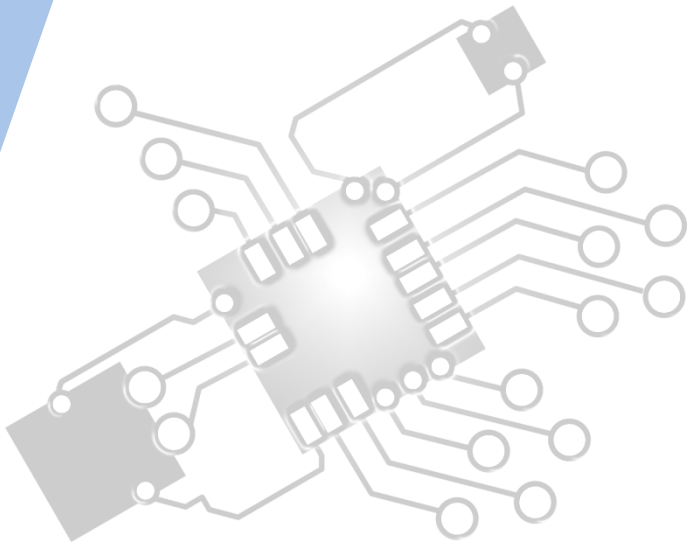




# Computer Organisation

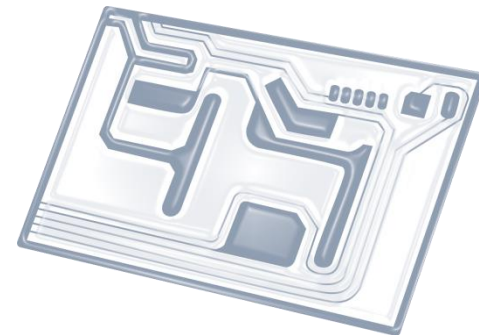
IB Computer Science



Content developed by  
**Dartford Grammar School**  
Computer Science Department



# HL Topics 1-7, D1-4



1: System design



2: Computer Organisation



3: Networks



4: Computational thinking



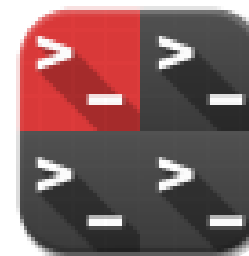
5: Abstract data structures



6: Resource management



7: Control



D: OOP

# HL & SL 2 Overview

## Computer architecture

2.1.1 Outline the architecture of the central processing unit (CPU) and the functions of the arithmetic logic unit (ALU) and the control unit (CU) and the registers within the CPU

2.1.2 Describe primary memory. 2 Distinguish between random access memory (RAM) and read-only memory (ROM), and their use in primary memory

