

# 1: Yr 9 Computer Science: Bits, Bytes, Binary

## Binary to Denary:

Method: 8 Bit Scale (128, 64, 32, 16, 8, 4, 2, 1)

Example with workings:

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

$$32+8+2+1 = 43$$

## Denary to Binary:

Method: 8 Bit Scale (128, 64, 32, 16, 8, 4, 2, 1)

Example with workings:

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

$$99 - 64 = 35 - 32 = 3 - 2 = 1 - 1 = 0$$

## Binary to Hexadecimal:

Method: 2 Nibbles (8,4,2,1, 8,4,2,1)

Example with workings:

|   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|
| 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 |

$$8+2+1=11 = B \quad 8+1=9 = 9 \quad \text{so Hex } B9$$

## Hexadecimal to Binary:

Method: 2 Nibbles (8,4,2,1, 8,4,2,1)

Example with workings:

|   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|
| 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 |

Hex AD = 10 13, put 10 in first nibble, 13 in second nibble

## Denary to Hexadecimal:

Method: Divide /

Example with workings:

$$106 / 16 = 6 \text{ r } 10 \text{ so in Hex } = 6A$$

So 106 Denary is 6A Hex

## Hexadecimal to Denary:

Method: multiply \*

Example with workings:

$$AF = 10 \quad 15$$

$$10 * 16 = 160 \quad 15 * 1 = 15$$

$$160 + 15 = 175 \quad \text{so AF Hex is 175 Denary}$$

## Biggest Numbers & Combinations:

**2Bits:** Number 3      Combinations 4

**4bits:** Number 15      Combinations 16

**6Bits:** Number 63      Combinations 64

**8Bits:** Number 255      Combinations 256

**Capacity Scale** (Smallest to Largest, with how many bits or bytes in each):

|          |                                           |
|----------|-------------------------------------------|
| Bit      | 1 bit                                     |
| Nibble   | 4 bits                                    |
| Byte     | 8 bits                                    |
| Kilobyte | 1024 bytes (1000 for maths calculations)  |
| Megabyte | 1024 kbytes (1000 for maths calculations) |
| Gigabyte | 1024 mbytes (1000 for maths calculations) |
| Terabyte | 1024 gbytes (1000 for maths calculations) |

## 2 Bit Binary Grid:

|   |   |
|---|---|
| A | B |
| 0 | 0 |
| 0 | 1 |
| 1 | 0 |
| 1 | 1 |

## 3 Bit Binary Grid:

|   |   |   |
|---|---|---|
| A | B | C |
| 0 | 0 | 0 |
| 0 | 0 | 1 |
| 0 | 1 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 0 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |
| 1 | 1 | 1 |

## Why computers use Binary?

Computers use Binary which uses 0s and 1s as computer operate using electricity which is either on or off. This state of on or off can be represented using 0 and 1. This means we can type binary code to program the computer.

## Competencies:

I can convert Binary to Denary

I can convert Denary to Hexadecimal

I can convert Hexadecimal to Binary

I can reverse convert the above 3

I can list the capacity scale smallest to largest

I can state combinations based on bits

I can state bits based on combinations

I can draw a 2 bit binary table

I can draw a 3 bit binary table

