write a 1 on the answer line.

3) You can check that you have the correct answer by converting everything into decimal and adding them: 0110 = 6, 0111 = 7 and 1101 = 13. 6 + 7 = 13 ✓

Adding Binary Numbers Workbook

Rules

0 + 0 = 0

0	+
0	
=0	

0 + 1 = 1

0	+
1	
=1	

1 + 1 = 10

1	+
1	
=10	

1 + 1 + 1 = 11

1	+
1	
=11	

Example

0	0	0	1	1	1	0	1
1	0	0	1	1	0	1	1
		1	1	1	1	1	
1	0	1	1	1	0	0	0

Row 1 and 2 contains the binary numbers to be added

Use Row 3 to mark where numbers were "carried over" from the last column

Put your final answer to the question in Row 4

Task 1: 01111101 + 01100010

0	1	1	1	1	1	0	1
0	1	1	0	0	0	1	0

Task 2: 11010010 + 00000110

1	1	0	1	0	0	1	0
0	0	0	0	0	1	1	0

Task 3: 01100110 + 00100001

0	1	1	0	0	1	1	0
0	0	1	0	0	0	0	1

Task 4: 10101010 + 01000111

1	0	1	0	1	0	1	0
0	1	0	0	0	1	1	1

Task 5: 10110001 + 00011010

1	0	1	1	0	0	0	1
0	0	0	1	1	0	1	0

Task 6: 00011101 + 10001011

0	0	0	1	1	1	0	1
1	0	0	0	1	0	1	1

Find the spy using binary addition

Top secret information has been stolen from a government database and you have just received a coded message which contains the location of the spy. To decrypt the message add up the binary numbers below and convert the results into denary (base 10).
Then go onto the second page and find the letter for each number. This will spell out the location of the spy.

Remember 0+0 =0, 1+0 =1, 0+1=1, 1+1= (carried) 1 0

  00010011
\+ 00000001
____

Converted into denary = ☐

  00000101
\+ 00100100
____

Converted into denary = ☐

  00010000
\+ 00010101
____

Converted into denary = ☐

  00011001
\+ 00011010
____

Converted into denary = ☐

  00011001
\+ 00010000
____

Converted into denary = ☐

Use the table to decrypt the message by writing the letter that is above the denary number you found from the binary sums above. Write each letter in the boxes below to reveal to location of the spy.

The spy and the data are in

A	B	C	D	E	F	G	H	I	J	K	L
1	2	3	4	5	6	7	8	9	10	11	12
M	N	O	P	Q	R	S	T	U	V	W	X
13	14	15	16	17	18	19	20	21	22	23	24
Y	Z	a	b	c	d	e	f	g	h	i	J
25	26	27	28	29	30	31	31	33	34	35	36
k	l	m	n	o	p	q	r	s	t	u	v
37	38	39	40	41	42	43	44	45	46	46	48
w	x	y	z	!	*	(	)	+	=	&	@
49	50	51	52	53	54	55	56	57	58	59	60

Lesson 4

Assessment lesson to see if you have understood Binary/ Denary and the rules associated to binary addition.