2.1.3 Explain the use of cache memory

2.1.4 Explain the machine instruction cycle

## Secondary memory

2.1.5 Identify the need for persistent storage

Operating systems and application systems

2.1.6 Describe the main functions of an operating system

2.1.7 Outline the use of a range of application software

2.1.8 Identify common features of applications

## Binary representation

2.1.9 Define the terms: bit, byte, binary, denary/decimal, hexadecimal

2.1.10 Outline the way in which data is represented in the computer

## Simple logic gates

2.1.11 Define the Boolean operators: AND, OR, NOT, NAND, NOR and XOR

2.1.12 Construct truth tables using the above operators

2.1.13 Construct a logic diagram using AND, OR, NOT, NAND, NOR and XOR gates



1: System design

2: Computer Organisation



3: Networks

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5: Abstract data structures

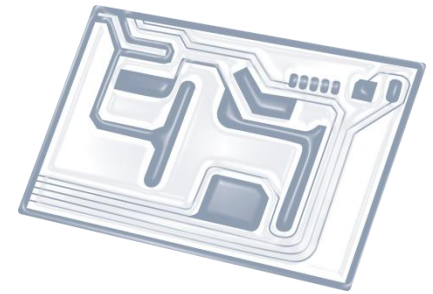
6: Resource management



7: Control

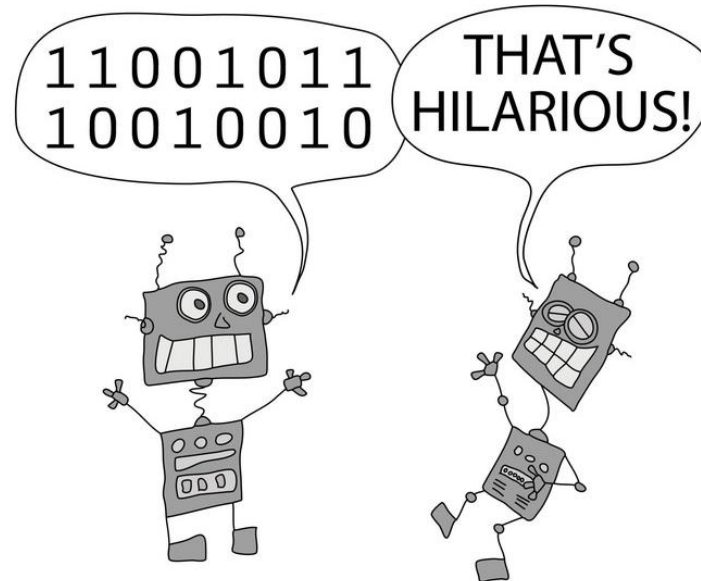
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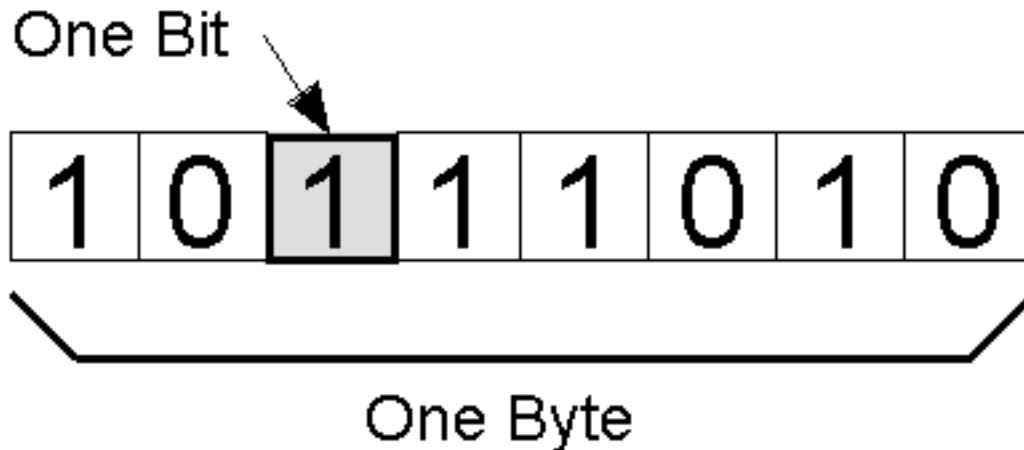
# Topic 2.1.9

Define the terms: **bit**, **byte**, **binary**, **denary/decimal** and **hexadecimal**



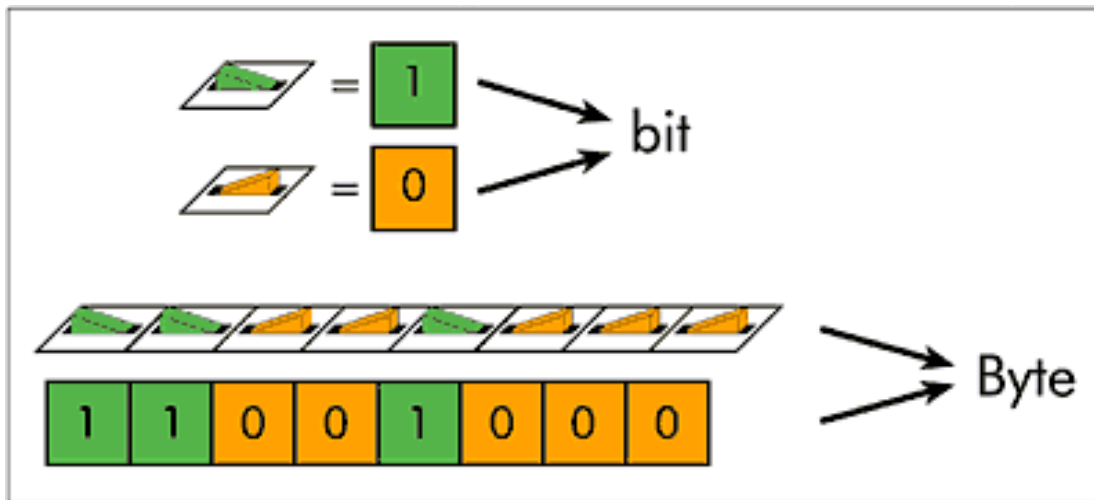
# Definition: **bit**

Computers use binary - the digits 0 and 1 - to store data. A **binary digit**, or **bit**, is the **smallest unit of data** in computing. It is represented by a 0 or a 1.



