

# GCSE Computer Science

CPD Session for Leeds West Academy

**Leeds West Academy**

LEADING IN LEARNING



# Outline Plan

- ✦ Binary Representation
- ✦ Low level programming
- ✦ Von Neumann architecture & the CPU
- ✦ Networking and protocols

# Binary Numbers

## Numbers

- how to convert positive denary whole numbers (0–255) into 8 bit binary numbers and vice versa
- how to add two 8 bit binary integers and explain overflow errors which may occur
- binary shifts
- how to convert positive denary whole numbers (0–255) into 2 digit hexadecimal numbers and vice versa
- how to convert from binary to hexadecimal equivalents and vice versa
- check digits.

# Binary --> Denary

8	4	2	1
0	1	1	0

# Binary --> Denary

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

# Denary --> Binary

$$173 - 128 = 45$$

$$45 - 32 = 13$$

$$13 - 8 = 5$$

$$5 - 4 = 1$$

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

# Binary Addition

$$\begin{array}{r} 01001111 \\ 01100110 \end{array}$$

# Binary Addition

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



# Binary Addition

$$\begin{array}{r} 11001111 \\ 01100110 \end{array}$$

# Binary Addition

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

# Binary Shifts

190

Left shift <-- 1900

Right shift --> 19

# Binary Shifts

0110

Left shift <-- 1100

Right shift --> 0011

# Binary Shifts

0110 6

x2 Left shift <-- 1100 12

÷2 Right shift --> 0011 3

# Hexadecimal

0000 - 1111  
0 - 15

# Hexadecimal

0

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

# Hexadecimal

0	0	6	6	12	C
1	1	7	7	13	D
2	2	8	8	14	E
3	3	9	9	15	F
4	4	10	A		
5	5	11	B		



# Hexadecimal

1101

1110

0110

1010

13

14

6

10

D

E

6

A

# Hexadecimal

222

106

1101 1110

0110 1010

13 14

6 10

D E

6 A

# Comparing number systems

## Binary

Base 2

Good for computers

Hard for humans to remember

## Denary

Base 10

Good for humans

Time consuming for computers to decode

## Hexadecimal

Base 16

Easier for humans to remember than binary

Quicker for computers to decode than denary

# Check digits

Waiting on clarification from OCR

Even Parity - an even number of 1s

0 1 1 1 0 1 1 (59)

Odd number of 1s so add a 1 to the start

1 0 1 1 1 0 1 1

# Check digits

Waiting on clarification from OCR

Transmitted data:

1 1 1 1 1 0 1 1

An odd number of 1s

It must be wrong - resend!

# Questions

Using EVEN parity - complete these packets:

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

Using EVEN parity - check these packets:

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