# Definition: **byte**

Bits can be grouped together to make them easier to work with. A **group of 8 bits** is called a **byte**.



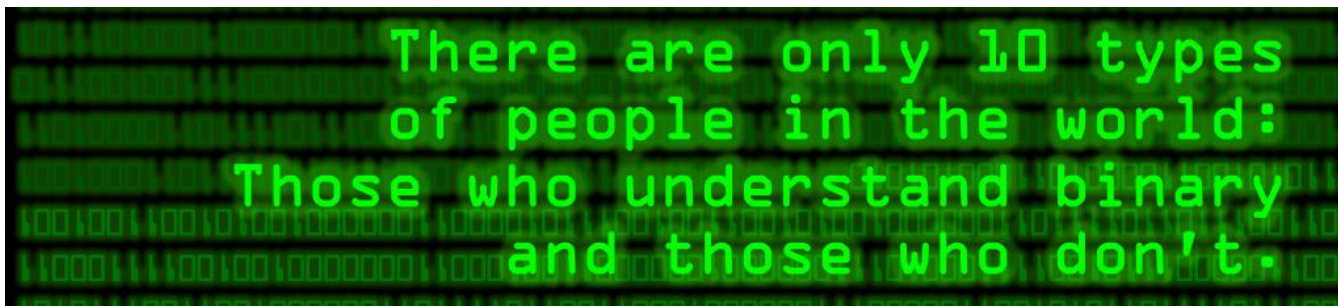
Multiples of byte		
SI decimal prefixes		Binary usage
Name (Symbol)	Value	
kilobyte (kB)	$10^3$	$2^{10}$
megabyte (MB)	$10^6$	$2^{20}$
gigabyte (GB)	$10^9$	$2^{30}$
terabyte (TB)	$10^{12}$	$2^{40}$
petabyte (PB)	$10^{15}$	$2^{50}$
exabyte (EB)	$10^{18}$	$2^{60}$
zettabyte (ZB)	$10^{21}$	$2^{70}$
yottabyte (YB)	$10^{24}$	$2^{80}$

# Common byte storage capacities

Data	Storage
One extended-ASCII character in a text file (eg 'A')	1 byte
The word 'Monday' in a document	6 bytes
A plain-text email	2 KB
64 pixel x 64 pixel GIF	12 KB
Hi-res 2000 x 2000 pixel RAW photo	11.4 MB
Three minute MP3 audio file	3 MB
One minute uncompressed WAV audio file	15 MB
One hour film compressed as MPEG4	4 GB

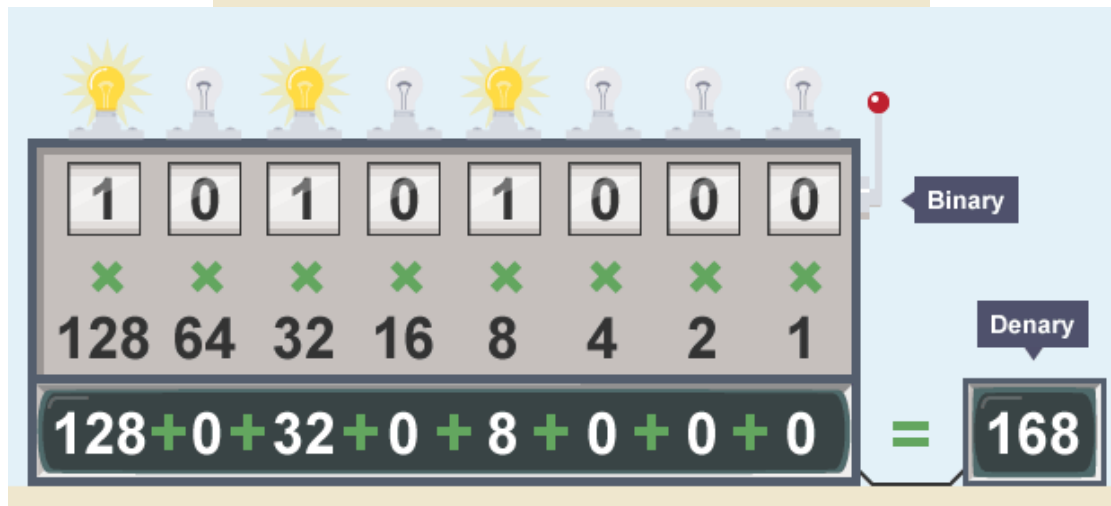
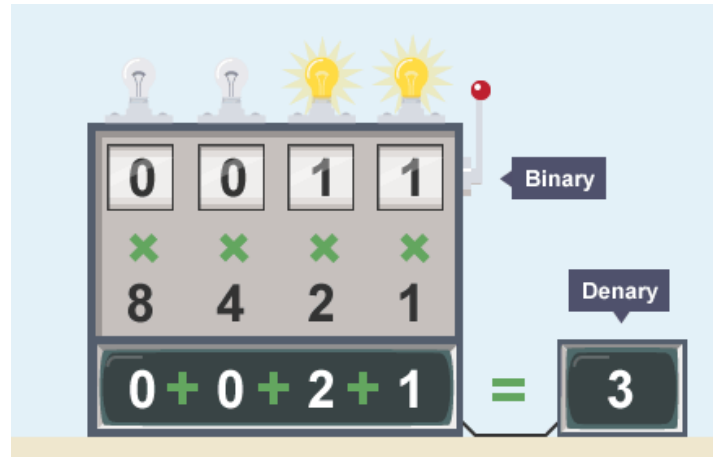
# Definition: **binary**

- Computers use binary - the **digits 0 and 1** - to store data.
- Because it only has 2 symbols (0 & 1) it is also called **BASE-2** numbering
- Binary also refers to the format in which numbers are transmitted and calculated in a computer system.





# Relationship between 'normal' numbers (denary) and binary



# How to convert from **binary** to **denary**:

<b>Binary:</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>
<b>Decimal:</b>	128	64	32	16	8	4	2	1
	No	Yes	Yes	No	No	Yes	No	Yes
		64 + 32			+	4	+	1

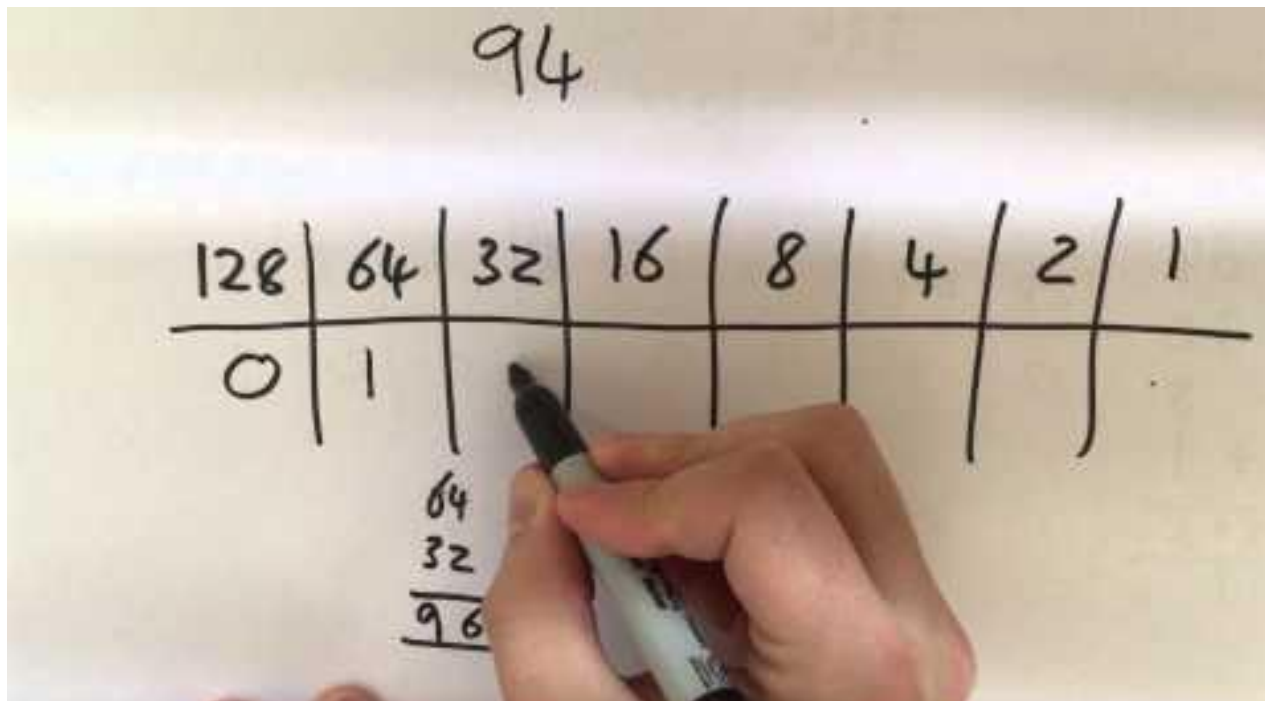
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**Decimal Equivalent: 101**

# Definition: **denary** / decimal

Denary is a **numbering system** with **10 symbols**: 0123456789

It is, therefore, often referred to as **BASE-10** numbering.



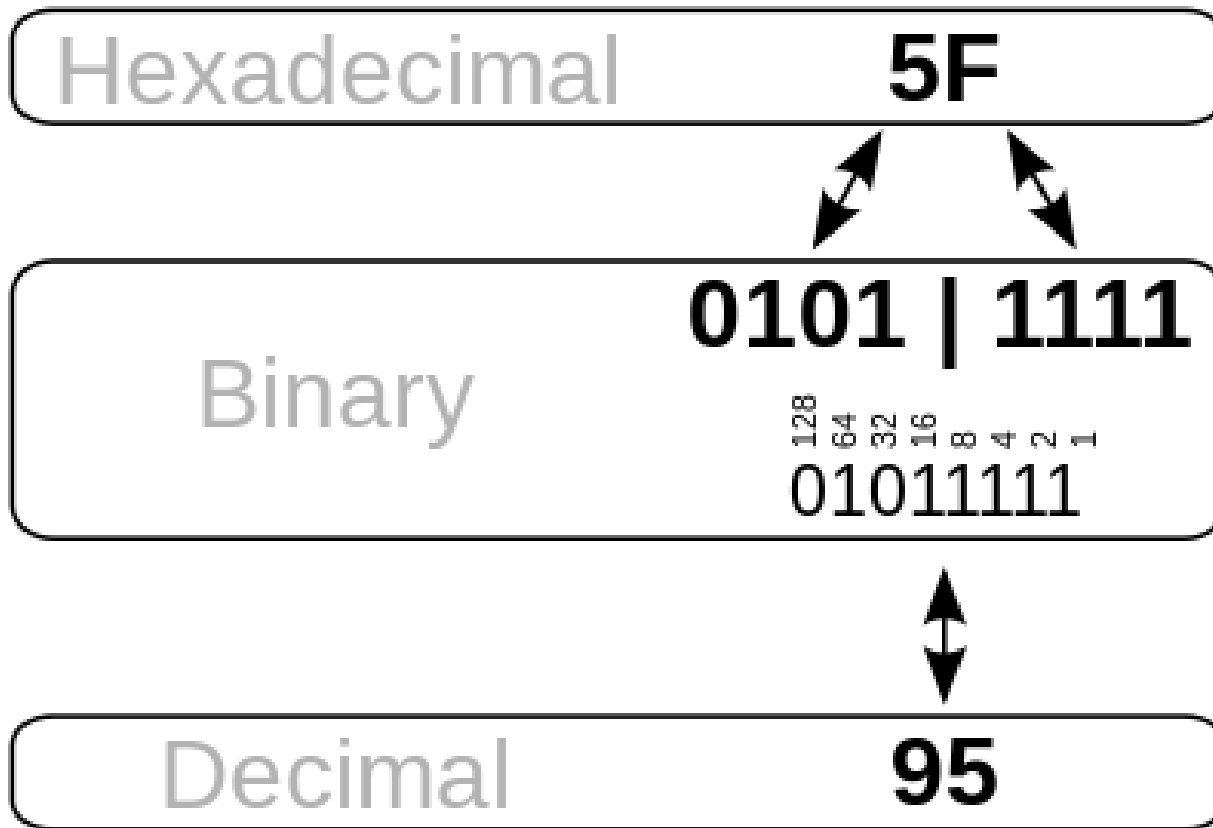
# Definition: hexadecimal

- Hexadecimal is a **numbering system** with **16 symbols**:

0123456789ABCDEF

- It is, therefore, often referred to as **BASE-16** numbering.
- Hex, as it is often called, is used to represent very large numbers quickly, such as those used in **colour representation**.

# Hexadecimal to Denary



# Binary to Hexadecimal

